City of Montgomery

CAPITAL OF DREAMS.

STATE OF ALABAMA
DART W. DAVIS 2767
RAY E. WILLIAMS 4239
JOHNNY B. RAINES, III 7127
REGISTERED ARCHITECTS

PROJECT MANUAL

NEW FIRE STATION NO. 10
COURT STREET
MONTGOMERY, ALABAMA 36108

PROTECTING SINCE 1898 MONTGOMERY ALABAMA FIRE RESCUE

CITY PROJECT NO. SP-5-21

Prepared by:
City of Montgomery
Montgomery, Alabama

ALABAMA REGISTERED No. 26988 PROFESSIONAL 1-16-2022 ENGINEER KENNETH RAY GUNN JR.
01-16-23

In Association with
BDW PROJECT NO. 2021-118

MAY 17, 2023

ALABAMA LICENSED No. 33812 PROFESSIONAL ENGINEER JUAN PABLO GACHA
11.15.2022

Barganier
Davis
Williams
Architects
Associated

bdw

ALABAMA LICENSED No. 23369 PROFESSIONAL 01.16.23 ENGINEER J. R. EIRING
01-16-23

STATE OF ALABAMA LORI LOUISE MURASKI NUMBER 506 REGISTERED LANDSCAPE ARCHITECT
01-16-23

ALABAMA REGISTERED No. 30036 PROFESSIONAL ENGINEER JACK W. DANIELS, III
1-16-23

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Montgomery, AL 36104

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05/17/2023
CONFORMANCE DOCUMENTS

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Court Street Montgomery, Alabama 36108
City of Montgomery Project No. SP-5-21 **BDW Project No.: 2021-118**

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ADDENDUM NO. 1 - Tuesday, December 27, 2022

FROM: Barganier Davis Williams Architects Associated
624 South McDonough Street, Montgomery, Alabama 36104

TO: **Bidders**

RE: **New Fire Station No. 10** for the City of Montgomery
South Court Street
Montgomery, Alabama 36104
City Project No: SP-5-21
BDW Project No: 2021 – 118

This Addendum forms a part of the Contract Documents dated December 15, 2022. If possible, this Addendum will be emailed to the bidders, vendors etc. who have requested the download link to access Construction Documents but note that it will be the responsibility of all bidders, vendors etc. to periodically verify with the architect for the latest Addendums issued prior to Bid Date.

GENERAL:

1. Refer to Advertisement for Bids and **disregard** the Pre-Bid and Bid dates. The Advertisement for Bids has been stopped. Revised Pre-Bid and Bid dates will be issued to all bidders when the revised Advertisement for Bids is updated.

END OF ADDENDUM NO. 1

Barganier Davis Williams Architects Associated bdw
624 South McDonough Street Montgomery, Alabama 36104
(334) 834-2038 www.bdwarchitects.com

ADDENDUM NO. 2 - Wednesday, February 15, 2023

FROM: Barganier Davis Williams Architects Associated
624 South McDonough Street, Montgomery, Alabama 36104

TO: **Bidders**

RE: **New Fire Station No. 10** for the City of Montgomery
South Court Street
Montgomery, Alabama 36104
City Project No: SP-5-21
BDW Project No: 2021 – 118

This Addendum forms a part of the Contract Documents dated February 02/02/2023. If possible, this Addendum will be emailed to the bidders, vendors etc. who have requested the download link to access Construction Documents but note that it will be the responsibility of all bidders, vendors etc. to periodically verify with the architect for the latest Addendums issued prior to Bid Date.

SPECIFICATIONS:

1. Bidders are to note that the entire current specifications are being deleted and see the attached DROPBOX link for new replacement specifications.
2. Refer to Section 012100 - Allowances and delete this section and insert the attached revised Section 012100 - Allowances.
3. Refer to Section 012300 - Alternates and delete this section and insert the attached revised Section 012300 - Alternates.

DRAWINGS:

1. Refer to Sheet T1.1 - Title Sheet, Drawing Index & Location Map.
   a. Delete reference on the Project Team to “Jacobs Engineering”. However, Contractors shall be aware, that the owner may employ a Program Manager as a representative of the City of Montgomery to oversee construction. Also, see revisions to Index to Drawings.

2. Refer to Sheet A0.2 - Wall Types and Partition Notes.
   a. At Wall Type D1/A0.2 revise note from “Pre-fabricated Wall System by DIRTT or approved equal, see Allowances “to Pre-fabricated Wall System - see Allowances.
   b.

3. Refer to Sheet A1.1 - Annotated Floor Plan.

a. See updated section mark 4/A5.1 and change to 5/A5.1.

4. Refer to Sheet A3.1 - Roof Plan.
   a. See attached revisions including the omitted roof drain east of entry tower.

5. Refer to attached Drawing A5.2 - Wall Sections.
   a. See updated Wall Section No. 4 to match structural drawings. Detail 4/A5.1 has been revised to 5/A5.1. See also revisions to Interior Elevation.

6. Refer to attached Drawing A6.1 - Door Schedule.
   a. See revision to Door Schedule - Door 156 N has been revised to 3'-0" wide.

7. Refer to Drawing A6.3 – Room Finish Schedule.
   a. References to "Epoxy Coating" at concrete floors refers to Specification Section 099600 - High Performance Coatings.
   b. Refer to Room No. 107 Dining and 108 Kitchen and note that contractor is to allow for a three-color floor pattern for LVT. Pattern to be provided by Architect.
   c. Refer to remarks No. 2; Revise "…Shower Wall" to …" All Shower Walls".

8. Refer to Drawing A6.4 – Head, Jamb and Sill Details.
   a. At Detail 1/A6.4 Provide U-Block lintel similar to that shown on 19/A6.4.

9. Refer to attached Drawing A6.5 - Head, Jamb and Sill Details.
   a. See added door Jamb Detail #9 for Door No. 156N.

10. Refer to attached Drawing A7.1 - Toilet Plans.
    a. Detail B/A7.1 has added apron under EWC. Coordinate with Plumbing contractor.

11. Refer to attached Drawing A7.3 - See corrected Interior Elevations No.11 and No. 12 to match Floor Plan.

12. Refer to Drawing S1.1 - Foundation Plan.
    a. Delete 1 ½" recessed floor slab as indicated at Toilet 117 and Toilet 118.
13. Refer to Drawing L1.0 – Revise note; "Flagpoles by others" to Flagpoles – see specifications. Provide three flagpoles as shown on Site Plan. Provide concrete flagpole footings as recommended by flagpole manufacturer.

END OF ADDENDUM NO. 2

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements governing the following:
   1. Contingency allowances.
   2. Testing and inspecting allowances.

1.2 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect from the designated supplier.

1.3 SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.4 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.5 CONTINGENCY ALLOWANCES

A. All Allowances stated in the Contract Documents shall be included in the Contract Sum.

B. The Contractor shall include in his Bid Proposal all costs of materials, equipment, office, job supervision, overhead, profit, and bond on these Contingency Allowances, as these costs will not be paid to the Contractor for work performed under these Contingency Allowances. Only the direct costs of performing work under this provision shall be paid under and charged against the Contingency Allowances: such cost includes costs of materials and delivery, labor, payroll taxes and insurance, equipment, and the cost of subcontracted work (subcontractor’s cost may include a maximum of 15% mark-up for overhead and profit.

B. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

C. The Contractor shall include a line item in the Schedule of Values for Contingency Allowance. The estimated value of the work completed pursuant to fully executed Contingency Allowance Authorizations may be included in the Contractor’s monthly Applications for Payment. Payments under this Contingency Allowance shall not exceed the net, total of fully executed Contingency Allowance Authorizations.

1.6 TESTING AND INSPECTING ALLOWANCES

A. Testing and inspecting allowances include the cost of engaging testing agencies, actual tests and inspections, and reporting results.

B. The allowance does not include incidental labor required to assist the testing agency or costs for retesting if previous tests and inspections result in failure. The cost for incidental labor to assist the testing agency shall be included in the Contract Sum.

C. Costs of services not required by the Contract Documents are not included in the allowance.

D. At Project closeout, credit unused amounts remaining in the testing and inspecting allowance to Owner by Change Order.

1.7 UNUSED MATERIALS

A. Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1. If requested by Architect, prepare unused material for storage by Owner when it is not economically practical to return the material for credit. If directed by Architect, deliver unused material to Owner's storage space. Otherwise, disposal of unused material is Contractor's responsibility.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. BASE BID PROPOSAL:

B. **Allowance No. 1**: General Contractors are to include in their Base Bid Proposal $150,000.00 for a General Contingency to cover unforeseen conditions to correct or supplement the work as detailed in the Contract Documents.

C. **Allowance No. 2:** General Contractors are to include in their Base Bid Proposal $65,000.00 for a General Contingency to furnish and install an Access Control System.

D. **Allowance No.3:** General Contractors are to include in their Base Bid Proposal an allowance of Thirty Thousand Dollars ($30,000.00) for Alabama Power Aid to Construction Cost.

E. **Allowance No. 4:** General Contractors are to include in their Base Bid Proposal an allowance of Fifteen Thousand Dollars ($15,000.00) for the Owner to purchase and install and public address system.

F. **Allowance No. 5:** General Contractors are to include in their Base Bid Proposal an allowance of Thirty Thousand Dollars ($30,000.00) for the purchase of additional IT equipment.

G. **Allowance No. 6:** General Contractors are to include in their Base Bid Proposal an allowance of Thirty Thousand Dollars ($30,000.00) for the purchase of additional IT equipment.

H. **Allowance No. 7:** General Contractors are to include in their Base Bid Proposal an allowance of $60,000.00 for the testing and installation of a two -way emergency radio system.

I. **Allowance No. 8:** General Contractors are to include in their Base Bid Proposal an allowance of $70,000.00 for prefabricated wall systems, Type D1, by Division 12 Consulting, Phone: (205)440-2695.

J. **Allowance No. 9:** General Contractors are to include in their Base Bid Proposal an allowance of $30,000.00 for back-lit signage and shields/emblems as shown on elevation 1/A4.1.

K. **Allowance No. 10:** General Contractors are to include in their Base Bid Proposal an allowance of $30,000.00 for Wall Covering Graphic Images on noted wall on the floor plans.

END OF SECTION 012100

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SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

1.5 SCHEDULE OF DEDUCTIVE ALTERNATES

DEDUCTIVE ALTERNATE NO. 1: General Contractor shall deduct from their Proposal all labor and material to furnish all work associated with the connecting the Church Parking New Road on the west side of the site.

DEDUCTIVE ALTERNATE NO. 2: General Contractor shall deduct from their Proposal their price to furnish all material and labor to construct the additional parking in reference to Sheet C-102 and the Landscape as per Sheet L2.0 and L4.0.

DEDUCTIVE ALTERNATE NO. 3: General Contractor shall deduct from their Proposal their price to furnish all material and labor associated with the wearing and binder surface of the asphalt paving. The Base Bid shall still include the curb and gutter and base course ready for asphalt installation.

DEDUCTIVE ALTERNATE NO.4: General Contractor shall deduct from their Proposal their price to furnish all material and labor to install the exterior light poles on the site. The Base Bid shall still include the power and concrete base for the light poles, ready for pole installation by others.

END OF SECTION 012300

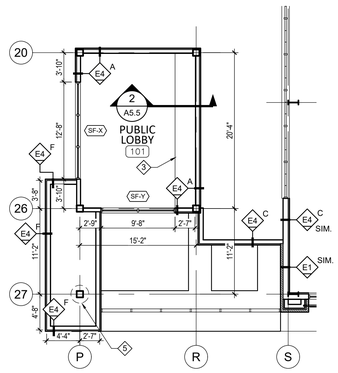
GENERAL NOTES

1. CONTRACTOR TO VERIFY EXISTING CONDITIONS PRIOR TO ANY FABRICATION OR CONSTRUCTION.
2. CONTRACTOR TO NOTIFY ARCHITECT OF ANY DISCREPANCIES AND OBTAIN OWNER APPROVAL FOR ANY CHANGES.
3. REFER TO SHEET A7.1 FOR ENLARGED TOILET ROOM PLANS.
4. REFER TO SHEET A0.3 FOR WALL TYPES
5. REFER TO SHEET LS.1 FOR FIRE RATED DOORS & PARTITIONS

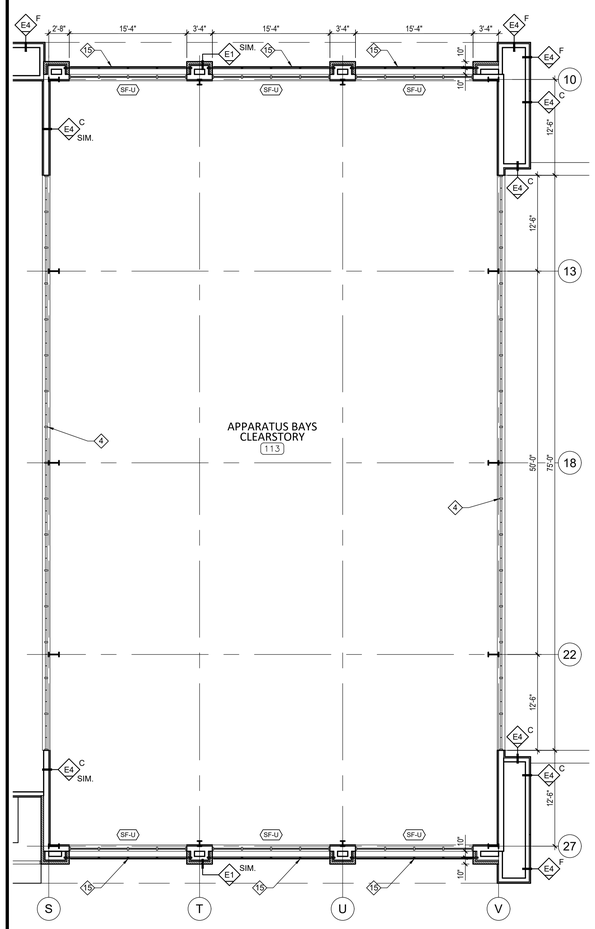
DF DRINKING FOUNTAIN. REFER TO PLUMBING DWGS.
DS STORMWATER DOWNSPOUT WITH BOOT TO UNDERGROUND STORM DRAIN.
FE WALL MOUNTED OR SEMI-RECESSED FIRE EXTINGUISHER CABINET. REFER TO SPECIFICATIONS.

KEYNOTES

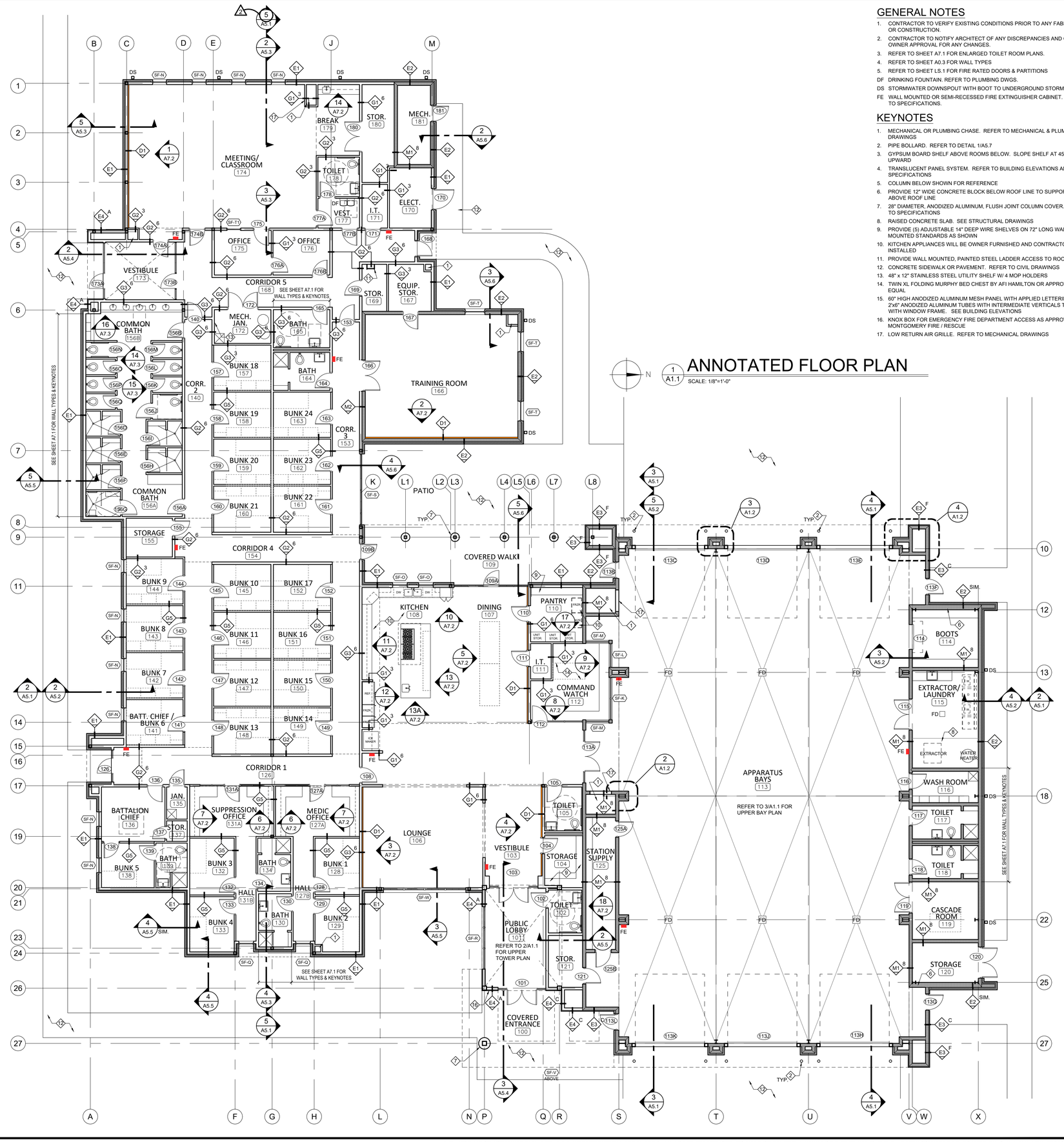
1. MECHANICAL OR PLUMBING CHASE. REFER TO MECHANICAL & PLUMBING DRAWINGS
2. PIPE BOLLARD. REFER TO DETAIL 1/A5.7
3. GYPSUM BOARD SHELF ABOVE ROOMS BELOW. SLOPE SHELF AT 45 DEGREES UPWARD
4. TRANSLUCENT PANEL SYSTEM. REFER TO BUILDING ELEVATIONS AND SPECIFICATIONS
5. COLUMN BELOW SHOWN FOR REFERENCE
6. PROVIDE 12" WIDE CONCRETE BLOCK BELOW ROOF LINE TO SUPPORT BRICK ABOVE ROOF LINE
7. 28" DIAMETER, ANODIZED ALUMINUM, FLUSH JOINT COLUMN COVER. REFER TO SPECIFICATIONS
8. RAISED CONCRETE SLAB. SEE STRUCTURAL DRAWINGS
9. PROVIDE (5) ADJUSTABLE 14" DEEP WIRE SHELVES ON 72" LONG WALL MOUNTED STANDARDS AS SHOWN
10. KITCHEN APPLIANCES WILL BE OWNER FURNISHED AND CONTRACTOR INSTALLED
11. PROVIDE WALL MOUNTED, PAINTED STEEL LADDER ACCESS TO ROOF HATCH
12. CONCRETE SIDEWALK OR PAVEMENT. REFER TO CIVIL DRAWINGS
13. 48" x 12" STAINLESS STEEL UTILITY SHELF W/ 4 MOP HOLDERS
14. TWIN XL FOLDING MURPHY BED CHEST BY AFI HAMILTON OR APPROVED EQUAL
15. 60" HIGH ANODIZED ALUMINUM MESH PANEL WITH APPLIED LETTERING ON 2'x6" ANODIZED ALUMINUM TUBES WITH INTERMEDIATE VERTICALS TO ALIGN WITH WINDOW FRAME. SEE BUILDING ELEVATIONS
16. KNOX BOX FOR EMERGENCY FIRE DEPARTMENT ACCESS AS APPROVED BY MONTGOMERY FIRE / RESCUE
17. LOW RETURN AIR GRILLE. REFER TO MECHANICAL DRAWINGS



N 2 A1.1 **TOWER PLAN**
SCALE: 1/8"=1'-0"



N 3 A1.1 **CLEARSTORY PLAN**
SCALE: 1/8"=1'-0"



N 1 A1.1 **ANNOTATED FLOOR PLAN**
SCALE: 1/8"=1'-0"

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NEW FIRE STATION NO. 10
FOR
THE CITY OF MONTGOMERY
SOUTH COURT STREET MONTGOMERY, ALABAMA 36104

REVISIONS		
No.	Description	Date
A	ISSUED FOR REVIEW	11/08/22
B	ISSUED FOR REVIEW	11/15/22
0	ISSUED FOR REVIEW	01/16/23
1	ISSUED FOR BID	02/03/23
2	ADDENDUM NO. 2	02/13/23

MGM Project No.	SP-5-21
BDW Project No.	2021-118
Drawn By:	BDW
Date:	
Scale:	AS NOTED

Drawing Title:

ANNOTATED FLOOR PLAN

Sheet No:

A1.1

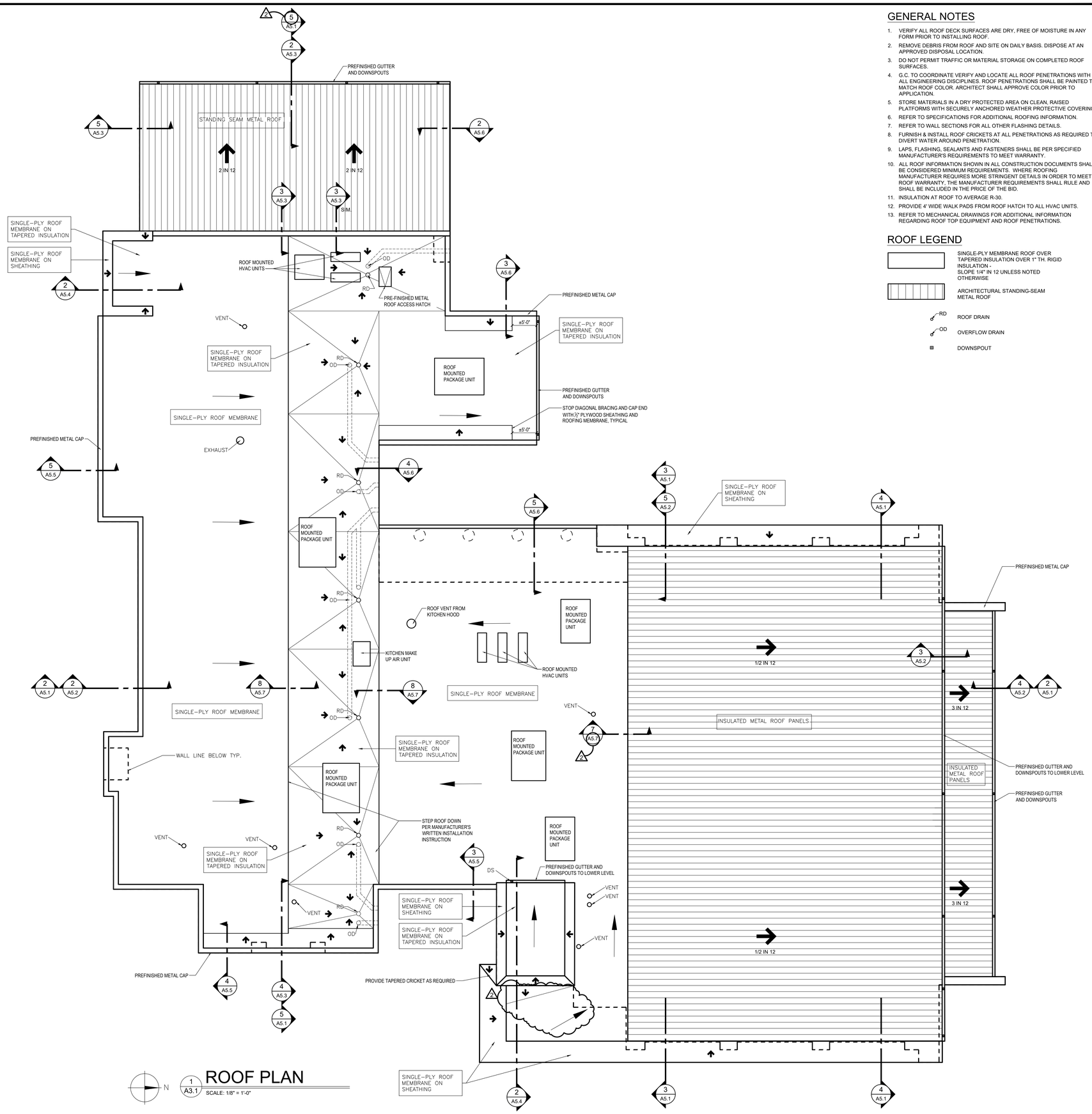
CONSTRUCTION DOCUMENTS

GENERAL NOTES

1. VERIFY ALL ROOF DECK SURFACES ARE DRY, FREE OF MOISTURE IN ANY FORM PRIOR TO INSTALLING ROOF.
2. REMOVE DEBRIS FROM ROOF AND SITE ON DAILY BASIS. DISPOSE AT AN APPROVED DISPOSAL LOCATION.
3. DO NOT PERMIT TRAFFIC OR MATERIAL STORAGE ON COMPLETED ROOF SURFACES.
4. G.C. TO COORDINATE VERIFY AND LOCATE ALL ROOF PENETRATIONS WITH ALL ENGINEERING DISCIPLINES. ROOF PENETRATIONS SHALL BE PAINTED TO MATCH ROOF COLOR. ARCHITECT SHALL APPROVE COLOR PRIOR TO APPLICATION.
5. STORE MATERIALS IN A DRY PROTECTED AREA ON CLEAN, RAISED PLATFORMS WITH SECURELY ANCHORED WEATHER PROTECTIVE COVERING.
6. REFER TO SPECIFICATIONS FOR ADDITIONAL ROOFING INFORMATION.
7. REFER TO WALL SECTIONS FOR ALL OTHER FLASHING DETAILS.
8. FURNISH & INSTALL ROOF CRICKETS AT ALL PENETRATIONS AS REQUIRED TO DIVERT WATER AROUND PENETRATION.
9. LAPS, FLASHING, SEALANTS AND FASTENERS SHALL BE PER SPECIFIED MANUFACTURER'S REQUIREMENTS TO MEET WARRANTY.
10. ALL ROOF INFORMATION SHOWN IN ALL CONSTRUCTION DOCUMENTS SHALL BE CONSIDERED MINIMUM REQUIREMENTS. WHERE ROOFING MANUFACTURER REQUIRES MORE STRINGENT DETAILS IN ORDER TO MEET ROOF WARRANTY, THE MANUFACTURER REQUIREMENTS SHALL RULE AND SHALL BE INCLUDED IN THE PRICE OF THE BID.
11. INSULATION AT ROOF TO AVERAGE R-30.
12. PROVIDE 4' WIDE WALK PADS FROM ROOF HATCH TO ALL HVAC UNITS.
13. REFER TO MECHANICAL DRAWINGS FOR ADDITIONAL INFORMATION REGARDING ROOF TOP EQUIPMENT AND ROOF PENETRATIONS.

ROOF LEGEND

- SINGLE-PLY MEMBRANE ROOF OVER TAPERED INSULATION OVER 1" TH. RIGID INSULATION - SLOPE 1/4" IN 12 UNLESS NOTED OTHERWISE
- ARCHITECTURAL STANDING-SEAM METAL ROOF
- RD — ROOF DRAIN
- OD — OVERFLOW DRAIN
- DOWNSPOUT



ROOF PLAN

1 A3.1 SCALE: 1/8" = 1'-0"

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MGM Project No.	SP-5-21
BDW Project No.	2021-118
Drawn By:	BDW
Date:	
Scale:	AS NOTED

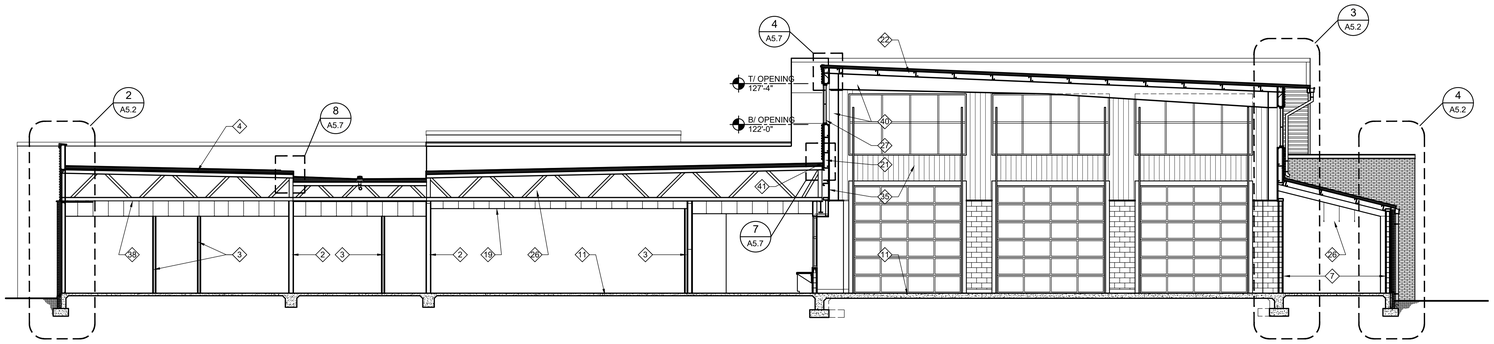
Drawing Title:

ROOF PLAN

Sheet No:

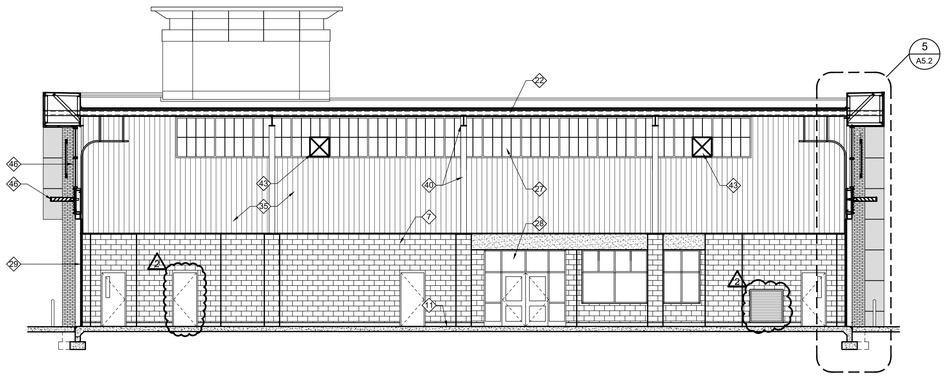
A3.1

CONSTRUCTION DOCUMENTS



2 A5.1 BUILDING SECTION

SCALE: 1/8" = 1'-0"



3 A5.1 BUILDING SECTION

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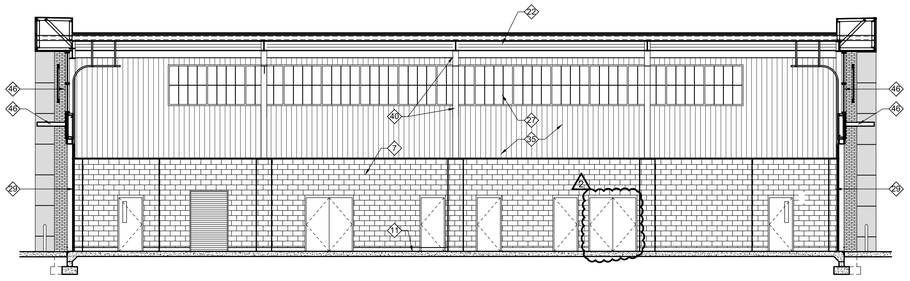

4 A5.1 BUILDING SECTION

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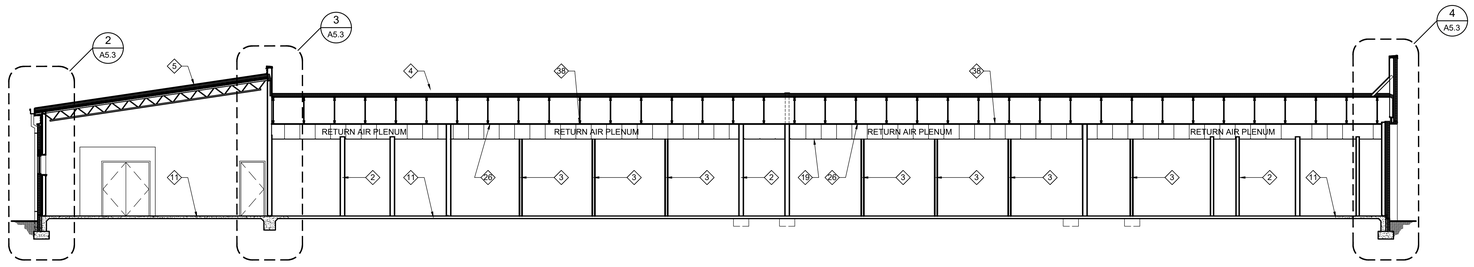

5 A5.1 BUILDING SECTION

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GENERAL NOTES

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4. REFER TO STRUCTURAL DRAWINGS FOR FRAMING MEMBER SIZING, CONCRETE REINFORCING AND ADDITIONAL INFORMATION.
5. COORDINATE FOOTING ELEVATIONS AND FINAL GRADES WITH CIVIL ENGINEERING DRAWINGS

KEYNOTES

ALL KEYNOTES ON THIS LIST ARE NOT PRESENT ON EACH DRAWING

1. BRICK VENEER. REFER TO SPECIFICATIONS
2. ⅝" GYPSUM BOARD ON METAL WALL STUD FRAMING AT 16" O.C. WITH ½" EXTERIOR FIRE TREATED PLYWOOD SHEATHING. REFER TO FLOOR PLANS FOR FRAMING SIZING
3. ⅝" GYPSUM BOARD SHEATHING EACH SIDE OF 3⅝" METAL WALL STUD FRAMING AT 16" O.C. TO UNDERSIDE OF SUSPENDED CEILING
4. TPO MEMBRANE ROOFING ON ½" DECK BOARD OVER ±4" (R-30) RIGID INSULATION BOARD ON METAL ROOF DECKING, WHERE SHOWN. REFER TO SPECIFICATIONS
5. STANDING SEAM METAL ROOFING ON ½" DECK BOARD OVER ±4" (R-30) RIGID INSULATION BOARD ON METAL ROOF DECKING
6. PROVIDE MINIMUM R-19 CLOSED CELL SPAY FOAM INSULATION. REFER TO SPECIFICATIONS
7. CONCRETE BLOCK WALL. PROVIDE INSULATION IN BLOCK CORE AT EXTERIOR LOCATIONS
8. LIQUID APPLIED VAPOR & MOISTURE BARRIER
9. 1½" RIGID INSULATION BOARD
10. EXTEND ROOFING MEMBRANE OVER ½" EXTERIOR GRADE FIRE TREATED PLYWOOD SHEATHING
11. CONCRETE FLOOR SLAB ON COMPACTED GRANULAR FILL. REFER TO STRUCTURAL DRAWINGS. EXTERIOR SLABS SHALL SLOPE AWAY FROM BUILDING FOR DRAINAGE
12. PVC TRIM, PAINTED
13. STEEL BEAM / COLUMN. REFER TO STRUCTURAL DRAWINGS
14. CLOSE OFF OPENINGS OR FILL VOIDS WITH CLOSED CELL SPRAY FOAM INSULATION
15. PRE-FINISHED SHEET METAL GUTTER & DOWNSPOUT
16. GROUT VOIDS SOLID
17. PROVIDE CONTINUOUS PRE-FINISHED METAL FLASHING
18. PROVIDE CONTINUOUS PRE-FINISHED METAL COPING OVER PRESSURE-TREATED WOOD BLOCKING. PROVIDE FLASHING
19. SUSPENDED ACOUSTIC TILE CEILING IN PRE-FINISHED METAL GRID
20. CONTINUOUS BASE FLASHING WITH WEEP HOLES AT 24" O.C. PROVIDE 24" HIGH MORTAR NET AT BOTTOM OF AIR SPACE. BASE FLASHING TO BE TWO BRICK COURSES BELOW FINISH FLOOR
21. METAL GIRT WALL SYSTEM WITH EXTERIOR PRE-FINISHED METAL PANEL OVER ½" FIRE TREATED PLYWOOD SHEATHING, R-19 MIN. SPRAY FOAM INSULATION AND INTERIOR PRE-FINISHED METAL LINER PANEL
22. CONCEALED FASTENER PRE-FINISHED INSULATED METAL PANEL ROOF SYSTEM, R-30, ON METAL PURLINS
23. CORRUGATED METAL SIDING
24. STANDING SEAM METAL ROOFING ON 1½" METAL DECKING ON METAL ROOF TRUSSES WITH R-30 VINYL FACED BATT INSULATION
25. ½" GYPSUM BOARD CEILING ON SUSPENDED METAL CHANNELS
26. METAL ROOF TRUSS. REFER TO STRUCTURAL DRAWINGS
27. TRANSLUCENT PANEL SYSTEM. REFER TO SPECIFICATIONS
28. GLASS & ALUMINUM STOREFRONT SYSTEM. REFER TO SPECIFICATIONS
29. MOTOR OPERATED PRE-FINISHED OVERHEAD SECTIONAL METAL DOOR AND TRACK. REFER TO DOOR SCHEDULE & SPECIFICATIONS
30. ALUMINUM PANEL CLADDING SYSTEM. REFER TO SPECIFICATIONS
31. 6"H x 36"D PRE-FINISHED ALUMINUM LOUVERED 'ECOSHADE' AWNING WITH SIX 35° BLADES BY MASA ARCHITECTURAL CANOPIES (www.architecturalcanopies.com) OR APPROVED EQUAL
32. 42" HIGH x 6" DIA. CONCRETE FILLED STEEL PIPE BOLLARD. REFER TO DETAIL 1/A5.5
33. CONCRETE PAVEMENT. SEE CIVIL ENGINEERING DRAWINGS
34. PROVIDE CAST IRON DOWNSPOUT BOOT AND CONNECT TO UNDERGROUND STORM WATER COLLECTION SYSTEM. SEE CIVIL ENGINEERING DRAWINGS
35. PRE-FINISHED METAL LINER PANEL. SEE SPECIFICATIONS
36. FIBER CEMENT BOARD CLADDING SYSTEM OVER ½" FIRE TREATED PLYWOOD WITH METAL FRAMING AT 16" O.C. REFER TO SPECIFICATIONS
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42. ½" FIRE TREATED PLYWOOD SHEATHING ON LIGHT GAUGE METAL FRAMING. REFER TO STRUCTURAL DRAWINGS
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44. ⅝" GYPSUM BOARD SHEATHING ON METAL WALL STUDS AT 16" O.C.
45. PROVIDE CONTINUOUS PRE-FINISHED METAL COPING OVER BEAD OF SEALANT
46. 60" HIGH PRE-FINISHED ALUMINUM PERFORATED 0.040" PANEL, BR5-36 ¾" ECONOLAP BY CENTRIA, WITH APPLIED LETTERING ON 2'x6" ANODIZED ALUMINUM TUBES WITH INTERMEDIATE VERTICALS TO ALIGN WITH WINDOW FRAME. SEE BUILDING ELEVATIONS
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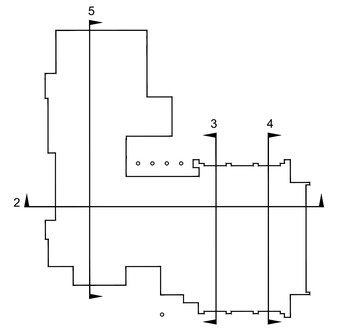
57. BREAK METAL TRIM (MATCH STOREFRONT) OVER WOOD BLOCKING



N

1 A5.1 KEY PLAN

SCALE: 1/32" = 1'-0"

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624 South McDonough Street
Montgomery, AL 36104

phone: 334.834.2038
www.bdwarchitects.com

STATE OF ALABAMA
REGISTERED ARCHITECTS
DART W. DAVIS 2767
RAY E. WILLIAMS 4239
JOHNNY B. RAINES, III 7127

NEW FIRE STATION NO. 10

FOR

THE CITY OF MONTGOMERY

SOUTH COURT STREET MONTGOMERY, ALABAMA 36104

REVISIONS		
No.	Description	Date
A	ISSUED FOR REVIEW	11/08/22
B	ISSUED FOR REVIEW	11/15/22
0	ISSUED FOR REVIEW	01/16/23
1	ISSUED FOR BID	02/03/23
2	ADDENDUM NO. 2	02/13/23

MGM Project No.	SP-5-21
BDW Project No.	2021-118
Drawn By:	BDW
Date:	
Scale:	AS NOTED

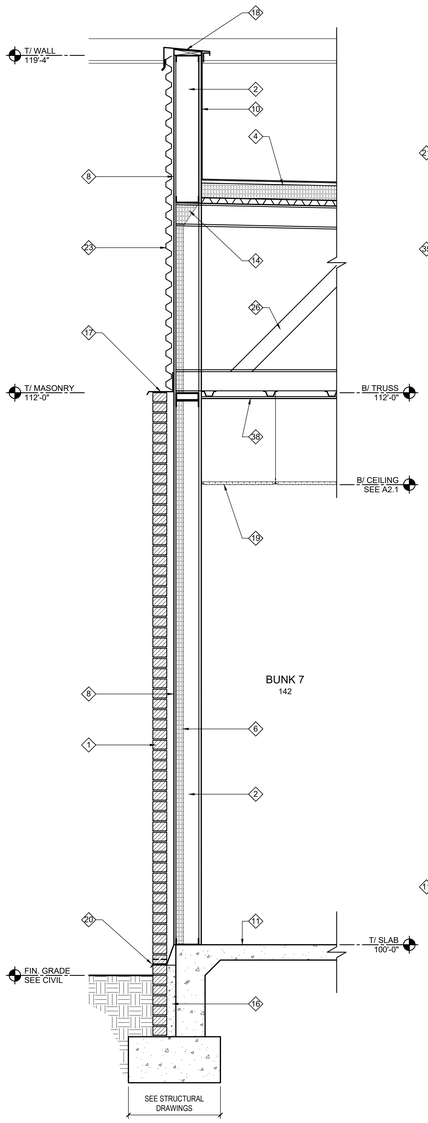
Drawing Title:

BUILDING SECTIONS

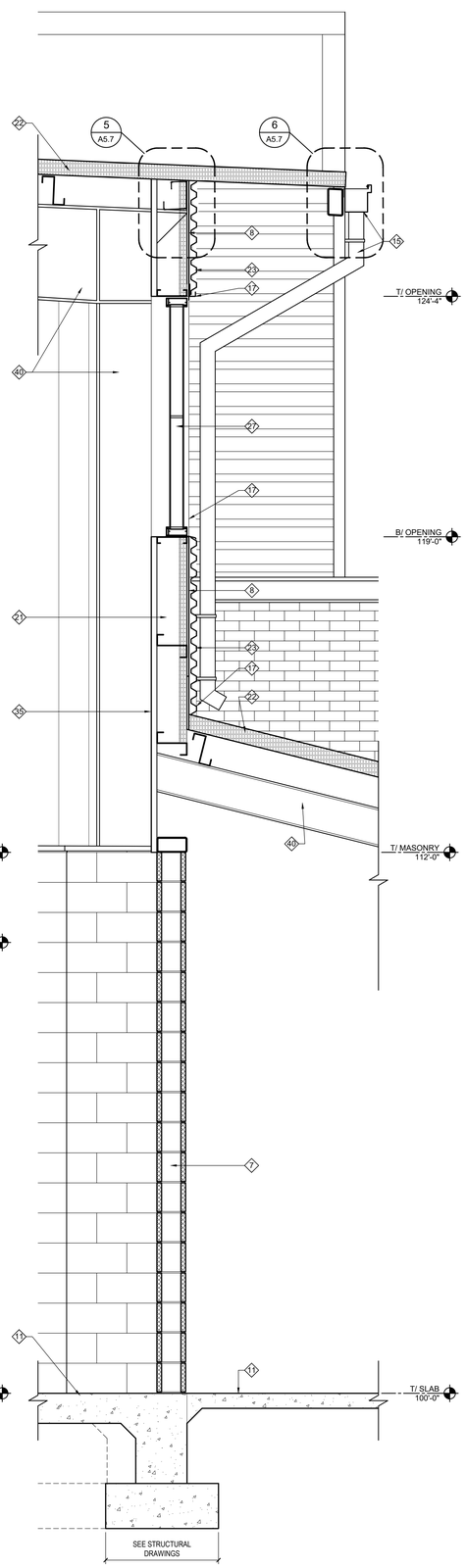
Sheet No:

A5.1

CONSTRUCTION DOCUMENTS



2 A5.2 WALL SECTION
SCALE: 3/4" = 1'-0"



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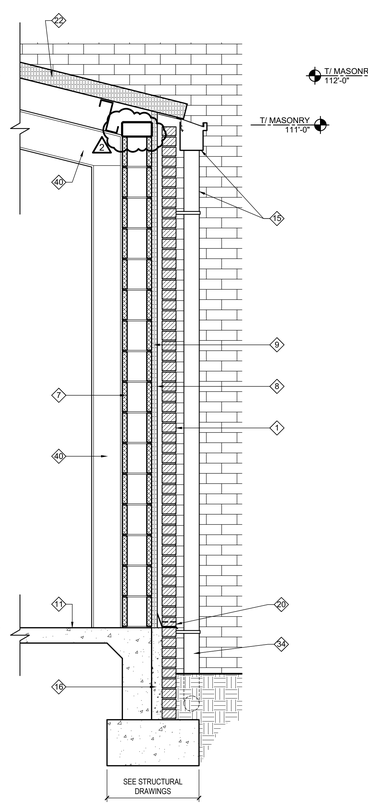

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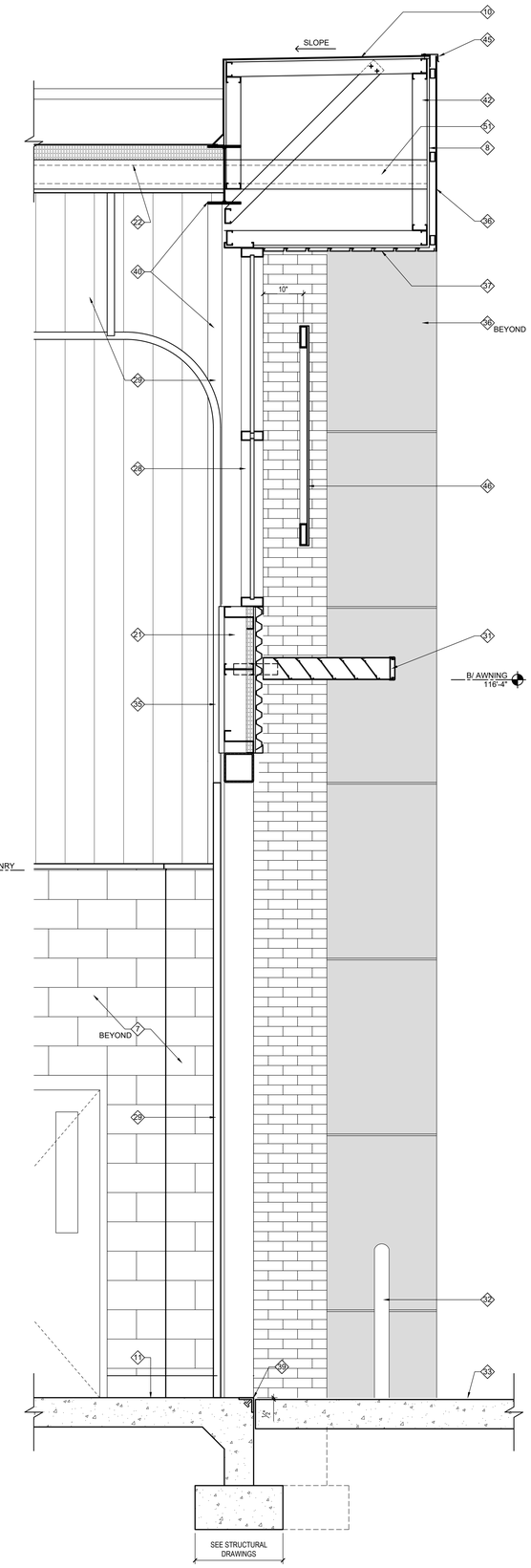

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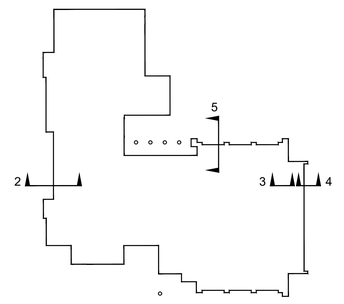

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Barganier Davis Williams Architects Associated

bdw architects

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STATE OF ALABAMA
REGISTERED ARCHITECTS
DART W. DAVIS 2767
RAY E. WILLIAMS 4239
JOHNNY B. RAINES, III 7127

NEW FIRE STATION NO. 10

FOR

THE CITY OF MONTGOMERY

SOUTH COURT STREET MONTGOMERY, ALABAMA 36104

REVISIONS		
No.	Description	Date
A	ISSUED FOR REVIEW	11/08/22
B	ISSUED FOR REVIEW	11/15/22
0	ISSUED FOR REVIEW	01/16/23
1	ISSUED FOR BID	02/03/23
2	ADDENDUM NO. 2	02/13/23

MGM Project No.	SP-5-21
BDW Project No.	2021-118
Drawn By:	BDW
Date:	
Scale:	AS NOTED

Drawing Title:

WALL SECTIONS

Sheet No:

A5.2

CONSTRUCTION DOCUMENTS

DOOR SCHEDULE

MARK	DOOR			FRAME		FIRE RATING	SIGNAGE	DETAILS			REMARKS
	SIZE	TYPE	MATERIAL	TYPE	MATERIAL			HEAD	JAMB	SILL	
101	PR 3'-0" x 8'-0"	SF-1	S.F.	SF-A	S.F.			1/A6.5	2/A6.5		
102	3'-0" x 7'-0"	B	WOOD	C	H.M.		UNI-SEX TOILET	1/A6.4	2/A6.4	3/A6.4	
103	PR 3'-0" x 8'-0"	SF-1	S.F.	SF-B	S.F.			21/A6.4	22/A6.4		1
104	3'-0" x 7'-0"	B	WOOD	C	H.M.		STORAGE	1/A6.4 (sim.)	2/A6.4 (sim.)	3/A6.4 (sim.)	
105	3'-0" x 7'-0"	B	WOOD	C	H.M.		UNI-SEX TOILET	1/A6.4	2/A6.4	3/A6.4	
108	3'-0" x 7'-0"	B	WOOD	C	H.M.	45 MINUTES		1/A6.4	2/A6.4	3/A6.4	
109A	3'-0" x 7'-0"	SF-2	S.F.	SF-C	S.F.			13/A6.4	14/A6.4		
109B	3'-0" x 7'-0"	SF-2	S.F.	E	S.F.			5/A6.5	6/A6.5		
110	3'-0" x 7'-0"	B	WOOD	C	H.M.			1/A6.4 (sim.)	2/A6.4 (sim.)	3/A6.4 (sim.)	
111	3'-0" x 7'-0"	B	WOOD	C	H.M.		I.T.	1/A6.4 (sim.)	2/A6.4 (sim.)	3/A6.4 (sim.)	
112	3'-0" x 7'-0"	B	WOOD	SF-P	S.F.		COMMAND WATCH	1/A6.4	2/A6.4	3/A6.4	
113A	PR 3'-0" x 7'-0"	SF-5	S.F.	SF-D	S.F.			19/A6.4	20/A6.4		
113B	3'-0" x 7'-0"	G	GHM	B	GHM			7/A6.4	8/A6.4	9/A6.4	
113C	PR 7'-0" x 14'-0"	BD-1	SECTIONAL OVERHEAD								
113D	PR 7'-0" x 14'-0"	BD-1	SECTIONAL OVERHEAD								
113E	PR 7'-0" x 14'-0"	BD-1	SECTIONAL OVERHEAD								
113F	3'-0" x 7'-0"	G	GHM	B	GHM			11/A6.4	12/A6.4		
113G	3'-0" x 7'-0"	G	GHM	B	GHM			11/A6.4	12/A6.4		
113H	PR 7'-0" x 14'-0"	BD-1	SECTIONAL OVERHEAD								
113J	PR 7'-0" x 14'-0"	BD-1	SECTIONAL OVERHEAD								
113K	PR 7'-0" x 14'-0"	BD-1	SECTIONAL OVERHEAD								
113L	3'-0" x 7'-0"	G	GHM	B	GHM			11/A6.4	12/A6.4		
114	5'-0" x 8'-0"	F	ROLL UP DOOR				GEAR STORAGE	10/A6.4	11/A6.4		
115	PR 3'-0" x 7'-0"	E	GHM	A	GHM		LAUNDRY	4/A6.4	5/A6.4	6/A6.4	
116	3'-0" x 7'-0"	A	GHM	B	GHM		WASH ROOM	4/A6.4	5/A6.4	6/A6.4	
117	3'-0" x 7'-0"	A	GHM	B	GHM		UNI-SEX TOILET	4/A6.4	5/A6.4	6/A6.4	
118	3'-0" x 7'-0"	A	GHM	B	GHM		UNI-SEX TOILET	4/A6.4	5/A6.4	6/A6.4	
119	PR 3'-0" x 7'-0"	E	GHM	A	GHM		CASCADE	4/A6.4	5/A6.4	6/A6.4	
120	PR 3'-0" x 7'-0"	E	GHM	A	GHM		STORAGE	7/A6.4	8/A6.4	9/A6.4	2
121	3'-0" x 7'-0"	A	GHM	B	GHM		STORAGE	4/A6.4	5/A6.4	6/A6.4	
125A	3'-0" x 7'-0"	A	GHM	B	GHM		SUPPLY	4/A6.4	5/A6.4	6/A6.4	
125B	3'-0" x 7'-0"	A	GHM	B	GHM		SUPPLY	4/A6.4	5/A6.4	6/A6.4	
126	3'-0" x 7'-0"	SF-2	S.F.	SF-G	S.F.			13/A6.4	3/A6.5		
127A	3'-0" x 7'-0"	B	WOOD	SF-Z	S.F.		MEDIC OFFICE	1/A6.4	2/A6.4	3/A6.4	
128	3'-0" x 7'-0"	B	WOOD	C	H.M.		BUNK 1	1/A6.4	2/A6.4	3/A6.4	
129	3'-0" x 7'-0"	B	WOOD	C	H.M.		BUNK 2	1/A6.4	2/A6.4	3/A6.4	
130	3'-0" x 7'-0"	B	WOOD	C	H.M.			1/A6.4	2/A6.4	3/A6.4	
131A	3'-0" x 7'-0"	B	WOOD	SF-Z	S.F.		SUPPRESSION OFF.	1/A6.4	2/A6.4	3/A6.4	
132	3'-0" x 7'-0"	B	WOOD	C	H.M.		BUNK 3	1/A6.4	2/A6.4	3/A6.4	
133	3'-0" x 7'-0"	B	WOOD	C	H.M.		BUNK 4	1/A6.4	2/A6.4	3/A6.4	
134	3'-0" x 7'-0"	B	WOOD	C	H.M.			1/A6.4	2/A6.4	3/A6.4	
135	3'-0" x 7'-0"	B	WOOD	C	H.M.		JAN.	1/A6.4	2/A6.4	3/A6.4	
136	3'-0" x 7'-0"	B	WOOD	C	H.M.		BATTALION CHIEF	1/A6.4	2/A6.4	3/A6.4	
137	2'-6" x 7'-0"	B	WOOD	C	H.M.			1/A6.4	2/A6.4	3/A6.4	
138	3'-0" x 7'-0"	B	WOOD	C	H.M.			1/A6.4	2/A6.4	3/A6.4	
139	3'-0" x 7'-0"	B	WOOD	C	H.M.			1/A6.4	2/A6.4	3/A6.4	
140	3'-0" x 7'-0"	B	WOOD	C	H.M.	45 MINUTES		1/A6.4	2/A6.4	3/A6.4	
141	3'-0" x 7'-0"	B	WOOD	C	H.M.		BUNK 6	1/A6.4	2/A6.4	3/A6.4	
142	3'-0" x 7'-0"	B	WOOD	C	H.M.		BUNK 7	1/A6.4	2/A6.4	3/A6.4	
143	3'-0" x 7'-0"	B	WOOD	C	H.M.		BUNK 8	1/A6.4	2/A6.4	3/A6.4	
144	3'-0" x 7'-0"	B	WOOD	C	H.M.		BUNK 9	1/A6.4	2/A6.4	3/A6.4	
145	3'-0" x 7'-0"	B	WOOD	C	H.M.		BUNK 10	1/A6.4	2/A6.4	3/A6.4	
146	3'-0" x 7'-0"	B	WOOD	C	H.M.		BUNK 11	1/A6.4	2/A6.4	3/A6.4	
147	3'-0" x 7'-0"	B	WOOD	C	H.M.		BUNK 12	1/A6.4	2/A6.4	3/A6.4	
148	3'-0" x 7'-0"	B	WOOD	C	H.M.		BUNK 13	1/A6.4	2/A6.4	3/A6.4	
149	3'-0" x 7'-0"	B	WOOD	C	H.M.		BUNK 14	1/A6.4	2/A6.4	3/A6.4	
150	3'-0" x 7'-0"	B	WOOD	C	H.M.		BUNK 15	1/A6.4	2/A6.4	3/A6.4	
151	3'-0" x 7'-0"	B	WOOD	C	H.M.		BUNK 16	1/A6.4	2/A6.4	3/A6.4	
152	3'-0" x 7'-0"	B	WOOD	C	H.M.		BUNK 17	1/A6.4	2/A6.4	3/A6.4	
153	3'-0" x 7'-0"	B	WOOD	C	H.M.	45 MINUTES		1/A6.4	2/A6.4	3/A6.4	
155	3'-0" x 7'-0"	B	WOOD	C	H.M.		STORAGE	1/A6.4	2/A6.4	3/A6.4	
156A	3'-0" x 7'-0"	B	WOOD	C	GHM		SHOWERS	1/A6.4	2/A6.4	3/A6.4	
156B	3'-0" x 7'-0"	B	WOOD	C	GHM		TOILETS / SHOWERS	1/A6.4	2/A6.4	3/A6.4	
156D	2'-6" x 7'-0"	C	FIBERGLASS	D	FIBERGLASS			1/A6.4	2/A6.4	3/A6.4	
156E	2'-6" x 7'-0"	C	FIBERGLASS	D	FIBERGLASS			1/A6.4	2/A6.4	3/A6.4	
156F	2'-6" x 7'-0"	C	FIBERGLASS	D	FIBERGLASS			1/A6.4	2/A6.4	3/A6.4	
156G	3'-0" x 7'-0"	C	FIBERGLASS	D	FIBERGLASS			1/A6.4	2/A6.4	3/A6.4	
156H	2'-6" x 7'-0"	C	FIBERGLASS	D	FIBERGLASS			1/A6.4	2/A6.4	3/A6.4	
156I	2'-6" x 7'-0"	C	FIBERGLASS	D	FIBERGLASS			1/A6.4	2/A6.4	3/A6.4	
156J	3'-0" x 7'-0"	D	WOOD	D	GHM			1/A6.4	2/A6.4	3/A6.4	
156K	2'-6" x 7'-0"	D	WOOD	D	GHM			1/A6.4	2/A6.4	3/A6.4	
156L	2'-6" x 7'-0"	D	WOOD	D	GHM			1/A6.4	2/A6.4	3/A6.4	
156M	2'-6" x 7'-0"	D	WOOD	D	GHM			1/A6.4	2/A6.4	3/A6.4	
156N	3'-0" x 7'-0" 1	D	WOOD	D	GHM			1/A6.4	9/A6.5 2	3/A6.4	
156O	2'-6" x 7'-0"	D	WOOD	D	GHM			1/A6.4	2/A6.4	3/A6.4	
156P	2'-6" x 7'-0"	D	WOOD	D	GHM			1/A6.4	2/A6.4	3/A6.4	
156Q	2'-6" x 7'-0"	D	WOOD	D	GHM			1/A6.4	2/A6.4	3/A6.4	
157	3'-0" x 7'-0"	B	WOOD	C	H.M.		BUNK 18	1/A6.4	2/A6.4	3/A6.4	
158	3'-0" x 7'-0"	B	WOOD	C	H.M.		BUNK 19	1/A6.4	2/A6.4	3/A6.4	
159	3'-0" x 7'-0"	B	WOOD	C	H.M.		BUNK 20	1/A6.4	2/A6.4	3/A6.4	
160	3'-0" x 7'-0"	B	WOOD	C	H.M.		BUNK 21	1/A6.4	2/A6.4	3/A6.4	
161	3'-0" x 7'-0"	B	WOOD	C	H.M.		BUNK 22	1/A6.4	2/A6.4	3/A6.4	
162	3'-0" x 7'-0"	B	WOOD	C	H.M.		BUNK 23	1/A6.4	2/A6.4	3/A6.4	
163	3'-0" x 7'-0"	B	WOOD	C	H.M.		BUNK 24	1/A6.4	2/A6.4	3/A6.4	
164	3'-0" x 7'-0"	B	WOOD	C	H.M.		UNI-SEX TOILET	1/A6.4	2/A6.4	3/A6.4	
165	3'-0" x 7'-0"	B	WOOD	C	H.M.	45 MINUTES	UNI-SEX TOILET	1/A6.4	2/A6.4	3/A6.4	
166	PR 3'-0" x 7'-0"	E	H.M.	A	H.M.	20 MINUTES	TRAINING	7/A6.5	8/A6.5		

DOOR SCHEDULE

MARK	DOOR			FRAME		FIRE RATING	SIGNAGE	DETAILS			REMARKS
	SIZE	TYPE	MATERIAL	TYPE	MATERIAL			HEAD	JAMB	SILL	
167	3'-0" x 7'-0"	A	H.M.	B	H.M.		STORAGE	4/A6.4	5/A6.4	6/A6.4	
168	3'-0" x 7'-0"	G	GHM	B	GHM			5/A6.5	6/A6.5		
169	3'-0" x 7'-0"	B	WOOD	C	H.M.		STORAGE	1/A6.4	2/A6.4	3/A6.4	
170	3'-6" x 7'-0"	B	GHM	B	GHM		ELECTRICAL	5/A6.5	6/A6.5		2
171	3'-0" x 7'-0"	B	WOOD	C	H.M.		I.T.	1/A6.4	2/A6.4	3/A6.4	
172	PR 3'-0" x 7'-0"	E	H.M.	G	H.M.		MECHANICAL	1/A6.4	2/A6.4	3/A6.4	
173A	3'-0" x 7'-0"	SF-2	S.F.	SF-H	S.F.			1/A6.5	4/A6.5		
173B	3'-0" x 7'-0"	SF-2	S.F.	SF-J	S.F.			21/A6.4	22/A6.4		1
174A	3'-0" x 7'-0"	B	WOOD	C	H.M.		MEETING ROOM	1/A6.4	2/A6.4	3/A6.4	
174B	3'-0" x 7'-0"	B	WOOD	C	H.M.		MEETING ROOM	1/A6.4	2/A6.4	3/A6.4	
175	3'-0" x 7'-0"	B	WOOD	C	H.M.			1/A6.4	2/A6.4	3/A6.4	
176A	3'-0" x 7'-0"	B	WOOD	C	H.M.			1/A6.4	2/A6.4	3/A6.4	
176B	3'-0" x 7'-0"	B	WOOD	C	H.M.		OFFICE	1/A6.4	2/A6.4	3/A6.4	
177A	3'-0" x 7'-0"	B	WOOD	C	H.M.			1/A6.4	2/A6.4	3/A6.4	
177B	3'-0" x 7'-0"	B	WOOD	C	H.M.			1/A6.4	2/A6.4	3/A6.4	
178	3'-0" x 7'-0"	B	WOOD	C	H.M.		UNI-SEX TOILET	1/A6.4	2/A6.4	3/A6.4	
180	PR 3'-0" x 7'-0"	E	WOOD	G	H.M.		STORAGE	1/A6.4	2/A6.4	3/A6.4	
181	3'-0" x 7'-0"	A	GHM	B	GHM		MECHANICAL	7/A6.4	8/A6.4	9/A6.4	2

REMARKS:

1. GLAZING WILL BE G6 AT THESE DOORS AND FRAMES
2. PROVIDE SIGNAGE "NO BUILDING ACCESS"

ABBREVIATIONS:

FRP	FIBERGLASS REINFORCED PANEL
GHM	GALVANIZED HOLLOW METAL, PAINTED
H.M.	HOLLOW METAL, PAINTED
PR	PAIR OF DOORS
S.F.	STOREFRONT - ANODIZED ALUMINUM
WOOD	WOOD, PAINTED OR STAINED

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STATE OF ALABAMA
DART W. DAVIS 2767
RAY E. WILLIAMS 4239
JOHNNY B. RAINES, III 7127
REGISTERED ARCHITECTS

NEW FIRE STATION NO. 10
FOR
THE CITY OF MONTGOMERY
SOUTH COURT STREET MONTGOMERY, ALABAMA 36104

REVISIONS

No.	Description	Date
A	ISSUED FOR REVIEW	11/08/22
B	ISSUED FOR REVIEW	11/15/22
0	ISSUED FOR REVIEW	01/16/23
1	ISSUED FOR BID	02/03/23
2	ADDENDUM NO. 2	02/13/23

MGM Project No.	SP-5-21
BDW Project No.	2021-118
Drawn By:	BDW
Date:	
Scale:	AS NOTED

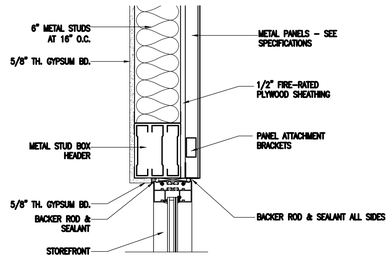
Drawing Title:

DOOR SCHEDULE

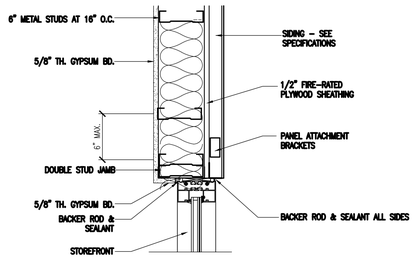
Sheet No:

A6.1

CONSTRUCTION DOCUMENTS



1 A6.5 HEAD DETAIL
SCALE: 1 1/2"=1'-0"



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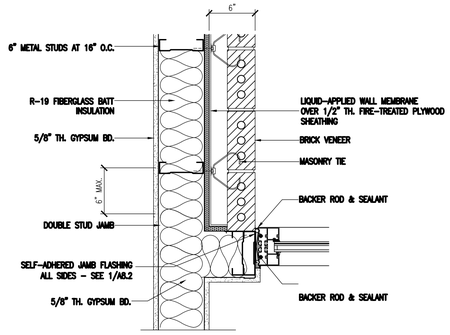

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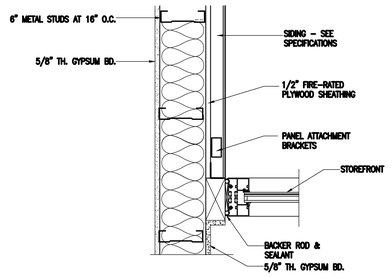

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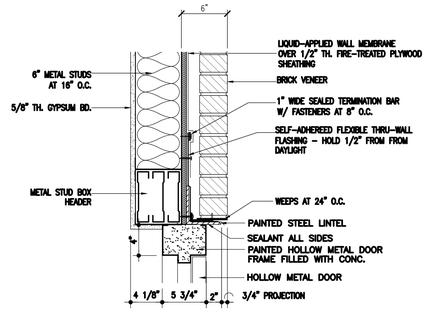

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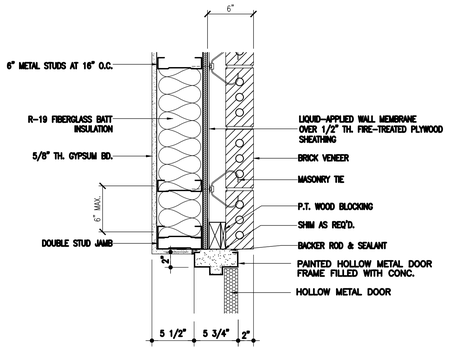

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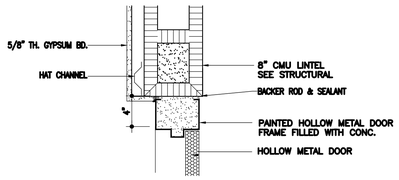

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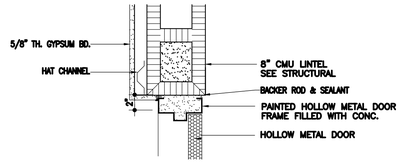
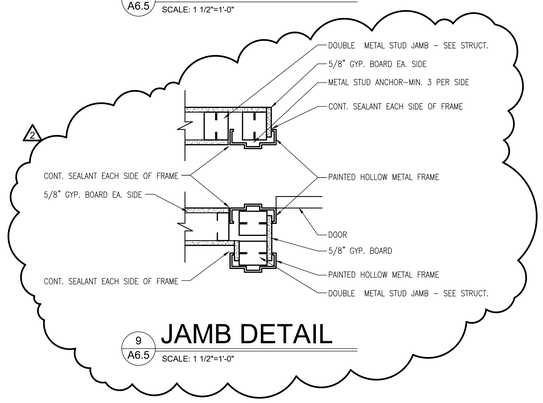


JAMB DETAIL

5 A6.5 HEAD DETAIL
SCALE: 1 1/2"=1'-0"



9 A6.5 JAMB DETAIL
SCALE: 1 1/2"=1'-0"

6 A6.5 JAMB DETAIL
SCALE: 1 1/2"=1'-0"

7 A6.5 HEAD DETAIL
SCALE: 1 1/2"=1'-0"

8 A6.5 JAMB DETAIL
SCALE: 1 1/2"=1'-0"

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BDW Project No.	2021-118
Drawn By:	BDW
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Scale:	AS NOTED

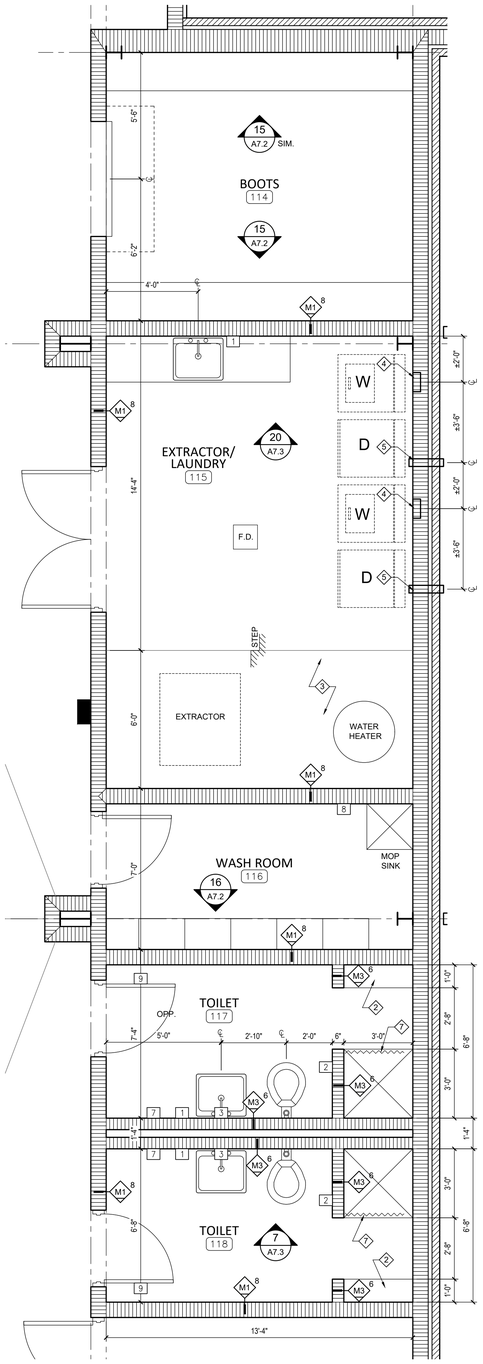
Drawing Title:

HEAD, JAMB & SILL DETAILS

Sheet No:

A6.5

CONSTRUCTION DOCUMENTS



1 A7.1 FLOOR PLAN
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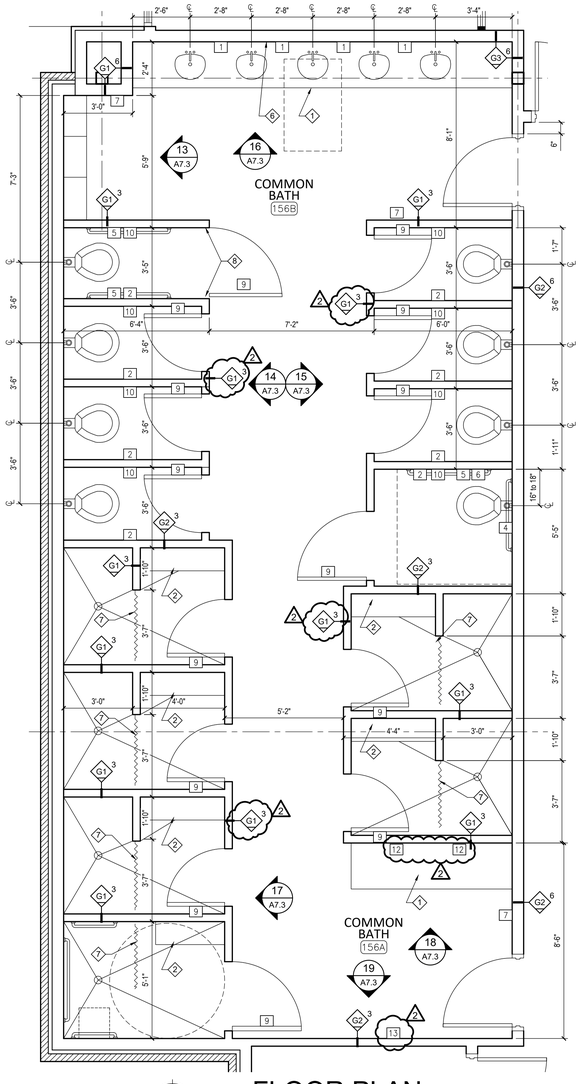

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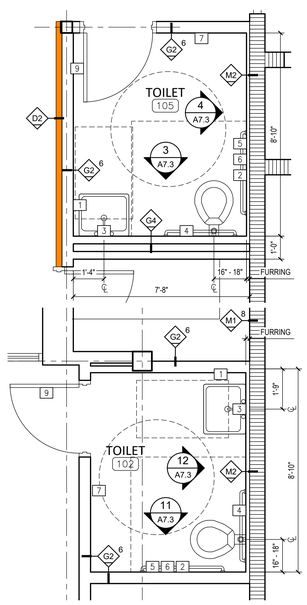

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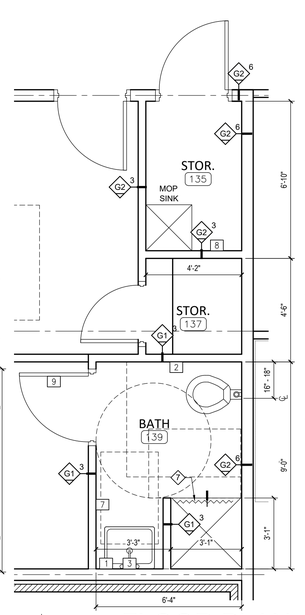

4 A7.1 FLOOR PLAN
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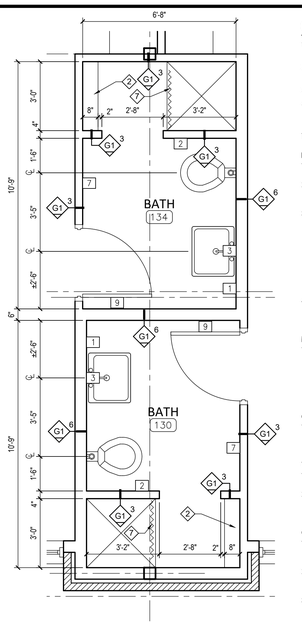

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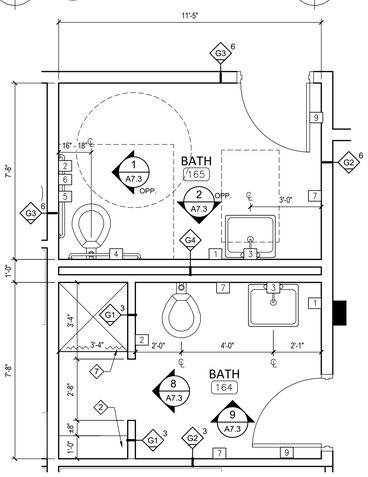

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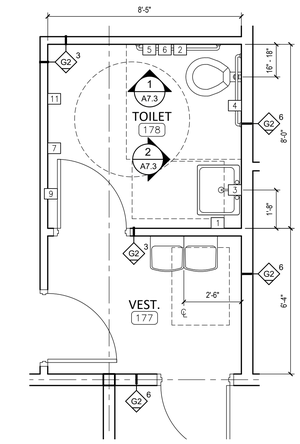
SCALE: 3/8"=1'-0"



7 A7.1 FLOOR PLAN
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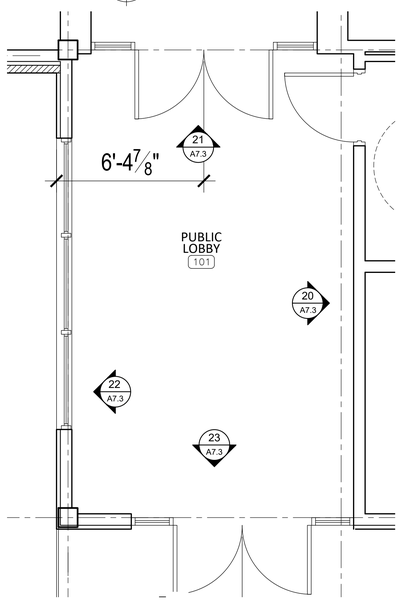


8 A7.1 FLOOR PLAN
SCALE: 3/8"=1'-0"

GENERAL NOTES

1. CONTRACTOR TO VERIFY EXISTING CONDITIONS PRIOR TO ANY FABRICATION OR CONSTRUCTION.
2. CONTRACTOR TO NOTIFY ARCHITECT OF ANY DISCREPANCIES AND OBTAIN OWNER APPROVAL FOR ANY CHANGES.
3. REFER TO SPECIFICATIONS FOR DESCRIPTIONS OF FINISH MATERIALS.
4. REFER TO SHEET A0.2 FOR WALL TYPE DESCRIPTIONS.

TYPICAL ADA PLUMBING ELEMENTS AND FACILITIES

DRINKING FOUNTAINS:
1. SPOUT HEIGHT : SPOUT OUTLETS SHALL BE 36 INCHES MAXIMUM ABOVE FINISH FLOOR.
2. SPOUT LOCATION : THE SPOUT SHALL BE LOCATED 15 INCHES MINIMUM FROM THE VERTICAL SUPPORT AND 5 INCHES MAXIMUM FROM THE FRONT EDGE OF THE UNIT, INCLUDING BUMPERS.
3. WATER FLOW : THE SPOUT SHALL PROVIDE A FLOW OF WATER 4 INCHES HIGH MINIMUM AND SHALL BE LOCATED 5 INCHES MAXIMUM FROM THE FRONT OF THE UNIT. THE ANGLE OF WATER STREAM SHALL BE MEASURED HORIZONTALLY RELATIVE TO THE FRONT FACE OF THE UNIT. WHERE THE SPOUTS ARE LOCATED LESS THAN 3 INCHES OF THE FRONT OF THE UNIT, THE ANGLE OF THE WATER STREAM SHALL BE 30 DEGREES MAXIMUM. WHERE SPOUTS ARE LOCATED BETWEEN 3 INCHES AND 5 INCHES MAXIMUM FROM THE FRONT OF THE UNIT, THE ANGLE OF THE WATER STREAM SHALL BE 15 DEGREES MAXIMUM.
4. SPOUT OUTLETS OF DRINKING FOUNTAINS FOR STANDING PERSONS SHALL BE 38 INCHES MINIMUM AND 43 INCHES MAXIMUM ABOVE THE FINISH FLOOR OF GROUND .

MIRRORS:
1. MIRRORS LOCATED ABOVE LAVATORIES OR COUNTERTOPS SHALL BE INSTALLED WITH THE BOTTOM EDGE OF THE REFLECTING SURFACE 40 INCHES MAXIMUM ABOVE THE FINISH FLOOR. MIRRORS NOT LOCATED ABOVE LAVATORIES OR COUNTERTOPS SHALL BE INSTALLED WITH THE BOTTOM EDGE OF THE REFLECTING SURFACE 35 INCHES MAXIMUM ABOVE THE FINISH FLOOR OR GROUND.

COAT HOOKS AND SHELVES:
1. COAT HOOKS SHALL BE LOCATED 47" MAXIMUM ABOVE FINISH FLOOR. SHELVES SHALL BE LOCATED 40 INCHES MINIMUM AND 48 INCHES MAXIMUM ABOVE THE FINISH FLOOR.

WATER CLOSETS
1. THE CENTERLINE OF THE WATER CLOSET SHALL BE 16 INCHES TO 18 INCHES MAXIMUM FROM "FINISHED" FACE OF WALL.
2. THE SEAT HEIGHT OF A WATER CLOSET ABOVE THE FINISH FLOOR SHALL BE 17 INCHES MINIMUM AND 19 INCHES MAXIMUM TO THE TOP OF THE SEAT. SEAT SHALL NOT BE SPRUNG TO RETURN TO A LIFTED POSITION.

GRAB BARS AT WATER CLOSET:
1. SIDE WALL : THE SIDE WALL GRAB BAR SHALL BE 42 INCHES LONG MINIMUM, LOCATED 12 INCHES MAXIMUM FROM THE REAR WALL AND EXTENDING 54 INCHES MINIMUM FROM THE REAR WALL.
2. REAR WALL : THE REAR WALL GRAB BAR SHALL BE 36 INCHES LONG AND EXTEND FROM THE CENTERLINE OF THE WATER CLOSET 12 INCHES MINIMUM ON ONE SIDE AND 24 INCHES MINIMUM ON THE OTHER SIDE.
3. GRAB BARS AND ANY WALL OR OTHER SURFACES ADJACENT TO GRAB BARS SHALL BE FREE OF SHARP OR ABRASIVE ELEMENTS AND SHALL HAVE ROUNDED EDGES.
4. STRUCTURAL STRENGTH: ALLOWABLE STRESSES SHALL NOT BE EXCEEDED FOR MATERIALS USED WHEN A VERTICAL OR HORIZONTAL FORCE OF 250 POUNDS IS APPLIED AT ANY POINT ON THE GRAB BAR, FASTENER, MOUNTING DEVICE, OR SUPPORTING STRUCTURE.

FLUSH CONTROLS:
1. FLUSH CONTROLS SHALL BE LOCATED ON THE OPEN SIDE OF THE WATER CLOSET.

DISPENSERS:
1. TOILET PAPER DISPENSERS SHALL BE 7 INCHES MINIMUM AND 9 INCHES MAXIMUM IN FRONT OF THE WATER CLOSET MEASURED TO THE CENTERLINE OF THE DISPENSER. THE OUTLET OF THE DISPENSER SHALL BE 15 INCHES AND 48 INCHES MAXIMUM ABOVE THE FINISHED FLOOR AND SHALL NOT BE LOCATED BEHIND GRAB BARS.

LAVATORIES:
1. LAVATORIES AND SINKS SHALL BE INSTALLED WITH THE FRONT OF THE HIGHER OF THE RIM OR COUNTER SURFACE 33 INCHES MAXIMUM ABOVE THE FINISH FLOOR OR GROUND.

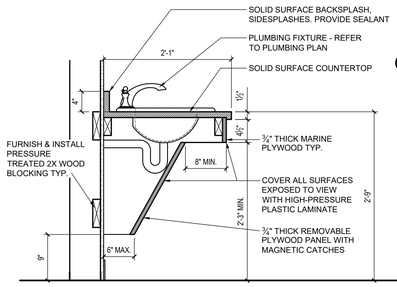
NOTE: PROVIDE SOLID WOOD BLOCKING IN WALL BEHIND ALL GRAB BARS AND TOILET ACCESSORIES.

KEYNOTES

1. COUNTERTOP CASEWORK. REFER TO DETAIL A/A7.1
2. STAINLESS STEEL SHOWER BENCH
3. RAISED CONCRETE FLOOR. REFER TO STRUCTURAL PLANS
4. PROVIDE GUY-GRAY BOX FOR WASHING MACHINE CONNECTION. REFER TO PLUMBING PLANS
5. PROVIDE THRU-WALL DRYER EXHAUST CONNECTION. REFER TO MECHANICAL PLANS
6. 42" HIGH x FULL WIDTH PLATE GLASS MIRROR
7. PROVIDE ROD & SHOWER CURTAIN
8. SEE JAMB DETAIL 9/A6.5

TOILET ACCESSORY INDEX

SYMBOL	ACCESSORY	MOUNTING HEIGHT
1	WALL MOUNTED SOAP DISPENSER	40" TO DISPENSING MECHANISM
2	TOILET TISSUE DISPENSER (SURFACE-MOUNTED)	28" AFF TO TOP OF UNIT
3	PLATE GLASS MIRROR 42" HIGH, FULL WIDTH	40" TO BOTTOM OF REFLECTIVE SURFACE
4	GRAB BAR 36"	36" AFF TO TOP OF BAR
5	GRAB BAR 42"	36" AFF TO TOP OF BAR
6	GRAB BAR 18"	SEE ELEVATIONS
7	TOWEL DISPENSER / WASTE RECEPTACLE	42" TO DISPENSER - SEE C/A7.1
8	STAINLESS STEEL UTILITY SHELF W/ 4 MOP HOLDERS	72" TO TOP OF SHELF
9	METAL COAT HOOK	48" TO HOOK. ON INSIDE FACE OF DOOR
10	SANITARY NAPKIN DISPOSER (WHERE APPLICABLE)	28" AFF TO TOP OF UNIT
11	WALL MOUNTED INFANT CHANGING STATION	30" AFF TO BOTTOM OF UNIT
12	18" x 36" PLATE GLASS MIRROR WITH FRAME	40" TO BOTTOM OF REFLECTIVE SURFACE
13	24" x 60" FRAMED PLATE GLASS MIRROR	12" TO BOTTOM OF REFLECTIVE SURFACE



A A7.1 DETAIL
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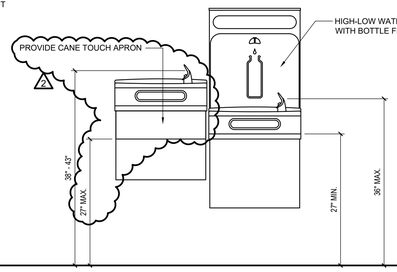

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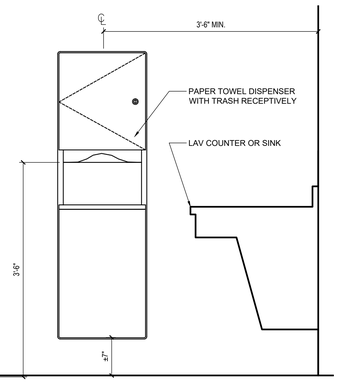

C A7.1 DETAIL
SCALE: 1"=1'-0"

Barganier Davis Williams Architects Associated

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STATE OF ALABAMA
DART W. DAVIS 2767
RAY E. WILLIAMS 4239
JOHNNY B. RAINES, III 7127
REGISTERED ARCHITECTS

NEW FIRE STATION NO. 10
FOR
THE CITY OF MONTGOMERY
SOUTH COURT STREET MONTGOMERY, ALABAMA 36104

REVISIONS		
No.	Description	Date
A	ISSUED FOR REVIEW	11/08/22
B	ISSUED FOR REVIEW	11/15/22
0	ISSUED FOR REVIEW	01/16/23
1	ISSUED FOR BID	02/03/23
2	ADDENDUM NO. 2	02/13/23

MGM Project No.	SP-5-21
BDW Project No.	2021-118
Drawn By:	BDW
Date:	
Scale:	AS NOTED

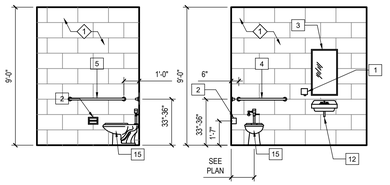
Drawing Title:

TOILET PLANS

Sheet No:

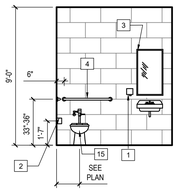
A7.1

CONSTRUCTION DOCUMENTS



1 A7.3 TOILET-178

2 A7.3 -178



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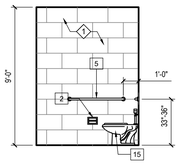

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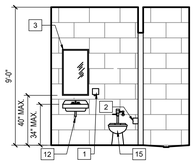

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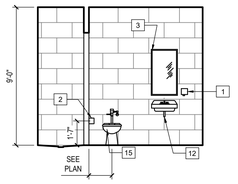

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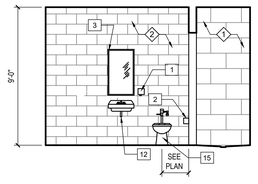
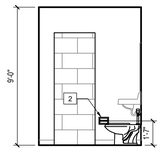
SCALE: 1/4"=1'-0"



7 A7.3 TOILET-118
SCALE: 1/4"=1'-0" 117 REVERSED



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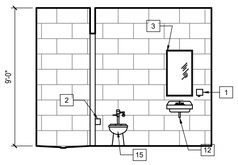

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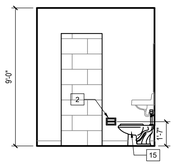

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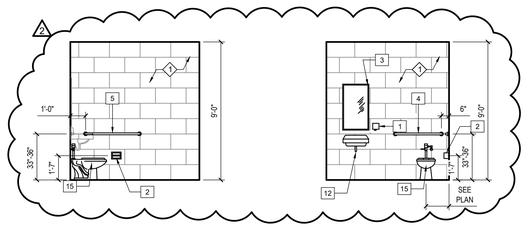
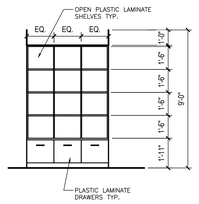
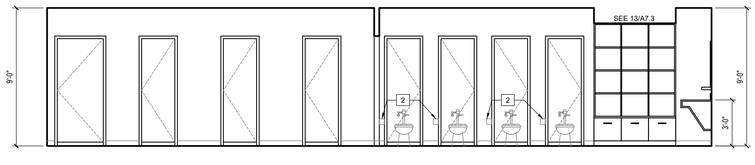


11 A7.3 TOILET-102
SCALE: 1/4"=1'-0"

12 A7.3 TOILET-102
SCALE: 1/4"=1'-0"



13 A7.3 TOILET
SCALE: 1/4"=1'-0"



14 A7.3 COMMON BATH 156
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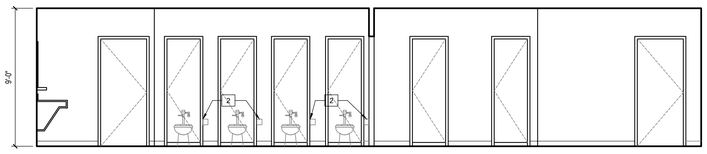

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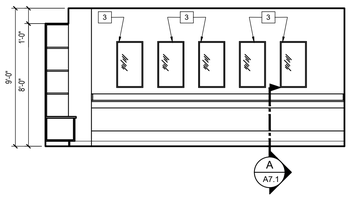

16 A7.3 COMMON BATH 156 B
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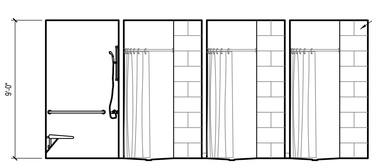

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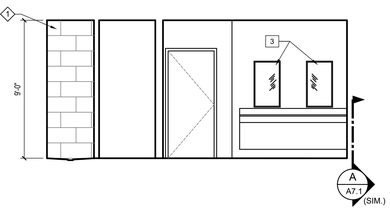
SCALE: 1/4"=1'-0"



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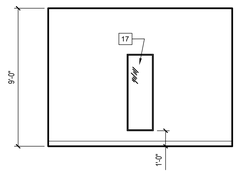

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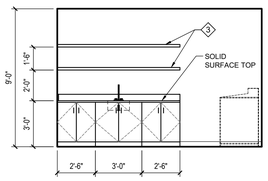


20 A7.3 EXTRACTOR/ LAUNDRY
SCALE: 1/4"=1'-0"

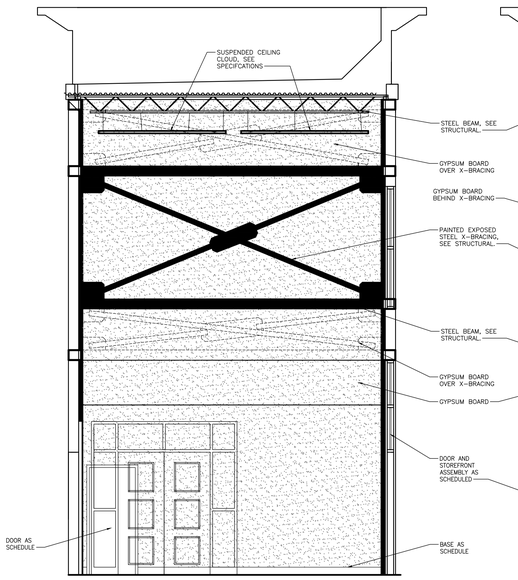
TOILET ACCESSORY INDEX		
SYMBOL	ACCESSORY	MOUNTING HEIGHT
1	WALL MOUNTED SOAP DISPENSER	40" TO DISPENSING MECHANISM
2	TOILET TISSUE DISPENSER (SURFACE-MOUNTED)	28" AFF TO TOP OF UNIT
3	18" x 36" PLATE GLASS MIRROR WITH FRAME	40" TO BOTTOM OF REFLECTIVE SURFACE
4	GRAB BAR 36"	36" AFF TO TOP OF BAR
5	GRAB BAR 42"	36" AFF TO TOP OF BAR
6	GRAB BAR 18" (WHERE APPLICABLE)	SEE ELEVATIONS
7	PAPER TOWEL DISPENSER / WASTE RECEPTACLE	42" TO DISPENSER - SEE C/A7.2
8	NOT USED	
9	METAL COAT HOOK	48" TO HOOK, ON INSIDE FACE OF DOOR
10	SANITARY NAPKIN DISPOSER (WHERE APPLICABLE)	28" AFF TO TOP OF UNIT
11	ADJUSTABLE SHELVING	
12	INSULATED PIPE, TYP.	
13	ACCESSIBLE FOLDING SEAT	
14	STAINLESS STEEL UTILITY SHELF W/ 4 MOP HOLDERS	
15	FLUSH VALVE TOILET	
16	UTILITY HOOKS	
17	24" x 60" FRAMED PLATE GLASS MIRROR	12" TO BOTTOM OF REFLECTIVE SURFACE

GENERAL NOTES

1. ALL CASEWORK TO BE LAMINATE CLAD CASEWORK UNLESS OTHERWISE NOTED. SEE SPECIFICATIONS.
2. COUNTER TOP MATERIALS TO BE (UNLESS NOTED OTHERWISE):
   TOILETS & BATHS: SOLID SURFACE
   KITCHEN #108: QUARTZ
   ALL OTHER SPACES: PLASTIC LAMINATE

KEYNOTES

1. PORCELAIN TILE 12" x 24"
2. PAINTED CONCRETE MASONRY UNITS
3. 12" DEEP COATED WIRE SHELVES



20 A7.3 PUBLIC LOBBY 101
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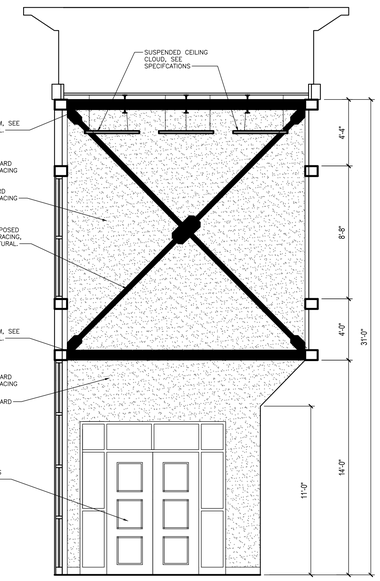

21 A7.3 PUBLIC LOBBY 101
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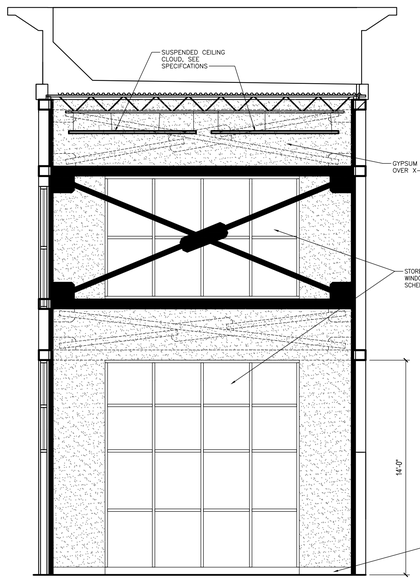

22 A7.3 PUBLIC LOBBY 101
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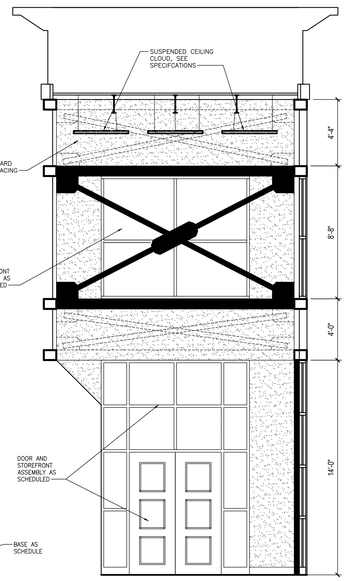

23 A7.3 PUBLIC LOBBY 101
SCALE: 1/4"=1'-0"

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STATE OF ALABAMA
REGISTERED ARCHITECTS
DART W. DAVIS 2767
RAY E. WILLIAMS 4239
JOHNNY B. RAINES, III 7127

NEW FIRE STATION NO. 10
FOR
THE CITY OF MONTGOMERY
SOUTH COURT STREET MONTGOMERY, ALABAMA 36104

REVISIONS		
No.	Description	Date
A	ISSUED FOR REVIEW	11/15/22
0	ISSUED FOR REVIEW	01/16/23
1	ISSUED FOR BID	02/03/23
2	ADDENDUM NO. 2	02/13/23

MGM Project No.	SP-5-21
BDW Project No.	2021-118
Drawn By:	BDW
Date:	
Scale:	AS NOTED

Drawing Title:

INTERIOR ELEVATIONS

Sheet No:

A7.3

CONSTRUCTION DOCUMENTS

Barganier Davis Williams Architects Associated bdw
624 South McDonough Street Montgomery, Alabama 36104
(334) 834-2038 www.bdwarchitects.com

ADDENDUM NO. 3 - Tuesday, February 21, 2023

FROM: Barganier Davis Williams Architects Associated
624 South McDonough Street, Montgomery, Alabama 36104

TO: **Bidders**

RE: **New Fire Station No. 10** for the City of Montgomery
South Court Street
Montgomery, Alabama 36104
City Project No: SP-5-21
BDW Project No: 2021 – 118

This Addendum forms a part of the Contract Documents dated February 02/02/2023. If possible, this Addendum will be emailed to the bidders, vendors etc. who have requested the download link to access Construction Documents but note that it will be the responsibility of all bidders, vendors etc. to periodically verify with the architect for the latest Addendums issued prior to Bid Date.

GENERAL:

1. Refer to the Advertisement for Bids and change the **Mandatory Pre-Bid** date from Wednesday, February 22, 2023, to **Wednesday, March 1, 2023**. Time and place to remain the same.

2. Refer to the Advertisement for Bids and change the Bid Date from Tuesday, March 7, 2023, to **Tuesday, March 28, 2023.** Time and place to remain the same.

RFI:

1. Sheet C-101 the staff parking lot is scheduled to add fence. The plan does not show a fence going along the back side of the parking lot. Is there an existing fence already there? **RESPONSE: See revised Sheet C-101 to show the fence closing on the north side of the staff parking lot.**

2. Please verify if there are any architectural block on this project. **RESPONSE: Yes.**

3. Can HDPE or HP be used in lieu of RCP for the storm pipe? **RESPONSE: HP storm can be used in lieu of RCP for the storm pipe.**

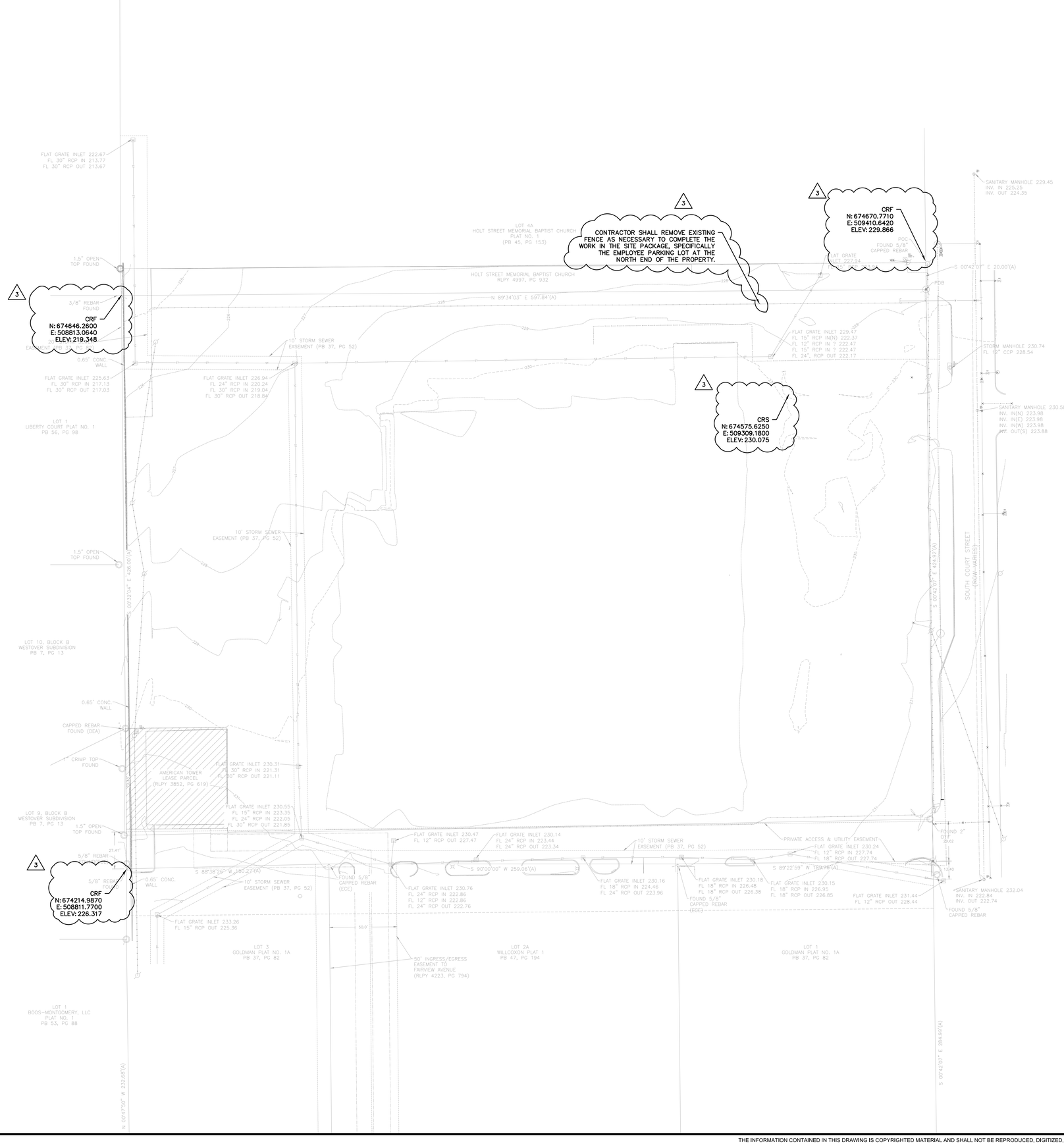
4. There is a note on sheet C-002 – EXISTING CONDITIONS that states: “note: the existing conditions shown here were the conditions of the site prior to the demolition package. Prior to beginning work on the site package, the contractor shall perform an as-built survey of the site. The price of the as-built survey shall be included in the bid. Any discrepancies shall be communicated to the owner and engineer so that it can be adjusted in the construction documents.”
   How do we need to quantify and estimate earthwork volumes for this project when the existing topo on the plans is from when there was a building, slab and pavements there previously but now it has been demolished and the topo isn’t accurate anymore? Do we bid based off of the existing topo, then if awarded, perform an as-built and any discrepancies between the topo on the plans and the as-built be handled through change order?

   RESPONSE: The contractor shall price the earthwork volumes from the existing topo. The contractors should also assume that the existing asphalt had a thickness of 4” and the existing concrete slab had a thickness of 5”. In addition to this, the contractor should give a unit price, as an allowance, for an additional haul-in of 1000 CYIP. This additional fill material takes into consideration any material that may have been removed during the demolition package.

DRAWINGS:

1. Refer to Sheet C-002 - Existing Site Conditions. See clouded revisions.
2. Refer to Sheet C-102 - SITE PLAN - DEDUCT. See clouded revisions.
3. Refer to Sheet C-302 - UTILITY PLAN - BASE BID. See clouded revisions.

END OF ADDENDUM NO. 3



Scale: 1" = 30'

LEGEND

- POWER POLE
- GUY WIRE
- FIRE HYDRANT
- SIGN
- WATER METER
- WATER VALVE
- LIGHT POLE
- CABLE TV BOX
- EX. STORM MANHOLE
- EXISTING IRON PIN
- OE — OVERHEAD ELECTRIC
- S — UNDERGROUND SEWER LINE
- W — UNDERGROUND WATERLINE
- G — UNDERGROUND GAS LINE
- ST — UNDERGROUND STORM PIPE
- 197 — EX. MAJOR CONTOUR
- 199 — EX. MINOR CONTOUR

NOTE: THE EXISTING CONDITIONS SHOWN HERE WERE THE CONDITIONS OF THE SITE PRIOR TO THE DEMOLITION PACKAGE. PRIOR TO BEGINNING WORK ON THE SITE PACKAGE, THE CONTRACTOR SHALL PERFORM AN AS-BUILT SURVEY OF THE SITE. THE PRICE OF THE AS-BUILT SURVEY SHALL BE INCLUDED IN THE BID. ANY DISCEPREPANCIES SHALL BE COMMUNICATED TO THE OWNER AND ENGINEER SO THAT IT CAN BE ADJUSTED IN THE CONSTRUCTION DOCUMENTS.

Barganier
Davis
Williams
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Associated

bdw architects

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Montgomery, AL 36104

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www.bdwarchitects.com

ALABAMA
No. 33812
PROFESSIONAL
ENGINEER
JUAN PABLO GARCIA

02.17.2023

NEW FIRE STATION NO. 10

FOR

THE CITY OF MONTGOMERY

SOUTH COURT STREET MONTGOMERY, ALABAMA 36104

REVISIONS		
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MGM Project No.	SP-5-21
BDW Project No.	2021-118
Drawn By:	
Date:	
Scale:	AS NOTED

Drawing Title:

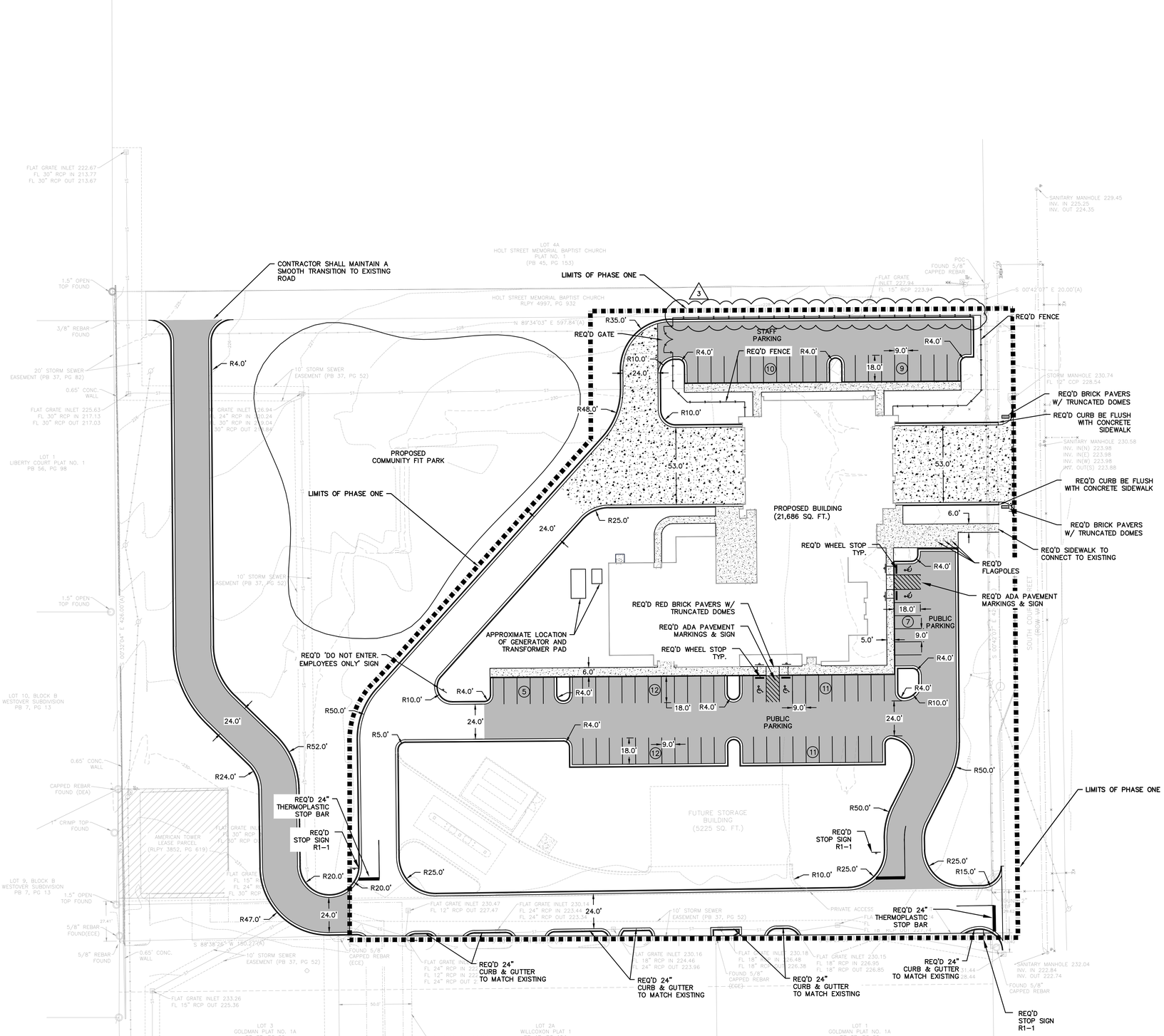
EXISTING CONDITIONS

Sheet No:

C-002

CONSTRUCTION DOCUMENTS

DRAWING FILE: T:\Montgomery\CM\GM Proj\Barganier, Davis, Sims\21-0158 New Fire Station No. 10\10WG\C-002 EXISTING CONDITIONS.dwg
PLOTTED: Feb 20, 2023 - 10:48am



N

0 30' 60'

Scale: 1" = 30'

LEGEND

- POWER POLE
- GUY WIRE
- FIRE HYDRANT
- SIGN
- WATER METER
- WATER VALVE
- LIGHT POLE
- CABLE TV BOX
- EX. STORM MANHOLE
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- ST — UNDERGROUND STORM PIPE
- 197 — EX. MAJOR CONTOUR
- 199 — EX. MINOR CONTOUR

- LIGHT DUTY PAVING
- HEAVY DUTY PAVING
- HEAVY DUTY CONCRETE PAVING
- CONCRETE SIDEWALK
- LIMITS OF PHASE ONE

Barganier Davis Williams Architects Associated

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ALABAMA LICENSED No. 33812 PROFESSIONAL ENGINEER JUAN PABLO GARCIA

02.17.2023

NEW FIRE STATION NO. 10

FOR

THE CITY OF MONTGOMERY

SOUTH COURT STREET MONTGOMERY, ALABAMA 36104

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MGM Project No.	SP-5-21
BDW Project No.	2021-118
Drawn By:	
Date:	
Scale:	AS NOTED

Drawing Title:

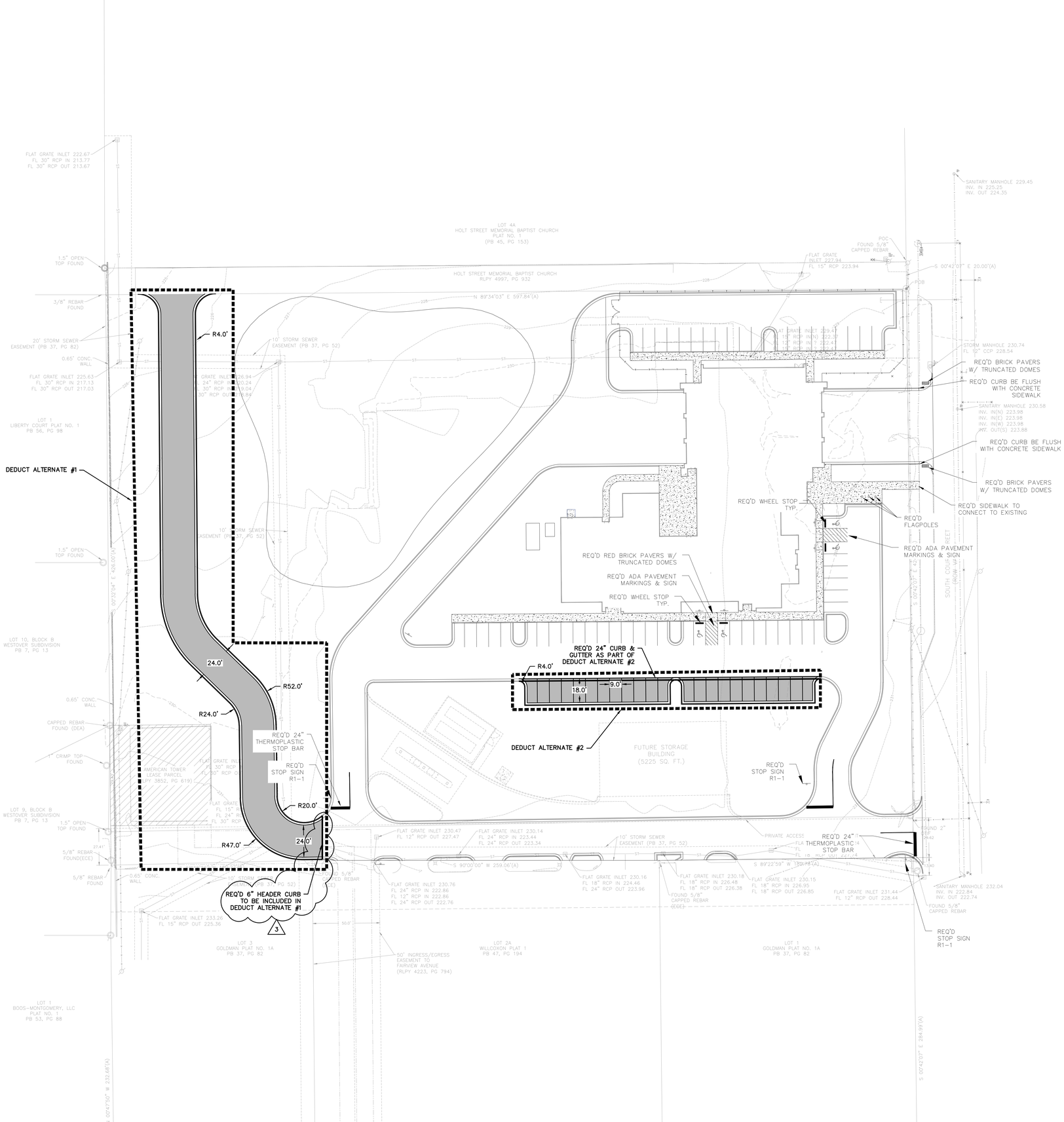
SITE PLAN - BASE BID

Sheet No:

C-101

CONSTRUCTION DOCUMENTS

DRAWING FILE: T:\Montgomery\CMGM Proj\Barganier, Davis, Sims\21-0158 New Fire Station No. 10\00 DWG\C-101 SITE PLAN.dwg
PLOTTED: Feb 20, 2023 - 10:34am



NOTE: PAVING OPERATIONS SHALL BE INCLUDED AS A BASE BID ITEM. A DEDUCT ALTERNATE #3 SHALL DEDUCT BOTH THE WEARING AND BINDER SURFACES.

Barganier Davis Williams Architects Associated

bdw architects

624 South McDonough Street
Montgomery, AL 36104

phone: 334.834.2038
www.bdwarchitects.com

ALABAMA LICENSE NO. 33812 PROFESSIONAL ENGINEER JUAN PABLO GARCIA

02.17.2023

NEW FIRE STATION NO. 10

FOR

THE CITY OF MONTGOMERY

SOUTH COURT STREET MONTGOMERY, ALABAMA 36104

REVISIONS		
No.	Description	Date
A	ISSUED FOR REVIEW	05/24/22
B	ISSUED FOR REVIEW	11/08/22
D	ISSUED FOR REVIEW	01/16/23
1	ISSUED FOR BID	02/03/23
2	ADDENDUM #3	02/17/23

MGM Project No.	SP-5-21
BDW Project No.	2021-118
Drawn By:	
Date:	
Scale:	AS NOTED

Drawing Title:

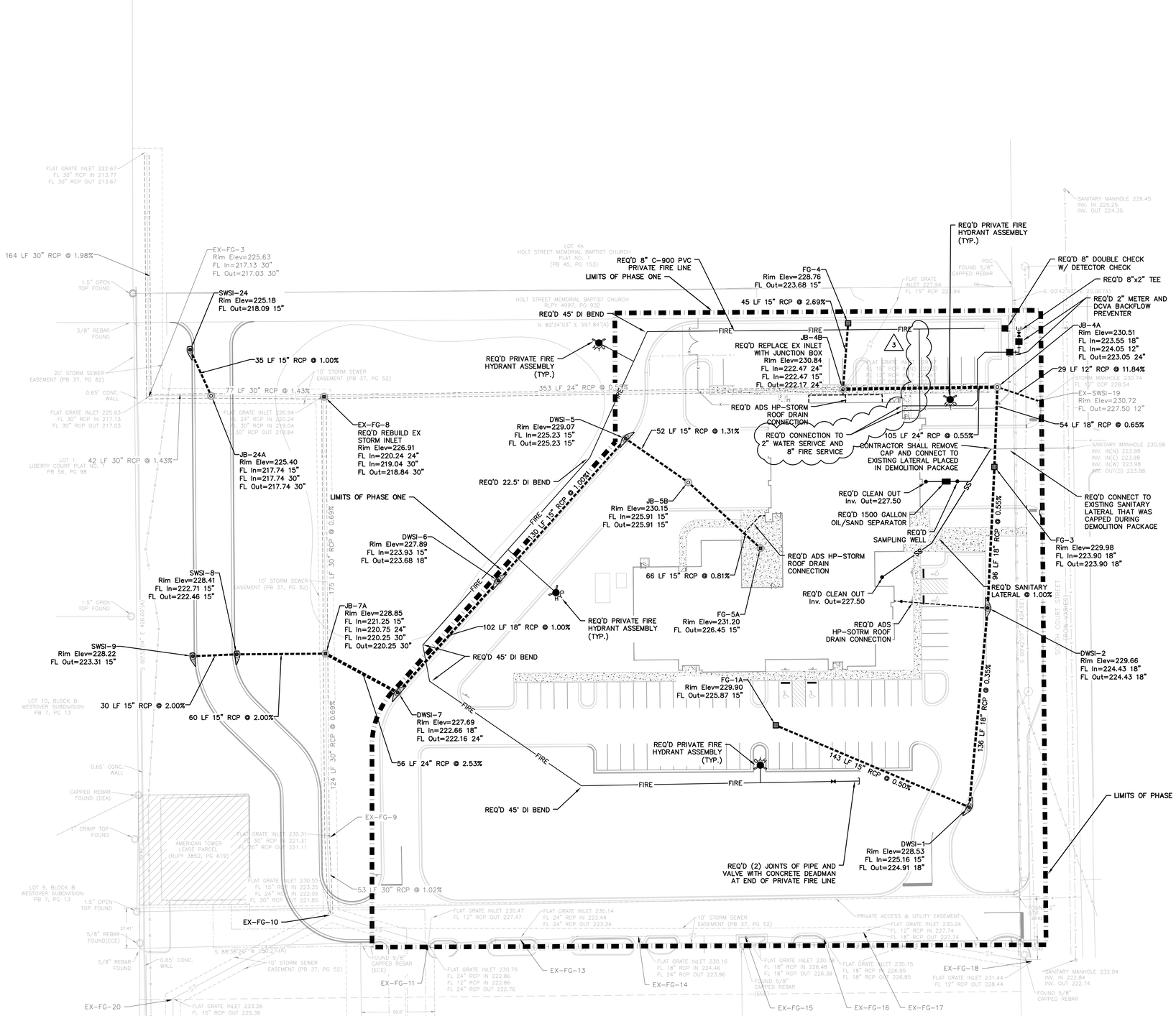
SITE PLAN - DEDUCT ALTERNATES

Sheet No:

C-102

CONSTRUCTION DOCUMENTS

DRAWING FILE: Y:\Montgomery\CMGM Proj\Barganier, Davis, Sims\21-0158 New Fire Station No. 10\0 DWG\C-101 SITE PLAN.dwg
PLOTTED: Feb 20, 2023 - 1:57pm



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02.17.2023

NEW FIRE STATION NO. 10

FOR

THE CITY OF MONTGOMERY

SOUTH COURT STREET MONTGOMERY, ALABAMA 36104

REVISIONS

No.	Description	Date
A	ISSUED FOR REVIEW	05/24/22
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2	ADDENDUM #3	02/17/23

MGM Project No. SP-5-21
BDW Project No. 2021-118
Drawn By:
Date:
Scale: AS NOTED

Drawing Title:

UTILITY PLAN - BASE BID

Sheet No:

C-301

CONSTRUCTION DOCUMENTS

DRAWING FILE: T:\Montgomery\CMGM Proj\Barganier, Davis, Sims\21-0118 New Fire Station No. 10\7.0 DWG\C-301 UTILITY PLAN.dwg
PLOTTED: Feb 20, 2023 - 10:50am

Barganier Davis Williams Architects Associated bdw
624 South McDonough Street Montgomery, Alabama 36104
(334) 834-2038 www.bdwarchitects.com

ADDENDUM NO. 4 - Thursday, March 9, 2023

FROM: Barganier Davis Williams Architects Associated
624 South McDonough Street, Montgomery, Alabama 36104

TO: **Bidders**

RE: **New Fire Station No. 10** for the City of Montgomery
South Court Street
Montgomery, Alabama 36104
City Project No: SP-5-21
BDW Project No: 2021 – 118

This Addendum forms a part of the Contract Documents dated February 02/02/2023. If possible, this Addendum will be emailed to the bidders, vendors etc. who have requested the download link to access Construction Documents but note that it will be the responsibility of all bidders, vendors etc. to periodically verify with the architect for the latest Addendums issued prior to Bid Date.

GENERAL:

1. The Cut-off date for RFI's shall be Friday, March 24th at 12:00 pm.
2. See attached Pre-bid conference minutes and sign-in sheet for pre-bid conference.
3. Refer to addendum No. 3, RFI No. 2; "Please verify if there are any architectural block on this project" – Response should read, "standard CMU only, no special CMU".

SPECIFICATIONS:

1. Refer to Section 15920, Building Automation System (BAS) and add the following requirement:

   Walters Controls (Honeywell), Mobile Alabama is an approved HVAC Controls Vendor.

RFI'S:

2. We cannot locate the specs on coiling door mark 114 at rear gate. Please advise.

   RESPONSE: Coiling door 114 is at gear storage in the building (see attached specs).

3. Spec Section 083600 Sectional Overhead Doors:

A. Page 2-B Wiring connections: Please choose one and delete the others.

RESPONSE: Wiring Connections: 208 volts, single phase, 60 Hz.

B. Page 3-2.2.J. Please confirm ¼ inch tempered glass is correct.

RESPONSE: ½" Insulated, Tempered glass.

C. Page 4-8a. Entrapment Protection: Please choose what is required and delete the others.

RESPONSE: Only #2 and #3

D. 8b. Operator Controls: Please choose what is required and delete the others.

RESPONSE: Only # 1

E. 8c. Special Operations: Please choose what is required and delete the others.

RESPONSE: Delete this section in its entirety.

4. Add 2 Allowance 5& 6 appear to be the same.

RESPONSE: Delete allowance No. 6

4. We are not seeing the ACM Panel section in the specifications. Will you please provide this section?

RESPONSE: See section 074216 Modular Metal Wall Panels – located in re-issued Specs. In Addendum No. 2.

5. Drawing C-102 mentions an Alternate 3. Alternate Section of Specs mentions only two Alternates.

RESPONSE: See Revised "Alternates" in Addendum No. 2.

6. Note on L1.0 indicates "flagpoles by others". There is a Spec Section for flagpoles – Please clarify.

RESPONSE: Delete "flagpoles by others" on L1.0. Flag poles to be furnished by contractor.

7. Allowance 2 is for an irrigation system, but a complete system appears to be on the drawings – Please clarify.

RESPONSE: See revised "Allowances" in Addendum No. 2.

8. Spec Sections 09723 & 099600 regarding flooring finishes were not included. Will these be added by addendum?

RESPONSE: The Sections are included in the re-issued Specifications in Addendum No. 2.

9. Will a Spec Section for the irrigation system by released?

   RESPONSE: See specification Section 328423 Irrigation Work attached.

10. Please verify there are not wall hydrants on this project.

    RESPONSE: Wall hydrants required. See attached revised drawing P-4.

11. Will a DBA communication system be required on this project?

    RESPONSE: See Allowance No. 7 included in re-issued Section 12100 Allowance in Addendum No. 2.

12. No suggested manufacturers are listed on the attached sign spec sheets other than matching certain sign types. Are we able to use the manufacturers we typically use on our projects for interior and exterior signage?

    RESPONSE: Interior signage manufacturers listed in Section 101400 Signage, paragraph 2.1.

13. On the attached allowances page…do we exclude from our quote the backlit "10" signage shown on A4.1 Exterior Elevations and let you include that in your part of the bid?

    RESPONSE: Yes, the backlit "10" would be included in the Allowance No. 9.

14. On the 2A/SOUTH ELEVATION drawing on the far right of the attached A4.1 Exterior Elevations, not specific type of vinyl is listed for the film signage over the panels. Do we quote that at our discretion?

    RESPONSE: Provide a permanent vinyl applied membrane to the shape of the "10". Provide an example (mockup) of the application prior to installation. Follow all other instructions per the drawing.

15. Is the G.C. responsible for furnishing folding beds in the bunkrooms?

    RESPONSE: Only one folding bed is required by G.C. This is in Command Watch 112. See keynote 14 on Drawing A1.1.

16. Is the G.C. responsible for furnishing cabinets or lockers in the bunkrooms.

    RESPONSE: No

17. Please provide Specs. for Knox Box.

    RESPONSE: See attached correspondence for the Knox Box.

18. Please advise the wind load requirement for the overhead coiling door?

    RESPONSE: Refer to SHEET S0.1, GENERAL NOTES AND SCHEDULE, - Design Live Loads: Wind.

19. Please clarify the type and gauge of metal roof deck over the CF Steel Trusses?

    RESPONSE:

21. Please confirm that the generator is natural gas. On the diagram on page E7.1 shows the natural gas diagram for the generator, and on another page it calls out diesel. Please advise what the generator should be.

RESPONSE: Natural Gas

DRAWINGS:

Mechanical

1. Refer to drawing Sheet M7 - HVAC Controls. See clouded revisions.
2. Refer to drawing Sheet M8 - HVAC Controls. See clouded revisions.
3. Refer to drawing Sheet M9 - HVAC Controls. See clouded revisions.
4. Refer to drawing Sheet M10 - HVAC Controls. See clouded revisions.
5. Refer to drawing Sheet M11 - HVAC Controls. See clouded revisions.
6. Refer to drawing Sheet M12 - HVAC Controls. See clouded revisions.

Electrical

7. Refer to drawing Sheet E1.1 - Electrical Site Plan. See clouded revisions.
8. Refer to drawing Sheet E2.1 - Lighting Plan. See clouded revisions.
9. Refer to drawing Sheet E7.1 - Generator Details. See clouded revisions.

END OF ADDENDUM NO. 4

SECTION 32 8423

IRRIGATION WORK

PART 1.0 - GENERAL

1.1 RELATED DOCUMENTS:

A. The general provisions of the Contract, including General and Supplementary Conditions, and General Requirements apply to the work specified in this Section.

B. Section 329000 - "Landscape Work"

1.2 DESCRIPTION OF WORK:

A. Furnish all labor, materials, equipment and services necessary for the complete installation of the landscape irrigation system as drawn and specified. The work includes, but is not limited to:

1. Trench, backfill and compaction for irrigation lines.
2. Automatically controlled landscape irrigation system; backflow preventer; pressure reducing valve; isolation gate valves; piping and sleeves under paving; repair of paving, main and lateral lines; electrical valves and wiring; valve boxes and controllers; sprinklers; couplings; connectors; fittings; and if needed, tape and meter.
3. Test all systems and make operative.
4. Submit Record Drawings and Maintenance Manual.
5. One-year Guarantee Period.
6. Maintain and operate for 1-year beyond Date of completion of Substantial Completion punch list.

1.3 QUALITY CONTROL:

A. Installer Qualifications: Firm shall hold Alabama General Contractors License for Specialty Construction, Subclassification - Landscaping or Other Specialty Construction (specified as Irrigation). Firm experienced in the successful installation of a minimum of five (5) projects within the past five (5) years similar in scope, quality, and contract value to that indicated for this project. Firm shall have sufficient manpower, equipment and financial resources to complete the Work of this Section.

B. The Owner and the Landscape Architect reserve the right to reject any and all materials and workmanship, which they deem to be not in accordance with Drawings and Specifications. Rejected materials and work shall be removed from site immediately and replaced with that of the specified quality.

C. Applicable Standards:

1. ASTM:
   a. D1785: Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedule 40.
   b. D2464: Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Threaded, Schedule 40.
   c. D2466: Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Socket Type, Schedule 40.
   d. D2564: Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

D. Applicable Codes:

1. Most current edition of Uniform Plumbing Code.
2. Applicable Building Code.
3. All applicable local codes and ordinances.
4. National Electrical Code.
5. Should Specification's requirements differ from local requirements, consider Contract Document requirements to be the minimum acceptable and comply with any more stringent local requirements.

E. Permits and Fees:

1. Obtain all permits and pay required fees to any agency having jurisdiction over the work.
2. Arrange inspections required by local ordinances during the course of construction.
3. Upon completion of the work, furnish satisfactory evidence to show that all work has been installed in accordance with the ordinances and code requirements.

F. Testing:

1. Perform testing and inspections required by specifications and by regulating authorities.
2. Give 24-hours notice that such tests are to be conducted.

1.4 <u>SUBMITTALS</u>:

A. Qualification data for firms specified in "Quality Control" article to demonstrate their capabilities and experience. Include a list of a minimum of 5-similar projects completed within the last 5-years with project name, address, names of Architects and Owners, overall description of scope of work and contract value.

B. Shop Drawings:

1. Submit with Shop Drawings manufacturer's catalog sheet showing full specifications of each type sprinkler proposed including discharge of GPM, minimum allowable operating pressure at sprinkler, maximum allowable spacing and distance of throw (coverage).

C. Record Drawings:

1. Prepare and submit a reproducible Record Drawing showing deviations from the Contract Documents made during construction affecting the main line pipe, controller location, valve locations, and all sprinkler head locations. Record Drawings shall also indicate and show approved substitutions of size, material, and manufacturer's name and catalog number and name.
2. Deliver Record Drawings with request for inspection and acceptance.
3. Deliver one (1) set of record drawings, reduced in size and laminated. Drawings should be suitable for mounting adjacent to irrigation controller.

D. Maintenance Manual:

1. Prepare and submit irrigation system maintenance and operating instructions, with relevant manufacturer's literature. Include complete parts list covering all operating equipment.
2. Submit in a hardcover, 3-ring binder.
3. Include full name, address, and telephone number of Installer.

1.5 COORDINATION:

A. Coordinate and cooperate with the Architect and other contractors and trades to enable the work to proceed as rapidly and efficiently as possible, and to be completed on schedule.

B. Anticipate last minute delays, which may necessitate overtime work to complete the work on schedule. Sleeves under paving shall be placed by Site Contractor. Coordinate with other trades on site for sequencing of work.

1.6 SITE INSPECTION:

A. Become familiar with all site conditions.

B. Should utilities not shown on plans be found during excavations, promptly notify the Architect for instructions as to further action.

C. Make necessary adjustments in the layout as may be required:

1. To connect to existing stubouts (should such stubs not be located exactly as shown); or
2. To work around existing work. Such adjustments shall be made with no increase in cost to the Owner.
3. To avoid existing utilities.

1.7 PROTECTION OF EXISTING CONDITIONS:

A. Take necessary precautions to protect site conditions to remain.

B. Should damage be incurred, repair the work to its original condition at no additional cost to the Owner.

PART 2.0 - PRODUCTS

2.1 PVC PIPE - (Polyvinyl Chloride Pipe):

A. PVC pipe shall be manufactured in accordance with standards noted herein.

B. Marking and Identification: PVC pipe shall be continuously and permanently marked with the following information:

1. Manufacturer's name, pipe, size, type of pipe and material, SDR number, ASTM standard number and NSF (National Sanitation Foundation) seal.

C. Irrigation Water Piping:

1. Main Lines: ASTM D-1785, Schedule 40.
2. Lateral Lines: ASTM D-1785, Class 200.

D. This Contractor is responsible for determining if sleeves were installed prior to submitting a bid. If not installed, boring under paving, and/or hand excavation is required.

2.2 PIPE FITTINGS:

A. PVC: Meeting specified standards, Schedule 40, Standard Weight, at PVC pipe; joints solvent welded as recommended by manufacturer, except swing joints and riser to head, which shall be threaded with Teflon Tape. Swing joints shall be Schedule 80.

2.3 SOLVENT CEMENT:

A. Meeting ASTM D-2564 and of proper consistency.

2.4 RISERS:

A. Spray Heads in all areas use swing pipe. Submit sample of swing joint for approval.

B. Rotor heads use triple elbow swing joint, submit sample of swing joint for approval.

2.5 VALVES:

A. Electric Remote-Control valve sized as per manufacturer’s recommendations, mechanical joint.

2.6 BACKFILL UNDER PAVING:

A. Crushed stone of the following gradation, placed and compacted to 100%:

1. 100% passing ½-inch sieve.
2. 90-100% passing 3/8-inch sieve.
3. 60-85% passing #4 sieve.
4. 40-70% passing #8 sieve.
5. 10-25% passing #50 sieve.
6. 1-5% passing #200 sieve.

2.7 VALVE BOX AND COVER:

A. Ametek or equal with provision for locking.

2.8 AUTOMATIC CONTROLLER:

A. Provide controller with ample stations for system, 120 Volt power will be supplied by others.

2.9 CONNECTION TO WATER MAIN:

A. Install backflow preventer as per City recommendations.

B. If needed, install irrigation water meter and tap as per City recommendations.

C. Contractor to check pressure at water meter and install a pressure reducing valve if pressure is too excessive for irrigation system.

PART 3.0 - EXECUTION

3.1 GENERAL:

A. Verify existing and proposed locations of all site utilities (i.e. gas, water, electric, telephone) prior to any trenching and laying of pipe.

B. Coordinate all irrigation work with that of all other site work trades and contractors.

C. All piping to be installed directly behind curb where possible and in all cases to be routed around existing or proposed site elements, including root balls of proposed trees and shrubs. Refer to the landscape planting Drawings for approximate tree locations and closely coordinate work and schedule with grading and planting work.

D. Contractor is responsible for full and complete coverage of all areas designated on the Drawings to be irrigated and shall make any necessary adjustments at any time, at no additional cost to the Owner.

E. Exact location and configuration of islands and other features may vary from that shown on these Drawings. Verify location and configuration at the site prior to trenching for sleeves and piping under paving, and make any minor adjustments to irrigation systems layout. Notify Architect of substantial changes.

F. Maintain all warning signs, barricades, bracing, flares, and red lanterns as required by safety regulations and local ordinances.

3.2 INSTALLATION:

A. General:

1. Lay out according to site coordinates and actual field dimensional controls; verify piping and sleeve locations before trenching.

B. Excavating and Trenching:

1. Perform all excavation required for installation of the work included under this Section, including shoring and bracing of earth banks to prevent cave-in.
2. Restore all surfaces and existing underground installations damaged or cut as a result of the excavations, to their original condition and in a manner approved by the Owner.
3. All excavation shall be unclassified. Trenches shall be 4-inches wide and to the depth required as specified herein and shown in the Drawings.
4. Over-excavation shall be backfilled at the Contractor's expense with cushion sand. Remove all unsuitable or excess material from the site.
5. Dewater excavations as required for dry work including both surface and ground water.
6. Trenches shall have sides as nearly vertical as possible and bottoms shall be shaped to provide continuous bedding of each section of pipe along its entire length in undisturbed soil or thoroughly compacted fill.
7. Trenches for piping shall be of sufficient depths to provide 12-inches minimum cover for pipes from finished grade. In Public Right-Of-Way, provide 18-inches minimum cover over top of main and lateral lines, or greater depth if required by local authorities.

C. Pipe Installation:

1. Pipe installation includes all irrigation piping required for water and electrical wiring to complete the automatic irrigation system.
2. Provide firm, uniform bearing for entire length of each pipeline to prevent uneven settlement. Wedging or blocking of pipe will not be permitted. Remove foreign matter or dirt from inside of pipe before joining and keep piping clean by approved means during and after laying of pipe.
3. Assemble pipe and solvent weld. Clean joint thoroughly of dust, dirt, and moisture before applying solvent with non-synthetic bristle brush.
4. Install all pipe and wiring under paving in sleeves as specified, whether or not shown on Drawings. Pressure test all piping under paving prior to paving. All mains and piping under pavement to be pressure tested and activated immediately.

D. Pipe Fitting:

1. Solvent: Use only solvent recommended by manufacturer to make solvent welded joints. Thoroughly clean pipe and fittings of dirt, dust and moisture before applying solvent.

2. PVC to Metal Connection: Work metal connection first. Use a TEFLON pipe fitting tape on threaded PVC to metal joints. Use only light wrench pressure.
3. Threaded PVC Connections: Where required, use threaded PVC adapters into which pipe may be welded.

E. Irrigation Heads:

1. Prior to installation, verify configuration of planting areas and tree locations, and stake head layout accordingly. Obtain approval of staked head locations from Landscape Architect before proceeding.
2. Rotor and Pop-up Spray Heads: Attach sprinkler as specified. Adjust riser height after planting.

F. Wiring:

1. Supply #14 UL listed single strand U.F. direct burial wire from automatic controllers to the valves in accordance with the Specifications. Use PVC conduit for all locations of wire under paving; in landscaped areas, the Contractor may add conduit for wires at his option, in lieu of tucking wire under main lines and lateral lines.
2. Secure all wire-to-wire connections by approved means.
3. All wire from controllers to valves shall be tucked under piping.
4. Test wires prior to backfilling to insure continuity from valve location to controller location. Any wire not indicating continuity shall be repaired or replaced immediately.

G. Controller:

1. Coordinate controller location with Architect and Contractor.
2. Coordinate with Alabama Power Company to provide temporary power to controller location. This Contractor shall make power available for system.
3. Pull valve wires, program controller, and put controller in operations.

H. Electrical Valves: Supply and install in accordance with the materials list and the manufacturer's recommendations; set in a level position.

I. Valve Boxes: Set flush with finish grade (adjust as necessary); set over all valves.

J. Drainage: Place a minimum 12-inches depth of crushed stone under each box containing either water meter, pressure regulator, valve or backflow preventer.

3.3 <u>TESTING</u>:

A. Conduct test in presence of Architect. Notify Architect 48-hours in advance of testing date and time:

1. Thoroughly flush out all water lines before installing heads and valves.

2. Operational Test: After backfilling and adjusting heads to final positions, show that system meets coverage requirements and controls function properly. Adjust heads to be not more than ½-inches above finish grade.

3.4 BACKFILL AND COMPACTING:

A. Do not backfill until pipe systems have been hydrostatic tested and approved.

B. After system is operating and required tests and inspections have been made, backfill excavations and trenches as follows:

1. Backfill Under Paving:

a. Backfill for full depth of excavation with the specified crushed stone. Compact in lifts. Backfill shall be free of debris, large clods, roots or other deleterious material.
b. Place backfill material evenly in lifts not to exceed 6-inched and compact to 100-percent of maximum density.
c. Contractor is responsible for establishing compaction in trenches equal to or exceeding overall compaction of paving base. Leave top of trench ready for asphalt by others.

2. Backfill in Landscape Areas:

a. Backfill trenches with material removed during excavation and compacted to 85-percent except where rock is encountered. In this case lay pipe in a cushion sand bed surrounding the pipe, a minimum of 4-inches deep.
b. Compact all excavation to prevent settling. Hand rake excavation areas and adjoining areas to leave grade at the previous elevation and in a good or better condition than before installation. Water-floor compaction will not be permitted.
c. Repair settled areas throughout Guarantee Period, including repair of affected landscape work.

3.5 FINAL ADJUSTMENT:

A. After planting and irrigation installation has been completed, make final adjustment to irrigation system prior to the Architect's final inspection.

B. The system shall be completely flushed to remove any and all debris from the lines by removing nozzles from all heads on ends of lines and turning on the system.

C. Check all heads for correct operation, alignment, and direction of throw.

D. Check each section of spray heads for operating pressure, and balance in relation to all other sections by use of the flow adjustment on top of each valve.

E. Check nozzles for complete coverage. Prevailing wind or other conditions may indicate the arc or angle of spray should be other than as shown on plan. In this case, revise nozzle degree to provide correct coverage, at the Contractor's expense.

F. Adjust head and valve heights as necessary. Make any other adjustments determined necessary by the Landscape Architect to provide complete and uninterrupted coverage.

3.6 CLEAN-UP:

A. Keep site clean on a daily basis by removing trash and debris resulting from construction operation.

B. Keep all walks, roads, and circulation routes free from debris, materials, and equipment at all items.

C. Upon completion of the irrigation work, clean up all work and storage areas by removing trash piles, surplus material, or other material from site.

D. Restore pavement, curbs, ground, and any other disturbed surface to its original condition.

3.7 MAINTENANCE AND COMPLETION OF THE WORK:

A. Complete the irrigation system as specified and operate and maintain same from time of installation until Substantial Completion and for a period of 1-year beyond Substantial Completion.

B. Instruct Owner's personnel in complete operation and maintenance of irrigation system.

SECTION 4.0 - ACCEPTANCE AND GUARANTEE

4.1 SUBSTANTIAL COMPLETION:

A. Submit request for inspection for Substantial Completion to the Landscape Architect at least 24-hours prior to anticipated date of inspection and testing (refer to Paragraph 3.3 TESTING, herein).

B. Submit Record Drawings and Maintenance Manual to the Landscape Architect with request for inspection (refer to Paragraph 1.4 SUBMITTALS, C. and D., herein).

C. Review the work jointly with the Owner and Landscape Architect for Substantial

Completion.

D. Upon completion of repairs and replacements found necessary at time of review, the Owner and Architect will confirm the date of Substantial Completion of the work.

E. The date of completion of repairs and replacements found necessary at time of Substantial Completion, will constitute the beginning date of the 1-Year Guarantee.

4.2 GUARANTEE:

A. Guarantee all work, products, equipment, and materials for 1-year, beginning at date of completion of punch list from Substantial Completion.

B. During the period of the Guarantee, replace immediately, with no additional compensation, all work not functioning correctly; make adjustments as necessary to maintain complete coverage; make good any other damage, loss, destruction, or failure. Repairs and replacements shall be done promptly and at no additional cost to the Owner.

C. Repair damage to grade, plants, and other work or property as necessitated due to irrigation defects, repairs, replacement, or adjustment.

D. If the replacement is not acceptable during or at the end of the Guarantee Period, the Owner may elect either subsequent replacement or credit. Replacement products shall have a similar 1-year guarantee from time of replacement.

E. Guarantee applies to all losses with the exception of those due to Acts of God, Vandalism, or Owner neglect, as determined by the Landscape Architect.

4.3 FINAL INSPECTION AND ACCEPTANCE:

A. At end of Guarantee Period and upon request for inspection, jointly review all guaranteed work for Final Acceptance.

B. Submit written request for inspection for Final Acceptance to the Landscape Architect at least 2-weeks prior to anticipated date of inspection; include list of work provisionally accepted and list of work replaced during Guarantee Period.

C. Upon completion by the Contractor of all required repairs and replacements; the Owner and the Landscape Architect will confirm the date of Final Acceptance of the Work.

END OF IRRIGATION WORK

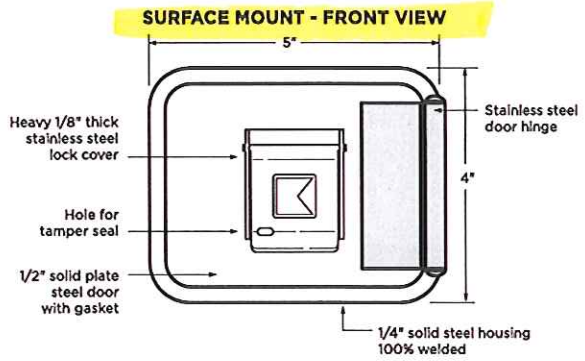
KNOX®
When seconds matter™

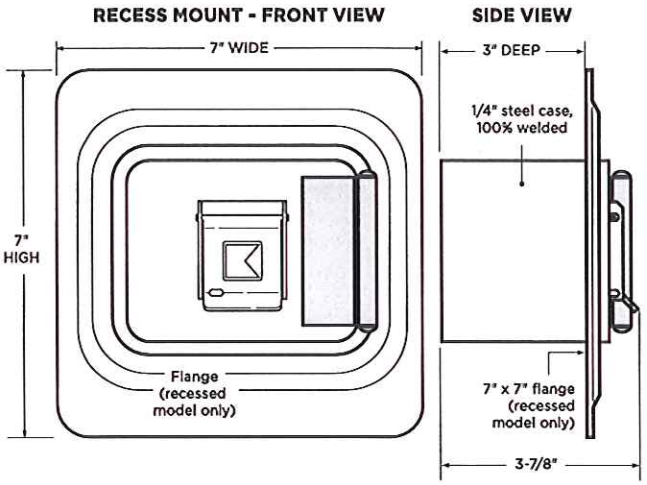
KNOXBOX® 3200

The KnoxBox 3200 is the number one high-security key lock box trusted by first responders and property owners. Store up to 10 keys to quickly gain rapid access to commercial properties.

WEIGHT:
Surface Mount - 8 lbs
Recessed Mount - 9 lbs

DIMENSIONS:
Surface Mount Body - 4"H x 5"W x 3-7/8"D
Recessed Mount Flange - 7"H x 7"W





FEATURES

- Stores maximum 10 keys. Access cards and small entry items may also fit in interior compartment but will reduce max key quantity.
- Built Knox-Rugged and secure: UL 1037, UL 1610, UL 1332, UL 437
- Finished with Knox-Coat® to protect four times better than standard powder coat
- Weather-resistant door gasket
- Hinged door

BENEFITS

- Allows rapid property access
- Reduces property damage
- Prevents forced entry into buildings
- Minimizes first responder injury
- Compliant to National Fire Code (NFPA, IFC, IBC)

OPTIONS

- Knox Tamper Alert connects to building's alarm system for extra security
- Mount types: Recessed and Surface
- 3 color options: Black, Aluminum, Dark Bronze

ACCESSORIES

- Multi-Purpose Switch for use on electrical doors, gates and other electrical equipment
- Recess Mounting Kit for new concrete or masonry construction
- Public Safety Labels
- Tag-Out Tamper Seals
- Key Tags
- Key Rings

ORDERING SPECIFICATIONS

To insure procurement and delivery of the KnoxBox 3200, it is suggested that following specification paragraph is used:

KnoxBox surface/recessed mount with hinged door, with/without UL Listed Knox Tamper Alert. 1/4" plate steel housing, 1/2" thick steel door with interior gasket seal and stainless steel door hinge. Box and lock UL Listed. Lock has 1/8" thick stainless steel dust cover with tamper seal mounting capability.

Exterior Dimensions: Surface Mount Body - 4"H x 5"W x 3-7/8"D
Recessed Mount Flange - 7"H x 7"W

Lock: UL Listed. Double-action rotating tumblers and hardened steel pins accessed by a biased cut key.

Finish: Knox-Coat proprietary finishing process

Color: Black, Dark Bronze or Aluminum

P/N: KnoxBox 3200 (mfr's cat. ID)

Mfr's Name: KNOX COMPANY

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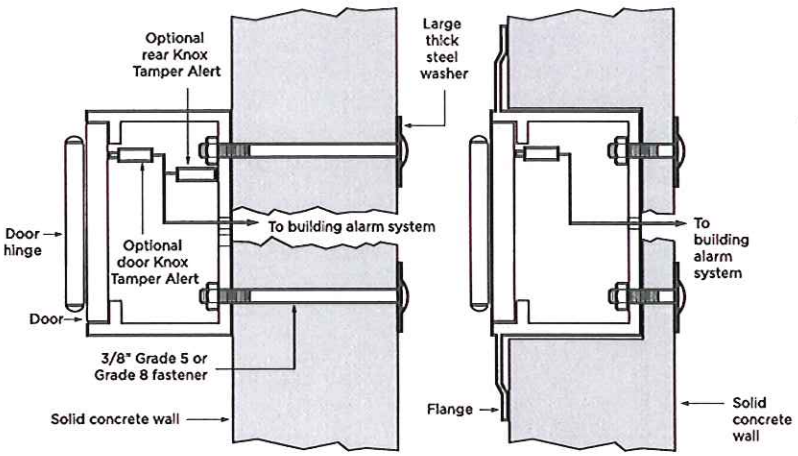
KNOXBOX® 3200

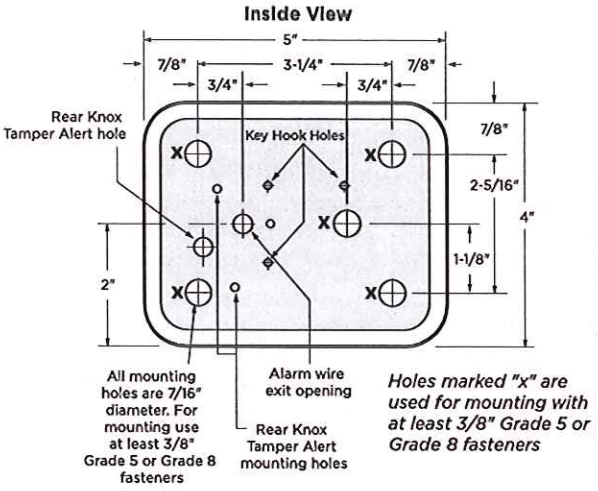
GENERAL MOUNTING INSTRUCTIONS

Suggested minimum mounting height, 6 feet above ground.

ATTENTION: KnoxBox is a very strong device that MUST be mounted properly to ensure maximum security and resist physical attack.



KnoxBox 3200 Hinged Door Surface Mount | **KnoxBox 3200 Hinged Door Recess Mount**



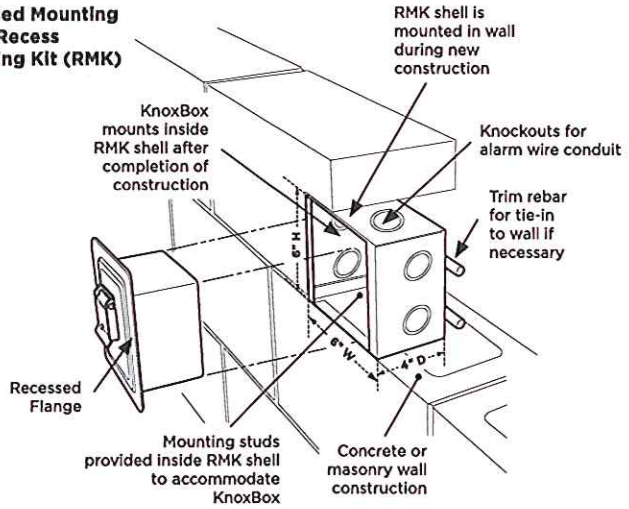
RECESS MOUNTING KIT AND INSTALLATION INSTRUCTIONS

The Recess Mounting Kit (RMK) includes shell housing and mounting hardware, which may only be used for recessed models to cast-in-place within new concrete or masonry construction. The KnoxBox is mounted into the shell housing after construction is completed.

RECESS MOUNTING KIT DIMENSIONS

Rough-in Dimensions:
6-1/2"H x 6-1/2"W x 5"D

Recessed Mounting Using Recess Mounting Kit (RMK)



IMPORTANT:
Care should be taken to ensure the front of the Recess Mounting Kit (RMK) shell housing, including the cover plate and screw heads, is flush with the wall. The RMK must be plumbed to ensure vertical alignment of the box.

ABOUT KNOX COMPANY

Over forty years ago, a unique concept in rapid access for emergency response was born. The KnoxBox®, a high-security key lock box, was designed to provide rapid access for emergency responders to reduce response times, minimize injuries and protect property from forced entry.

Today, one revolutionary lock box has grown into a complete system providing rapid access for public safety agencies, industries, military, and property owners across the world. The Knox Company is trusted by over 14,000 fire departments, law enforcement agencies, and governmental entities.

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KNOXBOX® 3200

TAMPER ALERT INSTALLATION INSTRUCTIONS

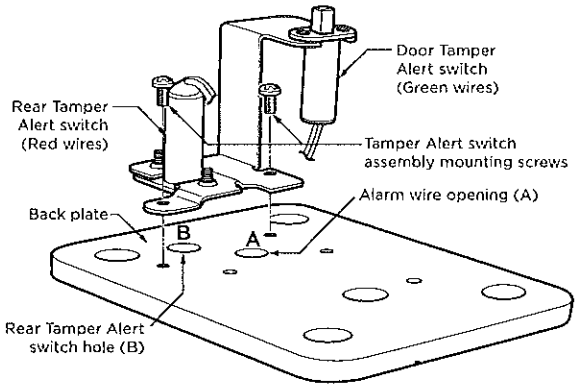


Figure 1

Backplate shown without housing for clarity

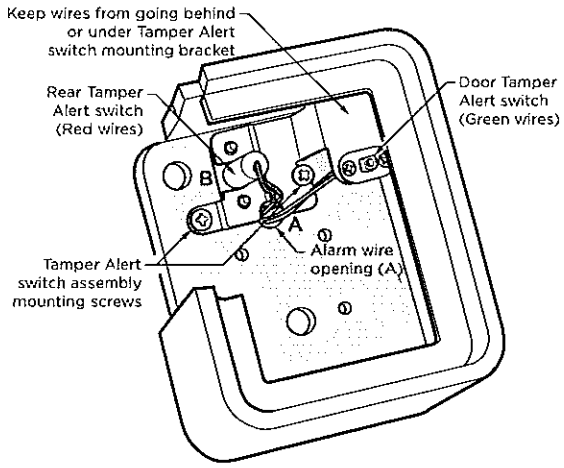


Figure 2

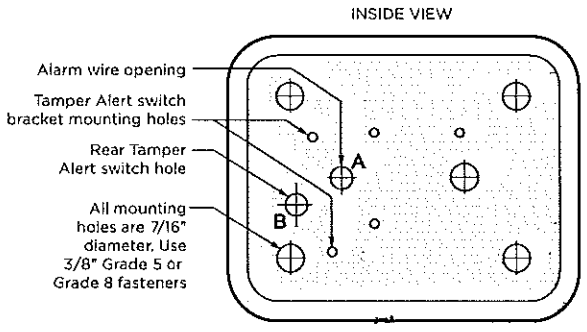
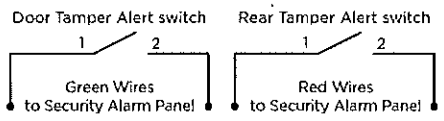


Figure 3



Wiring Diagram

1. The KnoxBox 3200 Tamper Alert is designed to be connected to an existing alarm system and should be installed only by a qualified alarm technician.
2. Remove Tamper Alert assembly from the KnoxBox before mounting the box.
3. Position KnoxBox on wall so wires from the alarm panel protrude into box through hole (A) in back plate. See Figures 1, 2 and 3.
4. Bolt KnoxBox to wall, following directions provided in mounting instructions.

> **IMPORTANT**
> Keep Tamper Alert switch hole (B) clear of caulk, debris or other foreign material, otherwise the Tamper Alert may not operate.

5. **Door Tamper Alert switch:** Align Tamper Alert bracket screw holes with the Tamper Alert bracket mounting holes in the back plate. (Door Tamper Alert switch used in both the Recess and Surface Mount KnoxBox 3200.)

   Rear Tamper Alert switch: Align the rear Tamper Alert switch plunger with hole (B), as shown in Figure 1. Check length of plunger and, if necessary, adjust plunger screw to give proper travel. Check plunger contact by GENTLY pressing the bracket flush against the back plate. (Rear Tamper Alert switch only used in the Surface Mount KnoxBox 3200.)

> **CAUTION**
> Do not bottom out Tamper Alert. If the rear Tamper Alert adjustment screw protrudes too far, the rear Tamper Alert switch will break when screws are tightened.

   Use of an ohm meter is recommended to assure that switch trips (0 ohms – for red/green wire, open for yellow wire) when Tamper Alert is GENTLY pushed flush against back plate.

   Secure the Tamper Alert bracket to the back plate with the provided screws. Do not allow wires to go behind mounting bracket, or between mounting bracket and box sidewall.

6. Connect Tamper Alert wires to building alarm. Alarm wiring must be pulled back through the alarm wire opening (A) to prevent interference with door locking mechanism. Green and Red wires must be secured tightly so that if box is removed, wires will be broken in the process, thereby causing alarm activation. In cases where yellow wires are used, the yellow wires should be loosely secured so that if box is removed, the wire can pull about an inch to allow the Tamper Alert switch to close, causing an alert before the wires break.

NOTES:

A. Electrical: maximum 24 V, 50 mA.

B. Red and Green wires indicate Normally Open Switch (Closed when KnoxBox is secure)

C. Yellow wires indicate Normally Closed Switch (Open when KnoxBox is secure)

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KNOXBOX® 3200
TAMPER ALERT INSTALLATION INSTRUCTIONS

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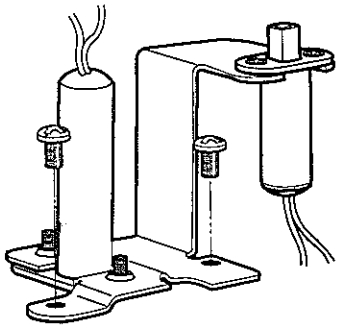
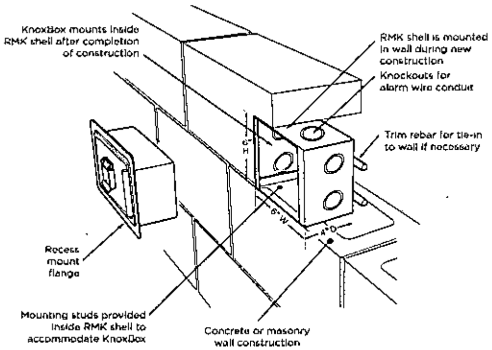


KNOXBOX® 3200
TAMPER ALERT INSTALLATION INSTRUCTIONS

OPE-KBSPEC-0060-C



Recess Mounting Using Recess Mounting Kit

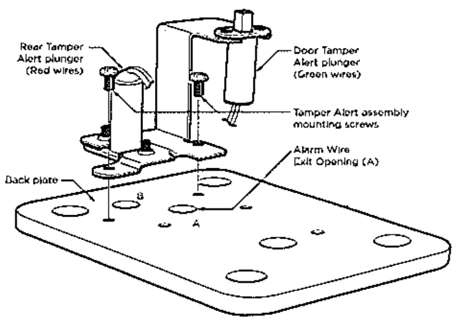
RECESS MOUNTING USING RECESS MOUNTING KIT (RMK)

The optional Recess Mounting Kit is for use in new concrete or masonry construction only. The kit includes a shell housing and mounting hardware to be cast-in-place. The KnoxBox is mounted into the shell housing after construction is completed.

Rough-In Dimensions: 6-1/2" H x 6-1/2" W x 5" D

Installation: Mounting kit may be fastened to inside wall of a concrete form or set in place during masonry wall construction. Wiring conduit may be connected through knock-out hole(s) in the shell housing.

IMPORTANT: Make sure that the front of the shell housing, including the cover plate and screw heads, are flush with the finished wall. Leave cover and screws in place until the KnoxBox is ready for mounting inside. The four (4) mounting studs may be replaced with Grade 5 or Grade 8 bolts or longer studs if required. Two (2) long sheet metal screws are provided for attachment of shell housing to the inside of a concrete form. With the housing held firmly in place, drill two (2) 1/8" holes through the form wall and the housing front cover. Insert screws and pull housing tight against form wall. Remove screws before removing form.



Tamper Alert Assembly

BOX LOCKUP:
When mounting of the KnoxBox 3200 is complete, contact your local fire department to inform them the box is ready for lock up. **They have the only key to lock up the box.**

For private, industrial or commercial use:
Keys will be sent separately to address requested.

UL LISTED — All KnoxBox 3200 units are fully tested and listed by Underwriters Laboratories as anti-theft devices. Alarm Tamper Alert switches are UL listed as Central Station Alarm Units. UL Electrical Range: Max Voltage of 24 VDC at 50 mA.

UL 437	Standard for Safety for Key Locks
UL 1037	Antitheft Alarms and Devices
UL 1332	Organic Coatings for Steel Enclosures for Outdoor Use Electrical Equipment
UL 1610	Central Station Alarm Units

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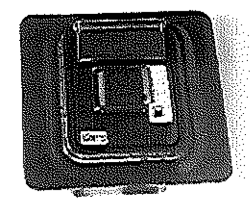
KNOXBOX® 3200 MOUNTING INSTRUCTIONS



KNOX

READ INSTRUCTIONS CAREFULLY BEFORE MOUNTING

The KnoxBox 3200 is a heavy-duty, high-security key vault that stores building keys, access cards and other small items. Each KnoxBox 3200 is coated with the Knox-Coat® proprietary finishing process* and includes a 1/8" thick stainless steel dust cover to protect the lock. For maximum security, mount the unit properly in an area sheltered from excessive moisture.

* Knox-Coat is a proprietary finishing process that protects Knox products up to four times better than standard powder coat.

This box is protected by KNOX-COAT. Four times better than standard powder coat.

WARNING:

Read all instructions carefully before beginning installation. This unit must be installed by a qualified installer and in accordance with applicable local codes and ordinances that govern this type of equipment. Failure to properly mount the device per the installation instructions will compromise the security of the device. The KnoxBox 3200 is an inherently strong device with many security features designed into the unit. However, careless installation with inadequate fasteners, flimsy mounting surfaces or improper mounting height can result in a security failure of the unit. Knox highly recommends that the device Tamper Alert be connected to the building's burglar alarm system for the highest level of security.

KNOXBOX® 3200 MOUNTING INSTRUCTIONS

KNOX

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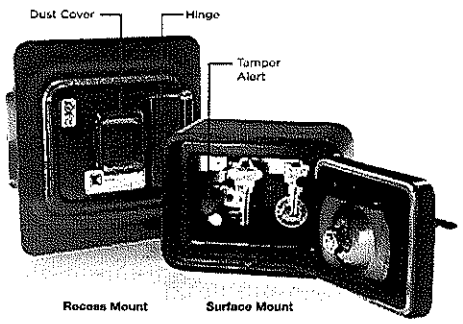
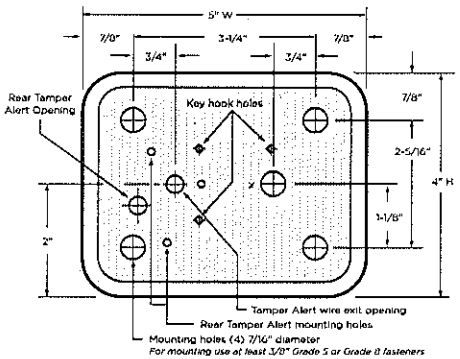
KNOXBOX® 3200
MOUNTING INSTRUCTIONS





Inside View of Back Plate

GENERAL MOUNTING INSTRUCTIONS

1. **CAUTION!** Be extremely careful when handling the KnoxBox 3200 prior to installation. When not mounted, the door will be OPEN. Always hold box and door securely to prevent door closing on fingers and causing injury.

   Tamper Alert: If your KnoxBox has the Tamper Alert feature, remove the Tamper Alert assembly and set aside for installation after the box is mounted.
2. Always mount your KnoxBox to a secure, solid wall, beam or post.
3. Use a small level to plumb the box square.
4. Position the KnoxBox with green mounting markers pointed up with the hinge on the right-hand side to allow for proper drainage. REMOVE the green markers after installation.
5. Use at least four (4) Grade 5 or Grade 8 fasteners (carriage bolts, etc.) of 3/8" diameter. Units may also be welded into place. Mounting to solid beams or steel supports is best. Mounting face down from ceiling or overhang area may cause contents to jam the lock.
6. For proper weatherproofing, caulk the back of box across top and down each side. Leave the bottom open for drainage.
7. Use of a professional locksmith or alarm product installer is highly recommended.

DOOR REMOVAL AND ADJUSTMENT:

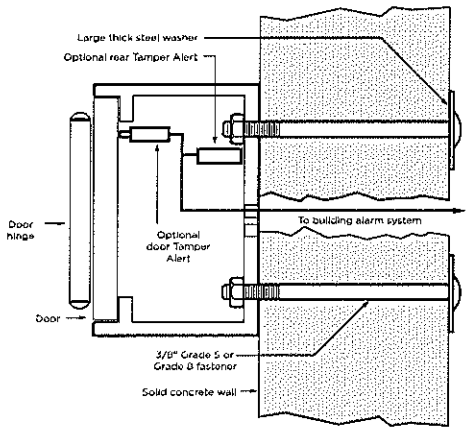
If the door must be removed and the door has a rounded powder coated hinge pin (see picture below), remove only the top and bottom hinge pin screw. Do not remove the three (3) hinge bracket screws as these are factory set for proper door alignment. When replacing the door, adjust hinge pin screws loose enough so that door swings freely. Thread locker (such as Loctite®) must be used on hinge pin screws.

For a KnoxBox 3200 that was manufactured before April 2013, the door will have a rounded powder coated hinge pin.

For a KnoxBox 3200 that has a flat, stainless steel hinge pin (models manufactured around or after April 2013), contact customer service and reference document OPE-IGINST-0226.

NOTE:
Suggested minimum mounting height: 6' above ground

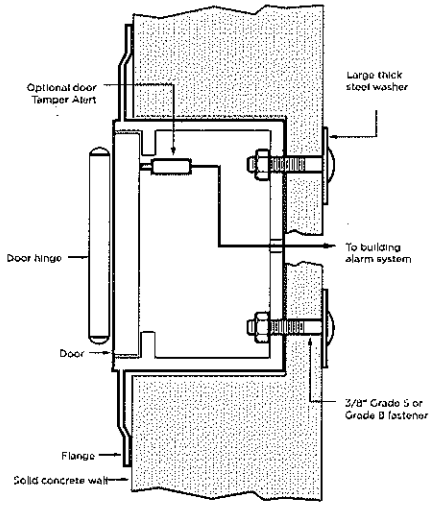
ATTENTION:
Installation of this product should be performed only by individuals skilled in the use of the tools and equipment necessary for installation. If you have any doubt concerning your competence or expertise, consult a qualified expert to perform the installation.



Surface Mounted Models

SURFACE MOUNT MODELS

Surface Mount models are designed for mounting on a flat wall. Do not mount face down from a ceiling or overhang area. Install the Tamper Alert assembly after the box is mounted and check to see that the "box to wall" Tamper Alert plunger is properly depressed. A qualified alarm installer should perform alarm wiring, testing and adjusting.



Recess Mounted Models

RECESS MOUNT MODELS

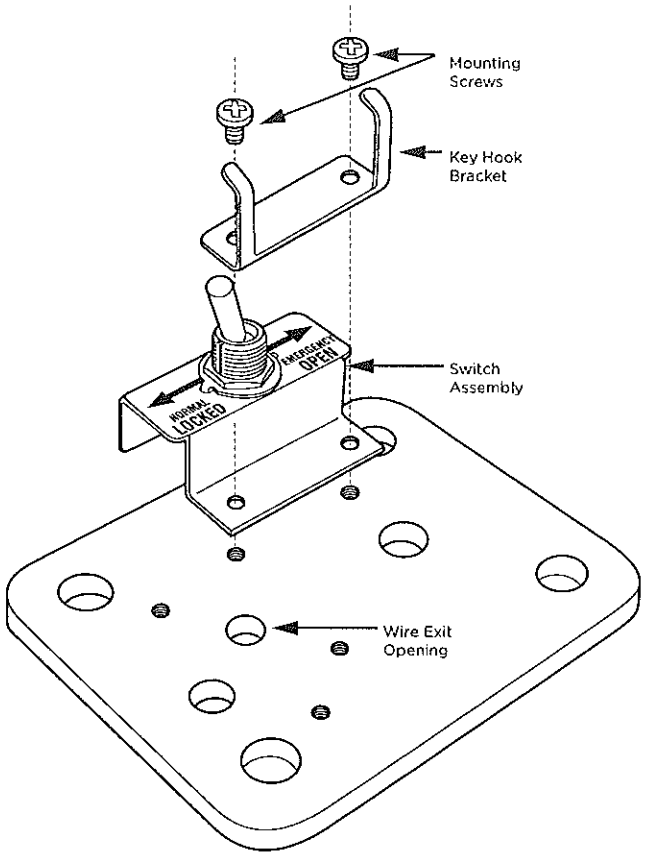
Recess Mount models are designed for flush mounting. Do not mount face down from a ceiling or overhang area. Units can be adapted to fit a variety of solid walls cored to a 6" diameter approximately 3 1/2" deep. A Recess Mounting Kit (RMK) is for new concrete or masonry walls under construction. Do not over tighten mounting bolts as this will distort the flange.

Install the Tamper Alert assembly **after** the box is mounted. Pull wiring tight so that any attempts to force the box out of the wall will break the wire or pull the terminals loose. A qualified alarm installer should perform alarm wiring, testing and adjusting.

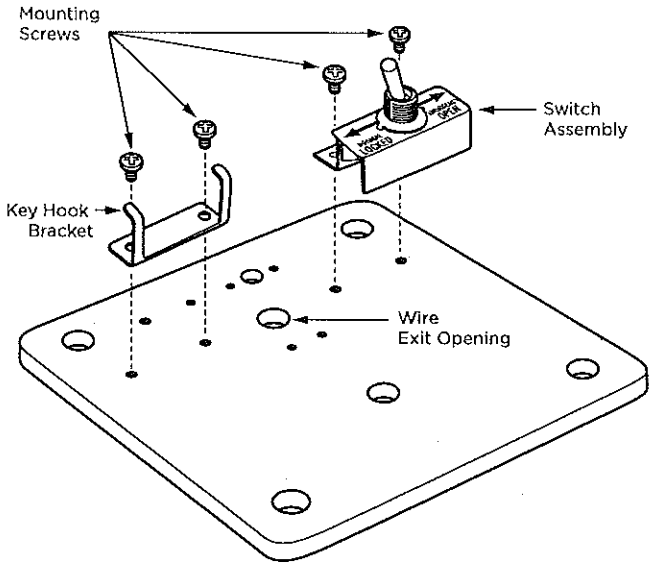
If installing the box on a thin or hollow wall, use a solid backing (like 3/8" steel plate fastened to solid studs on both sides) for secure mounting. Mounting to solid beams or steel support is best.

MULTI-PURPOSE ELECTRICAL SWITCH

INSTALLATION INSTRUCTIONS FOR KNOXBOX® 3200 & KNOXVAULT® 4400



KnoxBox 3200 Mounting Configuration
Backplate shown without housing for clarity



KnoxVault 4400 Mounting Configuration
Backplate shown without housing for clarity

This electric switch may be connected to most electric doors including those equipped with Maglock-type locks. Gates and other electrical equipment may also be operated by this switch.

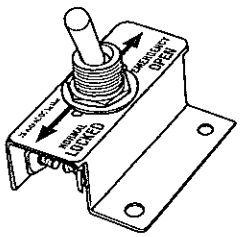
Typically, the switch will be used to unlock electrical doors and gates that are controlled by a low voltage circuit. Other devices may require an intermediate control relay for use with higher voltages.

IMPORTANT
The maximum load for this electrical switch is:
28 Volt AC/DC 5 Amp

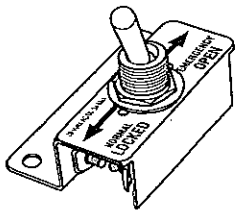
This switch may be retrofitted into all KnoxBox 3200 units sold since April 2002 and KnoxVault 4400 units sold since January 2003.

MOUNTING BRACKET ORIENTATION – KNOXBOX 3200 VS. KNOXVAULT 4400

Please note that the switch and label orientation remain the same, only the bracket is reversed to accommodate mounting differences. The switch can be rotated when installed to allow for normally open or normally closed circuits.



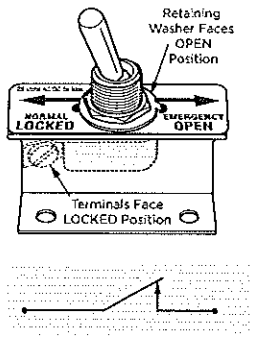
KnoxBox 3200



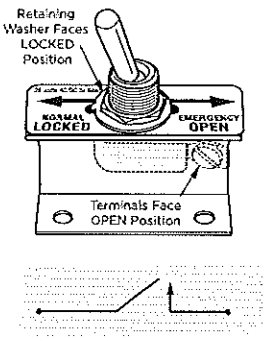
KnoxVault 4400

NORMALLY OPENED VS. NORMALLY CLOSED SWITCH OPERATION

Switch units may be oriented to achieve either a normally open or normally closed use. Upon installation, the switch must be inserted into its mounting hole so that the switch label will read correctly and the switch circuit will operate correctly when in use.



Normally Closed Circuit



Normally Open Circuit

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MULTI-PURPOSE ELECTRICAL SWITCH

INSTALLATION INSTRUCTIONS FOR KNOXBOX® 3200 & KNOXVAULT® 4400

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OPE-MTGINS-0107-C

KnoxBox 3200 Model
With optional Electrical Switch installed

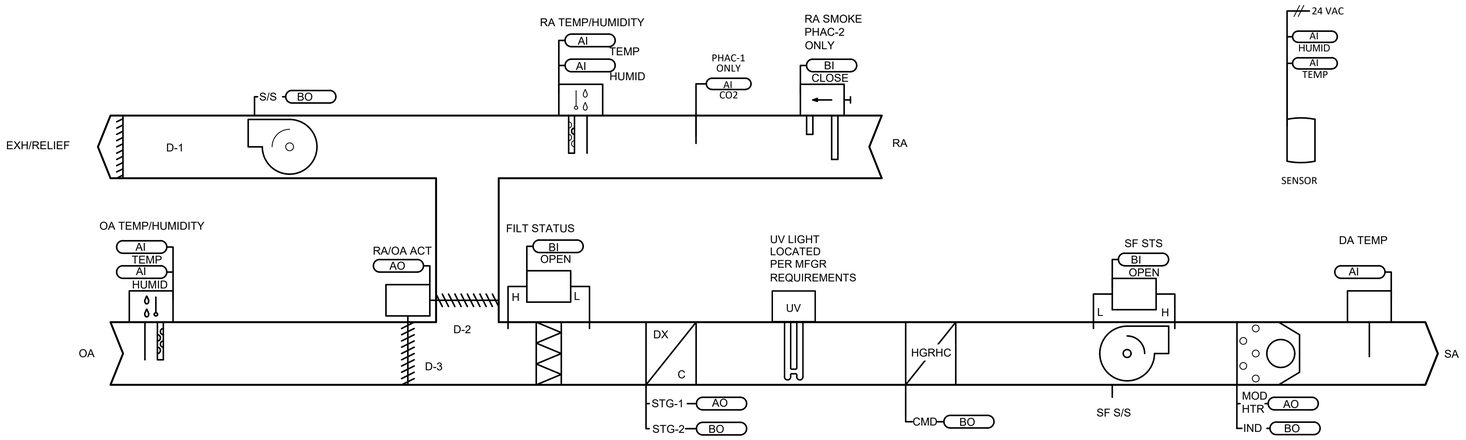
With optional Electrical Switch and Knox Tamper Alert installed

KnoxVault 4400 Model

Switch Assembly
Side View

Optional electrical switch for use in all KnoxBox 3200 and KnoxVault 4400 units.

The maximum load for this electrical switch is:
28 Volt AC/DC 5 Amp



PACKAGED ROOFTOP UNIT (PHAC-1 and PHAC-2) CONTROL SCHEMATIC

NOT TO SCALE

PACKAGED ROOFTOP HEATING AND AIR CONDITIONING UNITS PHAC-1 AND PHAC-2 SEQUENCE OF OPERATION

Building Automation System Interface:

The Building Automation System (BAS) shall send the controller Occupied Bypass, Occupied Heat / Cool modes. If a BAS is not present, or communication is lost with the BAS the controller shall operate using default modes and setpoints. This facility operates 24/7365.25. No unoccupied requirements are necessary

Occupied Mode:

During occupied periods, the supply fan shall run continuously and the outside air damper shall open to maintain minimum ventilation requirements. The DX cooling shall stage and gas heat shall modulate to maintain the occupied space temperature setpoint. If economizing is enabled the outside air damper shall modulate to maintain the occupied space temperature setpoint.

Optimal Stop:

Not required. The system operates 24/7/365.25

Occupied Bypass:

Not required. The system operates 24/7/365.25

Cooling Mode:

The unit controller shall use the space temperature sensor and space temperature cooling setpoint to calculate the discharge air cooling setpoint and determine when to initiate requests for cooling. Discharge air setpoint shall be maintained by modulating the economizer or staging the DX cooling as required to maintain the discharge air setpoint. Once all economizing requirements have been met, compressor operation will be enabled if the economizer alone cannot meet the demand. Once compressor operation is started, the variable speed compressor will be modulated to maintain the discharge air temperature to the active discharge air cooling setpoint. If the variable speed compressor reaches its maximum speed for stage one, and there is additional demand for cooling, the controller will energize the first fixed speed compressor on circuit two. Once the first fixed speed compressor is energized, the variable compressor speed will be reduced to its minimum speed, then released back to discharge air temperature control. Additional stages will respond in the same manner. Once the active cooling demand has been satisfied, compressors will begin staging down in reverse order from the stage up sequence. Once the unit has staged down all fixed compressors, and there is no longer a demand for the variable speed compressor, the compressor will modulate down to its minimum speed and then will be de-energized, while adhering to all shutdown requirements.

Heating Mode:

The unit controller shall monitor space temperature and space temperature heating setpoint to determine when to initiate requests for heat. When the space temperature drops below the space temperature heating setpoint, the controller shall enable the modulating heat bank at high fire for 60 seconds, then the controller shall modulate the heat bank to the necessary rate to satisfy the space temperature heating setpoint. The supply fan speed shall vary to meet zone heating requirements in conjunction with the heat bank output. Once the space temperature rises above the setpoint, the heating cycle shall be disabled.

Dehumidification:

Factory installed hot gas reheat, as applicable,shall allow application of dehumidification. Dehumidification shall be allowed only when the outside air temperature is above 40.0 deg. F and below 100.0 deg. F. The economizer outside air damper shall drive to minimum position during dehumidification.

On a call for dehumidification shall energize and both compressors shall enable. When the humidity control setpoint is satisfied, the valve shall be de-energized and both compressors shall be disabled. If there is a call for 1st stage cooling while in the dehumidification mode, no action shall take place. If there is a call for 2nd stage cooling, the reheat valve shall be de-energized, and the unit shall revert to the cooling mode. If 2nd stage cooling is satisfied and there is still a call for dehumidification, the hot gas reheat coil valve shall once again be energized.

Economizer Control / Comparative Enthalpy:

The supply air sensor shall measure the dry bulb temperature of the air leaving the evaporator coil while economizing. When economizing is enabled and the unit is operating in the cooling mode, the economizer damper shall modulate between its minimum position and 100% to maintain the space temperature setpoint. Minimum position shall be calculated based on supply fan speed. If the supply air temperature starts to fall below supply air temperature setpoint, the outdoor damper shall be at minimum position. Compressors shall be delayed from operating until the economizer has opened to 100% for 5 minutes.

Comparative Enthalpy:

Outside air enthalpy shall be compared with return air enthalpy point. The economizer shall be enabled when outdoor air enthalpy is less than return air enthalpy - 3.0 BTU/LB. The economizer shall be disabled when outdoor air enthalpy is greater than return air enthalpy.

Demand Control Ventilation (DCV) PHAC-1 Only:

As the supply fan speed command varies between minimum and maximum, the Building Design and DCV Minimum Position Targets shall be calculated linearly between the user selected setpoints based on the instantaneous supply fan speed. The Bldg. Design and DCV Minimum Position Targets will be used to calculate the Active OA Damper Minimum Position Target based on CO2 levels relative to the active Design and DCV CO2 setpoints.

The Design Minimum and DCV Minimum OA Damper Position setpoints shall have a range of 0-100% while the Design Minimum and DCV Minimum OA Damper Position setpoints at Full fan speed shall have a range of 0-50%.

Smoke Detector Shutdown (PHAC-2):

The unit shall shut down in response to a signal from the smoke detector indicating the presence of smoke. A signal shall be sent to the fire alarm panel in the facility. The smoke detectors shall be interlocked to the unit through the dry contacts of the smoke detectors and alarm at the BAS operator console. A manual reset of the smoke detectors shall be required to restart the unit. Upon resetting of the unit smoke detector the unit shall return to its normal, occupied sequence of operation. Prior to bid, coordinate all requirements with the Electrical Contractor, Mechanical Contractor and the Fire Alarm Contractor and provide as required to accomplish the specified sequence of operation.

Filter Status:

A differential pressure switch shall monitor the differential pressure across the filter when the fan is running. If the switch closes for 2 minutes after a request for fan operation a dirty filter alarm shall be annunciated at the BAS.

Condensate Drain Blockage:

Install a UL 508 conforming electronic water level monitoring device in the secondary drain line to automatically shut off the equipment served in the event the primary drain line becomes restricted. Upon detection of an obstruction in the condensate drain line, the unit shall shutdown and an alarm shall be annunciated at the BAS operator console. If the condensate switch is located outside of the unit casing, the sensor shall be provided with a completely weatherproof, easily accessible enclosure.

Building Pressure Control (Relief Air):

After the fan startup delay expires, building static pressure shall be controlled by modulating the outside air damper. As building pressure increases over the building pressure setpoint (adj.), the damper shall modulate closed. If the building pressure falls below the setpoint, the damper shall modulate open. Maintain positive pressure from within the fire station proper into the apparatus bay.

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NEW FIRE STATION NO. 10
FOR
THE CITY OF MONTGOMERY
SOUTH COURT STREET MONTGOMERY, ALABAMA 36104

REVISIONS

No.	Description	Date
A	ISSUED FOR REVIEW	05.24.22
B	ISSUED FOR REVIEW	11.08.22
C	ISSUED FOR REVIEW	11.15.22
0	ISSUED FOR REVIEW	01.16.23
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4	ADDENDUM	03.02.23

MGM Project No.	SP-5-21
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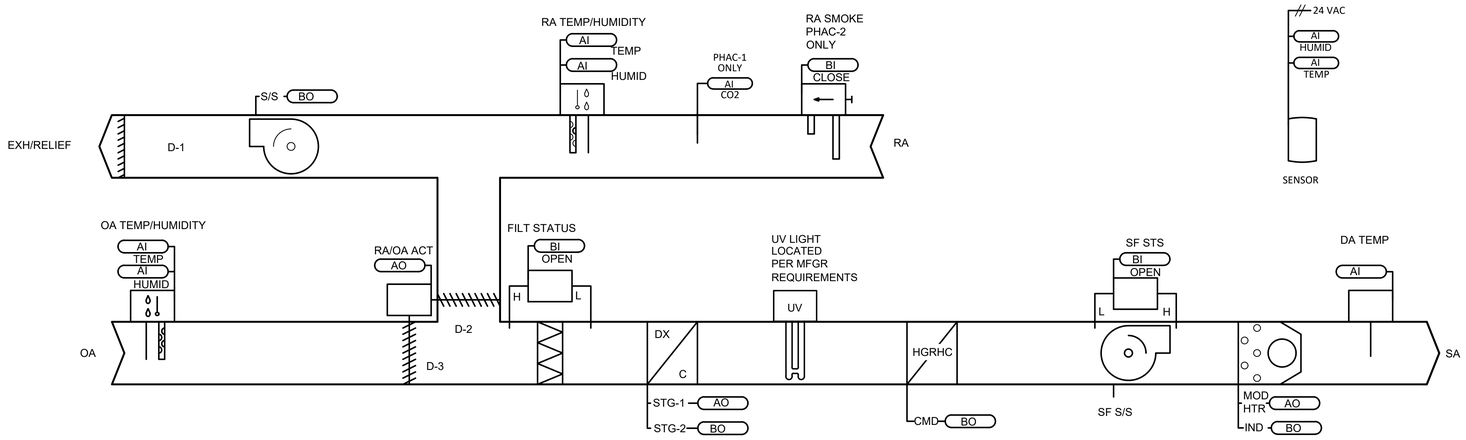
Drawing Title:
HVAC CONTROLS

4

Sheet No:

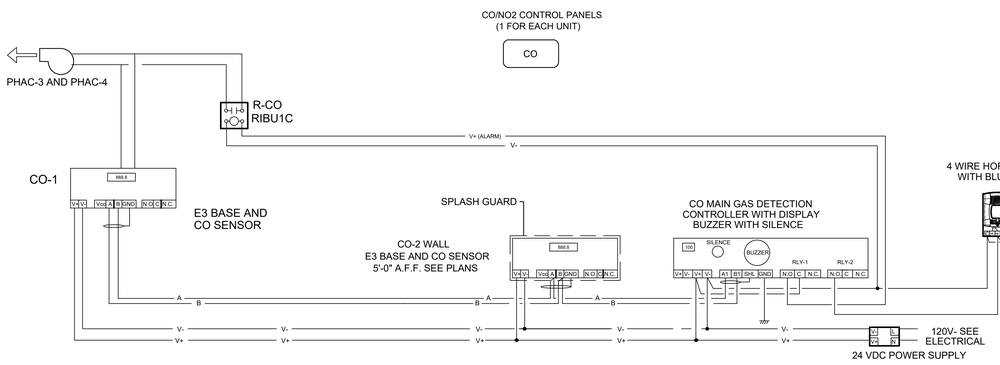
M7

CONSTRUCTION DOCUMENTS



PACKAGED ROOFTOP UNIT (PHAC-3 and PHAC-4) CONTROL SCHEMATIC

NOT TO SCALE



CARBON MONOXIDE SENSORS AND PHAC-3 AND PHAC-4 CONTROLS SCHEMATIC (APPARATUS BAY))
(NITROGEN DIOXIDE CONTROLS SCHEMATIC SIMILAR)

NOTES:

1. SCHEMATIC IS DIAGRAMMATIC AND IS SHOWN FOR GENERAL INFORMATIONAL PURPOSES AND INTENT OF OPERATION. CONTROLS SUBCONTRACTOR SHALL PROVIDE INSTALLATION AS REQUIRED FOR THE ACTUAL CO/NO2 SYSTEM PROVIDED AND AS REQUIRED TO COMPLETE THE SPECIFIED SEQUENCE OF OPERATION

2. REFER TO PLANS AT PHAC-3 AND PHAC-4 FOR LOCATIONS OF SPACE AND RETURN AIR MOUNTED CO AND NO2 DUCT SENSORS

PHAC-3 AND PHAC-4 UNITS AND APPARATUS BAY CARBON MONOXIDE (CO) AND NITROGEN DIOXIDE (NO2) MONITORING SYSTEM SEQUENCE OF OPERATION

BASIC SEQUENCE OF OPERATION SHALL BE AS SPECIFIED FOR PHAC UNITS WITH ADDITIONS SPECIFIED BELOW

UNIT ENABLE:

PHAC-3 AND PHAC-4 ARE PROVIDING CONDITIONED AIR TO THE APPARATUS BAY.

THE BAS SHALL MONITOR ALL CO/NO2 MONITORING POINTS AND ALARMS, ALL OF WHICH SHALL BE SHOWN AT THE BAS OPERATOR CONSOLE. PRIOR TO BID, COORDINATE REQUIREMENTS WITH CO/NO2 MONITORING SYSTEM PROVIDED.

OCCUPIED MODE:
SYSTEM IS OCCUPIED 24/7/365

SYSTEMS SHALL RUN CONTINUOUSLY. HEATING, COOLING AND HUMIDITY SETPOINTS SHALL BE AS SET BY THE INDIVIDUAL UNIT THERMOSTAT/HUMIDISTAT OR THROUGH THE BAS OPERATOR'S CONSOLE. ANYTIME SPACE OR DUCT MOUNTED CO SENSORS OR NO2 SENSORS INDICATE CO LEVELS OR NO2 LEVELS ARE ABOVE MANDATED VALUES, OR UPON THE OPENING OF ANY ROLL UP DOOR IN THE APPARATUS BAY, PHAC-3 AND PHAC-4 SHALL AUTOMATICALLY REVERT TO 100% OUTSIDE AIR/ECONOMIZER MODE AND OPERATE UNTIL LEVELS ARE BELOW EPA AND ASHRAE MANDATED LEVELS, OR ANY ROLLUP DOORS HAVE CLOSED. INITIAL CO LEVEL SETPOINT SHALL BE 20 PPM (PARTS PER MILLION WITH 8 HOUR TIME WEIGHTED AVERAGE). INITIAL NO2 LEVEL SETPOINT SHALL BE 75 PPB (PARTS PER BILLION) FOR 1 HOUR. IF CO AND NO2 SENSORS DETECT LEVELS OF CONCENTRATION HIGHER THAN SPECIFIED, THE CO/NO2 CONTROL PANEL SHALL SEND AN ALARM SIGNAL TO THE BAS OPERATOR CONSOLE.

UPON REDUCTION OF THE CO AND NO2 CONCENTRATION BELOW THE SPECIFIED LIMITS, OR THE CLOSING OF THE ROLLUP DOORS, PHAC-3 AND PHAC-4 SHALL RETURN TO THEIR PREVIOUS OPERATIONAL STATUS.

THE CONTROLS SUB-CONTRACTOR SHALL PROVIDE THE SEQUENCE OF OPERATION ABOVE AS AN ADDITIONAL FAIL SAFE REQUIREMENT SHOULD THE SPECIFIED SEQUENCE BE MODIFIED BY ANY PERSON(S) TO NOT OPERATE CONTINUOUSLY AFTER THE OWNER TAKES POSSESSION OF THE FACILITY. I.E. SHOULD OWNER DISABLE CONTINUOUS OPERATION, ALL OF THE REQUIREMENTS OF THE SEQUENCE AS THEY RELATE TO THE SPACE CO AND NO2 SENSORS SHALL REMAIN IN EFFECT. DO NOT OVERRIDE SENSOR REQUIREMENTS/CONTROLS.

PACKAGED ROOFTOP HEATING AND AIR CONDITIONING UNITS PHAC-3 AND PHAC-4 SEQUENCE OF OPERATION

Building Automation System Interface:

The Building Automation System (BAS) shall send the controller Occupied Bypass, Occupied Heat / Cool modes. If a BAS is not present, or communication is lost with the BAS the controller shall operate using default modes and setpoints. This facility operates 24/7365.25. No unoccupied requirements are necessary

Occupied Mode:

During occupied periods, the supply fan shall run continuously and the outside air damper shall open to maintain minimum ventilation requirements. The DX cooling shall stage and gas heat shall modulate to maintain the occupied space temperature setpoint. If economizing is enabled the outside air damper shall modulate to maintain the occupied space temperature setpoint.

Optimal Stop:

Not required. The system operates 24/7/365.25

Occupied Bypass:

Not required. The system operates 24/7/365.25

Cooling Mode:

The unit controller shall use the space temperature sensor and space temperature cooling setpoint to calculate the discharge air cooling setpoint and determine when to initiate requests for cooling. Discharge air setpoint shall be maintained by modulating the economizer or staging the DX cooling as required to maintain the discharge air setpoint. Once all economizing requirements have been met, compressor operation will be enabled if the economizer alone cannot meet the demand. Once compressor operation is started, the variable speed compressor will be modulated to maintain the discharge air temperature to the active discharge air cooling setpoint. If the variable speed compressor reaches its maximum speed for stage one, and there is additional demand for cooling, the controller will energize the first fixed speed compressor on circuit two. Once the first fixed speed compressor is energized, the variable compressor speed will be reduced to its minimum speed, then released back to discharge air temperature control. Additional stages will respond in the same manner. Once the active cooling demand has been satisfied, compressors will begin staging down in reverse order from the stage up sequence. Once the unit has staged down all fixed compressors, and there is no longer a demand for the variable speed compressor, the compressor will modulate down to its minimum speed and then will be de-energized, while adhering to all shutdown requirements.

Heating Mode:

The unit controller shall monitor space temperature and space temperature heating setpoint to determine when to initiate requests for heat. When the space temperature drops below the space temperature heating setpoint, the controller shall enable the modulating heat bank at high fire for 60 seconds, then the controller shall modulate the heat bank to the necessary rate to satisfy the space temperature heating setpoint. The supply fan speed shall vary to meet zone heating requirements in conjunction with the heat bank output. Once the space temperature rises above the setpoint, the heating cycle shall be disabled.

Dehumidification:

Factory installed hot gas reheat, as applicable,shall allow application of dehumidification. Dehumidification shall be allowed only when the outside air temperature is above 40.0 deg. F and below 100.0 deg. F. The economizer outside air damper shall drive to minimum position during dehumidification.

On a call for dehumidification shall energize and both compressors shall enable. When the humidity control setpoint is satisfied, the valve shall be de-energized and both compressors shall be disabled. If there is a call for 1st stage cooling while in the dehumidification mode, no action shall take place. If there is a call for 2nd stage cooling, the reheat valve shall be de-energized, and the unit shall revert to the cooling mode. If 2nd stage cooling is satisfied and there is still a call for dehumidification, the hot gas reheat coil valve shall once again be energized.

Economizer Control / Comparative Enthalpy:

The supply air sensor shall measure the dry bulb temperature of the air leaving the evaporator coil while economizing. When economizing is enabled and the unit is operating in the cooling mode, the economizer damper shall modulate between its minimum position and 100% to maintain the space temperature setpoint. Minimum position shall be calculated based on supply fan speed. If the supply air temperature starts to fall below supply air temperature setpoint, the outdoor damper shall be at minimum position. Compressors shall be delayed from operating until the economizer has opened to 100% for 5 minutes.

Comparative Enthalpy:

Outside air enthalpy shall be compared with return air enthalpy point. The economizer shall be enabled when outdoor air enthalpy is less than return air enthalpy - 3.0 BTU/LB. The economizer shall be disabled when outdoor air enthalpy is greater than return air enthalpy.

Demand Control Ventilation (DCV) PHAC-1 Only:

As the supply fan speed command varies between minimum and maximum, the Building Design and DCV Minimum Position Targets shall be calculated linearly between the user selected setpoints based on the instantaneous supply fan speed. The Bldg. Design and DCV Minimum Position Targets will be used to calculate the Active OA Damper Minimum Position Target based on CO2 levels relative to the active Design and DCV CO2 setpoints.

The Design Minimum and DCV Minimum OA Damper Position setpoints shall have a range of 0-100% while the Design Minimum and DCV Minimum OA Damper Position setpoints at Full fan speed shall have a range of 0-50%.

Smoke Detector Shutdown (PHAC-2):

The unit shall shut down in response to a signal from the smoke detector indicating the presence of smoke. A signal shall be sent to the fire alarm panel in the facility. The smoke detectors shall be interlocked to the unit through the dry contacts of the smoke detectors and alarm at the BAS operator console. A manual reset of the smoke detectors shall be required to restart the unit. Upon resetting of the unit smoke detector the unit shall return to its normal, occupied sequence of operation. Prior to bid, coordinate all requirements with the Electrical Contractor, Mechanical Contractor and the Fire Alarm Contractor and provide as required to accomplish the specified sequence of operation.

Filter Status:

A differential pressure switch shall monitor the differential pressure across the filter when the fan is running. If the switch closes for 2 minutes after a request for fan operation a dirty filter alarm shall be annunciated at the BAS.

Condensate Drain Blockage:

Install a UL 508 conforming electronic water level monitoring device in the auxiliary drain port to automatically shut off the equipment served in the event the primary drain line becomes restricted. Upon detection of an obstruction in the condensate drain line, the unit shall shutdown and an alarm shall be annunciated at the BAS operator console. If the condensate switch is located outside of the unit casing, the sensor shall be provided with a completely weatherproof, easily accessible enclosure.

Building Pressure Control (Relief Air):

After the fan startup delay expires, building static pressure shall be controlled by modulating the outside air damper. As building pressure increases over the building pressure setpoint (adj.), the damper shall modulate closed. If the building pressure falls below the setpoint, the damper shall modulate open. Maintain positive pressure from within the fire station proper into the apparatus bay.

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NEW FIRE STATION NO. 10
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REVISIONS

No.	Description	Date
A	ISSUED FOR REVIEW	05.24.22
B	ISSUED FOR REVIEW	11.08.22
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4	ADDENDUM	03.02.23

MGM Project No.	SP-5-21
BDW Project No.	2021-118
ZEA Project No.	2022-11
Drawn By:	C. WARD
Date:	02.03.2023
Scale:	AS NOTED

Drawing Title:
4 HVAC CONTROLS

Sheet No:
M8

CONSTRUCTION DOCUMENTS

PHHAC-1, PHAC-2, PHAC-3 AND PHAC-4 POINTS LIST

PHAC-1 AND PHAC-2 SYSTEM POINTS LIST

SYSTEM POINT DESCRIPTION	POINT TYPE							ALARMS								
	GRAPHIC	HARDWARE INPUT	HARWARE OUTPUT	SOFTWARE POINT	HARDWARE INTERLK	WIRELESS	NETWORK	DEFAULT VALUE	HIGH ANALOG LIMIT	LOW ANALOG LIMIT	BINARY	LATCH DIAGNOSTIC	SERSOR FAIL	COMMUNICATION FAIL	DIAGNOSTICS	NOTES
DISCHARGE AIR TEMPERATURE LOCAL	X	AI							X	X			X		SENSOR FAILURE	
MIXED AIR TEMPERATURE LOCAL	X	AI							X	X			X		SENSOR FAILURE	
													X			
RETURN AIR CO2 LOCAL	X	AI							X			X			CO2 SENSOR FAILURE	
SUPPLY FAN AIR FLOW LOCAL	X	AI														
DIRTY FILTER ALARM OPEN	X	BI										X			DIRTY FILTER	
SUPPLY FAN STATUS OPEN	X	BI														
SUPPLY FAN SPEED COMMAND	X		AO													
SUPPLY FAN START STOP COMMAND	X		BO													
OCCUPIED COOLING SETPOINT (ADJ)				X				74.0 deg. F								
OCCUPIED HEATING SETPOINT (ADJ)				X				70.0 deg. F								
UNOCCUPIED COOLING SETPOINT (ADJ)				X				78.0 deg. F								
UNOCCUPIED HEATING SETPOINT (ADJ)				X				67.0 deg. F								
BAS COMMUNICATION STATE	X			X										X		NOTE 1
MAINTENANCE REQUIRED				X				600 HRS								
UV LIGHTS MAINTENANCE REQUIRED				X				365 DAYS								

GENERAL NOTES

1. DISPLAYED AT THE BAS USER INTERFACE IF PRESENT
2. POINTS SHALL BE AS SHOWN ON SCHEMATIC AND THIS TABLE
3. INCLUDE POINTS AS REQUIRED PER THE SEQUENCE OF OPERATION AND FOR MONITORING OF CO/NO2 SENSORS AND ALL AVAILABLE POINTS FROM CO/NO2 PANELS

PHAC-3 AND PHAC-4 SYSTEM POINTS LIST

SYSTEM POINT DESCRIPTION	POINT TYPE							ALARMS								
	GRAPHIC	HARDWARE INPUT	HARWARE OUTPUT	SOFTWARE POINT	HARDWARE INTERLK	WIRELESS	NETWORK	DEFAULT VALUE	HIGH ANALOG LIMIT	LOW ANALOG LIMIT	BINARY	LATCH DIAGNOSTIC	SERSOR FAIL	COMMUNICATION FAIL	DIAGNOSTICS	NOTES
DISCHARGE AIR TEMPERATURE LOCAL	X	AI							X	X			X		SENSOR FAILURE	
MIXED AIR TEMPERATURE LOCAL	X	AI							X	X			X		SENSOR FAILURE	
													X			
RETURN AIR CO2 LOCAL	X	AI							X			X			CO2 SENSOR FAILURE	
SUPPLY FAN AIR FLOW LOCAL	X	AI														
DIRTY FILTER ALARM OPEN	X	BI										X			DIRTY FILTER	
SUPPLY FAN STATUS OPEN	X	BI														
SUPPLY FAN SPEED COMMAND	X		AO													
SUPPLY FAN START STOP COMMAND	X		BO													
OCCUPIED COOLING SETPOINT (ADJ)				X				74.0 deg. F								
OCCUPIED HEATING SETPOINT (ADJ)				X				70.0 deg. F								
UNOCCUPIED COOLING SETPOINT (ADJ)				X				78.0 deg. F								
UNOCCUPIED HEATING SETPOINT (ADJ)				X				67.0 deg. F								
BAS COMMUNICATION STATE	X			X										X		NOTE 1
MAINTENANCE REQUIRED				X				600 HRS								
UV LIGHTS MAINTENANCE REQUIRED				X				365 DAYS								

GENERAL NOTES

1. DISPLAYED AT THE BAS USER INTERFACE IF PRESENT
2. POINTS SHALL BE AS SHOWN ON SCHEMATIC AND THIS TABLE
3. INCLUDE POINTS AS REQUIRED PER THE SEQUENCE OF OPERATION AND FOR MONITORING OF CO/NO2 SENSORS AND ALL AVAILABLE POINTS FROM CO/NO2 PANELS

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MGM Project No.	SP-5-21
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Drawn By:	C. WARD
Date:	02.03.2023
Scale:	AS NOTED

Drawing Title:

4 HVAC CONTROLS

Sheet No:

M9

CONSTRUCTION DOCUMENTS

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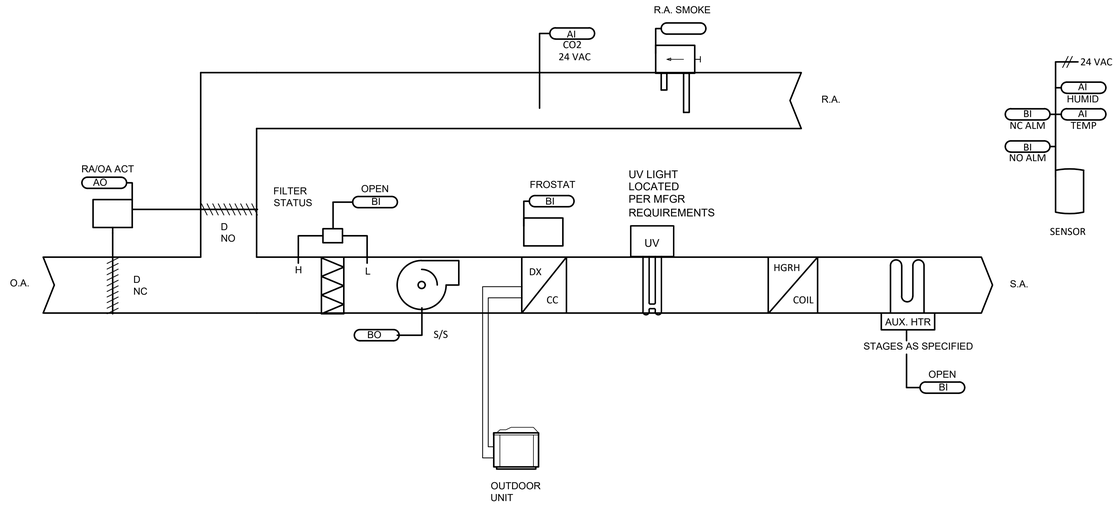

SPLIT SYSTEM HEAT PUMP UNIT WITH DEMAND CONTROL VENTILATION & HOT GAS REHEAT COIL CONTROLS SCHEMATIC (HP-A)

NOT TO SCALE

Split System Heat Pump Unit HP-A With Demand Ventilation & Hot Gas Reheat Coil Sequence of Operation

Building Automation System Interface:

The Building Automation System (BAS) shall send the controller Occupied Bypass, Occupied Heat / Cool modes. If communication is lost with the BAS, the controller shall operate using default modes and Setpoints. The supply air fan shall be started only upon satisfaction of all safeties, upon a call from the BAS or the individual thermostats/sensors override. A differential pressure switch shall monitor the differential pressure across the fan. If the switch does not open within 40 seconds after a request for fan operation a fan failure alarm shall be annunciated at the BAS, the unit shall stop, requiring a manual reset.

Smoke Detector Shutdown:

The unit shall shut down in response to a signal from the smoke detector in the return air ducts indicating the presence of smoke. The smoke detectors shall be interlocked to the unit through the dry contacts of the smoke detector. A manual reset of the smoke detector shall be required to restart the unit. Coordinate the quantity of smoke detectors required with the plans. Smoke detectors are furnished and wired by Division 16. Installation into the duct by the Mechanical Contractor. Coordinate all prior to bid and provide as specified.

Occupied Mode:

During occupied periods, the supply fan shall run, the normally closed (NC) outside air damper and normally open (NO) return air damper(s) shall open to their respective setpoints to provide for their minimum scheduled outside air setpoint. The heat pump DX cooling or heating cycle shall stage to maintain the occupied space temperature setpoint.

Unoccupied Mode:

When the space temperature is below the unoccupied heating setpoint of 60.0 deg. F (adj.) the supply fan shall start, the NC outside air damper shall remain closed, the NO return air damper (as applicable) shall remain open and the DX heating cycle shall be enabled. When the space temperature rises above the unoccupied heating setpoint of 60.0 deg. F (adj.) plus the unoccupied differential of 4.0 deg. F (adj.), the heating cycle shall be disabled, the supply fan shall stop, the NC outside air damper shall remain closed and the NO return air damper (as applicable) shall remain in its NO position.

When the space temperature is above the unoccupied cooling setpoint of 85.0 deg. F (adj.), the supply fan shall start, the NC outside air damper shall remain closed, the NO return air damper (as applicable) shall remain open and the DX cooling cycle shall be enabled. When the space temperature falls below the unoccupied cooling setpoint of 85.0 deg. F (adj.) minus the unoccupied differential of 4.0 deg. F (adj.) the cooling cycle shall be disabled, the supply fan shall stop, the NC outside air damper shall remain closed and the NO return air damper (as applicable) shall remain open.

Optimal Start:

The BAS shall monitor the scheduled occupied time, occupied space setpoints and space temperature to calculate when the optimal start occurs.

Morning Warm-Up Mode:

During optimal start, if the space temperature is below the occupied heating setpoint a morning warm-up mode shall be activated. When morning warm-up is initiated the unit shall enable the heating and supply fan. The NC outside air damper shall remain closed and the NO return air damper shall remain open. When the space temperature reaches the occupied heating setpoint (adj.), the unit shall transition to the occupied mode based on its respective schedule.

Morning Cool-Down/Pre-Cool Mode:

During optimal start, if the space temperature is above the occupied cooling setpoint, the morning cool-down/pre-cool mode shall be activated. When morning cool-down/pre-cool is initiated the unit shall enable the fan and cooling. The NC outside air damper shall remain closed and the NO return air damper (as applicable) shall remain open. When the space temperature reaches the occupied cooling setpoint (adj.), the unit shall transition to the occupied mode based on its respective schedule.

Optimal Stop:

The BAS shall monitor the scheduled unoccupied time, occupied setpoints and space temperature to calculate when the optimal stop occurs. When the optimal stop mode is active the unit controller shall maintain the space temperature to the space temperature offset setpoint.

Occupied Bypass:

The BAS shall monitor the status of the "on" and "cancel" buttons of the space temperature sensor. When an occupied bypass request is received from a space sensor, the unit shall transition from its current occupancy mode to occupied mode and the unit shall maintain the space temperature to the occupied setpoints (adj.).

Cooling Mode:

The unit controller shall use space temperature and space temperature setpoint to determine when to initiate requests for cooling. When the space temperature rises above the setpoint, the unit controller shall stage the DX cooling as required to maintain the space temperature setpoint. The first compressor (as applicable) shall energize after its minimum 3-minute off time has expired. If additional cooling capacity is required the second stage (as applicable) of cooling shall be enabled. Once the space temperature falls below the setpoint the compressors shall be deactivated and system returns to its occupied/unoccupied cooling schedule.

Heating Mode:

The unit controller shall use the space temperature and space temperature setpoint to determine when to initiate requests for heat. When the space temperature drops below the setpoint, the unit controller shall enable DX heating stage or the auxiliary heater when ambient temperature is below 35°F (adj.), to maintain the space temperature setpoint. Once the space temperature rises above the setpoint the compressor(s) or auxiliary electric heating stages shall be disabled.

Dehumidification/Humidity Control:

Factory installed hot gas reheat coil shall allow application of dehumidification.

Dehumidification shall be allowed only when the outside air temperature is above 40.0 deg. F and below 100.0 deg. F. The outside air damper shall drive to between its minimum and maximum scheduled outside air setpoint based on the CO2 readings during dehumidification.

Dual Compressor Units:

On a call for dehumidification, the hot gas reheat coil valve shall energize and both compressors shall enable. When the humidity control setpoint is satisfied, the valve shall be de-energized and both compressors shall be disabled. If there is a call for 1st stage cooling while in the dehumidification mode, no action shall take place. If there is a call for 2nd stage cooling, the hot gas reheat valve shall be de-energized, and the unit shall revert to the cooling mode. If 2nd stage cooling is satisfied and there is still a call for dehumidification, the hot gas reheat coil valve shall once again be energized and modulate as required to maintain space temperature.

CO2 Control/Demand Ventilation (As Applicable):

The duct mounted CO2 sensor shall modulate the motorized outside air and return air damper(s) in sequence to maintain a minimum concentration of 800 PPM (adj.). Upon satisfaction of the CO2 sensor setpoint, the outside air damper shall return to its minimum scheduled outside air setpoint and the the return air damper shall modulate up or down based on the outside air damper requirement

Filter Status:

A differential pressure switch shall monitor the differential pressure across the filter when the fan is running. If the switch closes for 2 minutes after a request for fan operation, a dirty filter alarm shall be annunciated at the BAS.

Condensate Drain Blockage:

Install a UL 508 conforming electronic water level monitoring device in the auxiliary drain port to automatically shut off the equipment served in the event the primary drain line becomes restricted. Upon detection of an obstruction in the condensate drain line, the unit shall shutdown and an alarm shall be annunciated at the BAS operator console. If the condensate switch is located outside of the unit casing, the sensor shall be provided with a completely weatherproof, easily accessible enclosure.

HP-A SYSTEM POINTS LIST

SYSTEM POINT DESCRIPTION	POINT TYPE							ALARMS								
	GRAPHIC	HARDWARE INPUT	HARWARE OUTPUT	SOFTWARE POINT	HARDWARE INTERLK	WIRELESS	NETWORK	DEFAULT VALUE	HIGH ANALOG LIMIT	LOW ANALOG LIMIT	BINARY	LATCH DIAGNOSTIC	SERSOR FAIL	COMMUNICATION FAIL	DIAGNOSTICS	NOTES
DISCHARGE AIR TEMPERATURE LOCAL	X	AI							X	X			X		SENSOR FAILURE	
MIXED AIR TEMPERATURE LOCAL	X	AI							X	X			X		SENSOR FAILURE	
													X			
RETURN AIR CO2 LOCAL	X	AI							X			X			CO2 SENSOR FAILURE	
SUPPLY FAN AIR FLOW LOCAL	X	AI														
DIRTY FILTER ALARM OPEN	X	BI										X			DIRTY FILTER	
SUPPLY FAN STATUS OPEN	X	BI														
SUPPLY FAN SPEED COMMAND	X		AO													
SUPPLY FAN START STOP COMMAND	X		BO													
OCCUPIED COOLING SETPOINT (ADJ)				X				74.0 deg. F								
OCCUPIED HEATING SETPOINT (ADJ)				X				70.0 deg. F								
UNOCCUPIED COOLING SETPOINT (ADJ)				X				78.0 deg. F								
UNOCCUPIED HEATING SETPOINT (ADJ)				X				67.0 deg. F								
BAS COMMUNICATION STATE	X			X										X		NOTE 1
MAINTENANCE REQUIRED				X				600 HRS								
UV LIGHTS MAINTENANCE REQUIRED				X				365 DAYS								
	GENERAL NOTES															
	1. DISPLAYED AT THE BAS USER INTERFACE IF PRESENT															
	2. POINTS SHALL BE AS SHOWN ON SCHEMATIC AND THIS TABLE															

4

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ALABAMA LICENSED PROFESSIONAL No. 23369 ENGINEER 02.03.23 J. R. EIRING

NEW FIRE STATION NO. 10
FOR
THE CITY OF MONTGOMERY
SOUTH COURT STREET MONTGOMERY, ALABAMA 36104

REVISIONS

No.	Description	Date
A	ISSUED FOR REVIEW	05.24.22
B	ISSUED FOR REVIEW	11.08.22
C	ISSUED FOR REVIEW	11.15.22
0	ISSUED FOR REVIEW	01.16.23
1	ISSUED FOR BIDS	02.03.23
4	ADDENDUM	03.02.23

MGM Project No.	SP-5-21
BDW Project No.	2021-118
ZEA Project No.	2022-11
Drawn By:	C. WARD
Date:	02.03.2023
Scale:	AS NOTED

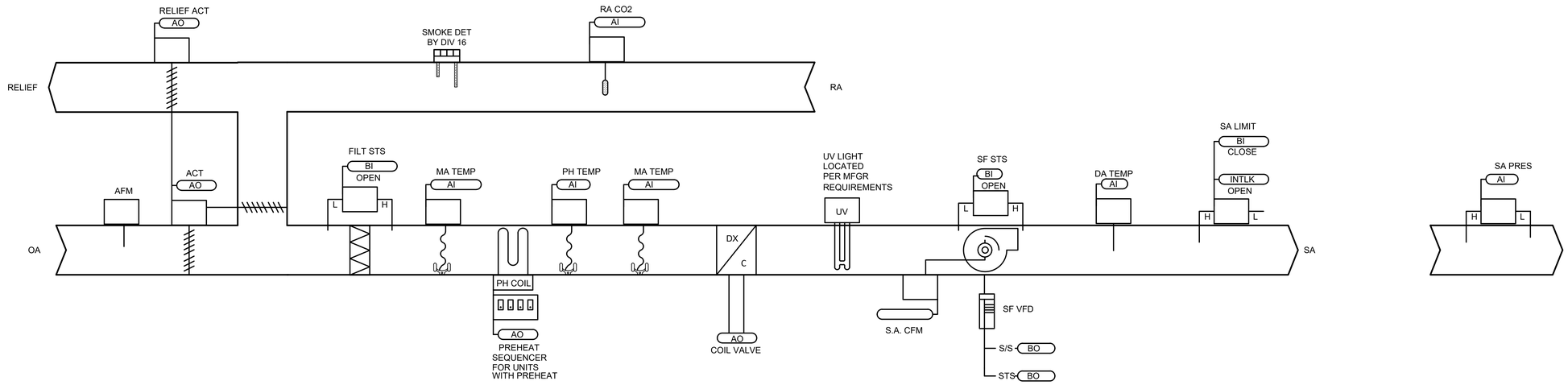
Drawing Title:
HVAC CONTROLS

Sheet No:

M10

CONSTRUCTION DOCUMENTS

ZGOUVAS, EIRING & ASSOCIATES
CONSULTING ENGINEERS
800 S McDONOUGH STREET
MONTGOMERY, AL. 36104
334.263.4406
ZEA PROJECT NUMBER 22-11



TYPICAL PACKAGED ROOFTOP VAV UNIT HVAC CONTROLS SCHEMATIC (PAC-1 &PAC-2)

NO SCALE

TYPICAL VAV AIR HANDLING UNIT - SYSTEM POINTS LIST

SYSTEM POINT DESCRIPTION	POINT TYPE							ALARMS								
	GRAPHIC	HARDWARE INPUT	HARWARE OUTPUT	SOFTWARE POINT	HARDWARE INTERLK	WIRELESS	NETWORK	DEFAULT VALUE	HIGH ANALOG LIMIT	LOW ANALOG LIMIT	BINARY	LATCH DIAGNOSTIC	SERSOR FAIL	COMMUNICATION FAIL	DIAGNOSTICS	NOTES
DISCHARGE AIR TEMPERATURE LOCAL	X	AI							X	X			X		SENSOR FAILURE	
DUCT STATIC PRESSURE LOCAL	X	AI														
MIXED AIR TEMPERATURE LOCAL	X	AI							X	X			X		SENSOR FAILURE	
PREHEAT LEAVING COIL TEMPERATURE LOCAL	X	AI							X	X			X		SENSOR FAILURE	
RETURN AIR CO2 LOCAL	X	AI							X			X			CO2 SENSOR FAILURE	
SUPPLY FAN AIR FLOW LOCAL	X	AI														
DIRTY FILTER ALARM OPEN	X	BI										X			DIRTY FILTER	
HIGH STATIC ALARM CLOSE	X	BI			X										DUCT STATIC PRESSURE HIGH LIMIT	NOTE 1
LOW LIMIT TEMPERATURE CUTOUT OPEN	X	BI			X						X	X			LOW TEMP DETECT	NOTE 1
SUPPLY FAN STATUS OPEN	X	BI														
REFRIGERANT COIL VALVE COMMAND OUTPUT	X		AO													
MIXED AIR DAMPER	X		AO													
SEQUENCER	X		AO													
SUPPLY FAN SPEED COMMAND	X		AO													
SUPPLY FAN START STOP COMMAND	X		BO													
OCCUPIED COOLING SETPOINT				X				74.0 deg. F								
OCCUPIED HEATING SETPOINT				X				70.0 deg. F								
DISCHARGE AIR TEMPERING SETPOINT				X				55.0 deg. F								
DISCHARGE AIR TEMPERATURE CONTROL POINTS				X												
BAS COMMUNICATION STATE	X			X										X		NOTE 2
MAINTENANCE REQUIRED				X				600 HRS								
UV LIGHTS MAINTENANCE REQUIRED				X				365 DAYS								
HIGH STATIC ALARM CLOSE	X	BI			X										LIGHTS OUT	NOTE 2
UNIVERSAL INPUT(S)		6														
ANALOG OUTPUT(S)			3													
BINARY OUTPUT(S)			3													

GENERAL NOTES
1. DEVICE IS HARDWIRE INTERLOCKED, MANUAL RESET MAY BE REQUIRED
2. DISPLAYED AT THE BAS USER INTERFACE IF PRESENT

TYPICAL VAV PACKAGED ROOFTOP UNIT SEQUENCE OF OPERATION

BUILDING AUTOMATION SYSTEM INTERFACE:

THE BUILDING AUTOMATION SYSTEM (BAS) SHALL SEND THE CONTROLLER OCCUPIED BYPASS, MORNING WARM-UP/PRE-COOL, OCCUPIED/UNOCCUPIED AND HEAT/COOL MODES. THE BAS SHALL ALSO SEND THE DISCHARGE AIR TEMPERATURE SETPOINT AND THE DUCT STATIC PRESSURE SETPOINT. IF A BAS IS NOT PRESENT, OR COMMUNICATION IS LOST WITH THE BAS, THE CONTROLLER SHALL OPERATE USING DEFAULT MODES AND SETPOINTS.

OCCUPIED:

DURING OCCUPIED PERIODS, THE SUPPLY FAN SHALL RUN CONTINUOUSLY AND THE OUTSIDE AIR DAMPER SHALL OPEN TO MAINTAIN MINIMUM VENTILATION REQUIREMENTS. THE CHILLED WATER VALVE SHALL MODULATE AND THE ELECTRIC PREHEAT SHALL STAGE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE SETPOINT. IF ECONOMIZING IS ENABLED, THE OUTSIDE AIR DAMPER SHALL MODULATE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE SETPOINT. IF THE DISCHARGE AIR TEMPERATURE SENSOR FAILS, THE CHILLED WATER VALVE SHALL CLOSE AND ELECTRIC HEAT SHALL BE DISABLED UPON SATISFACTION OF EQUIPMENT SAFETIES, AND AN ALARM SHALL BE ANNUNCIATED AT THE BAS.

UNOCCUPIED:

NOT REQUIRED. SPACES ARE OCCUPIED 24/7/365

SUPPLY FAN:

THE FAN SHALL BE OFF IN THE UNOCCUPIED MODE. WHEN THE UNIT CONTROLLER IS IN THE OCCUPIED MODE, THE SUPPLY FAN SHALL OPERATE CONTINUOUSLY AND ITS SPEED SHALL BE MODULATED TO MAINTAIN THE DUCT STATIC PRESSURE SETPOINT. THE DUCT STATIC PRESSURE SETPOINT SHALL BE SENT BY THE BAS AND SHALL BE RESET BETWEEN THE MINIMUM AND MAXIMUM STATIC PRESSURE LIMITS TO MAINTAIN THE CRITICAL ZONE VAV AIR DAMPER IN A POSITION BETWEEN 65% AND 75% OPEN.

IF THE SUPPLY FAN FAILS TO PROVE STATUS FOR 30 SECONDS (ADJ.), THE FAN SHALL BE COMMANDED OFF, THE OUTSIDE AIR DAMPER SHALL CLOSE, CHILLED WATER VALVE SHALL CLOSE, ELECTRIC HEAT SHALL BE DISABLED AND AN ALARM SHALL BE ANNUNCIATED AT THE BAS. A MANUAL RESET SHALL BE REQUIRED TO RESTART THE FAN. A HARDWIRED, HIGH STATIC PRESSURE CUT-OFF SWITCH SHALL BE ELECTRICALLY INTERLOCKED WITH THE VARIABLE SPEED DRIVE. IF THE HIGH STATIC PRESSURE CUT-OFF SWITCH IS TRIPPED THE FAN SHALL STOP, THE OUTSIDE AIR DAMPER SHALL CLOSE, CHILLED WATER VALVE SHALL CLOSE, ELECTRIC HEAT SHALL BE DISABLED AND AN ALARM SHALL BE ANNUNCIATED AT THE BAS. A MANUAL RESET OF THE HIGH STATIC PRESSURE CUT-OFF SWITCH SHALL BE REQUIRED TO RESTART THE FAN.

CO2 / DEMAND CONTROL VENTILATION:

WHEN THE INPUT CO2 CONCENTRATION SETPOINT IN THE RETURN AIR DUCT MAXIMUM SETPOINT OF 700 PPM (ADJ.) IS REACHED, THE OUTSIDE AIR DAMPER AND RETURN AIR DAMPER SHALL MODULATE IN SEQUENCE AND SHALL START TO MODULATE OPEN TO BRING IN MORE FRESH AIR TO REDUCE THE SPACE CO2 LEVEL. THE OUTSIDE AIR AND RETURN AIR DAMPERS SHALL MODULATE OPEN/CLOSE IN SMALL INCREMENTS UNTIL THE SPACE CO2 LEVEL IS SATISFIED OR THE OUTSIDE AIR DAMPER REACHES THE FULL OPEN POSITION. IF THE INPUT CO2 CONCENTRATION FALLS, THE OUTSIDE AIR AND RETURN AIR DAMPERS SHALL MODULATE TOWARD NORMAL OPERATION. IF THE MIXED AIR TEMPERATURE DROPS BELOW THE MIXED AIR LOW LIMIT SETPOINT, THE SPACE CO2 SENSOR INPUT IS OVERRIDDEN AND MODULATES THE OUTSIDE AIR DAMPER CLOSED AND THE RETURN AIR DAMPER OPEN TO MAINTAIN THE MIXED AIR TEMPERATURE LOW LIMIT SETPOINT. WHEN THE MIXED AIR TEMPERATURE RISES ABOVE THE MIXED AIR LOW LIMIT SETPOINT, CO2 OPERATION IS ONCE AGAIN RESTORED.

MIXED AIR LOW LIMIT:

THE INITIAL DAMPER OPENING RATE SHALL BE LIMITED TO 2% PER MINUTE (ADJ.) UNTIL THE DAMPER HAS REACHED ITS MINIMUM VENTILATION POSITION. THE OUTSIDE AIR DAMPER SHALL MODULATE TO A POSITION LESS THAN THE MINIMUM DAMPER POSITION IF THE MIXED AIR TEMPERATURE DROPS BELOW 50.0 DEG. F (ADJ.). IF THE MIXED AIR TEMPERATURE SENSOR FAILS AN ALARM SHALL BE ANNUNCIATED AT THE BAS OPERATOR CONSOLE AND THE OUTSIDE AIR DAMPER SHALL RETURN TO THE MINIMUM POSITION.

FILTER STATUS:

A DIFFERENTIAL PRESSURE SWITCH SHALL MONITOR THE DIFFERENTIAL PRESSURE ACROSS THE FILTER WHEN THE FAN IS RUNNING. IF THE SWITCH CLOSES DURING NORMAL OPERATION A DIRTY FILTER ALARM SHALL BE ANNUNCIATED AT THE BAS.

SMOKE DETECTOR SHUTDOWN:

THE UNIT SHALL SHUT DOWN IN RESPONSE TO A SIGNAL FROM EITHER SMOKE DETECTOR INDICATING THE PRESENCE OF SMOKE. THE SMOKE DETECTORS SHALL BE INTERLOCKED TO THE UNIT THROUGH THE DRY CONTACTS OF THE SMOKE DETECTORS. A MANUAL RESET OF THE SMOKE DETECTORS SHALL BE REQUIRED TO RESTART THE UNIT.

BUILDING PRESSURE CONTROL:

A DIFFERENTIAL PRESSURE TRANSDUCER SHALL ACTIVELY MONITOR THE DIFFERENCE IN PRESSURE BETWEEN THE BUILDING (INDOORS) AND OUTDOORS. IF THE BUILDING PRESSURE INCREASES ABOVE THE DESIRED SETPOINT, THE AHU CONTROLLER SHALL TURN ON THE EXHAUST FAN AND MODULATE THE UNIT EXHAUST FAN VFD TO CONTROL BUILDING PRESSURE AT SETPOINT. IF THE BUILDING PRESSURE DECREASES BELOW THE DESIRED SETPOINT, THE CONTROLLER SHALL TURN OFF THE EXHAUST FAN.

CONDENSATE DRAIN BLOCKAGE:

INSTALL A UL 508 CONFORMING ELECTRONIC WATER LEVEL MONITORING DEVICE IN THE AUXILIARY DRAIN PORT TO AUTOMATICALLY SHUT OFF THE EQUIPMENT SERVED IN THE EVENT THE PRIMARY DRAIN LINE BECOMES RESTRICTED. UPON DETECTION OF AN OBSTRUCTION IN THE CONDENSATE DRAIN LINE, THE UNIT SHALL SHUTDOWN AND AN ALARM SHALL BE ANNUNCIATED AT THE BAS OPERATOR CONSOLE. IF THE CONDENSATE SWITCH IS LOCATED OUTSIDE OF THE UNIT CASING, THE SENSOR SHALL BE PROVIDED WITH A COMPLETELY WEATHERPROOF, EASILY ACCESSIBLE ENCLOSURE.

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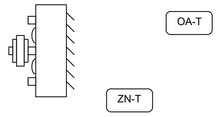
Drawing Title
4
HVAC CONTROLS

Sheet No:
M11

CONSTRUCTION DOCUMENTS



TYP. UNIT HEATERS CONTROL SEQUENCES

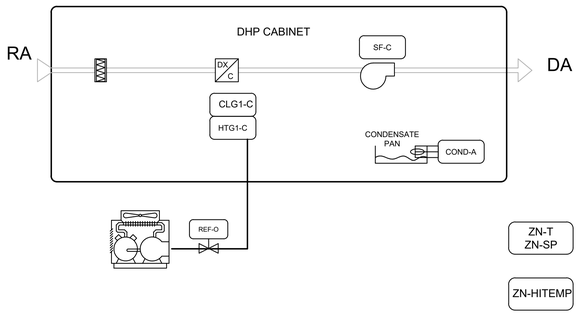
SEQUENCE OF OPERATION:

THE BAS WILL ENERGIZE THE ELECTRIC HEATING ELEMENT WHENEVER THE SPACE TEMPERATURE DROPS BELOW SETPOINT. A SEPARATE OUTSIDE AIR THERMOSTAT SHALL LOCK-OUT THE HEATER WHEN THE OA-T IS AT 68 DEG F ADJUSTABLE. THE UNIT IS SUBJECT TO THE "UNIT HEATER MASTER ENABLE/DISABLE POINT" AND THE OUTSIDE AIR TEMPERATURE (ADJ.)

PROVIDE A SPACE LOW LIMIT SENSOR. SHOULD TEMPERATURE FALL BELOW THE LOW LIMIT SETPOINT OF 50°F (ADJ.) AN ALARM SHALL BE SENT TO THE BAS OPERATORS CONSOLE

UNIT HEATERS CONTROL POINTS

TYPE	NAME	DESCRIPTION	SIGNAL
BO	HTG1-C	HEATING STAGE 1 COMMAND	24VAC MAINTAINED
AI	ZN-SP	ZONE SETPOINT	SAB
AI	ZN-T	ZONE TEMPERATURE	SAB



DHP/CCHP TYPICAL LAYOUT

1. THE ABOVE DRAWING IS REPRESENTATIVE OF A TYPICAL SYSTEM. SEE PLANS FOR QUANTITY AND LOCATION OF INDOOR AND OUTDOOR UNITS

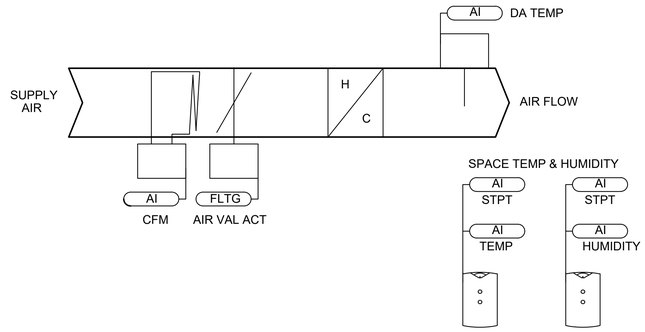
2. CONTROL CONTRACTOR TO PROVIDE AND INSTALL ALL LOW VOLTAGE WIRING FOR SYSTEM OPERATION, INCLUDING COMMUNICATION WIRING BETWEEN INDOOR, OUTDOOR UNITS, VRF ZONE SENSOR AND COMMUNICATION WIRING TO INTERFACE VRF SYSTEM WITH CONTROL SYSTEM.

3. CONTROL CONTRACTOR TO MAP IN ALL AVAILABLE POINTS FROM THE SYSTEM FOR USE BY THE OWNER.

DHP/CCHP TYPICAL SEQUENCE OF OPERATION

THE BAS SHALL MONITOR AND CONTROL THE STATUS OF THE INDOOR UNITS AS WELL AS THEIR ASSOCIATED ZONE TEMPERATURE. IF ANY UNITS GO INTO ALARM AND/OR THEIR ZONE TEMPERATURE EXCEEDS THE SETPOINT FOR MORE THAN FIVE MINUTES THE BAS WILL SEND A ALARM TO THE OPERATOR.

WHEN THE CONDENSATE FLOAT SWITCH IS IN "ALARM", THE COOLING CONTROL SEQUENCE WILL BE DISABLED, THE UNIT(S) WILL BE DISABLED AND AN ALARM SHALL BE SENT TO THE BAS OPERATOR CONSOLE



VAV TERMINAL UNITS WITH ELECTRIC REHEAT CONTROLS SCHEMATIC

NO SCALE

VAV TERMINAL UNITS WITH ELEC REHEAT SEQUENCE OF OPERATION

BUILDING AUTOMATION SYSTEM INTERFACE:

THE BUILDING AUTOMATION SYSTEM (BAS) SHALL SEND THE CONTROLLER OCCUPIED AND UNOCCUPIED COMMANDS. THE BAS MAY ALSO SEND A HEAT/COOL MODE, PRIORITY SHUTDOWN COMMANDS, SPACE TEMPERATURE AND/OR SPACE TEMPERATURE SETPOINT. IF COMMUNICATION IS LOST WITH THE BAS, THE VAV CONTROLLER SHALL OPERATE USING ITS LOCAL SETPOINTS.

OCCUPANCY MODE:

THE OCCUPANCY MODE SHALL BE COMMUNICATED OR HARDWIRED TO THE CONTROLLER VIA A BINARY INPUT. VALID OCCUPANCY MODES FOR THE UNIT SHALL BE:

OCCUPIED:

NORMAL OPERATING MODE FOR OCCUPIED SPACES OR DAYTIME OPERATION. WHEN THE UNIT IS IN THE OCCUPIED MODE THE VAV SHALL MAINTAIN THE SPACE TEMPERATURE AT THE ACTIVE OCCUPIED HEATING OR COOLING SETPOINT. APPLICABLE VENTILATION AND AIRFLOW SETPOINTS SHALL BE ENFORCED. THE OCCUPIED MODE SHALL BE THE DEFAULT MODE OF THE VAV.

UNOCCUPIED:

NO UNOCCUPIED REQUIREMENT. THE FACILITY IS OPERATIONAL 24/7/365.

HEAT/COOL MODE:

THE HEAT/COOL MODE SHALL BE SET BY A COMMUNICATED VALUE OR AUTOMATICALLY BY THE VAV. IN STANDALONE OR AUTO MODE THE VAV SHALL COMPARE THE PRIMARY AIR TEMPERATURE WITH THE CONFIGURED AUTO CHANGEOVER SETPOINT TO DETERMINE IF THE AIR IS "HOT" OR "COLD". HEATING MODE IMPLIES THE PRIMARY AIR TEMPERATURE IS HOT. COOLING MODE IMPLIES THE PRIMARY AIR TEMPERATURE IS COLD.

HEAT/COOL SETPOINT:

THE SPACE TEMPERATURE SETPOINT SHALL BE DETERMINED EITHER BY A LOCAL SETPOINT, THE VAV DEFAULT SETPOINT OR A COMMUNICATED VALUE. THE VAV SHALL USE THE LOCALLY STORED DEFAULT SETPOINTS WHEN NEITHER A LOCAL SETPOINT NOR COMMUNICATED SETPOINT IS PRESENT. IF BOTH A LOCAL SETPOINT AND COMMUNICATED SETPOINT EXIST, THE VAV SHALL USE THE COMMUNICATED VALUE.

COOLING MODE:

WHEN THE UNIT IS IN COOLING MODE, THE VAV CONTROLLER SHALL MAINTAIN THE SPACE TEMPERATURE AT THE ACTIVE COOLING SETPOINT BY MODULATING THE AIRFLOW BETWEEN THE ACTIVE COOLING MINIMUM AIRFLOW SETPOINT TO THE MAXIMUM COOLING AIRFLOW SETPOINT. THE VAV SHALL USE THE MEASURED SPACE TEMPERATURE AND THE ACTIVE COOLING SETPOINT TO DETERMINE THE REQUESTED COOLING CAPACITY OF THE UNIT. THE OUTPUTS WILL BE CONTROLLED BASED ON THE UNIT CONFIGURATION AND THE REQUESTED COOLING CAPACITY.

HEATING MODE:

WHEN THE UNIT IS IN HEATING MODE, THE VAV CONTROLLER SHALL MAINTAIN THE SPACE TEMPERATURE AT THE ACTIVE HEATING SETPOINT BY MODULATING THE AIRFLOW BETWEEN THE ACTIVE HEATING MINIMUM AIRFLOW SETPOINT TO THE MAXIMUM HEATING AIRFLOW SETPOINT. THE VAV CONTROLLER SHALL USE THE MEASURED SPACE TEMPERATURE AND THE ACTIVE HEATING SETPOINT TO DETERMINE THE REQUESTED HEATING CAPACITY OF THE UNIT. THE OUTPUTS WILL BE CONTROLLED BASED ON THE UNIT CONFIGURATION AND THE REQUESTED HEATING CAPACITY.

REHEAT CONTROL:

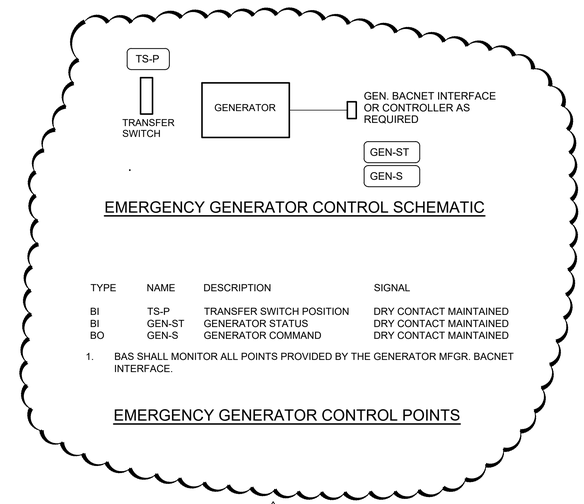
REHEAT WILL ONLY BE ALLOWED WHEN THE PRIMARY AIR TEMPERATURE IS 5.0 DEG. F BELOW THE CONFIGURED REHEAT ENABLE SETPOINT. THE REHEAT SHALL BE ENABLED WHEN THE SPACE TEMPERATURE DROPS BELOW THE ACTIVE HEATING SETPOINT AND THE MINIMUM AIRFLOW REQUIREMENTS ARE MET OR FOR HUMIDITY CONTROL. DURING REHEAT THE VAV SHALL OPERATE AT ITS MINIMUM HEATING AIRFLOW SETPOINT AND ENERGIZE THE HEAT AS FOLLOWS:

PROPORTIONAL ELECTRIC REHEAT:

IF THE SPACE TEMPERATURE IS BELOW THE HEATING SETPOINT THE SCR HEATER SHALL MODULATE AS REQUIRED TO MAINTAIN THE ACTIVE HEATING SETPOINT OR HUMIDITY SETPOINT.

SPACE SENSOR FAILURE:

IF THERE IS A FAULT WITH THE OPERATION OF THE ZONE SENSOR AN ALARM SHALL BE ANNUNCIATED AT THE BAS. SPACE SENSOR FAILURE SHALL CAUSE THE VAV TO DRIVE THE DAMPER TO MINIMUM AIR FLOW IF THE VAV IS IN THE OCCUPIED MODE



EMERGENCY GENERATOR CONTROL SCHEMATIC

TYPE	NAME	DESCRIPTION	SIGNAL
BI	TS-P	TRANSFER SWITCH POSITION	DRY CONTACT MAINTAINED
BI	GEN-ST	GENERATOR STATUS	DRY CONTACT MAINTAINED
BO	GEN-S	GENERATOR COMMAND	DRY CONTACT MAINTAINED

1. BAS SHALL MONITOR ALL POINTS PROVIDED BY THE GENERATOR MFGR. BACNET INTERFACE.

EMERGENCY GENERATOR CONTROL POINTS

4

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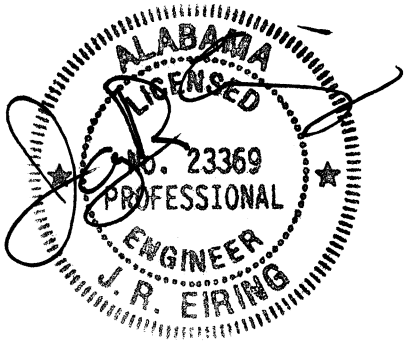
ZEA PROJECT NUMBER 22-11

ZGOUVAS, EIRING & ASSOCIATES
CONSULTING ENGINEERS, INC.

HVAC ADDENDUM

A New Fire Station #10 for the City of Montgomery

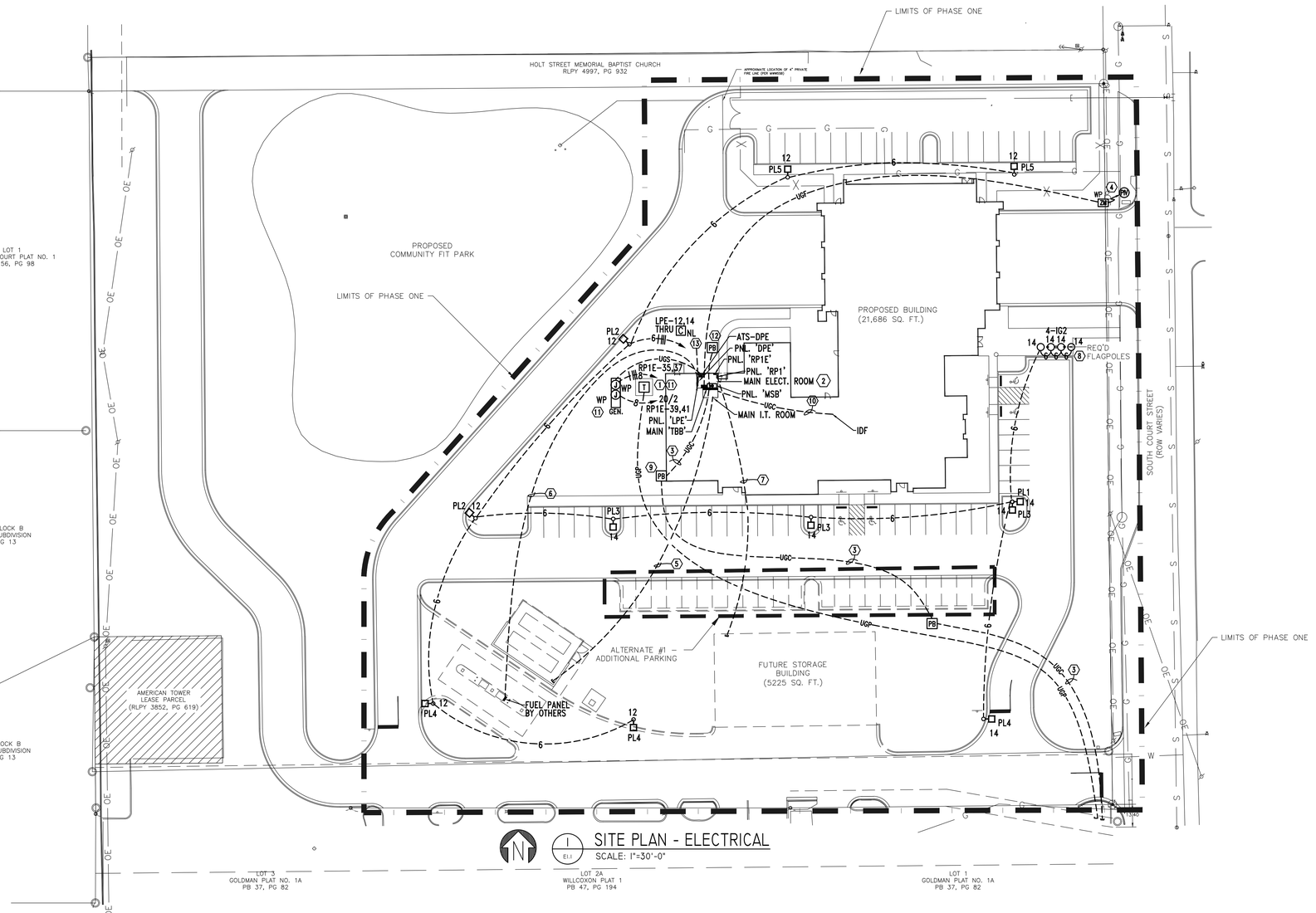
March 3, 2023



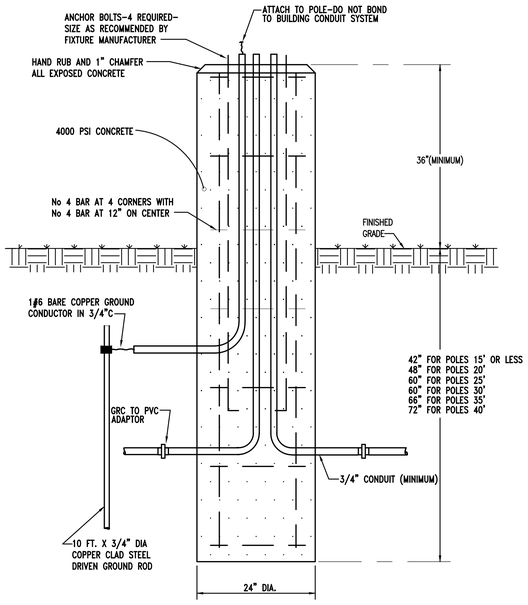
1. Refer to the specifications Section 15920, Building Automation System (BAS) and add the following requirement:

   Walters Controls (Honeywell)
   Mobile, AL. is an approved HVAC Controls Vendor

END OF ADDENDUM



1 E1.1 SITE PLAN - ELECTRICAL
SCALE: 1"=30'-0"



NOTES:

1. CONCRETE SHALL TEST TO BE 4,000 PSI STRENGTH IN 28 DAYS.
2. SEE LIGHT FIXTURE SCHEDULE FOR LIGHTING CONFIGURATION.
3. ALL DIMENSIONS SHALL BE COORDINATED AND COMPLY WITH GEOTECHNICAL REPORT.
4. INSTALLATION SHALL COMPLY WITH MANUFACTURER'S RECOMMENDATIONS IF MORE STRINGET.
5. POLE BASE SHALL BE IN FULL CONTACT WITH THE CONCRETE BASE.
6. PAINT POLE BASES YELLOW BEFORE INSTALLING POLES.

2 E1.1 DETAIL - TYPICAL ELEVATED CONCRETE POLE BASE
NO SCALE

UNDERGROUND UTILITY NOTES:

1. THE UNDERGROUND UTILITY PORTION OF THIS PROJECT CONSISTS OF BUT IS NOT LIMITED TO:
   a. TRENCHING/BACKFILLING FOR DUCT LINES AND CONDUIT SYSTEMS
   b. DUCTBANK INSTALLATIONS
   c. LOW VOLTAGE CONDUCTOR INSTALLATION
   d. PATCH/REPAIR ALL DAMAGED SURFACES AS A RESULT OF DUCTLINE INSTALLATIONS
2. INSTALLATION SHALL COMPLY WITH THE REQUIREMENTS OF THE NATIONAL ELECTRICAL SAFETY CODE (NESC) AND THE NATIONAL ELECTRICAL CODE (NEC).
3. ALL CONDUCTIVE PARTS OF EQUIPMENT, ENCLOSURES, SUPPORTS, FRAMES, CASES, CONDUIT SYSTEMS AND SURGE ARRESTORS, CABLE SHEATHS, CABLE SHIELDS, COMMON NEUTRALS, ETC., SHALL BE GROUNDED. UNLESS NOTED OTHERWISE CONNECTIONS BELOW GRADE SHALL BE FUSION-WELDED AND ABOVE GRADE FUSION-WELDED OR BOLTED SOLDERLESS. ALL GROUND CONDUCTORS SHALL BE COPPER.
4. ALL CLEARANCES SHALL BE MAINTAINED PER NESC AND NEC. ALL PARTS, DEVICES, EQUIPMENT, ETC. WHICH REQUIRE MAINTENANCE, ADJUSTMENT, OPERATION OR EXAMINATION DURING NORMAL NETWORK OPERATION SHALL BE ARRANGED SO AS TO BE ACCESSIBLE BY THE PROVISION OF ADEQUATE WORKING SPACES, WORKING FACILITIES AND CLEARANCES. UNLESS NOTED OTHERWISE ALL CLEARANCES ARE MEASURED FROM SURFACE TO SURFACE.
5. ALL DIMENSIONS INDICATED IN THESE DOCUMENTS ARE FOR REFERENCE AND COORDINATION PURPOSES ONLY. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL DIMENSIONS IN THE FIELD.
6. UNLESS OTHERWISE SHOWN OR DIRECTED DUCT LINES SHALL NOT BE LOCATED DIRECTLY UNDER STRUCTURES AND NOT DIRECTLY UNDER OR OVER OTHER SUBSURFACE STRUCTURES. WHERE DUCT LINES ARE REQUIRED TO CROSS OTHER UTILITIES SUCH AS SEWERS, WATER LINES, OTHER POWER LINES, COMMUNICATION LINES, ETC., ADEQUATE SUPPORT SHALL BE PROVIDED ON EACH SIDE OF THE CROSSING TO PREVENT TRANSFERRING ANY DIRECT LOAD ONTO THE OTHER LINE. DUCT LINES SHALL BE SO INSTALLED AS TO PREVENT HEAT TRANSFER BETWEEN ANY HEAT PRODUCING LINES AND/OR EQUIPMENT TO DUCT LINES.
   a. ROUTING SHOWN ON DRAWINGS IS TYPICAL AND THE CONTRACTOR SHALL PROPOSE FINAL ROUTING BASED UPON ACTUAL FIELD DIMENSIONS, CONDITIONS AND EXISTING UNDERGROUND UTILITIES AND STRUCTURES.
   b. PRIOR TO TRENCHING, THE CONTRACTOR SHALL STAKE OUT THE ENTIRE NETWORK ARRANGEMENT. ONE GRADE A WOODEN STAKE WITH RED FLAG SHALL BE DRIVEN EVERY 50'-0" AND AT EACH CHANGE OF DIRECTION. FOUR STAKES SHALL BE DRIVEN TO OUTLINE EQUIPMENT AND/OR MANHOLE LOCATIONS. ON PAVEMENTS RED PAINT SHALL BE USED TO OUTLINE THE AREAS TO BE CUT. SECURE EXISTING UNDERGROUND UTILITY INFORMATION FROM THE CONTRACTING OFFICER PRIOR TO PERFORMING ANY TRENCHING.
   c. DEPTHS INDICATED FOR INSTALLATION ARE MINIMUM. ACTUAL DEPTHS MAY VARY DUE TO TERMINATIONS, COMPENSATIONS FOR RADIUS OF VERTICAL TRANSITIONS, EXISTING UTILITY CROSSINGS, ETC. APPROVAL SHALL BE OBTAINED FOR ANY DEPTH LESS THAN INDICATED. TRENCHES SHALL BE OVER-EXCAVATED AS NECESSARY TO ALLOW FOR PROPER TRENCH PREPARATION, DUCT BANK CONSTRUCTION, FORMING AND/OR BACKFILLING REQUIREMENTS.
   d. ALL TRENCHING AND BACKFILL COMPACTION SHALL COMPLY WITH GEOTECHNICAL REPORT AND DIVISION 2.

GENERAL ELECTRICAL SITE NOTES:

1. ALL SITE ELECTRICAL WORK SHALL COMPLY WITH NEC, STATE, AND LOCAL CODES.
2. CONTRACTOR SHALL PATCH AND REPAIR ALL DAMAGED SURFACES AS A RESULT OF THE DUCTLINE INSTALLATION BACK TO PREVIOUS STATE.
3. ALL CONDUCTIVE PARTS OF ELECTRICAL EQUIPMENT SHALL BE GROUNDED. UNLESS NOTED OTHERWISE, CONNECTIONS BELOW GRADE BELOW GRADE SHALL BE FUSION-WELDED AND ABOVE GRADE FUSION WELDED OR BOLTED SOLDERLESS. ALL GROUND CONDUCTORS SHALL BE COPPER.
4. DUCT LINES SHALL NOT BE LOCATED DIRECTLY UNDER STRUCTURES AND NOT DIRECTLY UNDER OR OVER OTHER SUBSURFACE STRUCTURES, UNLESS SHOWN OR DIRECTED. WHERE DUCT LINES HAVE TO CROSS OTHER UTILITIES, SUCH AS SEWER, WATER, ELECTRICAL, AND COMMUNICATIONS LINES, PROVIDE ADEQUATE SUPPORT ON EACH SIDE OF THE CROSSING TO PREVENT PUTTING ANY DIRECT LOAD ONTO THE OTHER UTILITY LINES.
5. ALL DUCT AND CIRCUIT ROUTING ON DRAWINGS IS SHOWN TYPICAL. CONTRACTOR SHALL PROPOSE FINAL ROUTING BASED ON ACTUAL FIELD DIMENSIONS, CONDITIONS, AND EXISITNG UNDERGROUND UTILITIES AND STRUCTURES.
6. CONTRACTOR SHALL STAKE OUT THE ENTIRE UNDERGROUND DUCT SYSTEM AND COORDINATE THE ROUTING AGAINST EXISTING UNDERGROUND UTILITY INFORMATION AND NEW WORK BY THE OTHER TRADES, BEFORE DOING ANY TRENCHING. THE GENERAL CONTRACTOR, CONSTRUCTION MANAGER, OR CONTRACTING OFFICER SHALL GIVE APPROVAL OF ROUTING BEFORE TRENCHING SHALL BEGIN.
7. ALL TRENCHING AND BACKFILL COMPACTION SHALL COMPLY WITH THE GEOTECHNICAL REPORT AND ALL SPECIFICATIONS.
8. ALL DEPTHS INDICATED FOR INSTALLATION ARE MINIMUM. ACTUAL DEPTHS MAY VARY DUE TO TERMINATIONS, TRANSITIONS, EXISTING UTILITIES, ETC. APPROVAL SHALL BE OBTAINED FOR ANY DEPTH LESS THAN INDICATED.
9. ALL CONDUITS STUBBED OUT OF THE FACILITY FOR FUTURE SHALL BE CAPPED AND LOCATION MARKED WITH 2" SQUARE, PAINTED RED, WITH CONDUIT NAME AND SIZE SHOWN IN WHITE. PROVIDE WITH PULLWIRES.
10. PROVIDE PROPER CONCRETE POLE BASE FOR ALL POLE MOUNTED EXTERIOR LIGHTING FIXTURES. SEE DETAIL.
11. ALL UNDERGROUND CONDUITS SHALL BE 36" MINIMUM BELOW GRADE. PRIMARY CONDUIT SHALL BE MINIMUM 48" BELOW GRADE.
12. CONTRACTOR SHALL LABEL ALL CONDUITS ENTERING AND EXITING COMMUNICATIONS PULLBOXES AND BACKBOARDS.
13. ALL ROUTING IS SHOWN DIAGRAMMATIC. VERIFY ACTUAL ROUTING AND FIELD CONDITIONS PRIOR TO BIDS.
14. LOCATIONS OF RISER POLES, AND TRANSFORMERS SHALL BE COORDINATED WITH ALABAMA POWER COMPANY PRIOR TO BIDS. ADJUST FEEDER AND CONDUIT LENGTHS ACCORDINGLY. PAY ALL UTILITY COMPANY FEES. BID ACCORDINGLY.

SHEET NOTES:

1. COORDINATE WITH LOCAL UTILITY COMPANY FOR SPECIFIC LOCATION AND REQUIREMENTS FOR METER AND C.T. CABINET. COORDINATE WITH APC FOR SPECIFIC ROUTING OF CONDUIT PRIOR TO BID. SEE POWER RISER DIAGRAM SHEET E5.2 FOR FURTHER REQUIREMENTS. PROVIDE PULL BOXES AS REQUIRED FOR DISTANCE.
2. SEE SINGLE LINE RISER DIAGRAM ON SHEET E5.2 FOR ADDITIONAL INFORMATION ON CONDUIT INSTALLATIONS.
3. COORDINATE WITH COMMUNICATION COMPANY FOR SPECIFIC ROUTING AND TERMINATION POINT OF UNDERGROUND CABLE AND COMMUNICATION CONDUITS. COORDINATE ROUTING PRIOR TO BID. PROVIDE THREE (3) 3" CONDUITS. PROVIDE PULLBOXES AS INDICATED.
4. PROVIDE AND INSTALL ONE (1) 3/4"C FOR THE FIRE ALARM SYSTEM CABLE. FIELD VERIFY ON SITE EXACT LOCATION OF PIV. PROVIDE AND INSTALL FLOW AND TAMPER SWITCHES AS REQUIRED.
5. PROVIDE TWO (2) 1"C. FROM I.T. ROOM TO EXTERIOR OF BUILDING FOR GAS PUMP CONTROLS.
6. PROVIDE 4#1/0, 1#6G., 2"C. FROM PANEL 'DPE' TO PUMP STATION FOR FUEL PANEL. PANEL TO BE PROVIDED BY OTHERS. VERIFY EXACT PANEL LOCATION WITH EQUIPMENT SUPPLIER PRIOR TO ROUGH-IN. ~~2~~
7. STUB-OUT TWO (2) 2"C. FROM PANEL 'RP1' TO FUTURE STORAGE BUILDING SITE. CAP FOR FUTURE USE.
8. VERIFY LOCATION OF FLAGPOLES PRIOR TO ROUGH-IN. SPACE FIXTURES EQUALLY BETWEEN POLES.
9. PROVIDE COMMUNICATIONS CONDUIT FROM MDF TO COMMUNICATIONS PULL BOX. SEE COMMUNICATIONS SINGLE LINE DIAGRAM SHEET E8.1.
10. PROVIDE TWO (2) 3" CONDUITS.
11. PROVIDE PROPER CLEARANCES FOR TRANSFORMER AND GENERATOR WHEN INSTALLING EQUIPMENT. ADJUST LOCATIONS AS NEEDED.
12. PROVIDE THREE (3) 4" CONDUITS FROM MDF TO PULLBOX FOR FUTURE RADIO TOWER.
13. PROVIDE TWO (2) 1 1/4" AND TWO (2) 2" CONDUITS STUBBED OUT OF ELECTRICAL ROOM FOR FUTURE RADIO TOWER. DO NOT STUB UP CONDUITS INTO ANY PANEL.

SITE LEGEND

- UGP — UNDERGROUND PRIMARY CONDUITS, MIN BURIAL 48" BELOW GRADE
- UGS — UNDERGROUND SECONDARY CONDUITS
- UGC — UNDERGROUND COMMUNICATIONS CONDUITS
- UGF — UNDERGROUND FIRE ALARM CONDUITS
- — — — UNDERGROUND CONDUIT
- SINGLE LIGHT MOUNTED ON 20'H. POLE
- TWO LIGHTS MOUNTED ON SINGLE 20'H. POLE AT 90°
- IN-GRADE LIGHT FIXTURE
- (J)WP WEATHERPROOF J-BOX
- T PAD MOUNTED TRANSFORMER
- GEN GENERATOR
- PB NEW TELECOMMUNICATIONS PULL BOX, PROVIDE HIGHLINE NO. PHA243624HM2 OR APPROVED EQUAL BY OLDCASTLE OR HUBBELL.

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ALABAMA REGISTERED PROFESSIONAL ENGINEER KENNETH RAY GUNN, JR. NO. 26988 2-03-2023

NEW FIRE STATION NO. 10
FOR
THE CITY OF MONTGOMERY
SOUTH COURT STREET MONTGOMERY, ALABAMA 36104

REVISIONS		
No.	Description	Date
0	ISSUED FOR REVIEW	01/16/23
1	ISSUED FOR BID	02/03/23
2	ADDENDUM #4	03/10/23

MGM Project No.	SP-5-21
BDW Project No.	2021-118
Drawn By:	
Date:	11-15-2022
Scale:	AS NOTED

Drawing Title:

ELECTRICAL SITE PLAN

Sheet No:

E1.1

CONSTRUCTION DOCUMENTS

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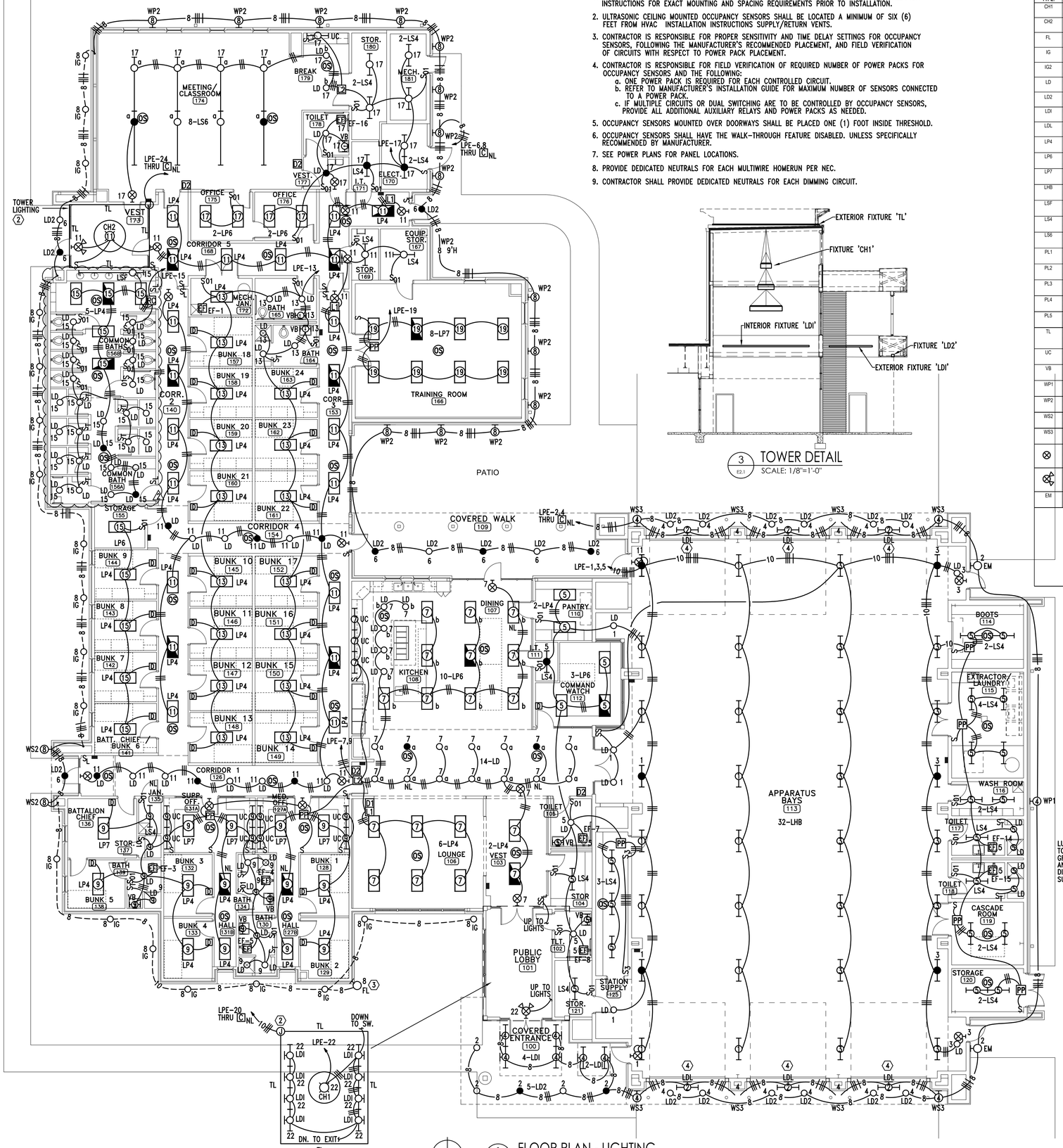
GENERAL NOTES:

1. ALL OCCUPANCY SENSORS LOCATIONS ARE APPROXIMATE. REFER TO MANUFACTURER'S INSTALLATION INSTRUCTIONS FOR EXACT MOUNTING AND SPACING REQUIREMENTS PRIOR TO INSTALLATION.
2. ULTRASONIC CEILING MOUNTED OCCUPANCY SENSORS SHALL BE LOCATED A MINIMUM OF SIX (6) FEET FROM HVAC INSTALLATION INSTRUCTIONS SUPPLY/RETURN VENTS.
3. CONTRACTOR IS RESPONSIBLE FOR PROPER SENSITIVITY AND TIME DELAY SETTINGS FOR OCCUPANCY SENSORS, FOLLOWING THE MANUFACTURER'S RECOMMENDED PLACEMENT, AND FIELD VERIFICATION OF CIRCUITS WITH RESPECT TO POWER PACK PLACEMENT.
4. CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFICATION OF REQUIRED NUMBER OF POWER PACKS FOR OCCUPANCY SENSORS AND THE FOLLOWING:
   a. ONE POWER PACK IS REQUIRED FOR EACH CONTROLLED CIRCUIT.
   b. REFER TO MANUFACTURER'S INSTALLATION GUIDE FOR MAXIMUM NUMBER OF SENSORS CONNECTED TO A POWER PACK.
   c. IF MULTIPLE CIRCUITS OR DUAL SWITCHING ARE TO BE CONTROLLED BY OCCUPANCY SENSORS, PROVIDE ALL ADDITIONAL AUXILIARY RELAYS AND POWER PACKS AS NEEDED.
5. OCCUPANCY SENSORS MOUNTED OVER DOORWAYS SHALL BE PLACED ONE (1) FOOT INSIDE THRESHOLD.
6. OCCUPANCY SENSORS SHALL HAVE THE WALK-THROUGH FEATURE DISABLED. UNLESS SPECIFICALLY RECOMMENDED BY MANUFACTURER.
7. SEE POWER PLANS FOR PANEL LOCATIONS.
8. PROVIDE DEDICATED NEUTRALS FOR EACH MULTIWIRE HOMERUN PER NEC.
9. CONTRACTOR SHALL PROVIDE DEDICATED NEUTRALS FOR EACH DIMMING CIRCUIT.



TOWER DETAIL

3 / E2.1 — SCALE: 1/8"=1'-0"

TOWER LIGHTING

2 / E2.1 — SCALE: 1/8"=1'-0"

FLOOR PLAN - LIGHTING

1 / E2.1 — SCALE: 1/8"=1'-0"

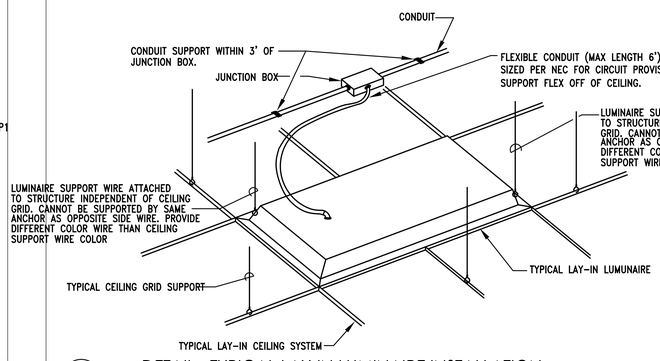
LIGHTING FIXTURE SCHEDULE

TYPE:	MANUFACTURER NUMBER AND EQUALS:	VOLTAGE:	MOUNTING:	LAMP TYPE:	LAMP QUANTITY:	DESCRIPTION:
CH1	SPI NO. AIP158803-AIP1187-L290W-PTXX-120/277-4000K-FB00-OAH(182.0)-MOD OR PRIOR APPROVED EQUALS BY ARCHITECT	MVOLT	PENDANT	LED 290W	30,000 LUMEN	3-TIER ROUND LED PENDANT WITH OPAL POLYCARBONATE DIFFUSERS AND INNER COLOR BANDS AS SELECTED BY ARCHITECT. COORDINATE MOUNTING WITH ARCHITECT
CH2	SPI NO. AIP11997-L113W-UNV-4K-H10-FB00-MIA-MB01 OR PRIOR APPROVED EQUALS BY ARCHITECT	MVOLT	PENDANT	LED 113W	11,500 LUMEN	72 IN ROUND LED PENDANT WITH OPAL POLYCARBONATE DIFFUSER AND INNER COLOR BAND AS SELECTED BY ARCHITECT. COORDINATE MOUNTING WITH ARCHITECT
FL	EATON #NVF2-74-32L-80W-40K8-UNV-TM OR PRIOR APPROVED EQUALS BY KIM, GARDCO, OR PARKER	MVOLT	ROOF	LED 80W	10,720 LUMEN	FLOODLIGHT FIXTURE. COORDINATE MOUNTING DETAILS AND FINISH WITH ARCHITECT.
IG	LIGMAN #UKI-60781-30W-W-W40-UNV OR PRIOR APPROVED EQUAL BY KIM, GARDCO, OR PARKER	MVOLT	IN-GRADE IN GROUND	LED 30W	3160 LUMEN	SLIGHTLY RAISED, ROUND, INGRADE FIXTURE, WET LOCATION, IMPACT RESISTANT
IG2	LIGMAN #UKI-60771-30W-N-W40-UNV OR PRIOR APPROVED EQUAL BY KIM, GARDCO, OR PARKER	MVOLT	IN-GRADE IN CONCRETE	LED 30W	3160 LUMEN	ROUND, INGRADE FIXTURE, WET LOCATION, IMPACT RESISTANT
LD	HALO #HC6-15-D010-IEM14 WHERE REQUIRED)-HM60525835-6WDHWF (IEM) OR PRIOR APPROVED EQUAL BY HUBBELL, WILLIAMS, OR PARKER	MVOLT	RECESSED	LED 14.5W	1500 LUMEN	6 INCH, 1500 LUMEN, LED, DOWNLIGHT, 3500K TEMPETURE LAMPS. MINIMUM 80 CRI. WET LOCATION. PROVIDE WITH EMERGENCY BATTERY PACK WHERE REQUIRED.
LD2	HALO #HC6-30-D010-IEM14 WHERE REQUIRED)-HM63040840-6WDHWF (IEM) OR PRIOR APPROVED EQUAL BY HUBBELL, WILLIAMS, OR PARKER	MVOLT	RECESSED IN SOFFIT	LED 28.6W	3000 LUMEN	6 INCH, 3000 LUMEN, LED, DOWNLIGHT, 4000K TEMPETURE LAMPS. MINIMUM 80 CRI. WET LOCATION. PROVIDE WITH EMERGENCY BATTERY PACK WHERE REQUIRED.
LDI	LUMENWERX #V2SEALW-DI-WET-EPDO/ASO-SW-80-500/500-40-4FT-UNV-D1-1C-COLOR BY ARCH OR PRIOR APPROVED EQUALS BY PARKER, HUBBELL, OR WILLIAMS	MVOLT	WALL	LED 41.3	2000 LUMEN UP 2000 LUMEN DOWN	4'-0" LED LINEAR DIRECT/INDIRECT FIXTURE MOUNTED TO SIDE OF BULKHEAD. WET LOCATION RATED. COORDINATE MOUNTING DETAILS WITH ARCHITECT.
LDL	LUMENWERX #V2SEALS-D-WET-ASDO-SW-80-500-40-12FT-UNV-D1-1C-COLOR BY ARCH OR PRIOR APPROVED EQUALS BY PARKER, HUBBELL, OR WILLIAMS	MVOLT	WALL	LED 62.1W	6000 LUMEN	12'-0" LED LINEAR FIXTURE MOUNTED TO BOTTOM OF CANOPY. WET LOCATION RATED. COORDINATE MOUNTING DETAILS WITH ARCHITECT.
LP4	HUBBELL NO. CFP24-41-35-PLD10M (WHERE REQUIRED) OR PRIOR APPROVED EQUAL BY COOPER, WILLIAMS, OR PARKER	MVOLT	RECESSED	LED 40W	4300 LUMEN	2'X4', DIMMABLE, FLAT PANEL FIXTURE. PROVIDE WITH EMERGENCY BATTERY PACK WHERE REQUIRED.
LP6	HUBBELL NO. CFP24-55-35-PLD10M (WHERE REQUIRED) OR PRIOR APPROVED EQUAL BY COOPER, WILLIAMS, OR PARKER	MVOLT	RECESSED	LED 49W	5500 LUMEN	2'X4', DIMMABLE, FLAT PANEL FIXTURE. PROVIDE WITH EMERGENCY BATTERY PACK WHERE REQUIRED.
LP7	HUBBELL NO. CFP24-75-35-PLD10M (WHERE REQUIRED) OR PRIOR APPROVED EQUAL BY COOPER, WILLIAMS, OR PARKER	MVOLT	RECESSED	LED 56W	7500 LUMEN	2'X4', DIMMABLE, FLAT PANEL FIXTURE. PROVIDE WITH EMERGENCY BATTERY PACK WHERE REQUIRED.
LHB	HUBBELL NO. LXEP4-40XL-RFA-EU-XEHC OR PRIOR APPROVED EQUAL BY COOPER, WILLIAMS, OR PARKER	MVOLT	SUSPENDED	LED 91.2W	10,000 LUMEN	4' LED HIGHBAY WITH FROSTED ACRYLIC LENS. SUSPEND FIXTURES EVEN WITH JOIST. PROVIDE WITH EMERGENCY BATTERY PACK WHERE REQUIRED.
LSF	LUMENWERX #VA2R-D-HLO-FR-SW-80-200-35-12'-UNV-D1-1C-W OR PRIOR APPROVED EQUALS BY PARKER, HUBBELL, OR WILLIAMS	MVOLT	RECESSED	LED 22W	1200 LUMEN	12', 2IN LINEAR SLOT FIXTURE
LS4	HUBBELL NO. LCL-4-35K-ML-E-MVOLT-CSHC OR PRIOR APPROVED EQUAL BY COOPER, WILLIAMS, OR PARKER	MVOLT	SURFACE OR SUSPENDED	LED 42W	5300 LUMEN	SURFACE MOUNTED 4'-0" LED STRIP. CHAIN HANG WHEN SURFACE MOUNT IS NOT POSSIBLE. PROVIDE WITH EMERGENCY BATTERY PACK WHERE REQUIRED.
LS6	VIA3P NO. DHLO-50-SW-85-1200-3S-10FT-UNV-D1-1-W OR PRIOR APPROVED EQUALS BY HUBBELL, WILLIAMS, OR EATON	MVOLT	SUSPENDED	LED 126W	12,000 LUMEN	10'-0" LED LINEAR FIXTURE WITH DROP LENSE PROVIDE WITH EMERGENCY BATTERY PACK WHERE REQUIRED.
PL1	EATON #GALN-SA3C-740-U-SLL OR PRIOR APPROVED EQUALS BY KIM, GARDCO, OR PARKER	MVOLT	25' POLE	LED 160W	18,000 LUMEN	AREA POLE LIGHT MOUNTED 30'H ON SQUARE ALUMINUM POLE
PL2	EATON #GALN-SA3C-740-U-SL3 OR PRIOR APPROVED EQUALS BY KIM, GARDCO, OR PARKER	MVOLT	25' POLE	LED 160W	20,800 LUMEN	AREA POLE LIGHT MOUNTED 30'H ON SQUARE ALUMINUM POLE
PL3	EATON #GALN-SA3C-740-U-SL4 OR PRIOR APPROVED EQUALS BY KIM, GARDCO, OR PARKER	MVOLT	25' POLE	LED 160W	20,500 LUMEN	AREA POLE LIGHT MOUNTED 30'H ON SQUARE ALUMINUM POLE
PL4	EATON #GALN-SA3C-740-U-SM3 OR PRIOR APPROVED EQUALS BY KIM, GARDCO, OR PARKER	MVOLT	25' POLE	LED 160W	22,000 LUMEN	AREA POLE LIGHT MOUNTED 30'H ON SQUARE ALUMINUM POLE
PL5	EATON #GALN-SA3C-740-U-SW3 OR PRIOR APPROVED EQUALS BY KIM, GARDCO, OR PARKER	MVOLT	25' POLE	LED 160W	22,000 LUMEN	AREA POLE LIGHT MOUNTED 30'H ON SQUARE ALUMINUM POLE
TL	ACCLAIM #XTC 2 4 1 A&D R V N WITH ART500 OR PRIOR APPROVED EQUALS BY PARKER, HUBBELL, OR WILLIAMS	MVOLT	SURFACE	LED 5W/FT	449 LM/FT	LINEAR LED COLOR CHANGING WALL WASHER WITH DMX CONTROLLER. PROVIDE LENGTH AS SHOWN ON PLANS. PROVIDE ALL CONNECTING AND MOUNTING ACCESSORIES AS REQUIRED FOR A FULLY FUNCTIONAL FIXTURE. WET LOCATION RATED. COORDINATE MOUNTING DETAILS WITH ARCHITECT.
UC	HALO #HU1148DISP OR PRIOR APPROVED EQUALS BY PARKER, HUBBELL, OR WILLIAMS	MVOLT	SURFACE	LED 21W	1540 LUMEN	4' LINEAR UNDER CABINET FIXTURE
VB	SHAPER #805-25-W-L3/835-UNV-GRM OR PRIOR APPROVED EQUALS BY VISA, SPI, OR PROGRESS	MVOLT	WALL	LED 20W	2000 LUMEN	VANITY WALL BRACKET FIXTURE.
WP1	EATON #GWC-SAID-740-U-T4FT- FINISH BY ARCH OR PRIOR APPROVED EQUALS BY KIM, GARDCO, OR PARKER	MVOLT	WALL 14' TO CENTER	LED 67W	8330 LUMEN	DARK BRONZE EXTERIOR LED LIGHT. UL LISTED FOR WET LOCATIONS.
WP2	RLM #CN1812GV-2TL-40K-EX-F-J2-CP104-SP6-FINISH BY ARCH-WLKA OR PRIOR APPROVED EQUALS BY KIM, GARDCO, OR PARKER	MVOLT	WALL 9' H	LED 18W	2700 LUMEN	DECORATIVE EXTERIOR LED LIGHT. UL LISTED FOR WET LOCATIONS.
WS2	VISA #OWT0474-L40KL-MVOLT-FINISH BY ARCH OR PRIOR APPROVED EQUALS BY SPI, SHAPER, OR EQUAL	MVOLT	WALL 6' TO CENTER	LED 36W	1100 LUMEN	21H. EXTERIOR LED HALF CYLINDER WALL SCONCE UL LISTED FOR WET LOCATIONS.
WS3	SPI #AEW9980-L36W-UNV-4K-DFOA-DFVERT-DFLUM-DFINST1-FINISH BY ARCH OR PRIOR APPROVED EQUALS BY VISA, SHAPER, OR EQUAL	MVOLT	WALL 8'-9" TO CENTER	LED 36W	2500 LUMEN	31H. EXTERIOR LED HALF CYLINDER WALL SCONCE. UL LISTED FOR WET LOCATIONS. PROVIDE WITH EMERGENCY BATTERY PACK WHERE REQUIRED.
⊗	LITHONIA NO. LCM - W - 120 - ELNSD OR PRIOR APPROVED EQUAL BY EMERGI-LITE, MCPHILBEN, OR EXTRONIX	MVOLT	UNIVERSAL	LED	WITH UNIT	THERMOPLASTIC LED EXIT SIGN. PROVIDE WITH NUMBER OF FACES AND DIRECTIONAL ARROWS AS SHOWN ON DRAWINGS. COORDINATE COLOR OF SIGNAGE WITH LOCAL REQUIREMENTS. PROVIDE WITH EMERGENCY BATTERY.
⊗	LITHONIA NO. LHQM - LP06/S - S - W - 3 - HO OR PRIOR APPROVED EQUAL BY EMERGI-LITE, MCPHILBEN, OR EXTRONIX	MVOLT	UNIVERSAL	LED	WITH UNIT	COMBO. THERMOPLASTIC LED EMERGENCY EGRESS / EXIT SIGN. COORDINATE COLOR OF SIGNAGE WITH LOCAL REQUIREMENTS. PROVIDE WITH EMERGENCY BATTERY.
EM	TRITON NO. TRL - ACEM - CL - FINISH BY ARCH OR PRIOR APPROVED EQUALS BY KIM, GARDCO, OR PARKER	MVOLT	WALL	LED	WITH UNIT	EXTERIOR EMERGENCY EGRESS FIXTURE. UL LISTED FOR WET LOCATIONS.

NOTES:
1. ARCHITECT RESERVES THE RIGHT TO SELECT ALL COLORS OR MAKE CUSTOM COLOR DURING SHOP DRAWING REVIEW. BID ACCORDINGLY.
2. COORDINATE MOUNTING OF ALL LUMINAIRES WITH ARCHITECTURAL ELEVATIONS PRIOR TO INSTALLATION
3. PROVIDE EMERGENCY BATTERY BALLAST FOR ALL EMERGENCY TYPE FIXTURES SHOWN ON PLAN CAPABLE OF 90-MINUTES.
4. FOR WARRANTY AND LONG TERM SUPPORT FOR OWNER, ALL LIGHTING FIXTURES SHALL BE PURCHASED THROUGH MANUFACTURER REPRESENTATIVES LOCATED IN THE STATE OF ALABAMA. SUBMITTALS RECEIVED THAT DO NOT COMPLY WITH THIS REQUIREMENT WILL BE REJECTED WITHOUT REVIEW. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIABLE FOR ANY DELAYS CAUSED BY NON COMPLIANCE WITH THIS REQUIREMENT.
5. ALL INTERIOR LIGHTS SHALL HAVE 3500K TEMPERTURE LAMPS, UNLESS NOTED OTHERWISE.
6. ALL EXTERIOR LIGHTS SHALL HAVE 4000K TEMPERTURE LAMPS.

NOTES:

1. ALL RECESSED LUMINAIRES SHALL BE WIRED FROM A JUNCTION BOX AS SHOWN, INCLUDING LUMINAIRES IN A CONTINUOUS ROW. NO WIRING THRU FIXTURES. NO MORE THAN TWO LUMINAIRES SHALL BE CIRCUITED TO ONE JUNCTION BOX.
2. LUMINAIRE SUPPORT WIRES TO BE A MINUMUM OF #14 GAGE PRE-STRAINED GALVANIZED WIRE ATTACHED AT OPPOSITE CORNERS. LUMINAIRE SHALL BE SUPPORTED TO THE STRUCTURE INDEPENDENT OF THE CEILING GRID.
3. CONDUCTORS IN FLEXIBLE CONDUIT FROM JUNCTION BOX TO LUMINAIRE SHALL CONTAIN AN INSULATED GREEN GROUND WIRE, WITH NEUTRAL AND PHASE CONDUCTORS REQUIRED FOR THE CIRCUITING AND SWITCHING REQUIREMENTS INDICATED.
4. JUNCTION BOXES SHALL BE ACCESSIBLE AND LOCATED WITHIN 1'-6" ABOVE LAY-IN CEILING INSTALLATION. PROVIDE PENDANT ALL-THREAD RODS AND/OR STRUT ASSEMBLIES TO MEET THIS REQUIREMENT WHERE DROP CEILING IS MORE THAN 1'-6" FROM STRUCTURE.
5. CONTRACTOR SHALL INSTALL ALL T-BAR SAFETY CLIPS TO GRID. IF FIXTURE DOES NOT COME WITH GRID SAFETY CLIPS, THEN THE CONTRACTOR SHALL PROVIDE SUPPORT WIRES ON ALL FOUR SIDES.



DETAIL - TYPICAL LAY-IN LUMINAIRE INSTALLATION

4 / E2.1 — NO SCALE

ROOM CONTROLLER NOTES:

1. CONTRACTOR SHALL LOCATE ALL ROOM CONTROLLERS ABOVE DOORS IN EACH ROOM 6" ABOVE CEILING GRID. PROVIDE ACCESS PANELS WHERE LOCATED ABOVE HARD CEILINGS OR MOUNT IN UTILITY TYPE ROOMS WHENEVER POSSIBLE. ROOM CONTROLLERS SHOWN ON THIS PLAN IS DIAGRAMMATIC FOR CIRCUITRY. DO NOT USE THESE FOR ACTUAL LOCATIONS. PROVIDE A WHITE PHENOLIC LABLEL WITH 1" BLACK TEXT THAT READS "RC" GLUED ON CEILING GRID UNDER POWER PACK FOR EACH LOCATION FOR FUTURE MAINTENANCE.

SHEET NOTES:

1. CHANDELIER TO BE SELECTED BY ARCHITECT.
2. SEE DETAIL 3 THIS SHEET. COORDINATE LOCATION OF DMX CONTROLLER WITH OWNER.
3. FLOOD LIGHT TO BE MOUNTED ON CORNER OF ROOF TO LIGHT SIGN. COORDINATE MOUNTING REQUIREMENTS WITH ARCHITECT.
4. FIXTURE TO BE MOUNTED TO WALL UNDER CANOPY AT 14'-7"H. TO BOTTOM OF FIXTURE.

1/8" = 1'-0"

8' 0 8 16 FT

GRAPHIC SCALE

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ALABAMA REGISTERED — Kenneth Ray Gunn Jr. — No. 26988 — PROFESSIONAL — 2-03-2023 — ENGINEER

NEW FIRE STATION NO. 10
FOR
THE CITY OF MONTGOMERY
SOUTH COURT STREET MONTGOMERY, ALABAMA 36104

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MGM Project No.	SP-5-21
BDW Project No.	2021-118
Drawn By:	
Date:	11-15-2022
Scale:	AS NOTED

Drawing Title:

LIGHTING PLAN

Sheet No:

E2.1

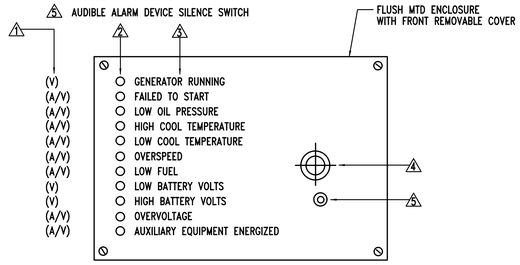
CONSTRUCTION DOCUMENTS

STANDBY GENERATOR SYSTEM NOTES

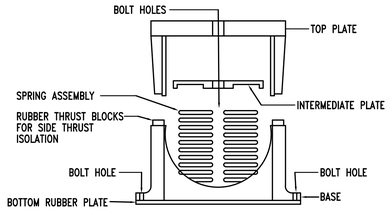
1. STANDBY GENERATOR SYSTEM SHALL CONSIST OF BUT NOT BE LIMITED TO THE FOLLOWING:
   a. GENERATOR SETS
   b. NATURAL GAS PIPING SYSTEM FOR GENERATOR
   c. POWER SYSTEM
   d. AUTOMATIC TRANSFER SYSTEM
   e. CONTROLS
   f. STARTING SYSTEM
   g. COOLING SYSTEM
   h. EXHAUST SYSTEM
   i. LUBRICATION SYSTEM
2. INSTALLATION SHALL COMPLY WITH THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE (NEC), NEMA, NESC AND NATIONAL FIRE PROTECTION AGENCY (NFPA).
3. ALL CONDUCTIVE PARTS OF EQUIPMENT, ENCLOSURES, FRAMES, ETC., SHALL BE GROUNDED.
4. ALL CLEARANCES SHALL BE MAINTAINED PER NESC AND NEC. ALL PARTS, DEVICES, EQUIPMENT, ETC. WHICH REQUIRE MAINTENANCE, ADJUSTMENT, OPERATION OR EXAMINATION DURING NORMAL NETWORK OPERATION SHALL BE ARRANGED SO AS TO BE ACCESSIBLE BY THE PROVISION OF ADEQUATE WORKING SPACES, WORKING FACILITIES AND CLEARANCES. UNLESS NOTED OTHERWISE ALL CLEARANCES ARE MEASURED FROM SURFACE TO SURFACE.
5. ALL DIMENSIONS INDICATED IN THESE DOCUMENTS ARE FOR REFERENCE AND COORDINATION PURPOSES ONLY. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL DIMENSIONS IN THE FIELD.
6. WIRING SYSTEMS SHALL BE IN ACCORDANCE WITH NEC AND THE FOLLOWING:
   a. SEE SINGLE LINE DIAGRAM FOR POWER SYSTEM REQUIREMENTS.
   b. CONTROL WIRING SHALL BE INSTALLED IN CONDUITS INDICATED. WIRING TO BE IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS FOR THE EQUIPMENT SPECIFIED. COORDINATE WITH SHOP DRAWINGS.
   c. PROVIDE FLEXIBLE CONDUIT CONNECTIONS TO THE GENERATOR SET.

GENERATOR ANNUNCIATOR KEY NOTES

1. COLUMN SHOWN INDICATES TYPE OF MALFUNCTION SIGNAL AT THE REMOTE PANEL (V – VISUAL, A/V – AUDIBLE AND VISUAL).
2. LED LAMP INDICATORS
3. LAMP LEGEND
4. AUDIBLE ALARM DEVICE
5. AUDIBLE ALARM DEVICE SILENCE SWITCH



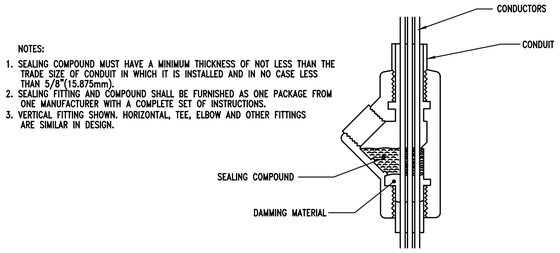
3 / E7.1 DETAIL - REMOTE GENERATOR ANNUNCIATOR PANEL "GA"
NO SCALE



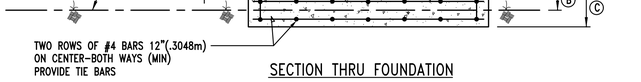
4 / E7.1 DETAIL - TYPICAL VIBRATION ISOLATOR
NO SCALE

GENERATOR KEYED NOTES

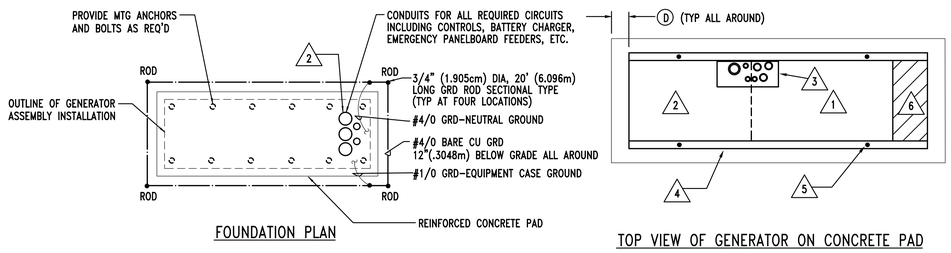
1. RAIN CAP
2. CONDUIT STUB-UPS, SEAL-OFF FITTINGS AND CONVERSIONS TO WEATHERPROOF FLEXIBLE CONNECTIONS TO ELECTRICAL APPARATUS. SEE DETAIL 3 THIS SHEET.
3. VARIOUS CONNECTIONS PER MANUFACTURER'S REQUIREMENTS AND APPLICABLE CODES, INCLUDING NORMAL AND EMERGENCY VENTS AND FUEL LEVEL GAUGE.
4. STEEL RAILS
5. HOLES FOR MOUNTING GENERATOR SKIDS
6. ELECTRICAL STUB-UP AREA. INSTALL EP SEAL-OFF FITTING IN EACH CONDUIT ENTERING THIS SPACE.
7. ELECTRICAL EQUIPMENT (CIRCUIT BREAKER, CONTROL PANEL, ETC.)
8. GENERATOR
9. FLEXIBLE EXHAUST SYSTEM
10. EXHAUST CRITICAL SILENCER
11. NATURAL GAS SYSTEM 7
12. FAN AND RADIATOR ASSEMBLY



3 / E7.2 DETAIL - TYPICAL SEALING FITTING INSTALLATION
NOT TO SCALE

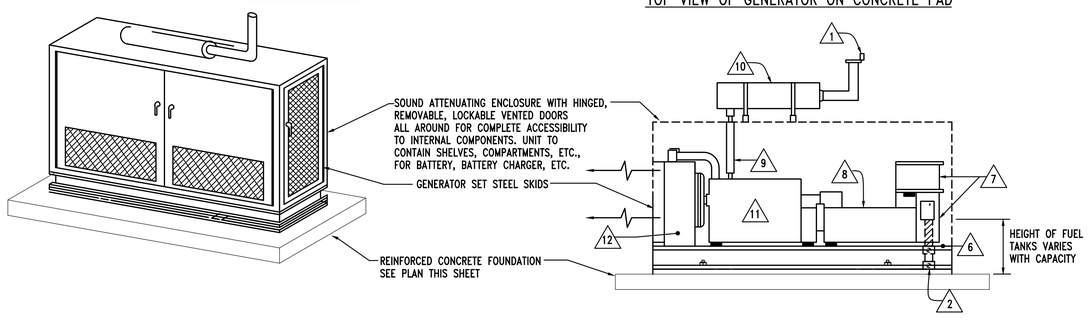


SECTION THRU FOUNDATION



FOUNDATION PLAN

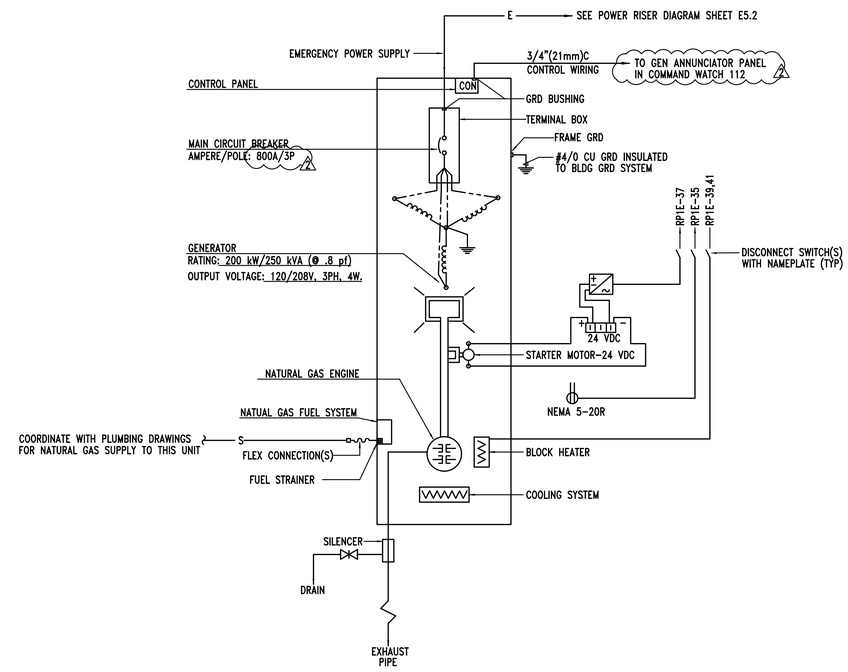
TOP VIEW OF GENERATOR ON CONCRETE PAD



TYPICAL PERSPECTIVE

SIDE VIEW – GENERATOR SET INSTALLED ON CONCRETE PAD

1 / E7.1 GENERATOR DETAILS AND ELEVATIONS - TYPICAL GENERATOR SET
NO SCALE



2 / E7.1 DETAIL - GENERATOR SCHEMATIC
NO SCALE

Barganier Davis Williams Architects Associated

bdw architects
624 South McDonough Street
Montgomery, AL 36104
phone: 334.834.2038
www.bdwarchitects.com

ALABAMA REGISTERED NO. 26988 PROFESSIONAL ENGINEER KENNETH RAY GUNN, JR. 2-03-2023

NEW FIRE STATION NO. 10
FOR
THE CITY OF MONTGOMERY
SOUTH COURT STREET MONTGOMERY, ALABAMA 36104

REVISIONS

No.	Description	Date
0	ISSUED FOR REVIEW	01/16/23
1	ISSUED FOR BID	02/03/23
2	ADDENDUM #4	03/10/23

MGM Project No.	SP-5-21
BDW Project No.	2021-118
Drawn By:	
Date:	11-15-2022
Scale:	AS NOTED

Drawing Title:

GENERATOR DETAILS

Sheet No:

E7.1

CONSTRUCTION DOCUMENTS

Gunn & Associates, P.C.
Consulting Engineers
3102 Highway 14
Millbrook, AL 36054
Tel: 334.285.1273
500 Southland Drive Suite 250
Hoover, AL 35226
GA#21-298

Barganier Davis Williams Architects Associated bdw
624 South McDonough Street Montgomery, Alabama 36104
(334) 834-2038 www.bdwarchitects.com

ADDENDUM NO. 5 - Thursday, March 23, 2023

FROM: Barganier Davis Williams Architects Associated
624 South McDonough Street, Montgomery, Alabama 36104

TO: Bidders

RE: New Fire Station No. 10 for the City of Montgomery
South Court Street
Montgomery, Alabama 36104
City Project No: SP-5-21
BDW Project No: 2021 – 118

This Addendum forms a part of the Contract Documents dated February 02/02/2023. If possible, this Addendum will be emailed to the bidders, vendors etc. who have requested the download link to access Construction Documents but note that it will be the responsibility of all bidders, vendors etc. to periodically verify with the architect for the latest Addendums issued prior to Bid Date.

GENERAL:

1. Refer to Addendum No.4, RFI's, No. 8. The P- 4 drawings left out of the Addendum, see attached P-4.
2. Refer to Addendum No. 4 and Specification Section 08330 - Overhead Coiling Door. This section was inadvertently left out of Addendum No. 4 and is now attached to this Addendum.
3. As per the City of Montgomery directive the following product is not approved to bid this project.
   a. Kingspan.

SPECIFICATIONS:

1. Refer to Section 012100 - Allowances.
   a. Allowance No. 11 was added. See attached revised Section 012100 - Allowances.
2. Refer to Section 012200 - Unit Prices.
   a. Delete this section in its entirety and insert the attached revised Section 012200 - Unit Prices.
3. Refer to Section 01500 - Temporary Facilities and Controls.
   a. Under paragraph 3.4 Security and Protection Facilities Installation add the following paragraph: H. Contractor to provide temporary chain link fencing around entire perimeter of the site throughout the entire construction period. Provide gates as needed by the contractor for entering and exiting the site.

4. Refer to Section 072100 - Thermal Insulation.
   a. Under B. MATERIALS and sentence 3. Cavity Wall Insulation change 1.5 inches to 1.0 inch.

5. Refer to Section 072726 - Fluid Applied Membrane and Vapor Barrier.
   a. Under PART 2 – PRODUCTS add the following approved manufacturer:
      1. W.R. Meadows Air - Shield LMP.

6. Refer to Section 83600 Sectional Overhead Doors and change the following: Under Part 2 Products, paragraph 2.2, Door Assembly, (i) Springs: 25,000 cycles.
7. Refer to Index to Specifications and under Division 7 Thermal and Moisture Protection add the following: Section 074200 Preformed Metal Roofing. Section 074200 is attached to this Addendum.
8. Refer to Index to Specifications and Section 099600 - High Performance Coatings (Apparatus Room Floor) and delete this section in its entirety. The coating for the Apparatus Room shall be equal to Tnemec Stratashield 241 Ultra-Tread MVT.
9. Refer to Section 055000 - Metal Fabrications. See attached Section 055000 Metal Fabrications that was inadvertently left out of the issued specifications.
10. Refer to Section 084113 - Aluminum Entrances and Storefronts.
    a. Under paragraph 2.7 FINISHES delete sentence A. and change to read as follows: Anodized; color to be from manufacturer's standard colors.
11. Refer to Section 087100-Door Hardware
    a. Item 1 - Delete door 113A from Architect's Hardware Set AL-04.

    Item 2 - Add door 113 to new hardware set 26 as shown below.

HARDWARE SET: 26

DOOR NUMBER:

113A

EACH TO HAVE:

CONT. HINGE	224XY	IVE
KEYED REMOVABLE MULLION	KR4954	VON
EXIT DEVICE	CD-98-DT-990DT-SNB	VON
EXIT DEVICE	CD-98-NL-990NL-SNB	VON
RIM CYLINDER	20-057 ICX	SCH
MORTISE CYLINDER	26-094- ICX	SCH
FSIC CORE	23-030	SCH
SURFACE CLOSERS	4040XP SCUSH TBSRT	LCN
KICK PLATE	8400 10" X 2" LDW B-CS	IVE
MULLION SEAL	139N PSA	ZER
THRESHOLD	655A-V3-226	ZER
SWEEPS	8192AA	ZER
WEATHER SEALS	8144S-BK	ZER

RFI'S:

1. May 14ga Bent Plate be used at CF Steel Truss ends in lieu of 1/4" angle iron (Typical, reference details 1,2,3,8,10,11/S2.2)? Welding to CF Steel Trusses is typically prohibited.

   Response: 12ga. Bent plate may be used in lieu of ¼" angle iron.

2. Please clarify the type and gauge of metal roof deck over the CF Steel Trusses?

   Response:1 ½" deep, 20 ga., wide rib steel deck. See attachment.

3. Retention pond is not shown on grading plans. It is shown on erosion control plans with no depth. We are requesting information for retention pond.

   Response: There is no retention pond for this project. There is a temporary sedimentation basin on Sheet C-601 and the bottom and top elevations can be found there as well.

4. Is the irrigation water meter furnished by the general contractor in this bid?

   Response: No irrigation meter is required. Tap off the domestic water line.

5. SF-T is called for on page A6.2 to have impact resistant glass, but there is no indication of an impact rated system in the specs. If this is a safe room or tornado shelter, they will need to specify that and that will require an ICC 500 rated window. Also on A6.2 they call out this glass; G3 1" 50%Tint Insulated Glazing (please clarify what this is) G4 1" Insulated Impact Resistant (Polycarbonate) (Please clarify what an insulated polycarbonate glass is).

   Response: G4 designation shall be glass equal to Kawneer IR 501 glazing 1-5/16″ insulated impact resistant Glazing.

DRAWINGS

1. Refer to Sheets S1.2 Roof Framing Plan and Sheet S2.5 Sections and Details.
   a. See attached Sheets S1.2 and S2.5 for clouded revisions.
2. Refer to Sheet A6.2 Door and Window Elevations.
   a. At BD-1 (Sectional Overhead) note that glass is ½" clear insulated tempered glass.
3. Refer to Sheet A6.1 Door Schedule.
   a. At Door 113A change door type to Door Type H, material shall be Hollow metal (1/2 Glass), Change frame type from SF-D to Frame Type "A". Doors to be painted.
4. Refer to Sheet A6.2 Door and Window Elevations.
   a. Door Type "H" shall be a pair of 3'-0" x 7'-0" x 1 3/4" thick ½ glass hollow metal doors.
5. Refer to Sheet A6.3 - Room Finish Schedule.
   a. At rooms 113 Apparatus Bay 113, 114 Boots & 115 Extractor/Laundry change Epoxy Flooring and Base to Resinous Flooring and Base equal to Tnemec Stratashield 241 Ultra-Tread MVT.

END OF ADDENDUM NO. 5

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements governing the following:
   1. Contingency allowances.
   2. Testing and inspecting allowances.

1.2 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect from the designated supplier.

1.3 SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.4 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.5 CONTINGENCY ALLOWANCES

A. All Allowances stated in the Contract Documents shall be included in the Contract Sum.

B. The Contractor shall include in his Bid Proposal all costs of materials, equipment, office, job supervision, overhead, profit, and bond on these Contingency Allowances, as these costs will not be paid to the Contractor for work performed under these Contingency Allowances. Only the direct costs of performing work under this provision shall be paid under and charged against the Contingency Allowances: such cost includes costs of materials and delivery, labor, payroll taxes and insurance, equipment, and the cost of subcontracted work (subcontractor’s cost may include a maximum of 15% mark-up for overhead and profit.

B. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

C. The Contractor shall include a line item in the Schedule of Values for Contingency Allowance. The estimated value of the work completed pursuant to fully executed Contingency Allowance Authorizations may be included in the Contractor’s monthly Applications for Payment. Payments under this Contingency Allowance shall not exceed the net, total of fully executed Contingency Allowance Authorizations.

1.6 TESTING AND INSPECTING ALLOWANCES

A. Testing and inspecting allowances include the cost of engaging testing agencies, actual tests and inspections, and reporting results.

B. The allowance does not include incidental labor required to assist the testing agency or costs for retesting if previous tests and inspections result in failure. The cost for incidental labor to assist the testing agency shall be included in the Contract Sum.

C. Costs of services not required by the Contract Documents are not included in the allowance.

D. At Project closeout, credit unused amounts remaining in the testing and inspecting allowance to Owner by Change Order.

1.7 UNUSED MATERIALS

A. Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1. If requested by Architect, prepare unused material for storage by Owner when it is not economically practical to return the material for credit. If directed by Architect, deliver unused material to Owner's storage space. Otherwise, disposal of unused material is Contractor's responsibility.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. BASE BID PROPOSAL:

B. **Allowance No. 1**: General Contractors are to include in their Base Bid Proposal $150,000.00 for a General Contingency to cover unforeseen conditions to correct or supplement the work as detailed in the Contract Documents.

C. **Allowance No. 2:** General Contractors are to include in their Base Bid Proposal $65,000.00 for a General Contingency to furnish and install an Access Control System.

D. **Allowance No.3:** General Contractors are to include in their Base Bid Proposal an allowance of Thirty Thousand Dollars ($30,000.00) for Alabama Power Aid to Construction Cost.

E. **Allowance No. 4:** General Contractors are to include in their Base Bid Proposal an allowance of Fifteen Thousand Dollars ($15,000.00) for the Owner to purchase and install and public address system.

F. **Allowance No. 5:** General Contractors are to include in their Base Bid Proposal an allowance of Thirty Thousand Dollars ($30,000.00) for the purchase of additional IT equipment.

G. **Allowance No. 6:** Deleted.

H. **Allowance No. 7:** General Contractors are to include in their Base Bid Proposal an allowance of $60,000.00 for the testing and installation of a two -way emergency radio system.

I. **Allowance No. 8:** General Contractors are to include in their Base Bid Proposal an allowance of $70,000.00 for prefabricated wall systems, Type D1, by Division 12 Consulting, Phone: (205)440-2695.

J. **Allowance No. 9:** General Contractors are to include in their Base Bid Proposal an allowance of $30,000.00 for back-lit signage and shields/emblems as shown on elevation 1/A4.1.

K. **Allowance No. 10:** General Contractors are to include in their Base Bid Proposal an allowance of $30,000.00 for Wall Covering Graphic Images on noted wall on the floor plans.

L. **Allowance No. 11:** General Contractors are to include in their Base Bid Proposal an allowance of $5,000.00 for the applied film signage indicated on Detail 2A/A4.1.

END OF SECTION 012100

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SECTION 012200 UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Contractor unit prices.

1.3 DEFINITIONS

A. Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Owner.

D. List of Unit Prices: A list of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used).

PART 3 - EXECUTION

1.5 LIST OF UNIT PRICES

A. In addition to the Contractor’s Base Bid Sum, the Bidder proposes the following Unit Prices to adjust the Contract Sum (additions and / or deductions) as required. The Bidder understands that such Unit Prices are the total cost to the Owner for each unit of work to include the cost of direct and indirect overhead; profit; labor; materials; equipment; subcontractor; and, any other cost not specifically mentioned, but necessary for the performance of the work units listed below, for every tier involved. The quantities, as measured and multiplied by the Unit Cost are the total cost for the addition or deduction to the Contract Sum.

B. UNIT PRICE SCHEDULE:
Attach to Proposal Form at time of Bid (use attached form – see next page).

CONTRACTOR’s UNIT PRICE SCHEDULE (Bid Attachment to Proposal Form)

In addition to the Contractor’s Base Bid Sum, the Bidder proposes the following Unit Prices to adjust the Contract Sum (additions and / or deductions) as required. The Bidder understands that such Unit Prices are the total cost to the Owner for each unit of work to include the cost of direct and indirect overhead; profit; labor; materials; equipment; subcontractor; and, any other cost not specifically mentioned, but necessary for the performance of the work units listed below, for every tier involved. The quantities, as measured and multiplied by the Unit Cost are

the total cost for the addition or deduction to the Contract Sum. 'IAW' shall mean 'In Accordance With'.
These Unit Prices shall be used for unforeseen conditions, Owner / Architect / Engineer directed change orders, and any other extraordinary condition beyond the stated allowances included in Section 01210 that are not included in the Base Bid for this Project.

A. Unit Price Number One: Excavation / Removal of Soil Materials:

1. Narrative Description for the Removal of Unsuitable Material and Excess Topsoil – Payment for "Removal of Unsuitable Material and Excess Topsoil" shall be made at the unit price bid, per cubic yard in place (CYIP) removed, and shall be compensation in full for furnishing all materials, equipment, tools, labor and incidentals necessary to complete the work. Payment for this item will include Removal of Unsuitable Material and Excess Topsoil underneath the building and surrounding areas. Base bid includes the removal of all structural excavation spoils as deemed necessary at an off-site location. Haul tickets shall not be considered a valid determination of quantities. Following topsoil stripping, the Contractor shall notify the Owner's Representative forty-eight (48) hours before any unsuitable material is excavated, so the area may be delineated, and removal depths measured to derive the cubic yards of topsoil removal. Following the removal of unsuitable material, the Contractor shall notify the Owner's Representative forty-eight (48) hours before any replacement material is placed, so the area may be delineated, and removal depths measured to derive the cubic yards of unsuitable removal. Failure to notify the Owner's Representative and performing unsuitable excavation without his/her presence for measurement shall forfeit payment of that amount of unobserved work. **Contractor to include 300 cubic yards in the base bid.**
2. Unit of Measure: Cubic Yard in Place (CYIP). $_____.

B. Unit Price Number Two: Placement of Engineered Fill Material:

1. Narrative Description for the Replacement of Engineered Material– Payment for "Replacement of Unsuitable Material" shall be made at the unit price bid, per cubic yard in place (CYIP) replaced, and shall be compensation in full for furnishing all materials, equipment, tools, labor and incidentals necessary to complete the work. Payment for this item will include replacement of Unsuitable Material, to noted elevation grade, which is removed from the project site under the "Removal of Unsuitable Material and Excess Topsoil" item. Haul tickets shall not be considered a valid determination of quantities. The replacement quantity shall be determined the "Removal of Unsuitable Material and Excess Topsoil" item, less topsoil removed. **Contractor to include 1300 cubic yards in the base bid.**
2. Unit of Measure: Cubic Yard in Place (CYIP). $_____.

END OF SECTION

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract including General and Supplementary Conditions and Division 1 Specification Sections apply to work of this section.

1.2 SUMMARY

A. Section Includes:

1. Miscellaneous steel framing and supports.
2. Miscellaneous steel trim.
3. Loose bearing and leveling plates.

B. Products furnished, but not installed, under this Section:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete.

1.3 QUALITY ASSURANCE

A. Qualify welding processes and welding operators in accordance with AWS D1.1 “Structural Welding Code-Steel”, D1.3 “Structural Welding Code – Sheet Steel”, and D1.2 “Structural Welding Code - Aluminum.”

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.4 SUBMITTALS

A. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

B. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes.

2.2 FERROUS METALS (**If Applicable or indicated on drawings**).

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.

C. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

D. Rolled-Stainless-Steel Floor Plate: ASTM A 793.

E. Steel Tubing: ASTM A 500, cold-formed steel tubing.

F. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.

G. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M.

H. Non-Shrink Non-Metallic Grout: Pre-Mixed, factory-packaged, non-corrosive, non-gaseous grout complying with CE CRDC621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

2.3 FASTENERS (If applicable or indicated on drawings)

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls.

B. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

2.4 MISCELLANEOUS MATERIALS (If applicable or indicated on drawings)

A. Shop Primers: Provide primers that comply with Division 09 painting Sections.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

F. Concrete: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.

C. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended.

D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Locate joints where least conspicuous.

E. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

F. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors not less than 24 inches o.c.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS (If applicable or indicated on the drawings)

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

C. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.

2.7 MISCELLANEOUS STEEL TRIM (If applicable or indicated on drawings).

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

C. Galvanize exterior miscellaneous steel trim.

2.8 LOOSE BEARING AND LEVELING PLATES (If applicable or indicated on drawings)

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

2.9 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.

B. Galvanize loose steel lintels located in exterior walls.

2.10 STEEL WELD PLATES AND ANGLES (If applicable or indicated on drawings)

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.11 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.12 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with universal shop primer unless zinc-rich primer is are indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Items Indicated to Receive Primers Specified in Division 09 Section "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
4. Other Items: SSPC-SP 3, "Power Tool Cleaning."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

C. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000

SECTION 083300 - OVERHEAD COILING DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Overhead coiling service doors.

1.2 RELATED SECTIONS

A. Section 05500 - Metal Fabrications: Support framing and framed opening.

B. Section 06200 - Finish Carpentry: Wood jamb and head trim.

C. Section 08710 - Door Hardware: Product Requirements for cylinder core and keys.

D. Section 09900 - Painting: Field applied finish.

1.3 REFERENCES

A. ANSI/DASMA 108 - American National Standards Institute Standard Method For Testing Sectional Garage Doors And Rolling Doors: Determination Of Structural Performance Under Uniform Static Air Pressure Difference.

B. NFRC 102 - Test Procedure for Measuring the Steady-State Thermal Transmittance of Fenestration Systems.

C. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Element.

D. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

E. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

F. ASTM A 666 - Standard Specification for Austenitic Stainless-Steel Sheet, Strip, Plate, and Flat Bar.

G. ASTM A 924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

H. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

I. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

J. NEMA MG 1 - Motors and Generators.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

A. Overhead coiling service doors:
   1. Wind Loads: Design door assembly to withstand wind/suction load of 20 psf (958 Pa) without damage to door or assembly components in conformance with ASTM E 330.
   2. Operation: Design door assembly, including operator, to operate for not less than 20,000 cycles.

B. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Details of construction and fabrication.
   4. Installation instructions.

C. Shop Drawings: Include detailed plans, elevations, details of framing members, anchoring methods, required clearances, hardware, and accessories. Include relationship with adjacent construction.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) long, representing actual product, color, and patterns.

F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

G. Operation and Maintenance Data: Submit lubrication requirements and frequency, and periodic adjustments required.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing Work of this section with a minimum of five years experience in the fabrication and installation of security closures.

B. Installer Qualifications: Installer Qualifications: Company specializing in performing Work of this section with minimum three years and approved by manufacturer.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.

C. Store materials in a dry, warm, ventilated weathertight location.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 COORDINATION

A. Coordinate Work with other operations and installation of adjacent materials to avoid damage to installed materials.

1.10 WARRANTY

A. Warranty: Manufacturer’s limited door and operator system, except the counterbalance spring and finish, to be free from defects in materials and workmanship for 3 years or 20,000 cycles, whichever occurs first.

B. Warranty: Manufacturer’s limited door system warranty for 2 years for all parts and components.

C. PowderGuard Finish

1. PowderGuard Max: Applied to curtain, guides, bottom bar, headplates: Manufacturer's limited Max Finish warranty for 5 years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer & Basis of Specification: Overhead Door Corp., 2501 S. State Hwy. 121, Suite 200, Lewisville, TX 75067. ASD. Tel. Toll Free: (800) 275-3290. Phone: (469) 549-7100 Fax: (972) 906-1499. Web Site: www.overheaddoor.com.
E-mail: info@overheaddoor.com.

B. Requests for substitutions will be considered in accordance with provisions of Section 016000.

2.2 OVERHEAD COILING SERVICE DOORS

A. Light Commercial Doors: Overhead Door Corporation, Model 600 Coil-Away Service Doors.
1. Curtain: Interlocking roll-formed galvanized steel slats, flat crown profile type CAW, 26 gauge for widths up to 12 feet 4 inches (3.75 m), 24 gauge for widths up to 16 feet (4.88 m). End of each slat shall be locked from lateral movement by a staking lock system. (Galvanized alternate malleable end locks.)
2. Finish:
   a. Curtain slats and hood shall be galvanized in accordance with ASTM A 653 and receive rust-inhibitive, roll coating process, including 0.2 mils thick baked-on prime paint, and 0.6 mils thick baked-on polyester topcoat.
      1) Polyester Topcoat.
         (a) White polyester.
         (b) Brown polyester.

      2) Powder Coat:
         (a) PowderGuard Premium: Powder coat color as selected by the Architect.

      3) Non-galvanized exposed ferrous surfaces shall receive one coat of rust-inhibitive primer.

3. Weatherseals: Vinyl bottom seal.

4. Bottom Bar: Extruded aluminum.

5. Guides: Roll-formed galvanized steel shapes attached to continuous galvanized steel wall angle.
   a. Finish: Powder Guard Premium powder coat, color as selected by Architect.

6. Brackets: Galvanized steel to support counterbalance and curtain.

    a. Finish: Powder Guard Premium powder coat, color as selected by Architect.

7. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel and supporting the curtain with deflection limited to 0.03 inch per foot of span. Spring tension shall be adjustable.

8. Hood: Required.

9. Hood: 24-gauge galvanized steel with intermediate supports as required.

10. Manual Operation:

    a. Manual push up for doors up to 100 SF.

    b. Chain hoist for doors over 100 SF.

11. Wind load Design:

    a. Per I.B.C. 2015

12. Locking:

    a. Two interior bottom bar slide bolts for manually operated doors.

13. Wall Mounting Condition: Face-of-wall.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify opening sizes, tolerances and conditions are acceptable.

B. Examine conditions of substrates, supports, and other conditions under which this work is to be performed.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

E. Coordinate installation of electrical service with Section 16150. Complete wiring from disconnect to unit components.

F. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07900.

G. Install perimeter trim and closures.

H. Instruct Owner’s personnel in proper operating procedures and maintenance schedule.

3.4 ADJUSTING

A. Test for proper operation and adjust as necessary to provide proper operation without binding or distortion.

B. Adjust hardware and operating assemblies for smooth and noiseless operation.

3.5 CLEANING

A. Clean curtain and components using non-abrasive materials and methods recommended by manufacturer.

B. Remove labels and visible markings.

C. Touch-up, repair or replace damaged products before Substantial Completion.

3.6 PROTECTION

A. Protect installed products until completion of project.

END OF SECTION 083300

SECTION 074200 – PREFORMED METAL ROOFING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Pre-finished standing seam - interlocking metal roofing.
B. Accessories and trim for metal roofs.

1.2 RELATED SECTIONS

A. Section 07620 - Flashing and Sheet Metal.

1.3 QUALITY ASSURANCE

A. Applicable Standards:

1. SMACNA: “Architectural Sheet Metal Manual”, Sheet Metal and Air Conditioning Contractors National Association, Inc.

2. AISC: “Steel Construction Manual”, American Institute of Steel Construction.

3. AISI: “Cold Form Steel Design Manual”, American Iron and Steel Institute.

4. ASTM A 792-83-AZ50: “Specifications for Steel Sheet, Aluminum-Zinc Alloy Coated (Galvanized) by the Hot Dip Process, General Requirements (Galvalume)”, American Society for Testing and Materials.

5. ASTM E 1514-93: “Standard Specification for Structural Standing Seam Steel Roof Panel Systems”, American Society for Testing and Materials.

6. UL: “Tests for Uplift Resistance of Roof Assemblies”, Underwriters Laboratories, Inc.

7. ASTM E 1592-95: “Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference”, American Society for Testing and Materials.

8. ASTM E 1680-95: “Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems”, American Society for Testing and Materials.
9. ASTM E 1646-95: “Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference”, American Society for Testing and Materials.

B. Manufacturer’s Qualifications:

1. Manufacturer has a minimum of three years’ experience in manufacturing panels

of this nature. Panels specified in this section shall be produced in a factory environment (not job site) with fixed base roll forming equipment to assure the highest level of quality control. A letter certifying compliance should accompany the product material submittal.

C. Installer's Qualifications:

1. Installer of the system shall be an approved installer, certified by the manufacturer, and meet the following minimum criteria:

a. Maintain a $250,000 general liability coverage for each loss.

b. Maintain sufficient worker's compensation coverage as mandated by law.

c. No viable claims pending regarding negligent acts or defective workmanship on previously performed or current projects.

d. Has not filed for protection from creditors under any state or federal insolvency or debtor relief statutes or codes.

e. Project foreman is the person having received specific training in the proper installation of the specified system and will be present to supervise whenever material is being installed. Specific training program shall include the following:

1. The instructor must have a minimum of 10 years' experience.

2. A formal curriculum.

3. Classroom instruction with review and thorough understanding of the specific product's technical manual.

4. Hands-on-mock-up instruction with a review and thorough understanding of the specific product's details.

5. The installer must pass a written and oral exam.

f. Provide five references from five different architects or building owners for projects that have been in service for a minimum of two years, stating satisfactory performance by the installer.

g. Provide certification letter that installer has a minimum of three years of metal product installation experience immediately preceding the date upon which work is to commence.

1.3A SYSTEM PERFORMANCE REQUIREMENTS

A. Performance Testing:

1. Metal roof system must be tested in accordance with Underwriters Laboratories,

Inc. (UL) Test Method 580 “Tests for Uplift Resistance of Roof Assemblies”.

2. Metal roof system must be installed in accordance with UL Construction methods that pertain to the system specified.

3. Metal roof system must be tested in accordance with ASTM E 1592-95 for negative loading when AISI specifications do not apply. Determine panel bending and clip - to - panel strength by testing in accordance with ASTM E 1592-95. Capacity for gauge, span or loading other than those tested may be determined by interpolating test values only.

4. Metal roof system must meet the air infiltration requirements of ASTM E 282-84 when tested with a 6.24 PSF pressure differential with resulting air infiltration of 0.0071 cfm/sq. ft.

5. Metal roof system must meet the water penetration requirements of ASTM E 331-83 when tested with a 6.24 PSF pressure differential with no uncontrollable water leakage when five gallons per hour of water is sprayed per square foot of roof area.

6. Metal roof system must meet the wind conditions of the project requirements as/if stated on Structural Drawings.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's product specifications, standard details, certified product test results, installation instructions and general recommendations, as applicable to materials and finishes for each component and for total system of preformed panels.

B. Samples: Submit two samples, 12" square, of each exposed finish material.

C. Shop Drawings: Submit small-scale layouts of panels on roofs, and large-scale details of edge conditions, joints, corners, custom profiles, supports, anchorages, trim, flashings, closures, and special details. Distinguish between factory and field assembly work.

D. Engineering data is to be provided for the roof system to include design pressures, clips, panels, fastener locations, etc. Engineering data is to be signed and sealed by an engineer registered in the State of Alabama.

1.5 WARRANTIES

A. Metal roof system manufacturer, upon final acceptance for project, furnish a warranty covering bare metal against rupture, structural failure and perforation due to normal atmospheric corrosion exposure for a period of 20 years.

B. Covering paint finish against cracking, checking, blistering, peeling, flaking, chipping, chalking and fading for a period of twenty (20) years for roof panels and for wall panels (see 2.2, E. Finishes).

C. Metal roof manufacturer, upon final acceptance of this project, shall provide a 20-year

weathertight warranty covering wind with 2 second gusts up to 130 mph.

D. Standard manufacturer's roofing guarantees which contain language regarding the governing of the guarantee by any state other than the State of Alabama, must be amended to exclude such language, and substituting the requirement that the Laws of the State of Alabama shall govern all such guarantees.

1.6 TEST REPORTS:

E. Submit Test Reports showing that metal panels have been tested in accordance with the Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference of ASTM E 1592-95.

F. Submit Test Reports showing that metal panels meet the air infiltration requirements of ASTM E 1680-95 when tested with a 6.24 PSF pressure differential with resulting air infiltration of 0.0071 cfm/sq. ft.

G. Submit Test Reports showing that metal panels meet the water penetration requirements of ASTM E 1646-95 when tested with a 12.00 PSF pressure differential with no uncontrollable water leakage when five gallons per hour of water is sprayed per square foot of roof area.

1.7 METAL ROOF SYSTEM FABRICATION CERTIFICATION:

A. Submit a letter from the metal roof system manufacturer certifying the panels have been produced in a factory environment (not job site roll formed) with fixed-base roll forming equipment.

1.8 THIRD PARTY METAL ROOF CONSULTANT APPROVAL:

A. Submit a letter from the metal roof system manufacturer indicating acceptance of the general contractor's third-party metal roofing consultant for use on this specific project.

1.9 INSTALLATION CONTRACTOR'S QUALIFICATIONS:

A. Submit certificate from manufacturer certifying that installer of the metal roof system has met all of the criteria outlined in "1.02 C. Installer's qualifications" and is an authorized installer certified by the manufacturer within one year of the beginning of installation of the metal roof system.

B. Submit the formal syllabus for the classroom and hands-on training.

C. Submit five references from five different architects or building owners for projects that have been in service for a minimum of two years, stating satisfactory performance by the installation contractor.

1.10 METAL ROOF SYSTEM INSTALLATION INSPECTION REPORTS:

A. Submit written and photographic metal roof system installation inspection reports from the general contractor's third-party metal roof consultant appraising the installation of the metal roof system. The written and photographic inspection reports are to be submitted to the architect (owner), metal roof system manufacturer, metal roof system installation contractor and general contractor.

B. A separate report is to be submitted for each of the following stages of the metal roof system installation:

1. At final completion of all metal roof system work.

1.11 PRE-ROOFING CONFERENCE

A. A Pre-Roofing Conference is required before any roofing materials are installed. This conference shall be conducted by a representative of the Architect and attended by representatives of the Owner, General Contractor, Roofing Contractor, Sheet Metal Contractor, Roof Deck Manufacturer (if applicable), and the Roofing Materials Manufacturer (if warranty is required of this manufacturer). If equipment of substantial size is to be placed on the roof, the Mechanical Contractor must also attend this meeting.

B. The Pre-Roofing Conference is intended to clarify demolition (for renovation or re-roofing projects) and application requirements for work to be completed before roofing operations can begin. This would include a detailed review of the specifications, roof plans, roof deck information, flashing details, and approved shop drawings, submittal data, and samples. If conflict exists between the specifications and the Manufacturer's requirements, this shall be resolved. If this pre-roofing conference cannot be satisfactorily concluded without further inspection and investigation by any of the parties present, it shall be reconvened at the earliest possible time to avoid delay of the work. In no case should the work proceed without inspection of all roof deck areas and substantial agreement on all points.

The following are to be accomplished during the conference:

1. Review all Factory Mutual and Underwriter's Laboratories requirements listed in the specifications and resolve any questions or conflicts that may arise.

2. Establish trade-related job schedules, including the installation of roof mounted mechanical equipment.
3. Establish roofing schedule and work methods that will prevent roof damage.

4. Require that all roof penetrations and walls be in place prior to installing the roof.
1. Establish those areas on the job site that will be designated as work and storage areas for roofing operations.

5. Establish weather and working temperature conditions to which all parties

must agree.

6. Establish acceptable methods of protecting the finished roof if any trades must travel across or work on or above any areas of the finished roof.

The Architect shall prepare a written report indicating actions taken and decisions made at this pre-roofing conference. This report shall be made a part of the project record and copies furnished to the General Contractor, the Owner, the Building Commission, and the Building Commission Inspector."

PART 2 - PRODUCTS

2.1 METAL ROOF PANELS

A. Mechanically-seamed, Concealed Fastener, Metal Roof Panels: Structural metal roof panel consisting of formed metal sheet with vertical ribs at panel edges, installed by lapping and mechanically interlocking edges of adjacent panels, and attaching panels to supports using concealed clips and fasteners in a weathertight installation.

1. Basis of Design: MBCI, BattenLok HS, www.mbci.com/battenlokHS.html or equal.
a. Morin/Kingspan Corporation.

2. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, structural quality, Grade 50, Coating Class AZ50 (Grade 340, Coating Class AZM150), prepainted by the coil-coating process per ASTM A 755/A 755M.

a. Nominal Coated Thickness: 24 gage.
b. Panel Surface: Smooth with striations in pan.

c. Exterior Finish: Fluoropolymer two-coat system.

d. Color: As selected by Architect from manufacturer's standard colors.

4. Panel Width:16 inches.

5. Panel Seam Height: 2 inches.

6. Joint Type: Mechanically seamed.

2.3 MISCELLANEOUS MATERIALS

A. Internal Panel Framing: Manufacturer's standard.

B. Fasteners: Manufacturer's standard noncorrosive types, with exterior heads gasketed.

C. Accessories: Provide all components required for a complete metal roofing system, including trim, corner units, ridge vents, clips, seam covers, battens, flashings, sealants, gaskets, fillers, closure strips, valleys and similar items. Match materials/finishes of preformed panels.

C. Bituminous Coating: Cold-applied asphalt mastic, SSPC paint 12, compounded for 15 mil dry film thickness per coat.

D.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with panel fabricator's and material manufacturer's instructions and recommendations for installation, as applicable to project conditions and supporting substrates. Anchor panels and other components of the work securely in place, with provisions for thermal/structural movement.

1. Install roof panels with concealed fasteners.

B. Installation Tolerances: Shim and align panel units within installed tolerance of 1/4" in 20'-0" on level/plumb/slope and location/line as indicated, and within 1/8" offset of adjoining faces and of alignment of matching profiles.

C. Seaming: Complete seaming of panel joints by operation of portable power-driven equipment of type recommended by panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers and sealants where indicated and where required for weatherproof performance of panel systems. Provide types of gaskets and sealants/fillers indicated or, if not otherwise indicated, types recommended by panel manufacturer.

1. Refer to other sections of these specifications for product and installation requirements applicable to indicated joint sealers.

3.2 CLEANING AND PROTECTION

A. Damaged Units: Replace panels and other components of the work which have been damaged or have deteriorated beyond successful repair by means of finish touch-up or similar minor repair procedures.

B. Cleaning: Remove temporary protective coverings and strippable films (if any) as each panel is installed. Upon completion of panel installation, clean finished surfaces as recommended by panel manufacturer, and maintain in a clean condition during construction.

END OF SECTION 074200

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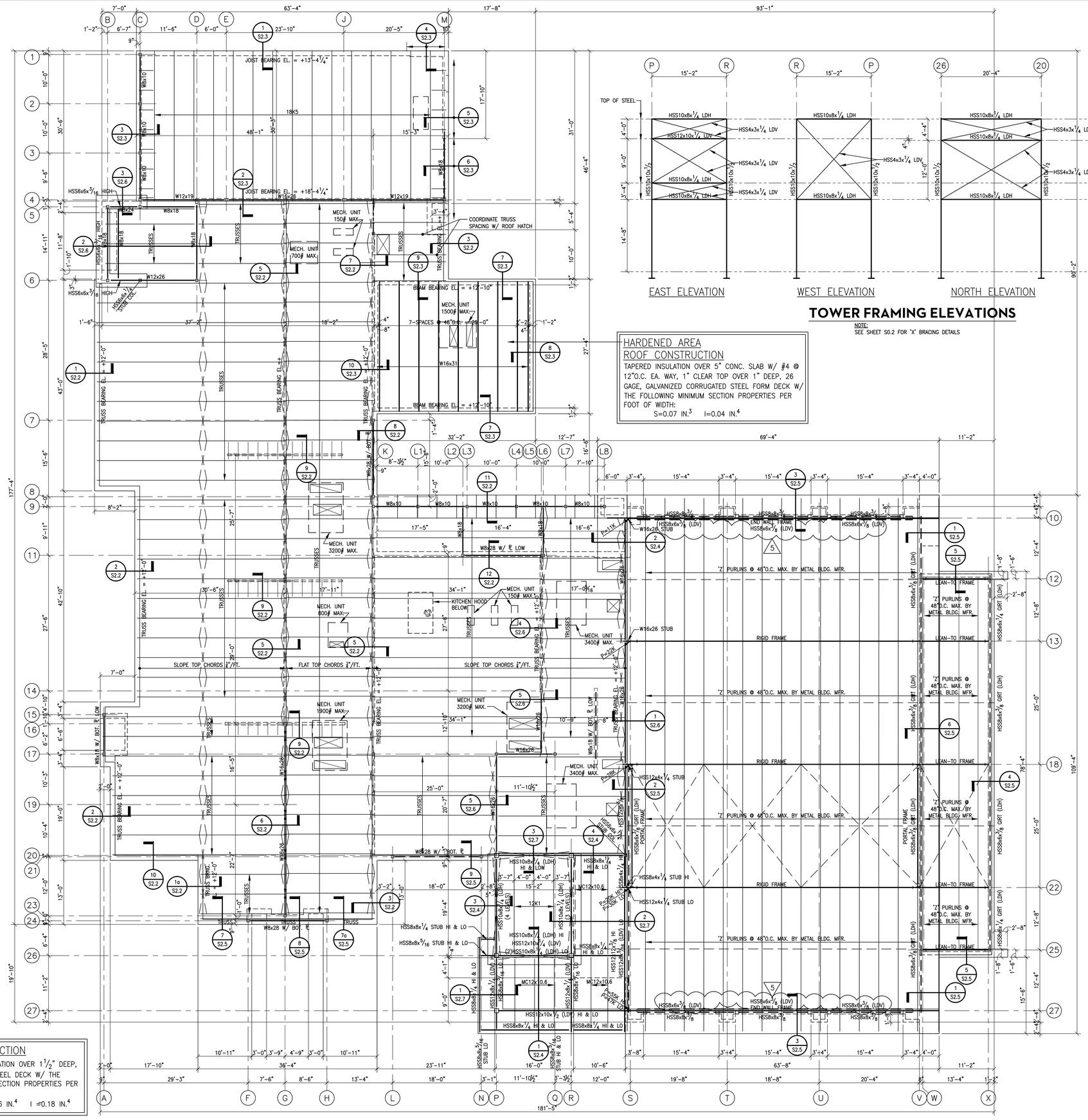

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ALABAMA REGISTERED No. 30026 ENGINEER RAY W. DANIELS 3-23-23

NEW FIRE STATION NO. 10

FOR

THE CITY OF MONTGOMERY

SOUTH COURT STREET MONTGOMERY, ALABAMA 36104

REVISIONS		
No.	Description	Date
A	ISSUED FOR REVIEW	11/08/22
B	ISSUED FOR REVIEW	11/15/22
0	ISSUED FOR REVIEW	01/16/23
1	ISSUED FOR BID	02/03/23
4	ADDENDUM NO.4	03/09/23
5	ADDENDUM NO.5	03/23/23

MGM Project No.	SP-5-21
BDW Project No.	2021-118
Drawn By:	RAS
Date:	02-22-2023
Scale:	AS NOTED

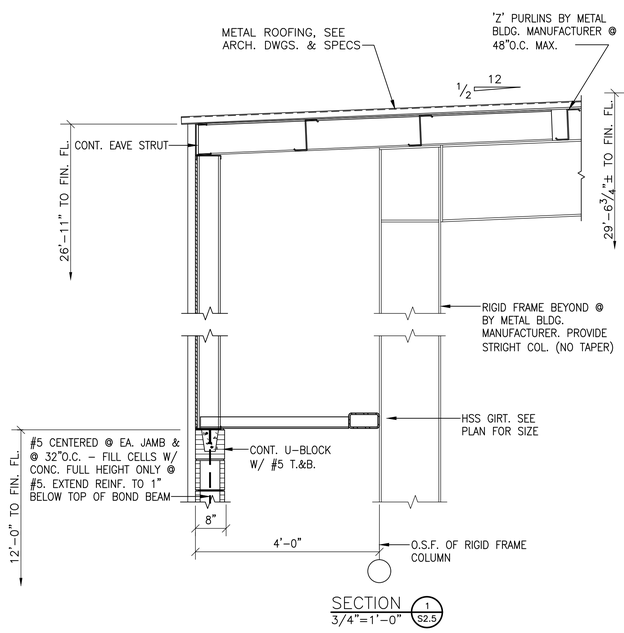
Drawing Title:

ROOF FRAMING PLAN

Sheet No:

S1.2

CONSTRUCTION DOCUMENTS



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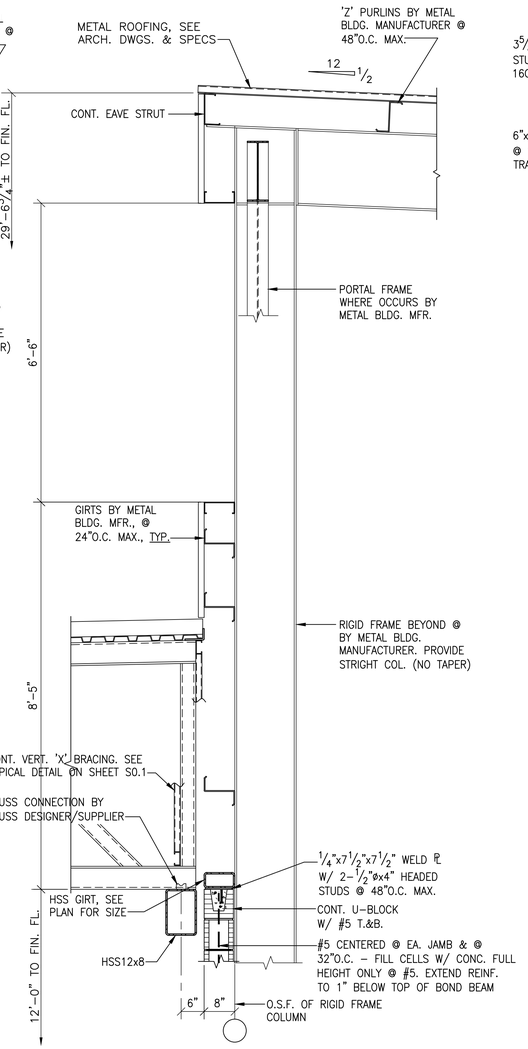

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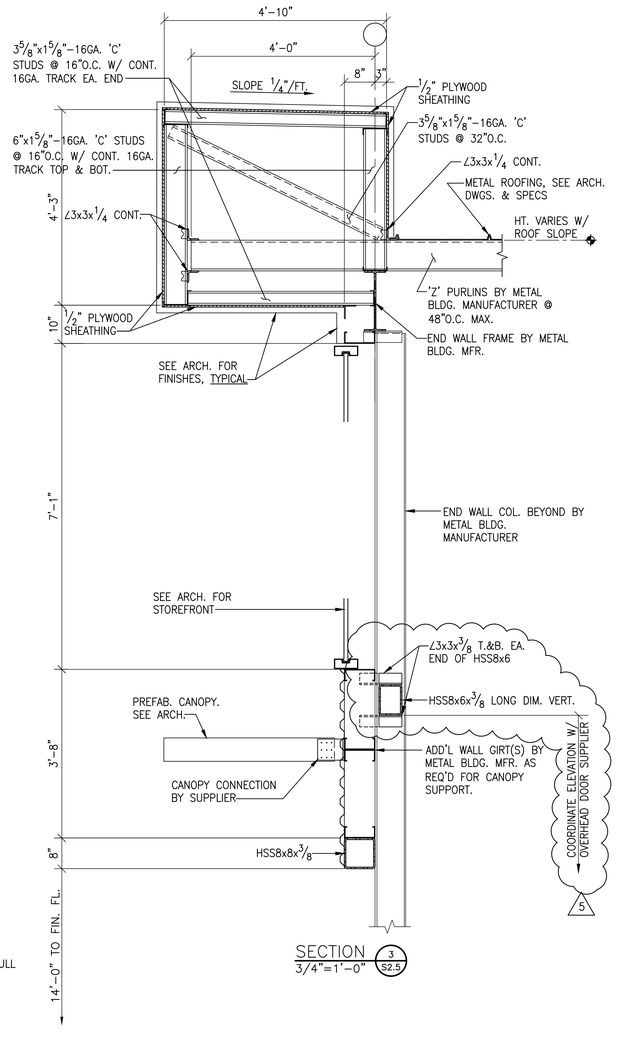

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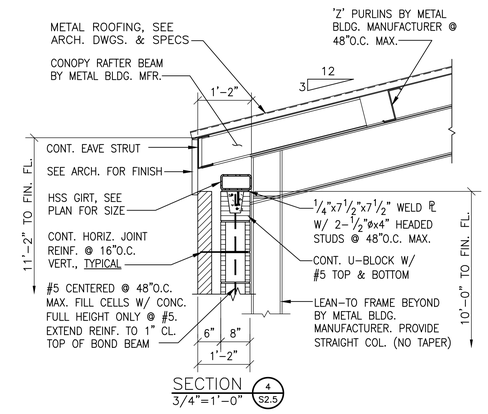

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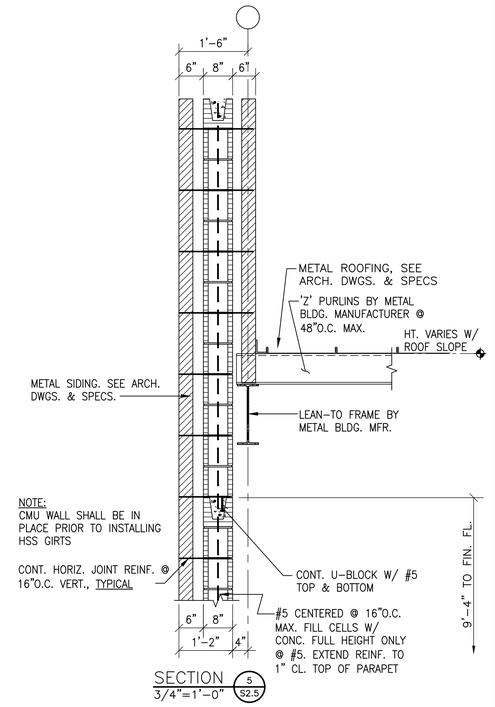

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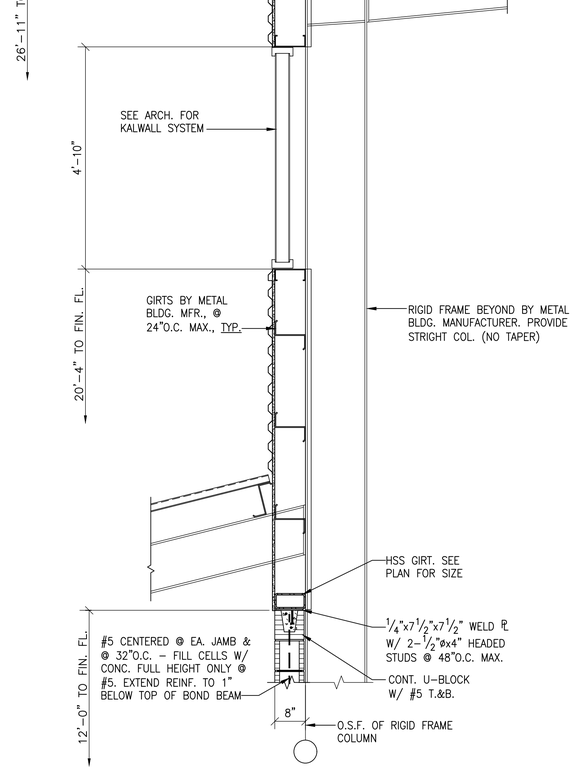

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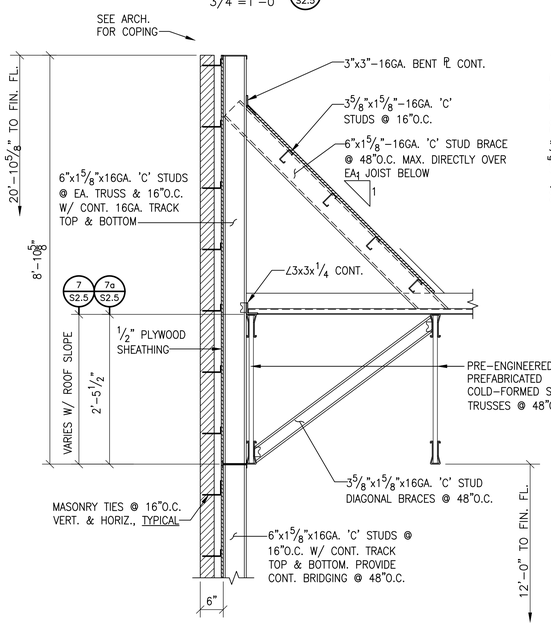

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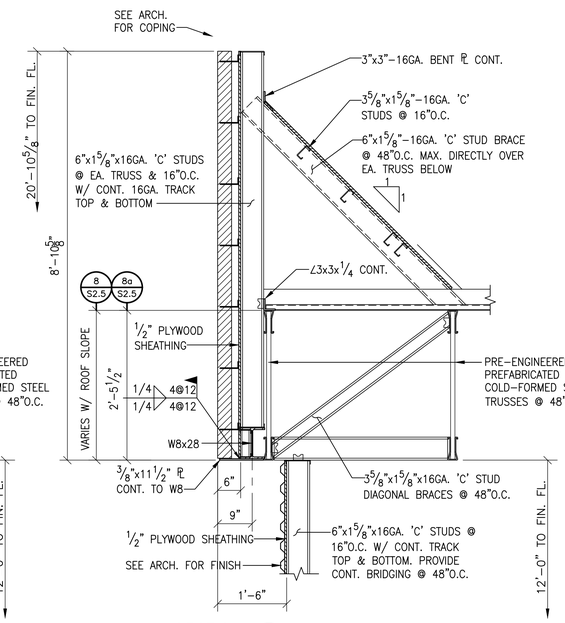

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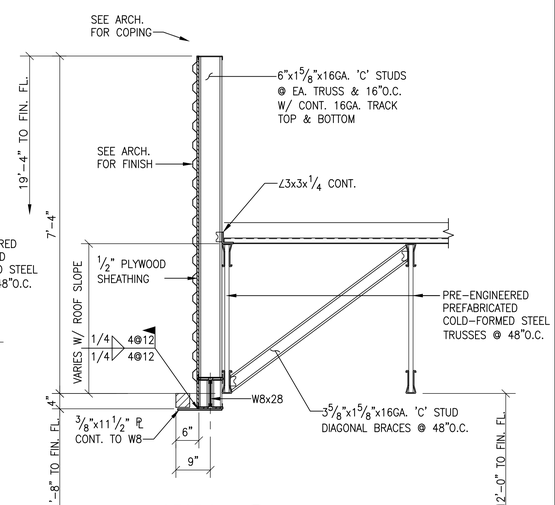


SECTION 3/4"=1'-0" (9 S2.5)

Barganier Davis Williams Architects Associated

bdw architects

624 South McDonough Street
Montgomery, AL 36104

phone: 334.834.2038
www.bdwarchitects.com

ALABAMA REGISTERED No. 30036 PROFESSIONAL ENGINEER RICK W. DANIEL 3-3-23

NEW FIRE STATION NO. 10
FOR
THE CITY OF MONTGOMERY
SOUTH COURT STREET MONTGOMERY, ALABAMA 36104

REVISIONS		
No.	Description	Date
A	ISSUED FOR REVIEW	11/08/22
B	ISSUED FOR REVIEW	11/15/22
0	ISSUED FOR REVIEW	01/16/23
1	ISSUED FOR BID	02/03/23

MGM Project No.	SP-5-21
BDW Project No.	2021-118
Drawn By:	RAS
Date:	02-03-2023
Scale:	AS NOTED

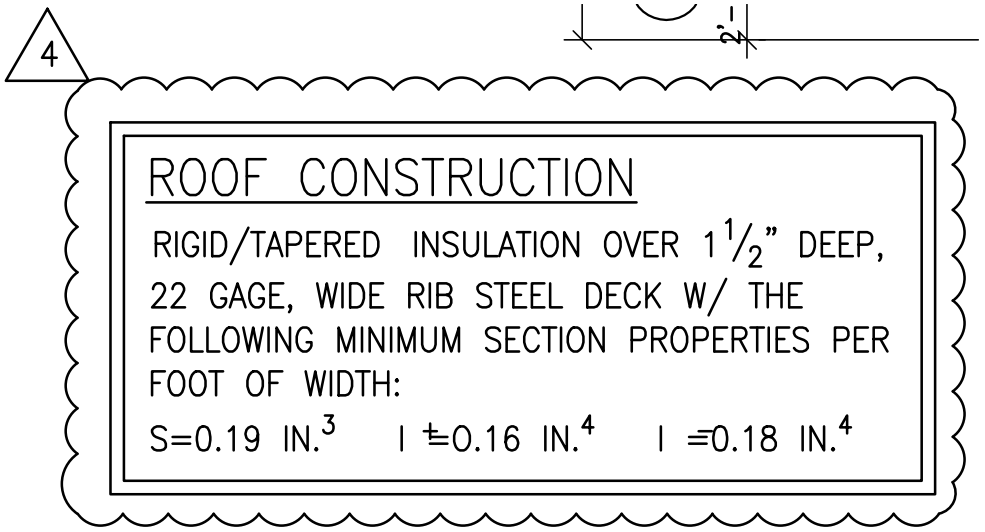
Drawing Title:

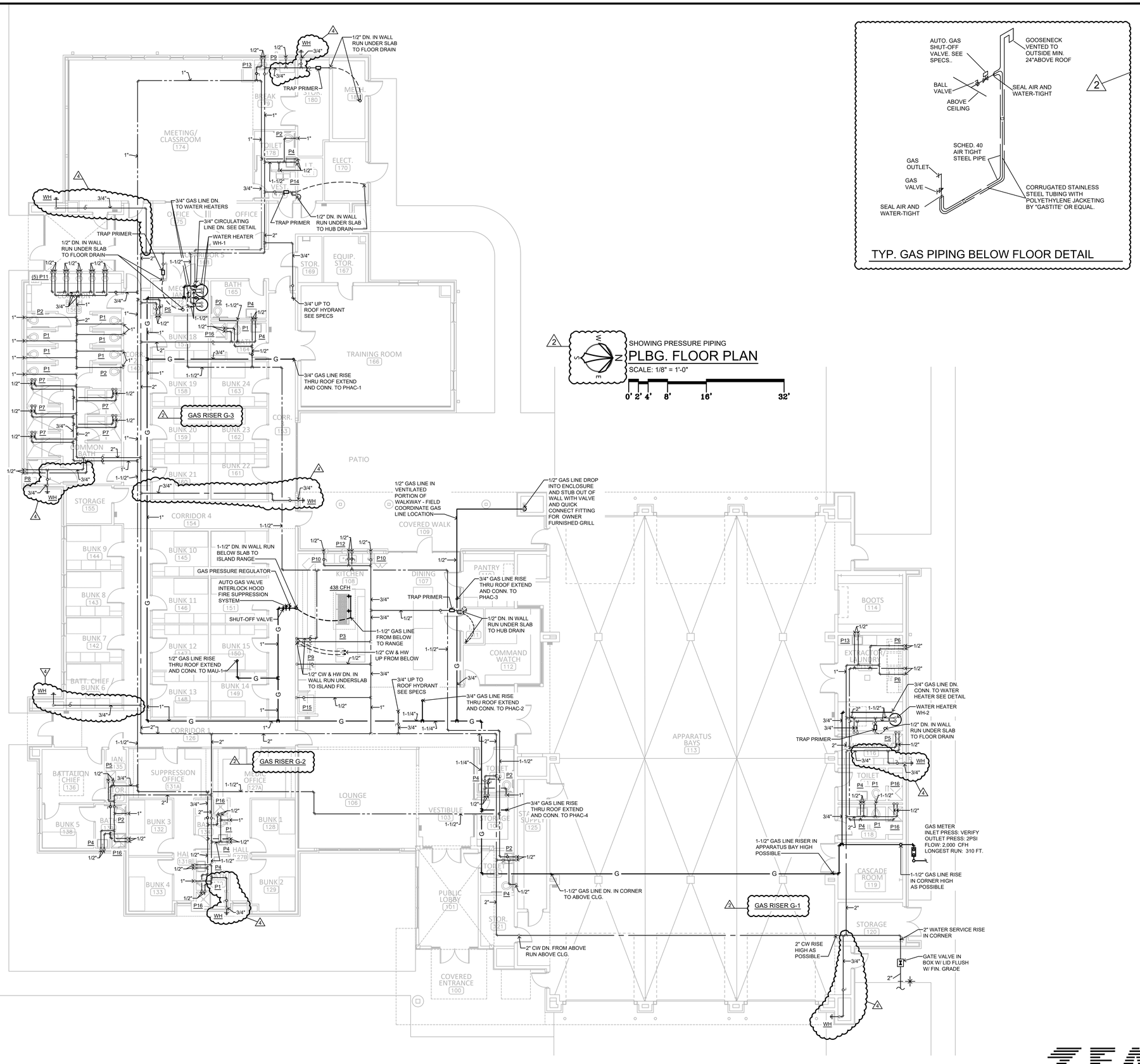
SECTIONS AND DETAILS

Sheet No:

S2.5

CONSTRUCTION DOCUMENTS


4
ROOF CONSTRUCTION
RIGID/TAPERED INSULATION OVER 1 1/2" DEEP,
22 GAGE, WIDE RIB STEEL DECK W/ THE
FOLLOWING MINIMUM SECTION PROPERTIES PER
FOOT OF WIDTH:
S=0.19 IN.3 I =0.16 IN.4 I =0.18 IN.4



TYP. GAS PIPING BELOW FLOOR DETAIL

2 SHOWING PRESSURE PIPING

PLBG. FLOOR PLAN

SCALE: 1/8" = 1'-0"

0' 2' 4' 8' 16' 32'

Barganier Davis Williams Architects Associated

bdw

624 South McDonough Street
Montgomery, AL 36104

phone: 334.834.2038
www.bdwarchitects.com

ALABAMA LICENSED PROFESSIONAL No. 23369 02.03.23 ENGINEER J. P. EIRING

NEW FIRE STATION NO. 10

FOR

THE CITY OF MONTGOMERY

SOUTH COURT STREET MONTGOMERY, ALABAMA 36104

REVISIONS		
No.	Description	Date
A	ISSUED FOR REVIEW	05.24.22
B	ISSUED FOR REVIEW	11.08.22
C	ISSUED FOR REVIEW	11.15.22
0	ISSUED FOR REVIEW	01.16.23
1	ISSUED FOR BIDS	02.03.23
4	ADDENDUM	03.02.23

MGM Project No.	SP-5-21
BDW Project No.	2021-118
ZEA Project No.	2022-11
Drawn By:	C. WARD
Date:	02.03.2023
Scale:	AS NOTED

Drawing Title:
PLBG. FLOOR PLAN - SHOWING PRESSURE PIPING

Sheet No:

P4

CONSTRUCTION DOCUMENTS

ZGOUVAS, EIRING & ASSOCIATES
CONSULTING ENGINEERS
800 S McDONOUGH STREET
MONTGOMERY, AL. 36104
334.263.4406
ZEA PROJECT NUMBER 22-11

Barganier Davis Williams Architects Associated bdw
624 South McDonough Street Montgomery, Alabama 36104
(334) 834-2038 www.bdwarchitects.com

ADDENDUM NO. 6 - Monday, March 27, 2023

FROM: Barganier Davis Williams Architects Associated
624 South McDonough Street, Montgomery, Alabama 36104

TO: Bidders

RE: New Fire Station No. 10 for the City of Montgomery
South Court Street
Montgomery, Alabama 36104
City Project No: SP-5-21
BDW Project No: 2021 – 118

This Addendum forms a part of the Contract Documents dated February 02/02/2023. If possible, this Addendum will be emailed to the bidders, vendors etc. who have requested the download link to access Construction Documents but note that it will be the responsibility of all bidders, vendors etc. to periodically verify with the architect for the latest Addendums issued prior to Bid Date.

GENERAL:

1. Provide **260 feet** of gas piping from the gas meter (located on Sheet P4) to the gas generator (located at the rear of the building).

2. See attached Addendum information (2 documents) from the Electrical Engineer in reference to the gas generator.

RFI'S:

1. On Sheet S2.2 – Sections and Details, it shows HSS 6x2x 3/16" welding to the top of the exterior metal stud wall system. Typically, you can't weld red iron to a light gauge member. Please have the structural engineer clarify this issue and/or provide a different solution for this application.

   Response: 1/8" welds to "16ga." metal is an acceptable attachment. Contractor's option to use (2) #12 self-drilling screws @ each vertical stud.

2. Miscellaneous Civil Comments.

   A. There was no Site Water Distribution specification provided. Please provide. RESPONSE: The specification for this was provided in Addendum #3, which we sent on 2/17/2023.

   B. Please clarify if an ADEM permit is required and, if so, has this permit already been obtained by the City of Montgomery. RESPONSE: See below.

C. Please clarify if an NPDES permit is required and, if so, has this permit already been obtained by the City of Montgomery. RESPONSE: Yes, the NPDES (ADEM) permit will be transferred to the contractor that is awarded the project.
In reference to deductive alternate No.3 does the deduct for the wearing and binder surface apply to the entire project or does it only apply to deductive alternates No 1 and 2. Please clarify. RESPONSE: Deductive alternate No. 3 applies to the entire project.

D. In reference to deductive alternate No. 1 please confirm that the storm drainage, related to the new road, will also be part of this deductive alternate. RESPONSE: Yes, storm drainage related to the new road should be included in the deductive alternate.

SPECIFICATIONS:

1. Refer to Index to Specifications
   a. Under Bidding Requirements and add the following sheet:
      1. Sale Tax Accounting Form.

2. Refer to Section 096520 - LVT Flooring.
   b. Under PART 2 – PRODUCTS add the following approved manufacturers:
      2. Shaw Contract Flooring, 'Solitude' product.
      3. Interface Flooring, 'Stargazing' Collection.

DRAWINGS

1. Refer to Sheets E0.1, E3.1, E4.1, and E5.1 for clouded revisions.
   a. Floor power and auxiliary added in Meeting/Classroom 174.

END OF ADDENDUM NO. 6

ACCOUNTING OF SALES TAX
Attachment to DCM Form C-3: Proposal Form

To: _____ Date: _____
(Awarding Authority)

NAME OF PROJECT _____

_____

SALES TAX ACCOUNTING

Pursuant to Act 2013-205, Section 1(g) the Contractor accounts for the sales tax NOT included in the bid proposal form as follows:

ESTIMATED SALES TAX AMOUNT

BASE BID: $_____

Alternate No. 1 (……..) ☐(add) ☐(deduct) $_____
(Insert key word for Alternate)

Alternate No. 2 (……..) ☐(add) ☐(deduct) $_____

Alternate No. 3 (……..) ☐(add) ☐(deduct) $_____

Alternate No. 4 (……..) ☐(add) ☐(deduct) $_____

Alternate No. 5 (……..) ☐(add) ☐(deduct) $_____

Alternate No. 6 (……..) ☐(add) ☐(deduct) $_____

Failure to provide an accounting of sales tax shall render the bid non-responsive. Other than determining responsiveness, sales tax accounting shall not affect the bid pricing nor be considered in the determination of the lowest responsible and responsive bidder.

Legal Name of Bidder _____

Mailing Address _____

***By (Legal Signature)** _____

*Name (type or print) _____ *(Seal)*

*Title _____

Telephone Number _____

Email Address _____

Note: A completed DCM Form C-3A: Accounting of Sales Tax must be submitted with DCM Form C-3: Proposal Form. Submission of DCM Form C-3A with DCM Form C-3 is required, it is not optional. A proposal shall be rendered non-responsive if an Accounting of Sales Tax is not provided.

GUNN AND ASSOCIATES, P.C.
3102 Highway 14
Millbrook, AL 36104
PH (334) 285-1273 FAX (334)285-1274

ADDENDUM #6 Dated: March 27, 2023

PROJECT: **New Fire Station #10 The City of Montgomery**
GA# 21-298

1. **Specifications:**
   a. Section 16231 2.1 Manufacturers – Caterpillar and Generac are approved equals for the generator.
   b. Please see typical generator cutsheet. The contractor is responsible for providing natural gas service to the generator. Coordinate with the generator manufacturer that the you are providing for their gas requirements. The cutsheet provided in this addendum is a typical cutsheet requirements from one of the four approved manufacturers.

2. Drawings:
   a. Sheet E4.1 Communications Riser Diagram – Change fiber optic cable to 6 Strand Single Mode (OS2) type fiber optic cable interconnecting MDF to IDF.
   b. Sheet E8.1 MDF and IDF Rack Elevations – Change fiber optic patch panels to accommodate Single Mode OS2 fiber optic cable with LC connectors.

MG200 | 14.2L | 200 kW

INDUSTRIAL SPARK-IGNITED GENERATOR SET

EPA Certified Stationary Emergency and Non-Emergency

GENERAC | INDUSTRIAL POWER

DEMAND RESPONSE READY

Standby Power Rating
200 kW, 250 kVA, 60 Hz

Demand Response Rating
200 kW, 250 kVA, 60 Hz

Prime Power Rating
180 kW, 225 kVA, 60 Hz

ISO 9001:2008

USA ENGINEERED & BUILT*

*Assembled in the USA using domestic and foreign parts

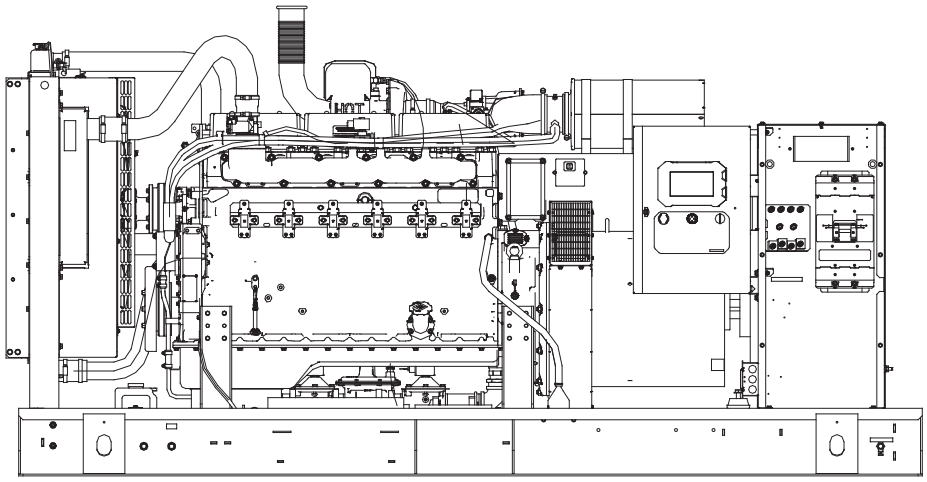


Image used for illustration purposes only

Codes and Standards

Not all codes and standards apply to all configurations. Contact factory for details.

UL2200, UL6200, UL1236, UL489

CSA C22.2, B149

BS5514 and DIN 6271

SAE J1349

NFPA 37, 70, 99, 110

NEC700, 701, 702, 708

ISO 3046, 7637, 8528, 9001

NEMA ICS10, MG1, 250, ICS6, AB1

ANSI C62.41

IBC 2009, CBC 2010, IBC 2012, ASCE 7-05, ASCE 7-10, ICC-ES AC-156 (2012)

Powering Ahead

Generac ensures superior quality by designing and manufacturing most of its generator components, such as alternators, enclosures, control systems and communications software. Generac also makes its own spark-ignited engines, and you'll find them on every Generac gaseous-fueled generator. We engineer and manufacture them from the block up — all at our facilities throughout Wisconsin. Applying natural gas and LP-fueled engines to generators requires advanced engineering expertise to ensure reliability, durability and necessary performance. By designing specifically for these dry, hotter-burning fuels, the engines last longer and require less maintenance. Building our own engines also means we control every step of the supply chain and delivery process, so you benefit from single-source responsibility.

Plus, Generac Industrial Power's distribution network provides all parts and service so you don't have to deal with third-party suppliers. It all leads to a positive owner experience and higher confidence level. Generac spark-ignited engines give you more options in commercial and industrial generator applications as well as extended run time from utility-supplied natural gas.

MG200 | 14.2L | 200 kW

INDUSTRIAL SPARK-IGNITED GENERATOR SET

EPA Certified Stationary Emergency and Non-Emergency

GENERAC | INDUSTRIAL POWER

STANDARD FEATURES

DEMAND RESPONSE READY

ENGINE SYSTEM

- Oil Drain Extension
- Air Cleaner
- Fan Guard
- Stainless Steel Flexible Exhaust Connection
- Factory Filled Oil and Coolant
- Radiator Duct Adapter (Open Set Only)
- Critical Silencer (Open Set Only)
- Oil Temperature Indication and Alarm

Fuel System

- NPT Fuel Connection on Frame
- Primary and Secondary Fuel Shutoff

Cooling System

- Closed Coolant Recovery System
- UV/Ozone Resistant Hoses
- Factory-Installed Radiator
- 50/50 Ethylene Glycol Antifreeze
- Radiator Drain Extension

Electrical System

- Battery Charging Alternator
- Battery Cables
- Battery Tray
- Rubber-Booted Engine Electrical Connections
- Solenoid Activated Starter Motor

ALTERNATOR SYSTEM

- UL2200 GENprotect™
- Motorized Main Line Circuit Breaker
- Class H Insulation Material
- 2/3 Pitch
- Skewed Stator
- Permanent Magnet Excitation
- Sealed Bearing
- Amortisseur Winding
- Full Load Capacity Alternator

GENERATOR SET

- Internal Genset Vibration Isolation
- Separation of Circuits - High/Low Voltage
- Separation of Circuits - Multiple Breakers
- Wrapped Exhaust Piping
- Standard Factory Testing
- 2 Year Limited Warranty (Standby and Demand Response Rated Units)
- 1 Year Limited Warranty (Prime Rated Units)
- Silencer Mounted in the Discharge Hood (Enclosed Units Only)

ENCLOSURE (If Selected)

- Rust-Proof Fasteners with Nylon Washers to Protect Finish
- High Performance Sound-Absorbing Material (Sound Attenuated Enclosures)
- Gasketed Doors
- Upward Facing Discharge Hood (Radiator and Exhaust)
- Stainless Steel Lift Off Door Hinges
- Stainless Steel Lockable Handles
- RhinoCoat™ - Textured Polyester Powder Coat Paint

CONTROL SYSTEM

Power Zone® Pro Sync Controller

Program Functions

- NFPA 110 Level 1 Compliant
- Engine Protective Functions
- Alternator Protective Functions
- Digital Engine Governor Control
- Digital Voltage Regulator
- Multiple Programmable Inputs and Outputs
- Remote Display Capability
- Remote Communication via Modbus® RTU, Modbus TCP/IP, and Ethernet 10/100
- Alarm and Event Logging with Real Time Stamping
- Expandable Analog and Digital Inputs and Outputs
- Remote Wireless Software Update Capable
- Wi-Fi®, Bluetooth®, BMS and Remote Telemetry
- Built-In Programmable Logic Eliminates the Need for External Controllers Under Most Conditions
- Ethernet Based Communications Between Generators
- Programmable I/O Channel Properties
- Built-In Diagnostics

Protections

- Low Oil Pressure
- Low Coolant Level
- High/Low Coolant Temperature
- Sensor Failure
- Oil Temperature
- Over/Under Speed
- Over/Under Voltage
- Over/Under Frequency
- Over/Under Current
- Over Load
- High/Low Battery Voltage
- Battery Charger Current
- Phase to Phase and Phase to Neutral Short Circuits (I^2T Algorithm)

7 Inch Color Touch Screen Display

- Resistive Color Touch Screen
- Sunlight Readable (1400 NITS)
- Easily Identifiable Icons
- Multi-Lingual
- On Screen Editable Parameters
- Key Function Monitoring
- Three Phase Voltage, Amperage, kW, kVA, and kVAr
- Selectable Line to Line or Line to Neutral Measurements
- Frequency
- Engine Speed
- Engine Coolant Temperature
- Engine Oil Pressure
- Engine Oil Temperature
- Battery Voltage
- Hourmeter
- Warning and Alarm Indication
- Diagnostics
- Maintenance Events/Information

PARALLELING CONTROL FEATURES

- Paralleling Control (Synchronizing)
- Reverse Power
- Loss of Synchronization Between Gensets
- Load and VAR Sharing

MG200 | 14.2L | 200 kW

INDUSTRIAL SPARK-IGNITED GENERATOR SET

EPA Certified Stationary Emergency and Non-Emergency

CONFIGURABLE OPTIONS

DEMAND RESPONSE READY

ENGINE SYSTEM

- ○ Engine Coolant Heater
- ○ Baseframe Cover/Rodent Guard
- ○ 2 Stage Air Cleaner
- ○ Oil Heater
- ○ Air Filter Restriction Indicator
- ○ Radiator Stone Guard (Open Set Only)
- ○ Level 1 Fan and Belt Guards (Enclosed Units Only)

FUEL SYSTEM

- ○ NPT Flexible Fuel Line

ELECTRICAL SYSTEM

- ○ 10A UL Listed Battery Charger
- ○ Battery Warmer

ALTERNATOR SYSTEM

- ○ Alternator Upsizing
- ○ Anti-Condensation Heater
- ○ Tropical Coating

CIRCUIT BREAKER OPTIONS

- ○ Main Line Circuit Breaker
- ○ Electronic Trip Breakers

GENERATOR SET

- ○ Demand Response Rating
- ○ Extended Factory Testing
- ○ 12 Position Load Center
- ○ Vapor Recovery Heater

ENCLOSURE

- ○ Weather Protected Enclosure
- ○ Level 1 Sound Attenuated
- ○ Level 2 Sound Attenuated
- ○ Level 2 Sound Attenuated with Motorized Dampers
- ○ Steel Enclosure
- ○ Aluminum Enclosure
- ○ Up to 200 MPH Wind Load Rating (Contact Factory for Availability)
- ○ AC/DC Enclosure Lighting Kit
- ○ Enclosure Heaters (with Motorized Dampers Only)
- ○ IBC Certification
- ○ Door Open Alarm Switch

CONTROL SYSTEM

- ○ NFPA 110 Level 1 Compliant 21-Light Remote Annunciator
- ○ Remote Relay Assembly (8 or 16)
- ○ Remote E-Stop (Break Glass-Type, Surface Mount)
- ○ Remote E-Stop (Red Mushroom-Type, Surface Mount)
- ○ Remote E-Stop (Red Mushroom-Type, Flush Mount)
- ○ 10A Engine Run Relay
- ○ Ground Fault Annunciator
- ○ 120V GFCI and 240V Outlets
- ○ Damper Alarm Contacts (with Motorized Dampers Only)
- ○ 100 dB Alarm Horn
- ○ Permissive/Load Shed Module

WARRANTY (Standby Gensets Only)

- ○ 2 Year Extended Limited Warranty
- ○ 5 Year Limited Warranty
- ○ 5 Year Extended Limited Warranty
- ○ 7 Year Extended Limited Warranty
- ○ 10 Year Extended Limited Warranty

ENGINEERED OPTIONS

ENGINE SYSTEM

- ○ Fluid Containment Pan

ALTERNATOR SYSTEM

- ○ 2nd Breaker System

CONTROL SYSTEM

- ○ Battery Disconnect Switch

GENERATOR SET

- ○ Special Testing
- ○ Battery Box

MG200 | 14.2L | 200 kW

INDUSTRIAL SPARK-IGNITED GENERATOR SET

EPA Certified Stationary Emergency and Non-Emergency

GENERAC | INDUSTRIAL POWER

APPLICATION AND ENGINEERING DATA

DEMAND RESPONSE READY

ENGINE SPECIFICATIONS

General

Make	Generac
Cylinder #	6
Type	In-line
Displacement - in^3 (L)	864.71 (14.2)
Bore - in (mm)	5.31 (135)
Stroke - in (mm)	6.50 (165)
Compression Ratio	9.5:1
Intake Air Method	Turbocharged/Aftercooled
Number of Main Bearings	7
Connecting Rods	Steel Alloy
Cylinder Head	Cast Iron
Cylinder Liners	Ductile Iron
Ignition	Electronic
Piston Type	Aluminum
Crankshaft Type	Ductile Iron
Lifter Type	Solid
Intake Valve Material	Special Heat-Resistant Steel
Exhaust Valve Material	High Temp Steel Alloy
Hardened Valve Seats	High Temp Steel Alloy

Engine Governing

Governor	Electronic
Frequency Regulation (Steady State)	±0.25%

Lubrication System

Oil Pump Type	Gear
Oil Filter Type	Full-Flow with Cartridge
Crankcase Capacity - qt (L)	36.2 (34.3)

Cooling System

Cooling System Type	Pressurized Closed Recovery
Fan Type	Pusher
Fan Speed - RPM	1,894
Fan Diameter - in (mm)	30 (762)

Fuel System

Fuel Type	Natural Gas
Carburetor	Down Draft
Secondary Fuel Regulator	Standard
Fuel Shut Off Solenoid	Standard
Operating Fuel Pressure - in H_2O (kPa)	7 - 11 (1.7 - 2.7)

Engine Electrical System

System Voltage	24 VDC
Battery Charger Alternator	57.5 A
Battery Size	See Battery Index 0161970SBY
Battery Voltage	(2) - 12 VDC
Ground Polarity	Negative

ALTERNATOR SPECIFICATIONS

Standard Model	K0200124Y21
Poles	4
Field Type	Revolving
Insulation Class - Rotor	H
Insulation Class - Stator	H
Total Harmonic Distortion	<5%
Telephone Interference Factor (TIF)	<50

Standard Excitation	Permanent Magnet
Bearings	Single Sealed Ball
Coupling	Direct via Flexible Disc
Prototype Short Circuit Test	Yes
Voltage Regulator Type	Full Digital
Number of Sensed Phases	All
Regulation Accuracy (Steady State)	±0.25%

MG200 | 14.2L | 200 kW

INDUSTRIAL SPARK-IGNITED GENERATOR SET

EPA Certified Stationary Emergency and Non-Emergency

GENERAC | INDUSTRIAL POWER

OPERATING DATA

DEMAND RESPONSE READY

POWER RATINGS - NATURAL GAS

	Standby/Demand Response		Prime	
Three-Phase 120/208 VAC @0.8pf	200 kW/250 kVA	Amps: 695	180 kW/225 kVA	Amps: 625
Three-Phase 277/480 VAC @0.8pf	200 kW/250 kVA	Amps: 241	180 kW/225 kVA	Amps: 217
Three-Phase 346/600 VAC @0.8pf	200 kW/250 kVA	Amps: 241	180 kW/225 kVA	Amps: 217

MOTOR STARTING CAPABILITIES (skVA)

skVA vs. Voltage Dip

277/480 VAC	30%	120/208 VAC	30%
K0200124Y21	478	K0200124Y21	361
K0250124Y21	630	K0250124Y21	506
K0300124Y21	790	K0300124Y21	609

FUEL CONSUMPTION RATES*

Natural Gas – scfh (m^3/hr)

Percent Load	Standby/Demand Response	Prime
25%	960 (27.2)	900 (25.5)
50%	1,440 (40.8)	1,320 (37.4)
75%	1,980 (56.1)	1,800 (51.0)
100%	2,460 (69.7)	2,280 (64.6)

* Fuel supply installation must accommodate fuel consumption rates at 100% load.

COOLING

		Standby/Demand Response	Prime
Air Flow (Fan Air Flow Across Radiator)	scfm (m^3/min)	9,162 (259.4)	9,162 (259.4)
Coolant Flow	gpm (Lpm)	90 (340.7)	90 (340.7)
Coolant System Capacity	gal (L)	11 (39.7)	11 (39.7)
Maximum Operating Ambient Temperature	°F (°C)	122 (50)	122 (50)
Maximum Operating Ambient Temperature (Before Derate)		See Bulletin No. 0199270SSD	
Maximum Radiator Backpressure	in H_2O (kPa)	0.5 (0.12)	0.5 (0.12)

COMBUSTION AIR REQUIREMENTS

	Standby/Demand Response	Prime
Flow at Rated Power - scfm (m^3/min)	390 (11.0)	362 (10.3)

ENGINE

		Standby/Demand Response	Prime
Rated Engine Speed	RPM	1,800	1,800
Horsepower at Rated kW**	hp	304	274
Piston Speed	ft/min (m/min)	1,950 (594)	1,950 (594)
BMEP	psi (kPa)	155 (1,065)	139 (959)

EXHAUST

		Standby/Demand Response	Prime
Exhaust Flow (Rated Output)	scfm (m^3/min)	1,327 (38)	1,213 (34)
Max. Backpressure (Post Silencer)	inHg (kPa)	0.75 (2.54)	0.75 (2.54)
Exhaust Temp (Rated Output - Post Silencer)	°F (°C)	1,378 (748)	1,350 (732)

** Refer to “Emissions Data Sheet” for maximum bHP for EPA and SCAQMD permitting purposes.

Deration – Operational characteristics consider maximum ambient conditions. Derate factors may apply under atypical site conditions.
Please contact a Generac Power Systems Industrial Dealer for additional details. All performance ratings in accordance with ISO3046, BS5514, ISO8528, and DIN6271 standards.
Standby - See Bulletin 0187500SSB
Demand Response - See Bulletin 10000018250
Prime - See Bulletin 0187510SSB

MG200 | 14.2L | 200 kW

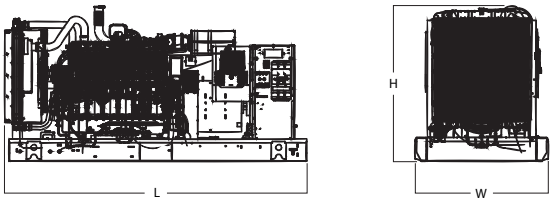
INDUSTRIAL SPARK-IGNITED GENERATOR SET

EPA Certified Stationary Emergency and Non-Emergency

GENERAC | INDUSTRIAL POWER

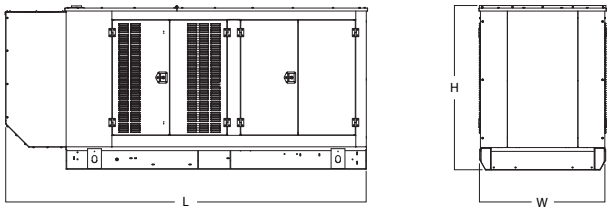
DIMENSIONS AND WEIGHTS*

DEMAND RESPONSE READY



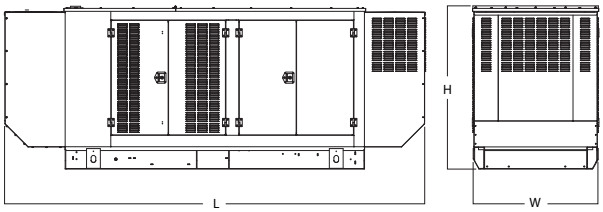
OPEN SET (Includes Exhaust Flex)

L x W x H - in (mm)	128.0 (3,251) x 52.9 (1,344) x 62.3 (1,582)
Weight - lbs (kg)	5,281 - 6,031 (2,395 - 2,735)



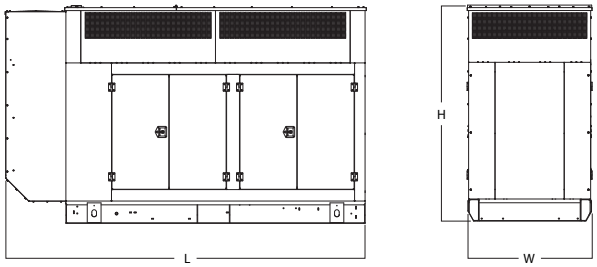
WEATHER PROTECTED ENCLOSURE

L x W x H - in (mm)	154.4 (3,922) x 54.0 (1,372) x 69.8 (1,773)
Weight - lbs (kg)	Steel: 6,261 - 7,596 (2,839 - 3,445) Aluminum: 5,795 - 6,786 (2,628 - 3,078)



LEVEL 1 SOUND ATTENUATED ENCLOSURE

L x W x H - in (mm)	179.9 (4,569) x 54.0 (1,372) x 69.8 (1,773)
Weight - lbs (kg)	Steel: 6,566 - 8,059 (2,978 - 3,655) Aluminum: 5,926 - 7,000 (2,688 - 3,175)



LEVEL 2 SOUND ATTENUATED ENCLOSURE

L x W x H - in (mm)	154.4 (3,922) x 54.0 (1,372) x 93.3 (2,370)
Weight - lbs (kg)	Steel: 6,801 - 8,632 (3,084 - 3,915) Aluminum: 6,027 - 7,247 (2,733 - 3,287)

* All measurements are approximate and for estimation purposes only.

YOUR FACTORY RECOGNIZED GENERAC INDUSTRIAL DEALER

Specification characteristics may change without notice. Please contact a Generac Power Systems Industrial Dealer for detailed installation drawings.

SPEC SHEET

Generac Power Systems, Inc. | P.O. Box 8 | Waukesha, WI 53189
P: (262) 544-4811

Part No. 10000039030
Rev. B 02/28/2020

ELECTRICAL LEGEND

CEILING OUTLETS

- A (2) RECESSED 2' X 4' LED FIXTURE MARK "A" CIRCUIT No. 2 TYPICAL
- A (2) RECESSED 2' X 4' LED FIXTURE MARK "A" CIRCUIT No. 2 TYPICAL "EMERGENCY POWER"
- A 2 RECESSED 1' X 4' LED FIXTURE MARK "A" CIRCUIT No. 2 TYPICAL
- A 2 RECESSED 1' X 4' LED FIXTURE MARK "A" CIRCUIT No. 2 TYPICAL "EMERGENCY POWER"
- A (2) RECESSED 2' X 2' LED FIXTURE MARK "A" CIRCUIT No. 2 TYPICAL
- A (2) RECESSED 2' X 2' LED FIXTURE MARK "A" CIRCUIT No. 2 TYPICAL "EMERGENCY POWER"
- FS 2 SURFACE OR PENDANT MOUNTED LED STRIP FIXTURE MARK "FS" CIRCUIT No. 2 TYPICAL
- FS 2 SURFACE OR PENDANT MOUNTED LED STRIP FIXTURE MARK "FS" CIRCUIT No. 2 "EMERGENCY POWER"
- RECESSED OR SURFACE MOUNT DOWNLIGHT
- RECESSED OR SURFACE MOUNT DOWNLIGHT "EMERGENCY POWER"
- SURFACE OR PENDANT MOUNTED ROUND FIXTURE
- (J) JUNCTION BOX
- EXIT LIGHT
- EF EXHAUST FAN
- INDUSTRIAL CORD REEL WITH PORTABLE NEMA 5-20R GFI DUPLEX OUTLET BOX EQUAL TO HUBBELL MODEL #HBL45123R20, SUSPEND FROM STRUCTURE ABOVE

WALL SWITCHES (UNLESS OTHERWISE NOTED, MOUNT 48" A.F.F.)

- S A.C. TYPE, SINGLE POLE, 20 AMP, 120/277 VOLT
- S_3 A.C. TYPE, 3-WAY, 20 AMP, 120/277 VOLT
- S_4 A.C. TYPE, 4-WAY, 20 AMP, 120/277 VOLT
- S_M MOTOR RATED TOGGLE SWITCH DISCONNECT, WITH THERMAL OVERLOADS A.C. TYPE, 20 AMP, 120/277 VOLT
- 30/1 S_M MOTOR RATED TOGGLE SWITCH DISCONNECT, WITH THERMAL OVERLOADS A.C. TYPE, 30 AMP, 120/277 VOLT
- S_T PRESET INTERVAL TIMER SWITCH, HUBBELL TD-300 SERIES OR EQUALS
- PUSH BUTTON, TOGGLE SWITCH, ROTARY SWITCH, ETC., FURNISHED WITH EQUIPMENT BY OTHERS, INSTALLED AND WIRED BY THE ELECTRICAL CONTRACTOR.

LIGHTING CONTROLS

- (OS) CEILING MOUNTED OCCUPANCY SENSOR
- PP POWER PACK FOR OCCUPANCY SENSOR
- AR AUXILIARY RELAY FOR OCCUPANCY SENSOR
- PP AR DOUBLE POLE SINGLE THROW RELAY 120 VAC COIL 2-20A CONTINUOUS CONTACTS, SIMILAR TO LEVITON OSP20-RDO
- L1 ROOM CONTROLLER - 1 ZONE DIMMING
- RC ROOM CONTROLLER - ON/OFF NO DIMMING
- D WALL DIMMER - ON/OFF & 0-10V
- D3 3-WAY WALL DIMMER - ON/OFF & 0-10V
- S_L LOW VOLTAGE SWITCH, 2-BUTTON
- S_{O1} OCCUPANCY SENSOR WALL SWITCH, MULTI-TECHNOLOGY, SELF POWERED, SIMILAR TO LEVITON OSSTMT-MD

*COORDINATE WITH LIGHTING CONTROL DETAILS FOR MORE REQUIREMENTS

PANELS AND POWER

- PANELBOARD
- PANELBOARD FLUSH MOUNTED
- CON CONTROL PANEL
- FUSIBLE DISCONNECT SWITCH; XX/YY/ZZ WHERE X INDICATES AMPERAGE, Y INDICATES # OF POLES, AND Z INDICATES NEMA RATING; FURNISH AND INSTALL FUSES PER MANUFACTURER'S RECOMMENDATIONS
- (S) MOTOR FURNISHED BY OTHERS AND CONNECTED BY ELECTRICAL CONTRACTOR; 'S' INDICATES HORSE POWER RATING
- CIRCUIT BREAKER
- TRANSFER SWITCH
- T TRANSFORMER
- ELECTRIC METER
- GROUNDING ELECTRODE CONNECTION
- (G) GROUND BUS

MISCELLANEOUS EQUIPMENT

- C 6 POLE CONTACTOR-ELECTRICALLY HELD, 120V HOLDING COIL, 20A CONTACTS SEE DETAIL 5/E2.3.
- (PC) PHOTOCELL. SEE DETAIL 5/E2.3.
- EXTERIOR POLE LIGHT
- (WH) WATER HEATER
- UH UNIT HEATER
- TC TIMECLOCK
- GA GENERATOR ANNUNCIATOR PANEL
- ATS AUTOMATIC TRANSFER SWITCH
- (J) MD MOTORIZED DAMPER

WALL OUTLETS

1. ALL 120V RECEPTACLES ON THIS PROJECT SHALL BE TAMPER PROOF TYPE WHERE REQUIRED BY THE NATIONAL ELECTRIC CODE.

- WALL MOUNTED EXIT LIGHT
- WALL MOUNTED LIGHTING FIXTURE
- DUPLEX RECEPTACLE - 20 AMP, 125 VOLT, 2 POLE, 3 WIRE GROUNDED TYPE, NEMA 5-20R. MOUNT 18" A.F.F. UNLESS NOTED OTHERWISE
- G DUPLEX RECEPTACLE - 20 AMP, 125 VOLT, GFI, 2 POLE, 3 WIRE GROUNDED TYPE, NEMA 5-20R. MOUNT 18" A.F.F. UNLESS NOTED OTHERWISE
- W DUPLEX RECEPTACLE - 20 AMP, 125 VOLT, GFI, 2 POLE, 3 WIRE GROUNDED TYPE, NEMA 5-20R. MOUNT 18" A.F.F. UNLESS NOTED OTHERWISE; PROVIDE WEATHERPROOF BOX FOR RECEPTACLE
- DUPLEX RECEPTACLE - 20 AMP, 125 VOLT, 2 POLE, 3 WIRE GROUNDED TYPE, NEMA 5-20R. MOUNT 6" ABOVE COUNTER
- G DUPLEX RECEPTACLE - 20 AMP, 125 VOLT, GFI, 2 POLE, 3 WIRE GROUNDED TYPE, NEMA 5-20R. MOUNT 6" ABOVE COUNTER
- DUPLEX RECEPTACLE - 20 AMP, 125 VOLT, 2 POLE, 3 WIRE GROUNDED TYPE, NEMA 5-20R. MOUNT ADJACENT TO CABLE OUTLET; COORDINATE LOCATION WITH CABLE OUTLET PRIOR TO ROUGH-IN
- G QUADRAPLEX RECEPTACLE - 20 AMP, 125 VOLT, GFI, 2 POLE, 3 WIRE GROUNDED TYPE, NEMA 5-20R. MOUNT 18" A.F.F. UNLESS NOTED OTHERWISE
- QUADRAPLEX RECEPTACLE - 20 AMP, 125 VOLT, 2 POLE, 3 WIRE GROUNDED TYPE, NEMA 5-20R. MOUNT 18" A.F.F. UNLESS NOTED OTHERWISE
- QUADRAPLEX RECEPTACLE - 20 AMP, 125 VOLT, 2 POLE, 3 WIRE GROUNDED TYPE, NEMA 5-20R. MOUNT 6" ABOVE COUNTER UNLESS NOTED OTHERWISE
- DUPLEX RECEPTACLE - 20 AMP, 125 VOLT, GFI, 3 POLE, 3 WIRE GROUNDED TYPE, NEMA 5-20R. MOUNT 26" AFF TO C/L FOR DRINKING FOUNTAIN
- 250V LOCKING RECEPTACLE; 2 POLE, 3 WIRE GROUNDED TYPE, NEMA L6-30R; HUBBELL. VERIFY LOCATION WITH OWNER PRIOR TO ROUGH-IN.
- 125V LOCKING RECEPTACLE; 2 POLE, 3 WIRE GROUNDED TYPE, NEMA L5-30R; HUBBELL. VERIFY LOCATION WITH OWNER PRIOR TO ROUGH-IN.
- SINGLE RECEPTACLE - 30 AMP, 250 VOLT, 2 POLE, 3 WIRE GROUNDED TYPE, NEMA 6-30R. MOUNT AS NEEDED FOR DRYER.
- (J) JUNCTION BOX SIZE NOTED OR REQUIRED, WITH BLANK SCREW COVER AND FLEXIBLE CONDUIT CONNECTION
- (P) PHOTOCELL; TORK MODEL 5231 (120V), TWIST RECEPTACLE: TORK 2421.

BRANCH CIRCUITING

- RUN CONCEALED UNDER FLOOR OR IN GRADE
- RUN CONCEALED IN CEILING OR WALLS
- LA-1 HOMERUN TO PANEL. ANY CIRCUIT WITHOUT FURTHER IDENTIFICATION INDICATES 2 #12, 1 #12 GROUND - 3/4" C; 3 #12, 1 #12 GROUND - 3/4" C; 4 #12, 1 #12 GROUND - 3/4" C; ETC. AS PER NEC. LETTERS AND NUMERALS INDICATE PANEL AND CIRCUIT NUMBER.
- LA-1 10 HOMERUN TO PANEL. ANY CIRCUIT WITHOUT FURTHER IDENTIFICATION INDICATES 2 #10, 1 #10 GROUND - 3/4" C; 3 #10, 1 #10 GROUND - 3/4" C; 4 #10, 1 #10 GROUND - 1" C; ETC. AS PER NEC. LETTERS AND NUMERALS INDICATE PANEL AND CIRCUIT NUMBER.
- LA-1 8 HOMERUN TO PANEL. ANY CIRCUIT WITHOUT FURTHER IDENTIFICATION INDICATES 2 #8, 1 #10 GROUND - 1" C; 3 #8, 1 #10 GROUND - 3/4" C; 4 #8, 1 #10 GROUND - 1 1/4" C; ETC. AS PER NEC. LETTERS AND NUMERALS INDICATE PANEL AND CIRCUIT NUMBER.
- 6 WHERE A NUMBER IS SHOWN NEXT TO OR ON THE CIRCUIT OR HOMERUN. THE NUMBER INDICATES CONDUCTOR SIZE OTHER THAN #12 - NUMBER #6 CONDUCTORS INDICATED. PROVIDE GROUND SIZED PER NEC TABLE 250-95 FOR MAX AMPACITY OF CONDUCTOR SIZE AS SHOWN. SIZE CONDUIT PER NEC ANNEX C.
- LIQUID-TIGHT FLEXIBLE CONDUIT CONNECTION
- SURFACE MOUNTED CONDUIT; RUN PARALLEL OR PERPENDICULAR TO BUILDING LINES
- EMERGENCY CIRCUITRY CONNECTED TO GENERATOR RUN CONCEALED IN CEILING OR WALLS
- LV LOW VOLTAGE CABLING FOR LIGHTING CONTROLS IN CONDUIT OR CONCEALED ABOVE CEILING.

FIRE ALARM SYSTEM

- FACP FIRE ALARM CONTROL PANEL
- ANN REMOTE ANNUNCIATOR
- NAC NOTIFICATION APPLIANCE CIRCUIT
- F MANUAL PULL STATION
- A ANSUL SYSTEM
- S SPEAKER/STROBE;
- H WP WEATHERPROOF SIGNAL HORN;
- STROBE ONLY
- TS TAMPER SWITCH
- FS FLOW SWITCH
- PS HI/LO PRESSURE SWITCH
- HD AUTOMATIC HEAT DETECTOR; 135 DEGREE/RATE OF RISE TYPE; CEILING MOUNTED
- SD AUTOMATIC SMOKE DETECTOR; CEILING MOUNTED
- SD LA AUTOMATIC SMOKE DETECTOR; CEILING MOUNTED WITH LOCAL ANNUNCIATION,
- CS COMBINATION CARBON MONOXIDE/ SMOKE DETECTOR; CEILING MOUNTED
- DD AUTOMATIC AIR DUCT SMOKE DETECTOR MOUNTED IN MECHANICAL DUCT
- RT REMOTE TEST STATION
- ZC ZONE MODULE, CONTROL TYPE
- ZM ZONE MODULE, MONITOR TYPE
- MAGNETIC DOOR HOLDERS
- — F — SUPERVISED CIRCUITING IN CONDUIT, RACEWAY INSTALLED CONCEALED

COMMUNICATION SYSTEMS

- DATA WALL OUTLET - SEE SHEET E8.1 FOR REQUIREMENTS
- MB DATA WALL OUTLET - SEE SHEET E8.1 FOR REQUIREMENTS
- DATA WALL OUTLET - SEE SHEET E8.1 FOR REQUIREMENTS
- DATA WALL OUTLET - SEE SHEET E8.1 FOR REQUIREMENTS
- DATA WALL OUTLET - SEE SHEET E8.1 FOR REQUIREMENTS
- TV DATA WALL OUTLET - SEE SHEET E8.1 FOR REQUIREMENTS
- DATA WALL OUTLET - SEE SHEET E8.1 FOR REQUIREMENTS
- TBB TELEPHONE BACKBOARD - 3/4" EXTERIOR GRADE PLYWOOD WITH TWO COATS OF INSULATING VARNISH, SIZE AS SHOWN; SEE DETAILS ON SH. #E8.1
- COMMUNICATIONS RACK. SEE DETAILS ON SH. #E8.1.

FLOOR OUTLETS

- RECESSED FLOOR BOX WITH FULL EIGHT GANGS. SIMILAR TO WALKER RFB11 OR PRIOR APPROVED EQUALS. ARCHITECT TO SELECT FINISH.
  PROVIDE WITHIN 2-DUPLEX RECEPTACLES NEMA 5-20R.
  PROVIDE WITHIN 2- 1 1/4" CONDUITS TO CABLE TRAY.
  PROVIDE WITHIN 2- 1 1/4" CONDUITS TO ABOVE ACCESSIBLE CEILING.
  PROVIDE PROTECTIVE COLLAR FOR STUBS.
  COORDINATE EXACT LOCATION WITH ARCH. PRIOR TO ROUGH-IN.

MISCELLANEOUS

A	UNIT HEATER
ADA	AMERICANS WITH DISABILITIES ACT
AFF	ABOVE FINISH FLOOR
AIC	AMPERE INTERRUPTING CAPACITY
ATS	AUTOMATIC TRANSFER SWITCH
C	CONDUIT
CL	CENTER LINE
CWP	COLD WATER PIPE
EM	EMERGENCY
EMT	ELECTRIC METALLIC TUBING
GFI	GROUND FAULT INTERRUPTER
GRC	GALVANIZED RIGID METAL CONDUIT
GRD	GROUND
MCB	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER
MLO	MAIN LUGS ONLY
MT	MOUNT
N	NEUTRAL
NIC	NOT IN CONTRACT
NEC	NATIONAL ELECTRICAL CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURER'S ASSOC.
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NL	NIGHT LIGHT
NTS	NOT TO SCALE
P	POLE
PF	POWER FACTOR
PH	PHASE
PNL	PANEL
PVC	PVC (POLYVINYL CHLORIDE) CONDUIT
SLD	SINGLE LINE DIAGRAM
TBB	TELEPHONE BACKBOARD
TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSORS
UL	UNDERWRITER'S LABORATORY
U.N.O.	UNLESS NOTED OTHERWISE
V	VOLTAGE
W	WIRE
WP	WEATHERPROOF
#	NUMBER
3R	NEMA 3R WEATHERPROOF ENCLOSURE
4X	NEMA 4X WEATHERPROOF/CORROSION ENCLOSURE

GENERAL ELECTRICAL NOTES:

1. THE SERVICE VOLTAGE TO THE FACILITY SHALL BE 120V/208V 3PH, 4-WIRE.
2. INSTALLATION SHALL COMPLY WITH THE NATIONAL ELECTRICAL CODE, STATE AND LOCAL CODES, AND MANUFACTURER'S RECOMMENDATIONS.
3. MAINTAIN ALL CLEARANCES FOR ELECTRICAL EQUIPMENT PER THE NEC.
4. COORDINATE ROUGH-IN OF ALL ELECTRICAL DEVICES WITH ARCHITECTURAL FLOOR PLANS, ELEVATIONS AND MILLWORK SHOP DRAWINGS PRIOR TO ROUGH-IN. AVOID ALL BACKSPLASHES AT COUNTERS.
5. ALL DIMENSIONS INDICATED IN THESE DOCUMENTS ARE FOR REFERENCE AND COORDINATION PURPOSES ONLY. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL DIMENSIONS IN THE FIELD, AND COORDINATING WORK WITH OTHER TRADES TO AVOID CONFLICTS.
6. VERIFY ALL DOOR SWINGS WITH ARCHITECTURAL BEFORE ROUGH-IN OF LIGHT SWITCHES TO ENSURE PROPER SWITCH LOCATION.
7. THE LOCATION OF OUTLETS, FIXTURES, AND EQUIPMENT SHOWN ON THE DRAWINGS ARE APPROXIMATE, OFFSET AS NEEDED OR AS REQUESTED BY THE OWNER. THE OWNER SHALL HAVE THE RIGHT TO RELOCATE ANY OUTLETS OR FIXTURES BEFORE THEY ARE INSTALLED WITHOUT ANY ADDITIONAL COST.
8. COORDINATE EXACT LOCATION OF ALL ELECTRICAL FLOOR DEVICES WITH ARCHITECT PRIOR TO INSTALLATION.
9. ALL CONDUIT SIZE SHALL BE A MINIMUM 3/4" UNLESS NOTED OTHERWISE IN THE DRAWINGS OR SPECIFICATIONS.
10. ALL ELECTRICAL RACEWAYS AND CABLING SHALL BE INSTALLED CONCEALED WITHIN THE CONFINES OF THE BUILDING FOUNDATIONS EXCEPT THOSE SPECIFICALLY SERVING LOADS OR EQUIPMENT EXTERIOR OF THE BUILDING. ALL SUCH RACEWAYS SHALL BE A MINIMUM 18" INSIDE FOUNDATIONS AND POWER AND COMMUNICATIONS RACEWAYS SHALL BE SEPARATED BY A MINIMUM 18".
11. ALL CONDUITS INSTALLED UNDERFLOOR SHALL BE ROUTED UNDER STRUCTURAL CONCRETE FLOOR SLABS. CONTRACTOR SHALL NOT INSTALL CONDUITS IN CONCRETE FLOORING WITHOUT THE EXPRESS WRITTEN PERMISSION OF THE STRUCTURAL ENGINEER. CONDUITS PENETRATING THRU CONCRETE FLOORS SHALL ADHERE TO THE ELECTRICAL SPECIFICATIONS AND RECOMMENDATIONS OF THE STRUCTURAL ENGINEER.
12. ALL RACEWAYS INSTALLED ON EXTERIOR OF THE BUILDING, INCLUDING CONDUIT UNDER CANOPIES, SHALL BE GRC. EMT WILL NOT BE ACCEPTED.
13. ALL RACEWAYS SHALL BE SUPPORTED PER NEC AND AT LEAST EVERY 10' AND WITHIN 3' OF EVERY JUNCTION BOX. RACEWAYS SUPPORTED ON BOTTOM OF SECONDARY CEILING SHALL BE SUPPORTED FROM THE STRUCTURE NOT FROM THE GYPBOARD CEILING.
14. ALL EMPTY WALL MOUNTED JUNCTION BOXES SHALL BE PROVIDED WITH A WALL BLANK AND ALL EMPTY RACEWAYS SHALL BE PROVIDED WITH A PULL WIRES.
15. PROVIDE ALL CONDUIT STUBS WITH A PROTECTIVE COLLAR.
16. INSURE THAT ALL PENETRATIONS OF FIRE WALLS AND DECKS ARE PROPERLY SEALED PER INTERNATIONAL BUILDING CODE 712 AND WITH AN UL APPROVED DEVICE OR FIRE CAULK. REFER TO ARCHITECTURAL PLANS FOR THE LOCATIONS OF RATED FIRE WALLS AND UL ASSEMBLY LOCATIONS AND TYPES AND BID ACCORDINGLY.
17. PROVIDE A CONDUIT EXPANSION JOINTS WITH BONDING JUMPER IN ALL CONDUITS CROSSING AN EXPANSION JOINT. REFER TO ARCHITECTURAL DRAWINGS FOR EXPANSION JOINT LOCATIONS.
18. ALL UNDERGROUND CONDUITS RUNS ENTERING THE BUILDING SHALL BE SEALED TO PREVENT THE ENTRANCE OF MOISTURE.
19. ALL FLEXIBLE CONDUITS ON THE EXTERIOR, IN WET LOCATIONS OR ANY MECHANICAL ROOM SHALL BE LIQUID TIGHT WITH SUITABLE FITTINGS.
20. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SEALING AROUND DEVICES, PENETRATIONS, OUTLETS, AND CONDUITS THAT PENETRATE THE WALLS ABOVE THE CEILING TO MAINTAIN SOUNDPROOFING. CONTRACTOR SHALL VERIFY THAT THE OPENINGS SIZES ARE LESS THAN 1/2" ON ALL SIDES OF THE PENETRATIONS. ALL OPENINGS IN EXCESS OF 1/2" SHALL BE CAULKED/SEALED WITH SHEET ROCK MUD. THE DRYWALL CONTRACTOR SHALL BE RESPONSIBLE FOR SEALING PENETRATIONS IN PLACE WHEN THE SHEETROCK ARE INSTALLED. PENETRATIONS MADE AFTER THE DRYWALL CONTRACTOR HAS FINISHED IN AN AREA SHALL BE SEALED BY THE CONTRACTOR MAKING THE PENETRATION.
21. PLANNED INTERRUPTIONS OF UTILITY SERVICE TO ANY EXISTING FACILITY OR AREAS WITHIN ANY FACILITY AFFECTED BY THIS CONTRACT, SHALL BE CAREFULLY PLANNED AND COORDINATED IN ADVANCE OF THE REQUESTED INTERRUPTION. THE CONTRACTOR SHALL NOT INTERRUPT SERVICES UNTIL SPECIFIED APPROVAL HAS BEEN GRANTED. THE REQUEST SHALL INDICATE SERVICES AND AREAS TO BE AFFECTED, DATE AND TIME OF INTERRUPTION AND DURATION OF OUTAGE. REQUEST FOR INTERRUPTION OF SERVICE WILL NOT BE APPROVED UNTIL ALL EQUIPMENT AND MATERIAL REQUIRED FOR THE COMPLETION OF THAT PARTICULAR PHASE OF WORK ARE ON THE JOB SITE. CONTRACTOR IS RESPONSIBLE FOR ALL OVERTIME, HOLIDAY, AND WEEKEND PAY TO THEIR EMPLOYEES TO DO THIS WORK DURING SCHEDULED NON-NORMAL WORK HOURS.
22. BUILDING OWNER MUST RECEIVE RECORD DRAWINGS AND MANUALS THAT PROVIDE INSTRUCTIONS ABOUT THE OPERATION AND MAINTENANCE OF THE BUILDING'S ELECTRICAL DISTRIBUTION SYSTEM.
23. CONTRACTOR IS RESPONSIBLE FOR PROPER SENSITIVITY AND TIME DELAY SETTINGS FOR OCCUPANCY SENSORS. PROVIDE PROPER NUMBER OF POWER PACKS AND LOCATE POWER PACKS AND OCCUPANCY SENSORS ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
24. ALL JUNCTION BOX COVERS ABOVE THE CEILING SHALL BE CLEARLY MARKED WITH WHICH CIRCUITS OR ELECTRICAL SYSTEM THEY CONTAIN.
25. HVAC EQUIPMENT POWER WIRING SHALL BE FURNISHED AND INSTALLED BY THIS CONTRACTOR. CONTROL EQUIPMENT AND CONTROL WIRING SHALL BE FURNISHED UNDER DIVISION 15 UNLESS OTHERWISE NOTED. PROVIDE 3/4" CONDUITS WITH PULL WIRE BETWEEN INSIDE AND OUTSIDE UNITS, THERMOSTAT OUTLETS AND UNITS AND/OR MECHANICAL CONTROL PANEL AS APPLICABLE. THERMOSTAT OUTLETS SHALL BE 4" SQUARE OUTLETS, FLUSH MOUNTED WITH SINGLE GANG OR DOUBLE GANG PLASTER RINGS AS DIRECTED BY THE HVAC CONTRACTOR. COORDINATE EXACT LOCATION OF ALL EQUIPMENT, DEVICES, OUTLETS, ETC, WITH THE MECHANICAL DRAWINGS AND DIVISION 15 SPECIFICATIONS. COORDINATE WITH THE HVAC CONTRACTOR FOR EXACT LOCATIONS OF ALL EQUIPMENT.

Barganier Davis Williams Architects Associated

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ALABAMA REGISTERED Kenneth Ray Gunn, Jr. NO. 26888 PROFESSIONAL 2-03-2023 ENGINEER

NEW FIRE STATION NO. 10
FOR
THE CITY OF MONTGOMERY
SOUTH COURT STREET MONTGOMERY, ALABAMA 36104

REVISIONS		
No.	Description	Date
0	ISSUED FOR REVIEW	01/16/23
1	ISSUED FOR BID	02/03/23
2	ADDENDUM #6	03/24/23

MGM Project No.	SP-5-21
BDW Project No.	2021-118
Drawn By:	
Date:	11-15-2022
Scale:	AS NOTED

Drawing Title:

ELECTRICAL LEGEND

Sheet No:

E0.1

CONSTRUCTION DOCUMENTS

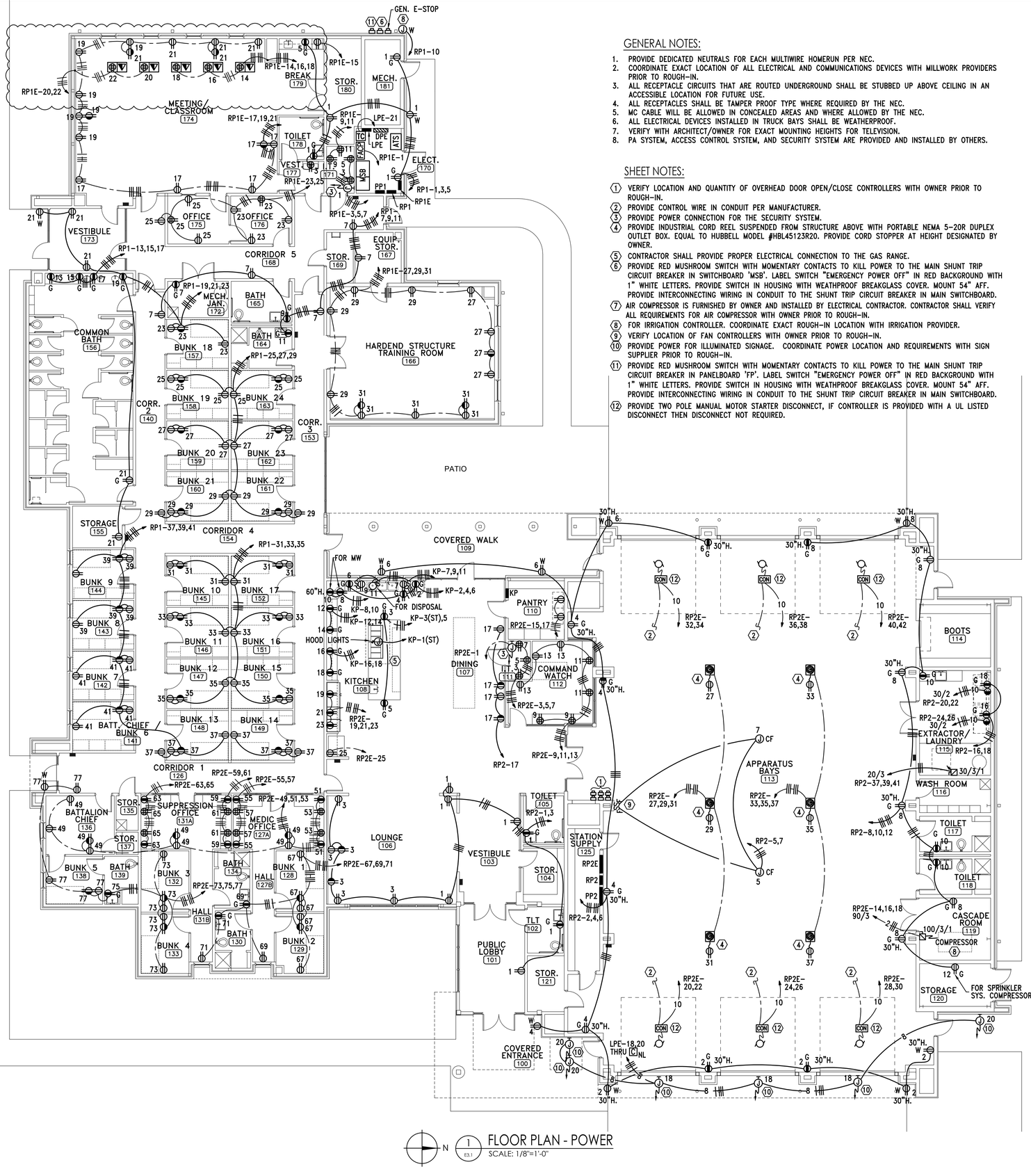
Gunn & Associates, P.C.
Consulting Engineers
3102 Highway 14
Millbrook, AL 36054
Tel: 334.285.1273
500 Southland Drive Suite 250
Hoover, AL 35226
GA#21-298

GENERAL NOTES:

1. PROVIDE DEDICATED NEUTRALS FOR EACH MULTIWIRE HOMERUN PER NEC.
2. COORDINATE EXACT LOCATION OF ALL ELECTRICAL AND COMMUNICATIONS DEVICES WITH MILLWORK PROVIDERS PRIOR TO ROUGH-IN.
3. ALL RECEPTACLE CIRCUITS THAT ARE ROUTED UNDERGROUND SHALL BE STUBBED UP ABOVE CEILING IN AN ACCESSIBLE LOCATION FOR FUTURE USE.
4. ALL RECEPTACLES SHALL BE TAMPER PROOF TYPE WHERE REQUIRED BY THE NEC.
5. MC CABLE WILL BE ALLOWED IN CONCEALED AREAS AND WHERE ALLOWED BY THE NEC.
6. ALL ELECTRICAL DEVICES INSTALLED IN TRUCK BAYS SHALL BE WEATHERPROOF.
7. VERIFY WITH ARCHITECT/OWNER FOR EXACT MOUNTING HEIGHTS FOR TELEVISION.
8. PA SYSTEM, ACCESS CONTROL SYSTEM, AND SECURITY SYSTEM ARE PROVIDED AND INSTALLED BY OTHERS.

SHEET NOTES:

1. VERIFY LOCATION AND QUANTITY OF OVERHEAD DOOR OPEN/CLOSE CONTROLLERS WITH OWNER PRIOR TO ROUGH-IN.
2. PROVIDE CONTROL WIRE IN CONDUIT PER MANUFACTURER.
3. PROVIDE POWER CONNECTION FOR THE SECURITY SYSTEM.
4. PROVIDE INDUSTRIAL CORD REEL SUSPENDED FROM STRUCTURE ABOVE WITH PORTABLE NEMA 5-20R DUPLEX OUTLET BOX. EQUAL TO HUBBELL MODEL #HBL45123R20. PROVIDE CORD STOPPER AT HEIGHT DESIGNATED BY OWNER.
5. CONTRACTOR SHALL PROVIDE PROPER ELECTRICAL CONNECTION TO THE GAS RANGE.
6. PROVIDE RED MUSHROOM SWITCH WITH MOMENTARY CONTACTS TO KILL POWER TO THE MAIN SHUNT TRIP CIRCUIT BREAKER IN SWITCHBOARD 'MSB'. LABEL SWITCH "EMERGENCY POWER OFF" IN RED BACKGROUND WITH 1" WHITE LETTERS. PROVIDE SWITCH IN HOUSING WITH WEATHPROOF BREAKGLASS COVER. MOUNT 54" AFF. PROVIDE INTERCONNECTING WIRING IN CONDUIT TO THE SHUNT TRIP CIRCUIT BREAKER IN MAIN SWITCHBOARD.
7. AIR COMPRESSOR IS FURNISHED BY OWNER AND INSTALLED BY ELECTRICAL CONTRACTOR. CONTRACTOR SHALL VERIFY ALL REQUIREMENTS FOR AIR COMPRESSOR WITH OWNER PRIOR TO ROUGH-IN.
8. FOR IRRIGATION CONTROLLER. COORDINATE EXACT ROUGH-IN LOCATION WITH IRRIGATION PROVIDER.
9. VERIFY LOCATION OF FAN CONTROLLERS WITH OWNER PRIOR TO ROUGH-IN.
10. PROVIDE POWER FOR ILLUMINATED SIGNAGE. COORDINATE POWER LOCATION AND REQUIREMENTS WITH SIGN SUPPLIER PRIOR TO ROUGH-IN.
11. PROVIDE RED MUSHROOM SWITCH WITH MOMENTARY CONTACTS TO KILL POWER TO THE MAIN SHUNT TRIP CIRCUIT BREAKER IN PANELBOARD 'FP'. LABEL SWITCH "EMERGENCY POWER OFF" IN RED BACKGROUND WITH 1" WHITE LETTERS. PROVIDE SWITCH IN HOUSING WITH WEATHPROOF BREAKGLASS COVER. MOUNT 54" AFF. PROVIDE INTERCONNECTING WIRING IN CONDUIT TO THE SHUNT TRIP CIRCUIT BREAKER IN MAIN SWITCHBOARD.
12. PROVIDE TWO POLE MANUAL MOTOR STARTER DISCONNECT, IF CONTROLLER IS PROVIDED WITH A UL LISTED DISCONNECT THEN DISCONNECT NOT REQUIRED.



FLOOR PLAN - POWER
SCALE: 1/8"=1'-0"

1/8" = 1'-0
8' 0 8 16 FT
GRAPHIC SCALE

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624 South McDonough Street
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GA#21-298

ALABAMA REGISTERED PROFESSIONAL ENGINEER KENNETH RAY GUNN, JR. NO. 26988 2-03-2023

NEW FIRE STATION NO. 10
FOR
THE CITY OF MONTGOMERY
SOUTH COURT STREET MONTGOMERY, ALABAMA 36104

REVISIONS		
No.	Description	Date
0	ISSUED FOR REVIEW	01/16/23
1	ISSUED FOR BID	02/03/23
2	ADDENDUM #6	03/24/23

MGM Project No.	SP-5-21
BDW Project No.	2021-118
Drawn By:	
Date:	11-15-2022
Scale:	AS NOTED

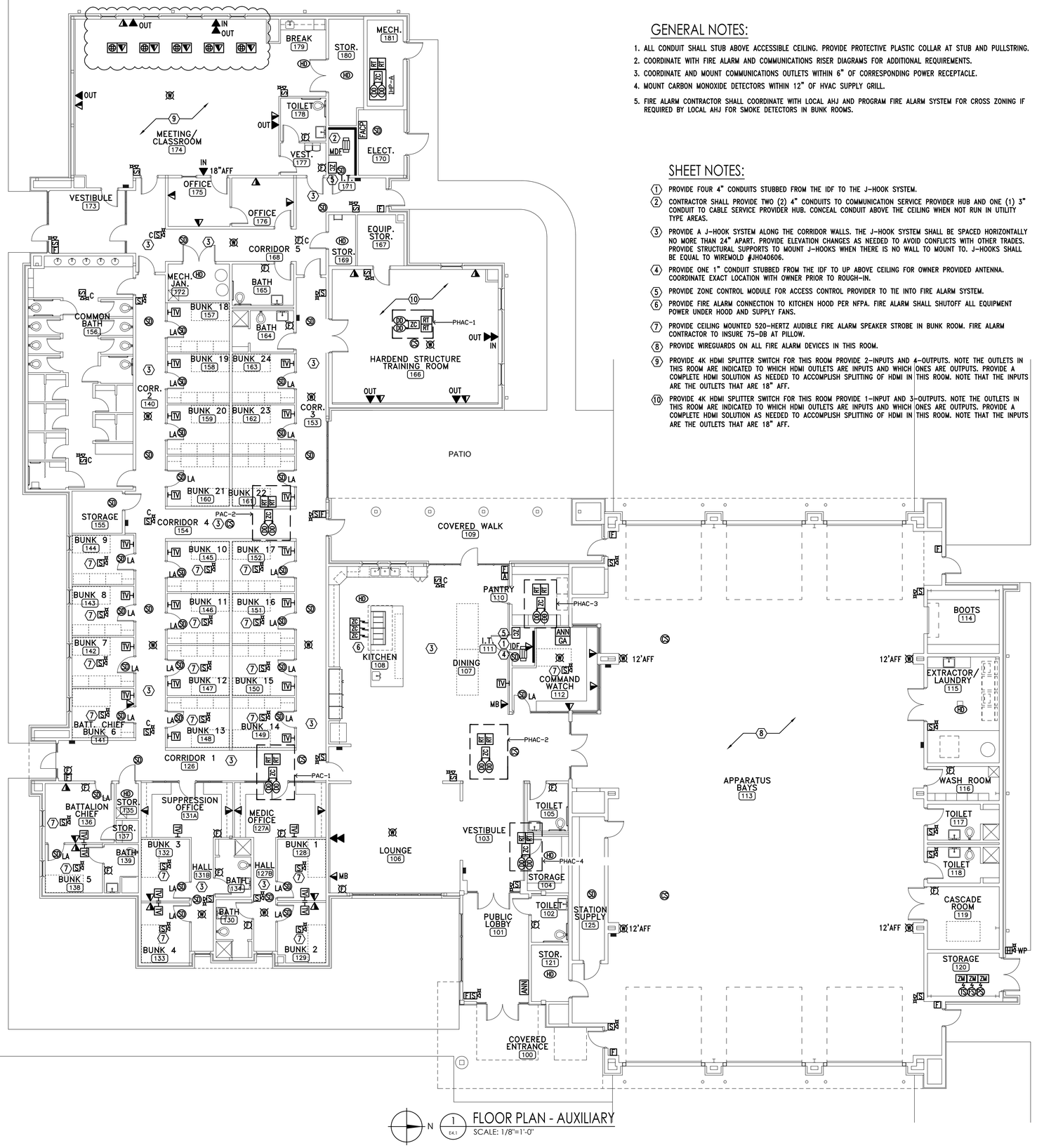
Drawing Title:

POWER PLAN

Sheet No:

E3.1

CONSTRUCTION DOCUMENTS



1 E4.1 FLOOR PLAN - AUXILIARY
SCALE: 1/8"=1'-0"

GENERAL NOTES:

1. ALL CONDUIT SHALL STUB ABOVE ACCESSIBLE CEILING. PROVIDE PROTECTIVE PLASTIC COLLAR AT STUB AND PULLSTRING.
2. COORDINATE WITH FIRE ALARM AND COMMUNICATIONS RISER DIAGRAMS FOR ADDITIONAL REQUIREMENTS.
3. COORDINATE AND MOUNT COMMUNICATIONS OUTLETS WITHIN 6" OF CORRESPONDING POWER RECEPTACLE.
4. MOUNT CARBON MONOXIDE DETECTORS WITHIN 12" OF HVAC SUPPLY GRILL.
5. FIRE ALARM CONTRACTOR SHALL COORDINATE WITH LOCAL AHJ AND PROGRAM FIRE ALARM SYSTEM FOR CROSS ZONING IF REQUIRED BY LOCAL AHJ FOR SMOKE DETECTORS IN BUNK ROOMS.

SHEET NOTES:

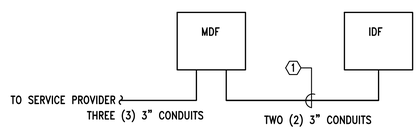
1. PROVIDE FOUR 4" CONDUITS STUBBED FROM THE IDF TO THE J-HOOK SYSTEM.
2. CONTRACTOR SHALL PROVIDE TWO (2) 4" CONDUITS TO COMMUNICATION SERVICE PROVIDER HUB AND ONE (1) 3" CONDUIT TO CABLE SERVICE PROVIDER HUB. CONCEAL CONDUIT ABOVE THE CEILING WHEN NOT RUN IN UTILITY TYPE AREAS.
3. PROVIDE A J-HOOK SYSTEM ALONG THE CORRIDOR WALLS. THE J-HOOK SYSTEM SHALL BE SPACED HORIZONTALLY NO MORE THAN 24" APART. PROVIDE ELEVATION CHANGES AS NEEDED TO AVOID CONFLICTS WITH OTHER TRADES. PROVIDE STRUCTURAL SUPPORTS TO MOUNT J-HOOKS WHEN THERE IS NO WALL TO MOUNT TO. J-HOOKS SHALL BE EQUAL TO WIREMOLD #JH040606.
4. PROVIDE ONE 1" CONDUIT STUBBED FROM THE IDF TO UP ABOVE CEILING FOR OWNER PROVIDED ANTENNA. COORDINATE EXACT LOCATION WITH OWNER PRIOR TO ROUGH-IN.
5. PROVIDE ZONE CONTROL MODULE FOR ACCESS CONTROL PROVIDER TO TIE INTO FIRE ALARM SYSTEM.
6. PROVIDE FIRE ALARM CONNECTION TO KITCHEN HOOD PER NFPA. FIRE ALARM SHALL SHUTOFF ALL EQUIPMENT POWER UNDER HOOD AND SUPPLY FANS.
7. PROVIDE CEILING MOUNTED 520-HERTZ AUDIBLE FIRE ALARM SPEAKER STROBE IN BUNK ROOM. FIRE ALARM CONTRACTOR TO INSURE 75-DB AT PILLOW.
8. PROVIDE WIREGUARDS ON ALL FIRE ALARM DEVICES IN THIS ROOM.
9. PROVIDE 4K HDMI SPLITTER SWITCH FOR THIS ROOM PROVIDE 2-INPUTS AND 4-OUTPUTS. NOTE THE OUTLETS IN THIS ROOM ARE INDICATED TO WHICH HDMI OUTLETS ARE INPUTS AND WHICH ONES ARE OUTPUTS. PROVIDE A COMPLETE HDMI SOLUTION AS NEEDED TO ACCOMPLISH SPLITTING OF HDMI IN THIS ROOM. NOTE THAT THE INPUTS ARE THE OUTLETS THAT ARE 18" AFF.
10. PROVIDE 4K HDMI SPLITTER SWITCH FOR THIS ROOM PROVIDE 1-INPUT AND 3-OUTPUTS. NOTE THE OUTLETS IN THIS ROOM ARE INDICATED TO WHICH HDMI OUTLETS ARE INPUTS AND WHICH ONES ARE OUTPUTS. PROVIDE A COMPLETE HDMI SOLUTION AS NEEDED TO ACCOMPLISH SPLITTING OF HDMI IN THIS ROOM. NOTE THAT THE INPUTS ARE THE OUTLETS THAT ARE 18" AFF.

RISER DIAGRAM KEYED NOTES:

1. CONTRACTOR SHALL PROVIDE A 6 STRAND OM1 (62.5/125) MULTIMODE FIBER OPTIC CABLE (OSP) INTERCONNECTING THE MDF TO THE IDF. PROVIDE LC TYPE CONNECTIONS.

COMMUNICATION NOTES:

1. PROVIDE 5/8" STRUT ASSEMBLY AT TOP AND BOTTOM OF TBB TO SUPPORT ALL CONDUITS TERMINATING AT BACKBOARD.
2. TBB SHALL BE 3/4" PLYWOOD EXTERIOR RATED AND CUT TO COVER ALL WALLS OR AS INDICATED. PAINT WITH TWO COATS OF FIRE RETARDENT PAINT. MOUNT 2' AFF.
3. PROVIDE A PLASTIC BUSHING OR PROTECTIVE COLLAR AT EACH CONDUIT TERMINATION, INCLUDING TERMINATIONS ABOVE THE CEILING, AT CABLE TRAY, OR AT TBB.
4. ALL CONDUIT TERMINATIONS SHOULD BE DONE EVENLY AT THE TOP AND BOTTOM OF TBB. TERMINATIONS SHALL BE MADE WITHIN THE FIRST FEW INCHES OF THE TBB.
5. SEAL ALL CONDUITS FROM THE EXTERIOR WITH A SEALING COMPOUND, ONCE ALL CABLING HAS BEEN INSTALLED.
6. PROVIDE GROUND BUS FOR EACH TBB. SEE GROUND BUS INSTALLATION DETAIL.
7. PROVIDE ALL CONDUITS WITH MINIMUM #800 MULE TAPE (PULL TAPE).
8. STENCIL ALL JUNCTION BOX COVERS ABOVE THE CEILING WITH 2" LETTERS THAT READ "COMM".
9. ELECTRICAL CONTRACTOR WILL BE RESPONSIBLE FOR ALL RACEWAYS, CABLE TRAY, CABLING, PATCH PANELS, TERMINATIONS, BACKBOARDS, ETC. SEE RISER DIAGRAM, DETAILS, AND SPECIFICATIONS FOR FURTHER EQUIPMENT REQUIREMENTS.
10. BOND RACK FRAMES, STRUT, CONDUITS, AND LADDER RACK TO THE GROUND BUS WITH MINIMUM SIZE WIRE OF #1/0.



2 E4.1 COMMUNICATIONS RISER DIGRAM
NO SCALE

1/8" = 1'-0
8' 0 8 16 FT
GRAPHIC SCALE

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ALABAMA REGISTERED
No. 26988
PROFESSIONAL
2-03-2023
ENGINEER
KENNETH RAY GUNN, JR.

NEW FIRE STATION NO. 10
FOR
THE CITY OF MONTGOMERY
SOUTH COURT STREET MONTGOMERY, ALABAMA 36104

REVISIONS		
No.	Description	Date
0	ISSUED FOR REVIEW	01/16/23
1	ISSUED FOR BID	02/03/23
2	ADDENDUM #6	03/24/23

MGM Project No.	SP-5-21
BDW Project No.	2021-118
Drawn By:	
Date:	11-15-2022
Scale:	AS NOTED

Drawing Title:

AUXILIARY PLAN

Sheet No:

E4.1

CONSTRUCTION DOCUMENTS

PANEL - MSB

TYPE: 1600A MB SWITCHBOARD | AIC: 65,000 AMPERES | MOUNTED: SURFACE | VOLTAGE: 120/208 VOLTS, 3 PHASE, 4 WIRE

CIRCUIT DIRECTORY	(VA) PER PHASE PHASE A	PHASE B	PHASE C	AMP	POLE	CIRCUIT NUMBER		AMP	POLE	(VA) PER PHASE PHASE A	PHASE B	PHASE C	CIRCUIT DIRECTORY
SPARE		=====	=====	125		1	2	125		9,180	=====	=====	PANEL KP
	=====		=====			3	4			=====	8,400	=====	
	=====	=====			3	5	6		3	=====	=====	6,200	
BUSSED SPACE		=====	=====	125		7	8	225			=====	=====	SPARE
	=====		=====			9	10			=====		=====	
	=====	=====			3	11	12		3	=====	=====		
PANEL 'RP1'	7,600	=====	=====	225		13	14	225		10,600	=====	=====	PANEL 'RP2'
	=====	7,600	=====			15	16			=====	8,400	=====	
	=====	=====	8,780		3	17	18		3	=====	=====	8,600	
BUSSED SPACE		=====	=====	225		19	20	225			=====	=====	BUSSED SPACE
	=====		=====			21	22			=====		=====	
	=====	=====			3	23	24		3	=====	=====		
PANEL PP1	44,325	=====	=====	600		25	26	600		53,285	=====	=====	PANEL PP2
	=====	43,065	=====			27	28			=====	51,000	=====	
	=====	=====	43,065		3	29	30		3	=====	=====	52,205	
ATS-DPE	62,165	=====	=====	800		31	32	800			=====	=====	BUSSED SPACE
	=====	62,860	=====			33	34			=====		=====	
	=====	=====	63,860		3	35	36		3	=====	=====		
SUB TOTAL (VA)	114,090	113,525	115,705							73,065	67,800	67,005	SUB TOTAL (VA)

TOTAL LOAD PHASE A: 187,155 (VA)
TOTAL LOAD PHASE B: 181,325 (VA)
TOTAL LOAD PHASE C: 182,710 (VA)
TOTAL LOAD: 551,190 (VA) = 1531 AMPS

NOTES:
1. PROVIDE SHUNT TRIP MAIN BREAKER
2. PROVIDE PANEL WITH INTERGRAL TVSS UNIT, 125K PER MODE PROTECTION.
3. PROVIDE NAMEPLATES PER DETAILS 2/E5.2.
4. MAIN BREAKER TO BE RATED AT 100%.
5. SWITCHBOARD TO BE U.L. SERVICE ENTRANCE RATED.

PROVIDE TVSS UNIT THAT IS COMPATIBLE WITH LIGHTNING PROTECTION U.L. MASTER LABEL.

PANEL - PP1

TYPE: 600 AMP MAIN LUG | AIC: 65,000 AMPERES | MOUNTED: SURFACE | VOLTAGE: 120/208 VOLTS, 3 PHASE, 4 WIRE

CIRCUIT DIRECTORY	(VA) PER PHASE PHASE A	PHASE B	PHASE C	AMP	POLE	CIRCUIT NUMBER		AMP	POLE	(VA) PER PHASE PHASE A	PHASE B	PHASE C	CIRCUIT DIRECTORY
IHP-A	9,655	=====	=====	125		1	2	40		3,120	=====	=====	PHAC-1
	=====	9,655	=====			3	4			=====	3,120	=====	
	=====	=====	9,655		3	5	6		3	=====	=====	3,120	
OHP-A	4,380	=====	=====	50		7	8	100		11,640	=====	=====	PAC-2
	=====	4,380	=====			9	10			=====	11,640	=====	
	=====	=====	4,380		3	11	12		3	=====	=====	11,640	
DHPO-1	1,260	=====	=====	20		13	14	50	1		=====	=====	BUSSED SPACE
	=====	1,260	=====		2	15	16	50	1	=====		=====	BUSSED SPACE
DHPO-2	=====	=====	1,260	20		17	18	50	1	=====	=====		BUSSED SPACE
	1,260	=====	=====		2	19	20	50	1		=====	=====	BUSSED SPACE
BUSSED SPACE	=====		=====	50	1	21	22	50	1	=====		=====	BUSSED SPACE
BUSSED SPACE	=====	=====		50	1	23	24	50	1	=====	=====		BUSSED SPACE
VAV-2-1	2,000	=====	=====	30		25	26	30		2,670	=====	=====	VAV-2-4
	=====	2,000	=====			27	28			=====	2,670	=====	
	=====	=====	2,000		3	29	30		3	=====	=====	2,670	
VAV-2-2	1,670	=====	=====	20		31	32	30		2,335	=====	=====	VAV-2-5
	=====	1,670	=====			33	34			=====	2,335	=====	
	=====	=====	1,670		3	35	36		3	=====	=====	2,335	
VAV-2-3	2,000	=====	=====	30		37	38	30		2,335	=====	=====	VAV-2-6
	=====	2,000	=====			39	40			=====	2,335	=====	
	=====	=====	2,000		3	41	42		3	=====	=====	2,335	
SUB TOTAL (VA)	22,225	20,965	20,965							22,100	22,100	22,100	SUB TOTAL (VA)

TOTAL LOAD PHASE A: 44,325 (VA)
TOTAL LOAD PHASE B: 43,065 (VA)
TOTAL LOAD PHASE C: 43,065 (VA)
TOTAL LOAD: 130,455 (VA) = 362 AMPS

NOTES:
1. PANELBOARD TO BE BOLT-ON TYPE WITH DOOR-IN-DOOR CONSTRUCTION.
2. PROVIDE NAMEPLATE PER DETAIL 1/E5.2.

PANEL - PP2

TYPE: 600 AMP MAIN LUG | AIC: 65,000 AMPERES | MOUNTED: SURFACE | VOLTAGE: 120/208 VOLTS, 3 PHASE, 4 WIRE

CIRCUIT DIRECTORY	(VA) PER PHASE PHASE A	PHASE B	PHASE C	AMP	POLE	CIRCUIT NUMBER		AMP	POLE	(VA) PER PHASE PHASE A	PHASE B	PHASE C	CIRCUIT DIRECTORY
PAC-1	8,040	=====	=====	70		1	2	90		8,640	=====	=====	PHAC-3
	=====	8,040	=====			3	4			=====	8,640	=====	
	=====	=====	8,040		3	5	6		3	=====	=====	8,640	
PHAC-2	7,680	=====	=====	90		7	8	90		8,640	=====	=====	PHAC-4
	=====	7,680	=====			9	10			=====	8,640	=====	
	=====	=====	7,680		3	11	12		3	=====	=====	8,640	
CCHPO-A	2,340	=====	=====	30		13	14	20		1,670	=====	=====	VAV-1-4
	=====	2,340	=====		2	15	16			=====	1,670	=====	
CCHPO-B	=====	=====	1,680	20		17	18		3	=====	=====	1,670	
	1,680	=====	=====		2	19	20	20		1,000	=====	=====	VAV-1-5
DHPO-3	=====	1,260	=====	20		21	22			=====	1,000	=====	
	=====	=====	1,260		2	23	24		3	=====	=====	1,000	
VAV-1-1	500	=====	=====	20		25	26	30		2,000	=====	=====	VAV-1-6
	=====	500	=====			27	28			=====	2,000	=====	
	=====	=====	500		3	29	30		3	=====	=====	2,000	
VAV-1-2	1,000	=====	=====	20		31	32	30		2,335	=====	=====	VAV-1-7
	=====	1,000	=====			33	34			=====	2,335	=====	
	=====	=====	1,000		3	35	36		3	=====	=====	2,335	
VAV-1-3	2,000	=====	=====	30		37	38	20		670	=====	=====	VAV-1-8
	=====	2,000	=====			39	40			=====	670	=====	
	=====	=====	2,000		3	41	42		3	=====	=====	670	
EUH-1	1,100	=====	=====	20		43	44	20		1,100	=====	=====	EUH-2
	=====	1,100	=====			45	46			=====	1,100	=====	
	=====	=====	1,100		3	47	48		3	=====	=====	1,100	
SPARE		=====	=====	20		49	50	20			=====	=====	SPARE
	=====		=====		2	51	52		2	=====		=====	
EUH-4	=====	=====	1,155	20		53	54	20		=====	=====	1,735	EUH-3
	1,155	=====	=====		2	55	56		2	1,735	=====	=====	
SPARE	=====		=====	20	1	57	58	20	1	=====	1,025	=====	EF'S 9-13
SPARE	=====	=====		20	1	59	60	20	1	=====	=====		SPARE
BUSSED SPACE		=====	=====	50	1	61	62	50	1		=====	=====	BUSSED SPACE
BUSSED SPACE	=====		=====	50	1	63	64	50	1	=====		=====	BUSSED SPACE
BUSSED SPACE	=====	=====		50	1	65	66	50	1	=====	=====		BUSSED SPACE
BUSSED SPACE		=====	=====	50	1	67	68	50	1		=====	=====	BUSSED SPACE
BUSSED SPACE	=====		=====	50	1	69	70	50	1	=====		=====	BUSSED SPACE
BUSSED SPACE	=====	=====		50	1	71	72	50	1	=====	=====		BUSSED SPACE
BUSSED SPACE		=====	=====	50	1	73	74	50	1		=====	=====	BUSSED SPACE
BUSSED SPACE	=====		=====	50	1	75	76	50	1	=====		=====	BUSSED SPACE
BUSSED SPACE	=====	=====		50	1	77	78	50	1	=====	=====		BUSSED SPACE
BUSSED SPACE		=====	=====	50	1	79	80	50	1		=====	=====	BUSSED SPACE
BUSSED SPACE	=====		=====	50	1	81	82	50	1	=====		=====	BUSSED SPACE
BUSSED SPACE	=====	=====		50	1	83	84	50	1	=====	=====		BUSSED SPACE
SUB TOTAL (VA)	25,495	23,920	24,415							27,790	27,080	27,790	SUB TOTAL (VA)

TOTAL LOAD PHASE A: 53,285 (VA)
TOTAL LOAD PHASE B: 51,000 (VA)
TOTAL LOAD PHASE C: 52,205 (VA)
TOTAL LOAD: 156,490 (VA) = 435 AMPS

NOTES:
1. PANELBOARD TO BE BOLT-ON TYPE WITH DOOR-IN-DOOR CONSTRUCTION.
2. PROVIDE NAMEPLATE PER DETAIL 1/E5.2.

PANEL - RP1

TYPE: 225 AMP MAIN LUGS | AIC: 65,000 AMPERES | MOUNTED: SURFACE | VOLTAGE: 120/208 VOLTS, 3 PHASE, 4 WIRE

CIRCUIT DIRECTORY	(VA) PER PHASE PHASE A	PHASE B	PHASE C	AMP	POLE	CIRCUIT NUMBER		AMP	POLE	(VA) PER PHASE PHASE A	PHASE B	PHASE C	CIRCUIT DIRECTORY
GENERAL REC	600	=====	=====	20	1	1	2	20	1	600	=====	=====	GAS WH-1 & 2 & TC
EWC (NOTE 3)	=====	1,200	=====	20	1	3	4	20	1	=====	600	=====	CP-1
COFFEE	=====	=====	1,800	20	1	5	6	30	1	=====	=====	1,680	EF-2
GENERAL REC	1,200	=====	=====	20	1	7	8	20	1	1,000	=====	=====	ROOF REC
BATH REC	=====	1,200	=====	20	1	9	10	20	1	=====	400	=====	IRRIGATION
BATH REC	=====	=====	1,200	20	1	11	12	20	1	=====	=====	500	UV LTS & DAMPER
BATH REC	1,200	=====	=====	20	1	13	14	20	1		=====	=====	SPARE
BATH REC	=====	1,200	=====	20	1	15	16	20	1	=====		=====	SPARE
BATH REC	=====	=====	1,200	20	1	17	18	20	1	=====	=====		SPARE
GENERAL REC	1,200	=====	=====	20	1	19	20	20	1		=====	=====	SPARE
BATH REC	=====	1,200	=====	20	1	21	22	20	1	=====		=====	SPARE
BUNK REC	=====	=====	600	20	1	23	24	20	1	=====	=====		SPARE
BUNK REC	600	=====	=====	20	1	25	26	50	1		=====	=====	BUSSED SPACE
BUNK REC	=====	600	=====	20	1	27	28	50	1	=====		=====	BUSSED SPACE
BUNK REC	=====	=====	600	20	1	29	30	50	1	=====	=====		BUSSED SPACE
BUNK REC	600	=====	=====	20	1	31	32	50	1		=====	=====	BUSSED SPACE
BUNK REC	=====	600	=====	20	1	33	34	50	1	=====		=====	BUSSED SPACE
BUNK REC	=====	=====	600	20	1	35	36	50	1	=====	=====		BUSSED SPACE
BUNK REC	600	=====	=====	20	1	37	38	50	1		=====	=====	BUSSED SPACE
BUNK REC	=====	600	=====	20	1	39	40	50	1	=====		=====	BUSSED SPACE
BUNK REC	=====	=====	600	20	1	41	42	50	1	=====	=====		BUSSED SPACE
SUB TOTAL (VA)	6,000	6,600	6,600							1,600	1,000	2,180	SUB TOTAL (VA)

TOTAL LOAD PHASE A: 7,600 (VA)
TOTAL LOAD PHASE B: 7,600 (VA)
TOTAL LOAD PHASE C: 8,780 (VA)
TOTAL LOAD: 23,980 (VA) = 67 AMPS

NOTES:
1. PANELBOARD TO BE BOLT-ON TYPE WITH DOOR-IN-DOOR CONSTRUCTION.
2. PROVIDE NAMEPLATE PER DETAIL 1/E5.2.
3. PROVIDE GFI TYPE BREAKER.

PANEL - RP2

TYPE: 225 AMP MAIN LUGS | AIC: 65,000 AMPERES | MOUNTED: SURFACE | VOLTAGE: 120/208 VOLTS, 3 PHASE, 4 WIRE

CIRCUIT DIRECTORY	(VA) PER PHASE PHASE A	PHASE B	PHASE C	AMP	POLE	CIRCUIT NUMBER		AMP	POLE	(VA) PER PHASE PHASE A	PHASE B	PHASE C	CIRCUIT DIRECTORY
GEN REC	1,400	=====	=====	20	1	1	2	20	1	800	=====	=====	GEN REC
LOUNGE REC	=====	1,200	=====	20	1	3	4	20	1	=====	1,000	=====	GEN REC
BIG ASS FAN	=====	=====	1,200	20	1	5	6	20	1	=====	=====	1,000	GEN REC
BIG ASS FAN	1,200	=====	=====	20	1	7	8	20	1	800	=====	=====	GEN REC
GAS WH-3 & TC	=====	600	=====	20	1	9	10	20	1	=====	600	=====	BAY TOILET REC
CP-2	=====	=====	600	20	1	11	12	20	1	=====	=====	800	GEN REC
SPARE		=====	=====	20	1	13	14	20	1		=====	=====	SPARE
SPARE	=====		=====	20	1	15	16	20	1	=====	1,200	=====	WASH MACH
SPARE	=====	=====		20	1	17	18	20	1	=====	=====	1,200	WASH MACH
SPARE		=====	=====	20	1	19	20	30		2,600	=====	=====	DRYER
SPARE	=====		=====	20	1	21	22		2	=====	2,600	=====	
SPARE	=====	=====		20	1	23	24	30		=====	=====	2,600	DRYER
BUSSED SPACE		=====	=====	50	1	25	26		2	2,600	=====	=====	
BUSSED SPACE	=====		=====	50	1	27	28	50	1	=====		=====	BUSSED SPACE
BUSSED SPACE	=====	=====		50	1	29	30	50	1	=====	=====		BUSSED SPACE
BUSSED SPACE		=====	=====	50	1	31	32	50	1		=====	=====	BUSSED SPACE
BUSSED SPACE	=====		=====	50	1	33	34	50	1	=====		=====	BUSSED SPACE
BUSSED SPACE	=====	=====		50	1	35	36	50	1	=====	=====		BUSSED SPACE
EXTRACTOR	1,200	=====	=====	20		37	38	50	1		=====	=====	BUSSED SPACE
	=====	1,200	=====			39	40	50	1	=====		=====	BUSSED SPACE
	=====	=====	1,200		3	41	42	50	1	=====	=====		BUSSED SPACE
SUB TOTAL (VA)	3,800	3,000	3,000							6,800	5,400	5,600	SUB TOTAL (VA)

TOTAL LOAD PHASE A: 10,600 (VA)
TOTAL LOAD PHASE B: 8,400 (VA)
TOTAL LOAD PHASE C: 8,600 (VA)
TOTAL LOAD: 27,600 (VA) = 77 AMPS

NOTES:
1. PANELBOARD TO BE BOLT-ON TYPE WITH DOOR-IN-DOOR CONSTRUCTION.
2. PROVIDE NAMEPLATE PER DETAIL 1/E5.2.
3. PROVIDE GFI TYPE BREAKER.

PANEL - KP

TYPE: 125A MAIN LUG | AIC: 65,000 AMPERES | MOUNTED: SURFACE | VOLTAGE: 120/208 VOLTS, 3 PHASE, 4 WIRE

CIRCUIT DIRECTORY	(VA) PER PHASE PHASE A	PHASE B	PHASE C	AMP	POLE	CIRCUIT NUMBER		AMP	POLE	(VA) PER PHASE PHASE A	PHASE B	PHASE C	CIRCUIT DIRECTORY
HOOD LIGHTS (NOTE 4)	300	=====	=====	20	1	1	2	20	1	1,800	=====	=====	COFFEE
ISLAND REC (NOTE 4)	=====	1,200	=====	20	1	3	4	20	1	=====	1,800	=====	KIT REC
ISLAND REC	=====	=====	1,200	20	1	5	6	20	1	=====	=====	1,800	KIT REC
DISHWASHER	1,200	=====	=====	30	1	7	8	20	1	1,800	=====	=====	MICROWAVE (NOTE 3)
DISHWASHER	=====	1,200	=====	30	1	9	10	20	1	=====	1,800	=====	MICROWAVE (NOTE 3)
DISPOSAL	=====	=====	800	20	1	11	12	20	1	=====	=====	1,800	KIT REC
HOOD EF-6	1,680	=====	=====	30	1	13	14	20	1	1,800	=====	=====	KIT REC
SPARE	=====		=====	20	1	15	16	20	1	=====	1,800	=====	KIT REC
SPARE	=====	=====		20	1	17	18	20	1	=====	=====		KIT REC
MAU-1	600	=====	=====	15		19	20	20	1		=====	=====	SPARE
	=====	600	=====			21	22	20	1	=====		=====	SPARE
	=====	=====	600		3	23	24	20	1	=====	=====		SPARE
SPACE WITH BUSSING		=====	=====	50	1	25	26	50	1		=====	=====	SPACE WITH BUSSING
SPACE WITH BUSSING	=====		=====	50	1	27	28	50	1	=====		=====	SPACE WITH BUSSING
SPACE WITH BUSSING	=====	=====		50	1	29	30	50	1	=====	=====		SPACE WITH BUSSING
SPACE WITH BUSSING		=====	=====	50	1	31	32	50	1		=====	=====	SPACE WITH BUSSING
SPACE WITH BUSSING	=====		=====	50	1	33	34	50	1	=====		=====	SPACE WITH BUSSING
SPACE WITH BUSSING	=====	=====		50	1	35	36	50	1	=====	=====		SPACE WITH BUSSING
SPACE WITH BUSSING		=====	=====	50	1	37	38	50	1		=====	=====	SPACE WITH BUSSING
SPACE WITH BUSSING	=====		=====	50	1	39	40	50	1	=====		=====	SPACE WITH BUSSING
SPACE WITH BUSSING	=====	=====		50	1	41	42	50	1	=====	=====		SPACE WITH BUSSING
SUB TOTAL (VA)	3,780	3,000	2,600							5,400	5,400	3,600	SUB TOTAL (VA)

TOTAL LOAD PHASE A: 9,180 (VA)
TOTAL LOAD PHASE B: 8,400 (VA)
TOTAL LOAD PHASE C: 6,200 (VA)
TOTAL LOAD: 23,780 (VA) = 66 AMPS

NOTES:
1. PANELBOARD TO BE BOLT-ON TYPE WITH DOOR-IN-DOOR CONSTRUCTION.
2. PROVIDE NAMEPLATE PER DETAIL 1/E5.2.
3. PROVIDE GFI TYPE BREAKER.
4. PROVIDE SHUNT TRIP BREAKER.

PANEL - DPE

TYPE: 800 AMP MAIN BREAKER | AIC: 65,000 AMPERES | MOUNTED: SURFACE | VOLTAGE: 120/208 VOLTS, 3 PHASE, 4 WIRE

CIRCUIT DIRECTORY	(VA) PER PHASE PHASE A	PHASE B	PHASE C	AMP	POLE	CIRCUIT NUMBER		AMP	POLE	(VA) PER PHASE PHASE A	PHASE B	PHASE C	CIRCUIT DIRECTORY
PANEL 'RP1E'	15,200	=====	=====	225		1	2	225			=====	=====	BUSSED SPACE
	=====	16,800	=====			3	4			=====		=====	
	=====	=====	15,800		3	5	6		3	=====	=====		
PANEL 'LPE'	7,240	=====	=====	125		7	8	100		9,600	=====	=====	PANEL 'FP'
	=====	6,240	=====			9	10			=====	9,600	=====	
	=====	=====	7,780		3	11	12		3	=====	=====	9,600	
BUSSED SPACE		=====	=====	125		13	14	125			=====	=====	BUSSED SPACE
	=====		=====			15	16			=====		=====	
	=====	=====			3	17	18		3	=====	=====		
BUSSED SPACE		=====	=====	225		19	20	225			=====	=====	BUSSED SPACE
	=====		=====			21	22			=====		=====	
	=====	=====			3	23	24		3	=====	=====		
BUSSED SPACE		=====	=====	400		25	26	400		28,925	=====	=====	PANEL 'RP2E'
	=====		=====			27	28			=====	27,200	=====	
	=====	=====			3	29	30		3	=====	=====	27,800	
SUB TOTAL (VA)	22,440	23,040	23,580							38,525	36,800	37,400	SUB TOTAL (VA)

TOTAL LOAD PHASE A: 60,965 (VA)
TOTAL LOAD PHASE B: 59,840 (VA)
TOTAL LOAD PHASE C: 60,980 (VA)
TOTAL LOAD: 181,785 (VA) = 505 AMPS

NOTES:
1. PANELBOARD TO BE BOLT-ON TYPE WITH DOOR-IN-DOOR CONSTRUCTION.
2. PROVIDE PANEL WITH INTERGRAL TVSS UNIT, 125K PER MODE PROTECTION.
3. PROVIDE NAMEPLATES PER DETAILS 1/E5.2.

PANEL - LPE

TYPE: 125 AMP MAIN LUGS | AIC: 65,000 AMPERES | MOUNTED: SURFACE | VOLTAGE: 120/208 VOLTS, 3 PHASE, 4 WIRE

CIRCUIT DIRECTORY	(VA) PER PHASE PHASE A	PHASE B	PHASE C	AMP	POLE	CIRCUIT NUMBER		AMP	POLE	(VA) PER PHASE PHASE A	PHASE B	PHASE C	CIRCUIT DIRECTORY
TRUCK BAY LTS	1,700	=====	=====	20	1	1	2	20	1	800	=====	=====	SECURITY LIGHTS
TRUCK BAY LTS	=====	1,650	=====	20	1	3	4	20	1	=====	250	=====	BLDG LIGHTS
STOR/LAUNDRY/TLT. LTS	=====	=====	1,600	20	1	5	6	20	1	=====	=====	250	SECURITY LIGHTS
KIT/LOUNGE/VEST LTS	1,400	=====	=====	20	1	7	8	20	1	400	=====	=====	BLDG LIGHTS
OFFICER'S QTRS LTS	=====	1,340	=====	20	1	9	10	20	1	=====	200	=====	FLAGPOLE LIGHT
CORRIDOR LTS	=====	=====	1,600	20	1	11	12	20	1	=====	=====	800	SITE LIGHTS
BUNK LTS	1,050	=====	=====	20	1	13	14	20	1	960	=====	=====	SITE LIGHTS
BATH/BUNK LTS	=====	1,120	=====	20	1	15	16	20	1	=====	600	=====	IRRIGATION
MEETING LTS	=====	=====	1,730	20	1	17	18	20	1	=====	=====	1,800	BUILDING SIGNAGE
TRAINING LTS	450	=====	=====	20	1	19	20	20	1	480	=====	=====	FRONT TOWER TAPE LIGHT
TIMECLOCK	=====	600	=====	20	1	21	22	20	1	=====	500	=====	FRONT TOWER INT. LIGHTS
SPARE	=====	=====		20	1	23	24	20	1	=====	=====	480	SIDE TOWER TAPE LIGHT
SPARE		=====	=====	20	1	25	26	20	1		=====	=====	SPARE
SPARE	=====		=====	20	1	27	28	20	1	=====		=====	SPARE
SPARE	=====	=====		20	1	29	30	20	1	=====	=====		SPARE
BUSSED SPACE		=====	=====	50	1	31	32	50	1		=====	=====	BUSSED SPACE
BUSSED SPACE	=====		=====	50	1	33	34	50	1	=====		=====	BUSSED SPACE
BUSSED SPACE	=====	=====		50	1	35	36	50	1	=====	=====		BUSSED SPACE
BUSSED SPACE		=====	=====	50	1	37	38	50	1		=====	=====	BUSSED SPACE
BUSSED SPACE	=====		=====	50	1	39	40	50	1	=====		=====	BUSSED SPACE
BUSSED SPACE	=====	=====		50	1	41	42	50	1	=====	=====		BUSSED SPACE
SUB TOTAL (VA)	4,600	4,710	4,930							2,640	1,550	3,330	SUB TOTAL (VA)

TOTAL LOAD PHASE A: 7,240 (VA)
TOTAL LOAD PHASE B: 6,260 (VA)
TOTAL LOAD PHASE C: 8,260 (VA)
TOTAL LOAD: 21,760 (VA) = 60 AMPS

NOTES:
1. PANELBOARD TO BE BOLT-ON TYPE WITH DOOR-IN-DOOR CONSTRUCTION.
2. PROVIDE NAMEPLATE PER DETAIL 1/E5.2.

PANEL - RP1E

TYPE: 225 AMP MAIN LUGS | AIC: 65,000 AMPERES | MOUNTED: SURFACE | VOLTAGE: 120/208 VOLTS, 3 PHASE, 4 WIRE

CIRCUIT DIRECTORY	(VA) PER PHASE PHASE A	PHASE B	PHASE C	AMP	POLE	CIRCUIT NUMBER		AMP	POLE	(VA) PER PHASE PHASE A	PHASE B	PHASE C	CIRCUIT DIRECTORY
FACP (NOTE 4)	600	=====	=====	20	1	1	2	30		2,800	=====	=====	UPS
SECURITY SYSTEM	=====	600	=====	20	1	3	4		2	=====	2,800	=====	
IT REC	=====	=====	600	20	1	5	6	30		=====	=====	2,800	UPS
IT REC	600	=====	=====	20	1	7	8		2	2,800	=====	=====	
IT REC	=====	600	=====	20	1	9	10	30	1	=====	2,600	=====	UPS
IT REC	=====	=====	600	20	1	11	12	30	1	=====	=====	2,600	UPS
IT REC	600	=====	=====	20	1	13	14	20	1	1,200	=====	=====	FLOOR OUTLET
REFRIG (NOTE 5)	=====	1,800	=====	20	1	15	16	20	1	=====	1,200	=====	FLOOR OUTLET
CLASSROOM REC	=====	=====	1,200	20	1	17	18	20	1	=====	=====	1,200	FLOOR OUTLET
CLASSROOM REC	1,200	=====	=====	20	1	19	20	20	1	1,200	=====	=====	FLOOR OUTLET
CLASSROOM REC	=====	1,200	=====	20	1	21	22	20	1	=====	1,200	=====	FLOOR OUTLET
OFFICE REC	=====	=====	1,200	20	1	23	24	20	1	=====	=====	1,200	SPARE
OFFICE REC	1,200	=====	=====	20	1	25	26	20	1		=====	=====	SPARE
TRAINING REC	=====	1,200	=====	20	1	27	28	20	1	=====		=====	SPARE
TRAINING REC	=====	=====	1,200	20	1	29	30	20	1	=====	=====		SPARE
TRAINING REC	1,200	=====	=====	20	1	31	32	50	1		=====	=====	BUSSED SPACE
SMOKE DETECT. (NOTE 4)	=====	600	=====	20	1	33	34	50	1	=====		=====	BUSSED SPACE
GEN. RECEPT.	=====	=====	200	20	1	35	36	50	1	=====	=====		BUSSED SPACE
GEN. BATTERY CHARGER	600	=====	=====	20	1	37	38	50	1		=====	=====	BUSSED SPACE
GEN. JACKET HEATER	=====	1,800	=====	20		39	40	50	1	=====		=====	BUSSED SPACE
	=====	=====	1,800		2	41	42	50	1	=====	=====		BUSSED SPACE
SUB TOTAL (VA)	6,000	7,800	6,800							8,000	7,800	7,800	SUB TOTAL (VA)

TOTAL LOAD PHASE A: 14,000 (VA)
TOTAL LOAD PHASE B: 15,600 (VA)
TOTAL LOAD PHASE C: 14,600 (VA)
TOTAL LOAD: 44,200 (VA) = 123 AMPS

NOTES:
1. PANELBOARD TO BE BOLT-ON TYPE WITH DOOR-IN-DOOR CONSTRUCTION.
2. PROVIDE NAMEPLATE PER DETAIL 1/E5.2.
3. PROVIDE LABEL ON EXTERIOR OF ENCLOSURE STATING "FACP".
4. PROVIDE RED HANDLE LOCK-ON DEVICE.
5. PROVIDE GFI TYPE BREAKER.

Gunn & Associates, P.C.
Consulting Engineers
3102 Highway 14
Millbrook, AL 36054
Tel: 334.285.1273
500 Southland Drive Suite 250
Hoover, AL 35226
GA#21-298

Barganier
Davis
Williams
Architects
Associated

bdw architects

624 South McDonough Street
Montgomery, AL 36104

phone: 334.834.2038
www.bdwarchitects.com

ALABAMA REGISTERED PROFESSIONAL ENGINEER
NO. 26988
KENNETH RAY GUNN JR.
2-03-2023

NEW FIRE STATION NO. 10
FOR
THE CITY OF MONTGOMERY
SOUTH COURT STREET MONTGOMERY, ALABAMA 36104

REVISIONS

No.	Description	Date
0	ISSUED FOR REVIEW	01/16/23
1	ISSUED FOR BID	02/03/23
2	ADDENDUM #6	03/24/23

MGM Project No. SP-5-21
BDW Project No. 2021-118
Drawn By:
Date: 11-15-2022
Scale: AS NOTED

Drawing Title:
PANELBOARD SCHEDULES

Sheet No:
E5.1

CONSTRUCTION DOCUMENTS

ADVERTISEMENT FOR BIDS

Sealed proposals will be received by _____
(Owner's legal title)

at the office of _____
(Name and address of Owner's authorized representative)

until _____ CST _____ for
(Hours) (Month), (Day), (Year)

(Description of the work to be inserted here):

at which time and place they will be publicly opened and read.

A cashier's check or bid bond payable to _____
(Owner's legal title)

in an amount not less than five (5) percent of the amount of the bid, but in no event more than $10,000, must accompany the bidder's proposal. Performance and Payment Bonds and evidence of insurance required in the bid documents will be required at the signing of the Contract.

Drawings and specifications may be examined at the office of _____

_____
(Owner's representative and address)

and _____
(appropriate plan rooms; i.e., F. W. Dodge, Builders Exchange, Construction Market Data, etc.).

Bid Documents may be obtained from the Architect (Engineer) upon deposit of $_____ per set, which will be refunded in full on the first _____sets issued to each general contract bidder submitting a bonafide bid, upon return of documents in good condition within ten days of bid date. Other sets for general contractors, and sets for subcontractors and dealers, may be obtained with the same deposit, which will be refunded as above, less cost of printing, reproduction, handling, and distribution.

(If applicable) Only general contractors who have been approved to bid pursuant to prequalification procedures and criteria established by the Owner will be eligible to bid for the Project. Written prequalification procedures and criteria are available for review at the office of _____.
(Owner's or Architect's/Engineer's representative and address)

Bids must be submitted on proposal forms furnished by the Architect (Engineer) or copies thereof. All bidders bidding in amounts exceeding that established by the State Licensing Board for General Contractors must be licensed under the provisions of Title 34, Chapter 8, Code of Alabama, 1975, and must show evidence of license before bidding or bid will not be received or considered by the Architect (Engineer); the bidder shall show such evidence by clearly displaying his or her current license number on the outside of the sealed envelope in which the proposal is delivered. The Owner reserves the right to reject any or all proposals and to waive technical errors if, in the Owner's judgement, the best interests of the Owner will thereby be promoted.

_____
(Awarding Authority/Owner)

_____
(Local Awarding Authority/Local Owner)

_____
(Architect/Engineer)

NOTE: For projects exceeding $50,000, this notice must be run once a week for three successive weeks in a newspaper of general circulation published in the City of Montgomery. If the project involves an estimated amount exceeding $500,000, this notice must also run at least once in three newspapers of general circulation throughout the state. Proof of publication is required.

BID BOND FORM

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned:

_____ Principal;

and _____ as Surety, are hereby held and firmly bound unto City of Montgomery hereinafter called the "Owner", in the sum of:

_____ Dollars ($_____)

for the payment of which sum well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors, and assigns. Said amount is five percent (5%) of amount bid (maximum amount of - $50,000.00).

The condition of the above obligation is such that whereas the Principal has submitted to the Owner a certain Bid, attached hereto and hereby made a part hereof, to enter into a contract in writing, for:

_____

_____

NOW, THEREFORE,

(a) If said Bid shall be rejected, or in the alternate,

(b) If said Bid shall be accepted and the Principal shall execute and deliver a Contract in the Form of Agreement attached hereto and shall execute and deliver Performance and Payment Bonds in the Forms attached hereto (all properly completed in accordance with said Bid), and shall in all other respects perform the agreement created by the acceptance of said Bid,

then, this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all default of the Principal hereunder shall be the amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by any extension of the time within which the Owner may accept such Bid; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the above-bound parties have executed this instrument under their several seals this _____ day of _____ 2021, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

IN PRESENCE OF:

SEAL

_____ _____
(INDIVIDUAL PRINCIPAL)

_____ _____
(ADDRESS) (BUSINESS ADDRESS)

SEAL

_____ _____

_____ _____
(ADDRESS) (BUSINESS ADDRESS)

ATTEST:

_____ _____
(CORPORATE PRINCIPAL)

_____

_____
(BUSINESS ADDRESS)

By: _____
(AFFIX CORPORATE SEALI)

ATTEST:

_____ _____
(CORPORATE SURETY)

_____

_____
(BUSINESS ADDRESS)

By: _____
(AFFIX CORPORATE SEAL)

RESOLUTION NO. 63-2021

A RESOLUTION SUPPORTING ADOPTION OF AN ADMINISTRATIVE PLAN FOR A THIRTY PER CENT (30%) MINIMUM GOAL FOR DISADVANTAGED, MINORITY AND WOMEN OWNED BUSINESS ENTERPRISE PARTICIPATION IN CITY OF MONTGOMERY GOVERNMENT CONSTRUCTION AND PROFESSIONAL SERVICES CONTRACTS.

WHEREAS, it is the policy of the City of Montgomery to provide minorities and women owned businesses (also referred to as "disadvantaged businesses") equitable opportunity to participate in all aspects of City purchasing and contracting programs, including, but not limited to, participation in procurement, professional and construction contracts; and

WHEREAS, minorities, especially Black residents in the City of Montgomery have historically been oppressed, marginalized, and denied equal access to opportunities; and

WHEREAS, women have also historically been denied equal access to opportunities; and

WHEREAS, this history of systemic and systematic racial discrimination has created a racial wealth and pay gap between minorities and white-owned businesses and workers; and

WHEREAS, this history of gender discrimination has created a gender wealth and pay gap between women and male-owned businesses and workers; and

WHEREAS, the City of Montgomery actively seeks to identify qualified disadvantaged businesses and offer them an equitable opportunity to participate as providers of goods and services to the city; and

WHEREAS, disadvantaged business enterprise shall mean any legally constituted business enterprise which is majority owned by any legal resident of the United States who is a member of an ethnic, cultural, racial or national origin group which as a history of non-participation in government contracts, including women and disabled persons; and

WHEREAS, it is the intent of the City to widen equitable opportunities for participation for disadvantaged groups, eliminate the racial wealth and pay gaps, eliminate the gender wealth and pay gaps, increase competition, and to ensure the prudent and diligent use of public funds:

NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE CITY OF MONTGOMERY, ALABAMA: that, potential contractors are hereby given notice that the City of Montgomery is an equal opportunity employer in accordance with Title VII, Civil Rights Act of 1964, 42 U.S.C., 1981, 1983, 1986 and amendments, and it is the policy of the City of Montgomery to require contractors, vendors and suppliers providing goods and services to the City to afford equal opportunity for employment to all individuals, regardless of race, color, sex, age, religion, national origin, disability or veteran status; provided, further, that as part of their bids on City of Montgomery construction contracts, contractors shall cooperate and in good faith do all things legal, proper, and reasonable to achieve the goal of thirty per cent participation by disadvantaged, minority and women owned businesses, and, that all departments of the City of Montgomery government shall make a good faith effort to award at least thirty percent of their professional services and other contracts to disadvantaged, minority and women owned business enterprises.

PROCEDURE

The clause set forth below which required contractor compliance with federal law shall be incorporated into each Request for Proposal (RFP) to do business with the City of Montgomery:

1. **It is the policy of the City of Montgomery to provide minorities and women owned businesses (also referred to as "disadvantaged businesses") equitable**

opportunity to participate in all aspects of City purchasing and contracting programs, including, but not limited to, participation in procurement, professional and construction contracts. Minorities, especially Black residents in the City of Montgomery have historically been oppressed, marginalized, and denied equal access to opportunities. Additionally, women have also historically been denied equal access to opportunities. This history of systemic and systematic racial discrimination has created a racial wealth and pay gap between minorities and white-owned businesses and workers. This history of gender discrimination has also created a gender wealth and pay gap between women and male-owned businesses and workers. Therefore, it is the intent of the City to widen equitable opportunities for participation for disadvantaged groups, eliminate the racial wealth and pay gaps, eliminate the gender wealth and pay gaps, increase competition, and to ensure the prudent and diligent use of public funds.

2. **Applicant for employment because of race, color, religion, sex, national origin, age, disability or veteran status pursuant to the provisions of Title VII of the Civil Rights Act of 1964, 42 U.S.C., 1981, 1983, 1986 and all amendments thereto relative to discriminatory employment practices. The contractor will ensure that qualified applicants are employed and, that during employment, employees are treated without regard to their race, color, religion, sex, national origin, age, disability or veteran status. Such action shall include, but not be limited to, the following: employment, promotion, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other compensation; and selection for training, including apprenticeship.**

3. **In the event of the contractor's non-compliance with the equal opportunity clause of the contract, the contract may not be awarded or may be cancelled, terminated, or suspended in whole or in part, and the contractor may be declared ineligible for further City contracts.**

4. **The contractor shall certify compliance with the policy to the City prior to receipt of any contract or business with the City of Montgomery. (EXHIBIT A)**

Additionally, all government construction contractors will include in their contracts that they will put forth a good faith effort to use DBE subcontractors and suppliers for at least thirty (30%) percent of the value of their bid in the performance of their contracts. Failure to put forth a good faith effort will result in termination of the contract for cause.

ADOPTED this the 20th **day of** April **, 2021.**

STATE OF ALABAMA)
COUNTY OF MONTGOMERY)
CITY OF MONTGOMERY)

I, Brenda Gale Blalock, City Clerk of the City of Montgomery, Alabama, DO HEREBY CERTIFY that the foregoing is a true and correct copy of a resolution which was duly adopted by the Council of the City of Montgomery, Alabama, at its regular meeting held the 20th **day of** April **, 2021.**

GIVEN under my hand and the official SEAL of the City of Montgomery, Alabama, this the 21st **day of** April **, 2021.**

Brenda Gale Blalock
BRENDA GALE BLALOCK, CITY CLERK

APPROVED: APR 2 2 2021

STEVEN L. REED, MAYOR

EXHIBIT A

CITY OF MONTGOMERY, ALABAMA

EQUAL EMPLOYMENT OPPORTUNITY CERTIFICATION FORM

Contractor/Vendor Name: _____

Address: _____

_____

_____

The contractor acknowledges receipt of the City of Montgomery, Alabama's Equal Employment Opportunity Contractor Compliance Policy and certified that it is an equal opportunity employer and agrees to the requirements of the Policy and the Equal Employment Opportunity Clause therein. The contractor further certified that it will require all subcontractors to execute an Equal Opportunity statement and certification of compliance.

The contractors will not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, age, disability or veteran status. The contractor will ensure that qualified applicants are employed, and that during employment employees are treated without regard to race, color, religion, sex, national origin, age, disability or veteran status. Such action shall include, but not be limited to, the following: employment, promotion, demotion, or transfer; recruitment ore recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this non-discrimination clause.

The contractor will furnish to the City of Montgomery, upon request, reports, notices, policies, and/or information certifying compliance with this policy.

In the event of the contractor's non-compliance with the equal employment clause of this contract, the contract may not be awarded or may be cancelled, terminated, or suspended in whole or in part, and the contractor may be declared ineligible for further City contracts.

_____ _____

Date **Signature**

Title: _____

EXHIBIT A

CITY OF MONTGOMERY, ALABAMA

EQUAL EMPLOYMENT OPPORTUNITY CERTIFICATION FORM

Contractor/Vendor Name: _____

Address: _____

_____

_____

The contractor acknowledges receipt of the City of Montgomery, Alabama's Equal Employment Opportunity Contractor Compliance Policy and certified that it is an equal opportunity employer and agrees to the requirements of the Policy and the Equal Employment Opportunity Clause therein. The contractor further certified that it will require all subcontractors to execute an Equal Opportunity statement and certification of compliance.

The contractors will not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, age, disability or veteran status. The contractor will ensure that qualified applicants are employed, and that during employment employees are treated without regard to race, color, religion, sex, national origin, age, disability or veteran status. Such action shall include, but not be limited to, the following: employment, promotion, demotion, or transfer; recruitment ore recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this non-discrimination clause.

The contractor will furnish to the City of Montgomery, upon request, reports, notices, policies, and/or information certifying compliance with this policy.

In the event of the contractor's non-compliance with the equal employment clause of this contract, the contract may not be awarded or may be cancelled, terminated, or suspended in whole or in part, and the contractor may be declared ineligible for further City contracts.

_____ _____

Date **Signature**

Title: _____

INSTRUCTIONS TO BIDDERS

CONTENTS

1. BID DOCUMENTS:

The Bid Documents consist of the Advertisement for Bids, these Instructions to Bidders, any supplements to these Instructions to Bidders, the Proposal Form and the proposed Contract Documents. The proposed Contract Documents consist of the Construction Contract, the Performance Bond and Payment Bond, the Conditions of the Contract (General, Supplemental, and other Conditions), Drawings, Specifications and all addenda issued prior to execution of the Construction Contract. Bid Documents may be obtained or examined as set forth in the Advertisement for Bids.

2. GENERAL CONTRACTOR'S STATE LICENSING REQUIREMENTS:

When the amount bid for a contract exceeds $50,000, the bidder must be licensed by the State Licensing Board for General Contractors and must show the Architect evidence of license before bidding or the bid will not be received by the Architect or considered by the Awarding Authority. A bid exceeding the bid limit stipulated in the bidder's license, or which is for work outside of the type or types of work stipulated in the bidder's license, will not be considered. In case of a joint venture of two or more contractors, the amount of the bid shall be within the maximum bid limitation as set by the State Licensing Board for General Contractors of the combined limitations of the partners to the joint venture.

3. QUALIFICATIONS of BIDDERS and PREQUALIFICATION PROCEDURES:

a. Any special qualifications required of general contractors, subcontractors, material suppliers, or fabricators are set forth in the Bid Documents.

b. The Awarding Authority may have elected to prequalify bidders. Parties interested in bidding for this contract are directed to the Advertisement for Bids and Supplemental Instructions to Bidders to determine whether bidders must be prequalified and how they may obtain copies of the Awarding Authority's published prequalification procedures and criteria.

c. Release of Bid Documents by the Architect to a prospective bidder will not constitute any determination by the Awarding Authority or Architect that the bidder has been found to be qualified, prequalified, or responsible.

4. INSURANCE REQUIREMENTS:

TYPES OF INSURANCE	MINIMUM LIMITS OF LIABILITY
Worker's Compensation	Statutory
Employer's Liability	$500,000 each employee, each accident and policy limit
Commercial General Liability	
Each Occurrence	$1,000,000
Personal and Advertising Injury	$1,000,000
Products/Completed	$5,000,000
Operations General Aggregate	$5,000,000
Automobile Liability	$1,000,000 each accident, combined single limit

5. EXAMINATION of BID DOCUMENTS and the SITE of the WORK:

Before submitting a bid for the Work, the bidders shall carefully examine the Bid Documents, visit the site, and satisfy themselves as to the nature and location of the Work, and the general and local conditions, including weather, the general character of the site or building, the character and extent of existing work within or adjacent to the site and any other work being performed thereon at the time of submission of their bids. They shall obtain full knowledge as to transportation, disposal, handling, and storage of materials, availability of water, electric power, and all other facilities in the area which will have a bearing on the performance of the Work for which they submit their bids. The submission of a bid shall constitute a representation by the bidder that the bidder has made such examination and visit and has judged for and satisfied himself or herself as to conditions to be encountered regarding the character, difficulties, quality, and quantities of work to be performed and the material and equipment to be furnished, and as to the contract requirements involved.

6. EXPLANATIONS and INTERPRETATIONS:

a. Should any bidder observe any ambiguity, discrepancy, omission, or error in the drawings and specifications, or in any other bid document, or be in doubt as to the intention and meaning of these documents, the bidder should immediately report such to the Architect and request clarification.

b. Clarification will be made only by written Addenda sent to all prospective bidders. Neither the Architect nor the Awarding Authority will be responsible in any manner for verbal answers or instructions regarding intent or meaning of the Bid Documents.

c. In the case of inconsistency between drawings and specifications or within either document, a bidder will be deemed to have included in its bid the better quality or greater quantity of the work involved unless the bidder asked for and obtained the Architect's written clarification of the requirements before submission of a bid.

7. SUBSTITUTIONS:

a. The identification of any product, material, system, item of equipment, or service in the Bid Documents by reference to a trade name, manufacturer's name, model number, etc. (hereinafter referred to as "source"), is intended to establish a required standard of performance, design, and quality and is not intended to limit competition unless the provisions of paragraph "d" below apply.

b. When the Bid Documents identify only one or two sources, or three or more sources followed by "or approved equal" or similar wording, the bidder's proposal may be based on a source not identified but considered by the bidder to be equal to the standard of performance, design and quality as specified; however, such substitutions must ultimately be approved by the Architect. If the bidder elects to bid on a substitution without "Pre-bid Approval" as described below, then it will be understood that proof of compliance with specified requirements is the exclusive responsibility of the bidder.

c. When the Bid Documents identify three or more sources and the list of sources is not followed by "or approved equal" or similar wording, the bidder's proposal shall be based upon one of the identified sources, unless the bidder obtains "Pre-bid Approval" of another source as described below. Under these conditions it will be expressly understood that no product, material, system, item of equipment, or service that is not identified in the Bid Documents or granted "Pre-Bid Approval" will be incorporated into the Work unless such substitution is authorized and agreed upon through a Contract Change Order.

d. If the Bid Documents identify only one source and expressly provide that it is an approved sole source for the product, material, system, item of equipment, or service, the bidder's proposal must be based upon the identified sole source.

e. Procedures for "Pre-bid Approval". If it is desired that a product, material, system, piece of equipment, or service from a source different from those sources identified in the Bid Documents be approved as an acceptable source, application for the approval of such source must reach the hands of the Architect at least ten days prior to the date set for the opening of bids. At the Architect's discretion, this ten day provision may be waived. The application for approval of a proposed source must be accompanied by technical data which the applicant desires to submit in support of the application. The Architect will give consideration to reports from reputable independent testing laboratories, verified experience records showing the reputation of the proposed source with previous users, evidence of reputation of the source for prompt delivery, evidence of reputation of the source for efficiency in servicing its products, or any other pertinent written information. The application to the Architect for approval of a proposed source must be accompanied by a schedule setting forth in which respects the materials or equipment submitted for consideration differ from the materials or equipment designated in the Bid Documents. The burden of proof of the merit of the proposed substitution is upon the proposer. To be approved, a proposed source must also meet or exceed all express requirements of the Bid Documents. Approval, if granted, shall not be effective until published by the Architect in an addendum to the Bid Documents.

8. PREPARATION and DELIVERY of BIDS:

a. Proposal Form:

(1) Bids must be submitted on the Proposal Form as contained in the Bid Documents; only one copy is required to be submitted.

(2) All information requested of the bidder on the Proposal Form must be filled in. The form must be completed by typewriter or hand-printed in ink.

(3) Identification of Bidder: On the first page of the Proposal Form the bidder must be fully identified by completing the spaces provided for:

- **(a)** the legal name of the bidder,
- **(b)** the state under which laws the bidder's business is organized and existing,
- **(c)** the city (and state) in which the bidder has its principal offices,
- **(d)** the bidder's business organization, i.e., corporation, partnership, or individual (to be indicated by marking the applicable box and writing in the type of organization if it is not one of those listed), and
- **(e)** the partners or officers of the bidder's organization, if the bidder is other than an individual. If the space provided on the Proposal Form is not adequate for this listing, the bidder may insert "See Attachment" in this space and provide the listing on an attachment to the Proposal Form.

(4) Where indicated by the format of the Proposal Form, the bidder must specify lump sum prices in both words and figures. In case of discrepancy between the prices shown in words and in figures, the words will govern.

(5) All bid items requested in the Proposal Form, including alternate bid prices and unit prices for separate items of the Work, must be bid. If a gross sum of bid items is requested in the Proposal Form, the gross sum shall be provided by the bidder.

(6) In the space provided in the Proposal Form under "Bidder's Alabama License", the bidder must insert his or her current general contractor's state license number, current bid limit, and type(s) of work for which bidder is licensed.

(7) The Proposal Form shall be properly signed by the bidder. If the bidder is:

- **(a) an individual**, that individual or his or her "authorized representative" must sign the Proposal Form;
- **(b) a partnership,** the Proposal Form must be signed by one of the partners or an "authorized representative" of the Partnership;
- **(c) a corporation,** the president, vice-president, secretary, or "authorized representative" of the corporation shall sign and affix the corporate seal to the Proposal Form.

As used in these Instructions to Bidders, "authorized representative" is defined as a person to whom the bidder has granted written authority to conduct business in the bidder's behalf by signing and/or modifying the bid. Such written authority shall be signed by the bidder (the individual proprietor, or a member of the Partnership, or an officer of the Corporation) and shall be attached to the Proposal Form.

(8) Interlineation, alterations or erasures on the Proposal Form must be initialed by the bidder or its "authorized representative".

b. Accounting of Sales Tax

A proposal shall be rendered non-responsive if an Accounting of Sales Tax is not provided.

c. Bid Guaranty

(1) The Proposal Form must be accompanied by a cashier's check, drawn on an Alabama bank, or a Bid Bond, executed by a surety company duly authorized and qualified to make such bonds in the State of Alabama, payable to the Awarding Authority.

(2) If a Bid Bond is provided in lieu of a cashier's check, the bond shall be on the Bid Bond form as stipulated in the Bid Documents.

(3) The amount of the cashier's check or Bid Bond shall not be less than five percent of the contractor's bid, but is not required to be in an amount more than ten thousand dollars.

d. Delivery of Bids:

(1) Bids will be received until the time set, and at the location designated, in the Advertisement for Bids unless notice is given of postponement. Any bid not received prior to the time set for opening bids will be rejected absent extenuating circumstances and such bids shall be rejected in all cases where received after other bids are opened.

(2) Each bid shall be placed, together with the bid guaranty, in a sealed envelope. On the outside of the envelope the bidder shall write in large letters "Proposal", below which the bidder shall identify the Project and the Work bid on, the name of the bidder, and the bidder's current general contractor's state license number.

(3) Bids may be delivered in person, or by mail if ample time is allowed for delivery. When sent by mail, the sealed envelope containing the bid, marked as indicated above, shall be enclosed in another envelope for mailing.

9. WITHDRAWAL or REVISION of BIDS:

a. A bid may be withdrawn prior to the time set for opening of bids, provided a written request, executed by the bidder or the bidder's "authorized representative", is filed with the Architect prior to that time. The bid will then be returned to the bidder unopened.

b. A bid which has been sealed in its delivery envelope may be revised by writing the change in price on the outside of the delivery envelope over the signature of the bidder or the bidder's "authorized representative". In revising the bid in this manner, the bidder must only write the amount of the change in price on the envelope **and must not reveal the bid price.**

c. Written communications, signed by the bidder or its "authorized representative", to revise bids will be accepted if received by the Architect prior to the time set for opening bids. The Architect will record the instructed revision upon opening the bid. Such written communication may be by facsimile if so stipulated in Supplemental Instructions to Bidders. In revising the bid in this manner, the bidder must only write the amount of the change in price **and must not reveal the bid price.**

d. Except as provided in Article 12 of these Instructions to Bidders, no bid shall be withdrawn, modified, or corrected after the time set for opening bids.

10. OPENING of BIDS:

a. Bids will be opened and read publicly at the time and place indicated in the Advertisement for Bids. Bidders or their authorized representatives are invited to be present.

b. A list of all proposed major subcontractors and suppliers will be submitted by Bidders to the Architect at a time subsequent to the receipt of bids as established by the Architect in the Bid Documents but in no event shall this time exceed twenty-four (24) hours after receipt of bids. If the list includes a fire alarm contractor and/or fire sprinkler contractor, Bidders will also submit a copy of the fire alarm contractor's and/or fire sprinkler contractor's permits from the State of Alabama Fire Marshal's Office.

11. INCOMPLETE and IRREGULAR BIDS:

A bid that is not accompanied by data required by the Bid Documents, or a bid which is in any way incomplete, may be rejected. Any bid which contains any uninitialed alterations or erasures, or any bid which contains any additions, alternate bids, or conditions not called for, or any other irregularities of any kind, will be subject to rejection.

12. BID ERRORS:

a. Errors and Discrepancies in the Proposal Form. In case of error in the extension of prices in bids, the unit price will govern. In case of discrepancy between the prices shown in the figures and in words, the words will govern.

b. Mistakes within the Bid. If the low bidder discovers a mistake in its bid, the low bidder may seek withdrawal of its bid without forfeiture of its bid guaranty under the following conditions:

(1) Timely Notice: The low bidder must notify the Awarding Authority and Architect in writing, within three working days after the opening of bids, that a mistake was made. This notice must be given within this time frame whether or not award has been made.

(2) Substantial Mistake: The mistake must be of such significance as to render the bid price substantially out of proportion to the other bid prices.

(3) Type of Mistake: The mistake must be due to calculation or clerical error, an inadvertent omission, or a typographical error which results in an erroneous sum. A mistake of law, judgment, or opinion shall not constitute a valid ground for withdrawal without forfeiture.

(4) Documentary Evidence: Clear and convincing documentary evidence of the mistake must be presented to the Awarding Authority and the Architect as soon as possible, but no later than three working days after the opening of bids.

The Awarding Authority's decision regarding a low bidder's request to withdraw its bid without penalty shall be made within 10 days after receipt of the bidder's evidence or by the next regular meeting of the Awarding Authority. Upon withdrawal of bid without penalty, the low bidder shall be prohibited from (1) doing work on the project as a subcontractor or in any other capacity and (2) bidding on the same project if it is re-bid.

13. DISQUALIFICATION of BIDDERS:

Any bidder(s) may be disqualified from consideration for contract award for the following reasons:

a. Collusion. Any agreement or collusion among bidders or prospective bidders in restraint of freedom of competition to bid at a fixed price or to refrain from bidding or otherwise shall render the bids void and shall cause the bidders or prospective bidders participating in such agreement or collusion to be disqualified from submitting further bids to the Awarding Authority on future lettings. (See § 39-2-6, Code of Alabama 1975, for possible criminal sanctions.)

b. Advance Disclosure. Any disclosure in advance of the terms of a bid submitted in response to an Advertisement for Bids shall render the proceedings void and require re-advertisement and rebid.

c. Failure to Settle Other Contracts. The Awarding Authority may reject a bid from a bidder who has not paid, or satisfactorily settled, all bills due for labor and material on other contracts in force at the time of letting.

14. CONSIDERATION of BIDS:

a. After the bids are opened and read publicly, the bid prices will be compared and the results of this comparison will be available to the public. Until the final award of the contract, however, the Awarding Authority shall have the right to reject any or all bids, and it shall have the right to waive technical errors and irregularities if, in its judgment, the bidder will not have obtained a competitive advantage and the best interests of the Awarding Authority will be promoted.

b. If the Bid Documents request bids for projects or parts of projects in combination or separately, the Bid Documents must include supplements to, these Instructions to Bidders setting forth applicable bid procedures. Award or awards will be made to the lowest responsible and responsive bidder or bidders in accordance with such bid procedures.

15. DETERMINATION of LOW BIDDER by USE of ALTERNATES:

a. The Awarding Authority may request alternate bid prices (alternates) to facilitate either reducing the base bid to an amount within the funds available for the project or adding items to the base bid within the funds available for the project. Alternates, if any, are listed in the

Proposal Form in the order in which they shall cumulatively deduct from or add to the base bid for determining the lowest bidder.

b. If alternates are included in the Proposal Form, the Awarding Authority shall determine the dollar amount of funds available and immediately prior to the opening of bids shall announce publicly the funds available for the project. The dollar amount of such funds shall be used to determine the lowest bidder as provided herein below, notwithstanding that the actual funds available for the project may subsequently be determined to be more or less than the expected funds available as determined immediately prior to the time of the opening of bids.

c. If the base bid of the lowest bidder exceeds the funds available and alternate bid prices will reduce the base bids to an amount that is within the funds available, the lowest bidder will be determined by considering, in order, the fewest number of the alternates that produces a price within the funds available. If the base bid of the lowest bidder is within the funds available and alternate bid prices will permit adding items to the base bid, the lowest bidder will be determined by considering, in order, the greatest number of the alternates that produces a price within the funds available.

d. After the lowest bidder has been determined as set forth above, the Awarding Authority may award that bidder any combination of alternates, provided said bidder is also the low bidder when only the Base Bid and such combination of alternates are considered.

16. UNIT PRICES:

a. Work Bid on a Unit Price Basis. Where all, or part(s), of the planned Work is bid on a unit price basis, both the unit prices and the extensions of the unit prices constitute a basis of determining the lowest responsible and responsive bidder. In cases of error in the extension of prices of bids, the unit price will govern. A bid may be rejected if any of the unit prices are obviously unbalanced or non-competitive.

b. Unit Prices for Application to Change Orders. As a means of predetermining unit costs for changes in certain elements of the Work, the Bid Documents may require that the bidders furnish unit prices for those items in the Proposal Form. Unit prices for application to changes in the work are not a basis for determining the lowest bidder. Non-competitive unit prices proposed by the successful bidder may be rejected and competitive prices negotiated by the Awarding Authority prior to contract award. Unit prices for application to changes in the work are not effective unless specifically included and agreed upon in the Construction Contract.

17. AWARD of CONTRACT:

a. The contract shall be awarded to the lowest responsible and responsive bidder unless the Awarding Authority finds that all the bids are unreasonable or that it is not in the best interest of the Awarding Authority to accept any of the bids. A responsible bidder is one who, among other qualities determined necessary for performance, is competent, experienced, and financially able to perform the contract. A responsive bidder is one who submits a bid that complies with the terms and conditions of the Advertisement for Bids and the Bid Documents. Minor irregularities in the bid shall not defeat responsiveness.

b. A bidder to whom award is made will be notified by telegram, confirmed facsimile, or letter to the address shown on the Proposal Form at the earliest possible date. Unless other

time frames are stipulated in Supplemental Instructions to Bidders, the maximum time frames allowed for each step of the process between the opening of bids and the issuance of an order to proceed with the work shall be as follows:

(1)	Award of contract by Awarding Authority	30 calendar days after the opening of bids
(2)	Contractor's return of the fully executed contract, with bonds and evidence of insurance, to the Awarding Authority	15 calendar days after the contract has been presented to the contractor for signature (from the Lead Design Professional)
(3)	Awarding Authority's approval of the contractor's bonds and evidence of insurance and completion of contract execution	20 calendar days after the contractor presents complete and acceptable documents to the Architect
(4)	Notice To Proceed issued to the contractor along with distribution of the fully executed construction contract to all parties.	15 calendar days after final execution of contract by the Awarding Authority, by various State Agencies if required and by the Governor if his or her signature on the contract is required by law

The time frames stated above, or as otherwise specified in the Bid Documents, may be extended by written agreement between the parties. Failure by the Awarding Authority to comply with the time frames stated above or stipulated in Supplemental Instructions to Bidders, or agreed extensions thereof, shall be just cause for the withdrawal of the contractor's bid and contract without forfeiture of bid security.

c. Should the successful bidder or bidders to whom the contract is awarded fail to execute the Construction Contract and furnish acceptable Performance and Payment Bonds and satisfactory evidence of insurance within the specified period, the Awarding Authority shall retain from the bid guaranty, if it is a cashier's check, or recover from the principal or the sureties, if the guaranty is a bid bond, the difference between the amount of the contract as awarded and the amount of the bid of the next lowest responsible and responsive bidder, but not more than $10,000. If no other bids are received, the full amount of the bid guaranty shall be so retained or recovered as liquidated damages for such default. Any sums so retained or recovered shall be the property of the Awarding Authority.

d. All bid guaranties, except those of the three lowest bona fide bidders, will be returned immediately after bids have been checked, tabulated, and the relation of the bids established. The bid guaranties of the three lowest bidders will be returned as soon as the contract bonds and the contract of the successful bidder have been properly executed and approved. When the award is deferred for a period of time longer than 15 days after the opening of the bids, all bid guaranties, except those of the potentially successful bidders, shall be returned. If no award is made within the specified period, as it may by agreement be extended, all bids will be rejected, and all guaranties returned. If any potentially successful bidder agrees in writing to a stipulated extension in time for consideration of its bid and its bid was guaranteed with a cashier's check, the Awarding Authority may permit the potentially successful bidder to substitute a satisfactory bid bond for the cashier's check.

END of INSTRUCTIONS TO BIDDERS

BID INSTRUCTIONS

The instructions on this page are issued to assist each bidder in preparation of their bid to prevent bid rejection or disqualifications.

1. All bid documents must be signed in ink.
2. Evidence of a General Contractor license should be provided by including the license number on the proposal form or a copy of the license inside the package.
3. The entire Alabama Beason-Hammond memorandum of understanding and the original affidavit should be attached to the outside of the sealed bid envelope or the envelope will not be opened.
4. If applicable, addenda should be acknowledged on the appropriate space on the proposal form.
5. The City of Montgomery adopted Resolution 63-2021 which describes an administrative plan for a 30% minimum participation goal for disadvantaged, minority and women owned business enterprises for public works projects. This resolution is included in the bid documents for each bidder to review and acknowledge the review by signing the Exhibit A and including it with their bid. Each bidder should also submit a completed copy of the minority questionnaire stating whether or not their firm identifies as minority owned.

RFP/PROCUREMENT STATEMENT OF COMPLIANCE WITH THE BEASON-HAMMON ALABAMA TAXPAYER AND CITIZEN PROTECTION ACT AS AMENDED

This form with attachment is to be returned with the response to any RFP or other form of procurement and is to be completed as a condition for the award of any contract, grant, or incentive by the State of Alabama, any political subdivision thereof, or any state-funded entity to a business entity or employer that employs one or more employees within the State of Alabama.

State of _____

County of _____

"As a condition for the award of any contract, grant, or incentive by the State of Alabama, any political subdivision thereof, or any state-funded entity to a business entity or employer that employs one or more employees, I hereby attest that in my capacity as _____(state position) for _____ _____ (state business entity/employer/contractor name) that said business entity/employer/contractor shall not knowingly employ, hire for employment, or continue to employ an unauthorized alien within the State of Alabama."

I further attest that said business entity/employer/contractor is enrolled in the E-Verify program. (ATTACH DOCUMENTATION ESTABLISHING THAT BUSINESS ENTITY/EMPLOYER/CONTRACTOR IS ENROLLED IN THE E-VERIFY PROGRAM).

_____ Signature

THIS FORM PROVIDED FOR COMPLIANCE WITH SECTIONS 9 (a) and (b) BEASON-HAMMON ALABAMA TAXPAYER AND CITIZEN PROTECTION ACT; CODE OF ALABAMA, SECTIONS 31-13-9 (a) and (b) and (c) as amended.

PROPOSAL FORM

To: _____ Date: _____
(Awarding Authority)

In compliance with the Advertisement for Bids and subject to all the conditions thereof, the undersigned

_____
(Legal Name of Bidder)

hereby proposes to furnish all labor and materials and perform all work required for the construction of

WORK _____

_____

in accordance with Drawings and Specifications, dated _____, prepared by

_____, Architect/Engineer.

The Bidder, which is organized and existing under the laws of the State of _____,

having its principal offices in the City of _____,

is: ☐ a Corporation ☐ a Partnership ☐ an Individual ☐ (other) _____.

LISTING OF PARTNERS OR OFFICERS: If Bidder is a Partnership, list all partners and their addresses; if Bidder is a Corporation, list the names, titles, and business addresses of its officers:

_____

_____

_____

BIDDER'S REPRESENTATION: The Bidder declares that it has examined the site of the Work, having become fully informed regarding all pertinent conditions, and that it has examined the Drawings and Specifications (including all Addenda received) for the Work and the other Bid and Contract Documents relative thereto, and that it has satisfied itself relative to the Work to be performed.

ADDENDA: The Bidder acknowledges receipt of Addenda Nos._____ through _____ inclusively.

BASE BID: For construction complete as shown and specified, the sum of _____

_____ Dollars ($ _____)

ALTERNATES: If alternates as set forth in the Bid Documents are accepted, the following adjustments are to be made to the Base Bid:

For Alternate No. 1 (. . . . .) ☐ (add) ☐ (deduct) $ _____
(Insert key word for Alternate)

For Alternate No. 2 (. . . . .) ☐ (add) ☐ (deduct) $ _____

For Alternate No. 3 (. . . . .) ☐ (add) ☐ (deduct) $ _____

For Alternate No. 4 (. . . . .) ☐ (add) ☐ (deduct) $ _____

For Alternate No. 5 (. . . . .) ☐ (add) ☐ (deduct) $ _____

For Alternate No. 6 (. . . . .) ☐ (add) ☐ (deduct) $ _____

UNIT PRICES - (Attach to this Proposal Form the unit prices, if any, on a separate sheet.)

BID SECURITY: The undersigned agrees to enter into a Construction Contract and furnish the prescribed Performance and Payment Bonds and evidence of insurance within fifteen calendar days, or such other period stated in the Bid Documents, after the contract forms have been presented for signature, provided such presentation is made within 30 calendar days after the opening of bids, or such other period stated in the Bid Documents. As security for this condition, the undersigned further agrees that the funds represented by the Bid Bond (or cashier's check) attached hereto may be called and paid into the account of the Awarding Authority as liquidated damages for failure to so comply.

Attached hereto is a: (*Mark the appropriate box and provide the applicable information.*)

○ Bid Bond, executed by _____as Surety,

○ a cashier's check on the_____ Bank of _____,

for the sum of _____

Dollars ($ _____) made payable to the Awarding Authority.

BIDDER'S ALABAMA LICENSE:

State License for General Contracting: _____

License Number Bid Limit Type(s) of Work

CERTIFICATIONS: The undersigned certifies that he or she is authorized to execute contracts on behalf of the Bidder as legally named, that this proposal is submitted in good faith without fraud or collusion with any other bidder, that the information indicated in this document is true and complete, and that the bid is made in full accord with State law. Notice of acceptance may be sent to the undersigned at the address set forth below.

The Bidder also declares that a list of all proposed major subcontractors and suppliers will be submitted at a time subsequent to the receipt of bids as established by the Architect in the Bid Documents but in no event shall this time exceed twenty-four (24) hours after receipt of bids.

Legal Name of Bidder _____

Mailing Address _____

* **By (Legal Signature)** _____

* Name & Title (print) _____ (*Seal*)

Telephone Number _____

Email Address _____

* If other than the individual proprietor, or an above named member of the Partnership, or the above named president, vice-president, or secretary of the Corporation, attach written authority to bind the Bidder. Any modification to a bid shall be over the initials of the person signing the bid, or of an authorized representative.

CONTRACT

THIS AGREEMENT made and entered into this _____ day of _____, 2022, by and between the City of Montgomery, Alabama, party of the first part, (hereinafter called the City), and _____ herinafter called the Contractor).

W I T N E S S E T H

WHEREAS, the City of Montgomery desires the construction of New Fire Station No. 10 _____, more particularly described, and the Contractor desires to furnish and deliver all the material and to do and perform all work and labor for the said purpose;

NOW, THEREFORE, in consideration of the premises, the mutual covenants herein contained and the sum of five dollars ($5.00) by each of the parties to the other in hand paid, the receipt whereof is hereby acknowledged, the parties hereto agree as follows:

(1) The Contractor promises and agrees to furnish and deliver all the material and to do and perform all the work and labor required to be furnished and delivered, done and performed in and about the improvement and construction on referenced project in strict and entire conformity with the provisions of the Contract, and the Notice to Contractor and Proposal, and the Plan and Specifications prepared by the City Engineering Department, the original of which are on file in the City Engineering Department, copies of which are hereto attached and which plans and Specifications and the Notice to Contractors and the Proposal are hereby made a part of this agreement as fully and to the same effect as if the same had been set forth at length in the body of this agreement.

(2) The work covered by this contract shall be started within ten (10) days after the date of written notice from the City Engineering Department to begin and shall be completed within __365 calendar days.

(3) The City agrees and promises to pay the Contractor for said work, when completed in accordance with the provisions of this Contract, upon presentation of the proper certificates of the City Engineering Department and upon the terms set forth in the said specifications and pursuant to the terms of this Contract.

(4) The said work shall be done in accordance with the ordinances of the City of Montgomery under the direct supervision and to the entire satisfaction of the City Engineering Department, subject at all times to the inspection and approval of the City Engineering Department.

(5) The decision of the City Engineering Department, upon any question connected with the execution of this agreement, or any failure or delay in the prosecution of the work, by the said Contractor, shall be final and conclusive.

(6) "The Contractor, _____, hereby certifies that it: IS NOT included on the U.S. Comptroller General's Consolidated List of Persons or Firms Currently Debarred for Violations of Various Public Contractors Incorporating Labor Standards Provisions."

(7) In compliance with Act 2016-312, the contractor hereby certifies that it is not currently engaged in, and will not engage in, the boycott of a person or an entity based in or doing business with a jurisdiction with which this state can enjoy open trade.

IN WITNESS WHEREOF, the City of Montgomery, Alabama, has caused these presents to be executed in five counterparts in its name and behalf by Steven L. Reed, Mayor of the City of Montgomery, Alabama, and _____, the Contractor, has hereunto set his hand seal, this the day and year above written.

ATTEST: CITY OF MONTGOMERY, ALABAMA

_____ BY:_____

CITY CLERK MAYOR, CITY OF MONTGOMERY DATE

INDIVIDUAL

_____

NAME OF BUSINESS

_____ BY:_____

WITNESS

PARTNERSHIP

_____

NAME OF BUSINESS

_____ BY:_____

WITNESS

CORPORATION

_____

NAME OF BUSINESS

_____ BY:_____

WITNESS CORPORATE SEAL

(CITY ATTORNEY LEGAL SEAL)

City of Montgomery, Alabama

NEW FIRE STATION NO. 10

AGREEMENT FOR GENERAL CONTRACTING SERVICES

THIS AGREEMENT made and entered into by and between _____, hereinafter "Contractor," and the City of Montgomery, Alabama, a Municipal Corporation, hereinafter "City" or "Owner."

W-I-T-N-E-S-S-E-T-H:

In consideration of the mutual agreements and provisions contained in this Agreement, the Contractor and the City agree in regard to a public works project (hereinafter the "Project") as described in the Advertisement for Bid.

The Contractor shall construct the Project as well as furnish at its own cost and expense all labor, tools, equipment, materials, and transportation as are required to be furnished by the Contractor, and shall perform the work in the manner and form required to construct the Project as it is more specifically described in this Agreement and as provided by the plans, specifications, and documents, all of which are incorporated into this Agreement by reference, and all addenda together with all plans and drawings on file in the Montgomery City Attorney's Office and the City of Montgomery Inspection Department (the "Work").

The City Representative for this Project is as follows:

Johnny Raines
Bargainer Davis and Williams Architects Associated
624 South McDonough Street
Montgomery, AL 36104

ARTICLE I. GENERALLY

A. Contract. As used throughout these documents, the term "Contract " means and includes all of the following documents regarding this agreement: Advertisement for Bids, each issued Addendum, any Instructions to Bidders, the submitted Bid, all General Specifications, any Detail Specifications, Supplemental and Special Conditions (if attached), together with this Agreement and any modifications, including Change Orders, if made, and the drawings, plans, and profiles now on file with the City Attorney and City Representative, as well as all guaranties and sureties posted by Bidder/Contractor in connection with this Contract and all insurance certificates.

All documents listed in this section are adopted by this reference and constitute a part of this Agreement to the same extent as if each were set out in full.

B. Independent Contractor. City and Contractor hereby state that it is the express mutual intent of the parties that an independent contractor relationship be, and hereby is, established under the terms and

conditions of this Agreement. Both parties further mutually understand and agree that employees of the Contractor are not nor shall they be deemed employees of the City and that employees of the City are not nor shall they be deemed employees of the Contractor. In no event shall the Contractor attempt to commit, promise, or obligate the name or resources of the City in any manner whatsoever.

C. Order of Precedence. Where more than one document relates to the same matter, if both can be given reasonable effect both are to be retained. In the event of conflict, written specifications will take precedence over drawings.

D. Integration; Contract Terms and Construction.

1. Integration: This Agreement together with all other component documents of the Contract constitute the entirety of the agreement of the parties with respect to its subject matter. All understandings, representations and agreements heretofore had between and among the parties are merged into this Agreement, which alone fully and completely expresses their understandings. No representation, warranty, or covenant made by any party that is not contained in this Agreement has been relied on by any party in entering into this Agreement.

2. Amendment in Writing: This Agreement may not be amended, modified, altered, changed, terminated, or waived in any respect whatsoever, except by a further agreement or Change Order, in writing, properly executed by the parties.

3. Binding Effect: This Agreement shall bind the parties and their respective personal representatives, heirs, successors, and assigns.

4. Captions: The captions of this Agreement are for convenience and reference only, are not a part of this Agreement, and in no way define, describe, extend, or limit the scope or intent of this Agreement.

5. Construction: This Agreement shall be construed in its entirety according to its plain meaning and shall not be construed against the party who provided or drafted it.

6. Mandatory and Permissive: "Shall," "will," and "agrees" are mandatory; "may" is permissive.

7. Governing Laws: The laws of the State of Alabama shall govern the validity of this Agreement, the construction of its terms, the interpretation of the rights, the duties of the parties, the enforcement of its terms, and all other matters relating to this Agreement.

8. Ownership of Contract: The Contract, and copies of parts thereof, are furnished and owned by the City. All portions of the Contract are the instruments of service for this Project. They are not to be used on other work and are to be returned to the City on request at the completion of the Project. Any reuse of these materials without specific written verification or adaptation by the City will be at the risk of the user and without liability or legal expense to the City, the City Representative, or the City Attorney. Such user shall hold the City and its employees, agents, and officials harmless from any and all damages, including reasonable attorneys' fees, from any and all claims arising from any such reuse. Any such verification and adoption entitles the City to

further compensation at rates comparable to those paid for similar work by licensed professionals.

E. **Rules of Construction.** For the purposes of this Contract, except as otherwise expressly provided or unless the context otherwise requires:

1. Words of masculine, feminine, or neutral gender include the correlative words of other genders. Singular terms include the plural as well as the singular, and vice versa.

2. All references in this Agreement to designated "articles," "sections," and other subdivisions or to lettered appendices are to the designated articles, sections and subdivisions hereof and the appendices attached hereto unless expressly otherwise designated in context. All article, section, and other subdivision and appendix captions are used for reference only and do not limit or describe the scope or intent of, or in any way affect, this agreement.

3. The terms "include," "including," and similar terms are construed as if followed by the phrase, "without being limited to".

4. All recitals set forth in, and all appendices to, this agreement are hereby incorporated into this agreement by reference.

6. No inference in favor of or against any party shall be drawn from the fact that such party or such party's counsel has drafted any portion hereof.

7. All references in this Agreement to a separate instrument are to such separate instrument as the same may be amended or supplemented from time to time pursuant to the applicable provisions thereof.

8. Each provision of this Agreement shall be considered to be severable and if for any reason any such provision or any part thereof is determined to be invalid and contrary to any existing or future applicable law, such invalidity shall not impair the operation of or affect those portions of this Agreement that are valid, but this Agreement shall be construed and enforced in all respects as if the invalid or unenforceable provision or part thereof had been omitted.

F. **Coordination of Plans, Specifications.** The specifications, plans, drawings, and all supplementary documents are essential parts of the Contract, and requirements occurring in one are as binding as though occurring in all. They are intended to be comprehensive to describe and provide a complete work. Should any portions of the plans, specifications, or drawings be obscure or in dispute, they shall be referred to the City Representative, and he/she shall decide the true meaning and intent. The City Representative shall also have the right to correct any errors or omissions at any time when such corrections are necessary for the proper fulfillment of said plans and specifications.

G. **Taxes and Charges.** Subject to Contractor's application for and receipt of a Certificate of Sales and Use Tax Exemption from the State of Alabama, Contractor shall withhold and pay all sales and use taxes and all withholding taxes, whether local, state, or federal, and pay all Social Security taxes and also all State Unemployment Compensation taxes, and pay or cause to be withheld, as the case may

be, any and all taxes, charges, or fees or sums whatsoever, which are now or may hereafter be required to be paid or withheld under any laws. Pursuant to *Ala. Code* §39-1-3 (1975), Contractor shall be reimbursed for any additional severance, sales, or uses taxes incurred as a result of an increase in the rate of such taxes imposed during performance of the Contract, measured from the time Contractor submitted the successful Bid until completion of the Contract.

H. **Shop Drawings and Submittals.** The Contractor shall submit to the City Representative any requested shop drawings, samples, and submittals depicting or representing the construction of portions of the Project in accordance with the plans and specifications. The Contractor shall pay for, or the cost may be withheld from payments to the Contractor, the cost of more than two (2) reviews of the shop drawings, samples, submittals, or similar element of work by the City Representative.

I. **Alabama Immigration Law.** By signing this Contract, the Contractor affirms, for the duration of the agreement, that it will not violate federal immigration law or knowingly employ, hire for employment, or continue to employ an unauthorized alien within the State of Alabama. Furthermore, if the Contractor is found to be in violation of this provision, it shall be deemed in breach of the agreement and shall be responsible for all damages, costs and fines resulting therefrom, to the extent allowed by Federal law and state law.

J. **Open Trade.** By signing this contract, Contractor represents and agrees that it is not currently engaged in, nor will it engage in, any boycott of a person or entity based in or doing business with a jurisdiction with which the State of Alabama can enjoy open trade.

ARTICLE II. PAYMENTS, CHANGE ORDERS, ETC.

A. **Contract Price.** The City will pay and the Contractor will accept as full consideration for the performance of its Work on the Project the agreed lump sum price of $_____ or, if the Work was bid on a unit price basis, the unit prices set forth in Contractor's accepted Bid (not to exceed $_____), all subject to additions and deductions as provided in this Agreement.

B. **Estimated Quantities and Unit Prices.** If award was made in whole or in part based upon unit prices, the Contractor agrees that the prices given in the Bid are unit prices. The estimated quantities as stated in the Bid and as indicated on the plans are approximate only; are subject either to increase or decrease; and are only for the purpose of comparing on a uniform basis the Bids offered for the Project under this Contract. Contractor further agrees that, should the quantities of any of the items of the work be increased, he will do the additional work at the unit prices set out in the Bid and that, should the quantities be decreased, payment will be made and accepted on actual quantities at the unit prices, and he will make no claim for anticipated profits for any decrease in the quantities. Actual quantities will be determined upon completion of the Project.

C. **Overtime Work by Contractor.** If the Contractor, for his convenience and at his own expense, should desire to carry on his work outside the hours of 7:00am to 5:00pm local time, Monday through Friday, he shall submit written notice to the City Representative and he shall allow ample time for satisfactory arrangements to be made for inspecting the work in progress. At no time shall the notice be given less than twenty-four (24) hours before such overtime work is started. The Contractor must

obtain, through the City Representative, the City's approval for work outside the specified hours or on Saturdays, Sundays, or legal holidays. The Contractor shall light the different parts of the Project as required to comply with all applicable federal and state regulations and with all applicable requirements of the City.

In general, the City's Inspectors are subject to being present at all times that the Contractor is working. Therefore, if the Contractor elects to schedule and perform overtime work, the Contractor shall pay the City for the City's Inspector's salary and reimbursable expenses for each hour of overtime incurred by the City's Inspector as a result of Contractor's performance outside the hours set forth above. Overtime shall be rounded up to the nearest whole hour. This amount shall include the Inspector's salary at his overtime rate and the labor additive, which includes insurance, social security, workmen's compensation, sick pay, paid holidays, vacation pay, and his vehicle and equipment. Payment to the City shall be made by an equal deduction from the amount due on a subsequent invoice submitted by Contractor for payment.

D. **Payments to Contractor, Retainage.** City shall make partial payments to Contractor of the billable work performed less payments already made and less deductions for any incomplete, unaccepted, or defective work. In making partial payments to the Contractor, there shall be retained five percent (5%) of the estimated amount of work done and of the estimated value of materials suitably stored on the site or suitably stored and insured off-site. No later than the 10th each month, Contractor may apply for payment for work performed that month by submitting to the City Representative an application for payment showing the status of the Contract sum to date, including the total dollar amount of the Project completed to date; the amount of retainage (if any); the total of previous payments; a summary of approved in writing Change Orders; and the amount of current payment requested. If properly completed and acceptable to the City Representative, he/she shall affix his/her signature and certify to the City that payment in the amount indicated is due to Contractor. If the City is in agreement with the certification, it shall release the payment to Contractor. However, if, upon inspection of the Work performed, the City Representative finds that the payment requested is not appropriate given the Work completed, the City Representative may certify an amount different than the amount applied for and provide an explanation therefor.

Once fifty percent (50%) of the Project has been satisfactorily completed, no further retainage will be withheld. Retainage shall be held until final completion and acceptance of all Work covered by the Contract unless escrow or deposit arrangements are agreed to by the City.

At the conclusion of the Project and upon Contractor's final completion of the Work, Contractor shall present a verified application for final payment. On completion and acceptance of each separately identifiable portion of the Project for which a separate price has been stated in the Contract or which can be separately ascertained, payment may be made in full to the Contractor, including retainage, but less any deductions allowed under this Agreement.

All materials and work covered by partial payments as provided for in this Agreement shall become the sole property of the City, but the Contractor shall maintain the sole responsibility for the care and protection of materials and Work upon which payments have been made and for the restoration of any damaged Work until final acceptance of the entire Work by the City and the City representative.

The City may also withhold from time to time from payment to the Contractor in such an amount or amounts as may be necessary to pay and fully satisfy all claims and demands for labor, materials and services rendered in and about the Project, including any such amount or amounts due to be paid to or by any subcontractor or supplier, amounts for City's or City Representative's observers or inspectors for Contractor's overtime as provided in this Agreement, or for engineering or design services associated with Contractor-initiated Change Orders, or for submittal reviews in excess of that permitted in this Agreement. The Contractor hereby authorizes the City, as its limited agent, to apply such amounts so withheld to the payment of any amount so due to be paid and all other just and lawful claims arising out of the Work other than claims for damages for tort, which payments shall be credited against any amounts due Contractor under this Agreement. In case of disagreement with reference to any such claim or claims, the City may keep such amounts so withheld on account of such claim or claims until such disagreement is finally settled and determined.

In addition, the City may also withhold payment of the whole or any part of a verified or approved application for payment from the Contractor to such an extent as may be necessary to protect itself from loss on account of any of the following causes:

a. Defective or incomplete work.
b. Evidence indicating probable filing of claims by other parties against the Contractor or the City.
c. Failure of the Contractor or its subcontractors to promptly make payments to subcontractors or for materials, labor, food stuffs, and supplies.
d. Damage to another contractor under separate contract with the City.
e. Assessment of liquidated damages.

At any time during the term of this Contract or any extensions thereof, Contractor shall not attempt to withdraw, without the express written consent of the City, the whole or any part of the amounts so retained by the City from payments due the Contractor by the establishment of an escrow account or by depositing securities in lieu thereof pursuant to *Ala. Code* §39-2-12(e) or (f), or any amendments thereto or any equivalent law, ordinance, or regulation. It is expressly agreed between the parties hereto that should the City elect not to consent to the same, then the Contractor shall not withdraw, attempt to withdraw, or in any manner whatsoever endeavor to withdraw such retained amounts.

E. **Differing Site Conditions.** If, in the performance of the Contract, subsurface or latent conditions are found to be materially different from those indicated by the plans and specifications, or unknown conditions of an unusual nature are disclosed which differ materially from conditions usually inherent in work of the character shown and specified, the Contractor shall immediately notify the City Representative in writing regarding such conditions but in no event later than twenty-four (24) hours after discovery of such conditions by the Contractor.

Upon such notice or upon the City Representative's observation of such conditions, whichever is later, the City Representative will promptly make or require, as applicable, such changes in the plans and/or specifications as he/she finds necessary (if any are necessary) to conform to the different conditions, and any increase or decrease in the cost of the Project or the time of performance resulting from such changes may be adjusted as provided under Change Orders as set forth in this Agreement.

F. **Change Orders.** Change Orders shall be allowed only under the following conditions:

1. Minor changes for a total monetary amount less than that required for competitive bidding.
2. Changes for matters incidental to the original Contract necessitated by unforeseeable circumstances arising in the course of work under the Contract.
3. Changes due to emergencies.
4. Changes provided for in the original bidding and original Contract as alternates.
5. Changes of items not contemplated or foreseen when the plans and specifications were prepared and the Project was advertised, which are in the public interest, and which generally do not exceed ten percent (10%) of the Contract Price, subject to Alabama Bid Law exceptions.

The Contractor is expected to complete the Project as bid and specified within the financial parameters stated in the Contract. However, if it shall be determined that a Change Order condition exists during the performance of the Contract, the Contractor shall promptly notify in writing the City Representative and shall not implement such change until having received necessary City approvals. If the change is minor in the opinion of the City Representative and does not involve (1) an increase in the Contract sum or construction bid price; (2) an extension of the Contract time; or (3) a material change in the Contract scope of services, then the City Representative may authorize the change in writing to the Contractor. The Contractor shall not perform such change until receipt of such written Change Order.

In the event the Change Order requested by the Contractor involves (1) an increase in the Contract sum or construction bid price, (2) extension of the Contract time, or (3) a material change in the Contractor's scope of work or services, then the Contractor shall request a Change Order in writing and present the same to the City Representative who shall determine whether this is a Change Order which can be allowed and, if so, what exception it would fall under. The City Representative shall then document the same, attach the same to the Contractor's request for a Change Order and submit the same with his recommendation to the Mayor for approval. It is mutually agreed that no Change Order shall be effective unless granted in writing, signed by the Mayor.

The City reserves the right to institute Change Orders as the Project Owner pursuant to the aforesaid terms and conditions and in the best interests of the City.

In no event is a Change Order to be executed by the Contractor prior to approval thereof by the Mayor, except for emergencies.

G. **Omitted Work.** A change order for omission of work shall be valid only if signed by the Mayor in which event the work so ordered must be omitted by the Contractor. The amount by which the Contract price shall be reduced shall be determined as follows:

1. By such applicable unit prices, if any, as are set forth in the approved bid; or
2. By the appropriate lump sum price set forth in the Contract; or
3. By the fair and reasonably estimated cost of such omitted work as determined by the City.

H. **Construction Schedule and Periodic Estimates.** After execution and delivery of the Contract and before the first partial payment is made, the Contractor shall deliver to the City Representative a CPM

construction schedule showing the proposed dates of commencement and completion of each of the various activities; the work required under the Contract; the interrelationship of each activity; sequencing and timing of performance of each portion of the Project; and the anticipated amount of each monthly payment that will become due in accordance with the Construction Schedule. The Contractor shall also furnish a detailed estimate giving a complete breakdown on the Contract price and periodic itemized estimates of the Work done for the purpose of making partial payments. However, the same will not be considered as fixing a basis for additions to or deductions from the Contract price.

ARTICLE III. TIME

A. **Time for Completion.** The Contractor hereby agrees to commence performance of this Contract on the date to be specified in a written "Notice to Proceed" and to fully complete the Project within _____ calendar days of such Notice to Proceed. It is agreed and understood that time is of the essence for the Contractor's performance of the Work hereunder.

B. **Delay.** Contractor may be entitled to a reasonable extension of time, as determined by the City, in which to complete the Project if the critical path of the Work is delayed at any time by any of the following causes:

1. Fires, abnormal floods, tornadoes, or other cataclysmic phenomena of nature.
2. Strikes, embargoes, lockouts, war, acts of public enemy.
3. Fully approved and executed Change Orders.
4. Unreasonable and unforeseeable delays in performance by other contractors employed by the City.
5. Causes conclusively shown by Contractor to be both beyond its control and its reasonable expectation.

In the event one of the above-cited circumstances results in delay to the critical path of the Work, Contractor shall immediately give notice in writing to the City and follow extension of time procedures as provided for in this Agreement. The City expressly disclaims any liability to Contractor for any cost, expense, loss or damage caused by other contractors, subcontractors, or suppliers, including those engaged by the City. The City will not be liable for damages or costs to the Contractor sustained due to any interference from utilities or appurtenances or from the operations of relocating the same.

C. **Extensions of Time.** It is mutually agreed that no extension beyond the date of completion fixed by the terms of the Agreement shall be effective unless granted in writing, signed by the Mayor. All written requests for extensions of time must be submitted to the City Representative within five (5) calendar days after the occurrence of the cause for delay, or otherwise the right to an extension shall be waived by Contractor. The City Representative shall ascertain the facts and the extent of the delay and shall recommend to the Mayor whether it should extend the time for completing the Project. Any extension of time shall be in writing and processed as a Change Order.

For Change Orders requesting extensions of time due to rain, wind, flood, or any other natural phenomenon, the Contractor's written request must be accompanied, at the City Representative's

request, by a detailed report of weather at this site for the last three (3) years with averages showing means and statistical deviations from mean averages to support request for extension. No extension shall be made for delays due to rain, wind, flood, or any other natural phenomenon of normal intensity or duration for the locality.

In the event any material changes, alterations, or additions are requested and which, in the opinion of the City Representative, will require additional time for execution of any work under the Contract, the time of the completion of the Project may be extended through Change Order to the extent the critical path is impacted. No extensions of time shall be given for any minor changes, alterations, or additions.

The Contractor shall not be entitled to any reparation or compensation on account of such additional time or extensions of time, and the City's granting of an extension of time shall not be valid grounds for a claim by the Contractor for damages or for additional costs, expenses, overhead, profit, or other compensation.

Any extensions of Contract Time available under the provisions of this Agreement shall be Contractor's sole and exclusive remedy for delay, impacts or disruption in the progress of the Work, and Contractor shall not be entitled to an adjustment in the Contract Price and/or damages of any kind as a result of any such delay, impacts or disruption.

D. **Right of the City to Terminate Contract.** Owner may at any time and for any reason terminate Contractor's services and work at Owner's convenience by providing written notice to Contractor of such termination. Upon receipt of such notice, Contractor shall, unless the notice directs otherwise, immediately discontinue the work and placing of orders for materials, equipment, and supplies in connection with the performance of this Agreement. Upon such termination, Contractor shall only be entitled to payment for Work properly completed at the time of such notice, as certified by the Owner's Representative, and shall not be entitled to anticipatory profit, overhead, indirect or impact costs of any kind, or consequential damages.

If the Contractor should be adjudged as bankrupt, or if it should make a general assignment for the benefit of its creditors, or if a receiver should be appointed for the Contractor or any of its property, or if it should persistently or repeatedly refuse or fail to supply enough properly skilled workmen or if it should refuse or fail to make prompt payment to persons supplying labor or materials for the Project, or persistently disregard instructions of the City Representative or fail to observe or perform any provisions of the Contract, or fail or neglect to promptly prosecute or perform the Project in accordance with the Contract, or otherwise be guilty of a material violation of any provision of the Contract, then the City may, without prejudice to any other rights or remedies of the City in the premises, immediately terminate the Contractor's right to proceed with the Project. In such event, the City may take over the Project and prosecute the same to completion, by contract or otherwise, and the Contractor and its sureties shall be liable to the City for any and all excess cost occasioned to the City thereby, including reasonable attorney's fees; and in any such case, the City may take possession of and utilize in completing the Project such appliances, tools, equipment and plant of the Contractor or its subcontractors as may be on the work site and necessary or useful therefor.

In the event of termination, the same shall not relieve the Contractor or any of its sureties of their obligations pursuant to this Contract.

In the event it becomes necessary for the City to maintain any legal action against the Contractor to enforce its rights under this Agreement, the Contractor shall pay the City's expenses associated therewith, including a reasonable attorney's fee.

In the event it is subsequently determined in any legal proceeding that the City's termination of the Contractor for default was without legal basis, then such termination shall be converted to a termination for convenience and the Contractor compensated only as provided in the first paragraph of this subsection D.

E. **Time of the Essence; Liquidated Damages.** The parties hereto mutually understand, agree, and state that, due to the nature of the Project and the damage and inconvenience to the City and its citizens that would be caused by any delay in completion thereof, ***time is of the essence***. Because time is a material element of this Agreement, should the Project not be completed within the time specified and/or adjusted pursuant to this Contract, it is understood and agreed that there may be deducted by the City from the partial and/or final payments to the Contractor, or otherwise charged to the Contractor separately, a sum computed at the rate of $500.00 per day, beginning from the stated or extended date of completion and continuing for so long as the Project remains incomplete. The parties agree that potential delay damages to the City are difficult to determine at the time of execution and that this amount is a reasonable estimation thereof.

It is understood and agreed by the parties that the above deduction or charge is not a penalty, but money due to reimburse the City for inconvenience and damage to it and the general public due to the delay in the completion of the Project and is a reasonable sum. The collection of liquidated damages by the City shall not constitute an election or waiver by the City of recovery of additional delay or non-delay-related damages from the Contractor, and the City expressly reserves the right to recover actual damages for other harms resulting from delay. The provisions of the liquidated damages clause shall apply and continue to apply even if the Contractor is terminated or abandons the Project prior to the scheduled completion date.

F. **Acceleration.** (a) Contractor shall at all times supply sufficient tools, equipment, materials, supervision, subcontracted services and labor to meet the then-current approved project schedule. To the extent, in the reasonable belief of the Owner, the progress of the Work is such that the contract completion date, as adjusted for time extensions provided elsewhere in this Agreement, will not be met due to the fault or cause of Contractor or its subcontractors, suppliers, consultants, agents and employees, then the Owner may direct Contractor in writing to take such steps as Owner deems necessary to improve Contractor's progress, all without additional cost or fee to the Owner. Such steps may include, but shall not be limited to, increasing the number of shifts, adding overtime operations, increasing the labor force and/or supervision, working holidays and weekends and adding equipment and operators. Such an acceleration shall be separately accounted for by Contractor. If Contractor reasonably believes that acceleration is not justified under the terms of this clause, it shall so advise Owner in writing within seven (7) days of receipt of the directive to accelerate. In such case of objection, Contractor may expressly reserve its right to claim a

compensable acceleration under paragraph (b) below, but nevertheless must proceed with the acceleration as directed.

(b) In the event the progress of the Work is on schedule for meeting the contract completion date, as adjusted for time extensions provided elsewhere in this Agreement, the Owner reserves the right to direct Contractor in writing to accelerate its progress as a change in the Work and with compensation as provided in Article II F. hereof. Upon such written direction, costs of such acceleration shall be separately accounted for by Contractor.

G. COVID Pandemic. Contractor acknowledges that it has factored, and assumed the risk for, Coronavirus impacts into the Contract time and the Contract price it has bid for the Project, including but not limited to abiding by all local, state and federal laws, guidelines, policies, regulations, procedures, orders and protocols that have been and may be implemented from time to time.

ARTICLE IV. WORK AND MATERIALS

A. Cooperation of Contractor. Contractor shall have available on the job site at all times at least one (1) copy of the plans and specifications prepared for the Project. He shall give the Project all attention necessary to facilitate the progress thereof and shall cooperate with the City, City Representative, and with other contractors in every way possible. Using his best skill and attention, Contractor shall give efficient supervision to the Project and shall be solely responsible for all construction means, methods, techniques, and procedures; for providing adequate safety precautions; and for coordinating all portions of the Project under the Contract.

B. Superintendence. Contractor shall assign to and keep at the Project site competent supervisory personnel and, prior to commencement of the Work, shall designate in writing an authorized representative who shall be an employee of the Contractor and who shall have complete authority to represent, to receive notice for, and to act for the Contractor. Contractor shall not permit or allow any work to be conducted upon the Project site without the presence of such supervisory personnel. The City Representative shall be notified in writing prior to any change in superintendent assignment.

C. Contractor's Tools and Equipment. The Contractor's tools and equipment used on the Project shall be furnished in sufficient quantity and of a capacity and type that will adequately and safely perform the work specified, and shall be maintained and used in a manner that will not create a hazard to persons or property or cause a delay in the progress of the Project.

D. Furnishing Labor and Equipment. Contractor shall furnish and pay for all equipment, labor, and supervision, and all such materials as required to be furnished to perform the Work and as may otherwise be necessary to the completion of the Project and the operation of each construction crew required.

E. Employees. Contractor shall employ only competent, skillful workers on the Project, and whenever any person shall appear to be incompetent or to act in a disorderly, unsafe, illegal, or improper manner, such person shall promptly be removed from the Project by the Contractor.

F. Materials and Appliances. Unless otherwise stipulated, the Contractor shall provide and pay for all materials, water, heating, lighting, fuel, power, transportation, machinery, appliances, telephone, sanitary facilities, temporary facilities, and other facilities and incidentals necessary for the execution and completion of the Project.

Contractor warrants to the City that, unless otherwise specified, all materials furnished under this Contract shall be new and that both workmanship and materials shall be of good quality, free of faults and defects, and in conformance with the Contract. Contractor shall, if required, furnish satisfactory evidence as to the kind and quality of materials. Material and/or equipment damaged by flooding or other causes during the construction period shall be subject to rejection by the City Representative. Reconditioning and/or repairing materials used for the Project is not acceptable unless first approved by the City Representative.

G. Asbestos and Hazardous Materials. Unless specifically authorized and instructed to the contrary by the City, the Contractor shall not permit, allow, place, install, or incorporate into the Project or upon the work site, any hazardous material(s), including, but not limited to, any products or materials that contain asbestos in any quantity. It shall be the responsibility of the Contractor to inspect all materials and products delivered for incorporation or installation in the Project to ensure that they contain no hazardous materials or asbestos. Where the Contractor or any subcontractor has or should have a reasonable suspicion that any product or material contains asbestos or other hazardous material, the Contractor shall immediately inspect the material or product, obtain a product or material data sheet, and notify the City's representative prior to installation or incorporation of the same into the Project. Any product or material determined to contain asbestos or other hazardous material shall be removed from the Project immediately and properly disposed of as required by law. Products or material to which the Contractor should pay particular attention to avoid the presence of asbestos include, but are not limited to, the following: concrete, batt insulation, roof insulation, building felts, mastics, water proofing products, adhesives, resilient flooring products, ceiling tiles, interior coatings, exterior coatings, roofing, pipe installation, duct installation, and pre-assembled items of equipment.

At the completion of the Project, the Contractor shall submit a duly executed Asbestos Affidavit (if applicable) prior to final payment.

The Contractor is responsible for insuring that all of its employees and subcontractors are adequately trained to handle hazardous materials in accordance with 49 CFR §172(g).

H. Protection of Project and Property (as applicable). Contractor shall furnish and install all necessary temporary works for the protection of the Project. The Contractor shall at all times adequately maintain, guard, and protect the Project from damage and safely guard and protect private, commercial, industrial, the City's, and others' property from injury or loss arising in connection with this Contract. He shall make good any such damage, injury, or loss, except such as may be directly due to errors in the plans or specifications or caused by agents or employees of the City.

Contractor shall protect all existing vegetation such as trees, shrubs, and grass on or adjacent to the site which are not required to be removed or do not unreasonably interfere with construction, as may be determined by the City Representative, and be responsible for all cutting or damaging of trees and shrubs or grassed areas, including damage due to careless operation of equipment or to the stockpiling of materials or equipment.

Care shall be taken by the Contractor in felling trees that are to be removed to avoid any unnecessary damage to vegetation or other trees that are to remain in place. Any limbs or branches unavoidably broken during such operations shall be trimmed with a clean cut and painted with an approved tree priming compound. The Contractor may be required to replace or restore at his own expense all vegetation not protected and preserved as required.

Contractor shall provide and maintain all passageways, guard fences, lights, and other facilities required for protection by federal, state, or municipal laws and regulations, or local conditions.

Contractor shall comply with local and state regulations governing the operation of premises that are occupied and shall perform the Contract in such a manner as not to interrupt or interfere with the operation of other facilities.

Contractor shall store his apparatus, materials, supplies, and equipment in such orderly fashion at the site of the Project as will not unduly interfere with the progress of the Work or the work of any subcontractor.

Contractor shall not place upon the Project, or upon any part thereof, loads inconsistent with the design or safety of that portion of the Project.

Contractor shall provide and maintain access to all public and private properties at all times and be responsible for any damage caused by his operation to existing driveways, yards, streets, parking lots, utilities, railroads, etc., and such damage shall be corrected at the Contractor's expense. Roadways authorized closed by State or Local authorities shall be maintained to provide access to all fire, police, and other emergency vehicles, and all individuals having private property in the closed area. In the event access to any public or private property or right-of-way will be completely closed for a period of time, Contractor shall notify the City Representative and all other individuals, businesses, or governmental agencies that may be affected by such closure at least seventy-two (72) hours in advance.

I. Protection of Existing Utilities. Contractor shall determine the exact location of all existing utilities before commencing the Work and shall provide whatever measures are necessary to properly protect and maintain all existing utilities encountered in the course of the Work. Contractor agrees hereby to be fully responsible and liable for any and all damages which might occur by his failure to exactly locate and/or preserve the location of any and all underground or overhead utilities. If any utilities are to be affected during the course of construction, the Contractor shall so notify the owners thereof at least seventy-two (72) hours prior to any such construction activity. The Contractor shall fully cooperate and coordinate with all utility owners in the event of an interruption to any utility service. The cost for locating, uncovering, and protecting underground and/or overhead utilities is included within the Contractor's Bid price.

Additionally, Contractor shall maintain all storm sewers, drains, and/or ditches so that flow is not disturbed or impeded. Contractor shall protect storm drains, inlets and/or ditches, lawns, landscaping, and other facilities from damage during the testing and flushing.

J. Limiting Exposures. The Contractor shall perform the work on the Project to insure that no part of the construction, complete or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

Contractor shall minimize dust and air pollution through the use of water or other devices and shall require the use of properly operating combustion emission control devices. Contractor shall also encourage the shutdown of construction vehicles when not in use.

K. Safety. Contractor shall take all necessary precautions for the safety of employees on the Project and shall comply with all applicable provisions of federal, state, and municipal safety laws and applicable regulations to prevent accidents or injury to persons on or about or adjacent to the premises where the Project is being performed. He shall erect and properly maintain at all times, as required by conditions and progress of the Project, all necessary safeguards for the protection of workmen and the public and shall post danger signs warning against the hazards created by features of construction and the site.

Machinery, equipment, and all hazards shall be guarded or eliminated in accordance with the State Accident Prevention in Construction provisions to the extent that such provisions are not in contravention with applicable laws.

Contractor shall do whatever work is necessary for safety and be solely and completely responsible for conditions of the jobsite, including safety of all persons (including, but by no means limited to, the public, site personnel, visitors, or City employees) and property during the Contract period. The Contract period shall include any subsequent warranty or other period associated with Project deficiency or repair and all hours including, and in addition to, normal working hours.

Safety provisions shall conform to the Federal and State Departments of Labor and the Occupational Safety and Health Act (OSHA), and all other applicable federal, state, county, and local laws, ordinances, codes, the requirements set forth in this Agreement, and any regulations that may be specified in other parts of this Contract. Where any of these are in conflict, the more stringent requirement shall be followed. The Contractor's failure to thoroughly familiarize himself with the aforementioned safety provisions shall not relieve him from compliance with the obligations and penalties set forth in those standards and regulations.

Contractor shall at all times provide proper facilities for safe access to the work by authorized representatives of the Owner.

L. Traffic Control. Contractor shall be responsible for any necessary traffic control, including a plan and all necessary devices, required to work in, upon, or in proximity to public right-of-way or vehicular traffic. The traffic control plan and all traffic control devices shall conform, at a minimum, to the *Manual on Uniform Traffic Control Devices for Streets and Highways*, latest edition, Federal Highway Administration. Should the appropriate public authority determine a greater degree of traffic control is required, the Contractor shall promptly provide the same. Where deemed necessary by either the Contractor or the City, the Contractor shall submit a plan to the City Representative for approval before commencing construction.

Reasonable means of ingress and egress by vehicular and/or pedestrian traffic to property adjacent to the Project shall be maintained by the Contractor at all times. The Contractor shall defend, indemnify and hold the City harmless (including the payment of attorney's fees) for any claims or causes of action arising out of Contractor's failure to so maintain including, but not limited to, those for inverse condemnation and/or lost profits arising out of or in any manner associated with access to or the restriction or prevention thereof to adjoining property. Traffic control is of paramount importance during the construction of this Project and the terms and conditions in the Contract in regard to these matters must be strictly adhered to.

M. Sanitary Regulations. Contractor shall provide and maintain such sanitary accommodations for the use of his employees and those of his subcontractors as may be necessary to comply with the requirements and regulations of the local and State Department of Health. At a minimum, necessary sanitary conveniences for the use of the laborers on the work shall be erected and maintained by the Contractor in such a manner and at such points as shall be approved by the City Representative. Use of these facilities must be strictly enforced.

N. Cutting, Patching. Unless otherwise stated in this Agreement, the Contractor shall be responsible for any necessary cutting, fitting, and patching of the Project that may be required to properly receive the Work, to make its several parts join together properly, and to receive and provide for the work of other contractors or utilities, or as required by drawings and specifications to complete the Project. After such cutting, Contractor shall replace or restore or repair and make good all defective or patched work as required by the City Representative. He shall not cut, excavate, or otherwise alter any work in any manner or by a method or methods that will endanger the Project, adjacent property, workmen, the public, or the work of any other contractor. The Contractor shall check the location of all sleeves, openings, slots, etc., for the piping, ducts, breeching, conduits, louvers, grills, fans, etc., as they are laid out on the job.

Pipes passing through concrete or masonry walls shall be protected by pipe sleeves two sizes larger than the pipe plus its installation to provide free movement.

Under no condition shall structural, framing, or other parts or members subjected to computed stress be cut or disturbed without the approval of the City Representative. Any plates, studs or joists, or rafters that are approved to be cut to execute necessary work shall be securely strapped and braced to restore their strength by approved methods.

Unless otherwise indicated in the Contract Documents, all pavement, rights-of-way, or driveways cut by the Contractor during the performance of the Project shall be returned to service as soon as possible and replaced or repaired within seven (7) calendar days of completion of the Project.

All major thoroughfares must be repaired the same day as cut. The Contractor shall be responsible for the safety and welfare of the traveling public while construction work is being done and until the City accepts the Project.

Contractor will replace, at his own expense, all pipe and accessories that may be broken, damaged, stolen, or lost and all materials that may become damaged, lost, stolen, or misused.

City Representative's approval shall be obtained before cutting or drilling holes in concrete or masonry that tend to damage or weaken the load capacity.

O. Trailers. With the approval of the City Representative, the Contractor may park trailers or other structures for housing men, tools, machinery, and supplies, but they will be permitted only at approved places and their surroundings shall be maintained at all times in a sanitary and satisfactory manner by the Contractor. On or before the completion of the Project, all such trailers or structures shall be removed, unless the City authorizes their abandonment without removal, together with all rubbish and trash, at the expense of the Contractor.

P. Construction Staking. If necessary as determined by the City, the City Representative will furnish initial lines and grades to establish the initial horizontal and vertical control points and define the beginning and ending points of the Project. The Contractor is responsible for engaging the services of a qualified engineer or land surveyor to replace and/or re-establish, in accordance with the construction plans and/or specs, all construction stakes that are disturbed, displaced, or destroyed during construction.

If the Contractor finds any errors or discrepancies with the construction staking or the criteria upon which it is based, he/she shall promptly notify the City Representative.

Q. Periodic Cleanup. At all times, the Project premises should be sanitary, safe, reasonably clean, and orderly. Contractor shall provide adequate and approved containers throughout the work site for collection and disposal of waste material, debris, and rubbish and shall, at least weekly (and as requested by the City Representative during the progress of the Project), clean up and remove from the premises all refuse, rubbish, scrap materials, and debris caused by its employees or its subcontractors resulting from the Work. Trash and combustible materials shall not be allowed to accumulate inside buildings or elsewhere on the premises. At no time shall any rubbish be thrown from window openings, except during building renovations with adequate precautions and into proper receptacles. The Contractor shall comply with all municipal litter and construction site ordinances.

Contractor shall conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws, including, but not limited to all applicable portions of the City's stormwater control ordinance. No burning or burying of rubbish or waste materials is permitted on the Project site. The Contractor shall dispose of any hazardous material in a safe manner, off site, in accordance with applicable laws and regulations and shall not dispose of volatile or hazardous waste in storm or sanitary sewer drainage ditches, streams, or waterways.

Before the Project will be considered complete, all rubbish created by or in connection with the Project must be removed by the Contractor and the premises left in a condition by the Contractor satisfactory to the City Representative. Streets, curbs, crosswalks, pavement, sidewalks, fences, and other public and private property disturbed shall be restored to their former condition or better, and final payment will be withheld until such work is finished by the Contractor.

R. Erosion Control. As required by the City of Montgomery Engineering Department and the Alabama Department of Environmental Management, Contractor shall provide and maintain temporary soil erosion and sediment controls necessary for the management of construction stormwater discharge quality. These controls shall also be in accordance with the most recent version of Section 665, "Temporary Soil Erosion

and Sediment Control," of the Alabama Department of Transportation's *Standard Specifications for Highway Construction*, and shall be designed to protect the Project site from soil erosion and adjacent property and waters from damage by sediment transport and deposition during construction.

S. Wastewater Containment and Management Plan. To the extent that construction activity by the Contractor involves any wastewater infrastructure or construction activities in close proximity to any wastewater infrastructure, Contractor shall submit to the City Engineer, prior to commencing construction, a wastewater containment and management plan (the "Plan"). The Plan shall adequately address the means, methods, and techniques to be employed by the Contractor for containing and transporting wastewater in a sanitary manner without, at any time, permitting the discharge of wastewater into the environment or creating the necessity of a State-required sanitary sewer overflow report. The City Engineer may waive the requirement of submitting a Plan if he determines that the construction activity to which the Plan would relate does not involve any potential for the discharge of wastewater into the environment or does not necessitate creation of a State-required sanitary sewer overflow report.

T. Environmental Clause/Covenant. In all respects, Contractor shall comply with all local, state and federal environmental laws and regulations affecting the Premises. Contractor covenants to defend and hold the City, its officers, agents, and employees harmless from and against any losses, costs, damages, or expenses (including attorney's fees and expenses) arising out of the presence of hazardous substances on or about the premises or the violation of any environmental laws or regulations with respect thereto, the occurrence of which having arisen solely from the acts or omissions of Contractor, its subcontractors, agents, invitees, or employees. This indemnity shall survive the termination of this Contract and shall inure to the benefit of the City of Montgomery and its successors and assigns.

ARTICLE V. INSURANCE, LIABILITY

A. Contractor's Insurance.

1. Insurance Required. The Contractor shall not commence work under this Contract until it has obtained all insurance required by the Instructions to Bidders and such insurance has been accepted by the City. The Contractor shall maintain the required insurance during the term of the Contract including any extensions of the term.

   Insurance shall be written in comprehensive form by insurance companies rated A- or better by A. M. BEST and shall protect the Contractor, City Representative and the City against claims for injuries to members of the public (including City employees) or damages to property of others (including City property) arising out of any act of the Contractor or any of its agents, employees or subcontractors and shall cover both on-site and off-site operations under this Contract and insurance coverage shall extend to any motor vehicles or other related equipment, irrespective of whether the same is owned, non-owned or hired.

   The obtaining and maintaining by Contractor and subcontractors of the insurance required in this Agreement does not relieve the Contractor of any responsibilities, obligations, or duties to the City pursuant to this Contract.

2. Additional Insurance. The Contractor may have an insurance professional review the Contractor's activities in regard to the performance of this Contract and is free to obtain any further or additional insurance or greater limits as recommended by the insurance professional. All additional policies of insurance shall name the City as an additional insured.

3. Insurance Limits. Neither the setting of insurance limits or requirements nor the acceptance or approval of the same by the City imply or represent that the limits or the insurance carrier is sufficient or that such insurance actually has been obtained, that being the responsibility of the Contractor.

4. Subcontractors. The Contractor shall require all subcontractors to take out and maintain the type of insurance required in this Agreement to the extent of their involvement in the Project so as to be adequate to protect against liability. In the event any work under this Contract is performed by a subcontractor(s), the Contractor shall remain responsible for any liability directly or indirectly arising out of the work performed under this Contract, regardless of whether or not such work is covered by the subcontractor's insurance. The Contractor shall not allow any subcontractor to commence work on the project until all similar insurance required of the subcontractor has been obtained. All subcontractors shall maintain required insurance during the term of the Contract including any extensions of the term.

5. City's Right to Review Coverage. The City shall have the right to inspect and approve Contractor's insurance coverage required in this Agreement. Should the City deem it advisable to modify the coverage in any way, it shall so request of the Contractor in writing and should the Contractor fail to modify the coverage, then the City may pay the cost of any increased coverage or take credit for any decreases as may be appropriate. Review or acceptance of insurance by the City or representatives of the City shall not relieve or decrease the responsibility of the Contractor hereunder.

6. Waiver of Subrogation. To the extent that the Contractor is required to maintain insurance coverage for loss or damage to property or bodily injury, including Builders or All Risk insurance, the insurance must waive and the Contractor hereby waives subrogation of claims against the City, the City Representative, and the City's officers, agents, consultants and employees.

7. City as Additional Insured. The City shall be named as additional insured for ongoing and completed operations for up to two (2) years on the Contractor's and any subcontractor's policies for any claims arising out of the Work. Contractor shall provide the City with a Certificate of Insurance naming the City as an additional insured and giving the City the promise of a thirty (30) day notice of cancellation or intent not to renew the insurance. Unless precluded by law, all policies must waive the right to recovery or subrogation against the City, officers, directors, employees, agents, consultants and representatives. The coverage available to the City as an additional insured shall not be less than the limits set forth in this section and shall apply as primary and non-contributory insurance with respect to any other insurance afforded to the City through its own carrier or otherwise.

8. Elevators, Hoists, Cranes, Conveyors. If the Contractor or a subcontractor will utilize in connection with the performance of the Work an elevator, material hoist, crane, conveyor, or other similar equipment, then the Contractor shall take out and maintain (or require the subcontractor to take out and maintain) insurance that shall protect the Contractor and the City against claims for injuries to members of the public (including City employees) or damages to property of others (including City property) arising out of any act of the Contractor or any of its agents, employees, or subcontractors resulting from the operation of such equipment.

B. Insurance.

TYPES OF INSURANCE	MINIMUM LIMITS OF LIABILITY
Worker's Compensation	Statutory
Employer's Liability	$500,000 *each employee, each accident and policy limit*
Commercial General Liability	
Each Occurrence	$1,000,000
Personal and Advertising Injury	$1,000,000
Products/Completed	$5,000,000
Operations General Aggregate	$5,000,000
Automobile Liability	$1,000,000 *each accident, combined single limit*

1. Worker's Compensation Insurance. Contractor shall take out and maintain during the term or any extensions of this Contract Workmen's Compensation Insurance as required by Alabama law for all of its employees employed on the Project and, in case any work is sublet, the Contractor shall require the subcontractor similarly to provide Workmen's Compensation Insurance for all of the latter's employees unless such employees are covered by the protection afforded by the Contractor.

   In case any class of employees engaged in any work under this Contract at the site of the Project is not protected under the Workmen's Compensation statute, the Contractor shall provide, and shall cause each subcontractor to provide, adequate accident insurance for the protection of its employees not otherwise protected.

   Where work under this Contract may trigger the requirement for Federal Longshoreman's and Harbor Worker's Act and Federal Jones Act or insurance required by other applicable law or regulations, the Contractor shall obtain the same as required.

2. Owner's Protective Insurance. For projects with a contract amount of $500,000.00 or greater, an Owner's Protective Policy is required in the minimum amount of $1,000,000 each occurrence.

3. Miscellaneous Insurance. Contractor shall provide whatever insurance may be required of the City or the Contractor by permits from or agreements with the railroad, highways, or other utilities. Contractor shall familiarize himself with all insurance requirements contained in easements, permits, and agreements associated with this Project. Contractor shall provide

any Railroad Protective Liability and other General Liability Insurance in the amounts contained in the agreements, permits, or easements or in greater amounts if higher limits are appropriate or required elsewhere. Contractor shall bear the cost of all required insurance and shall include in his Bid a sufficient amount to cover the cost of all required insurance. To the extent the City obtains permits or licenses for railroad or highway bores, crossings, or other work involved in the Project, the Contractor shall obtain adequate insurance to protect itself and the City.

4. Builder's Risk or All Risk Insurance. To the extent applicable to the Project, the Contractor shall secure and maintain during the life of this Contract Builder's Risk or All Risk Insurance coverage for 100% of the Contract Price. This insurance shall not exclude coverage for earthquake, landslide, tornado, flood, collapse, or loss due to the result of faulty workmanship. Such insurance shall also provide for any damages caused by injury to, or destruction of, tangible property, including loss of use resulting therefrom, and shall pay all losses to the Contractor and the City as their interest may appear.

5. Proof of Carriage of Insurance. Contractor shall furnish the City with satisfactory proof of carriage of the insurance required in this Agreement in the form of an insurance certificate or, if the City elects, in the form of a policy.

   a. Contractor's and any subcontractor's general liability and automobile liability insurance shall endorse the City of Montgomery, Alabama, a municipal corporation, and its officers, agents, representatives, consultnats and employees as additional insureds for any claims arising out of the Work.

   b. Contractor's insurance endorsing the Owner and others as additional insureds shall be primary and non-contributory as to such endorsed insureds.

   c. The certificate or policy, as the case may be, shall state that the City shall be given thirty (30) days' written notice of cancellation or of any change in the insurance coverage.

   d. There shall be a statement that the Contractor and any subcontractors waive subrogation as to the City, its officers, agents, and employees.

   e. There shall be a statement that full aggregate limits apply per job or contract.

   f. Agent's verification of Contractor's insurance must be provided in a form satisfactory to the City.

   g. Insurance shall contain no XCU exclusions or special endorsements.

   h. Full aggregate limits must apply per job or contract.

C. No Personal Liability of Public Officials. In carrying out any of the provisions hereof in exercising any authority granted by the Contract, there will be no personal liability upon any public official.

D. Indemnity. To the maximum extent permitted by law, the Contractor shall save harmless, indemnify, and defend the City and its officers, agents, representatives, consultants and employees from and against any and all claims and losses, costs, expenses, or liability, including attorney's fees and litigation costs, caused by, arising out of, resulting from, or occurring in connection with the performance of the Work by the Contractor or any subcontractor, regardless of the fault, breach of contract, or negligence of the City, its officers, agents, representatives, consultants or employees, excepting only such claims or losses that have been adjudicated to have been caused solely by the negligence of the City.

Contractor agrees to defend, indemnify and/or reimburse the City for any fines, violations, charges, suits, or sums of money imposed by the Alabama Department of Environmental Management, the Environmental Protection Agency (EPA), the U. S. Corps of Engineers, or any other administrative agency for any sewage or contaminate discharged or wetlands regulations violated as a result of or arising out of the Work as performed by Contractor.

E. Errors and Omissions. Contractor agrees to release and hold harmless the City of Montgomery and each of its officers, agents, representative, consultants and employees from any damages claimed by the Contractor or subcontractors resulting from or attributable, in whole or in part, to errors in or omissions of the plans and specifications, including final drawings of the Engineer, Architect or other design professionals. As to plans, specifications, or designs prepared by independent design professionals, the parties agree that any City review or approval thereof is only for overall suitability, maintenance, and usability and there are no express or implied warranties by the City as to the adequacy, accuracy, correctness, or code compliance thereof.

F. Exclusion of Contractor Claims. In performing its obligations, the City Representative may cause expense for the Contractor or its subcontractors and equipment or material suppliers. However, those parties and their sureties shall maintain no direct action against the City or its officers, employees, representative, consultants or agents for any claim arising out of, in connection with, or resulting from the engineering or architectural services performed or required to be performed where such services are performed in good faith to protect the City or the public.

G. Inadequate Surety/Insurance. It is further mutually agreed between the parties hereto that if, at any time after the execution of this Agreement, any of the surety bonds of the Contractor or subcontractors relating to the Project shall be deemed by the City to be unsatisfactory, or if for any reason such bond(s) ceases to be adequate to cover the performance of the Work or the surety ceases to do business by agent in Alabama, the Contractor shall, at its expense, within five (5) days after the receipt of notice from the City so to do, furnish an additional bond or bonds in such form and amount and with such surety or sureties as shall be satisfactory to the City. In such event, no further payment to the Contractor shall be deemed to be due under this Agreement until such new or additional security for the faithful performance of the Work shall be furnished in manner and form satisfactory to the City.

H. Changes. When changes in the scope of work by written order or Change Orders cumulatively equal ten percent (10%) of the total Contract Price, the insurance coverage included under this heading shall be increased accordingly by the Contractor. Proof of coverage shall be established by endorsement to the original policy or by re-issue of the original policy to include the added coverage, or in accordance with any other acceptable policy with the insuring company for increasing the coverage.

ARTICLE VI. OBSERVATION OF THE PROJECT

A. Authority and Duties of City Representative. The City Representative shall be authorized and permitted to inspect all facets of the Work, including all materials, workmanship, equipment, processes, and methods of construction used by Contractor. Subject to the provisions of Article II, paragraphs E, F & G, he is not authorized to alter or waive any requirements of the specifications or the Contract. However, he shall have authority to reject material, workmanship, and/or equipment that are defective or otherwise not in accordance with the drawings and specifications and require correction by the Contractor at Contractor's expense. No work shall be deemed complete until it has been inspected and approved by the City Representative.

The City Representative may designate observers, with assigned duties and restricted authority, to inspect the Project and to report to him on the progress of the Project, manner of procedure, quality of the material and workmanship, and compliance with the Contract. However, the presence of the City Representative or his designee as an inspector of the work performed shall not in any manner lessen the responsibility of the Contractor pursuant to this Agreement. Neither the City Representative nor any other representative of the City shall be responsible in any way for construction means, methods, or techniques or for the safety of the construction work, progress, or employees of the Contractor or any subcontractors.

B. Defective Work/Correction. Rejected workmanship shall be satisfactorily corrected by Contractor and rejected material shall be satisfactorily replaced with proper material by the Contractor, each without charge therefor, and the Contractor shall promptly segregate and remove the rejected material from the premises. Upon failure or neglect by the Contractor to promptly prosecute or perform the Work in accordance with the Contract or to make corrections to the Work as required by the City Representative, the City may, without prejudice to any other remedy it may have, complete the Work and/or correct the deficiencies and then deduct the actual cost thereof from payment which is then or thereafter due to the Contractor.

C. Contractor's Obligation Continues. The inspection of the Work shall not relieve the Contractor of any of its obligations to fulfill its Contract, notwithstanding that such work has been previously inspected by the City Representative and accepted or estimated for payment. The failure of the City Representative as inspector to condemn improper workmanship shall not be considered as a waiver of any defect, whether known at the time or discovered later, or as preventing the City at any time subsequently from recovering damages for work actually defective. All work shall be guaranteed by the Contractor against defects in workmanship or material for a period of **two (2) years from date of final payment**.

D. Disagreement. Should any disagreement or difference arise as to the estimated quantities or classifications or as to the meaning of the drawings or specifications, or any point concerning the character or acceptability or nature of the several kinds of work, or construction thereof, the decision of the City Representative shall be final and conclusive and binding on the Contractor.

E. Stop Work Orders. During unseasonable weather, all Work must stop when the City Representative so directs, and all work must be suitably protected by Contractor at all times. However, the City

Representative shall be under no obligation to stop work on the Project. If the Project is stopped, the Contractor shall not be entitled to extra compensation for delays or problems associated with the stoppage.

F. Progress Meetings. Contractor shall conduct regular progress meetings during the course of the Project at least once a week or at any different frequency as directed by the City Representative. The meetings shall be held at a site convenient to all parties and if a site cannot be agreed upon, the City will designate a site. The Contractor, City Representative, the Contractor's Superintendent, all subcontractors, engineers, architects and inspectors, will attend.

If requested by the City Representative, Contractor shall keep accurate written minutes of the meetings and forward copies thereof to the City Representative before the next scheduled meeting.

ARTICLE VII. PROJECT COMPLETION

A. Substantial Completion. "Substantial completion" shall be that degree of completion of the Project or a defined portion of the Project, as evidenced by the City Representative's written notice of Substantial Completion, sufficient to provide the City, at its discretion, the full-time use of the Project or defined portion of the Work for the purposes for which it was intended.

When the Contractor believes that the Project is substantially complete, the Contractor shall prepare and submit to the City Representative a list of items to be completed or corrected and request an inspection for Substantial Completion. The failure by the Contractor to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract. After inspection and/or, if an operating facility, after a minimum of seven (7) continuous days of successful, trouble-free operation has been achieved during startup, the City Representative may, at his sole discretion, issue a written notice of substantial completion for the purpose of establishing the starting date for specific equipment guarantees or warranties, and to establish the date that the City will assume the responsibility for the cost of operating such equipment.

Said notice shall not be considered as final acceptance of any portion of the Project or relieve the Contractor from completing the remaining Work, including any remaining performance or acceptance testing, within the specified time and in full compliance with the Contract. Specifically, the issuance of a written notice of Substantial Completion shall not relieve the Contractor of his obligation to promptly remedy any omissions and latent or unnoticed defects in the Project.

B. Final Inspection. Upon notice from the Contractor that its work is fully complete, the City Representative shall make a final inspection of the Work and conduct any necessary testing. The City Representative shall notify the Contractor of all apparent and/or visible instances where the Project fails to comply with the plans and specifications and Contract, as well as any defects he may discover. Contractor shall immediately make such alterations as are necessary to make the Project comply with the plans and specifications and to the satisfaction of the City Representative.

After the City Representative has determined that the Work is acceptable under the Contract and after publication of final completion and all other requirements of final payment as provided for in this Agreement and by the State of Alabama's Public Works Laws, then there shall be issued a final certificate of payment to the City stating the balance due the Contractor, less such amounts as may have been withheld

by the City from time to time as provided in the Contract. In recommending to the City that it make such final payment to the Contractor, the City Representative shall also issue a certificate of final acceptance in which he shall recommend to the City that it accept the Work as complete and the Project as being final pursuant to the Contract.

None of the steps or actions taken by the City or the City Representative shall in any way relieve the Contractor of responsibility for faulty materials or workmanship. All warranty and guarantee periods for Contractor's Work on this Project shall commence on the date of issuance of final payment.

C. "As-Built" Drawings. Unless waived by the City Representative, the Contractor must provide to the City a set of "as-built" drawings acceptable to the City as a component part of the Project prior to final payment.

D. Final Cleanup. Before final completion and final acceptance, the Contractor shall remove from all rights-of-way and from all public and private property all tools, scaffolding, false work, temporary structures and/or utilities and their foundations (except those the City permits in writing to remain), rubbish and waste materials resulting from its operation or caused by its employees, and all surplus materials, leaving the site clean and true to its line and grade and the Project in a safe and clean condition ready for use and operation.

In the case of failure to comply with the above requirements for any part of the Project within the time specified by the City Representative, he may cause the work to be done and deduct the cost thereof from the Contract price on the next or succeeding application for payment, or in the event that the cost exceeds the balance due the Contractor, bill the Contractor for the excess.

E. Notice of Completion. Contractor shall, immediately after the completion of the Project and acceptance by the Owner as provided for in this Agreement, give notice as required by and in accordance with *Ala. Code* §39-1-1(f). Proof of publication of said notice shall be made by the Contractor to the City of Montgomery by affidavit of the Publisher and a printed copy of the notice published.

F. Final Payment. Upon completion of the Project by the Contractor and acceptance by the City Representative of all Work required of the Contractor for the Project, the amount due the Contractor pursuant to the Contract shall be paid upon the presentation by the Contractor to the City Representative of the documents set forth in Article II, Section D., including the following:

1. Evidence that all payrolls and all amounts due for labor and materials, other than claims for damages due to tort, have been fully paid and satisfied and there are no outstanding claims or demands associated with the work on the Project.

2. A release of all claims and claims of lien against the City from the Contractor and all major subcontractors (the City may waive the requirement for subcontractor releases) arising under and by virtue of the Contract and with the consent of the surety for release of final payment. If any subcontractor refuses to furnish such a release, Contractor may, with the consent of the City representative, furnish a bond with surety satisfactory to the City representative to indemnify against such claims.

3. Proof of publication of notice of completion, including affidavit of publisher and a printed copy of the notice so published, as provided by law.

4. In accordance with Ala. Code §39-2-12(c), a Non-Resident Contractor shall satisfy the City that he or she has paid all taxes due and payable to the State, the City and all applicable political subdivisions.

G. Acceptance of Final Payment Constitutes Release. The acceptance by the Contractor of the final payment shall release the City, the City Representative, and their officers, employees, agents, and consultants from all claims and all liability to the Contractor for all things done or furnished in connection with the Project, and every act of the City and others relating to or arising out of the Project except claims previously made in writing to the City and still unsettled. No payment, however, final or otherwise, shall operate to release the Contractor or its Sureties from obligations under this Contract and the Performance Bond, Payment Bond, and other bonds, warranties and guarantees as provided in this Agreement and the Project Manual.

ARTICLE VIII. WARRANTY AND GUARANTEES

A. Warranty and Guarantee.

1. *Warranty*. Contractor warrants to the City that all materials and equipment furnished under this Contract will be new unless otherwise specified and that all work, materials, and equipment will be of good quality, free from fault and defects and in conformance with the Contract. The Project must be safe, substantial, and durable construction in all respects. All work, materials, and equipment not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. Warranties shall commence to run from the date of final payment.

   The Project furnished must be of first quality and the workmanship must be the best obtainable. The Contractor hereby guarantees the Project and the work on the Project against defective materials or faulty workmanship for **two (2) years after final payment** by the City and shall replace or repair any defective materials or equipment or faulty workmanship during the period of guarantee at no cost to the City.

2. *Guarantee*. If, within the designated warranty period, any of the Project, work, materials, or equipment is found to be defective or not in accordance with the Contract, the Contractor shall correct it promptly after receipt of written notice from the City to do so. The City shall give such notice promptly after discovery of the condition.

B. Correction of Defective Work During Warranty/Guarantee Period. Contractor hereby agrees to make, at his own expense and no cost to the City, all repairs or replacements necessitated by defects in materials or workmanship, provided under the terms of this Contract, and to pay for any damage to other works resulting from such defects, which become evident within **two (2) years after the date of final payment** unless the City has previously given the Contractor a written acceptance of such defects. The Contractor shall promptly correct such defects upon receipt of a written notice from the City to do so. This obligation shall survive the termination of the Contract.

Unremedied defects identified for correction during the warranty period, but remaining after its expiration, shall be considered as part of the obligations of the warranty. Defects in material, workmanship, or equipment which are remedied as a result of obligations of the warranty shall subject the remedied portion of the Project to an extended warranty period of **one (1) year after the defect has been remedied**.

Contractor also agrees to defend, indemnify and hold the City, the City Representative, and City's employees, agents and consultants harmless from liability or damages and cost and expenses of litigation (including attorney's fees) of any kind arising from damage due to said defects.

City's rights under this Article shall be in addition to, and not a limitation of, any other rights and remedies available by law.

ARTICLE IX. LAWS, PERMITS

Contractor shall comply with and keep itself fully informed of all federal, state, city, and county laws, ordinances, and regulations which affect those engaged or employed in the Project or the execution of the Project. Contractor shall possess all permits and licenses required by applicable law, rule, or regulation for the performance of the Project.

Contractor shall defend, protect and indemnify the City and its employees, officers, consultants, and agents against any claim or liability arising from or based on the violation of any such laws, ordinances, or regulations, including, but not limited to, violation of copyright or patent laws.

Contractor shall cooperate with the City Engineer to register and obtain any and all necessary National Pollutant Discharge Elimination System (NPDES) Permits required by USEPA or the Alabama Department of Environmental Management as well as any applicable storm water permits or registration for the construction of the improvements specified in the Contract. Contractor shall abide by all regulations and conditions relative to the permit or registration and attachments to the permit or registration, including, but not limited to, sampling and monitoring. At the request of the City Representative, Contractor shall fulfill for the City all the requirements made upon the City by the permit or registration and shall perform all Work in compliance with and as required thereby. Contractor agrees to defend, indemnify and hold harmless the City and its officers, agents, representatives, consultants and employees from any fines, penalties, damages, claims, liabilities, or judgments arising out of or in any manner associated with Contractor's failure to perform the Work in strict accordance with all stormwater registration, permits, or license requirements.

If any portion of the Project involves work upon State right-of-way, the Contractor agrees to abide by the laws, terms, and conditions applicable to the same and obtain all permits required by the Alabama Department of Transportation.

ARTICLE X. MISCELLANEOUS

A. Notice and Service Thereof.

1. All notices, demands, requests, Change Orders, instructions, approvals and claims shall be in writing. Unless expressly otherwise provided elsewhere in this Agreement, any election, notice, or other communication required or permitted to be given under this Agreement shall be in writing and deemed to have been duly given if provided in accordance with the provisions hereof.

2. Any notice to or demand upon either party shall be in writing and shall be sufficiently given if addressed as stated in this Agreement and deposited in the United States mail in a sealed envelope with sufficient postage prepaid or delivered via private carrier in a sealed package with all costs being paid by the sender. It shall also be sufficient if such notice or demand is served personally on a party at the address set forth below.

3. All notices to the City shall be addressed as follows:

Attention: Harold Kippy Tate, AIA
Chief Building Official
City of Montgomery
25 Washington Avenue, Suite 107
Montgomery, AL 36104

With a copy to:
Stacy Bellinger
City Attorney
City of Montgomery
City Hall
103 North Perry Street, Suite 200
Montgomery, AL 36104

All notices to Contractor shall be addressed as follows:

B. Capacity. Each party to this Agreement represents and warrants to the other as follows:

1. That it is an individual of the age of majority or otherwise a legal entity duly organized and in good standing pursuant to all applicable laws, rules, and regulations.

2. That it has full power and capacity to enter into this Agreement and to perform each of the obligations and responsibilities conferred and assumed hereunder.

3. That, to the extent required, it has obtained the necessary authorization and approval through a legally binding act of its organization and that such approval has been reduced to writing and certified or attested by the appropriate official of the party.

4. That it has duly authorized and empowered a representative to execute this Agreement on its behalf and the execution of this Agreement by such representative fully and completely binds the party to the terms and conditions hereof.

5. That, absent fraud or other illegality, the execution of this Agreement by a representative of the party shall constitute a certification that all such authorizations for execution exist and have been performed and the other party shall be entitled to rely upon the same. To the extent a party is a partnership, limited liability company, or joint venture, the execution of this Agreement by any member thereof shall bind the party and to the extent that execution of the Agreement is limited to a manager, managing partner, or specific member, then the person so executing this Agreement is duly authorized to act in such capacity for the party.

6. That it represents and warrants to the other party that, to its knowledge, there is no litigation, claim, or administrative action threatened or pending or other proceedings against it which would have an adverse impact upon this transaction or upon its ability to conclude the transaction or perform pursuant to the terms and conditions of this Agreement.

7. That it has obtained any and all required licenses, permits, approvals, and/or authorizations from third parties to enable it to fully perform pursuant to this Agreement.

8. That under the applicable provisions of the Constitution and laws of the State of Alabama it has the power to consummate the transactions contemplated by this Agreement.

9. That it represents and warrants that the execution and delivery of this Agreement and the consummation of the transactions contemplated herein will not conflict with, be in violation of, or constitute (upon notice or lapse of time or both) a default under the laws of the State of Alabama; any resolution, agreement, or other contract, agreement, or instrument to which the party is subject; or any resolution, order, rule, regulation, writ, injunction, decree, or judgment of any governmental authority or court having jurisdiction over the party.

10. That this Agreement constitutes the legal, valid, and binding obligation of the party and is enforceable against it in accordance with its terms, except in so far as the enforceability thereof may be limited by:

    (a) Bankruptcy, insolvency, or other similar laws affecting the enforcement of creditors' rights
    (b) General principles of equity, regardless of whether such enforceability is considered as a proceeding at equity or at law.

11. That it will not enter into any agreement to do anything prohibited in this Agreement or enter into any agreement or take any action which would in any way impair the ability of the other party to faithfully and fully perform its obligations hereunder.

C. No Waiver of Rights. Neither the inspection by the City Representative or by any of the City's officers, employees, agents, or consultants; nor any order by the City for payment of money; nor any payment for, or acceptance of, the whole or any part of the Project by the City; nor any extension of time or Change Order; nor any possession taken by the City or its employees; nor the failure by either party to enforce any provision of this Agreement shall operate as a waiver of any provision of this Agreement or of any power reserved to the City in this Agreement, or any right to damages, nor shall any waiver of any breach in this Agreement be held to be a waiver of any other or subsequent breach. Acceptance or final payment shall not be final and conclusive with regard to latent defects, fraud, or such gross mistakes as may amount to fraud, or with regard to the City's rights under any warranty, guarantee or indemnity.

D. Subletting or Assigning of Contract. Contractor shall not sublet, assign, transfer, convey, sell, or otherwise dispose of any portion of the Agreement, its obligations, rights, or interest in it, or its power to execute such Agreement, to any person, firm, or corporation without written consent of the City and such written consent shall not be construed to relieve the Contractor of any duty or responsibility to fulfill the Agreement. A sale, conveyance, or transfer of 50% or more of the stock or ownership of the Contractor shall be considered an assignment. However, in no event shall any portion of this Agreement be assigned to an unsuccessful Bidder whose Bid was rejected because he or she was not a responsible or responsive Bidder.

E. Third Party Beneficiaries. It is the intent of the parties hereto that there shall be no third-party beneficiaries to this Agreement.

F. Liability of the City or City Officials. Notwithstanding any provision hereof to the contrary, the parties agree and acknowledge that the liability and obligations of the City, City officials, and City employees as set forth in this Agreement are subject to the limitations imposed on municipalities by the Constitution and laws of the State of Alabama. No present or future official, officer, or employee of the City shall ever be personally liable for the performance of any obligations hereunder.

G. Non-Discrimination. Contractor agrees that it will not discriminate against any person on the basis of race, color, sex, religion, national origin, or age in performing the Work required under this Agreement. Contractor shall fully comply with the Americans with Disabilities Act, the Fair Labor Standards Act, and all other applicable laws and regulations.

H. Fines and Penalties. The Contractor shall be solely liable for any and all fines or penalties which may be levied by any governmental authority against the Owner or Contractor which are related to the Contractor's operations.

I. Disputes. Following the initial written decision of the Owner's Representative, which shall be a condition precedent to further review, any and all disputes or claims between the Contractor, and/or its surety, and the Owner arising out of or related to this Agreement, or any of its provisions and their implementation, shall be submitted to the Mayor of the City of Montgomery for final resolution. Contractor and Owner shall be given the opportunity for an informal hearing before the Mayor, for the presentation of their evidence and arguments, according to rules and procedures determined by the Mayor. The Mayor shall issue a written decision on the claim or dispute, which shall be final and binding on the parties, as well enforceable in a court of law.

H. Agreement Date, Counterparts. This Agreement shall be effective as of the date it is executed by the parties. In the event the authorized signatures are affixed on different dates, the latter date of execution shall be the effective date. This instrument may be executed in no more than two (2) counterparts, each of which so executed shall be deemed an original, but all such counterparts shall together constitute but one and the same instrument.

IN TESTIMONY WHEREOF, the parties hereto have caused to be affixed the signatures of their duly authorized representatives on the dates set forth below.

CITY OF MONTGOMERY, ALABAMA
a municipal corporation

By: _____
Honorable Steven Reed, Mayor

ATTEST:

_____
City Clerk-Treasurer

Date: _____

STATE OF ALABAMA §
§
COUNTY OF MONTGOMERY §

I, the undersigned authority, as Notary Public in and for said County in said State, hereby certify that Steven Reed and _____, whose names as Mayor and the City Clerk-Treasurer of the City of Montgomery, Alabama, respectively, are signed to the foregoing instrument, and who are known to me, acknowledged before me on this day that, being informed of the contents of the instrument, they, as such officers and with full authority, executed the same voluntarily for and as the act of the City of Montgomery, Alabama, a municipal corporation, on the day the same bears date.

Given under my hand and official seal this _day of_____, 2023.

_____
Notary Public

_____
Contractor

By: _____

Its: _____

Date: _____

STATE OF ALABAMA §
§
COUNTY OF _____ §

I, the undersigned authority, as Notary Public in and for said County in said State, hereby certify that _____, whose name as _____ of _____ Company, Inc., is signed to the foregoing instrument, and who is known to me, he/she as such officer and with full authority, executed the same voluntarily for, with full authority and as the act of said corporation on the day the same bears date.

Given under my hand and official seal this ____ day of _____, 2023.

_____
Notary Public

CERTIFICATION:

I _____ certify that I am the Secretary of the Corporation named as contractor herein; that _____ who signed this Agreement on behalf of the contractor was then _____ of said corporation; that said agreement was duly signed for and in behalf of said corporation by authority of its governing body, and is within the scope of its corporate powers.

Secretary:_____

Corporate Seal:_____

(1) # PERFORMANCE BOND

SURETY'S BOND NUMBER

Do not staple this form; use clips.

(2) The **PRINCIPAL** (*Company name and address of Contractor as appears in the Construction Contract*)
Name:
Address:

(3) The **SURETY** (*Company name and primary place of business*)
Name:
Address:

(4) The **OWNER** (*Entity name and address, same as appears in the Construction Contract*)
Name:
Address:

(5) The **PENAL SUM** of this Bond (the Contract Sum)

Dollars ($).

(6) **DATE** of the Construction Contract :

(7) The **PROJECT**: (*Same as appears in the Construction Contract*)

1. **WE, THE PRINCIPAL (hereinafter "Contractor") AND THE SURETY**, jointly and severally, hereby bind ourselves, our heirs, executors, administrators, successors, and assigns to the Owner in the Penal Sum stated above for the performance of the Contract, and Contract Change Orders, in accord with the requirements of the Contract Documents, which are incorporated herein by reference. If the Contractor performs the Contract, and Contract Change Orders, in accordance with the Contract Documents, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

2. The Penal Sum shall remain equal to the Contract Sum as the Contract Sum is adjusted by Contract Change Orders. All Contract Change Orders involving an increase in the Contract Sum will require consent of Surety by endorsement of the Contract Change Order form. The Surety waives notification of any Contract Change Orders involving only extension of the Contract Time.

3. Whenever the Architect gives the Contractor and the Surety, at their addresses stated above, a written Notice to Cure a condition for which the Contract may be terminated in accordance with the Contract Documents, the Surety may, within the time stated in the notice, cure or provide the Architect with written verification that satisfactory positive action is in process to cure the condition.

4. The Surety's obligation under this Bond becomes effective after the Contractor fails to satisfy a Notice to Cure and the Owner:
   (a) gives the Contractor and the Surety, at their addresses stated above, a written Notice of Termination declaring the Contractor to be in default under the Contract and stating that the Contractor's right to complete the Work, or a designated portion of the Work, shall terminate seven days after the Contractor's receipt of the notice; and
   (b) gives the Surety a written demand that, upon the effective date of the Notice of Termination, the Surety promptly fulfill its obligation under this Bond.

5. In the presence of the conditions described in Paragraph 4, the Surety shall, at its expense:
   (a) On the effective date of the Notice of Termination, take charge of the Work and be responsible for the safety, security, and protection of the Work, including materials and equipment stored on and off the Project site, and
   (b) Within twenty-one days after the effective date of the Notice of Termination, proceed, or provide the Owner with written verification that satisfactory positive action is in process to facilitate proceeding promptly, to complete the Work in accordance with the Contract Documents, either with the Surety's resources or through a contract between the Surety and a qualified contractor to whom the Owner has no reasonable objection.

6. As conditions precedent to taking charge of and completing the Work pursuant to Paragraph 5, the Surety shall neither require, nor be entitled to, any agreements or conditions other than those of this Bond and the Contract Documents. In taking charge of and completing the Work, the Surety shall assume all rights and obligations of the Contractor under the Contract Documents; however, the Surety shall also have the right to assert "Surety Claims" to the Owner in accordance with the Contract Documents. The presence or possibility of a Surety Claim shall not be just cause for the Surety to fail or refuse to promptly take charge of and complete the Work or for the Owner to fail or refuse to continue to make payments in accordance with the Contract Documents.

7. By accepting this Bond as a condition of executing the Construction Contract, and by taking the actions described in Paragraph 4, the Owner agrees that:
   (a) the Owner shall promptly advise the Surety of the unpaid balance of the Contract Sum and, upon request, shall make available or furnish to the Surety, at the cost of reproduction, any portions of the Project Record, and
   (b) as the Surety completes the Work, or has it completed by a qualified contractor, the Owner shall pay the Surety, in accordance with terms of payment of the Contract Documents, the unpaid balance of the Contract Sum, less any amounts that may be or become due the Owner from the Contractor under the Construction Contract or from the Contractor or the Surety under this Bond.

8. In the presence of the conditions described in Paragraph 4, the Surety's obligation includes responsibility for the correction of Defective Work, liquidated damages, and reimbursement of any reasonable expenses incurred by the Owner as a result of the Contractor's default under the Contract, including architectural, engineering, administrative, and legal services.

9. Nothing contained in this Bond shall be construed to mean that the Surety shall be liable to the Owner for an amount exceeding the Penal Sum of this Bond, except in the event that the Surety should be in default under the Bond by failing or refusing to take charge of and complete the Work pursuant to Paragraph 5. If the Surety should fail or refuse to take charge of and complete the Work, the Owner shall have the authority to take charge of and complete the Work, or have it completed, and the following costs to the Owner, less the unpaid balance of the Contract Sum, shall be recoverable under this Bond:

(a) the cost of completing the Contractor's responsibilities under the Contract, including correction of Defective Work;

(b) additional architectural, engineering, managerial, and administrative services, and reasonable attorneys' fees incident to completing the Work;

(c) interest on, and the cost of obtaining, funds to supplement the unpaid balance of the Contract Sum as may be necessary to cover the foregoing costs;

(d) the fair market value of any reductions in the scope of the Work necessitated by insufficiency of the unpaid balance of the Contract Sum and available supplemental funds to cover the foregoing costs; and

(f) additional architectural, engineering, managerial, and administrative services, and reasonable attorneys' fees incident to ascertaining and collecting the Owner's losses under the Bond.

10. All claims and disputes arising out of or related to this bond, or its breach, shall be resolved in accordance with the agreement for contracting services.

(8) **SIGNED AND SEALED** this _____ day of _____, _____.

(9 & 10)

SURETY:	**CONTRACTOR as PRINCIPAL:**
_____	_____
Company Name	Company Name
By_____	By _____
Signature	Signature
_____	_____
Name and Title	Name and Title

(11) NOTE: Original power of attorney for the Surety's signatory shall be furnished with each of the original three bond forms to be attached to each of the three contract copies (with original signatures) per project.

(1) # PAYMENT BOND

SURETY'S BOND NUMBER

Do not staple this form; use clips.

(2) The **PRINCIPAL** (*Company name and address of Contractor, same as appears in the Construction Contract*)
Name:
Address:

(3) The **SURETY** (*Company name and primary place of business*)
Name:
Address:

(4) The **OWNER(s)** (*Entity name and address, same as appears in the Construction Contract*)
Name:
Address:

(5) The **PENAL SUM** of this Bond (the Contract Sum)

Dollars ($).

(6) **DATE** of the Construction Contract:

(7) The **PROJECT**: (*Same as appears in the Construction Contract*)

1. **WE, THE PRINCIPAL (hereinafter "Contractor") AND THE SURETY**, jointly and severally, hereby bind ourselves, our heirs, executors, administrators, successors, and assigns to the Owner in the Penal Sum stated above to promptly pay all persons supplying labor, materials, or supplies for or in the prosecution of the Contract, which is incorporated herein by reference, and any modifications thereof by Contract Change Orders. If the Contractor and its Subcontractors promptly pay all persons supplying labor, materials, or supplies for or in the prosecution of the Contract and Contract Change Orders, then this obligation shall be null and void; otherwise to remain and be in full force and effect.

2. The Penal Sum shall remain equal to the Contract Sum as the Contract Sum is adjusted by Contract Change Orders. All Contract Change Orders involving an increase in the Contract Sum will require consent of Surety by endorsement of the Contract Change Order form. The Surety waives notification of any Contract Change Orders involving only extension of the Contract Time.

3. Any person that has furnished labor, materials, or supplies for or in the prosecution of the Contract and Contract Change Orders for which payment has not been timely made may institute a civil action upon this Bond and have their rights and claims adjudicated in a civil action and judgment entered thereon. Notwithstanding the foregoing, a civil action may not be instituted on this bond until 45 days after written notice to the Surety of the amount claimed to be due and the nature of the claim. The civil action must commence not later than one year from the date of final settlement of the Contract. The giving of notice by registered or certified mail, postage prepaid, addressed to the Surety at any of its places of business or offices shall be deemed sufficient. In the event the Surety or Contractor fails to pay the claim in full within 45 days from the mailing of the notice, then the person or persons may recover from the Contractor and Surety, in addition to the amount of the claim, a reasonable attorney's fee based on the result, together with interest on the claim from the date of the notice.

4. Every person having a right of action on this bond shall, upon written application to the Owner indicating that labor, material, or supplies for the Work have been supplied and that payment has not been made, be promptly furnished a certified copy of this bond and the Construction Contract. The claimant may bring a civil action in the claimant's name on this Bond against the Contractor and the Surety, or either of them, in the county in which the Work is to be or has been performed or in any other county where venue is otherwise allowed by law.

5. This bond is furnished to comply with Code of Alabama, §39-1-1, and all provisions thereof shall be applicable to civil actions upon this bond.

6. All claims and disputes between Owner and either the Contractor or Surety arising out of or related to this bond, or its breach, shall be resolved in accordance with the agreement for contracting services.

(8) **SIGNED AND SEALED** this_____ day of _____, _____.

(9 & 10)

SURETY:	**CONTRACTOR as PRINCIPAL:**
_____	_____
Company Name	Company Name
By_____	By _____
Signature	Signature
_____	_____
Name and Title	Name and Title

(11) NOTE: Original power of attorney for the Surety's signatory shall be furnished with each of the original three bond forms to be attached to each of the three contract copies (with original signatures) per project.

You may use your own form provided all information requested below, including the "I certify..." statement, and signatures, are on your form. Do not use colored print or shaded cells.

CERTIFIED TABULATION OF BIDS

Project:

Project No.: _____

Amount of Available Funds: _____

As tabulated below, bids were received:

Date: _____ Time: _____

Place: _____

Contractor:				
Surety:				
All Addenda Acknowledged:				
Base Bid on Proposal:				
Base Bid Envelope Adjustment:				
Total Base Bid:	$ -	$ -	$ -	$ -
Bid Alternate #1 on Proposal:				
Bid Alt. #1 Envelope Adjustment:				
Total Alternate #1:	$ -	$ -	$ -	$ -
Bid Alternate #2 on Proposal:				
Bid Alt. #2 Envelope Adjustment:				
Total Alternate #2:	$ -	$ -	$ -	$ -
Remarks:				

I certify that the above bids were advertised, were received sealed, were publicly opened, and read aloud at the time and place indicated and that this is a true and correct tabulation of all bids received for this project.

_____
Architectural / Engineering Firm Name

By: _____
Signature

_____
Print Name and Title of Architect / Engineer

Sworn to and subscribed before me this _____day of _____ (Month, Year).

_____
Notary Public Signature My Commission Expires

Seal:

GENERAL CONTRACTOR'S ROOFING GUARANTEE

Project No. _____

Project Name & Address	Project Owner Entity(ies) Name(s) & Address(es)

General Contractor's Company Name, Address, & Telephone Number	**EFFECTIVE DATES OF GUARANTEE**
	Date of Acceptance:
	Date of Expiration:

1. The General Contractor does hereby certify that the roofing work included in this contract was installed in strict accordance with all requirements of the plans and specifications and in accordance with approved roofing manufacturers recommendations.

2. The General Contractor does hereby guarantee the roofing and associated work including but not limited to all flashing and counter flashing both composition and metal, roof decking and/or sheathing; all materials used as a roof substrate or insulation over which roof is applied; promenade decks or any other work on the surface of the roof; metal work; gravel stops and roof expansion joints to be absolutely watertight and free from all leaks, due to faulty or defective materials and workmanship for a period of five (5) years, starting on the date of substantial completion of the project. This guarantee does not include liability for damage to interior contents of building due to roof leaks, nor does it extend to any deficiency which was caused by the failure of work which the general contractor did not damage or did not accomplish or was not charged to accomplish.

3. Subject to the terms and conditions listed below, the General Contractor also guarantees that during the Guarantee Period he will, at his own cost and expense, make or cause to be made such repairs to, or replacements of said work, in accordance with the roofing manufacturers standards as are necessary to correct faulty and defective work and/or materials which may develop in the work including, but not limited to: blisters, delamination, exposed felts, ridges, wrinkles, splits, warped insulation and/or loose flashings, etc. in a manner pursuant to the total anticipated life of the roofing system and the best standards applicable to the particular roof type in value and in accordance with construction documents as are necessary to maintain said work in satisfactory condition, and further, to respond on or within three (3) calendar days upon proper notification or leaks or defects by the Owner or Architect.

A. Specifically excluded from this Guarantee are damages to the work, other parts of the building and building contents caused by: (1) lightning, windstorm, hailstorm and other unusual phenomena of the elements; and (2) fire. When the work has been damaged by any of the foregoing causes, the Guarantee shall be null and void until such damage has been repaired by the General Contractor, and until the cost and expense thereof has been paid by the Owner or by the responsible party so designated.

B. During the Guarantee Period, if the Owner allows alteration of the work by anyone other than the General Contractor, including cutting, patching and maintenance in connection with penetrations, and positioning of anything on the roof, this Guarantee shall become null and void upon the date of said alterations. If the owner engages the General Contractor to perform said alterations, the Guarantee shall not become null and void, unless the General Contractor, prior to proceeding with the said work, shall have notified the Owner in writing, showing reasonable cause for claim that said alterations would likely damage or deteriorate the work, thereby reasonably justifying a termination of this Guarantee.

C. Future building additions will not void this guarantee, except for that portion of the future addition that might affect the work under this contract at the point of connection of the roof areas, and any damage caused by such addition. If this contract is for roofing of an addition to an existing building, then this guarantee covers the work involved at the point of connection with the existing roof.

D. During the Guarantee period, if the original use of the roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray cooled surface, flooded basin, or other use of service more severe than originally specified, this Guarantee shall become null and void upon the date of said change.

E. The Owner shall promptly notify the General Contractor of observed, known or suspected leaks, defects or deterioration, and shall afford reasonable opportunity for the General Contractor to inspect the work, and to examine the evidence of such leaks, defects or deterioration.

IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, _____.

_____

General Contractor's Authorized Signature

_____

Typed Name and Title

Project No. _____

Application No. _____

Date: _____

APPLICATION and CERTIFICATE for PAYMENT

Attach: Schedule of Values

TO OWNER: Entity Name: Address:	PROJECT:
FROM CONTRACTOR: Company Name & Address, which must exactly match City of Montgomery vendor profile	ARCHITECT / ENGINEER: Firm Name: Address:

A. Total Original Contract	$
B. Fully Executed (fully signed) Change Order(s) Numbers __ through __	+$ _____
C. Total Contract To Date	$

1. Work Completed to Date per attached Schedule of Values		$
2. Materials Presently Stored		+$ _____
3. Total Work Completed to Date & Materials Presently Stored (_____% of Contract To Date)		$
4. Less Retainage	*(If Total Work Completed to Date & Materials Presently Stored (#3) is less than or equal to 50% of Total Contract to Date (C), Retainage = #3 x 0.05. Once #3 exceeds 50% of C and up until project is complete, Retainage = C x 0.025. $0 is retained on final payment application, see last bullet point below Instructions.)*	−$ _____
5. Total Due		$
6. Less Total Previous Payments Billed	*(Must exactly match #5 Total Due from previous payment application. # 6 is $0.00 if there is no previous payment application)*	−$ _____
7. Balance Due This Estimate		$

Final pay app? ☐ Yes.

CONTRACTOR'S CERTIFICATION

The undersigned Contractor certifies that to the best of his knowledge, information, and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by him for Work for which previous Certificates for Payments were issued and payments received from the Owner and that current payment shown herein has not yet been received.

By: _____ Date: _____
Contractor's Signature

Name & Title _____

Sworn and subscribed before me this _____ day of _____
Day Month, Year

Seal:

_____
Notary Public's Signature

ARCHITECT'S / ENGINEER'S CERTIFICATION

In accordance with the Contract Documents, the Architect/ Engineer certifies to the Owner that, to the best of the Architect's/ Engineer's knowledge and belief, the Work has progressed to the point indicated herein, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the amount approved.

By _____
Architect's / Engineer's Signature

Name & Title _____

Date _____

APPROVAL

_____
Owner Entity

By _____
Signature

Name & Title _____

Date _____

SCHEDULE OF VALUES (SOV)

Project:

Contractor Company:

Project Number:

Application Number:

Application Date:

Period From:

Period To:

A	B	C	D	E	F	G	H	I	J
Item No.	Description of Work	Scheduled Value (including fully executed [signed by all parties] change order amounts)	Work Completed: Work Previously Completed (Previous pay app SOV's column F. D is $0 if this SOV is for first pay app.)	Work Completed: Work Completed This Period (Period as noted above)	Total Work Completed to Date (This application SOV's D + E)	Materials Presently Stored (G total greater than $0 must match C-10SM's column E total. This SOV's G amounts are not in this SOV's D nor E amounts.)	Total Work Completed to Date & Materials Presently Stored (This SOV's F + G)	Percent of Contract Completed to Date (This SOV's H / C)	Retainage (This column's Total's cell formula calculates the applicable variable rate)
1.					$ -		$ -		Retainage Variable Rate:
2.					$ -		$ -		
3.					$ -		$ -		If Total Work Completed to Date & Materials Presently Stored (H) is less than or equal to 50% of Total Scheduled Value (C), Retainage = H x 0.05.
4.					$ -		$ -		
5.					$ -		$ -		
6.					$ -		$ -		
7.					$ -		$ -		
8.					$ -		$ -		
9.					$ -		$ -		
10.					$ -		$ -		
11.					$ -		$ -		
12.					$ -		$ -		
13.					$ -		$ -		
14.					$ -		$ -		
15.					$ -		$ -		Once H exceeds 50% of C and up until project is complete, Retainage = C x 0.025.
16.					$ -		$ -		
17.					$ -		$ -		
18.					$ -		$ -		
19.					$ -		$ -		
20.					$ -		$ -		
21.					$ -		$ -		
22.					$ -		$ -		There will be no retainage on final payment application.
23.					$ -		$ -		
24.					$ -		$ -		
25.					$ -		$ -		
	TOTALS:	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**		**$ -**
		C.	None	None	1.	2.	3.	3.	4.

CERTIFICATE OF SUBSTANTIAL COMPLETION

OWNER ENTITY NAME AND ADDRESS:

ARCHITECTURAL / ENGINEERING FIRM NAME AND ADDRESS:

Email to receive executed copy: _____

CONTRACTOR COMPANY NAME AND ADDRESS:

Email to receive executed copy: _____

BONDING COMPANY NAME AND ADDRESS:

Email to receive executed copy: _____

Email to receive executed copy: _____

PROJECT:

Email to receive executed copy: _____

Substantial Completion has been achieved for ☐ the entire Work ☐ the following portion of the Work:

_____

_____

The **Date of Substantial Completion** of the Work covered by this certificate is established to be _____.

"Substantial Completion" means the designated Work is sufficiently complete, in accordance with the Contract Documents, such that the Owner may occupy or utilize the Work for its intended use without disruption or interference by the Contractor in completing or correcting any remaining unfinished Work. The Date of Substantial Completion is the date upon which all warranties for the designated Work commence, unless otherwise agreed and recorded herein.

Punch List: A _____ page list of items to be completed or corrected prior to the Owner's approval of Final Payment is attached hereto, but does not alter the Contractor's responsibility to complete or correct all Work in full compliance with the Contract Documents. The Contractor shall complete or correct all items on the attached list, ready for re-inspection for Final Acceptance, within 30 days after the above Date of Substantial Completion, unless another date is stated here: _____
If completed or corrected within this period, warranties of these items commence on the Date of Substantial Completion, otherwise such warranties commence on the date of Final Acceptance of each item.

ARCHITECT/ENGINEER: _____ DATE: _____

CONTRACTING PARTIES:

CONTRACTOR: _____ DATE: _____

OWNER: _____ DATE: _____

_____ DATE: _____

LIST OF SUBCONTRACTORS

Type of Work	Corporate Name of Subcontractor	Subcontractor Primary Contact Person & Telephone Number	Subcontractor's License Number (if applicable)

Type of Work	Corporate Name of Subcontractor	Subcontractor Primary Contact Person & Telephone Number	Subcontractor's License Number (if applicable)

Signed: _____

Company: _____

Address: _____

Date: _____

FORM OF ADVERTISEMENT FOR COMPLETION

LEGAL NOTICE

In accordance with Chapter 1, Title 39, Code of Alabama, 1975, as amended, notice is hereby given

that _____,
(*Contractor Company Name*)
Contractor, has completed the Contract for ☐(Construction) ☐(Renovation) ☐(Alteration) ☐(Equipment) ☐(Improvement) of (*Name of Project*):

at _____

(*Insert location data in County or City*)
for the State of Alabama and the (County) (City) of _____, Owner(s), and have made request for final settlement of said Contract. All persons having any claim for labor, materials, or otherwise in connection with this project should immediately notify

_____

_____
(*Architect / Engineer*)

_____
(Contractor)

_____
(Business Address)

NOTE: This notice must be run once a week for four successive weeks for projects exceeding $50,000.00. For projects of $50,000.00 or less, run one time only. A copy of the publisher's affidavit of publication (including a copy of the advertisement) shall be submitted by the Contractor to the Design Professional for inclusion with Final Payment Checklist.

Project Number: _____

Date of the Construction Contract: _____

Contractor's Affidavit of Payment of Debts and Claims

To Owner (*Entity name and address*):	**Project** (*Same as appears in the Construction Contract*):

STATE OF:

COUNTY OF:

The undersigned hereby certifies that, except as listed below, payment has been made in full and all obligations have otherwise been satisfied for all materials and equipment furnished, for all work, labor and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Construction Contract referenced above for which the Owner or Owner's property might in any way be held responsible or encumbered.

EXCEPTIONS:

Supporting Documents Attached Hereto:

1. Consent of Surety to Final Payment. Whenever Surety is involved, Consent of Surety is required.

Indicate attachment: ☐ Yes ☐ No

The following supporting document should be attached hereto if required by the Owner:

1. Contractor's Release of Waiver of Liens.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment supplies, to the extent required by the Owner, accompanied by the list thereof.
3. Contractor's Affidavit of Release of Liens.

Contractor (*Insert company name and address*):

By:_____
Signature of authorized representative

_____
Name and Title

Sworn to and subscribed before me this _____ day

of _____, _____.

_____
Notary Public's Signature

My commission expires: _____

Seal:

Project Number: _____

Date of the Construction Contract: _____

Contractor's Affidavit of Release of Liens

To Owner (*Entity name and address*):	**Project** (*Same as appears in the Construction Contract*):

STATE OF:

COUNTY OF:

The undersigned hereby certifies that, except as listed below, the Releases or Waivers of Lien attached hereto include the Contractor, all Subcontractors, all suppliers of materials and equipment, and all performers of Work, labor or services who have or may have liens or encumbrances or the right to assert liens or encumbrances against any property of the Owner arising in any manner out of the performance of the Construction Contract referenced above.

EXCEPTIONS:

Supporting Documents Attached Hereto:

1. Contractor's Release of Waiver of Liens.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment supplies, to the extent required by the Owner, accompanied by the list thereof.

Contractor (*Insert company name and address*):

By: _____
Signature of authorized representative

_____
Name and Title

Sworn to and subscribed before me this _____ day

of _____, _____.

_____
Notary Public's Signature

My commission expires: _____

Seal:

Project Number: _____

Date of the Construction Contract: _____

Surety's Bond Number: _____

CONSENT OF SURETY TO FINAL PAYMENT

To Owner (*Entity name and address):*	**Project** (*Same as appears in the Construction Contract*)**:**

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the

Surety (*Insert name and address of Surety*)

on bond of

Contractor (*Insert name and address of Contractor*)

hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve the Surety of any of its obligations to

Owner (*Insert name and address of Entity*)**:**

as set forth in said Surety's bond.

SIGNED AND SEALED this _____ day of _____, _____.

SURETY:

_____ Seal:

Company Name

By _____

Signature of Authorized Representative

_____

Printed Name and Title

Note: Original Power of Attorney for the Surety's signatory shall be furnished with each of the original forms to be attached to each of the four (4) final payment forms.

JULIE P. MAGEE
Commissioner

State of Alabama
Department of Revenue
(www.revenue.alabama.gov)
50 North Ripley Street
Montgomery, Alabama 36132

MICHAEL E. MASON
Assistant Commissioner
JOE W. GARRETT, JR.
Deputy Commissioner
CURTIS E. STEWART
Deputy Commissioner

Alabama Department of Revenue
NOTICE

Tax Guidance for Contractors, Subcontractors and Alabama Governmental Entities Regarding Construction-related Contracts

Legislative Act 2013-205 requires the Department of Revenue to issue Form STC-1, *Sales and Use Tax Certificate of Exemption for Government Entity Projects*, to all contractors and subcontractors working on qualifying governmental entity projects once the Form ST: EXC-01 is approved.

Each exempt entity, contractor and subcontractor must make application for qualification of the exemption using Form ST: EXC-01 for each tax-exempt project. The application is available on the department's website at http://revenue.alabama.gov/salestax/ST-EXC-01.pdf. Applications should be submitted directly to the Sales and Use Tax Division Central Office, P.O Box 327710, Montgomery, AL 36132-7710.

The sales and use tax exemption provided for in Act 2013-205 applies to the purchase of building materials, construction materials and supplies, and other tangible personal property that become part of the structure pursuant to a qualifying contract entered into on or after January 1, 2014. Qualifying projects and contracts are those generally entered into with the following governmental entities, unless otherwise noted: the State of Alabama, a county or incorporated municipality of Alabama, an Alabama public school, or an Alabama industrial or economic development board or authority already exempt from sales and use taxes. **Please note that contracts entered into with the federal government and contracts pertaining to highway, road, or bridge construction or repair do not qualify for the exemption provided for in Act 2013-205.** [Reference: Sales and Use Tax Division Administrative Rule 810-6-3-.77 *Exemption for Certain Purchases by Contractors and Subcontractors in Conjunction with Construction Contracts with Certain Governmental Entities.*]

The Alabama Department of Revenue will assign each contractor and sub-contractor a consumers use tax account, if one is currently not in place, at the time the Form STC-1, Sales *and Use Tax Certificate of Exemption for Government Entity Projects*, is issued.

Contractors and sub-contractors for qualifying projects will be required to file monthly consumers use tax returns and report all exempt purchases for ongoing projects, as well as all taxable purchases on one return. These returns are required to be filed through the department's online tax return filing and payment portal, My Alabama Taxes (https://myalabamataxes.alabama.gov).

As another option for these types of contracts, as well as with other contracts entered into with other types of exempt entities, the Form ST:PAA1, *Purchasing Agent Appointment*, may be used. However, please be advised that the use of the Form ST:PAA1 option will require the exempt entity to be invoiced directly and pay for directly from their funds any construction and building material and supply purchases.

For additional information concerning this guidance, taxpayers should contact Sales and Use Tax Division representative Thomas Sims at 334-242-1574 or by email at Thomas.Sims@revenue.alabama.gov.

Reference Guide for Form No. ST: EXC-01

Application for Sales Tax Certificate of Exemption for Government Entity Project

The information provided below serves as a basic guideline for the needed documentation and proper way to complete the abovementioned application.

Exempt Entity (Owner) must provide:

- Completed application
- Copy of signed contract or LOI – letter of intent (please inquire for further details)

General Contractor must provide:

- Completed application
- Copy of signed contract
- List of all subcontractors
- Proof of License from Alabama License Board for Contractors
- Proof of State & County Business License (Section 84)

Sub-Contractor must provide:

- Completed application
- Proof of License from Alabama License Board for Contractors
- Proof of State & County Business License (Section 84)

Along with this exemption, each contractor and subcontractor is required to have a Consumers Use Tax account. Monthly returns are required to be filed where all exempt purchases for ongoing projects are reported on one return in addition to their taxable purchases. Taxpayers who do not already have a consumers use tax account will be assigned a CNU account at the time a certificate is issued.

If you happen to have any further questions regarding the application process, please contact Thomas Sims at (334)242-1574 or the Exemption Section at (334)242-1490.

ST: EXC-01
1/14

ALABAMA DEPARTMENT OF REVENUE
SALES AND USE TAX DIVISION
P.O Box 327710 • Montgomery, AL 36132-7710

Application For
Sales and Use Tax Certificate of Exemption

FOR GOVERNMENT ENTITY PROJECT

This Certificate of Exemption will be limited to purchases which qualify for an exemption of sales and use taxes pursuant to Rule No. 810-6-3-.77

PROJECT INFORMATION:

PROJECT NAME			PROJECT OWNER'S FEIN (EXEMPT ENTITY)
STREET ADDRESS OF PROJECT (CITY AND COUNTY INCLUDED)	CITY	ZIP	COUNTY

APPLICANT'S INFORMATION:

RELATION: *(CHOOSE ONE)*

☐ Exempt Entity ☐ General Contractor ☐ Sub-Contractor

NAICS CODE

APPLICANT'S LEGAL NAME

FEIN

DBA

CONSUMER'S USE TAX ACCOUNT NUMBER

MAILING ADDRESS

CONTACT PERSON

BUSINESS TELEPHONE NUMBER ( )

ESTIMATED START DATE

ESTIMATED COMPLETION DATE

REASON EXEMPTION IS CLAIMED

JOB DESCRIPTION

WILL ANY POLLUTION CONTROL EXEMPTION BE APPLICABLE?

☐ Yes ☐ No

ESTIMATED POLLUTION CONTROL COST

$

TOTAL BID AMOUNT	LABOR COST	MATERIAL COST
$	$	$

PROJECT NAME	PROJECT OWNER'S FEIN (EXEMPT ENTITY)

FORM OF OWNERSHIP:

☐ Individual ☐ Partnership ☐ Corporation ☐ Multi member LLC ☐ Single member LLC

If applicant is a corporation, a copy of the certified certificate of incorporation, amended certificate of incorporation, certificate of authority, or articles of incorporation should be attached. If the applicant is a limited liability company or a limited liability partnership, a copy of the certified articles of organization should be attached.

OWNERSHIP INFORMATION:

Corporations – give name, title, home address, and Social Security Number of each officer.

Partnerships – give name, home address, Social Security Number or FEIN of each partner.

Sole Proprietorships – give name, home address, Social Security Number of owner.

LLC – give name, home address, and Social Security Number or FEIN of each member.

LLP – give name, home address, and Social Security Number or FEIN of each partner.

NAME *(PLEASE PRINT)* SIGNATURE

TITLE DATE

Exempt entity must provide a copy of the contract accepted by the General Contractor. The General Contractor must provide a copy of the contract and a list of sub-contractors to the Department of Revenue, Sales and Use Tax Division. Any updates, additions and/or deletions, must also be submitted to the Department within 30 days of occurrence.

REVENUE DEPARTMENT USE ONLY

Examiner's Remarks

Examiner Date

Supervisor's Recommendation

Supervisor Date

SECTION 011000 – SUMMARY OF THE WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Work Identification by the Contract Documents.
2. Type of Construction Contract
3. Work phases.
4. Work under other contracts.
5. Use of premises.
6. Owner's occupancy requirements.
7. Specification formats and conventions.

1.3 WORK IDENTIFICATION BY CONTRACT DOCUMENTS

A. Project Identification: Project name is A New Fire Station No. 10 as in the Advertisement for Bids and as shown on the Contract Documents as prepared by Barganier Davis Williams Architects Associated.

B. Owner Contact: Kelli M. Gates
Contracts & Special Projects Administrator
City of Montgomery Public Works
25 Washington Avenue
Montgomery, AL 36104 Cell: 334-354-6150

C. Architect: Barganier Davis Williams Architects Associated, 624 South McDonough Street, Montgomery, Alabama 36104. 334-834-2038.

D. Construction Manager has been engaged for this project to serve as an advisor to Owner and to help in administering the Contract for Construction between Owner and Contractor, according to a separate contract between Owner and Construction Manager.

Construction Manager: Jacobs, 4121 Carmichael Road, Montgomery, Alabama 36106.

1.4 TYPE OF CONTRACT

A. City of Montgomery standard Construction Contract.

1.5 COMPLETION TIMES

A. Project shall be completed within 365 calendar days from the start date in the Notice to Proceed.

1.6 OWNER FURNISHED PRODUCTS

A. None.

1.7 WORK PHASES

A. The Work shall be conducted in a single phase.

B. **WORK UNDER OTHER CONTRACTS**.

A. The owner is currently under separate contract for the site demolition project. All work will be completed before this project starts.

1.8 USE OF PREMISES

A. General: Contractor shall have full use of premises for construction operations, including use of Project site, during construction period. Contractor's use of premises is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. Keep existing public roads, entrances always serving the site clear and available. Remove dirt, mud, debris etc., from sidewalks, streets, etc.

C. Firearms or any other weapons are not allowed on the site.

D. Smoking or other use of tobacco products shall not be permitted within the site perimeter.

E. The contractor shall provide temporary toilets as required for the number of workers on the site.

F. Furnish and install temporary barricades, fencing, etc. as indicated on drawings or by Section 015000 Temporary Facilities.

1.9 OWNER'S OCCUPANCY REQUIREMENTS

A. Owner will not occupy the site during the construction period.

B. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.

1.10 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the MASTERSPEC numbering system.

1. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for

clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01100

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SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements governing the following:
   1. Contingency allowances.
   2. Testing and inspecting allowances.

1.2 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect from the designated supplier.

1.3 SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.4 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.5 CONTINGENCY ALLOWANCES

A. All Allowances stated in the Contract Documents shall be included in the Contract Sum.

B. The Contractor shall include in his Bid Proposal all costs of materials, equipment, office, job supervision, overhead, profit, and bond on these Contingency Allowances, as these costs will not be paid to the Contractor for work performed under these Contingency Allowances. Only the direct costs of performing work under this provision shall be paid under and charged against the Contingency Allowances: such cost includes costs of materials and delivery, labor, payroll taxes and insurance, equipment, and the cost of subcontracted work (subcontractor’s cost may include a maximum of 15% mark-up for overhead and profit.

B. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

C. The Contractor shall include a line item in the Schedule of Values for Contingency Allowance. The estimated value of the work completed pursuant to fully executed Contingency Allowance Authorizations may be included in the Contractor’s monthly Applications for Payment. Payments under this Contingency Allowance shall not exceed the net, total of fully executed Contingency Allowance Authorizations.

1.6 TESTING AND INSPECTING ALLOWANCES

A. Testing and inspecting allowances include the cost of engaging testing agencies, actual tests and inspections, and reporting results.

B. The allowance does not include incidental labor required to assist the testing agency or costs for retesting if previous tests and inspections result in failure. The cost for incidental labor to assist the testing agency shall be included in the Contract Sum.

C. Costs of services not required by the Contract Documents are not included in the allowance.

D. At Project closeout, credit unused amounts remaining in the testing and inspecting allowance to Owner by Change Order.

1.7 UNUSED MATERIALS

A. Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1. If requested by Architect, prepare unused material for storage by Owner when it is not economically practical to return the material for credit. If directed by Architect, deliver unused material to Owner's storage space. Otherwise, disposal of unused material is Contractor's responsibility.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. BASE BID PROPOSAL:

B. **Allowance No. 1**: General Contractors are to include in their Base Bid Proposal $150,000.00 for a General Contingency to cover unforeseen conditions to correct or supplement the work as detailed in the Contract Documents.

C. **Allowance No. 2:** General Contractors are to include in their Base Bid Proposal $65,000.00 for a General Contingency to furnish and install an Access Control System.

D. **Allowance No.3:** General Contractors are to include in their Base Bid Proposal an allowance of Thirty Thousand Dollars ($30,000.00) for Alabama Power Aid to Construction Cost.

E. **Allowance No. 4:** General Contractors are to include in their Base Bid Proposal an allowance of Fifteen Thousand Dollars ($15,000.00) for the Owner to purchase and install and public address system.

F. **Allowance No. 5:** General Contractors are to include in their Base Bid Proposal an allowance of Thirty Thousand Dollars ($30,000.00) for the purchase of additional IT equipment.

G. **Allowance No. 6:** Deleted.

H. **Allowance No. 7:** General Contractors are to include in their Base Bid Proposal an allowance of $60,000.00 for the testing and installation of a two -way emergency radio system.

I. **Allowance No. 8:** General Contractors are to include in their Base Bid Proposal an allowance of $70,000.00 for prefabricated wall systems, Type D1, by Division 12 Consulting, Phone: (205)440-2695.

J. **Allowance No. 9:** General Contractors are to include in their Base Bid Proposal an allowance of $30,000.00 for back-lit signage and shields/emblems as shown on elevation 1/A4.1.

K. **Allowance No. 10:** General Contractors are to include in their Base Bid Proposal an allowance of $30,000.00 for Wall Covering Graphic Images on noted wall on the floor plans.

L. **Allowance No. 11:** General Contractors are to include in their Base Bid Proposal an allowance of $5,000.00 for the applied film signage indicated on Detail 2A/A4.1.

END OF SECTION 012100

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SECTION 012200 UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Contractor unit prices.

1.3 DEFINITIONS

A. Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Owner.

D. List of Unit Prices: A list of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used).

PART 3 - EXECUTION

1.5 LIST OF UNIT PRICES

A. In addition to the Contractor’s Base Bid Sum, the Bidder proposes the following Unit Prices to adjust the Contract Sum (additions and / or deductions) as required. The Bidder understands that such Unit Prices are the total cost to the Owner for each unit of work to include the cost of direct and indirect overhead; profit; labor; materials; equipment; subcontractor; and, any other cost not specifically mentioned, but necessary for the performance of the work units listed below, for every tier involved. The quantities, as measured and multiplied by the Unit Cost are the total cost for the addition or deduction to the Contract Sum.

B. UNIT PRICE SCHEDULE:
Attach to Proposal Form at time of Bid (use attached form – see next page).

CONTRACTOR’s UNIT PRICE SCHEDULE (Bid Attachment to Proposal Form)

In addition to the Contractor’s Base Bid Sum, the Bidder proposes the following Unit Prices to adjust the Contract Sum (additions and / or deductions) as required. The Bidder understands that such Unit Prices are the total cost to the Owner for each unit of work to include the cost of direct and indirect overhead; profit; labor; materials; equipment; subcontractor; and, any other cost not specifically mentioned, but necessary for the performance of the work units listed below, for every tier involved. The quantities, as measured and multiplied by the Unit Cost are

the total cost for the addition or deduction to the Contract Sum. 'IAW' shall mean 'In Accordance With'.
These Unit Prices shall be used for unforeseen conditions, Owner / Architect / Engineer directed change orders, and any other extraordinary condition beyond the stated allowances included in Section 01210 that are not included in the Base Bid for this Project.

A. Unit Price Number One: Excavation / Removal of Soil Materials:

1. Narrative Description for the Removal of Unsuitable Material and Excess Topsoil – Payment for "Removal of Unsuitable Material and Excess Topsoil" shall be made at the unit price bid, per cubic yard in place (CYIP) removed, and shall be compensation in full for furnishing all materials, equipment, tools, labor and incidentals necessary to complete the work. Payment for this item will include Removal of Unsuitable Material and Excess Topsoil underneath the building and surrounding areas. Base bid includes the removal of all structural excavation spoils as deemed necessary at an off-site location. Haul tickets shall not be considered a valid determination of quantities. Following topsoil stripping, the Contractor shall notify the Owner's Representative forty-eight (48) hours before any unsuitable material is excavated, so the area may be delineated, and removal depths measured to derive the cubic yards of topsoil removal. Following the removal of unsuitable material, the Contractor shall notify the Owner's Representative forty-eight (48) hours before any replacement material is placed, so the area may be delineated, and removal depths measured to derive the cubic yards of unsuitable removal. Failure to notify the Owner's Representative and performing unsuitable excavation without his/her presence for measurement shall forfeit payment of that amount of unobserved work. **Contractor to include 300 cubic yards in the base bid.**

2. Unit of Measure: Cubic Yard in Place (CYIP). $_____.

B. Unit Price Number Two: Placement of Engineered Fill Material:

1. Narrative Description for the Replacement of Engineered Material– Payment for "Replacement of Unsuitable Material" shall be made at the unit price bid, per cubic yard in place (CYIP) replaced, and shall be compensation in full for furnishing all materials, equipment, tools, labor and incidentals necessary to complete the work. Payment for this item will include replacement of Unsuitable Material, to noted elevation grade, which is removed from the project site under the "Removal of Unsuitable Material and Excess Topsoil" item. Haul tickets shall not be considered a valid determination of quantities. The replacement quantity shall be determined the "Removal of Unsuitable Material and Excess Topsoil" item, less topsoil removed. **Contractor to include 1300 cubic yards in the base bid.**

2. Unit of Measure: Cubic Yard in Place (CYIP). $_____.

END OF SECTION

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

1.5 SCHEDULE OF DEDUCTIVE ALTERNATES

DEDUCTIVE ALTERNATE NO. 1: General Contractor shall deduct from their Proposal all labor and material to furnish all work associated with the connecting the Church Parking New Road on the west side of the site.

DEDUCTIVE ALTERNATE NO. 2: General Contractor shall deduct from their Proposal their price to furnish all material and labor to construct the additional parking in reference to Sheet C-102 and the Landscape as per Sheet L2.0 and L4.0.

DEDUCTIVE ALTERNATE NO. 3: General Contractor shall deduct from their Proposal their price to furnish all material and labor associated with the wearing and binder surface of the asphalt paving. The Base Bid shall still include the curb and gutter and base course ready for asphalt installation.

DEDUCTIVE ALTERNATE NO.4: General Contractor shall deduct from their Proposal their price to furnish all material and labor to install the exterior light poles on the site. The Base Bid shall still include the power and concrete base for the light poles, ready for pole installation by others.

END OF SECTION 012300

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections include the following:
   1. Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.03 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing Minor Changes in the Work, that may or may not involve an adjustment to the Contract Sum or the Contract Time, as an Architect's Supplemental Instructions, "ASI".

1.04 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time in the form of an ASI. If necessary, the description will include supplemental or revised Drawings and Specifications.
   1. ASI's issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
   2. Within time specified in ASI after receipt of ASI, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change. The submission shall include:
      a. A list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
      b. Indication of applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
      c. Costs of labor directly attributable to the change.
      d. An updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
      e. Other requirements of the General Conditions of the Contract.

B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect.
   1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time. The submission shall include:
      a. A list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
      b. Indication of applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

c. Costs of labor directly attributable to the change.
d. An updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

e. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system specified.

1.05 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Change Order for signatures of Owner and Contractor the Architect may issue a Memo to the Contractor authorizing in writing for him to proceed with the proposed change and an official Change Order will be written later.

1.06 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive, "CCD": Architect may issue a Construction Change Directive. Construction Change Directive instructs Contractor to proceed with a change in the Work, for Subsequent inclusion in a Change Order. Construction Change Directive contains a complete description of change in the work

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.03 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.04 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
   1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
      a. Application for Payment forms with Continuation Sheets.
      b. Submittals Schedule.
      c. Contractor's Construction Schedule.
   2. Submit the Schedule of Values to Architect no later than ten days after the Notice to Proceed (NTP).

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one-line item for each Specification Section.
   1. Identification: Use DCM Form C-10 SOV, August 2021 included in the specifications.
   2. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
   3. To the greatest extent possible, round amounts to nearest whole dollar; total shall equal the Contract Sum.
   4. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
      a. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.
   5. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
   6. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
   7. Alternates: Provide a separate line item in the Schedule of Values for each alternate. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.

8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.

1.05 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
    1. Initial Application for Payment, Application for Payment at time of Completion, and Final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Forms: Use DCM Form C-10, August 2021.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
    1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
    2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. Transmittal: Submit six, signed in blue ink and notarized, original copies of each Application for Payment to Architect by a method ensuring receipt. Include waivers of lien and similar attachments as required.
    1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

F. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
    1. List of subcontractors.
    2. Schedule of Values.
    3. Contractor's Construction Schedule.
    4. Submittals Schedule (preliminary if not final).
    5. List of Contractor's principal consultants.

G. Periodic Applications for Payment: Administrative actions and submittals that must coincide with submittal of each Application for Payment include the following:
    1. Contractor’s Periodical Request for Partial Payment.
    2. Submittals Schedule (updated).
    3. Inventory of Stored Materials - Use DCM Form C-10 SM, August 2021.
    4. Contractor’s Progress Schedule and Report - Use DCM Form C-1, August 2021.
    5. Partial Lien Waivers – Use DCM Form C-19, August 2021.
    6. Weather Delay Documentation Form as provided by general contractor.
    7. Updated list of subcontractors.

H. Final Payment Application: Submit final Application for Payment with releases and supporting documentation showing 100 percent completion for portion of the Work claimed as complete, including, but not limited, to the following:
    1. Evidence of completion of Project closeout requirements.
    2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.

3. Updated final statement, accounting for final changes to the Contract Sum.
4. Updated final Weather Delay Documentation Form.
5. Certificate of Substantial Completion DCM Form C-13, August 2021.
6. Contractor's Affidavit of Payments of Debts and Claims DCM Form C-18, August 2021.
7. Contractor's Affidavit of Release of Liens - DCM Form C-19, August 2021.
8. Consent of Surety to Final Payment – DCM Form C-20, August 2021.
9. Evidence that claims have been settled.
10. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Final Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
11. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Coordination Drawings.
2. Administrative and supervisory personnel.
3. Project meetings.
4. Requests for Interpretation (RFIs).

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.

1.3 DEFINITIONS

A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.4 COORDINATION

A. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.
9. Project closeout activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1.5 SUBMITTALS -COORDINATION DRAWINGS (If Applicable or Specified)

A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:

    a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    b. Indicate required installation sequences.
    c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

2. Sheet Size: At least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
3. Number of Copies: Submit two opaque copies of each submittal. Architect will return one copy.

    a. Submit five copies where Coordination Drawings are required for operation and maintenance manuals. Architect will retain two copies; remainder will be returned. Mark up and retain one returned copy as a Project Record Drawing.

4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.

1.6 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

1. Include special personnel required for coordination of operations with other contractors.

1.7 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Architect will schedule the Pre-Construction after the Construction Contract has been fully executed by the owner.

C. Preinstallation Conferences: (Where applicable or noted on drawings or in specifications) Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the activity under consideration, including requirements for the following:

    a. The Contract Documents.
    b. Options.
    c. Related RFIs.
    d. Related Change Orders.
    e. Purchases.
    f. Deliveries.
    g. Submittals.
    h. Review of mockups.
    i. Possible conflicts.
    j. Compatibility problems.
    k. Time schedules.
    l. Weather limitations.
    m. Manufacturer's written recommendations.
    n. Warranty requirements.
    o. Compatibility of materials.
    p. Acceptability of substrates.
    q. Temporary facilities and controls.
    r. Space and access limitations.
    s. Regulations of authorities having jurisdiction.
    t. Testing and inspecting requirements.
    u. Installation procedures.
    v. Coordination with other work.
    w. Required performance results.
    x. Protection of adjacent work.
    y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Architect's construction administration representative will visit the site once a week for inspection.

1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

        1) Review schedule for next period.

    b. Review present and future needs of each entity present, including the following:

        1) Interface requirements.
        2) Sequence of operations.
        3) Status of submittals.
        4) Deliveries.
        5) Off-site fabrication.
        6) Access.
        7) Site utilization.
        8) Temporary facilities and controls.
        9) Work hours.
        10) Hazards and risks.
        11) Progress cleaning.
        12) Quality and work standards.
        13) Status of correction of deficient items.
        14) Field observations.
        15) RFIs.
        16) Status of proposal requests.
        17) Pending changes.
        18) Status of Change Orders.
        19) Pending claims and disputes.
        20) Documentation of information for payment requests.

3. Minutes: Architect will record the meeting minutes and send electronically to the contractor.

4. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

E. Coordination Meetings: Conduct Project coordination meetings as needed or if applicable. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to Combined Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    b. Schedule Updating: Revise Combined Contractor's Construction Schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
    c. Review present and future needs of each contractor present, including the following:
        1) Interface requirements.
        2) Sequence of operations.
        3) Status of submittals.
        4) Deliveries.
        5) Off-site fabrication.
        6) Access.
        7) Site utilization.
        8) Temporary facilities and controls.
        9) Work hours.
        10) Hazards and risks.
        11) Progress cleaning.
        12) Quality and work standards.
        13) Change Orders.
3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.8 REQUESTS FOR INTERPRETATION (RFIs)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.

1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:

1. Project name.
2. Date.
3. Name of Contractor.
4. Name of Architect.
5. RFI number, numbered sequentially.
6. Specification Section number and title and related paragraphs, as appropriate.
7. Drawing number and detail references, as appropriate.
8. Field dimensions and conditions, as appropriate.
9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
10. Contractor's signature.
11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
    a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

C. Hard-Copy RFIs:

1. Identify each page of attachments with the RFI number and sequential page number.

D. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

E. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow **seven** working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:
    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for coordination information already indicated in the Contract Documents.
    d. Requests for adjustments in the Contract Time or the Contract Sum.
    e. Requests for interpretation of Architect's actions on submittals.
    f. Incomplete RFIs or RFIs with numerous errors.

2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within **seven** days of receipt of the RFI response.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within **seven** days if Contractor disagrees with response.

G. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log biweekly. Log with not less than the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 – GENERAL

1.00 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.01 SUMMARY

A. Section Includes: Administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Contractor's Construction Schedule.
   2. Submittals Schedule.
   3. Daily construction reports.
   4. Field condition reports.

B. Related Sections:
   1. Section 012900 - Payment Procedures: Submitting the Schedule of Values.
   2. Section 013100 - Project Management and Coordination: Submitting and distributing meeting and conference minutes.
   3. Section 013300 - Submittal Procedures: Submitting schedules and reports.
   4. Section 014000 - Quality Assurance: Submitting a schedule of tests and inspections.

1.02 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
   1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
   2. Predecessor Activity: An activity that precedes another activity in the network.
   3. Successor Activity: An activity that follows another activity in the network.

B. Fragment: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

C. Major Area: A story of construction, a separate building, or a similar significant construction element.

1.03 SUBMITTALS

A. Submittals Schedule: Submit three (3) copies of schedule. Arrange the following information in a tabular format:
   1. Scheduled date for first submittal.
   2. Specification Section number and title.
   3. Submittal category (action or informational).
   4. Name of subcontractor.
   5. Description of the Work covered.
   6. Scheduled date for Architect's final release or approval.

B. Contractor's Construction Schedule: Submit two (2) opaque copies of initial schedule, large enough to show entire schedule for entire construction period.

C. Field Condition Reports: Submit two (2) copies at time of discovery of differing conditions.

1.04 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
   1. Secure time commitments for performing critical elements of the Work from parties involved.
   2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.01 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
   1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
   2. Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.02 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.
   1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
   1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
   2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
   3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 - Submittal Procedures in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
   4. Startup and Testing Time: Include not less than three (3) days for startup and testing.
   5. Project Completion: Indicate completion in advance of date established for Project Completion and allow time for Architect's administrative procedures necessary for certification of Project Completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.
   1. Phasing: Arrange list of activities on schedule by phase.
   2. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
   3. Work Restrictions: Show the effect of the following items on the schedule:
      a. Coordination with existing construction.
      b. Limitations of continued occupancies.
      c. Uninterruptible services.

d. Partial occupancy before Final Acceptance.
e. Use of premises restrictions.
f. Provisions for future construction.
g. Seasonal variations.
h. Environmental control.

4. Work Stages: Indicate important stages of construction for each major portion of the Work.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragments to demonstrate the effect of the **proposed change on the overall project schedule.**

2.03 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. CPM Schedule: Submit Contractor's Construction Schedule using a computerized, time-scaled CPM network analysis diagram for the Work in accordance with General Conditions, Article 9.

1. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
2. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
3. Use "one workday" as the unit of time. Include list of nonworking days and holidays incorporated into the schedule.

C. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
   a. Preparation and processing of submittals.
   b. Mobilization and demobilization.
   c. Purchase of materials.
   d. Delivery.
   e. Fabrication.
   f. Utility interruptions.
   g. Installation.
   h. Work by Owner that may affect or be affected by Contractor's activities.
   i. Testing and commissioning.
2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
   a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

D. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:
   1. Contractor or subcontractor and the Work or activity.
   2. Description of activity.
   3. Principal events of activity.
   4. Immediate preceding and succeeding activities.
   5. Early and late start dates.
   6. Early and late finish dates.
   7. Activity duration in workdays.
   8. Total float or slack time.
   9. Average size of workforce.

E. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
   1. Identification of activities that have changed.
   2. Changes in early and late start dates.
   3. Changes in early and late finish dates.
   4. Changes in activity durations in workdays.
   5. Changes in the critical path.
   6. Changes in total float or slack time.
   7. Changes in the Contract Time.

2.04 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
   1. List of subcontractors at Project site.
   2. Equipment at Project site.
   3. Material deliveries.
   4. High and low temperatures and general weather conditions.
   5. Accidents.
   6. Stoppages, delays, shortages, and losses.
   7. Meter readings and similar recordings.
   8. Orders and requests of authorities having jurisdiction.
   9. Services connected and disconnected.
   10. Equipment or system tests and startups.

B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

3.01 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
   1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
   2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
   3. As the Work progresses, indicate Actual Completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
   1. Post copies in Project meeting rooms and temporary field offices.
   2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION

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SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Periodic construction photographs.

1.3 SUBMITTALS

A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same label information as corresponding set of photographs.

B. Digital Construction Photographs: Submit one prints of each photographic view within seven days of taking photographs.
1. Format: Digital
2. Identification: On back of each print, provide an applied label or rubber-stamped impression with the following information:

a. Name of Project.
b. Name of Architect.
c. Name of Contractor.
d. Date photograph was taken if not date stamped by camera.
e. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
f. Unique sequential identifier.

3. Digital Images: Submit a complete set of digital image electronic files as a Project Record Document on CD-ROM. Identify electronic media with date photographs were taken. Submit images that have same aspect ratio as the sensor, uncropped.

PART 2 - EXECUTION

2.1 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
1. Maintain key plan with each set of construction photographs that identifies each photographic location.

B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in filename for each image.
2. Field Office Images: Maintain one set of images on CD-ROM in the field office at Project site, available always for reference. Identify images same as for those submitted to Architect.

C. Preconstruction Photographs: Before starting construction digital photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
   1. Take eight photographs to show existing conditions adjacent to property before starting the Work.
   2. Take eight photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.

D. Periodic Construction Photographs: Take 12 digital photography monthly with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

E. Additional Photographs: Architect may issue requests for additional photographs, in addition to periodic photographs specified. Additional photographs will be paid for by Change Order and are not included in the Contract Sum.

   1. Three days' notice will be given, where feasible.
   2. In emergency situations, take additional photographs within 24 hours of request.
   3. Circumstances that could require additional photographs include, but are not limited to, the following:

      a. Special events planned at Project site.
      b. Immediate follow-up when on-site events result in construction damage or losses.
      c. Photographs to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
      d. Substantial Completion of a major phase or component of the Work.
      e. Extra record photographs at time of final acceptance.
      f. Owner's request for special publicity photographs.

END OF SECTION 013233

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Procedures:
   1. Electronic PDF Format submittals shall be used.
   2. Submit physical samples for color samples, color charts, or physical material samples.
   3. The contractor shall review and apply electronic stamp certifying that the submittal with complies with the requirements of the Contract Documents.
   4. Submit paper copies of reviewed submittals at project closeout for record purposes in accordance with Section 01770 - Closeout Procedures.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect’s responsive action.

B. Informational Submittals: Written information that does not require Architect’s responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

A. General: Electronic copies of CAD Drawings of the Contract Drawings will be, under certain circumstances, be provided by Architect for Contractor’s use in preparing submittals

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

      a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

   1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
   2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.

3. Resubmittal Review: Allow 15 days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.

D. Identification: Place a permanent label or title block on each electronic submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information on label for processing and recording action taken:

a. Project name.
b. Date.
c. Name and address of Architect.
d. Name and address of Contractor.
e. Name and address of subcontractor.
f. Name and address of supplier.
g. Name of manufacturer.
h. Submittal number or other unique identifier, including revision identifier.

1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).

i. Number and title of appropriate Specification Section.
j. Drawing number and detail references, as appropriate.
k. Location(s) where product is to be installed, as appropriate.
l. Other necessary identification.

E. Deviations: Highlight or otherwise specifically identify deviations from the Contract Documents on submittals.

F. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals**,** without review, received from sources other than Contractor.

1. Transmittal Form: Provide locations on form for the following information:

a. Project name.
b. Date.
c. Destination (To:).
d. Source (From:).
e. Names of subcontractor, manufacturer, and supplier.
f. Category and type of submittal.
g. Submittal purpose and description.
h. Specification Section number and title.
i. Drawing number and detail references, as appropriate.
j. Transmittal number numbered consecutively.

k. Submittal and transmittal distribution record.
l. Remarks.
m. Signature of transmitter.

2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.

H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked " approval notation from Architect’s action stamp."

I. Distribution: Furnish electronic copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

1.5 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

A. General: At Contractor's written request, copies of Architect's CAD files will be provided to Contractor for Contractor's use in connection with Project.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

1. Submit electronic submittals directly to extranet specifically established for Project.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

a. Manufacturer's written recommendations.
b. Manufacturer's product specifications.
c. Manufacturer's installation instructions.
d. Standard color charts.
e. Manufacturer's catalog cuts.
f. Wiring diagrams showing factory-installed wiring.
g. Printed performance curves.
h. Operational range diagrams.
i. Mill reports.
j. Standard product operation and maintenance manuals.
k. Compliance with specified referenced standards.
l. Testing by recognized testing agency.

m. Application of testing agency labels and seals.
n. Notation of coordination requirements.

4. Submit Product Data before or concurrent with Samples.
5. Electronic Submittals are acceptable.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data**,** unless submittal of Architect's CAD Drawings are otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Dimensions.
b. Identification of products.
c. Fabrication and installation drawings.
d. Roughing-in and setting diagrams.
e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
f. Shopwork manufacturing instructions.
g. Templates and patterns.
h. Schedules.
i. Design calculations.
j. Compliance with specified standards.
k. Notation of coordination requirements.
l. Notation of dimensions established by field measurement.
m. Relationship to adjoining construction clearly indicated.
n. Seal and signature of professional engineer if specified.
o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
p. Electronic Shop Drawings are acceptable.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

a. Generic description of Sample.
b. Product name and name of manufacturer.
c. Sample source.
d. Number and title of appropriate Specification Section.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.

b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

E. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product.
2. Number and name of room or space.
3. Location within room or space.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S/ ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken.:

C. Informational Submittals: Architect will review each submittal and will not return it or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

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SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

1.3 DEFINITIONS

A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 USE CHARGES

A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to**,** Owner's construction forces, Architect, testing agencies, and authorities having jurisdiction.

B. Water Service: Pay water service use charges for water used by all entities for construction operations.

C. Electric Power Service: Pay electric power service use charges for electricity used by all entities for construction operations.

1.5 SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

1.6 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.7 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

2.2 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

1. Install electric power service overhead or underground, unless otherwise indicated.
2.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

3.3 SUPPORT FACILITIES INSTALLATION

A. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

B. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

C. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.

D. Project Identification and Temporary Signs: Provide Project identification and other signs.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

C. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

D. Tree and Plant Protection: (If applicable) Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

E. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

F. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.

G. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

1. Prohibit smoking on owner property.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

B. See Division 02 through 33 Section "Closeout Procedures" for submitting warranties for Contract closeout.

1.3 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process, or were indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor. See Instructions to Bidders, paragraph 7.

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.4 SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use Contractor’s own form.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified material or product cannot be provided.
b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
j. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
k. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within **7** days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 7 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

a. Form of Acceptance: Change Order.
b. Use product specified if Architect cannot decide on use of a proposed substitution within time allocated.

B. Comparable Product Requests: Submit one copy of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 7 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
b. Use product specified if Architect cannot make a decision on use of a comparable product request within time allocated.

C. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store cementitious products and materials on elevated platforms.
5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
3. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

B. Product Selection Procedures:

1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
7. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the

specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.

8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product match.
    a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.
10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
    a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
    b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: Architect will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.

B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
2. Requested substitution does not require extensive revisions to the Contract Documents.
3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Requested substitution will not adversely affect Contractor's Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.

9. Requested substitution provides specified warranty.

2.3 COMPARABLE PRODUCTS

A. Conditions: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. General installation of products.
4. Progress cleaning.
5. Starting and adjusting.
6. Protection of installed construction.
7. Correction of the Work.

1.3 SUBMITTALS

A. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

1. Before construction, verify the location and points of connection of utility services.

B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

3.2 PREPARATION

A. Field Measurements: Take field measurements of buildings as required to fit the roofing work properly.

B. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a

B. detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 INSTALLATION

A. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

B. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

C. Conduct construction operations so no part of the Work is subjected to damaging operations or loading more than that expected during normal conditions of occupancy.

D. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

E. Templates: Obtain and distribute to the parties' involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

F. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.4 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

D. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.6 CORRECTION OF THE WORK

A. Repair or remove and replace defective roofing work if directed by Architect.

END OF SECTION

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Warranties.
3. Final cleaning.

B. See Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.

C. See Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.

D. See Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.

E. See Divisions 02 through 49 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION

Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems.
9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.

11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit one copy of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.

1. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

1.6 WARRANTIES

A. Submittal Time: Submit One Copy of written warranties within thirty days of Substantial Completion is indicated.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. Reference General Conditions of the Contract – ARTICLE 48 - IN-PROGRESS and FINAL CLEANUP.

B. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

C. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Remove snow and ice to provide safe access to building.

f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

h. Sweep concrete floors broom clean in unoccupied spaces.

i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.

j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.

k. Remove labels that are not permanent.

l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

n. Replace parts subject to unusual operating conditions.

o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

r. Leave Project clean and ready for occupancy.

D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Emergency manuals.
2. Operation manuals for systems, subsystems, and equipment.
3. Maintenance manuals for the care and maintenance of products, materials, and finishes systems and equipment.

B. See Divisions 02 through 49 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 SUBMITTALS

A. Manual: Submit one copy of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.

PART 2 - PRODUCTS

2.1 MANUALS, GENERAL

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain a title page, table of contents, and manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name, address, and telephone number of Contractor.
6. Name and address of Architect.
7. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on

spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for type of emergency, emergency instructions, and emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component for fire, gas leak, water leak, power failure, water outage and equipment failure.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include instructions on stopping, shutdown instructions for each type of emergency, operating instructions for conditions outside normal operating limits, and required sequences for electric or electronic systems.

2.3 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and equipment descriptions, operating standards, operating procedures, operating logs, wiring and control diagrams, and license requirements.

B. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.

7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include start-up, break-in, and control procedures; stopping and normal shutdown instructions; routine, normal, seasonal, and weekend operating instructions; and required sequences for electric or electronic systems.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and inspection procedures, types of cleaning agents, methods of cleaning, schedule for cleaning and maintenance, and repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including maintenance instructions, drawings and diagrams for maintenance, nomenclature of parts and components, and recommended spare parts for each component part or piece of equipment:

D. Maintenance Procedures: Include test and inspection instructions, troubleshooting guide, disassembly instructions, and adjusting instructions that detail essential maintenance procedures:

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

1. Do not use original Project Record Documents as part of operation and maintenance manuals.

F. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. See Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.

C. See Divisions 02 through 49 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one of marked-up Record Prints.

B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one copy of each Product Data submittal.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of prints of the Contract Drawings and Shop Drawings.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

   a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
   b. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

2.2 **RECORD SPECIFICATIONS**

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. Note related Change Orders and Record Drawings where applicable.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders and Record Drawings where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training DVD’s or Manuals.

B. See Divisions 02 through 49 Sections for specific requirements for demonstration and training for products in those Sections.

1.3 SUBMITTALS

A. Instruction Program: Submit one copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

B. Demonstration and Training electronically or Manuals: Submit one copy at end of each training module.

1.4 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Pre-instruction Conference: Conduct conference at Project site. Review methods and procedures related to demonstration and training.

D. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:

1. Basis of System Design, Operational Requirements, and Criteria: Include system and equipment descriptions, operating standards, regulatory requirements, equipment function, operating characteristics, limiting conditions, and performance curves.
2. Documentation: Review emergency, operations, and maintenance manuals; Project Record Documents; identification systems; warranties and bonds; and maintenance service agreements.
3. Emergencies: Include instructions on stopping; shutdown instructions; operating instructions for conditions outside normal operating limits; instructions on meaning of warnings, trouble indications, and error messages; and required sequences for electric or electronic systems.
4. Operations: Include startup, break-in, control, and safety procedures; stopping and normal shutdown instructions; routine, normal, seasonal, and weekend operating instructions; operating procedures for emergencies and equipment failure; and required sequences for electric or electronic systems.
5. Adjustments: Include alignments and checking, noise, vibration, economy, and efficiency adjustments.
6. Troubleshooting: Include diagnostic instructions and test and inspection procedures.
7. Maintenance: Include inspection procedures, types of cleaning agents, methods of cleaning, procedures for preventive and routine maintenance, and instruction on use of special tools.
8. Repairs: Include diagnosis, repair, and disassembly instructions; instructions for identifying parts; and review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Owner will furnish an instructor to describe Owner's operational philosophy.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral performance-based test.

END OF SECTION

Report of Geotechnical Subsurface Investigation

New City of Montgomery Fire Station
South Court Street
Montgomery, Alabama
Our Job No. G21-6336

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Report of Geotechnical Subsurface Investigation

New City of Montgomery Fire Station
South Court Street
Montgomery, Alabama
Our Job No. G21-6336

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December 20, 2021

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Attachments :

Boring Plans
Test Boring Logs
Laboratory Test Data
Notes and References
Investigative Procedures
Unified Soil Classification Chart
Exhibit C

1.0 Introduction

Carmichael Engineering, Inc., is pleased to provide this report of our subsurface investigation for the proposed New City of Montgomery Fire Station Development. The scope of this investigation included 17 soil test bores in the proposed building and pavement areas. The quantity and location of the test bores were taken in accordance with the authorized scope of work. The intent of this investigation was to evaluate the subsurface conditions with respect to the development of the site for support of the proposed building, canopy, and pavements.

This report has been prepared in accordance with generally accepted current standards of geotechnical engineering practices and no other warranties are expressed or implied. The recommendations of this report are based on our professional judgment considering the proposed construction as described by this report and the data available to us. The construction should include follow up geotechnical monitoring and construction materials testing by our firm. It is important that we confirm the expected subsurface conditions based on the soil boring data during the construction phase. This report is presented on the basis that all of our recommendations will be followed.

2.0 Summary

Generally, the subsurface investigation indicated conditions which should be compatible with the planned building and pavement construction provided the site preparation and construction are completed in accordance with the recommendations which follow in this report. Please note that our recommendations are site specific and may not be suitable for other types of structures or other locations.

A total of 17 soil test bores were completed to evaluate the subsurface profile. Beneath asphalt pavement, concrete pavement, or organic topsoil, the test bores penetrated fill and in-situ earth described as cohesive clayey sand (sections with gravel and sections with organics), sandy clay (sections with organics), sandy plastic clay, plastic clay with trace organics, and non-cohesive silty sand (sections with gravel), and gravel. The site has been previously graded and some fill earth is present. The fill earth is similar in composition to the in-situ earth and it is difficult to distinguish the fill earth in the test bores. The predominate sand earth is of a marginal to good drainage classification. The predominate clay earth is of a poor drainage classification and sections of the clay are expansive. Beneath weak surficial soil conditions, the test bores indicated moderate soil strengths and consolidation characteristics which are expected to be compatible with the planned type of construction. Localized weak soil conditions will require correction to provide structural support.

The test bores did not indicate any groundwater during drilling. Twenty-four hours following drilling, 6 test bores indicated water levels from 0.7 to 20.2' below ground surface. Some of the water levels reflect localized shallow "perched" water conditions. The test bores caved following drilling at depths of 2.1 to 32.1' below ground surface. The groundwater condition at this site is subject to seasonal variation and is expected to fluctuate. We do not anticipate that the groundwater condition will affect the long-term performance of this project. Shallow groundwater (if any) encountered during construction can be controlled using shallow drainage ditches, sump pumps, and/or permanent underdrains.

The property was previously developed for a Sears Store and included a large building and other miscellaneous structures. The building superstructure has been demolished and removed. Old floor slabs, foundations, old pavements and expected underground utility and plumbing service lines remain. It is possible that disturbed sections of soil and other anomalies obscured by the remaining floor slab are present which have not been identified by the test bores.

The expansive and poor drainage classification of the plastic clay earth present in localized sections of the site is one of the primary concerns for the site development and the design of foundations. The expansive clay soil can undergo volume change when subjected to fluctuating moisture contents and can cause severe damage to foundations which bear in or near the zone of moisture fluctuation. Providing adequate surface drainage during and following construction is critical to the performance of the foundations.

After removing the topsoil, old foundations and slabs, and old pavements, the exposed subgrade should be processed (mixed and moisture conditioned) and compacted to 98% of the materials ASTM D-698 standard density. Areas which fail to compact should be undercut to expose a firm level of earth followed by backfilling with "engineered fill". The suitable sections of the predominate native silty sand, clayey sand and sandy clay may be used to construct "engineered fill" for support of the planned building structure and new pavements. The plastic clay soils with "CH" Unified Soil Classifications should not be used as structural fill for this project.

Following proper site preparation, the project can use conventional design and construction techniques to develop a shallow spread foundation system for support of the proposed building and canopy. Spread foundations may be designed to bear transitional between the firm to stronger in-situ earth (compacted as required), existing fill (compacted as required) and new "engineered fill" utilizing net allowable soil bearing pressures of up to 2000 pounds per square foot for isolated square foundations and 1,500 pounds per square foot for continuous foundations. The depth of the foundations should be at least 24" below the outside finish grade. The perimeter building foundations should be extended to 48" below grade in areas of the site where expansive clay soil ("CH") is present within 4' of ground surface. The additional foundation depth can be accomplished by using a 24" thick non-reinforced concrete mud sill beneath the reinforced portion of the foundation.

The pavement sections may be developed using locally available materials and conventional construction techniques. The pavement sections may be constructed using a crushed aggregate base and high stability bituminous pavement section or a crushed aggregate base and concrete pavement section placed directly over an improved layer of the subgrade earth.

3.0 Evaluation

3.1 Site Location

The site subject to this report is located on the west side of South Court Street just north of Fairview Avenue in the City of Montgomery, Montgomery County, Alabama. Our field personnel utilized the provided site plan and a survey grade GPS to locate the site and test bores. Ground elevations at each bore location were established using the GPS. The horizontal and vertical accuracy of the GPS can be variable due to atmospheric influences, tree canopies and other obstructions. The GPS data is provided for information only and has not been field verified.

The enclosed boring plans further describe the test bore locations.

3.2 Site Conditions

The site consisted of an irregular shaped parcel of property. The site was clear and open with asphalt pavements and concrete slabs. The site had been previously developed for a Sears Store and had included a large building, asphalt pavements and related improvements. The building superstructure had been demolished and removed.

The local terrain is described as gently sloping. There was less than 3' of relief between the test bore locations. Surface drainage was described as fair to good. Surface water is expected to flow over the site and discharge beyond the areas planned for development. There were no significant areas of ponded surface water located on the site during the field testing.

Site access was described as good. There was no difficulty mobilizing our track mounted Geoprobe and rubber tired ATV mounted drilling equipment over the site to access the selected test bore locations.

3.3 Site Geology and Subsurface Stratigraphy

Geologically, the site is located in the Coastal Plain Provence in an area transitional between the Selma Chalk Formation and the Eutaw Formation deposited in the Upper Cretaceous Epoch of the Cretaceous Period. The majority of the soils penetrated by the test bores is associated with the Eutaw Formation. Typically, the Eutaw formation yields partly fossiliferous fine to medium quartz sand with carbonaceous clay and micaceous sandy clay.

Beneath 5" of organic topsoil and 3 to 7.1" of asphalt pavement or concrete slab, the test bores penetrated fill and in-situ earth described as cohesive clayey sand (sections with gravel and sections with organics), sandy clay (sections with organics), sandy plastic clay, plastic clay with trace organics, and non-cohesive silty sand (sections with gravel), and gravel. The fill earth is similar in nature to the in-situ earth and it is difficult to distinguish the fill from the in-situ earth in the test bores. Laboratory analyses confirmed "SM", "SC", "CL" and "CH" Unified Soil Classifications of the predominate silty sand, clayey sand, sandy clay and sandy plastic clay earth with plasticity indices of non-plastic, 11, 13, 15, 20, and 31. The penetration resistance values, "N", ranged from 6 to 100+ blows per foot indicating relative densities of loose to very dense in the predominate sand earth and firm to stiff in the predominate clay earth. Moisture tests indicated water contents ranging from 8.7 to 33.3%. The test bores were terminated in the in-situ earth at depths of 6.5 to 35' below existing ground surface.

The test bores did not indicate any groundwater during drilling. Twenty-four hours following drilling, bores B-5, B-11, B-13, B-14, B-16 and B-17 indicated water levels at depths of 0.7 to 20.2' below ground surface. The test bores had caved at depths of 2.1 to 32.1' below ground surface after twenty-four hours which may have prevented measurement of a stabilized water level in some of the test bores.

The enclosed test boring records further describe the subsurface stratigraphy, Unified Soil Classifications, penetration resistance values, moisture contents, water levels, caved depths, and boring termination depths.

3.4 General Construction Information

The following data was extrapolated from the provided construction information and plans. The construction data described in this section was considered in the formulation of our recommendations; therefore, any significant changes, additions or modifications to the planned development may have a significant impact on our recommendations. We ask that we be advised of any significant errors, omissions, or revisions in the construction data to permit further comment as needed.

We understand the proposed development will include conventional type building construction for a new fire station along with related grading, drainage and pavement improvements. The proposed building will include single to two story height, concrete floor slab on grade, wood or steel frame, or CMU block wall with brick veneer type construction. Specific structural loads were not provided; however, we anticipate that concentrated loads will be less than 90 kips and that wall loads will be less than 5.0 kips per linear foot. A canopy will be constructed at the fuel island. We do not expect that the planned construction will be particularly sensitive to usual settlements.

Specific pavement design information was not provided. The pavement areas are expected to be designed for a medium duty traffic classification including a moderate volume of automobiles and occasional medium and heavy weight service trucks. Access drives and other areas accessed by the fire trucks and other heavy truck areas are expected to be subjected to a heavy duty classification of traffic with a moderate volume of automobiles and a moderate volume of heavy weight trucks and fire trucks.

Specific grading information was not provided. Based on the existing grades, we anticipate earth cutting / filling thicknesses will be less than 2' to establish subgrade elevation for the building and pavement areas. Fill earth required to establish subgrade elevation is expected to originate from on-site cuts and/or local off-site borrow sources.

The enclosed boring plan further describes the planned development.

4.0 Recommendations - Site Preparation

4.1 "Controlled Areas"
Define those areas throughout and 5' beyond the proposed building areas, canopy, pavement areas, and throughout significant slopes as "controlled areas".

4.2 Stripping
Remove all topsoil, stumps, vegetation, old pavements, old slabs, old foundations, old plumbing, and otherwise unsuitable materials from the "controlled areas". All unsuitable materials should be wasted off-site or in non-structural areas. Care should be exercised in the demolition of the old improvements to prevent excessive soil disturbance.

4.3 Drainage
Maintain the "controlled areas" in a drained condition that will insure the continual removal of surface water that may flow over the construction areas. Temporary site drainage, which is critical for the project, can be enhanced by the installation of the final site drainage structures during the early phases of the site development.

4.4 Site Examination
Prior to the placement of fill earth and following removal of cut earth, the "controlled areas" should be examined by Carmichael Engineering, Inc., representatives. The examination should include proof rolling with construction equipment, test pits, supplemental test bores, visual examinations, etc., as needed to determine the presence, location, and extent of any localized organic, weak, and/or otherwise unsuitable soil conditions which may exist at the site. Areas which exhibit weak soil or otherwise unsuitable conditions should be corrected in accordance with our recommendations. Typically, areas which yield excessively under proof rolling should be undercut to a expose firm level of soil followed by backfilling with "engineered fill".

4.5 Correction of Weak Soil Conditions and Proof Rolling
Following stripping, removal of cut earth and prior to the placement of fill earth, the exposed subgrade areas should be thoroughly compacted to 98% of the materials ASTM D-698 standard density. Areas which fail to properly compact should be undercut to expose a firm level of earth followed by backfilling with "engineered fill". Following completion of the soil density improvements, proof rolling should be completed using rubber-tired construction equipment or a partially loaded dump truck weighing 40 tons. Proof rolling should include a minimum of 2 passes in perpendicular directions over the "controlled areas". Areas which yield excessively should be undercut to a firm level followed by backfilling with "engineered fill". Note that the soil moisture contents for soils immediately beneath the existing asphalt pavements and concrete slabs are elevated above the material's optimum moisture content for compaction purposes. Mixing and processing will be required to adjust the soil moisture content to properly compact the exposed subgrade.

4.6 Fill Earth

Fill earth required to establish subgrade elevation in the "controlled areas" can consist of the clean, non-saturated, and non-organic sections of the native silty sand, clayey sand or sandy clay earth typical of the majority of that penetrated by the test bores. Processing and moisture conditioning will be required to properly compact the native soil. The plastic clay ("CH") soils or native soils with plasticity indices of 25 or more should not be used for structural fill for this project.

4.7 "Select Fill"

All fill earth originating from an off-site borrow source should be designated as "select fill". The "select fill" should consist of a clean, non-saturated, and non-organic clayey sand or clayey silty sand that meets the following criteria.

"Select Fill" Composition

Sieve Requirements	% Passing
3"	100
No. 4	75 - 100
No. 200	20 - 40
Liquid Limit	35 max
Plasticity Index	6 to 12
Maximum Dry Unit Weight Based on ASTM-698 Standard Density Test	$\geq$ 110 pcf

4.8 "Engineered Fill"

Unless otherwise specified, all fill earth and "select fill" earth placed in the "controlled areas" should be designated as "engineered fill". Place fill earth in thin lifts not to exceed 8" loose measure and thoroughly compact each lift of fill to at least 98% of the materials ASTM D-698 standard density. At the time of densification, the moisture content of the "engineered fill" should be within 3% of the materials optimum water content. Following acceptance for moisture and density, any "engineered fill" areas which are disturbed should be retested prior to the placement of additional fill earth or structures.

4.9 Weather Considerations

The native soils contain varying amounts of clay. During the normally wetter winter and spring seasons, the exposed weak soils can become wet or saturated and the soil will pump and yield under heavy construction traffic. During favorable weather conditions, the weak soil can be processed and compacted. During poor weather conditions, a greater quantity of undercutting and replacement of the weak surficial soils may be required.

4.10 Undercutting Quantities

The site has been disturbed by previous construction activities. Spoil disturbance will also likely occur from demolition activities. As a contingency, the construction documents should establish quantities for weak soil undercutting and backfilling with "engineered fill". We recommend establishing 300 cubic yards of weak soil undercutting and backfilling with "engineered fill". The construction documents should also establish an add/deduct unit price per cubic yard for more or less undercutting and backfilling with "engineered fill" to adjust the estimated 300 cubic yard volume. Payment quantities should be established by cross-sectioning the undercut areas. The undercut volumes and unit prices should be based on in place (compacted) volumes.

5.0 Recommendations - Shallow Spread Foundations and Ground Supported Floor Slabs

5.1 Maximum Net Allowable Soil Bearing Pressures
2,000 pounds per square foot.
1,500 pounds per square foot.

Note: Foundations may bear transitional between the firm to stronger in-situ earth (compacted as required), existing fill earth (compacted as required), and new "engineered fill" earth exhibiting "N" values of 8 or greater. Please note that in some sections of the site the depth of the foundations may require increasing to reach suitable bearing material.

5.2 Minimum Foundation Dimensions
Depth - The bottom of perimeter wall and column foundations below outside finish grades should be at least 24". Increase depth as required to extend foundations through weak soil conditions. When expansive clay soil is present within 4' of finish subgrade elevation, the perimeter foundations should be extended to at least 48" below grade. The additional foundation depth can be accomplished using non-reinforced mud sill concrete.

- The bottom of interior foundations below the top of ground supported floor slabs should be at least 24". Increase depth as required to extend foundations through weak soil conditions.

Width - Isolated square foundations - 30".
- Continuous wall foundations - 18".
- Turned down slab edges - 12"

Note: All foundations should be sized for total load but should not be less than the minimums described preceding in this report. The use of the recommended minimum foundation depths considers that adequate surface drainage is provided at finish subgrade elevation.

5.3 Settlement
The planned structures will be subjected to total long term settlements of less than 1" with differential settlements of less than 1/2". The foundations should be designed to tolerate these estimated settlements.

5.4 Seismic Design Parameters

The design parameters for the IBC 2018 are as follows for the Fire Station site in Montgomery, Alabama.

$S_S = 0.135$ $S_{MS} = 0.216$ $S_{DS} = 0.144$
$S_1 = 0.076$ $S_{M1} = 0.182$ $S_{D1} = 0.122$
Site Class D
Seismic Design Category B for Use Group I, II or III and Seismic Design Category C for Use Group IV.

5.5 Foundation Construction

Do not permit foundation bearing soil to become saturated or dry excessively. Caution should be used not to disturb the foundation bearing level of soil. Weak soil exposed in foundation trenches should be compacted to 98% standard density with "jumping jack" type compactors. Areas which fail to compact should be undercut to expose a firm level of soil prior to the placement of the foundation concrete. Any weak soil may be replaced with non-reinforced lean concrete (mud sill). All loose soil material or other debris should be removed from the top of the mud sill before placing the foundation concrete. For estimation purposes, assume 150 cu. yds. of over excavation and mud sill concrete is required to penetrate weak soil or expansive clay soil. The construction documents should establish add/deduct unit prices to adjust the estimated 150 cu. yd. volume of mud sills. In addition to replacing weak soil, "mud sill" concrete should be used to extend the foundation bearing level of perimeter foundations to a depth of 48" when expansive clay soil is present in the upper 4' of finish subgrade. The extent of expansive clay spoil present in the perimeter trenches should be determined once the initial foundation trenches are excavated.

5.6 Acceptance of Foundation Bearing Levels

All foundation excavations should be examined by the project geotechnical consultant prior to the installation of the foundation reinforcement and concrete. All unacceptable conditions should be corrected in accordance with the geotechnical consultant's recommendations.

5.7 Floor Slab

The floor slab should bear on the properly compacted in-situ earth or new "engineered fill". Provide a minimum 4" layer of compacted ALDOT 825 crushed stone base, no. 8910 crushed stone, "select fill", or other suitable compactable granular fill between the subgrade layer and the slab. Provide a minimum 10 mil vapor barrier beneath the floor slab. Portions of the floor slab for support of fire trucks should use a minimum 8" thick, 4000 psi concrete with fiber mesh slab placed over a minimum 5" thick layer of compacted ALDOT 825 crushed aggregate base (100% modified density). Use doweled joints for all heavy duty concrete pavements subject to fire truck traffic.

5.8 Acceptance of Floor Slab Bearing Levels
All floor slab bearing levels should be examined by the projects geotechnical consultant prior to the placement of the vapor barrier. All unacceptable conditions should be corrected in accordance with the geotechnical consultant's recommendations.

5.9 Control/Expansion Joints
All masonry walls and floor slabs related to the construction should include control/expansion joints to reduce the effects of the usual differential settlement and concrete shrinkage that can occur. The design and location of control/expansion joints should be in accordance with the recommendations of the Portland Cement Association.

6.0 Recommendations - Pavements

6.1 Reference

Alabama Department of Transportation (ALDOT), Standard Specifications For Highway Construction - 2018 Edition.

6.2 Subgrade Support Values

Based on estimated California Bearing Ratios (CBR) for the native earth expected at subgrade elevation, a design CBR value of 6 is recommended.

6.3 Traffic Data

Specific design pavement traffic data was not available. The pavements are expected to be subjected to a medium duty traffic classification including a moderate volume of automobiles and occasional medium to heavy weight trucks. Drives and fire truck areas are expected to be subjected to a heavy duty traffic classification with a moderate volume of automobiles and a moderate volume of fire trucks and heavy trucks. Please contact our office if specific pavement design data is available so that we may modify our pavement recommendations (if required).

6.4 Subgrade Improvements

Thoroughly mix and compact the top 6" of subgrade to 100% standard density.

Slope subgrade to provide positive drainage to side drainage ditches, underdrains, and/or storm drains to prevent the entrapment of water in the subgrade layer.

6.5 Medium Duty Pavement Sections

Based on a estimated CBR value of 6.0, the medium duty pavement sections may be developed using a crushed aggregate base and high stability bituminous pavement section or a concrete pavement section placed over the improved subgrade layer as follows;

6.5.1 Crushed Aggregate Base and High Stability Bituminous Pavement Section

1.5" - ALDOT Section 424-A 340 bituminous wearing surface.
1 - ALDOT Section 405 bituminous tack coat.
2.5" - ALDOT Section 424-B 635 bituminous binder.
1 - ALDOT Section 401-A bituminous prime coat.
6" - ALDOT Section 825 crushed aggregate base (100% modified density).
6" - ALDOT Section 230 improved roadbed (100% standard density).
Note: All bituminous mixes should be designed on the fine side of the restrictive zone to reduce the permeability of the pavement section.

6.5.2 Concrete Pavement Section

6" - 4000 psi compressive strength (550 psi flexural strength) concrete, maximum 4" slump.
5" - ALDOT Section 825 crushed aggregate base (100% modified density).
6" - Improved subgrade (100% standard density).

Note: Concrete pavements are recommended for areas subject to fuel spillage, short turning radii, or other areas subject to abuse.

6.6 Heavy Duty Pavement Sections

Based on a estimated CBR value of 6.0, the heavy duty pavement sections may be developed using a crushed aggregate base and high stability bituminous pavement section or a concrete pavement section placed over the improved subgrade layer as follows;

6.6.1 Crushed Aggregate Base and High Stability Bituminous Pavement Section

1.5" - ALDOT Section 424-A 340 bituminous wearing surface.
1 - ALDOT Section 405 bituminous tack coat.
2.25" - ALDOT Section 424-B 635 upper bituminous binder.
1 - ALDOT Section 405 bituminous tack coat.
2.25" - ALDOT Section 424-B 669 lower bituminous binder.
1 - ALDOT Section 401-A bituminous prime coat.
6" - ALDOT Section 825 crushed aggregate base (100% modified density).
6" - ALDOT Section 230 improved roadbed (100% standard density).

Notes: All bituminous mixes should be designed on the fine side of the restrictive zone to reduce the permeability of the pavement section.

6.6.2 Concrete Pavement Section

8" - 4000 psi compressive strength (550 psi flexural strength) concrete, maximum 4" slump.
5" - ALDOT Section 825 crushed aggregate base (100% modified density).
6" - Improved subgrade (100% standard density).

Note: Concrete pavements are recommended for areas subject to fuel spillage, short turning radii, long term parking of tractor trailers, or other areas subject to abuse.

6.7 Trash Dumpster Loading Areas

A minimum 8" thick concrete pad should be developed in front and beneath trash dumpster areas to provide support for the sanitation vehicles during handling of the dumpsters.

6.8 Concrete Pavement Joints

The design and location of construction joints should be in accordance with the recommendations of the Portland Cement Association. We recommend a maximum control joint spacing of 12'. Use doweled joints in all heavy duty pavements. All joints should be filled with a suitable flexible joint compound to prevent water intrusion at the joints.

6.9 Material Thicknesses

All material thicknesses referred to in this section are completed thicknesses.

7.0 Recommendations - General

7.1 Utility Trenches
All utility trenches (new and existing) extending through the "controlled areas" should be back-filled with "engineered fill".

7.2 Grading and Drainage Improvements
Incorporate finish grades, side drainage ditches, underdrains, etc., to reduce the possibility of ponding surface water within 5' of foundations, pavements and significant slopes.

7.3 Vertical Cuts
Vertical cuts greater than 4' or cuts required to remain open for extended periods of time should be sloped or braced as required for the protection of workmen entering deep excavations. Heavy construction traffic and stockpiling of excavated earth or other materials should not be permitted near the top of open unsupported excavations. Current OSHA regulations should be adhered to with respect to excavations for this project.

7.4 Cut and Fill Slopes
Permanent cut and fill slopes should perform satisfactorily as steep as 2.5(H):1(V) in the native earth or "select fill". All slopes should be protected from erosion using suitable vegetation or pavements.

7.5 Underground Fuel Storage Tanks
All underground tanks should be designed to resist hydrostatic uplift to account for any short term accumulation of water in the tank pits.

7.6 Quality Control
A qualified geotechnical and construction materials testing consultant should provide the following services;

7.6.1 Verify the results of stripping, proof-rolling, and correction of weak soil conditions, quality and density of "engineered fill", and conditions of the foundation, floor slab and pavement subgrade bearing levels.

7.6.2 Complete soil particle size, atterberg limits and laboratory compaction tests on each different type of fill earth used in the "controlled areas".

7.6.3 Complete a minimum of 1 field density test per each 1' of vertical thickness per each 2500 square feet of fill placed in the building "controlled areas" and 1 test every 3500 square feet in the pavement areas. Also, a minimum of 1 field density test should be taken for each 50 linear feet per each 2' of vertical thickness of fill placed at utility trenches extending through "controlled areas".

7.6.4 Test all structural concrete in accordance with the guidelines established by the American Concrete Institute.

7.6.5 Quality assurance testing on the improved subgrade and pavement materials should be in accordance with the State of Alabama Department of Transportation Specifications.

8.0 General Comments

The comments of this report do not consider local flood conditions. The local flood condition/elevation (if any) should be determined and considered in the design of this project.

The frost penetration depth in the area of this project is generally taken to be less than 10". Provided our recommendations for the development of foundations and floor slabs are followed, we do not expect that the frost penetration will have any detrimental effects on the performance of these structures.

Sections of the native clay earth penetrated at this site characteristically exhibits low electrical resistivity values and can contribute to the corrosion of metal products. Metal pipes, etc., buried in the native clay should be protected or designed to eliminate the effects of such corrosion.

The comments of this report are based upon our interpretation of the construction information supplied by others, the data collected at the 17 soil test bores, and our visual examination of the site. The evaluation of subsurface conditions based on the 17 test bores taken with this study requires a certain amount of interpolation. Improper site preparation, extremes in climatic conditions, significant changes in locations, grades, time, etc., can each affect groundwater, surface, and subsurface conditions. If conditions are encountered as the construction advances which vary significantly from those described by this report, we should be contacted for supplemental comment.

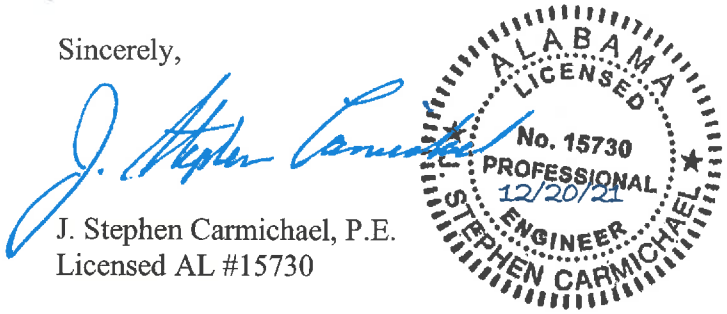
The scope of this investigation is not intended to establish volumetric estimates of the various subsurface materials at the site. Volumetric estimates may require a large number of test bores placed on a close grid to establish reliable cross sections. If volume estimates are required of us for the design/development of this project to advance, please contact us for further comment.

We are available to provide a review of the final plans and project specifications with respect to their compatibility with the contents of this report. Furthermore, our firm would appreciate the opportunity to continue to serve as the geotechnical consultant and to provide the construction materials testing and monitoring for this project.

9.0 Signature

Thank you for selecting Carmichael Engineering, Inc., to provide the geotechnical services for this project. We are available to answer any questions concerning our findings and recommendations. If we can be of any further assistance, please contact our office.

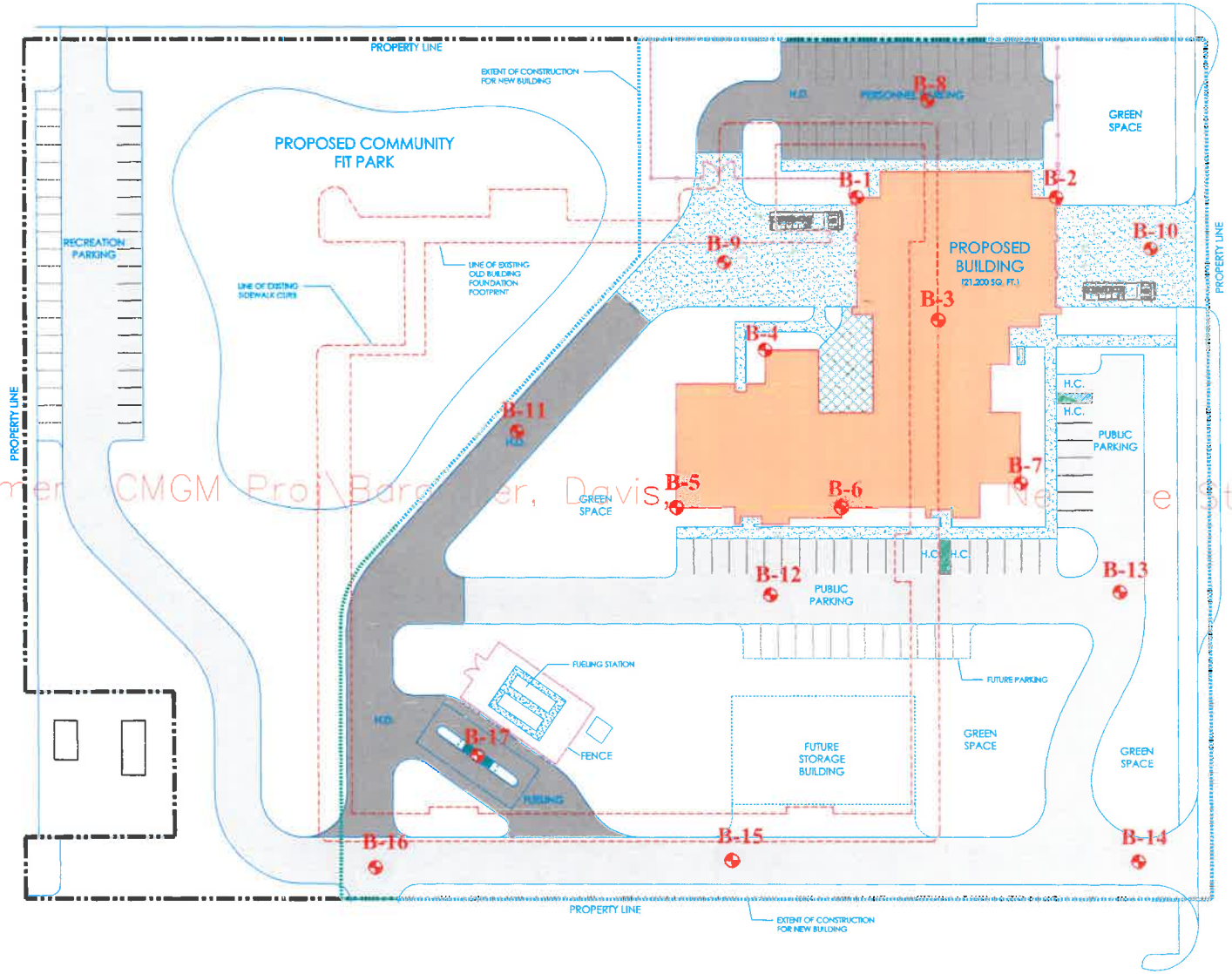
Sincerely,



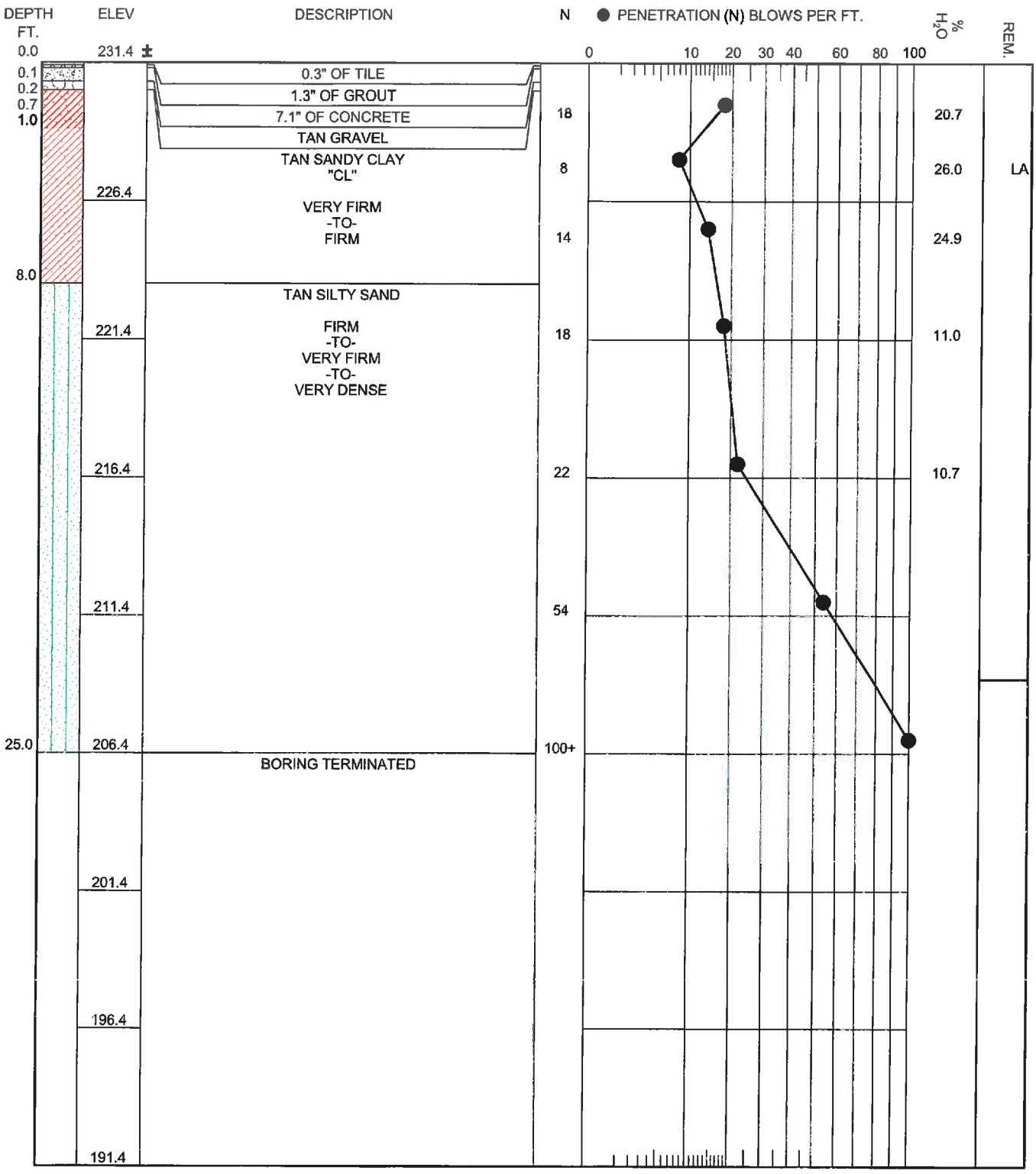
J. Stephen Carmichael, P.E.
Licensed AL #15730

Report Distribution: 1- Mr. Johnny Raines - Architect

JSC/lc


PROPERTY LINE
EXTENT OF CONSTRUCTION FOR NEW BUILDING
PROPOSED COMMUNITY FIT PARK
RECREATION PARKING
LINE OF EXISTING SIDEWALK CURB
LINE OF EXISTING OLD BUILDING FOUNDATION FOOTPRINT
PROPOSED BUILDING (21,200 SQ. FT.)
GREEN SPACE
PUBLIC PARKING
H.C.
FUTURE PARKING
FUTURE STORAGE BUILDING
FUELING STATION
FENCE
FUELING
H.D.
B-1
B-2
B-3
B-4
B-5
B-6
B-7
B-8
B-9
B-10
B-11
B-12
B-13
B-14
B-15
B-16
B-17
FREDERICK AVE.
SOUTH COURT ST.


Holt Street Memorial Baptist Church
B-8
B-1
B-2
B-10
B-9
B-3
B-4
B-11
B-5
B-6
B-7
B-12
B-13
B-17
B-16
B-15
B-14
Frederick Ave
Frederick Ave
S Court St
S Court St
Family Dollar
Easy Money
Sunoco Gas Station
Walgreens
Google Earth
300 ft
N



Boring and Sampling Meets ASTM D-1586

Penetration (N) is the Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in I.D. Sampler 1 Ft.

☒ Undisturbed Sample

LA Lab Analysis

Water Level

Water Level

Boring Caved 22.3' AFTER 24 HOURS

CARMICHAEL ENGINEERING, INC.

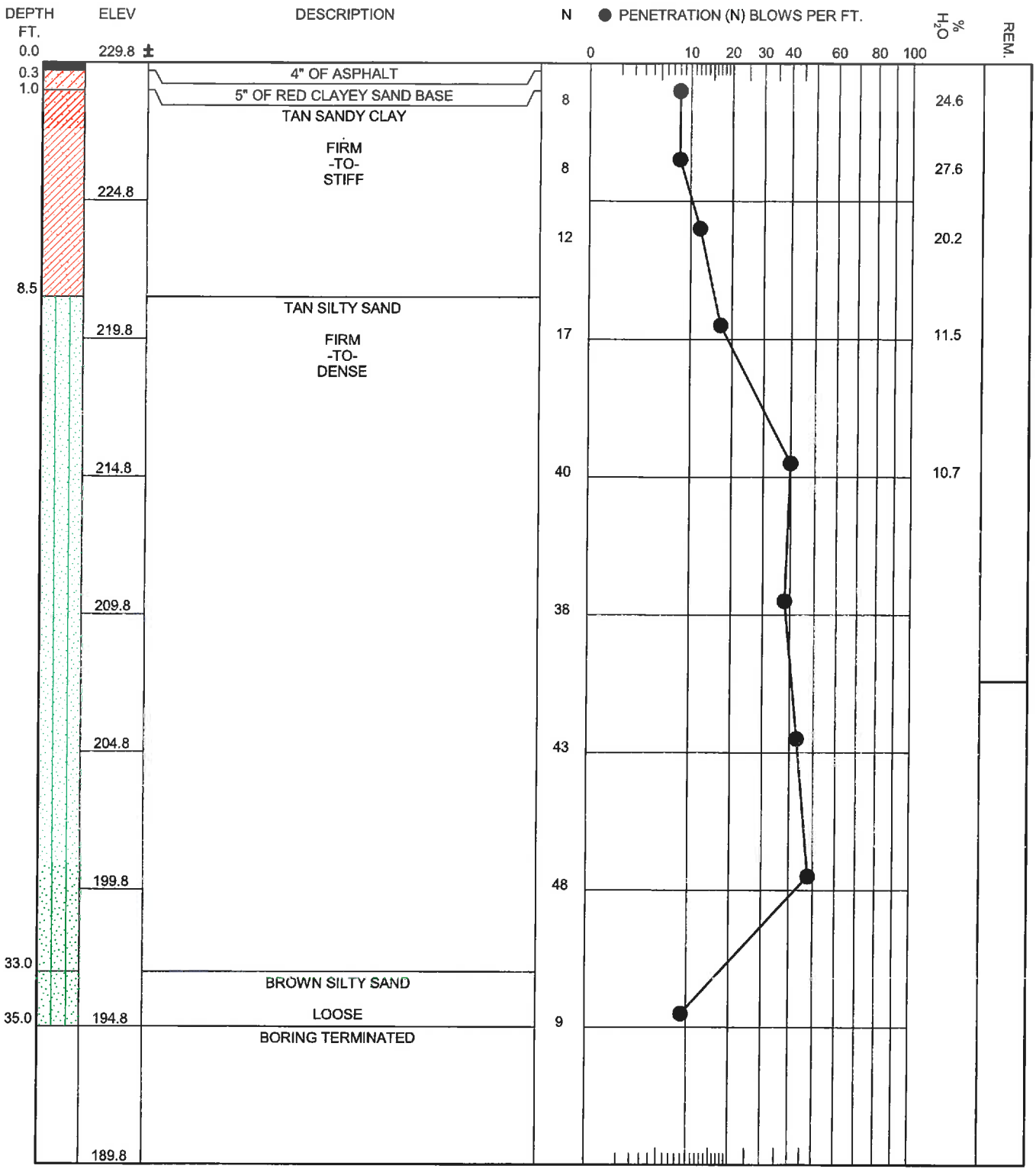
TEST BORING LOG

JOB NO. G21-6336

BORING NO. B-1

DATE DRILLED 12/9/21

TYPE BORING SB



Boring and Sampling Meets ASTM D-1586

Penetration (N) is the Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in I.D. Sampler 1 Ft.

☒ Undisturbed Sample

LA Lab Analysis

Water Level

Water Level

Boring Caved 22.4' AFTER 24 HOURS

CARMICHAEL ENGINEERING, INC.

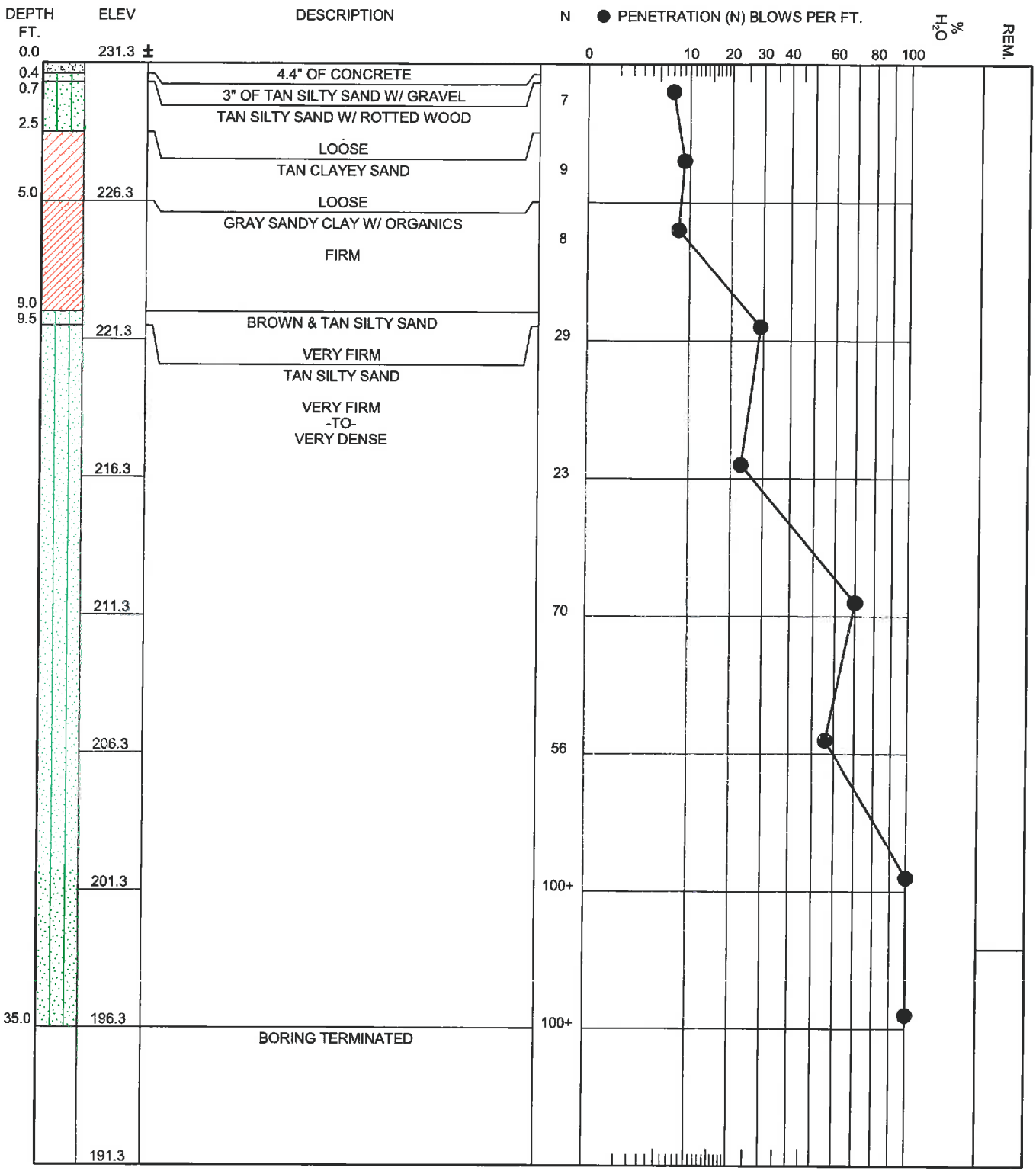
TEST BORING LOG

JOB NO. G21-6336

BORING NO. B -2

DATE DRILLED 12/9/21

TYPE BORING SB



Boring and Sampling Meets ASTM D-1586

Penetration (N) is the Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in I.D. Sampler 1 Ft.

☒ Undisturbed Sample

LA Lab Analysis

Water Level

Water Level

Boring Caved 32.1' AFTER 24 HOURS

CARMICHAEL ENGINEERING, INC.

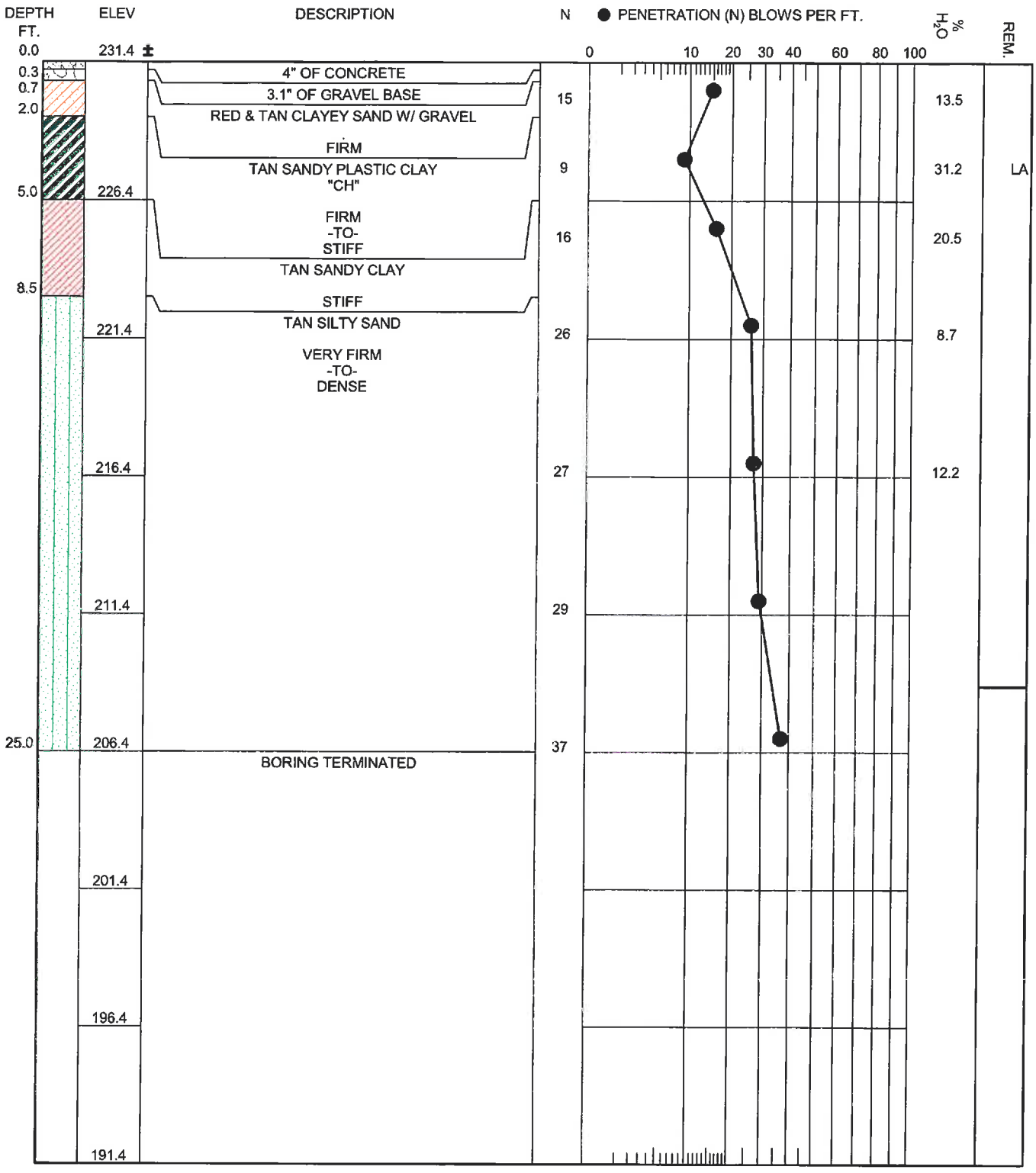
TEST BORING LOG

JOB NO. G21-6336

BORING NO. B -3

DATE DRILLED 12/9/21

TYPE BORING SB



Boring and Sampling Meets ASTM D-1586

Penetration (N) is the Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in I.D. Sampler 1 Ft.

☒ Undisturbed Sample

LA Lab Analysis

Water Level

Water Level

Boring Caved 22.6' AFTER 24 HOURS

CARMICHAEL ENGINEERING, INC.

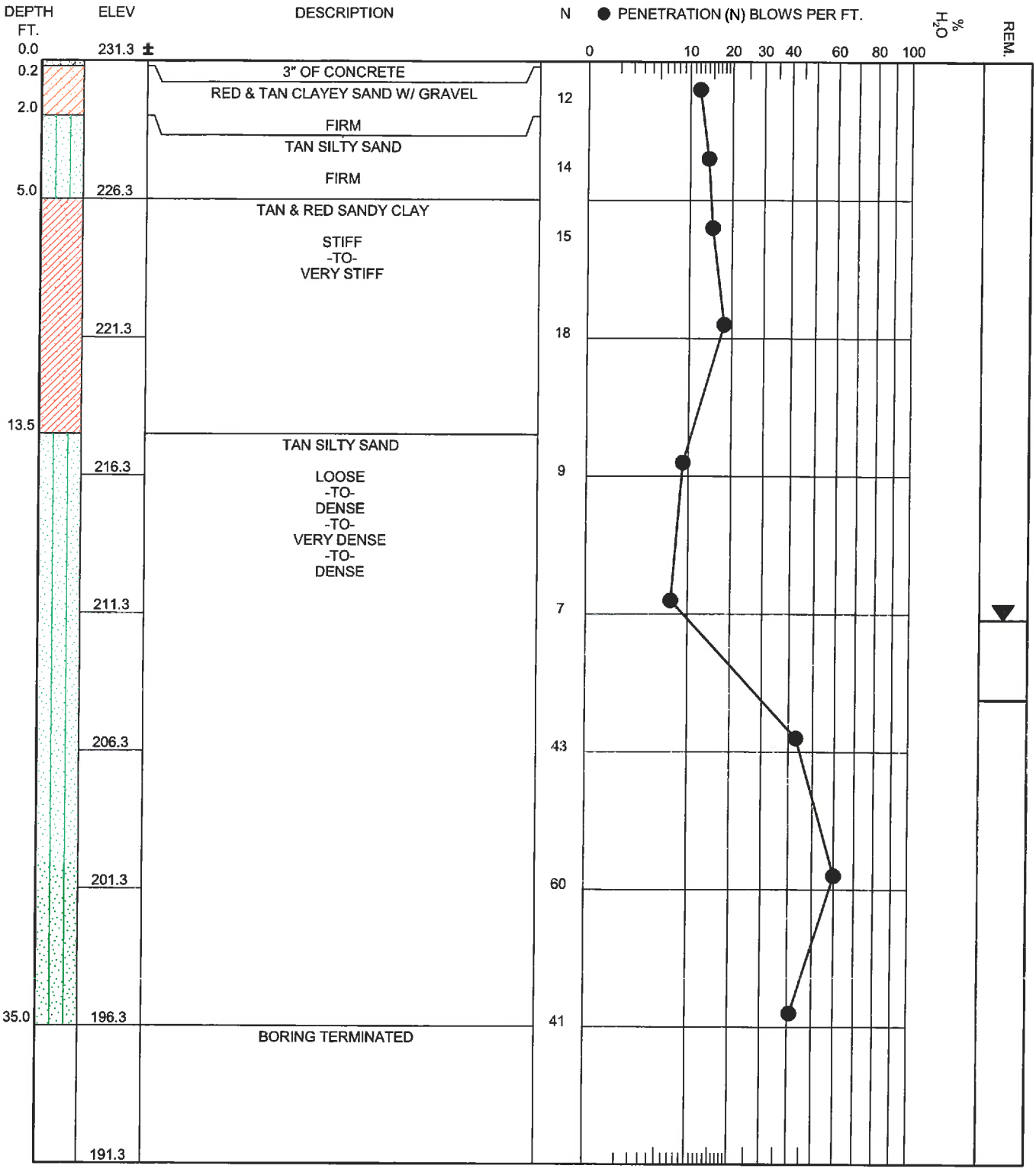
TEST BORING LOG

JOB NO. G21-6336

BORING NO. B -4

DATE DRILLED 12/9/21

TYPE BORING SB



Boring and Sampling Meets ASTM D-1586

Penetration (N) is the Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in I.D. Sampler 1 Ft.

☒ Undisturbed Sample

LA Lab Analysis

Water Level 20.2' AFTER 24 HOURS

Water Level

Boring Caved 23.1' AFTER 24 HOURS

CARMICHAEL ENGINEERING, INC.

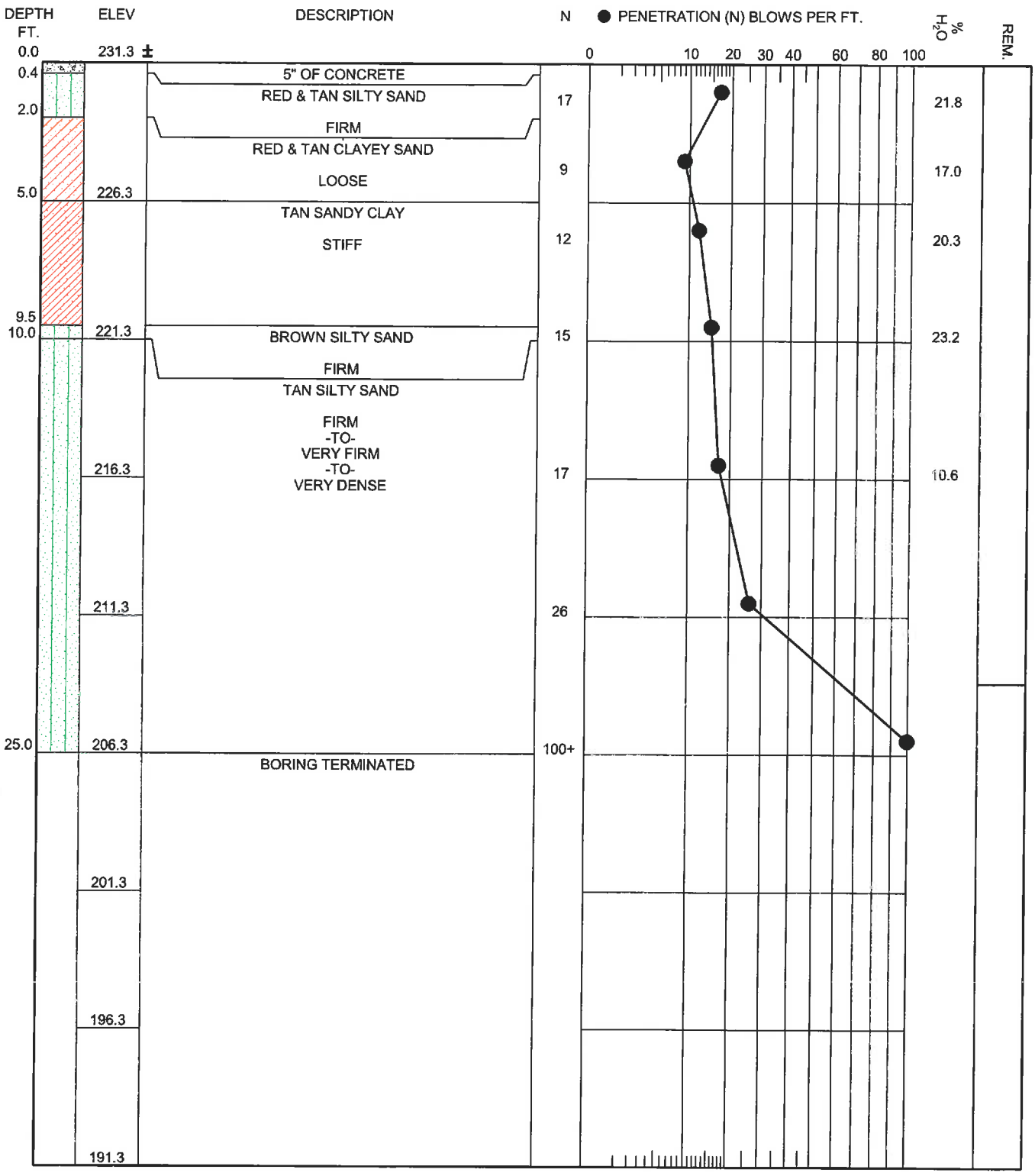
TEST BORING LOG

JOB NO. G21-6336

BORING NO. B -5

DATE DRILLED 12/9/21

TYPE BORING SB



Boring and Sampling Meets ASTM D-1586

Penetration (N) is the Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in I.D. Sampler 1 Ft.

☒ Undisturbed Sample

LA Lab Analysis

Water Level

Water Level

Boring Caved 22.4' AFTER 24 HOURS

CARMICHAEL ENGINEERING, INC.

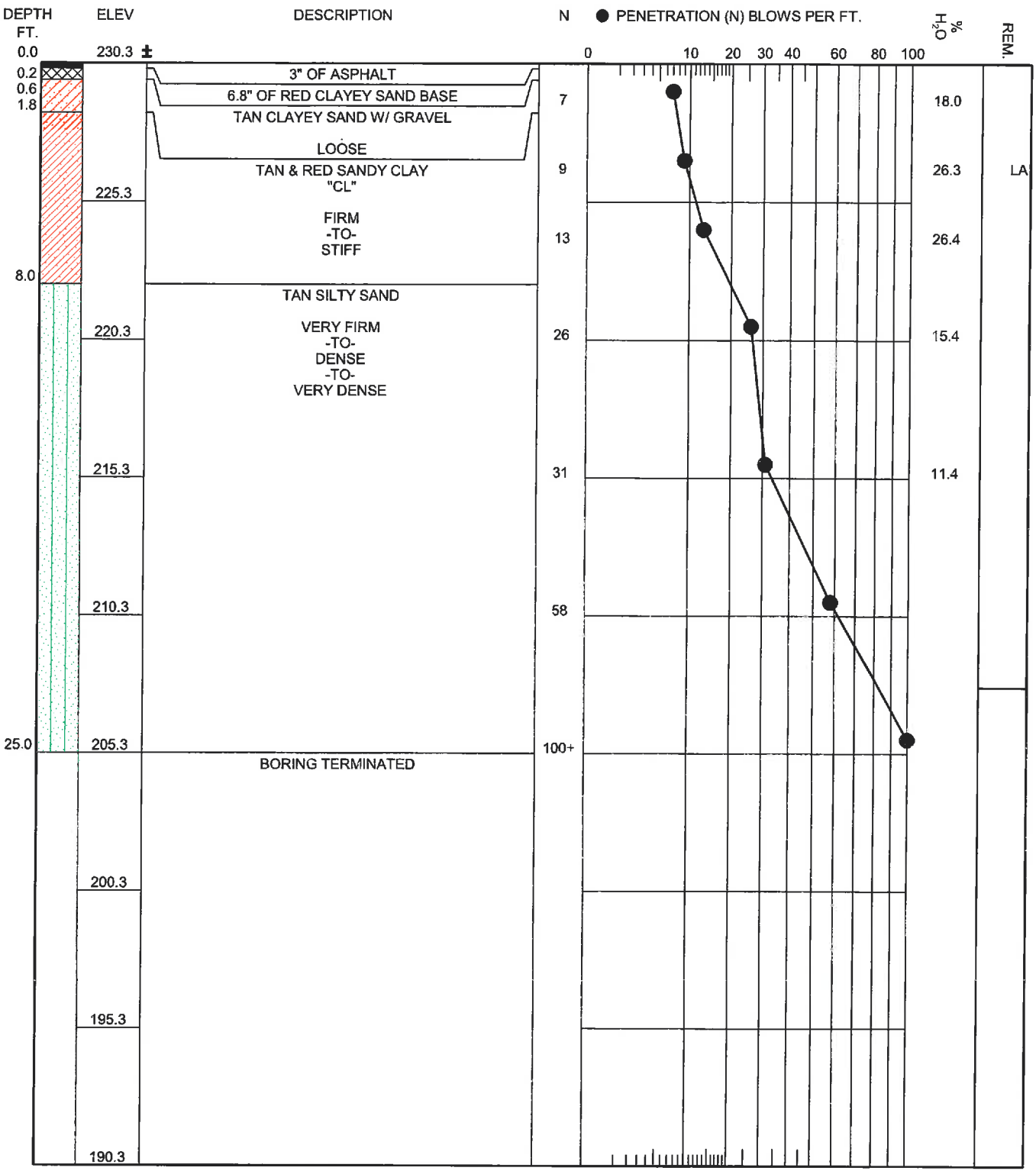
TEST BORING LOG

JOB NO. G21-6336

BORING NO. B -6

DATE DRILLED 12/9/21

TYPE BORING SB



Boring and Sampling Meets ASTM D-1586

Penetration (N) is the Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in I.D. Sampler 1 Ft.

☒ Undisturbed Sample

LA Lab Analysis

Water Level

Water Level

Boring Caved 22.6' AFTER 24 HOURS

CARMICHAEL ENGINEERING, INC.

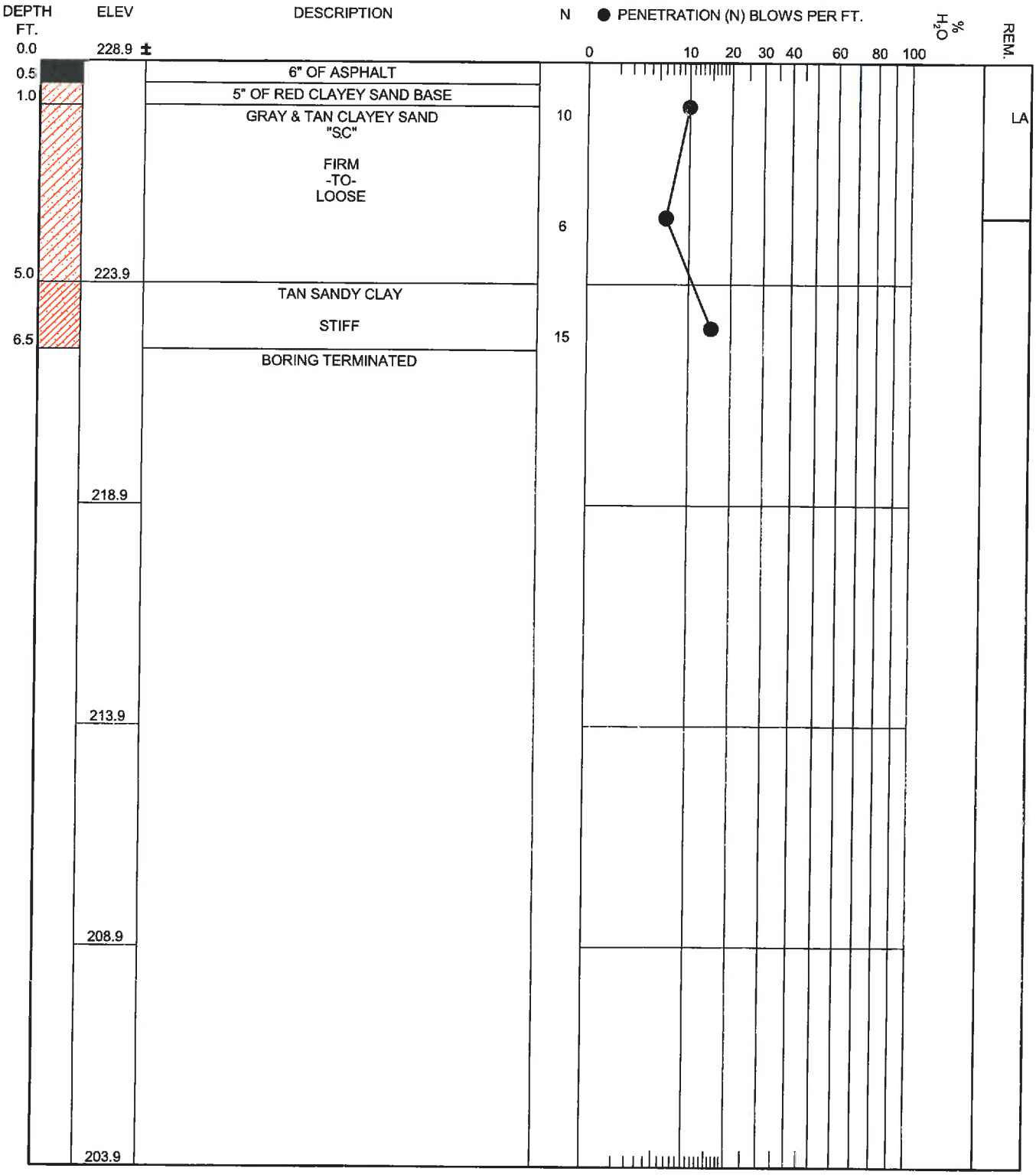
TEST BORING LOG

JOB NO. G21-6336

BORING NO. B -7

DATE DRILLED 12/9/21

TYPE BORING SB



Boring and Sampling Meets ASTM D-1586

Penetration (N) is the Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in I.D. Sampler 1 Ft.

☒ Undisturbed Sample

LA Lab Analysis

Water Level

Water Level

Boring Caved 3.5' AFTER 24 HOURS

CARMICHAEL ENGINEERING, INC.

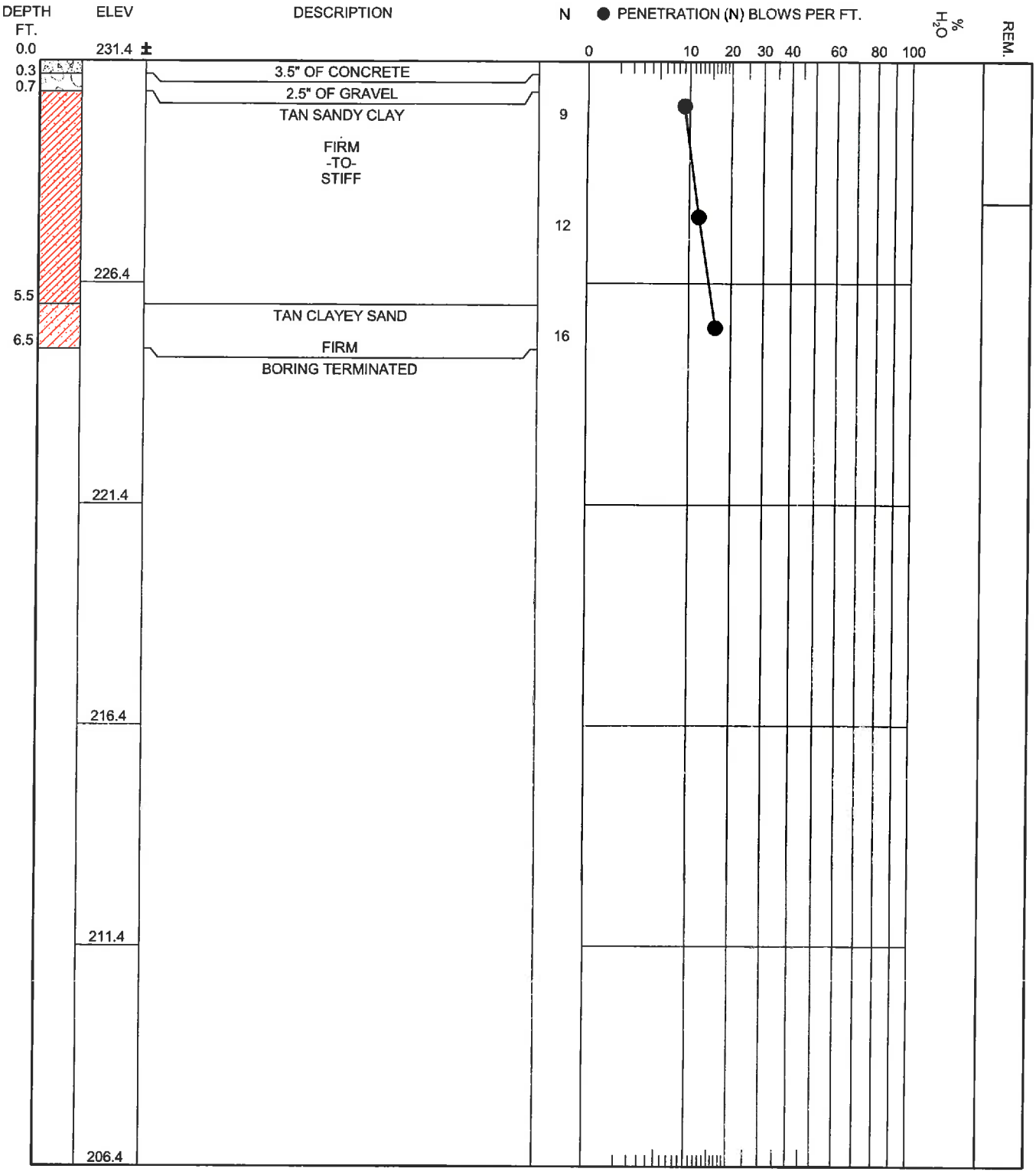
TEST BORING LOG

JOB NO. G21-6336

BORING NO. B -8

DATE DRILLED 12/9/21

TYPE BORING SB



Boring and Sampling Meets ASTM D-1586

Penetration (N) is the Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in I.D. Sampler 1 Ft.

☒ Undisturbed Sample

LA Lab Analysis

Water Level

Water Level

Boring Caved 3.2' AFTER 24 HOURS

CARMICHAEL ENGINEERING, INC.

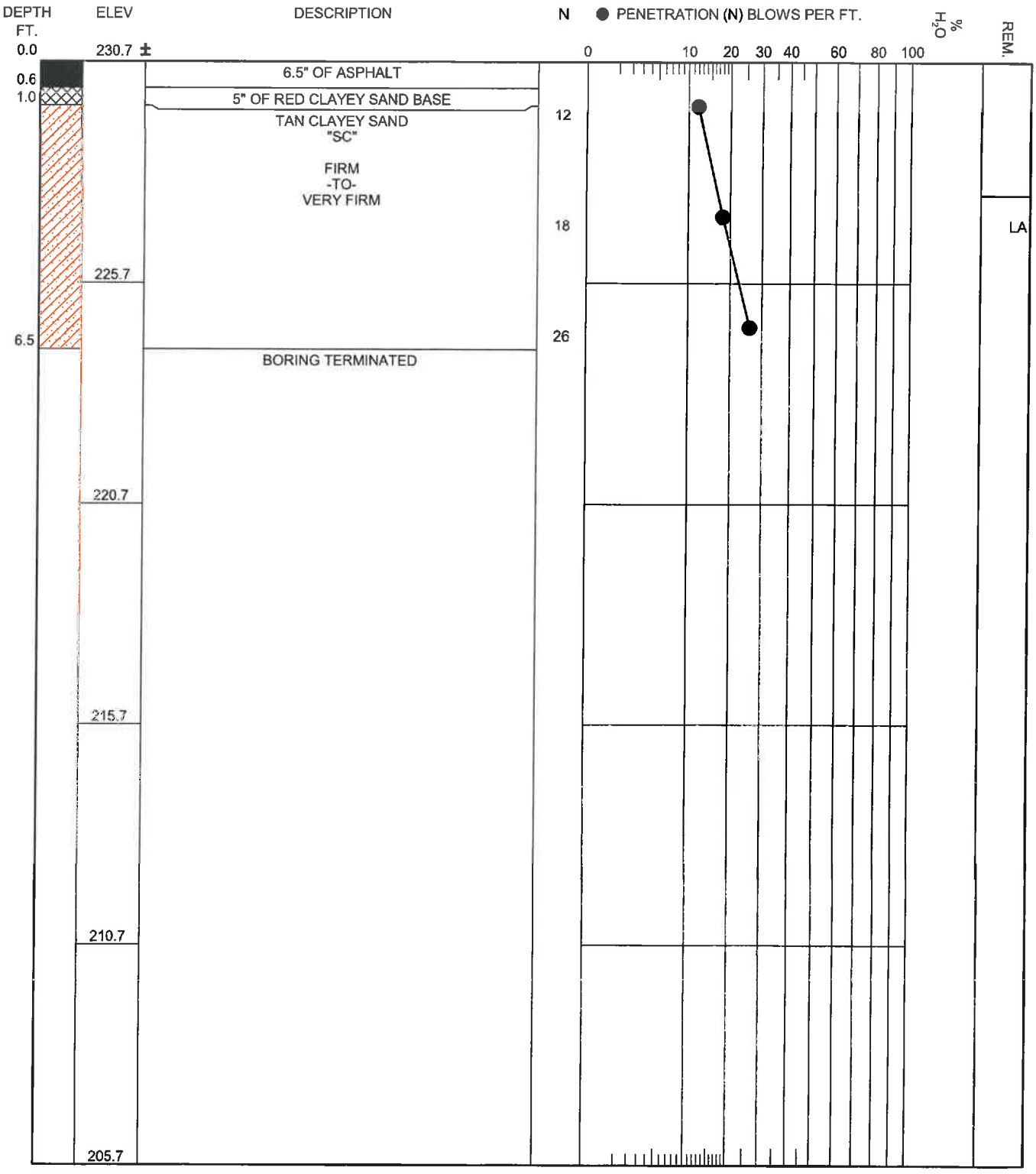
TEST BORING LOG

JOB NO. G21-6336

BORING NO. B -9

DATE DRILLED 12/9/21

TYPE BORING SB



Boring and Sampling Meets ASTM D-1586

Penetration (N) is the Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in I.D. Sampler 1 Ft.

☒ Undisturbed Sample

LA Lab Analysis

Water Level

Water Level

Boring Caved 3.0' AFTER 24 HOURS

CARMICHAEL ENGINEERING, INC.

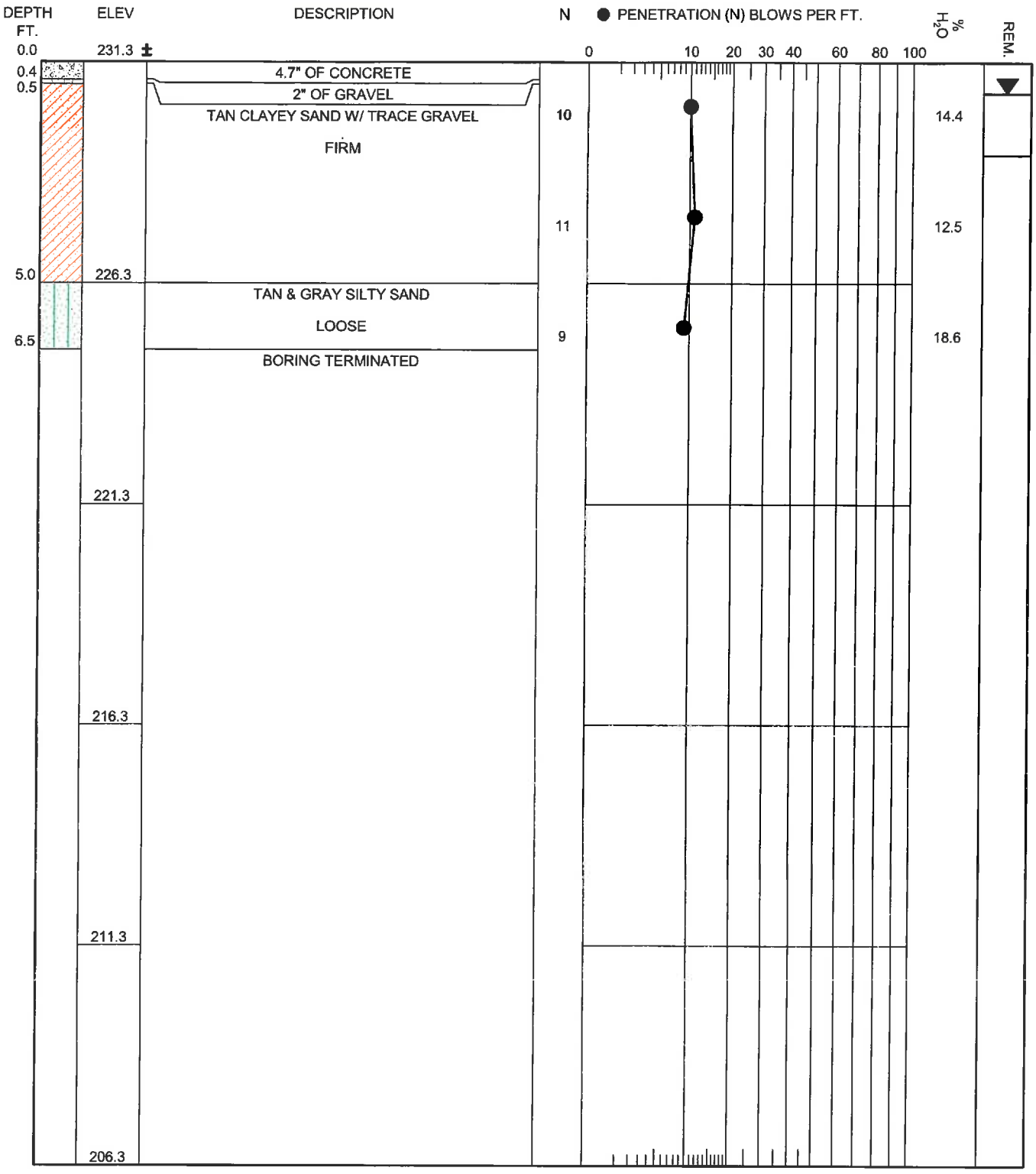
TEST BORING LOG

JOB NO. G21-6336

BORING NO. B-10

DATE DRILLED 12/9/21

TYPE BORING SB



Boring and Sampling Meets ASTM D-1586

Penetration (N) is the Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in I.D. Sampler 1 Ft.

☒ Undisturbed Sample

LA Lab Analysis

Water Level 0.7' AFTER 24 HOURS

Water Level

Boring Caved 2.1' AFTER 24 HOURS

CARMICHAEL ENGINEERING, INC.

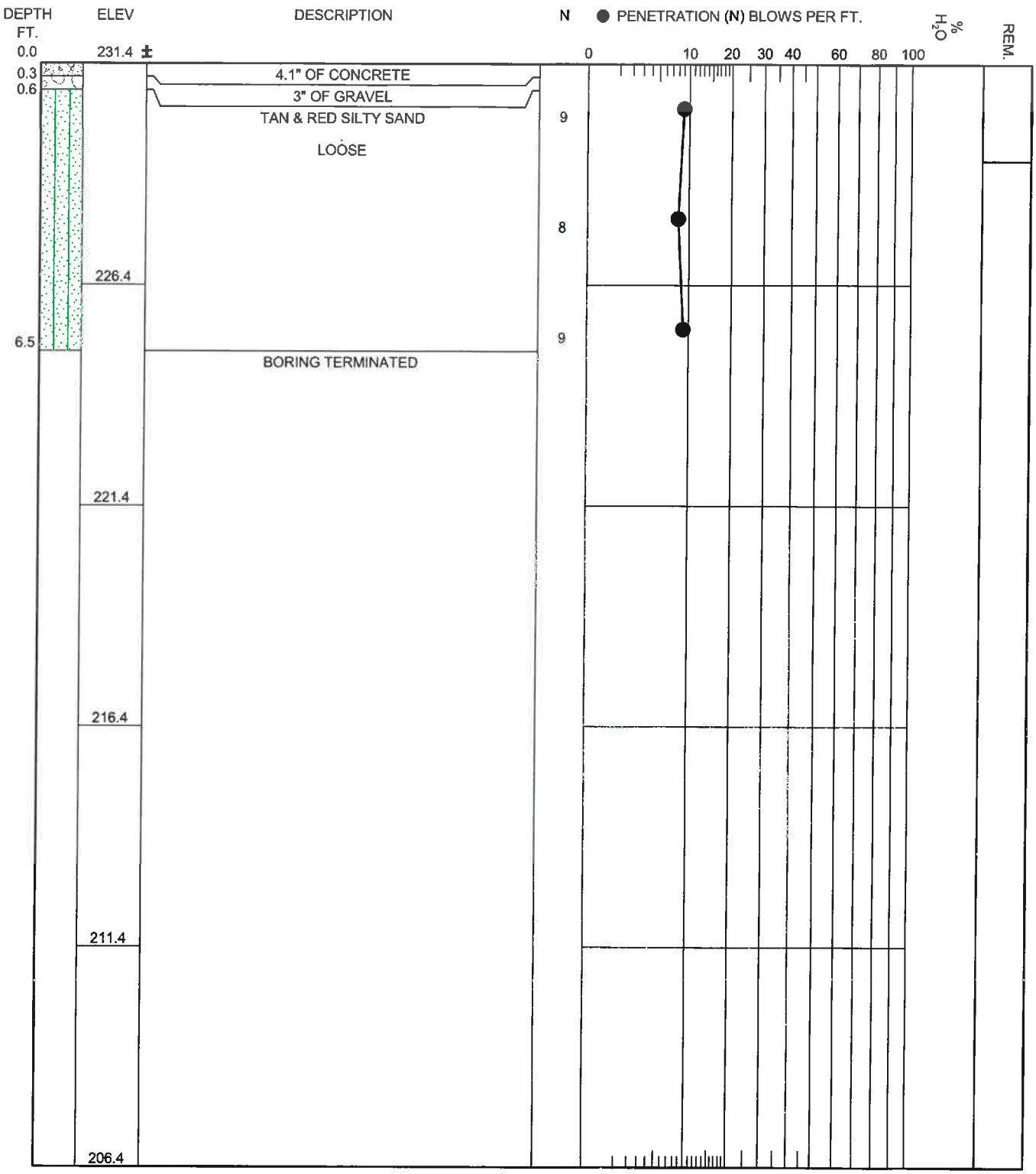
TEST BORING LOG

JOB NO. G21-6336

BORING NO. B-11

DATE DRILLED 12/9/21

TYPE BORING SB



Boring and Sampling Meets ASTM D-1586

Penetration (N) is the Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in I.D. Sampler 1 Ft.

☒ Undisturbed Sample

LA Lab Analysis

Water Level

Water Level

Boring Caved 2.2' AFTER 24 HOURS

CARMICHAEL ENGINEERING, INC.

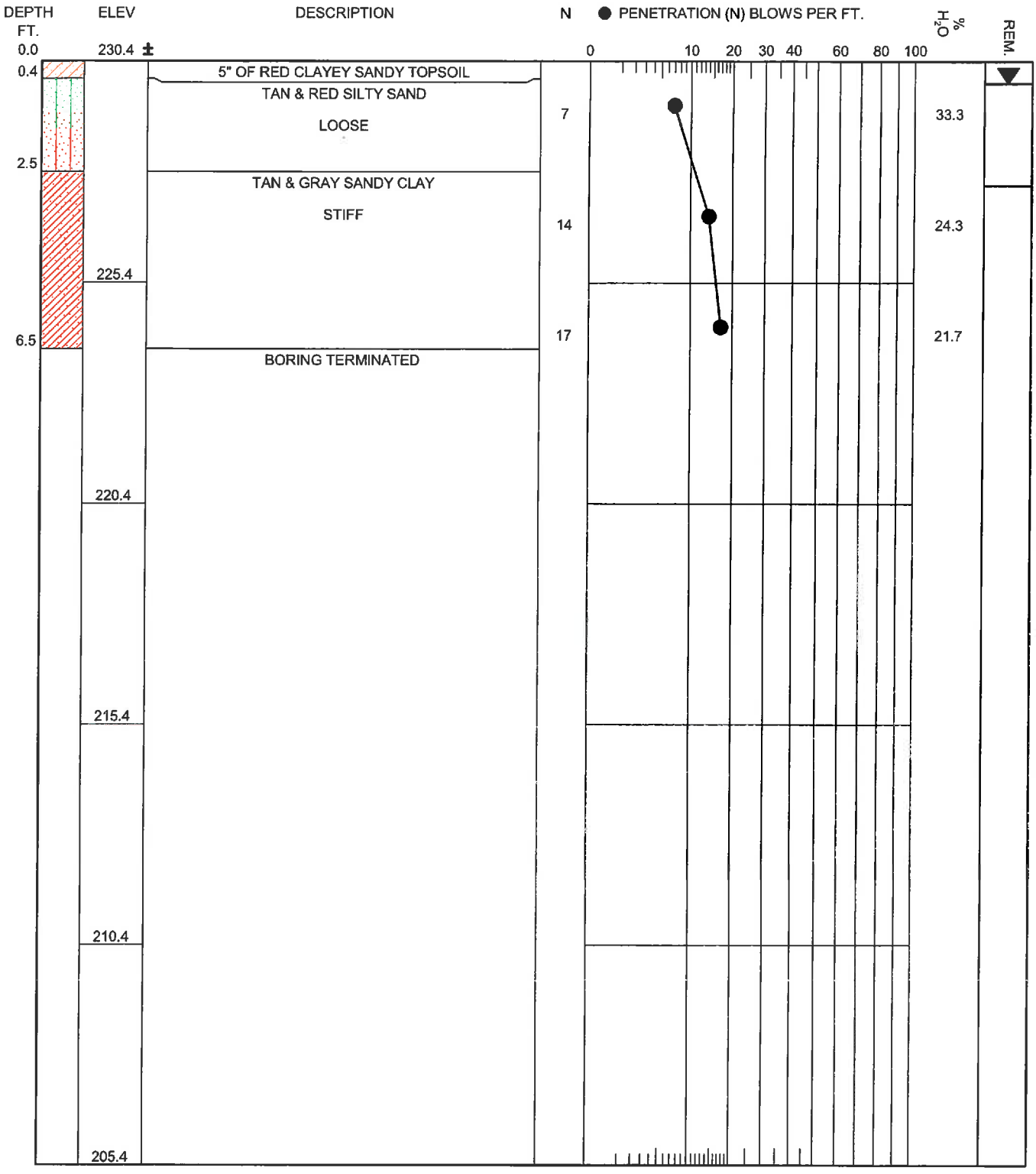
TEST BORING LOG

JOB NO. G21-6336

BORING NO. B-12

DATE DRILLED 12/9/21

TYPE BORING SB



Boring and Sampling Meets ASTM D-1586

Penetration (N) is the Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in I.D. Sampler 1 Ft.

☒ Undisturbed Sample

LA Lab Analysis

Water Level 0.5' AFTER 24 HOURS

Water Level

Boring Caved 2.8' AFTER 24 HOURS

CARMICHAEL ENGINEERING, INC.

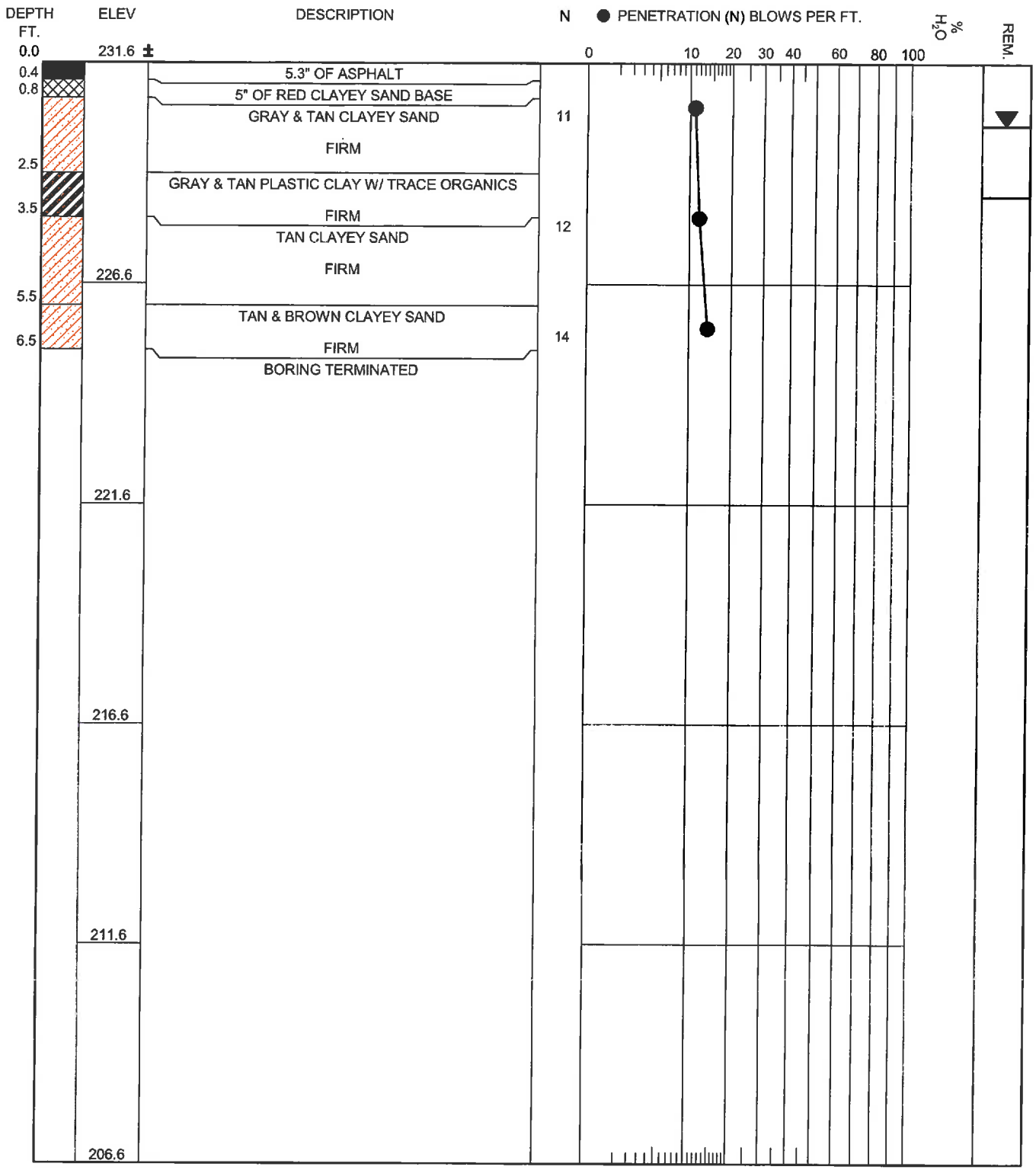
TEST BORING LOG

JOB NO. G21-6336

BORING NO. B-13

DATE DRILLED 12/9/21

TYPE BORING SB



Boring and Sampling Meets ASTM D-1586

Penetration (N) is the Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in I.D. Sampler 1 Ft.

☒ Undisturbed Sample

LA Lab Analysis

Water Level 1.4' AFTER 24 HOURS

Water Level

Boring Caved 3.0' AFTER 24 HOURS

CARMICHAEL ENGINEERING, INC.

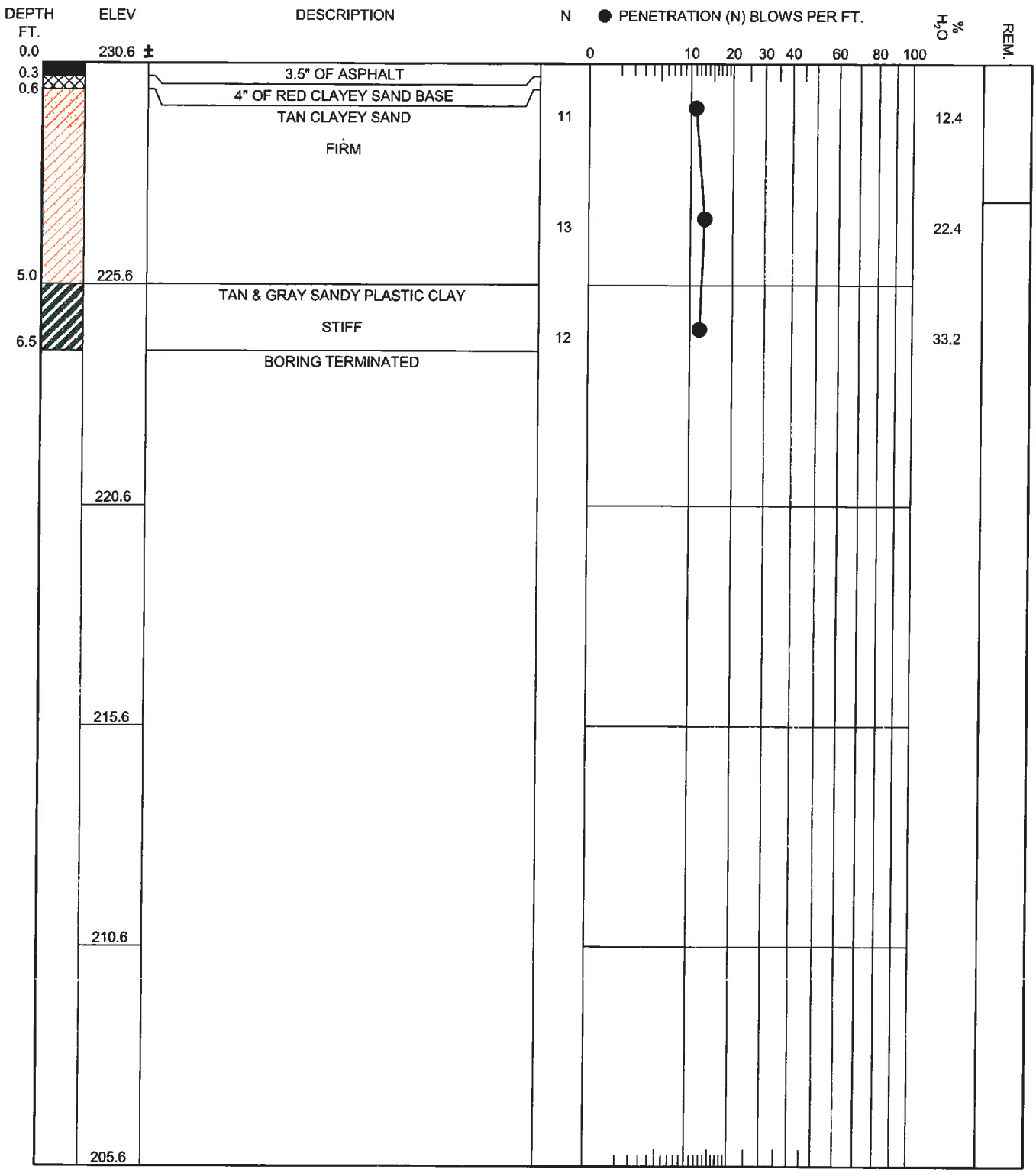
TEST BORING LOG

JOB NO. G21-6336

BORING NO. B-14

DATE DRILLED 12/9/21

TYPE BORING SB



Boring and Sampling Meets ASTM D-1586

Penetration (N) is the Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in I.D. Sampler 1 Ft.

☒ Undisturbed Sample

LA Lab Analysis

Water Level

Water Level

Boring Caved 3.1' AFTER 24 HOURS

CARMICHAEL ENGINEERING, INC.

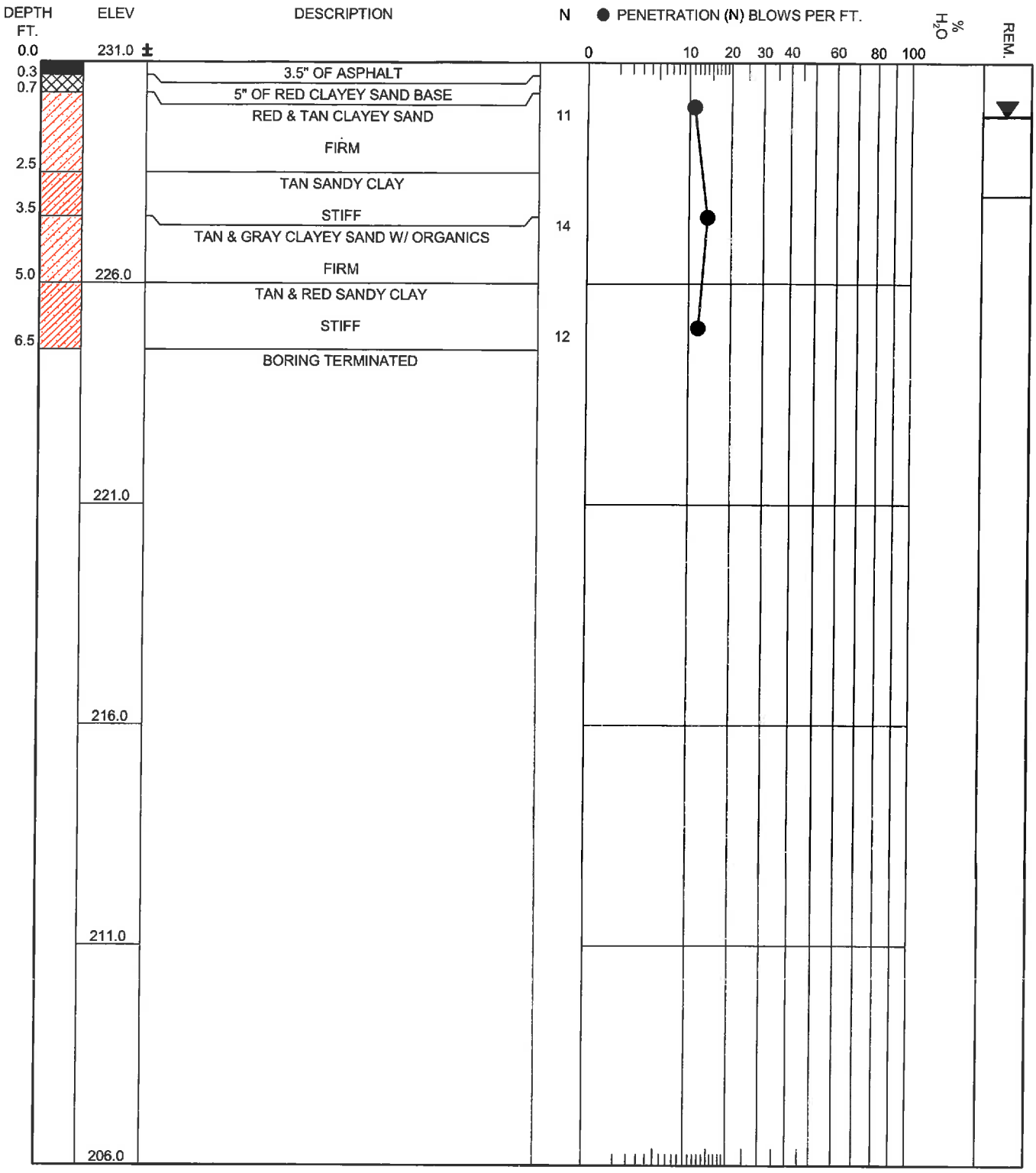
TEST BORING LOG

JOB NO. G21-6336

BORING NO. B-15

DATE DRILLED 12/9/21

TYPE BORING SB



Boring and Sampling Meets ASTM D-1586

Penetration (N) is the Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in I.D. Sampler 1 Ft.

☒ Undisturbed Sample

LA Lab Analysis

Water Level 1.2' AFTER 24 HOURS

Water Level

Boring Caved 3.0' AFTER 24 HOURS

CARMICHAEL ENGINEERING, INC.

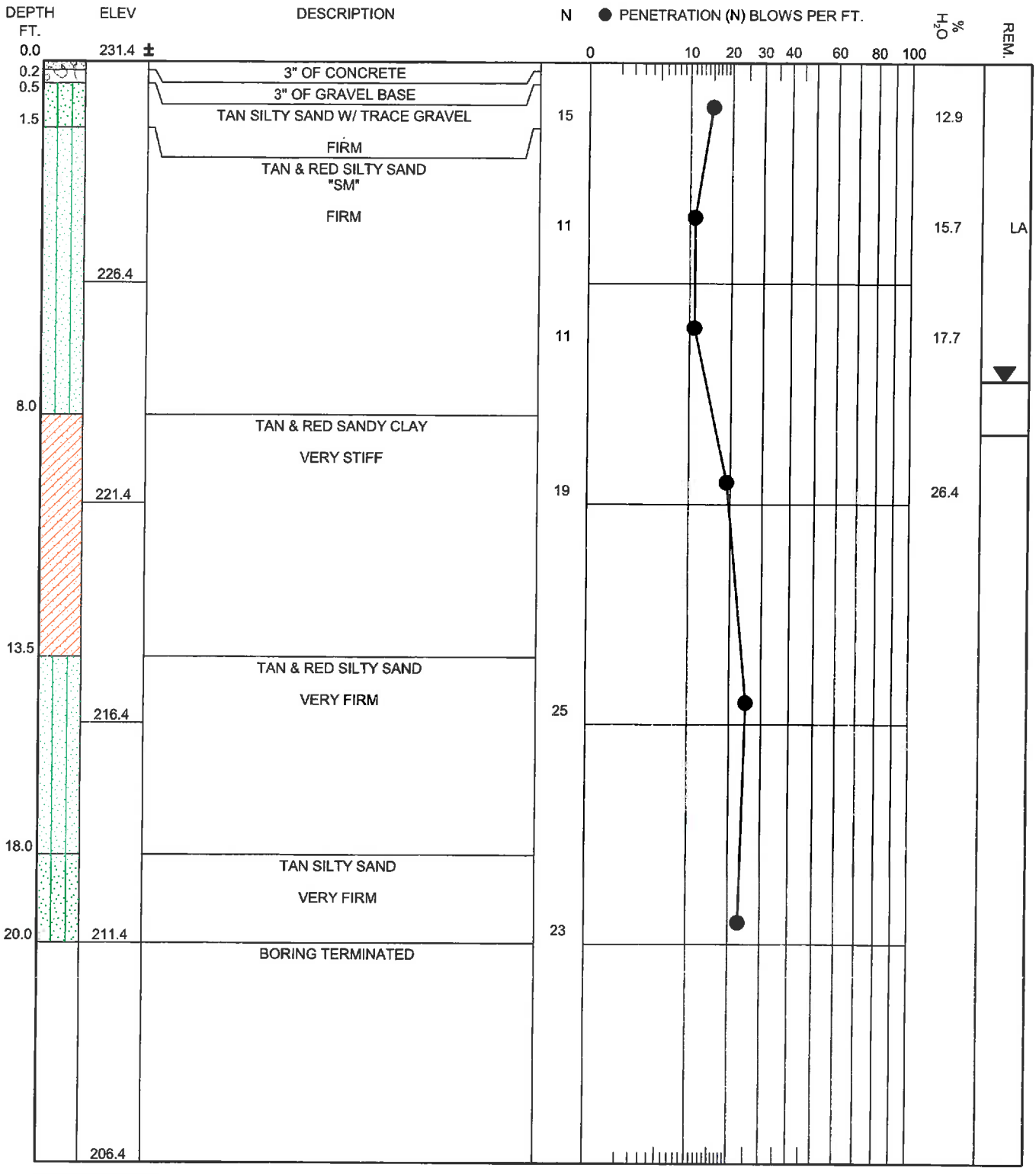
TEST BORING LOG

JOB NO. G21-6336

BORING NO. B-16

DATE DRILLED 12/9/21

TYPE BORING SB



Boring and Sampling Meets ASTM D-1586

Penetration (N) is the Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in I.D. Sampler 1 Ft.

☒ Undisturbed Sample

LA Lab Analysis

Water Level 7.2' AFTER 24 HOURS

Water Level

Boring Caved 8.4' AFTER 24 HOURS

CARMICHAEL ENGINEERING, INC.

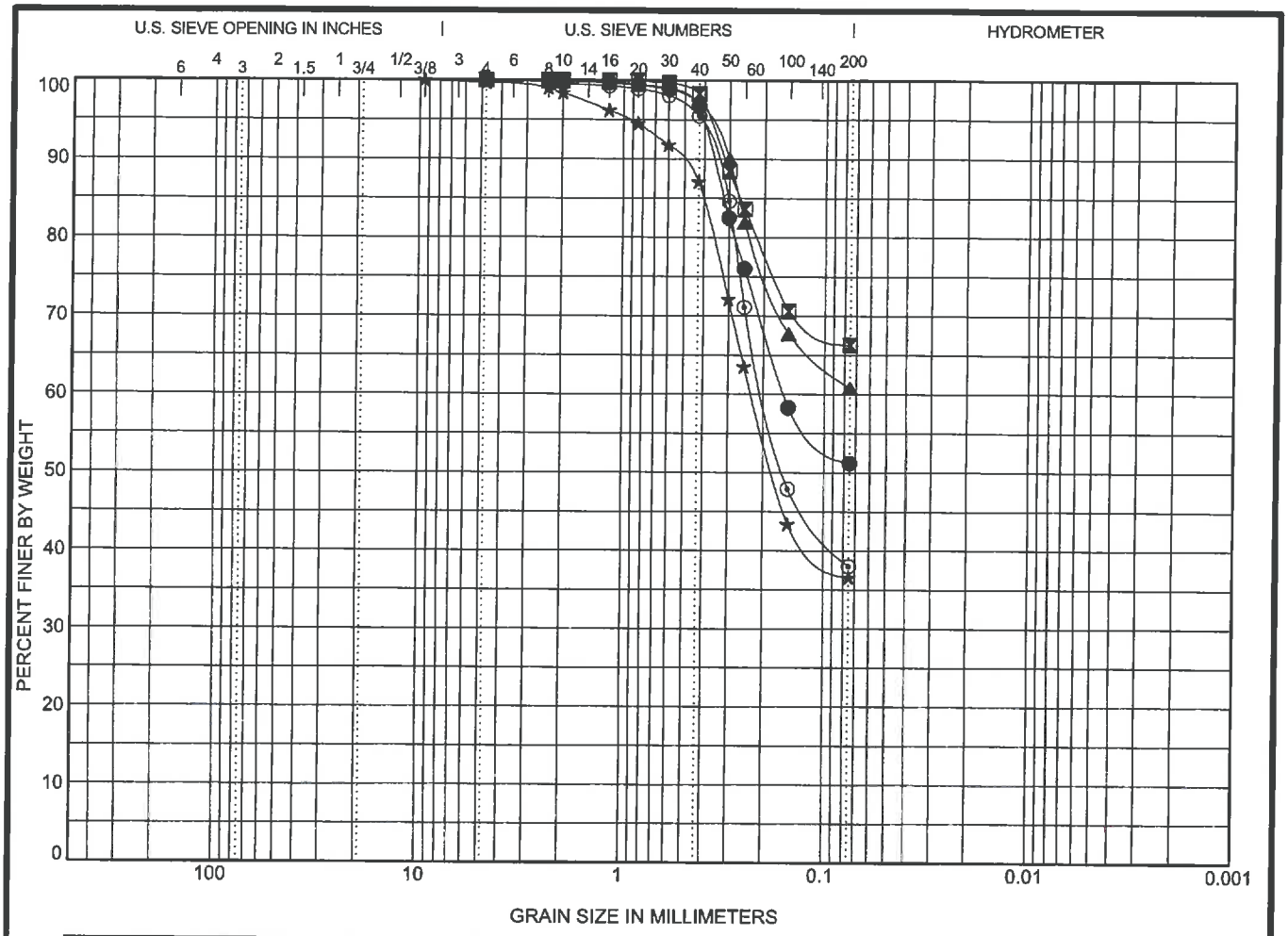
TEST BORING LOG

JOB NO. G21-6336

BORING NO. B-17

DATE DRILLED 12/9/21

TYPE BORING SB



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	2567	B-1 2.5-4'	SANDY LEAN CLAY CL	32	19	13		
⊠	2568	B-4 2.5-4'	SANDY FAT CLAY CH	60	29	31		
▲	2569	B-7 2.5-4'	SANDY LEAN CLAY CL	36	16	20		
★	2570	B-8 6"-2'	CLAYEY SAND SC	32	21	11		
⊙	2571	B-10 2.5-4'	CLAYEY SAND SC	40	25	15		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	2567	B-1 2.5-4'	4.75	0.158			0.0	48.8	51.2	
⊠	2568	B-4 2.5-4'	4.75				0.0	33.7	66.3	
▲	2569	B-7 2.5-4'	4.75				0.0	39.2	60.8	
★	2570	B-8 6"-2'	9.525	0.229			0.3	63.1	36.6	
⊙	2571	B-10 2.5-4'	4.75	0.196			0.0	62.0	38.0	

Client: Barganier, Davis, & Williams Architect
624 South McDonough Street
Montgomery, AL 36104

Test Methods: ASTM D422, ASTM D4318
Sample Received Date: 12/9/2021
Test Date(s): Grain Size - 12/14/2021, Atterberg Limits - 12/14/2021

CARMICHAEL ENGINEERING, INC.
650 Oliver Road
Montgomery, Alabama 36117

GRAIN SIZE DISTRIBUTION

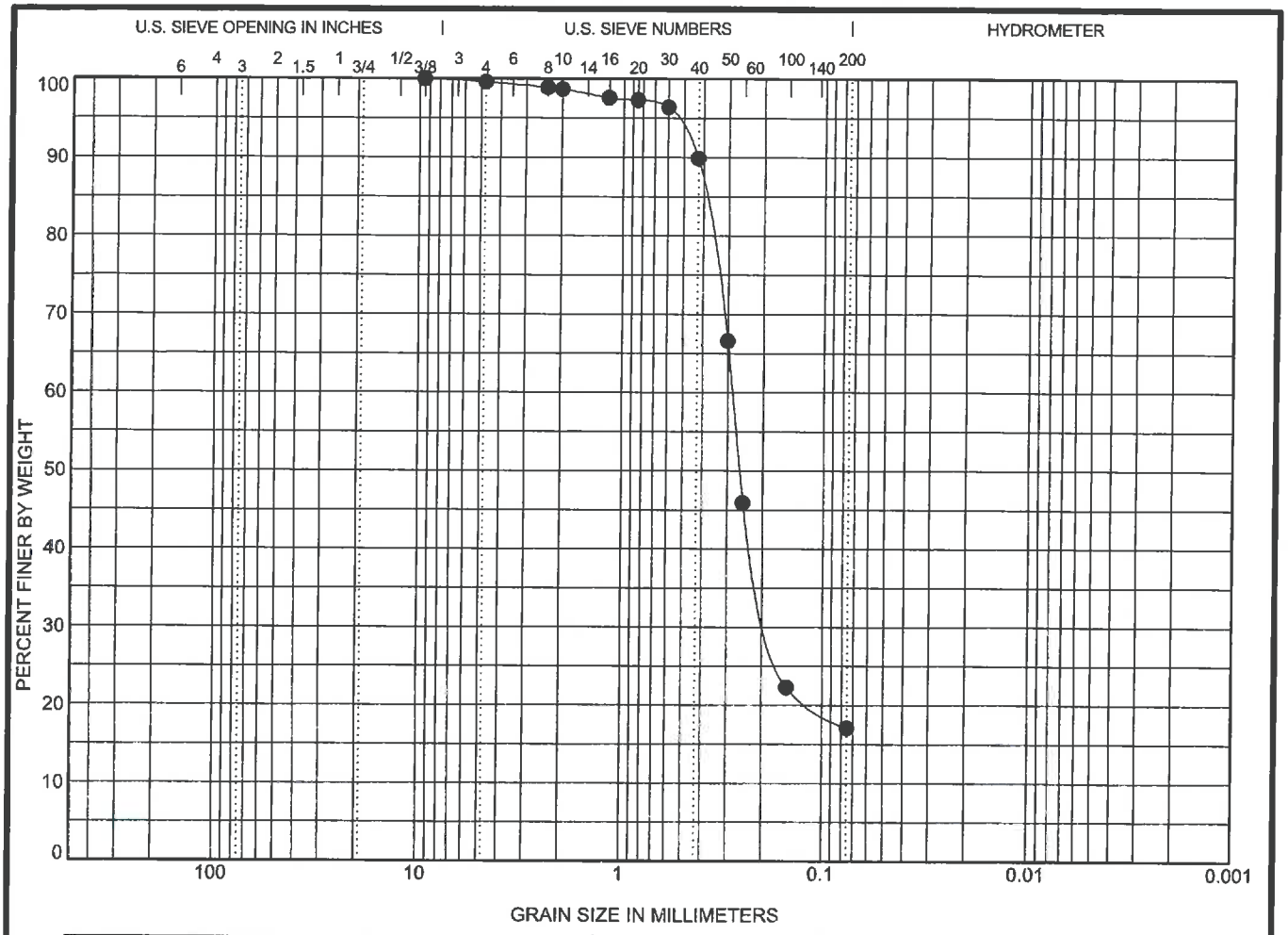
Project: Montgomery South Court Street Fire Station

Location: Montgomery, AL

Job No.: G21-6336 Report Date: 12/17/2021

Reviewed By: Brandon M. Rountree, P.E.

US GRAIN SIZE2 G21-6336.GPJ CARMICHL.GDT 12/20/21



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● 2572	B-17 2.5-4'	**SILTY SAND SM**	**NP**	**NP**	**NP**		

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● 2572	B-17 2.5-4'	**9.525**	**0.283**	**0.177**		**0.4**	**82.5**	**17.1**	

Client: Barganier, Davis, & Williams Architect
624 South McDonough Street
Montgomery, AL 36104

Test Methods: ASTM D422, ASTM D4318
Sample Received Date: 12/9/2021
Test Date(s): Grain Size - 12/14/2021, Atterberg Limits - 12/14/2021

CARMICHAEL ENGINEERING, INC.
650 Oliver Road
Montgomery, Alabama 36117

GRAIN SIZE DISTRIBUTION

Project: Montgomery South Court Street Fire Station

Location: Montgomery, AL

Job No.: G21-6336 Report Date: 12/17/2021

Reviewed By: Brandon M. Rountree, P.E.

US GRAIN SIZE2 G21-6336.GPJ CARMICHL.GDT 12/20/21

INVESTIGATIVE FIELD PROCEDURES

Penetration Testing & Split Barrel Sampling: A standard 2.0" O.D. (1.4" I.D.) split barrel sampler is first seated 6" to penetrate any loose cuttings and then driven an additional 12" with blows of a 140-pound hammer falling 30". The number of blows required to drive the sampler the final foot is recorded and designated the "penetration resistance" (N). (ASTM D- 1586)

Soil Boring (SB): The test bore is advanced by a drilling rig utilizing 5-5/8" O.D. (2-1/4" I.D.) hollow stem augers. Soil samples are obtained with a standard split-tube sampler by driving the sampler thru the hollow auger. Collected soil specimens are sealed in air tight containers and delivered to the laboratory to confirm the drillers classifications. (ASTM D- 1452 & 1586)

Auger Boring (AB): Steel flight augers are utilized to advance the test bore. The soils are visually classified and sampled from the cuttings which are bought to the surface. (ASTM D-1452)

Undisturbed Sampling (UD): Relatively undisturbed soil samples are obtained by forcing a section of 3" O.D. 16-gauge steel tubing into the soil at the desired sample location. The tube is then sealed from moisture loss and delivered to the laboratory for possible laboratory testing.

Rotary-Wash Boring (RB): The drilling operation is performed by first setting a length of casing and then advancing the test bore by "jetting" a bentonite solution thru drill rods and bit.

Core Drilling (CD): The test bore is advanced thru rock by coring which utilizes a diamond bit and a double tube, swivel type core barrel. (ASTM D-2113)

Monitoring Wells (MW): Temporary or permanent wells may be installed to provide the accurate water table determination and periodic monitoring. The well is constructed with 1.5" to 4" diameter PVC pipe meeting current standards for monitoring well construction.

NOTES AND REFERENCES

Soil descriptions are based on the predominate constituent of the material and are further described by appropriate modifiers in reverse order of their importance. For example, a predominate sand soil containing clay would be described as "clayey sand". Additional modifiers may be used, beginning with the least important constituent such as "silty clayey sand", etc.

Water levels shown on the test boring logs reflect those levels measured at the specified time and date indicated on the logs. These water levels are subject to seasonal fluctuation and can be effected by local surface drainage and/or rainfall during the monitoring period.

The following table describes soil relative densities and consistencies based on penetration resistance values (N) determined by the Standard Penetration Test. The "N" values are estimated for hand tool bores using a portable dynamic cone penetrometer.

	N	Relative Density
	0 – 3	Very Loose
	4 – 9	Loose
Sand	10 – 19	Firm
	20 - 29	Very Firm
	30 - 49	Dense
	50+	Very Dense

	N	Consistency
	0 - 2	Very Soft
	3 - 5	Soft
	6 - 11	Firm
Clay and Silt	12 - 17	Stiff
	18 - 29	Very Stiff
	30 - 49	Hard
	50+	Very Hard

Laboratory Test References

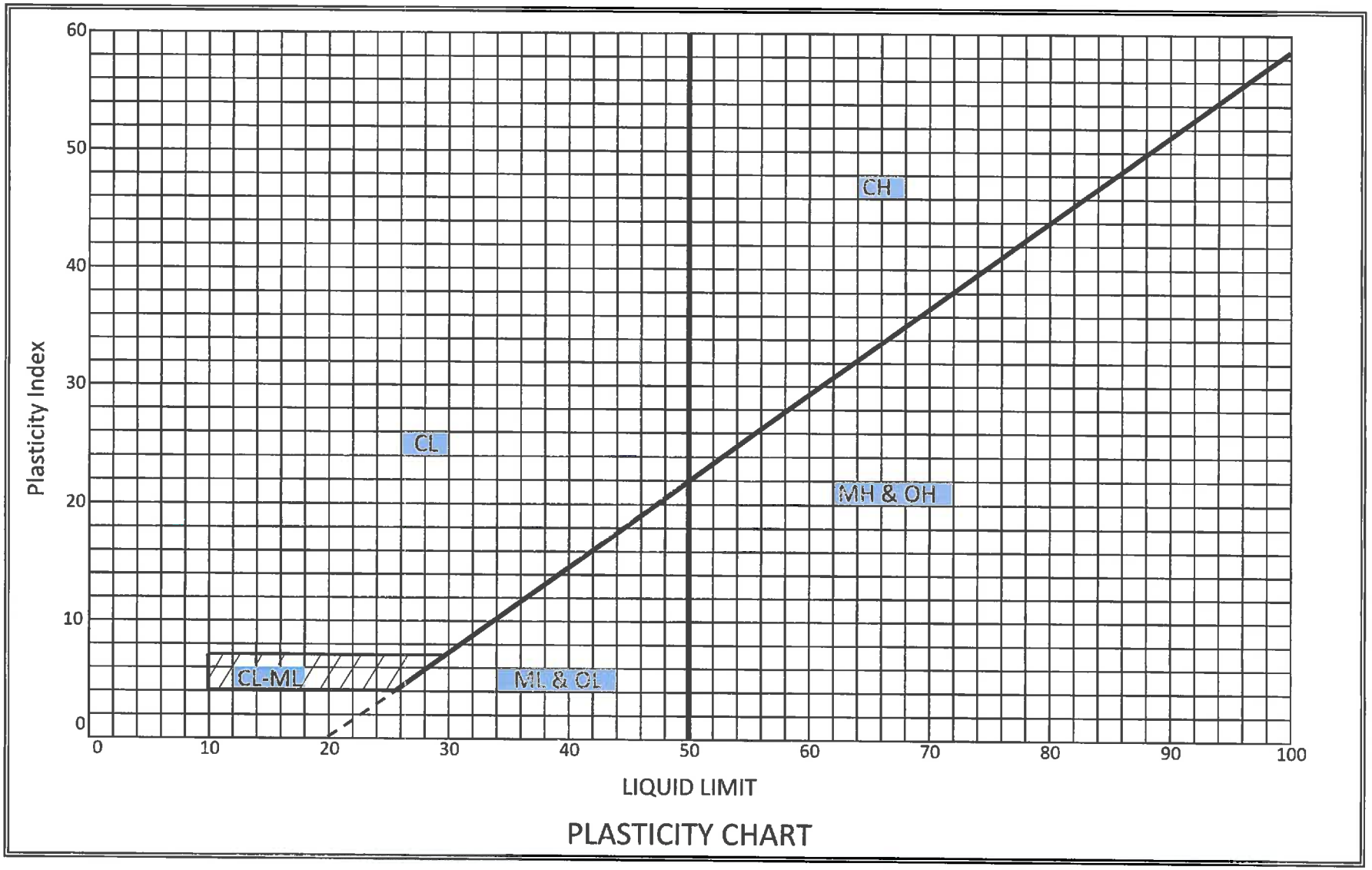
Test	**Reference**
Moisture Content	ASTM D-854
Particle Size Analysis	ASTM D-421,422,1140
Atterberg Limit	ASTM D-423, 424
Specific Gravity	ASTM D-2216
Compaction Test	ASTM D-698, 1557
California Bearing Ratio Test	AASHTO T-193
Triaxial Shear Test	ASTM D-2850
Unconfined Compression Test	ASTM D-2166
Consolidation Test	ASTM D-2435
Soil Permeability Test	ASTM D-2434

The Unified Soil Classification System

Major divisions			Group symbol		Typical names	Classification criteria for coarse-grained soils	
Coarse-grained soils (more than half of material is larger than No. 200)	Gravels (more than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (little or no fines)	GW		Well-graded gravels, gravel-sand mixtures, little or no fines	$C_U \geq 4$ $1 \leq C_C \leq 3$	
			GP		Poorly graded gravels, gravel-sand mixtures, little or no fines	Not meeting all gradation requirements for GW ($C_U < 4$ or $1 > C_C > 3$)	
		Gravels with fines (appreciable amount of fines)	GM	d/u	Silty gravels, gravel-sand-silt mixtures	Atterberg limits below A line or $I_P < 4$	Above A line with $4 < I_P < 7$ are borderline cases requiring use of dual symbols
			GC		Clayey gravels, gravel-sand-clay mixtures	Atterberg limits below A line with $I_P > 7$	
	Sands (more than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (little or no fines)	SW		Well-graded sands, gravelly sands, little or no fines	CU ≥ 6 $1 \leq C_C \leq 3$	
			SP		Poorly graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW ($C_U < 6$ or $1 > C_C > 3$)	
		Sands with fines (appreciable amount of fines)	SM	d/u	Silty sands, sand-silt mixtures	Atterberg limits below A line or $I_P < 4$	Limits plotting in hatched zone with $4 \leq I_P \leq 7$ are borderline cases requiring use of dual symbols
			SC		Clayey sands, sand-clay mixtures	Atterberg limits above A line with $I_P > 7$	
Fine-grained soils (more than half of material is smaller than No. 200)	Silts and clays (liquid limit < 50)		ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity	1. Determine percentages of sand and gravel from grain-size curve. 2. Depending on percentages of fines (fraction smalled than 200 sieve size), coarse-grained soils are classified as follows: Less than 5%-GW, GP, SW, SP More than 12%-GM, GC, SM, SC 5 to 12%-Borderline cases requiring dual symbols.	
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
			OL		Organic silts and organic silty clays of low plasticity		
	Silts and clays (liquid limit > 50)		MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts		
			CH		Inorganic clays or high plasticity, fat clays		
			OH		Organic clays of medium to high plasticity, organic silts		
	Highly organic soils		Pt		Peat and other highly organic soils		

$$C_U = D_{60}/D_{10}$$

$$C_C = D^2_{30}/D_{10}D_{60}$$



PLASTICITY CHART

EXHIBIT C

CARMICHAEL ENGINEERING, INC.

GENERAL CONDITIONS OF AGREEMENT WITH THE CLIENT

1. PAYMENT TERMS. CARMICHAEL ENGINEERING, INC., (hereinafter called "CEI") will submit invoices to client monthly and a final bill upon completion of services. Invoice will show charges for different personnel, unit prices and/or expense classifications unless a lump sum payment is agreed to as part of this agreement. Payment is due upon presentation of invoice and is past due ten (10) days from the invoice date. Client agrees to pay a finance charge of one and one-half percent (1 1/2%) per month (minimum of $15.00 per month) on the principal amount of any past due account. In the event CEI deems it necessary to refer the account to an attorney for collection, client agrees to pay all costs of collection, including a reasonable attorney's fee.

2. INSURANCE. CEI maintains Worker's Compensation and Employer's Liability Insurance in conformance with applicable state law. In addition, we maintain Comprehensive General Liability Insurance and Automobile Liability Insurance with bodily injury limits and property damage limits of, to wit $1,000,000 combined single limit. A certificate of insurance can be supplied evidencing such coverage which contains a clause providing that fifteen (15) days written notice be given prior to cancellation. Cost of the above is included in our quoted fees. If additional coverage, such as additional insured endorsements, waiver of subrogation or increased limits of liability are required, CEI will endeavor to obtain the requested insurance and charge separately for costs associated with additional coverage or increased limits.

3. STANDARD OF CARE. The only warranty or guarantee made by CEI in connection with the services performed hereunder is that we will use that degree of care and skill ordinarily exercised under similar conditions by reputable members of our profession practicing in the same or similar locality. No other warranty, expressed or implied, is made or intended by our proposal for geotechnical/environmental services or by our furnishing oral or written reports.

4. LIMITATION OF LIABILITY. Client agrees to limit CEI's liability to client, and to all construction contractors and subcontractors on the project, arising from CEI's professional acts, errors or omissions or other professional negligence, so that the total aggregate liability of CEI to all those named shall not exceed $350,000.

5. RIGHT OF ENTRY. Unless otherwise agreed in writing, client will provide for the right of entry for CEI, its agents and employees and all equipment necessary for the completion of the work. While CEI will take reasonable precautions to minimize any damage to the site, it is understood by the client that in the normal course of work some damage may occur and that the cost of correction or repairing such damage is not included in the quoted fee and CEI is not responsible unless specifically stated. If client desires CEI to repair or correct the damage, the cost of such repairs or corrections will be paid by client as an additional fee.

6. EXISTING MAN MADE OBJECTS. It is the duty of the client to disclose the presence and accurate location of all hidden or obscure man made objects, including utility lines, relative to field test or boring locations. CEI field personnel are trained to recognize clearly identifiable stakes or markings in the field and, without special written instructions to initiate field testing, drilling and/or sampling within a reasonable distance of each designated location. If CEI is notified in writing of the presence or potential presence of underground or above ground obstructions, such as utilities, CEI will give special instructions to its field personnel. Client agrees to indemnify and save harmless CEI from all claims, suits, losses, personal injuries, deaths and property liability resulting from unusual subsurface structures, owned by client or third parties, occurring in the performance of the proposed services, the presence and exact locations of which were not revealed to CEI in writing, and to reimburse CEI for expenses in connection with any such claims or suits, including reasonable attorney's fees.

7. SAMPLING OR TESTING LOCATION. The fees included in the Agreement do not include costs associated with surveying of the site or the accurate horizontal and vertical locations of tests. Field test or boring locations described in CEI's report or shown on sketches are based on specific information furnished by the client or clients agent or estimates made by CEI technicians. Such dimensions, depths or elevations should be considered as approximations unless otherwise stated in the report or contracted for at the inception of the Agreement.

8. SAMPLE DISPOSAL AGREEMENT. CEI will retain soil and rock samples which are not used for testing for forty-five (45) days after submission of our report. After forty-five (45) days the retained samples will be discarded unless the client has made written request for storage or transfer of the samples. Client shall be responsible for the expense of such storage or transfer.

9. SAFETY. When CEI provides periodic observations or monitoring services at the job site during construction, Client agrees that, in accordance with generally accepted construction practices, the contractor (i.e. not CEI) will be solely and completely responsible for working conditions on the job site, including safety of all persons and property during the performance of the work, and compliance with OSHA regulations, and that these requirements will apply continuously and not be limited to normal working hours. Any monitoring of the contractor's procedures conducted by CEI is not intended to include review of the adequacy of the contractor's safety measures in, on, adjacent to, or near the construction site.

10. ENGINEERING, EQUIPMENT AND TECHNICAL SERVICES. Fees for such services are based on all time spent on the project by engineering or technical personnel at the hourly or unit rates of the Fee Schedules. The quoted fee may not cover the cost of conferences, site visits, review of foundation plans and specifications, or other services subsequent to submission of our report. Such additional services will be invoiced at the applicable rates. All engineering and technical work is generally done by CEI's regular employees; however, special services by other firms or consultants may be needed on occasion and will be invoiced at the applicable rates but no "outside" services will be contracted for without clients prior permission.

11. ASSIGNMENT. Neither client or CEI may delegate, assign, sublet or transfer its duties or interest in this agreement without the prior written consent of the other party.

12. OWNERSHIP OF DOCUMENTS. All reports, boring logs, field data, field notes, laboratory test data, calculations, estimates and other documents prepared by CEI, as instruments or service, shall remain the property of CEI. Client agrees that under no circumstances shall any documents or reports produced by CEI pursuant to this Agreement be used at any location or for any project not expressly provided for in this agreement without the written permission of CEI. Client agrees that all reports and other work furnished to client or its agents, which are not paid for, will be returned upon demand and will not be used by client for any purpose whatsoever. CEI will retain all pertinent written records relating to the services performed for a period of five (5) years following submission of the report, during which period the records will be made available to client at all reasonable times. During this five (5) year period, CEI will provide client with copies of documents created in the performance of the work, at the expense of client.

13. TERMINATION. This agreement may be terminated by either party upon fourteen (14) days written notice in the event of material failure by the other party to perform in accordance with the terms hereof. Such termination shall not be effective if the material failure has been remedied before the expiration of the period specified in the written notice. In the event of termination, CEI shall be paid for all services performed and expenses incurred up to the termination notice data plus reasonable termination expenses. The expenses of termination or suspension shall include all direct costs or CEI in completing such analysis, records and reports.

14. GOVERNING LAW. This agreement shall be governed and construed in accordance with the laws of the State of Alabama, United States of America.

15. SEPARABILITY. The provisions of this agreement are separate and divisible, and, if any court of competent jurisdiction shall determine that any provision hereof is void and/or unenforceable, the remaining provisions shall be construed and shall be valid as if the void and/or unenforceable provisions or were not included in this Agreement.

16. WAIVER. Except as otherwise especially provided in this Agreement, no failure on the part of either party to exercise, and no delay in exercising, any rights, privilege or power under this Agreement shall operate as a waiver or relinquishment thereof, nor shall any single partial exercise by either party or any right, privilege or power under this Agreement preclude any other or further exercise thereof, or the exercise of any right, privilege or power. Waiver by any party of any breach of any provisions of the Agreement shall not constitute or be construed as a continuing waiver, or a waiver of any other breach of any provision of this Agreement.

17. BINDING. This agreement shall be binding upon all of the parties and their respective estates, heirs, administrators, executors, successors and assigns.

18. STIPULATION. Each of the parties to this Agreement as set forth herein and in the Work Order furnished by CEI stipulates that they have read, understand and agree to be bound by all of the terms set forth pursuant to the documents which are the basis of this agreement.

(Revised 10/26/20)

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes as indicated on the drawings.

1.3 SUBMITTALS

A. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

B. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement. Comply with ACI 315 “Manual od Standard Practice for Detailing Reinforced Concrete Structures”.

C. Field quality-control test and inspection reports.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

B. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code-Reinforcing Steel."

C. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

D. Concrete Testing Service: The **Owner** will engage and pay a testing laboratory to perform material evaluation testing. Retesting of rejected materials and installed work, shall be done at Contractor’s expense.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Plain-Steel Wire: ASTM A 82, COLD drawn, steel.

C. Welded-Wire Fabric: ASTM 185, welded wire steel fabric.

D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

2.3 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut bars true to length with ends square and free of burrs.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I or Type III unless otherwise acceptable to Architect.

2. At Contractor's option, supplement with the following:
   a. Fly Ash: ASTM C 618, Class C or Class F.
   b. Maximum Content: No more than 15 percent.

B. Normal-Weight Aggregates: ASTM C 33, graded, nominal maximum coarse-aggregate size.
1. Provide aggregates from a single source.
2. 1 ½ -inch nominal maximum aggregate size.
3. Fine aggregate free of materials with deleterious reactivity to alkali in cement.
4. Gap graded mixes will not be accepted

C. Water: ASTM C 94/C 94M; Potable.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260. Air-Entrainment is only to be used on slabs where mechanical troweling is not required.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.6 RELATED MATERIALS

A. Vapor Retarder: Multi-Ply reinforced polyethylene sheet, ASTM E 1745, Class C, or polyethylene sheet, ASTM D 4397, not less than 10 mils thick. See Section 079110 - Under Slab Vapor Barrier.

B. Moisture-Retaining Cover: UltraCure or similar compliant with ASTM C171 for white opaque polyethylene film or white burlap-polyethylene sheets. Clear or black polyethylene film may be used for cold weather protection.

C. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

1. Products:
   a. Burke by Edoco; Aqua Resin Cure.
   b. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
   c. Euclid Chemical Company (The); Kurez DR VOX.
   d. Lambert Corporation; Aqua Kure-Clear.

2.7 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned based on laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
4. Use air-entraining admixture in all concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer’s prescribed rate to result in concrete at point of placement having total air content of 6% with a tolerance of plus or minus 1-1/2%.

2.8 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Proportion normal-weight concrete mixture as follows:
1. Air Content: 5-1/2 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.

B. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:
1. Air Content: 5-1/2 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.

C. Concrete Toppings: Proportion normal-weight concrete mixture as follows:
1. Air Content: 5-1/2 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.

2.9 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class A, 1/8 inchfor smooth-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.3 VAPOR RETARDERS

A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions. See Section 071910 - Under-Slab Vapor Barrier.

1. Lap joints 6 inches and seal with manufacturers recommended tape.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Weld reinforcing bars according to AWS D1.4, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.5 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Space vertical joints in walls [as indicated] <Insert spacing>. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed. Clumps of mud and loose fill will not be allowed on slab pad.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

G. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.7 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one-part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into

voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.

3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one-part portland cement and one-part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in 1 direction.

1. Apply scratch finish to surfaces indicated to receive trowel finish concrete floor toppings or to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces indicated to receive trowel finish.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic, or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.

2. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-foot-long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed.

E. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete slabs, steps, walks and ramps and elsewhere indicated.

3.9 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.10 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

    a. Water.
    b. Continuous water-fog spray.
    c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

    a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
    b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
    c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

    a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.11 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.12 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one-part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks more than 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare,

mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.13 FIELD QUALITY CONTROL

A. Testing and Inspecting: The Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

1. Provide a minimum 24-hour notice to testing agency prior to placement.
2. Testing lab shall immediately notify Construction Project Manager, Design Professional and General Contractor of any test results that do not meet minimum test requirements as specified.

B. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100-cu. yd. or fraction thereof of each concrete mixture placed each day.
    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173/C 173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C 31/C 31M.
    a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
    b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
    a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
    b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
9. Strength of each concrete mixture will be satisfactory if every average of any three-consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
10. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate dos does not comply with the Contract Documents.

END OF SECTION

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:

1. Concrete masonry units (CMUs).
2. Face brick.

1.3 SUBMITTALS

A. Face Brick: Submit samples for approval.

B. Shop Drawings: For reinforcing steel. Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement.

C. Samples for each type of colored mortar.

D. Material Certificates: For each type of product indicated. Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards.

1. For masonry units include material test reports substantiating compliance with requirements.

E. Mix Designs: For each type of mortar. Include description of type and proportions of ingredients.

1.4 QUALITY ASSURANCE

A. Fire-Resistance Ratings: If applicable or indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

B. Mock-Up Panel: Build Mock-Up Panel to verify selections made under sample submittals and to demonstrate aesthetic effects.

1. Build sample panels for typical exterior wall in sizes approximately 48 inches long by 48 inches high.
2. Locate mock-up panel on site were directed by Architect.
3. mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
4. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.

C. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

D. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

E. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

1.6 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

B. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

C. Where 1 wythe of multi-wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

D. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

E. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that meet such masonry.

F. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.

G. Protect sills, ledges, and projections from mortar droppings.

H. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.

I. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

J. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602

K. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

L. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

2.2 CONCRETE MASONRY UNITS (CMUs)

A. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

B. Provide bullnose units for outside corners, unless otherwise indicated.

C. Concrete Masonry Units: Provide concrete masonry units complying with requirements indicated below for size that are manufactured to specified face dimensions with tolerances specified in the applicable referenced ASTM specification for concrete masonry units.

1. Size: Manufacturer's standard units with nominal face dimensions of 16" long x 8" high x thickness indicated.
2. Grade N.
3. Type I: Moisture controlled units.
4. Hollow load-bearing Block: ASTM C 90.
5. Weight Classification: Lightweight.

2.3 BRICK

A. MANUFACTURERS: The following manufacturers' have been approved for use on this project:

1. ACME Brick Company.

2. Capital Brick Company, Montgomery, Alabama.

3. Henry Brick Company, Selma, Alabama.

4. Equal products will be considered provided the product has been approved by the Architect ten days prior to bid opening.

B. General: Provide shapes indicated and as follows:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

C. BRICK ALLOWANCES

1. Face Brick (Brick 1and Brick 2) shall have an allowance of **$575.00 per thousand**. Allowances shall be for material only, based on actual number of bricks purchased for the project. Installation, profit, overhead, shipping shall be included in the Contractors Proposal). If Architect chooses brick of lesser value after Bid Process, the Contractor shall issue a deductive Change Order for the difference.

2.4 MORTAR AND GROUT MATERIALS

A. MANUFACTURERS: The following manufacturers' have been approved for use on this project: (Other products will be considered for use provided the Request for Substitution has been provided to the Architect at ten days prior to the bid date).

1. Southern Heritage

2. Cemex

3. Argos Magnolia

B. Masonry Cement Product: ASTM C91

1. Type S for CMU walls.

2. Type N for Exterior Face and Accent Brick - colored pigment.

C. Allowances:

1. Mortar shall have an Allowance of **$19.00 per bag**. (Allowances shall be for material only, based on actual number of bricks purchased for the project. Installation, profit, overhead, shipping shall be included in the Contractors Proposal). If Architect chooses a mortar of lesser value after Bid Process, the Contractor shall issue a deductive Change Order for the difference.

D. Hydrated Lime: ASTM C 270, Type S.

E. Aggregate for Mortar: ASTM C 144.

F. Water: Clean and potable.

2.5 REINFORCEMENT, TIES AND ANCHORING DEVICES

A. Manufacturers: The following manufacturers 'have been approved for use on this project: (Other products will be considered for use provided the Request for Substitution has been provided to the Architect at least ten days prior to the bid date).

1. Hohmann and Barnard, Inc. - Dur-O-Wall.

2. Heckmann Building Products, Inc.

B. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

C. Masonry Joint Reinforcement: ASTM A 951; hot-dip galvanized, carbon-steel wire for exterior walls.

1. Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

2.6 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with eight subparagraphs below, unless otherwise indicated.

B. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating for Interior Walls.

C. Anchors for Connecting to Sheathing: Provide two-piece assemblies that are equal to Hohmann Barnard DW 10 to allow vertical or horizontal adjustment. Install at 16" o.c. vertically and horizontally.

D.

1. Products:
   a. Heckmann Building Products, Inc.
   b. Hohmann Barnard Inc.

2.7 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with SMACNA's "Architectural Sheet Metal Manual and as follows:

1. Stainless Steel: ASTM A 240/A 240M, Type 304, 26-gauge thick drip plate. See details for installation and 40 mil stick on flashing. Flashing equal to H & B 40 mil Flex Flashing and stainless steel termination bar.
2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet.
3. Fabricate through wall flashing with drip edge where indicated. Fabricate by extending metal flashing ½ inch out from wall, with outer edge bent down 30 degrees.

2.8 MISCELLANEOUS MASONRY ACCESSORIES

A. Weep/Vent Products: Equal to H-B Quadro-Vent, 2-1/2 x 3-3/8 x 3/8 thick Honeycomb Polypropylene. Gray color.

B. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
   1. Equal to Hohmann Barnard Mortar Trap. See plans for height of mortar net.

C. Termination Bars: Type 304 stainless steel, 26 gauge, 1- ½" high x 8' long, with 3/8" flange on top for easy caulking, and ¼" holes spaced 8" on center.

D. Bond Breaker Strips: Asphalt-saturated organic roofing felt complying with ASTM D 226, Type I, (No. 15 asphalt felt).

E. Expansion Joint Strips: Pre-Molded, flexible closed cellular neoprene rubber filler strips complying with ASTM D 1056, Grade RE41, Grade 2A1, capable of compression up to 35% of width and thickness indicated.

F. Horizontal Expansion Joint: Adhesive on one side, compression up to 50%, manufactured of closed cell neoprene conforming to ASTM D 1056, Grade RE41, Grade 2A1.

2.9 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains from new masonry without damaging masonry. Use product approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.10 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, unless otherwise indicated.

   1. Do not use calcium chloride in mortar or grout.
   2. Limit cementitious materials in mortar for exterior masonry to portland cement and lime.
   3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Mortar for Unit Masonry: Comply with ASTM C 270.

   1. For masonry below grade or in contact with earth, use Type S.

2. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.

C. Grout for Unit Masonry: Comply with ASTM C 476.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Use full-size units without cutting if possible. If cutting is required, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

B. This project will have fluid-applied Membrane Air Barrier material applied to the cavity side of the CMU. Special attention and care must be taken to provide a smooth, filled surface to receive the membrane. The care is necessary to insure the design performance of the selected materials.

C. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

D. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

E. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:

1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.

3.2 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

D. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.

3.3 MORTAR BEDDING AND JOINTING

A. Lay hollow brick and concrete masonry units as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

3.4 CAVITY WALLS

A. Bond wythes of cavity walls together using one of the following methods:

1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for wall area spaced not to exceed 16 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses.

B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

3.5 MASONRY JOINT REINFORCEMENT (If applicable)

A. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

B. Provide continuity at wall intersections by using prefabricated T-shaped units.

C. Provide continuity at corners by using prefabricated L-shaped units.

3.6 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to wall framing/ concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:

1. Fasten screw-attached anchors through sheathing to wall framing with metal fasteners of type indicated. Use two fasteners.
2. Embed tie sections in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of sheathing.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 16 inches o.c. vertically and 32 inches o.c. horizontally with not less than 1 anchor for each 3.5 sq. ft. of wall area.

3.7 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and were indicated.

B. Install flashing as follows, unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing as recommended by flashing manufacturer.
2. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
3. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing flush with exterior brick and adhere flexible flashing to top of metal flashing termination.

C. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material.

D. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/vent products to form vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.8 CONTROL AND EXPANSION JOINTS

A. General: Provide expansion, control and isolation joints in masonry where shown.

3.9 LINTELS

A. Install lintels where indicated.

B. Provide minimum bearing of 8” at each jamb, unless otherwise indicated.

3.10 CLEANING

A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
2. Protect adjacent surfaces from contact with cleaner.
3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
4. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

END OF SECTION

SECTION 051200 - STRUCTURAL STEEL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

a. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section.

1.2 DESCRIPTION OF WORK

a. Work described in this section includes structural steel work. Structural steel is that
b. work defined in AISC “Code of Standard Practice” and otherwise shown on drawings.

1.3 QUALITY ASSURANCE

a. Codes and Standards:
b. Comply with provisions of following, except as otherwise indicated:
    i. AISC “Code of Standard Practice for Steel Buildings and Bridges”.
    ii. Paragraph 4.2.1 of the above code is hereby modified by deletion of the following sentence: “This approval constitutes the Owner’s acceptance of all responsibility for the design adequacy of any connections designed by the fabricator as a part of his preparation of these shop drawings”.
    iii. AISC “Specifications for the Design, Fabrication and Erection of
    iv. Structural Steel for Buildings”, including the “Commentary” and
c. Supplements thereto as issued.
    i. AISC “Specifications for Structural Joints Using ASTM A 325 or A 490Bolts” approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.
    ii. AWS D1.1 “Structural Welding Code”.
    iii. ASTM A 6 “General Requirements for Delivery of Rolled Steel Plates,
d. Shapes, Sheet Piling and Bars for Structural Use”.
    i. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS “Standard Qualification Procedures”. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests within previous 12 months. If recertification of welders is required, retesting will be Contractor’s responsibility.

1.4 SUBMITTALS

a. Product Data: Submit producer’s or manufacturer’s specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

b. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.
c. High-strength bolts (each type), including nuts and washers.
d. Structural steel primer paint.
e. Shrinkage-resistant grout.

1.5 SHOP DRAWINGS:

a. Submit shop drawings prepared under supervision of registered professional engineer, including complete details and schedules for fabrication and assembly of structural steel members, procedures, and diagrams.
b. Include details of cuts, connections, camber, holes and other pertinent data.
c. Indicate welds by standards AWS symbols, and show size, length, and type of each weld.
d. Provide setting drawings, templates and directions for installation of anchor bolts and other anchorages to be installed by others.

1.6 DELIVERY, STORAGE AND HANDLING

a. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-inplace concrete or masonry, in ample time to not delay that work.
b. Store materials to permit easy access for inspection and identification. Keep steel members off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.
c. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.
d. Refer to Division 1 Sections “Summary of Work” and “Special Conditions” for additional information and requirements regarding stored materials.

PART 2 – PRODUCTS

2.1 MATERIALS

A) Metal Surfaces, General: For fabrication of work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes.
B) Structural Steel Shapes, Plates and Bars: ASTM A 36, except where other type steel is indicated.
C) W and WT Shapes: ASTM A992, Grade 50, unless otherwise indicated on Structural Drawings.
D) Cold-Formed Steel Tubing: ASTM A 500, Grade B.
E) Hot-Formed Steel Tubing: ASTM A 501, Grade B.
F) Steel Pipe: ASTM A 53, Type E or S, Grade B.
G) Finish: Black, except where indicated to be galvanized.

H) Steel Castings: ASTM A 27, Grade 65-35, medium-strength carbon steel.
I) Anchor Bolts: ASTM A 307, non-headed type unless otherwise indicated.
J) High-Strength Threaded Fasteners:
    1) Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:
    2) Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A 325.
    3) Direct tension indicator washers may be used at Contractor's option.
K) Electrodes for Welding: Comply with AWS Code.
L) Structural Steel Primer Paint: Southern Coatings "Heavy Duty RIP Primer 1 0900",
M) Tnemec "10-99 Primer", or preapproved equivalent.
N) Verify that primer is 100% and fully compatible with any sprayed-on fireproofing product intended for use. Notify Architect immediately in writing of any related problems.
O) Non-Metallic Shrinkage-Resistant Grout:
P) Pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CRD-621.
Q) Products offered by manufacturer to comply with requirements for non-metallic, non-shrink grout include the following:
    1) Euco N.S.; Euclid Chemical Company
    2) Crystex; L & M Construction Chemicals.
    3) Masterflow 713; Master Builders.
    4) Five Star Grout; U.S. Grout Corp.
    5) Upcon; Upco Chemical Division, USM Corp.
    6) Propak; Protex Industries, Inc.

2.2 FABRICATION

A) Shop Fabrication and Assembly:
    1) Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specification and as indicated on final shop drawings. Provide camber in structural members where indicated.
    2) Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
    3) Where finishing is required, complete assembly, including welding of units, before start of finish operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.
B) Connections:
    1) Weld or bolt shop connections, as indicated.
    2) Bolt field connections, except where welded connections or other connections are indicated. Use high-strength threaded fasteners.

3) High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" (RCRBSJ).

C) Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work. Assemble and weld built-up sections by methods which will produce true alignment of axes without warp.

D) Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on final shop drawings.

E) Provide threaded nuts welded to framing, and other specialty items as indicated to receive other work.

F) Cut, drill or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.3 SHOP PAINTING

A) General:

1) Shop paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel which is partially exposed on exposed portions and initial 2" of embedded areas only.
2) Do not paint surfaces which are to be welded or high-strength bolted with friction-type connections.
3) Apply 2 coats of paint to surfaces which are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.
4) Surface Preparation: After inspection and before shipping, clean steelwork to be painted. Remove loose rust, loose mill scale, and spatter slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows:
   (a) SP-1 "Solvent Cleaning", followed by SP-3 "Power Tool Cleaning".
5) Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide a uniform dry film thickness of 2.5 mils. Use painting methods which result in full coverage of joints, corners, edges and exposed surfaces. Apply 2nd coat paint in accordance with manufacturers instructions and at a rate to provide a uniform dry film thickness of 7.5 mils. Provide total uniform dry film thickness of 10 mils.

PART 3 – EXECUTION

3.1 INSPECTION

A) Erector must examine areas and conditions under which structural steel work is to be installed and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until satisfactory conditions have been corrected in a manner acceptable to the Erector.

3.2 ERECTION

A) Surveys: Employ a registered professional engineer or land surveyor, experienced in survey work, to establish permanent benchmarks as shown and as necessary for accurate erection of structural steel. Check elevations of concrete and masonry bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Architect. Do not proceed with erection until corrections have been made, or until compensating adjustments to structural steel work have been agreed upon with Architect.

B) Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.

C) Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.

D) Anchor Bolts:

E) Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.

F) Furnish templates and other devices as necessary for presetting bolts and other anchors to accurate location.

G) Refer to Division 3 of these specifications for anchor bolt installation requirements in concrete, and Division 4 for masonry installation.

H) Setting Bases and Bearing Plates:

I) Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.

J) Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.

K) Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.

L) Pack grout solidly between bearing surfaces and bases of plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials and allow to cure. For proprietary grout materials, comply with manufacturer’s instructions.

M) Field Assembly:

N) Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming a part of a complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

O) Level and plumb individual members of structure within specified AISC tolerances.

P) Splice members only where indicated and accepted on shop drawings.

Q) Erection Bolts:

R) On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surfaces.
S) Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
T) Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.
U) Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in structural framing. Cutting will be permitted only on secondary members which are not under stress, as acceptable to Architect. Finish gas-cut sections equal to a sheared appearance when permitted.
V) Touch-Up Painting:
W) Immediately after erection, clean field welds, bolted connections and abraded areas of shop paint. Apply paint to exposed areas with same material as used for shop painting.
X) Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

3.3 FIELD QUALITY CONTROL

A) An independent testing and inspection agency shall inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.
B) Refer to Section 01015 - “Special Conditions” for additional information and requirements.
C) Testing agency shall conduct and interpret tests and state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.
D) Contractor shall provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.
E) Testing agency may inspect structural steel at plant before shipment; however, Architect reserves right, at any time before final acceptance, to reject material not complying with specified requirements.
F) Contractor shall correct deficiencies in structural steel work which inspections and laboratory test reports have indicated to be not in compliance with requirements. Additional tests as may be necessary to reconfirm any noncompliance of original work, and as may be necessary to show compliance of corrected work will be performed at Contractor’s expense.
G) Shop Bolted Connections: Inspect in accordance with AISC specifications.
H) Shop Welding:
I) Inspect during fabrication of structural steel assemblies, as follows:
J) Certify welders and conduct inspections as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
K) Perform visual inspection of all welds.
L) Field Bolted Connections: Inspect in accordance with AISC specifications.
M) Field Welding:
N) Inspect during erection of structural steel as follows:

O) Certify welders and conduct inspections as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
P) Perform visual inspection of all welds after welding, and again after cleaning and re-priming.

END OF SECTION

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SECTION 054000 COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Exterior load-bearing wall framing.
2. Exterior non-load-bearing wall framing.

B. Related Sections include the following:

1. Division 5 Section "Metal Fabrications" for masonry shelf angles and connections.
2. Division 9 Section "Gypsum Board Assemblies" for interior non-load bearing, metal-stud framing and ceiling-suspension assemblies.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated on structural drawings.
2. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
3. Design framing system to maintain clearances at openings, and to allow for construction tolerances.

B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."

1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.4 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

D. Qualification Data: For testing agency.

E. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:

1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips
7. Miscellaneous structural clips and accessories.

F. Research/Evaluation Reports: For cold-formed metal framing.

1.5 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.

D. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

E. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

F. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

G. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Truss Design."
2. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

H. Comply with AISI's "Standard for Cold-Formed Steel Framing - Prescriptive Method for One- and Two-Family Dwellings."

I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:
1. AllSteel Products, Inc.
2. Clark Steel Framing.
3. Dietrich Metal Framing; a Worthington Industries Company.
4. MarinoWare; a division of Ware Industries.

2.2 MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: As required by structural performance.
2. Coating: G60.

2.3 LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges:

1. As indicated on structural drawings.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:

1. As indicated on structural drawings.

C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: As indicated on structural drawings.

2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: As indicated on structural drawings.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: As indicated on structural drawings.

2.5 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.

3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers, knee braces, and girts.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

2.6 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts or headless, hooked bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1-part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

D. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

E. Sealer Gaskets: Closed-cell neoprene foam, 1/4-inch-thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.8 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.

3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
    a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies' level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Install insulation, specified in Division 7 Section "Building Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:

1. Anchor Spacing: 32 inches.

B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:

1. Stud Spacing: 16 inches.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced 48 inches. Fasten at each stud intersection.

1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of 2 screws into each flange of the clip angle for framing members up to 6 inches deep.
2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

J. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:

1. Stud Spacing: 16 inches.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

E. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.6 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 REPAIRS AND PROTECTION

Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 054500 - COLD-FORMED STEEL TRUSSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Roof trusses.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

   1. Design Loads: As indicated on structural drawings.

1.4 SUBMITTALS

A. Product Data: For each type of product and accessory indicated.

B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners.

   1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

D. Qualification data.

E. Product test reports.

F. Research/evaluation reports.

1.5 QUALITY ASSURANCE

A. Product Tests: An independent testing agency for owner qualified according to ASTM E 329 to conduct testing indicated, as per ASTM 548.

B. Mill certificates by steel producer indicating steel sheet complies with requirements, including uncoated steel thickness, yield strength, tensile strength, total elongation, chemical requirements, and galvanized-coating thickness.

C. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code--Sheet Steel."

D. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

E. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Truss Design."

F. Engineering Requirement: A professional engineer shall be engaged to prepare shop drawings, connection details, etc. The design of the truss system shall be the responsibility of the supplier.

1.6 DELIVERY, STORAGE AND HANDLING

A. Protect steel trusses from corrosion. Deformation and other damage during delivery, storage, and handling.

B. Store trusses with waterproof covering.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Sheet Steel: ASTM A653 “Specification for Sheet Steel, Zinc Coated Galvanized by the Hot-Dip Process, Physical (Structural) Quality”.
1. Grade A, Fy=33ksi; 18 gage and lighter.
2. Grade D, Fy=50ksi; 16 gage and heavier.
3. Galavnizing: G60 Coating Class.

B. Galvanizing: ASTM A525

C. Fasteners: ITW Buildex pan head screws and bolts or others submitted and approved by the Architect.

D. Electrodes for Welding: Comply with AWS Code.

E. Paint: Zinc Chromate, Oil-alkyd, TT-P-57, Type I.

2.02 DESIGN

A. All calculations and procedures pertaining to design, analysis, and computation of section Properties shall be in accordance with the Specifications for the Design of the Cold-Formed Steel Structural Members of the American Iron and Steel Institute.

B. Design Trusses for loads indicated on drawings plus concentrated loads hung from or supported On Trusses. Refer to Mechanical, Electrical and Plumbing drawings and specifications for Loading information and location. Loading as required by other subcontractors, such as fire Protection shall be coordinated by the General Contractor.

C. Holes in Members: Design for holes in members were shown for securing other work to trusses; however, deduct area of holes from the area of chord when calculating strength of member.

D. Design Bridging and other temporary and permanent bracing for same loads as used to design Trusses plus any temporary loads and permanent loads resulting laterally bracing of members.

2.03 FABRICATION

A. All trusses shall be fabricated and erected in strict accordance with the current printed Instructions of the approved subcontractor or fabricator.

B. All truss components shall be straight and true prior to fabrication. Flattening or straightening Of components, when necessary, shall be accomplished in a manner so as to not damage the component.

C. All truss components shall be cut neatly to fit snugly against adjacent members.

D. No Splices will be allowed in trusses except as authorized in writing by the Architect or as Shown on the approved shop drawings.

F. Framing components shall be field or shop fabricated and joined to one another by means Of welding or using screws.

G. Welds must be thoroughly cleaned and wire brushed and primed and painted with a high zinc Content paint capable of providing an equal or greater degree of protection than the original G-60 galvanized coating.

H. Bridging: Fabricate horizontal or diagonal type bridging for trusses as required to prevent Buckling of members where sheathing applied to the truss members is not present or is not Adequate to brace the truss member. Bridging shall transfer all forces to the roof diaphragm.

I. End Anchorage: Fabricate end anchorage to secure trusses to adjacent construction.

J. Fabricate all clips, angles, henways and other miscellaneous pieces necessary to attach light gauge steel trusses to the substructure or to attach other components within this section to one another.

PART 3 - EXECUTION

3.01 INSPECTION

A. Erector must examine areas and conditions under which the trusses are to be installed, notify contractor and Architect in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the erector. Additionally, the following items shall be installed and inspected prior to roof truss installation.

1. Conditions of Surfaces
    a. Exterior and Interior Bearing Plates
        1. Properly positioned
        2. Installed so as allow complete and adequate contact with truss connection member.
    b. Exterior and Interior Bearing Plates installed in proper elevations to permit The installation of the truss system without the use of shims or adjustability.

3.02 PREPARATION

A. Structural Adequacy: Contractor shall prepare the structure to insure proper and adequate structural materials for the materials specified.

3.03 ERECTION

A. Prefabricated trusses shall be braced against racking. Lifting of trusses shall be done to not cause local distortion in any member.

B. All light gage steel framing shall be erected using equipment of adequate capacity to safely perform the work.

C. The General Contractor is responsible for checking the dimensions and assuring the fit of all members and trusses before erection begins.
   1. All work shall be erected plumb and level and to dimensions and spacings indicated on the drawings. Provide bridging as shown in the shop drawings.

D. Assemblies shall be of the size and spacing shown on the approved shop drawings.

E. Provide web stiffeners and reinforcement at reaction points where required by analysis or to suit details.

F. Hoist units in place by means of lifting equipment suited to sizes and types of trusses required, applied at designated lift points by fabricator, exercising care not to damage truss members.

G. Provide temporary bracing as required to maintain trusses plumb, parallel and in location indicated, until permanent bracing is installed.

H. Anchor trusses securely at all bearing points to comply with methods and details indicated.

I. Install permanent bracing and related components to enable trusses to maintain design spacing, withstand design loads and comply with other indicated requirements.

J. Do not cut or remove truss members.

K. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.

L. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening.

3.04 QUALITY CONTROL

A. The Owner will engage an independent testing agency to perform shop and field inspection of trusses during fabrication.

B. Testing Agency shall conduct and interpret test and state in each report whether observations and tests comply with the requirements and specifically state any deviations therefrom.

C. Provide Access for testing agency to places where truss work is being fabricated or produced so that required inspections, observations and testing can be accomplished.

D. Architect reserves the right, at any time before final acceptance, to reject material not complying with specified regardless of when testing agency completed inspection, observation or testing.

E. Correct deficiencies in truss work which inspections and test reports have indicated to be not in compliance with requirements. Perform additional test, at Contractor’s expense, as may be

necessary to reconfirm any non-compliance of original work, and as may be necessary to show compliance of correct work.

F. Confirmation of Quality Control Manual: The testing agency will make a minimum of five site visits to the fabricators shop and/or to the jobsite to confirm conformance with the Quality Control Manual submitted to and accepted to and accepted by the Architect. Provide minimum of three of the five visits to the jobsite.

G. Prior to Truss Erection: The testing agency will inspect all trusses as follows eighter at the shop of in the field.
1. The testing Agency will visually inspect all trusses and certify them as meeting the requirements of the approved shop drawings and these specifications.
2. Inspection shall include welds. Visually inspect all welds to AWS Welding Code.

H. After Truss Erection: The testing agency will inspect all trusses after erection and temporary and permanent bracing is in place as follows.

1. The testing agency shall inspect the installed trusses to certify that installation is in accordance with approved shop drawings and these specifications.

I. Testing Agency shall submit written reports to Architect within 3 days of the inspections. Under no circumstances are trusses to be erected prior to testing agency approval.

END OF SECTION 054000

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SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract including General and Supplementary Conditions and Division 1 Specification Sections apply to work of this section.

1.2 SUMMARY

A. Section Includes:

1. Miscellaneous steel framing and supports.
2. Miscellaneous steel trim.
3. Loose bearing and leveling plates.

B. Products furnished, but not installed, under this Section:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete.

1.3 QUALITY ASSURANCE

A. Qualify welding processes and welding operators in accordance with AWS D1.1 “Structural Welding Code-Steel”, D1.3 “Structural Welding Code – Sheet Steel”, and D1.2 “Structural Welding Code - Aluminum.”

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.4 SUBMITTALS

A. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

B. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes.

2.2 FERROUS METALS (**If Applicable or indicated on drawings**).

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.

C. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

D. Rolled-Stainless-Steel Floor Plate: ASTM A 793.

E. Steel Tubing: ASTM A 500, cold-formed steel tubing.

F. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.

G. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M.

H. Non-Shrink Non-Metallic Grout: Pre-Mixed, factory-packaged, non-corrosive, non-gaseous grout complying with CE CRDC621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

2.3 FASTENERS (If applicable or indicated on drawings)

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls.

B. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

2.4 MISCELLANEOUS MATERIALS (If applicable or indicated on drawings)

A. Shop Primers: Provide primers that comply with Division 09 painting Sections.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

F. Concrete: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.

C. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended.

D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Locate joints where least conspicuous.

E. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

F. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors not less than 24 inches o.c.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS (If applicable or indicated on the drawings)

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

C. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.

2.7 MISCELLANEOUS STEEL TRIM (If applicable or indicated on drawings).

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

C. Galvanize exterior miscellaneous steel trim.

2.8 LOOSE BEARING AND LEVELING PLATES (If applicable or indicated on drawings)

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

2.9 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.

B. Galvanize loose steel lintels located in exterior walls.

2.10 STEEL WELD PLATES AND ANGLES (If applicable or indicated on drawings)

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.11 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.12 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with universal shop primer unless zinc-rich primer is are indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Items Indicated to Receive Primers Specified in Division 09 Section "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
4. Other Items: SSPC-SP 3, "Power Tool Cleaning."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

C. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000

SECTION 055813 - ALUMINUM PLATE COLUMN COVERS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The drawings and provisions of the General Conditions, and the sections included under Division 1 specification sections, apply to this section.

1.2 SUMMARY

A. This section includes aluminum plate column covers that are used as the exterior and interior cladding.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: provide aluminum plate column cover assemblies capable of withstanding the effects of normal stress from thermal movements and load affects from: wind loads, dead loads, and snow loads; without evidence of permanent defects of the assembly.
B. System design for a mechanically fastened assembly to substructure
    1. Dead Load as required by applicable building code
    2. Live Load as required by applicable building code
    3. Wind Load: uniform pressure (define velocity pressure) of (insert design criteria) pound/square foot, acting inward and outward.
    4. Thermal Movements: provide column assemblies that allow for thermal movements to prevent buckling, opening of joints and other thermal effects
C. Design the column for a mechanically fastened assembly to substructure
D. Design column tolerances to manufacturer's standard tolerances
E. Column joints will be sealed appropriately using backer rod and approved caulk

1.4 SUBMITTALS

A. Product Data: Manufacturer's product literature
B. Finish Samples: submit color samples for final approval
C. Shop Drawings: submit shop drawings showing plans, sections and details

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum of five years experience in manufacturing of metal column cover products
B. Installer Qualifications: Acceptable to manufacturer
C. Engineering Qualifications: Provide engineering calculations for the column assembly to be prepared by an engineer registered in the state the project is located

1.6 DELIVERY, STORAGE AND HANDLING

A. Delivery: deliver column covers in manufacturer's crates packed for long haul transit
B. Storage: store materials in a dry and safe area
C. Handling: handle materials to avoid any damage to materials and finishes

1.7 WARRANTY

A. The contractor must warrant the materials to be free of defects in accordance with the general conditions. Finish warranty shall be extended by paint manufacturer's standard warranty

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. Basis of Design
Quality Metalcrafts, LLC/AMERICLAD,
21925 Industrial Boulevard, Rogers, Minnesota 55374
Telephone: (866) 260-4047
www.americlad.com
1. AC-20P Aluminum Plate Column Cover Hairline Joint System

B. Approved equal submitted for approval 10 days prior to bid

2.2 MATERIALS

A. Aluminum Sheet: ASTM B209, Aluminum Association specification
1. 3003-H14/3105-H14/5052-H32 for painted finishes
2. 5005-H34 for anodized finish

B. Thickness: .125" (1/8") unless otherwise specified

2.3 FABRICATION

A. Tolerances
1. Column surfaces shall be free of blemishes, scratches or marks caused during fabrication process
2. Roll columns to a true radius with return attachment legs formed to accommodate proper installation

2.4 ACCESSORIES

A. All fasteners shall be stainless steel

2.5 FINISHES

A. Paint:

1. Coating shall be a Spray Applied Fluorocarbon Resin Utilizing a 70% Kynar 500/Hylar 5000 resin
2. Color as selected by owner from paint manufacturer's standard colors or Custom color as specified
3. Material to be painted in accordance with either AAMA specification 2605 or 2604

B. Anodized:

1. Class I, Clear Anodic Finish: AA-M12C22A41, mechanical finish, nonspecular as fabricated. Coating to have an anodic coating of 0.7 mil (0.018 mm) thickness
2. Class I, Color Anodic Finish: AA-M12C22A42/A44, mechanical finish, nonspecular as fabricated. Color to be determined by Owner. Coating to have an anodic coating of 0.7 mil (0.018) thickness

PART 3 – EXECUTION

3.1 PREPARATION

A. A. Coordinate drawings, diagrams, and instructions for installation

3.2 INSTALLATION

A. Install column covers plumb and level per shop drawing detailing
B. Isolation tape or shim shall be installed where dissimilar materials come in contact

3.3 CLEANING AND PROTECTION

A. Clean exposed surfaces after installation per manufacturer's recommendation
B. B. Touch up minor abrasions in finish with touch up paint supplied by finish applicator

END OF SECTION

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SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the contract including General and Supplementary Conditions and Division 1 Specification Sections apply to work of this section.

1.3 SUMMARY

A. This Section includes the following:

1. Framing with dimension lumber.
2. Wood blocking and nailers.
3. Plywood backing panels.

1.4 REFERENCES

A. Lumber Standards: American Softwood Lumber Standard PS 20-70.

B. Plywood Standards: U.S. Product Standard PS 1 for Structural Plywood, the consensus softwood plywood standard.

1.5 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee Board of Review.

1.6 DELIVERY, STORAGE AND HANDLING

A. Store lumber and plywood in stacks with provisions for air circulation within stacks. Protect wood from moisture.

1.7 DELIVERY, STORAGE AND HANDLING

A. Storage of Materials

1. Protect lumber materials to ensure proper ventilation and drainage and to protect against damage and weather.
2. Deliver the materials and store out of the way of traffic and stored up off the ground surface.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20-70 and applicable rules of grading agencies indicated.

1. Each piece of lumber shall be STRESS REATED AND GRADE MARKED.
2. Provide dressed lumber, S4S, unless otherwise indicated.

3. Moisture Content: Moisture content of any material for framing not to exceed 19% for boards 8" in width or less. Boards exceeding 8" in width does not exceed 15% at of installation. All material used for finish and trim work to be kiln dried material with moisture content not to exceed that allowed by FHA for intended use.

2.2 DIMENSION LUMBER FRAMING

A. Framing members except studs and manufactured lumber members shall be No. 2 dense, kiln dried, southern yellow pine or approved equal. All LVL's shall be 2.0 E Louisiana Pacific or equal.

2.3 MISCELLANEOUS WOOD AND MATERIALS

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
   1. Provide dressed lumber, S4S, unless otherwise noted.
   2. Plates, Grounds or Furring: Pressure Treated No. 2 KD Southern Yellow Pine in contact with concrete or masonry.

B. Exterior Sheathing: ½ inch APA Plywood. See Structural Drawings.

C. Building Wrap Vapor Barrier: Equal to Dupont "Commercial Wrap over the entire exterior wall sheathing.

D. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified.
   1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating**.**

B. Power-Driven Fasteners: NER-272.

C. Bolts: Steel bolts complying with ASTM A 307.

D. Nails, Wire, Brads, and Staples; FS FF-N-105.

E. Wood Screws: ANSI B18.6.1.

F. Lag Bolts: ANSI B18.2.1.

G. Bolts: Steel bolts complying with ASTM a 307, Grade A; with ASTM A 563 hex nuts and where indicated, flat washers.

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

A. Discard units of material with defects that impair quality of rough carpentry construction and that are too small to use in fabricating rough carpentry with minimum joints or optimum joint arrangement.

B. Set rough carpentry to required levels and lines, with members plumb and true to line and cut and fitted.

C. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.

D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated.

E. Countersink nail heads on exposed carpentry work and fill holes.

F. Treated Wood: Use only treated lumber for all wood blocks and nailing grounds, etc. in, or in contact with concrete.

G. Blocking: Install all blocking required to support all wall finishes and to cut off all concealed draft openings, both vertical and horizontal, between ceiling and floor areas.
   1. Fire-Block in all stud walls at ceiling and floor levels and in all furred spaces.

H. Use common wire nails, unless otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.

I. Building Wrap: Install the specified building wrap over all exterior sheathing where indicated to be installed, lapping all joints to prevent penetration of water into the stud spaces, and securely fastening the wrap in place in accordance with the manufacturer’s recommendations.

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SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Roof sheathing.

B. Related Sections include the following:

   1. Division 06 Section " Rough Carpentry" for plywood backing panels.

1.3 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
   3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
   4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
   5. For building wrap, include data on air-/moisture-infiltration protection based on testing according to referenced standards.

B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

   1. Fire-retardant-treated plywood.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

   1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 ROOF SHEATHING

1. Fiberglass-mat faced gypsum roof boards for application directly under roof membrane systems equal to GP 1/2" thick Dens Deck.

2.2 WALL SHEATHING

1. 1/2" thick Structural Grade plywood Class A Fire Retardant UL Classified with a Flame Spread rating of 25 or less

2.3 MISCELLANEOUS MATERIALS

1. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.030 inch.

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. For roof sheathing, provide fasteners of with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

1. For wall and roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

F. Panel Edge Clips: Equal to Simpson PSCL 3/4 in. 20-Gauge Galvanized Panel Sheathing Clip.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

D. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30S, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Roof Sheathing:

   a. Screw to cold-formed metal framing.
   b. Space panels 1/8 inch apart at edges and ends.

3.3 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to cold-formed metal framing with screws.
2. Install boards with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
3. Install boards with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing boards but do not cut into facing.

C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.
2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

D. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.
2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

3.4 SHEATHING JOINT-AND-PENETRATION TREATMENT

A. Seal sheathing joints according to sheathing manufacturer's written instructions.

1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply enough sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing board joints and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.
3. Apply sheathing tape to joints between foam-plastic sheathing panels and at items penetrating sheathing. Apply at upstanding flashing to overlap both flashing and sheathing.

3.5 FLEXIBLE FLASHING INSTALLATION

A. Apply flexible flashing were indicated to comply with manufacturers written instructions.

1. Prime substrates as recommended by flashing manufacturer.
2. Lap seams and junctures with other materials at least 4 inches, except that at flashing flanges of other construction, laps need not exceed flange width.
3. Lap flashing over weather-resistant building paper at bottom and sides of openings.
4. Lap weather-resistant building paper over flashing at heads of openings.
5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

END OF SECTION

SECTION 064200 - SOLID SURFACE COUNTERTOPS & WINDOWSILLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section. (Verify if applicable)

1.2 SUMMARY

A. Section Includes:
   1. Solid surface material countertops.
   2. Solid surface material backsplashes.
   3. Solid surface material end splashes.

B. Related Requirements: (Verify if needed based on list above and select applicable sub-section)
   1. Section 064100 -Custom Cabinetwork.

1.3 ACTION SUBMITTALS

A. Product Data: For countertop materials.

B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
   1. Show locations and details of joints.
   2. Show direction of directional pattern, if any.

C. Samples: For each type of material exposed to view in manufacturer's standard size.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator/ installer.
   1. Installer: Provide work of this section executed by competent installer with minimum 5 years' experience in the application of products, systems and assemblies specified.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For solid surface material countertops to include in maintenance manuals.
   1. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops like that required for this Project, and whose products have a record of successful in-service performance.
   1. Installer Qualifications: Fabricator of countertops with experience in custom shape configurations.

B. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.
   1. Build mockup of typical countertop as shown on Drawings.
   2. Subject to compliance with requirements, approved mockups may become part of the complete Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.8 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

1.9 DELIVERY, STORAGE AND HANDLING

A. Delivery and Acceptance Requirements: Deliver no components to Project site until areas are ready for installation.
   1. Storage and Handling Requirements: Store components indoors prior to installation. Handle materials to prevent damage to finished surfaces.

1.10 WARRANTY

1. Manufacturer Warranty: Provide manufacturer's standard warranty for material only for a period of 5 years against defects and/ or deficiencies in accordance with General Conditions of the Contract. Promptly correct and defects or deficiencies which become apparent within warranty period, to satisfaction of Architect and at no expense to Owner.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer:
   1. Corian® DuPont; www.corian.com
   2. Wilsonart Contract; www.wilsonartcontract.com
B. Substitutions:
   1. Request for substitution will be considered in accordance with provisions of Section 016000
   2. Product Requirements.
      a. Approval of comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:
      b. Project references: minimum of 5 installations not less than 5 years old, with owner contact information.
      c. List of successful installations of similar products of similar complexity for evaluation by Architect
      d. Sample warranty.

2.2 SOLID SURFACE COUNTERTOP MATERIALS

A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.
   1. Color and Patterns: As selected by Owner from Manufacturer's full range.
B. Particleboard: ANSI A208.1, Grade M-2
C. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.3 COUNTERTOP FABRICATION

A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
   1. Grade: Custom.
B. Configuration:
   1. Front: Straight, slightly eased at top
   2. Backsplash: Straight, slightly eased at corner
   3. End Splash: Matching backsplash.
C. Countertops: 3/4-inch thick, solid surface material with front edge built up with same material.
D. Backsplashes: 3/4-inch thick, solid surface material.
E. Fabricate tops with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
   1. Fabricate with loose backsplashes for field assembly.
F. Joints: Fabricate countertops without joints.

G. Joints: When required, fabricate countertops in sections for joining in field.
   1. Joint Locations: Not within 18 inches of a sink or cooktop and not where a countertop section less than 36 inches long would result, unless unavoidable.
   2. Splined Joints: Accurately cut kerf in edge at joint for insertion of metal splines to maintain alignment of surfaces at joints. Make width of cuts slightly more than thickness of splines to provide snug fit.
H. Cutouts and Holes:
   1. Undercounter Plumbing Fixtures: Make cutouts for fixtures using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
   2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
   3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

2.4 INSTALLATION MATERIALS

A. Adhesive: Product recommended by solid surface material manufacturer.
B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.
B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer’s written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
C. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
D. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
E. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
F. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION

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NEW FIRE STATION NO. 10
COURT STREET
MONTGOMERY, ALABAMA 36108
CITY PROJECT NO. SP-5-21

SECTION 071910 - UNDER-SLAB VAPOR BARRIER

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Vapor Barrier, Seam Tape, Mastic, Pipe Boots, for installation under concrete slabs.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM E 1745 Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
   2. ASTM D 1709 Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.
   3. ASTM F 1249 Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.
   4. ASTM E 96 Standard Test Methods for Water Vapor Transmission of Materials.
   5. ASTM E 154 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
   6. ASTM E 1643 Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

B. American Concrete Institute (ACI):
   1. ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.

1.4. SUBMITTALS

A. Product Data: Provide data indicating material characteristics, performance criteria, limitations.

B. Manufacturer's Installation Instructions: Indicate preparation and installation requirements, techniques.

C. Samples: Submit 8.5-inch x 11-inch samples of specified vapor barrier.

PART 2 - PRODUCTS

2.1 UNDER-SLAB VAPOR BARRIERS

A. Vapor Barrier Must Have all the Following Qualities:
1. Permeance of less than 0.006 perms per ASTM F 1249 or ASTM E 96.
2. Puncture Resistance not less than 3,000 grams per ASTM D 1709, Method B
3. ASTM E 1745 “Class A”.
4. Minimum 10-mil thick.

A. Vapor Barrier Products

1. Barrier Bac VB Series 10 mil.

2. Stego Wrap 10-mil Vapor Barrier by STEGO INDUSTRIES LLC.

2. Zero-Perm by Alumiseal.

4. Textrude Xtreme Vapor Barrier 10 mil Class A by Textrude LP.

5. Viper Vapor Check II 10-mil “Class A” vapor barrier by Insulation Solutions Inc.

2.2 ACCESSORIES

A. Seam Tape must have the following qualities:

1. Minimum 4-inch width.
2. Permeance less than 0.1 perms per ASTM F 1249 or ASTM E 96.

B. Pipe Boot Must Have all of the Following Qualities:
1. Permeance less than 0.01 perms per ASTM F 1249 or ASTM E 96.

B. Vapor Proofing Mastic

1. Permeance less than 0.1 perms per ASTM F 1249 or ASTM E 96.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ensure that subsoil is approved by Architect or geotechnical firm.

1. Level and tamp or roll aggregate, sand or tamped earth base.

3.2 INSTALLATION

A. Install Vapor Barrier/Retarder:

1. Installation shall be in accordance with manufacturer's instructions and ASTM E 1643-98.

a. Unroll Vapor Barrier/Retarder with the longest dimension parallel with the direction fo the pour.
b. Lap Vapor Barrier/Retarder over footings and seal to foundation walls.
c. Overlap joints 6 inches and seal with manufacturer's tape.
d. Seal all penetrations (including pipes) per manufacturer's instructions.
e. No penetration of the Vapor Barrier/Retarder is allowed except for reinforcing steel and permanent utilities.
f. Repair damaged areas by cutting patches of Vapor Barrier/Retarder, overlapping damaged area 6 inches and taping all four sides with tape.

END OF SECTION 071910

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SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
1. Blanket-type insulation.
2. Cavity Wall Insulation.
3. Sound Attenuation insulation.
4. Accessories/fasteners.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for insulation products.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.

B. ASTM
1. Fire-Resistance Ratings: ASTM E 119.
2. Combustion Characteristics: ASTM E 136.
3. ASTM C 665 – Standard specification fir Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
4. ASTM E 84 - Surface-Burning Characteristics.
5. ASTM C518.
6. ASTM E970.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 BATT INSULATION

A. MANUFACTURERS:

1. The following manufacturers’ products have been approved for establishing minimum Standards:

a. CertainTeed Corporation.
b. Johns Manville.
c. Knauf Fiber Glass.
d. Owens Corning.

2. Equal products of other manufacturers may be used, provided such products have been approved by the Architect, not less than ten days prior to bid opening.

B. MATERIALS

1. Batt Insulation: Pre-formed, flexible blanket insulation. Unfaced.

2. Un-faced Sound Attenuation Batt Insulation.

3. Cavity Wall Insulation: 1.0 inches thick.
   a. Foamular 250, OC Industries.
   b. Styrofoam S/SB; Dow Chemical.
   c. Certifoam; Diversified Products.
4. Sound Attenuation Batt Insulation: Equal to PINK NEXT GEN™ SOUND ATTENUATION BATTS (SAB).

2.2 EXAMINATION

B. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.

2.2 PREPARATION

A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

2.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

E. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

2.4 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

1. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

2.12 PROTECTION

B. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

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SECTION 072101 – SPRAY FOAM INSULATION

PART 1 - **GENERAL**

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Self-supported, spray-applied cellulosic insulation.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: Full-size units for insulation indicated.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for insulation products.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

   1. Surface-Burning Characteristics: ASTM E 84.
   2. Fire-Resistance Ratings: ASTM E 119.
   3. Combustion Characteristics: ASTM E 136.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect plastic insulation as follows:

   1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
   2. Always protect against ignition. Do not deliver plastic insulating materials to Project site before installation time.
   3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

2.2 SPRAY-APPLIED CELLULOSIC POLYURETHANE FOAM INSULATION

A. Self-Supported, Spray-Applied Cellulosic Polyurethane Foam Insulation: ASTM C 1149, Closed-cell rigid foam 1.7-2.0 pcf with R-value 7.0 per inch.

B. 1. Heatlok Soy 200, as manufactured by Demilec (USA) LLC, Arlington, TX.
2. Foamtix by Foamtix, Inc., 100 Enterprise Drive, Cartersville, GA 30120.
3. Icynene MD-C-200 Closed Cell by Icynene, Inc.
4. SWD URETHANE – SWD Quick Shield 112.
5. Lapolla Industries, Inc.
6. Certain Teed Corporation.
7. Premium Spray Products.

2.3 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

2.4 PREPARATION

A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

2.5 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

E. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

F. No Spray-Applied Cellulosic Polyurethane Foam Insulation shall remain visible as part of the finished construction.

2.12 PROTECTION

F. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072101

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SECTION 072140 - FOAMED-IN-PLACE MASONRY WALL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Foamed-In-Place masonry insulation for thermal, sound and fire resistance values.

1.3 SUBMITTALS

A. Product Data and technical presentation.

B. Certified Test Reports: With product data, submit copies of certified test report showing compliance with specified performance values, including R-values, fire performance and sound abatement characteristics.

C. Material Safety Data Sheets: Submit Material Safety Data Sheet complying with OSHA Hazard Communication Standard, 29 CRF 1910 1200.

1.4 QUALITY ASSURANCE

A. Manufacturing Standards: Provide insulation produced by a single and approved manufacturer. The product must come from the manufacturer pre-mixed to ensure consistency.

B. Installer Qualifications for Foamed-In-Place Masonry Insulation: Engage an experienced dealer/applicator who has been trained and licensed by the product manufacturer and which has not less ten years direct experience in the installation of the product used.

C. Warranty: Upon request, a one-year product and installation warranty will be issued by the manufacturer and installer.

D. Fire-Performance Characteristics: Provide insulation materials which are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, per methods indicated below, by a testing agency acceptable to authorities having jurisdiction.
   1. ASTM E-119, ASTM E-84 & ASTM E-136.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers of Foamed-In-Place Masonry Insulation: Subject to compliance with requirements, provide products from the following:
   1. “Core-Fill 500” - Tailored Chemical Products, P.O. Drawer 4186, Hickory, N.C. 28663 (800) 627-1687.
   2. Air-Krete, Inc., P.O. Box 380, Weedsport, N.Y. 13166.
   3. CP Chemical Co. (Tripolymer), White Plains, N.Y.

B. Provide basis of design product, or comparable product approved by Architect ten days prior to bid.

2.2 INSULATING MATERIALS

A. General: Provide insulating materials which comply with requirements indicated for materials, compliance with referenced standards, and other characteristics.

B. Foamed-In-Place Masonry Insulation: Two component thermal insulation produced by combing a plastic resin and catalyst foaming agent surfactant which, when properly ratioed and mixed, together with compressed air produce a cold-setting foam insulation in the hollow cores of hollow unit masonry walls.
   1. Fire Resistant Ratings: (If applicable or Indicated on Drawings) Masonry Insulation is a thermal foam insulation product.
   2. It is not intended to increase the fire rating of a concrete masonry unit.
   3. Surface Burning Characteristics: Maximum Flame Spread, smoke developed and fuel contributed of 0, 5 and 0 respectively.
   4. Thermal Values: "R" Value of 4.91/inch @ 32 degrees F mean; ASTM C – 177.
   5. Sound Abatement: Minimum Sound Transmission Class (STC) rating of 53 and a minimum Outdoor Indoor Transmission Class (OITC) rating of 44 for 8" wall assembly (ASTM E 90-90)
   6. Open-cell polyurethane foam.
   7. Closed-cell polyethylene foam nonabsorbent to liquid water and gas, non-outgassing in unruptured state.

PART 3 - EXECUTION

3.1 INSPECTION ANDPREPARATION

A. Application Assemblies:
   1. Block Walls: 6",8" or 12" concrete masonry walls.
   2. Cavity Walls: 2" cavity or greater

3.2 INSTALLATION OF FOAMED-IN-PLACE INSULATION

A. General: Install Foamed-In-Place Masonry Insulation from interior, or as specified, prior to installation of interior finish work and after all masonry and structural concrete work is in place; comply with manufacturer's instructions.

B. Installation: Fill all open cells and voids in hollow concrete masonry walls where shown on drawings. The foam insulation shall be pressure injected through a series of 5/8" to 7/8" holes drilled into every vertical column of block cells (every 8" on center) beginning at an approximate height of ten (10) feet above the first horizontal row of holes (or as needed) until the void is completely filled. Patch holes with mortar and score to resemble existing surface.

END OF SECTION

SECTION 072726 - FLUID-APPLIED MEMBRANE AND VAPOR AIR BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Fluid-applied membrane air barrier, vapor retarding.

1.2 PERFORMANCE REQUIREMENTS

A. General: Air barrier shall be capable of performing as a continuous vapor-retarding, air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, including installation instructions, use limitations and substrate preparation recommendations.

B. Shop Drawings: Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strip, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.

1. Include details of interfaces with other materials that form part of air barrier.

C. Product certificates.

D. Qualification data.

E. Product test reports.

F. Samples: Submit representative samples of the following approval:
1. Fluid applied air barrier membrane.
2. Transition membrane.
3. Through wall flashing.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: A firm experienced in applying air barrier materials similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Mockups: Before beginning installation of air barrier, build mockups of exterior wall assembly, 8’ long x 8’ wide, incorporating backup wall construction, external cladding, window, door frame and sill, insulation, and flashing to demonstrate surface preparation, crack and joint treatment, and sealing of gaps, terminations, and penetrations of air barrier membrane.

1. Coordinate construction of mockup to permit inspection by Owner's testing agency of air barrier before external insulation and cladding is installed.
2. Include junction with roofing membrane, building corner condition and foundation wall intersection.

C. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.1 FLUID-APPLIED MEMBRANES

A. GENERAL: For each type of material required for the work of this section, provide primary materials that are the product of one manufacturer.

B. FLUID APPLIED MEMBRANES

1. Description: A two part, self-curing, synthetic rubber based material free of solvents, isocyanates and bitumen.

2. Performance Requirements:

Property	**Test Method**	**Typical Value**
Color		Green
Cured Film Thickness	ASTM D 3767 Method A	1.5 mm (0.060 in.) nominal
Solids Content	ASTM D 1644	100%
Air Permeance at 75Pa (0.3 in. water) Differential Pressure	ASTM E 2178	<0.001 L/(s.m^2) (<0.0002 cfm/ft^2)
Assembly Air Permeance at 75Pa (0.3 in. water) Differential Pressure	ASTM E 2357	<0.004 L/s*m^2 (<0.0008 cfm/ft^2)
Water Vapor Permeance	ASTM E 96, Method BW	Less than 4.6 ng/Pa.s.m^2 (0.08 Perms)
Pull Adhesion to Concrete Block (CMU)	ASTM D 4541-02	0.24 N/mm² (35 psi)
Pull Adhesion to Glass Faced Wall Board	ASTM D 4541-02	0.12 N/mm² (18 psi)
Peel Adhesion to Concrete	ASTM D 903 Modified[1]	880 N/m (5 lb./in.)
Elongation	ASTM D 412	500% minimum
Pliability, 180° Bend over 25 mm (1 in.) Mandrel at -30°C (-23°F)	ASTM D 1970	Unaffected
Low Temperature Flexibility and Crack Bridging 3.2mm (1/8in.) crack cycling at –26°C (-15°F)	ASTM C836	Pass
Extensibility over 6.4mm (1/4in.) crack after heat aging	ASTM C836	Pass

Footnote:

a. The membrane is applied to concrete and allowed to cure. Peel adhesion of the membrane is measured at a rate of 50 mm (2 in.) per minute with a peel angle of 90° at room temperature.

3. Acceptable Materials:
   a. Perm-A-Barrier ® Liquid from Grace Construction Products, 62 Whittemore Avenue, Cambridge, MA, or approved equal.

b. Sto Guard Systems – Vapor Seal , Trade name- Sto Guard by Sto Corp, 3800 Camp Creek, Atlanta, GA.
c. W.R. Meadows Air – Shield LMP

Note: Where Grace Products are shown as the basis of design products in the drawings, Sto Guard Components meeting the specification requirements are approved as equal components.

C. TRANSITION MEMBRANE

1. Description: 0.9 mm (36 mils) of self-adhesive rubberized asphalt integrally bonded to 0.1 mm (4 mil) of cross-laminated, high-density polyethylene film to provide a min. 0.1 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed.
2. Performance Requirements:

   a. Water Vapor Transmission: ASTM E 96, Method B: 2.9 ng/m2sPa (0.05 perms) max.
   b. Air Permeance at 75Pa (0.3 in. water) pressure difference: 0.0006 L/(s.m^2) (0.00012 cfm/ft^2) max.
   c. Puncture Resistance: ASTM E 154: 178 N (40 lbs.) min.
   d. Lap Adhesion at –4°C (25°F), ASTM D 1876: 880 N/m (5.0 lbs./in.) of width min.
   e. Low Temperature Flexibility, ASTM D 1970: Unaffected to –43°C (-45°F).
   f. Tensile Strength, ASTM D 412, Die C Modified: min. 2.7 MPa (400 psi)
   g. Elongation, Ultimate Failure of Rubberized Asphalt, ASTM D 412 Die C: min. 200%.

3. Acceptable Materials: Perm-A-Barrier Detail Membrane manufactured by Grace Construction Products. Equal Products will be considered if submitted prior to bid.

D. FLEXIBLE MEMBRANE THROUGH WALL FLASHING

1. Description: 0.8 mm (32 mils) of self-adhesive rubberized asphalt integrally bonded to 0.2 mm (8 mil) of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed.

2. Performance Requirements:
   a. Water Vapor Transmission, ASTM E 96, Method B: 2.9 ng/m2sPa (0.05 perms) max.
   b. Water Absorption, ASTM D 570: Max. 0.1% by weight.
   c. Puncture Resistance, ASTM E 154: 356N (80 lbs.) min.
   d. Tear Resistance
      1.) Initiation ASTM D 1004: Min. 58 N (13.0 lbs.) M.D.
      2.) Propagation ASTM D1938: Min. 40 N (9.0 lbs.) M.D.
   e. Lap Adhesion at-4ºC (25ºF), ASTM D 1876: 880 N/m (5.0 lbs./in.) of width.
   f. Low Temperature Flexibility, ASTM D 1970: Unaffected to -43ºC (-45ºF).
   g. Tensile Strength, ASTM D 412, Die C Modified: Min. 5.5 MPa (800 psi).

h. Elongation, Ultimate Failure of Rubberized Asphalt D412, Die C: Min. 200%

3. Acceptable Materials: Perm-A-Barrier Wall Flashing manufactured by Grace Construction Products or approved equal.

2.2 AUXILIARY MATERIALS

A. Description: Water-based primer which imparts an aggressive, high tack finish on the treated substrate:

1. Flash Point: No flash to boiling point.
2. Solvent Type: Water.
3. VOC Content: Not to exceed 10 g/l.
4. Application Temperature: -4ºC (25ºF) and above.
5. Freezing point (as packaged): -7ºC (21ºF).

Product: Perm-A-Barrier WB Primer manufactured by Grace Construction Products, or approved equal.

B. Description: Two-part, elastomeric, trowel grade material designed for use with self-adhered membranes and tapes. 10 g/l max. VOC Content.

Product: Bituthene ® Liquid Membrane manufactured by Grace Construction Products, or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. The installer shall examine conditions of substrates and other conditions under which this work is to be performed and notify the Contractor, in writing, of circumstances detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods that are acceptable to manufacturer of the fluid-applied waterproofing.

B. Exterior sheathing panels: Ensure that the boards are sufficiently stabilized with corners and edges fastened with appropriate screws. Pre-treat all board joints with 50-75mm (2-3 in.) wide, reinforced self-adhesive tape or fiberglass mesh style wallboard tape. Gaps greater than 6mm (1/4 in.) should be filled with mastic or caulk, allowing sufficient time to fully cure before application of the tape and fluid applied membrane.

C. Masonry Substrates: Apply air and vapor barrier over concrete block and brick with smooth flush mortar joints. Fill all voids and holes, particularly in the mortar joints, with a lean mortar mix, non-shrinking grout or parge coat.

D. Related Materials: Treat construction joints and install flashing as recommended by manufacturer.

3.3 INSTALLATION

A. Refer to manufacturer's literature for recommendations on installation.

B. Application of Fluid Applied Membrane:

1. Spray or trowel apply a continuous uniform film at min. 60 mils (1.5 mm or .060 in.) dry film thickness using multiple, overlapping passes.
2. When spraying use a cross-hatching technique (alternating horizontal and vertical passes) to ensure even thickness and coverage.
3. When spraying use high pressure, multi-component, airless spray equipment approved by material manufacturer.
4. Carry membrane into any openings a minimum of 50 mm (2 in.).
5. Seal all brick-ties and other penetrations as work progresses.

C. Application of Transition Membrane:

1. After allowing the Fluid Applied Membrane to cure to tack-free, apply transition membrane with a minimum overlap of 75mm (3 in.) onto each surface at all beams, columns and joints as indicated in detail drawings.
2. Tie in to window and door frames, spandrel panels, roof and floor intersections and changes in substrate.
3. Use pre-cut, easily handled lengths for each location.
4. Remove silicone-coated release paper and position membrane flashing carefully before placing it against the surface.
5. When properly positioned, place against surface by pressing firmly into place by hand roller.
6. Overlap adjacent pieces 50 mm (2 in.) and roll all seams with a hand roller.
7. Seal top edge of flashing with termination mastic.
8. When transition flashing is pre-installed prior to application of Fluid Applied Membrane, apply transition flashing as above. Spray or trowel a continuous uniform film of Fluid Membrane at min. 60 mils (1.5 mm or .060 in.) dry film thickness using multiple, overlapping passes, with a minimum overlap of 75 mm (3 in.) onto transition flashing. For sill condition, spray or trowel Fluid Membrane onto pre-installed sill flashing and onto horizontal section of sill.

D. Application of Flexible Membrane Wall Flashing:

1. Precut pieces of flashing to easily handled lengths for each location.
2. Remove silicone-coated release paper and position flashing carefully before placing it against the surface.

3. When properly positioned, place against surface by pressing firmly into place by hand roller. Fully adhere flashing to substrate to prevent water from migrating under flashing.
4. Overlap adjacent pieces 50 mm (2 in.) and roll all seams with a hand roller.
5. Trim bottom edge 13mm (1/2 in.) back from exposed face of the wall. Flashing shall not be permanently exposed to sunlight.
6. At heads, sills and all flashing terminations, turn up ends a minimum of 50 mm (2 in.) and make careful folds to form an end dam, with the seams sealed.
7. Seal top edge of flashing with termination mastic.
8. Do not allow the rubberized asphalt surface of the flashing membrane to come in contact with poly-sulfide sealants, creosote, uncured coal tar products or EPDM.

3.4 PROTECTION AND CLEANING

A. Remove any masking materials after installation. Clean any stains on materials that would be exposed in the completed work using procedures as recommended by manufacturer.

B. Perm-A-Barrier Liquid is not suitable for permanent exposure and should be protected from the effects of sunlight.

C. Schedule work to ensure that the Perm-A-Barrier Liquid system is covered as soon as possible after installation. Protect Perm-A-Barrier Liquid system from damage during subsequent operations. If the Perm-A-Barrier Liquid system cannot be covered within 60 days after installation, apply temporary UV protection such as dark plastic sheet or tarpaulins.

END OF SECTION 072726

SECTION 074100 PREFORMED ALUMINUM SOFFIT PANELS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This section covers the pre-finished, prefabricated Factory Manufactured Aluminum Soffit System. All metal trim, accessories, fasteners, insulation, and sealants indicated on the drawings are part of this section

1.2 QUALITY ASSURANCE

A. Petersen Aluminum Corp, Acworth, GA, 800-272-4482 products establish a minimum of quality required.
B. Manufacturer and erector shall demonstrate experience of a minimum of five (5) years in this type of project.

1.3 SUBSTITUTIONS

A. The material, products and equipment specified in this section establish a standard for required function, dimension, appearance, and quality to be met by any proposed substitution.

1.4 SYSTEM DESCRIPTION

A. Material to comply with:
    0. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

1.5 SOFFIT SYSTEM PERFORMANCE TESTING

A. Soffit System shall be designed to meet Standard Building Code wind load requirements.
B. Soffit System shall be designed to meet applicable Local Building Code and the Soffit System shall have been tested by the Manufacturer per ASTM E-330 and have the applicable Load Tables published from this Air Bag testing for negative loads.

1.6 WARRANTIES

A. Finish warranty: Manufacturer's standard form in which manufacturer agrees to repair finish or replace standing seam metal roof panels that show evidence of deterioration of factory-applied finish within specified warranty period.
    0. Exposed Panels Finish - deterioration includes the following:
        . Color fading more than 5 hunter units when tested according to ASTM D 2244
        a. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214
        b. Cracking, checking, peeling or failure of a paint to adhere to a bare metal.
    1. Warranty Period: 20 Years from the date of substantial completion

1.7 SUBMITTALS

A. Furnish detailed drawings showing profile and gauge of exterior sheets, location and type of fasteners, location, gauges, shape and method of attachment of all trim locations and types of sealants, and any other details as may be required for a weather-tight installation.
B. Provide finish samples of all colors specified.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver components, sheets, metal soffit panels and other manufactured items so as not to be damaged or deformed. Package metal soffit panels for protection during transportation and handling.
B. Unload, store and erect metal soffit panels in a manner to prevent bending, warping, twisting and surface damage.
C. Stack metal soffit panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal soffit panels to ensure dryness. Do not store metal soffit panels in contact with other materials that might cause staining, denting or other surface damage.
D. Protect strippable protective coating on any metal coated product from exposure to sunlight and high humidity, except to the extent necessary for material installation.

1.8 PROJECT CONDITIONS

A. Weather Limitations: proceed with installation only when existing and forecasted weather conditions permit metal roof panel work to be performed.
B. Field Measurements: Verify actual dimensions of construction contiguous with metal roof panels by field measurements before fabrication

PART 2 - PRODUCTS

2.1 PANEL DESIGN

A. Flush soffit panels shall be 12" wide by 3/8" deep and manufacturer shall be able to provide all three options of panel surface: Full Vent, Half Vent or Solid Soffit in the specified color (s).

2.2 ACCEPTABLE MANUFACTURERS

A. This project is specified around the roofing product of Petersen Aluminum Corporation, Petersen Aluminum Corp, Acworth, GA, 800-272-4482, PAC-850 Soffit.
B. Other acceptable manufacturers if they comply with specification:
    0. IMETCO, Tucker, GA, Soffit Panel only
    1. ATAS Aluminum, Allentown, PA, "Wind-Lock" Panel only

2.3 MATERIALS AND FINISHES

A. Materials: ASTM B-209 quality aluminum, 3105-H14 Alloy and Temper material. Aluminum shall be tension leveled (temper passed and stretcher leveled) with camber of a maximum of 1/4" in 20 feet, manufactured in the USA, and shall be .032" thick aluminum, US standard grade.
    0. Color shall be PAC-CLAD Kynar 500.
    1. Panel Surface shall be: Solid. Provide full vent panels at locations indicated on the Reflected Ceiling Plan.
B. Finishes: Finish shall be Kynar 500 or Hylar 5000 Fluorocarbon coating with a top side film thickness of 0.70 to 0.90 mil over 0.25 to 0.31 mil prime coat to provide a total dry film thickness of 0.95 to 1.25 mil. Finish shall conform to tests for adhesion, flexibility and longevity as specified by Kynar 500 or Hylar 5000 finish supplier.
C. Field protection must be provided by the Contractor at the job site so material is not exposed to weather and moisture.
D. If any strippable film coating is applied to any pre-finished panels or materials for protection during shipping, strippable film shall be removed prior to installation.
E. Forming: use continuous and rolling method. No end laps on panels. No "portable rollforming" machines will be permitted on this project; no installer-owned or installer-rented machines shall be permitted. It is the intent of the Architect to provide Factory-Manufactured soffit systems only for this project.
F. Trim: Trim shall be fabricated of the same material and finish to match the profiled sheeting and press broken in lengths of 10 - 12 feet. Trim shall be formed only by the manufacturer or their approved dealer. Trim to be erected in overlapped condition. Use lap strips only as indicated on drawings. Miter conditions shall be factory welded material to match the sheeting.
G. Fasteners: Fasteners shall be 400 series stainless steel, dished washers stainless steel with bonded neoprene.
H. Zees: Where required by design of primary structural framing system, zees shall be used to span between beams and/or other joists. Thermally responsive base and top clips shall be fastened to the zees on 12" centers.

2.4 SEALANTS

A. Provide two-part polysulfide class B non-sag type for vertical and horizontal joints or
B. One part polysulfide not containing pitch or phenolic extenders or
C. Exterior grade silicone sealant recommended by roofing manufacturer or
D. One-part non-sag, gun grade exterior type polyurethane recommended by the roofing manufacturer.

2.5 FABRICATION

A. Comply with dimensions, profile limitations, gauges and fabrication details shown and if not shown, provide manufacturer's standard product fabrication.
B. Fabricate components of the system in factory, ready for field assembly.
C. Fabricate components and assemble units to comply with fire performance requirements specified.
D. Apply specified finishes in conformance with manufacturer's standard, and according to manufacturer's instructions.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine alignment of structural steel and related supports, primary and secondary roof framing, solid roof sheathing, prior to installation.
B. For the record, prepare written report, endorsed by installer, listing conditions detrimental to performance of the Work.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FASTENERS

A. Secure units to supports
B. Place fasteners as indicated in manufacturer's standards.

3.3 INSTALLATION

A. Panels shall be installed plumb and true in a proper alignment and in relation to the structural framing. The erector must have at least five years successful experience with similar applications.
B. Install soffit panels, fasteners, trim and related sealants in accordance with approved shop drawings and as may be required for a weather-tight, complete and architecturally pleasing installation.
C. Remove all strippable coating and provide a dry wipe down cleaning of the panels as they are erected.
D. Panels attached to any TREATED LUMBER MUST HAVE AN APPROPRIATE VAPOR BARRIER INSTALLED OVER THE TREATED LUMBER PRIOR TO INSTALLING ANY SOFIT PANELS OR RELATED FLASHINGS. DO NOT ALLOW ANY METAL PRODUCTS TO COME INTO DIRECT CONTACT WITH TREATED LUMBER

3.4 DAMAGED MATERIAL

A. Upon determination of responsibility, repair or replace damaged metal panels and trim to the satisfaction of the Architect and Owner.

END OF SECTION

SECTION 074113 - INSULATED METAL ROOF PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Foamed-insulation-core standing seam metal roof panels, with related metal trim and accessories.

1.3 RELATED REQUIREMENTS

A. Division 05 Section "Structural Steel Framing" for steel framing supporting metal panels.

B. Division 05 Section "Cold-Formed Metal Framing" for cold-formed metal framing supporting metal panels.

C. Division 07 Section "Metal Wall and Roof Panels" for factory-formed metal wall, roof, and soffit panels.

D. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal copings, flashings, reglets and roof drainage items in addition to items specified in this Section.

E. Division 07 Section "Manufactured Roof Specialties" for manufactured copings, reglets, and roof drainage items in addition to items specified in this Section.

F. Division 07 Section "Roof Accessories" for roof hatches, smoke vents, equipment curbs, and equipment supports.

G. Division 07 Section "Joint Sealants" for field-appliedJoint Sealants.

H. Division 13 Section "Metal Building Systems" for steel framing supporting metal panels.

1.4 REFERENCES

A. American Society of Civil Engineers (ASCE): www.asce.org/codes-standards:

1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

B. ASTM International (ASTM): www.astm.org: Use where applicable.

1. ASTM A 653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM A 755 - Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
3. ASTM A 792 - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
4. ASTM A 924 – General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
5. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus
6. ASTM D 1621 – Compressive Properties of Rigid Cellular Plastics.
7. ASTM D 1622 – Apparent Density of Rigid Cellular Plastics.
8. ASTM D 6226 - Standard Test Method for Open Cell Content of Rigid Cellular Plastics
9. ASTM C 518 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

10. ASTM D 2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
11. ASTM D 4214 - Test Methods for Evaluating Degree of Chalking of Exterior Paint Films.
12. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
13. ASTM E 84 - Test Methods for Surface Burning Characteristics of Building Materials.
14. ASTM E 1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
15. ASTM E 1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.
16. ASTM E 1680 - Standard Test Method for Rate of Air Leakage through Exterior Metal Roof Panel Systems.
17. ASTM E 1980 - Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

C. Cool Roof Rating Council (CRRC): www.coolroofs.org/productratingprogram.html:

1. CRRC-1-2016 – CRRC Product Rating Program.

D. FM Global (FM): www.fmglobal.com:

1. ANSI/FM 4471 - Approval Standard for Class 1 Panel Roofs.
2. ANSI/FM 4880 - American National Standard for Evaluating Insulated Wall and Roof/Ceiling Assemblies.

1.5 QUALITY ASSURANCE

A. Manufacturer/Source: Provide metal panel assemblies and accessories from a single manufacturer approved under an accredited third-party quality control program

B. Manufacturer Qualifications: Approved manufacturer listed in this Section with minimum ten years' experience in the manufacturing of similar products and successful use in similar applications.

1. Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:

a. Product data, including certified independent test data indicating compliance with requirements.
b. Samples of each component.
c. Sample submittal from similar project.
d. Project references: Minimum of five installations not less than five years old, with Owner and Architect contact information.
e. Sample warranty.
f. Certificate from an accredited third-party Quality Control Program.

1.6 Substitutions following award of contract are not allowed except as stipulated in Division 01 General Requirements

1.7 Approved manufacturers must meet separate requirements of Submittals Article.

A. Installer Qualifications: Experienced Installer with minimum of five years' experience with successfully completed projects of a similar nature and scope.

1. Installer's Field Supervisor: Experienced mechanic certified by metal panel manufacturer supervising work on site whenever work is underway.

1.8 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Prior to erection of framing, conduct preinstallation meeting at site attended by Owner, Architect, metal panel installer, metal panel manufacturer's technical representative, inspection agency, and related trade contractors.

1. Coordinate building framing in relation to metal panel system.
2. Coordinate openings and penetrations of metal panel system.
3. Coordinate work of Division 07 Sections "Roof Specialties" and "Roof Accessories" and openings and penetrations and manufacturer's accessories with installation of metal panels.

1.9 ACTION SUBMITTALS

A. Product Data: Manufacturer’s data sheets for specified products.

B. Shop Drawings: Show layouts of metal panels. Include details of each condition of installation, panel profiles, and attachment to building. Provide details at a minimum scale 1-1/2-inch per foot of edge conditions, joints, fastener and sealant placement, flashings, openings, penetrations, curbs, vents, snow guards, lightning arresting equipment, and special details. Make distinctions between factory and field assembled work.

1. Include data indicating compliance with performance requirements.
2. Indicate points of supporting structure that must coordinate with metal panel system installation.
3. Include structural data indicating compliance with performance requirements and requirements of local authorities having jurisdiction.

C. Samples for Initial Selection: For each exposed product specified including sealants. Provide representative color charts of manufacturer's full range of colors.

D. Samples for Verification:

1. Provide 12-inch - long section of each metal panel profile.
2. Provide color chip verifying color selection.

1.10 INFORMATIONAL SUBMITTALS

A. Product Test Results: Indicating compliance of products with requirements.

B. Qualification Information: For Installer firm and Installer’s field supervisor.

C. Accreditation Certificate: Indicating that manufacturer is accredited under an accredited third-party quality control program, including IAS AC472 and based upon chapter 17 of the International Building Code (IBC).

D. Warranty:

1. Submit manufacturer’s written two (2) year limited warranty providing panels to be free from defects in materials and workmanship, beginning from the date of substantial completion excluding coil coatings (paint finishes) that are covered under a separate warranty.
2. The installation contractor shall issue a separate warranty against defects in installed materials and workmanship, beginning from the date of substantial completion of the installation.

1.11 CLOSEOUT SUBMITTALS

A. Maintenance data.

B. Manufacturer's Warranty: Executed copy of manufacturer's warranty.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Protect products of metal panel system during shipping, handling, and storage to prevent staining, denting, deterioration of components, or other damage. Protect panels and trim bundles during shipping. Protect painted surfaces with a protective covering before shipping.

1. Deliver, unload, store, and erect metal panels and accessory items without misshaping panels or exposing panels to surface damage from weather or construction operations.
2. Store in accordance with Manufacturer's written instructions. Provide wood collars for stacking and handling in the field.
3. Shield foam insulated metal panels from direct sunlight until installation.

1.13 WARRANTY

A. Special Manufacturer’s Warranty: Submit Manufacturer’s two (2) year limited warranty providing panels to be free from defects in materials and workmanship, beginning from the date of substantial completion excluding coil coatings (paint finishes) that are covered under a separate warranty.

B. The installation contractor shall issue a separate warranty against defects in installed materials and workmanship, beginning from the date of substantial completion of the installation.

C. Special Panel Finish Warranty: Submit Manufacturer’s limited warranty on the exterior paint finish for adhesion to the metal substrate and limited warranty on the exterior paint finish for chalk and fade.

1. Fluoropolymer Two-Coat System:
   a. Color fading more than 5 or 10 for copper, silver metallic and bright red; Hunter units per ASTM D 2244.
   b. Chalking more than 6 for copper, silver metallic and bright red or 8 rating per ASTM D 4214.
   c. Failure of adhesion, peeling, checking, or cracking.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis of Design Manufacturer: Metl-Span, a Nucor company; Lewisville, Texas Tel: 972.221.6656; Email: info@metlspan.com; Web: metlspan.com

1. Provide basis of design product, or comparable product approved by Architect ten days prior to bid.

2.2 PERFORMANCE REQUIREMENTS

A. General: Provide metal panel system meeting performance requirements as determined by application of specified tests by a qualified testing facility on manufacturer's standard assemblies.

B. Roof Panel Radiative Property Performance:
1. Energy Star Qualified: Listed on USDOE ENERGY STAR Roof Products Qualified Product List.
2. Cool Roof Rating Council: Listed in CRRC Rated Product Directory, with minimum properties as required by applicable Energy efficiency or High-Performance Green Building standard.

C. Structural Performance: Provide metal panel assemblies capable of withstanding the effects of indicated loads and stresses within limits and under conditions indicated, as determined by ASTM E 72 or ASTM E 1592 applied in accordance with ICC AC 04, Section 4, Panel Load Test Option or Section 5, Panel Analysis Option:

1. Wind Loads: Determine loads based on uniform pressure, importance factor, exposure category, and basic wind speed indicated on drawings.

    a. Roof Panel Wind Uplift Testing: Certify capacity of metal panels by testing of proposed assembly per ASTM E 72 or ASTM E 1592.

2. Deflection Limits: Withstand inward and outward wind-load design pressures in accordance with applicable building code with maximum deflection of 1/180 of the span with no evidence of failure.

D. Roof Panels FM Approvals Listing: Comply with FM Approvals 4471 as part of a panel roofing system, and that are listed in FM Approvals' "RoofNav" for Class 1 construction.

1. Fire/Windstorm Classification: Class 1A-90
2. Hail Resistance Rating: SH.

E. Fire Performance Characteristics: Provide metal panel systems with the following fire-test characteristics determined by indicated test standard as applied by UL or other testing and inspection agency acceptable to authorities having jurisdiction.

1. Surface-Burning Characteristics: Provide metal panel systems with the following characteristics when tested per ASTM E 84. The core shall have:

    a. Flame spread index: 25 or less.
    b. Smoke developed index: 450 or less.

2. Fire Performance of Insulated Roof: Class 1 roof and wall panel per ANSI/FM 4880.

F. Roof Panel Air Infiltration, ASTM E 1680: Maximum 0.023 cfm/sq. ft at static-air-pressure difference of 12 lbf/sq. ft.

G. Roof Panel Water Penetration Static Pressure, ASTM E 1646: No uncontrolled water penetration at a static pressure of 20 lbf/sq. ft.

H. Test procedure for susceptibility to leakage of discontinuous roof systems protocol TAS 114: Water applied to a depth of 6” above the lowest section of roof profile. No water infiltration observed during the seven-day test period.

I. Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction. Allow for deflection and design for thermal stresses caused by temperature differences from one side of the panel to the other.

J. Thermal Performance: When tested in accordance with ASTM C 518, Measurement of Steady State thermal Transmission, the panels shall provide a k factor of 0.114 btu/sf/hr/deg F at a 35° F mean temperature.

2.3 INSULATED METAL ROOF PANELS

A. Standing Seam, Foamed-Insulation-Core Metal Roof Panels: Structural metal panels consisting of an exterior standing seam with an interior tongue and groove joint, coupled with a vapor seal in the standing seam, and provides superior resistance to air and moisture intrusion. Attached with concealed fasteners to the structure.

1. Basis of Design: Metl-Span**,** CFR Insulated Metal Panel.

2. G-90 Galvanized Coated Steel: ASTM A 653 or Aluminum-Zinc Alloy-Coated Steel: ASTM A 792/A 792M, structural quality, Grade 50, Coating Class AZ50 (Grade 340, Coating Class AZM150), pre-painted by the coil-coating process per ASTM A 755/A 755M.

3. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, structural quality, Grade 50, Coating Class AZ55 (Grade 340, Coating Class AZM165) unpainted Galvalume Plus coating.

4. Exterior Face Sheet: 24 gauge coated thickness, with stucco embossed surface.
    1) Finish: Fluoropolymer two-coat metallic color system.
    2) Color: As selected by Architect from manufacturer's standard colors.

5. Interior Face Sheet: 24 gauge coated thickness, with stucco embossed surface Mesa profile.
    1) Finish: Polyester two-coat system
    2) Color: As selected by Architect from manufacturer's standard colors.

6. End-laps: Provide panels with factory end-laps, notching, swedging and backer plates; where panel lengths permit.

7. Low Eave Treatment: Provide cutback for trim/gutter installation; where panel lengths permit.

8. Panel Width: 36 inches.

6. Panel Thickness: as shown on drawings.

7. Insulating Core: Polyurethane with zero ozone depletion potential blowing agent
    a. Closed Cell Content: 90% or more as determined by ASTM D 6226.
    b. Compressive Strength: As required to meet structural performance requirements and with a minimum of 22 psi as determined by ASTM D 1621.
    c. Shear Strength: As required to meet structural performance requirements and with a minimum of 36 psi as determined by ASTM C 273.
    d. Tensile Strength: As required to meet structural performance requirements and with a minimum of 41 psi ASTM D 1623.
    e. Minimum Density: 2.0 pcf as determined by ASTM D 1622.

    d. Thermal Resistance (R-Value): R-30 as determined by ASTM C 518 at 35 degrees Fahrenheit mean temperature.

8. Heat Transfer Coefficient (U-factoras determined by ASTM C 1363 at 35 degrees Fahrenheit mean temperature. Tested specimen must include at least two engaged side joints.

2.4 METAL ROOF PANEL ACCESSORIES

A. General: Provide complete metal panel assemblies incorporating trim, copings, fasciae, gutters and downspouts, and miscellaneous flashings. Provide required fasteners, closure strips, and sealants as indicated in manufacturer's written instructions.

B. Flashing and Trim: Match material, thickness, and finish of metal panel face sheet.

C. Panel Fasteners: Self-tapping screws and other acceptable fasteners recommended by metal panel manufacturer. Provide corrosion-resistant fasteners with heads matching color of metal panels by means of factory-applied coating, with weathertight resilient washers.

D. Joint Sealers: Provide Tape Mastic Sealants and Concealed Joint Sealants per Section 079200, “Joint Sealants”.

E. Roof Accessories: (If Applicable) Approved by metal panel manufacturer. Refer to Section 0772 00 "Roof Accessories" for requirements for curbs, equipment supports, roof hatches, heat and smoke vents, ventilators, and preformed flashing sleeves.

F. Snow Guards: (If Applicable) Compatible with standing seam roof and approved by metal panel manufacturer. Refer to Section 077253 "Snow Guards" for requirements for snow guards attached to metal roof panels.

G. Roof Curbs: (If Applicable) Compatible with standing seam roof and approved by metal panel manufacture. Refer to Section 07 72 10 “Roof Curbs” for requirements for roof curbs attached to metal roof panels.

2.5 FABRICATION

A. General: Provide factory fabricated and finished metal panels, trim, and accessories meeting performance requirements, indicated profiles, and structural requirements.

B. Fabricate metal panel joints configured to accept sealant tape providing weathertight seal and preventing metal-to-metal contact and minimizing noise resulting from thermal movement.

C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's written instructions, approved shop drawings, and project drawings.

2.6 FINISHES

A. Finishes, General: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

B. Exterior Face Sheet Coil-Coated Finish System

1. Fluoropolymer Two-Coat System: 0.2 – 0.3 mil primer with 0.7 - 0.8 mil 70 percent PVDF fluoropolymer color coat, [meeting solar reflectance index requirements].
   a. Basis of Design: Metl-Span, Fluoropolymer.

C. Interior Face Sheet Coil-Coated Finish System:

1. Fluoropolymer Two-Coat System: 0.2-mil primer with 0.7 - 0.8 mil 70 percent PVDF fluoropolymer color coat
   a. Basis of Design: Metl-Span, Fluoropolymer

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine metal panel system substrate with Installer present. Inspect for erection tolerances and other conditions that would adversely affect installation of metal panels.

1. Inspect framing that will support insulated metal panels to determine if support components are installed as indicated on approved shop drawings and are within tolerances acceptable to metal panel manufacturer and installer. Confirm presence of acceptable framing members at recommended spacing to match installation requirements of metal panels.

2. Panel Support Tolerances: Confirm that metal panel supports are within tolerances acceptable to metal panel manufacturer but not greater than the following:

    a. 1/4 inch in 20 foot in any direction.
    b. 3/8 inch over any single roof plane.
    c. At Purlin Spacing 7 feet or less: 1/8 inches, out only.

B. Correct out-of-tolerance work and other deficient conditions prior to proceeding with insulated metal panel installation.

3.2 METAL PANEL INSTALLATION

A. Standing Seamed, Concealed-Fastener Insulated Metal Panels: Install metal panel system in accordance with manufacturer's written instructions, approved shop drawings, and project drawings. Install metal panels in orientation, sizes, and locations indicated. Anchor panels and other components securely in place. Provide for thermal and structural movement.

B. Attach panels to metal framing using clips, fasteners, and sealants recommended for application by metal panel manufacturer.

1. Fasten metal panels to supports with fasteners at each location indicated on approved shop drawings, at spacing and with fasteners recommended by manufacturer.
2. Cut panels in field where required using manufacturer's recommended methods.
3. Provide weatherproof jacks for pipe and conduit penetrating metal panels.
4. Dissimilar Materials: Where elements of metal panel system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by metal panel manufacturer.

C. Attach panel flashing trim pieces to supports using recommended fasteners and joint sealers.

D. Joint Sealers: Install tape sealers and liquid sealants where indicated and where required for weatherproof performance of metal panel assemblies.

1. Seal panel side and perimeter joints using joint sealers indicated in manufacturer's instructions.
2. Seal roof panel joints utilizing tape sealer and vapor seal bead of non-curing butyl.
3. Prepare joints and apply sealants per requirements of Division 07 Section "Joint Sealants."

3.3 ACCESSORY INSTALLATION

A. General: Install metal panel accessories with positive anchorage to building and weathertight mounting; provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel assembly, including trim, copings, flashings, sealants, closure strips, and similar items.
2. Comply with details of assemblies utilized to establish compliance with performance requirements and manufacturer's written installation instructions.
3. Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently weather resistant.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage an independent testing and inspecting agency acceptable to Architect to perform field tests and inspections and to prepare test reports.

3.5 CLEANING AND PROTECTION

A. Remove temporary protective films immediately in accordance with metal panel manufacturer's instructions. Clean finished surfaces as recommended by metal panel manufacturer.

B. Replace damaged panels and accessories that cannot be repaired to the satisfaction of the Architect.

END OF SECTION

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SECTION 074200 – PREFORMED METAL ROOFING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Pre-finished standing seam - interlocking metal roofing.
B. Accessories and trim for metal roofs.

1.2 RELATED SECTIONS

A. Section 07620 - Flashing and Sheet Metal.

1.3 QUALITY ASSURANCE

A. Applicable Standards:

1. SMACNA: “Architectural Sheet Metal Manual”, Sheet Metal and Air Conditioning Contractors National Association, Inc.

2. AISC: “Steel Construction Manual”, American Institute of Steel Construction.

3. AISI: “Cold Form Steel Design Manual”, American Iron and Steel Institute.

4. ASTM A 792-83-AZ50: “Specifications for Steel Sheet, Aluminum-Zinc Alloy Coated (Galvanized) by the Hot Dip Process, General Requirements (Galvalume)”, American Society for Testing and Materials.

5. ASTM E 1514-93: “Standard Specification for Structural Standing Seam Steel Roof Panel Systems”, American Society for Testing and Materials.

6. UL: “Tests for Uplift Resistance of Roof Assemblies”, Underwriters Laboratories, Inc.

7. ASTM E 1592-95: “Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference”, American Society for Testing and Materials.

8. ASTM E 1680-95: “Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems”, American Society for Testing and Materials.
9. ASTM E 1646-95: “Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference”, American Society for Testing and Materials.

B. Manufacturer’s Qualifications:

1. Manufacturer has a minimum of three years’ experience in manufacturing panels

of this nature. Panels specified in this section shall be produced in a factory environment (not job site) with fixed base roll forming equipment to assure the highest level of quality control. A letter certifying compliance should accompany the product material submittal.

C. Installer's Qualifications:

1. Installer of the system shall be an approved installer, certified by the manufacturer, and meet the following minimum criteria:

a. Maintain a $250,000 general liability coverage for each loss.

b. Maintain sufficient worker's compensation coverage as mandated by law.

c. No viable claims pending regarding negligent acts or defective workmanship on previously performed or current projects.

d. Has not filed for protection from creditors under any state or federal insolvency or debtor relief statutes or codes.

e. Project foreman is the person having received specific training in the proper installation of the specified system and will be present to supervise whenever material is being installed. Specific training program shall include the following:

1. The instructor must have a minimum of 10 years' experience.

2. A formal curriculum.

3. Classroom instruction with review and thorough understanding of the specific product's technical manual.

4. Hands-on-mock-up instruction with a review and thorough understanding of the specific product's details.

5. The installer must pass a written and oral exam.

f. Provide five references from five different architects or building owners for projects that have been in service for a minimum of two years, stating satisfactory performance by the installer.

g. Provide certification letter that installer has a minimum of three years of metal product installation experience immediately preceding the date upon which work is to commence.

1.3A SYSTEM PERFORMANCE REQUIREMENTS

A. Performance Testing:

1. Metal roof system must be tested in accordance with Underwriters Laboratories,

Inc. (UL) Test Method 580 “Tests for Uplift Resistance of Roof Assemblies”.

2. Metal roof system must be installed in accordance with UL Construction methods that pertain to the system specified.

3. Metal roof system must be tested in accordance with ASTM E 1592-95 for negative loading when AISI specifications do not apply. Determine panel bending and clip - to - panel strength by testing in accordance with ASTM E 1592-95. Capacity for gauge, span or loading other than those tested may be determined by interpolating test values only.

4. Metal roof system must meet the air infiltration requirements of ASTM E 282-84 when tested with a 6.24 PSF pressure differential with resulting air infiltration of 0.0071 cfm/sq. ft.

5. Metal roof system must meet the water penetration requirements of ASTM E 331-83 when tested with a 6.24 PSF pressure differential with no uncontrollable water leakage when five gallons per hour of water is sprayed per square foot of roof area.

6. Metal roof system must meet the wind conditions of the project requirements as/if stated on Structural Drawings.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's product specifications, standard details, certified product test results, installation instructions and general recommendations, as applicable to materials and finishes for each component and for total system of preformed panels.

B. Samples: Submit two samples, 12" square, of each exposed finish material.

C. Shop Drawings: Submit small-scale layouts of panels on roofs, and large-scale details of edge conditions, joints, corners, custom profiles, supports, anchorages, trim, flashings, closures, and special details. Distinguish between factory and field assembly work.

D. Engineering data is to be provided for the roof system to include design pressures, clips, panels, fastener locations, etc. Engineering data is to be signed and sealed by an engineer registered in the State of Alabama.

1.5 WARRANTIES

A. Metal roof system manufacturer, upon final acceptance for project, furnish a warranty covering bare metal against rupture, structural failure and perforation due to normal atmospheric corrosion exposure for a period of 20 years.

B. Covering paint finish against cracking, checking, blistering, peeling, flaking, chipping, chalking and fading for a period of twenty (20) years for roof panels and for wall panels (see 2.2, E. Finishes).

C. Metal roof manufacturer, upon final acceptance of this project, shall provide a 20-year

weathertight warranty covering wind with 2 second gusts up to 130 mph.

D. Standard manufacturer's roofing guarantees which contain language regarding the governing of the guarantee by any state other than the State of Alabama, must be amended to exclude such language, and substituting the requirement that the Laws of the State of Alabama shall govern all such guarantees.

1.6 TEST REPORTS:

E. Submit Test Reports showing that metal panels have been tested in accordance with the Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference of ASTM E 1592-95.

F. Submit Test Reports showing that metal panels meet the air infiltration requirements of ASTM E 1680-95 when tested with a 6.24 PSF pressure differential with resulting air infiltration of 0.0071 cfm/sq. ft.

G. Submit Test Reports showing that metal panels meet the water penetration requirements of ASTM E 1646-95 when tested with a 12.00 PSF pressure differential with no uncontrollable water leakage when five gallons per hour of water is sprayed per square foot of roof area.

1.7 METAL ROOF SYSTEM FABRICATION CERTIFICATION:

A. Submit a letter from the metal roof system manufacturer certifying the panels have been produced in a factory environment (not job site roll formed) with fixed-base roll forming equipment.

1.8 THIRD PARTY METAL ROOF CONSULTANT APPROVAL:

A. Submit a letter from the metal roof system manufacturer indicating acceptance of the general contractor's third-party metal roofing consultant for use on this specific project.

1.9 INSTALLATION CONTRACTOR'S QUALIFICATIONS:

A. Submit certificate from manufacturer certifying that installer of the metal roof system has met all of the criteria outlined in "1.02 C. Installer's qualifications" and is an authorized installer certified by the manufacturer within one year of the beginning of installation of the metal roof system.

B. Submit the formal syllabus for the classroom and hands-on training.

C. Submit five references from five different architects or building owners for projects that have been in service for a minimum of two years, stating satisfactory performance by the installation contractor.

1.10 METAL ROOF SYSTEM INSTALLATION INSPECTION REPORTS:

A. Submit written and photographic metal roof system installation inspection reports from the general contractor's third-party metal roof consultant appraising the installation of the metal roof system. The written and photographic inspection reports are to be submitted to the architect (owner), metal roof system manufacturer, metal roof system installation contractor and general contractor.

B. A separate report is to be submitted for each of the following stages of the metal roof system installation:

1. At final completion of all metal roof system work.

1.11 PRE-ROOFING CONFERENCE

A. A Pre-Roofing Conference is required before any roofing materials are installed. This conference shall be conducted by a representative of the Architect and attended by representatives of the Owner, General Contractor, Roofing Contractor, Sheet Metal Contractor, Roof Deck Manufacturer (if applicable), and the Roofing Materials Manufacturer (if warranty is required of this manufacturer). If equipment of substantial size is to be placed on the roof, the Mechanical Contractor must also attend this meeting.

B. The Pre-Roofing Conference is intended to clarify demolition (for renovation or re-roofing projects) and application requirements for work to be completed before roofing operations can begin. This would include a detailed review of the specifications, roof plans, roof deck information, flashing details, and approved shop drawings, submittal data, and samples. If conflict exists between the specifications and the Manufacturer's requirements, this shall be resolved. If this pre-roofing conference cannot be satisfactorily concluded without further inspection and investigation by any of the parties present, it shall be reconvened at the earliest possible time to avoid delay of the work. In no case should the work proceed without inspection of all roof deck areas and substantial agreement on all points.

The following are to be accomplished during the conference:

1. Review all Factory Mutual and Underwriter's Laboratories requirements listed in the specifications and resolve any questions or conflicts that may arise.

2. Establish trade-related job schedules, including the installation of roof mounted mechanical equipment.
3. Establish roofing schedule and work methods that will prevent roof damage.

4. Require that all roof penetrations and walls be in place prior to installing the roof.
1. Establish those areas on the job site that will be designated as work and storage areas for roofing operations.

5. Establish weather and working temperature conditions to which all parties

must agree.

6. Establish acceptable methods of protecting the finished roof if any trades must travel across or work on or above any areas of the finished roof.

The Architect shall prepare a written report indicating actions taken and decisions made at this pre-roofing conference. This report shall be made a part of the project record and copies furnished to the General Contractor, the Owner, the Building Commission, and the Building Commission Inspector."

PART 2 - PRODUCTS

2.1 METAL ROOF PANELS

A. Mechanically-seamed, Concealed Fastener, Metal Roof Panels: Structural metal roof panel consisting of formed metal sheet with vertical ribs at panel edges, installed by lapping and mechanically interlocking edges of adjacent panels, and attaching panels to supports using concealed clips and fasteners in a weathertight installation.

1. Basis of Design: MBCI, BattenLok HS, www.mbci.com/battenlokHS.html or equal.
a. Morin/Kingspan Corporation.

2. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, structural quality, Grade 50, Coating Class AZ50 (Grade 340, Coating Class AZM150), prepainted by the coil-coating process per ASTM A 755/A 755M.

a. Nominal Coated Thickness: 24 gage.
b. Panel Surface: Smooth with striations in pan.

c. Exterior Finish: Fluoropolymer two-coat system.

d. Color: As selected by Architect from manufacturer's standard colors.

4. Panel Width:16 inches.

5. Panel Seam Height: 2 inches.

6. Joint Type: Mechanically seamed.

2.3 MISCELLANEOUS MATERIALS

A. Internal Panel Framing: Manufacturer's standard.

B. Fasteners: Manufacturer's standard noncorrosive types, with exterior heads gasketed.

C. Accessories: Provide all components required for a complete metal roofing system, including trim, corner units, ridge vents, clips, seam covers, battens, flashings, sealants, gaskets, fillers, closure strips, valleys and similar items. Match materials/finishes of preformed panels.

C. Bituminous Coating: Cold-applied asphalt mastic, SSPC paint 12, compounded for 15 mil dry film thickness per coat.

D.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with panel fabricator's and material manufacturer's instructions and recommendations for installation, as applicable to project conditions and supporting substrates. Anchor panels and other components of the work securely in place, with provisions for thermal/structural movement.

1. Install roof panels with concealed fasteners.

B. Installation Tolerances: Shim and align panel units within installed tolerance of 1/4" in 20'-0" on level/plumb/slope and location/line as indicated, and within 1/8" offset of adjoining faces and of alignment of matching profiles.

C. Seaming: Complete seaming of panel joints by operation of portable power-driven equipment of type recommended by panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers and sealants where indicated and where required for weatherproof performance of panel systems. Provide types of gaskets and sealants/fillers indicated or, if not otherwise indicated, types recommended by panel manufacturer.

1. Refer to other sections of these specifications for product and installation requirements applicable to indicated joint sealers.

3.2 CLEANING AND PROTECTION

A. Damaged Units: Replace panels and other components of the work which have been damaged or have deteriorated beyond successful repair by means of finish touch-up or similar minor repair procedures.

B. Cleaning: Remove temporary protective coverings and strippable films (if any) as each panel is installed. Upon completion of panel installation, clean finished surfaces as recommended by panel manufacturer, and maintain in a clean condition during construction.

END OF SECTION 074200

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SECTION 074214 - METAL WALL PANELS, PERFORATED

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Metal Screen Wall System On Protected Exterior Sheathing With Cavity Insulation: Single-skin exposed fastener perforated metal wall panels.

1.3 RELATED REQUIREMENTS

A. Division 05 Section "Structural Steel Framing" for primary structural members supporting metal screen wall system.

B. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal copings, flashings, reglets and roof drainage items.

1.4 REFERENCES

A. American Architectural Manufacturer's Association (AAMA):

1. AAMA 620 - Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Aluminum Substrates.

B. American Society of Civil Engineers (ASCE):

1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

C. ASTM International (ASTM):

1. ASTM A 653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless-Steel Sheet, Strip, Plate, and Flat Bar.
3. ASTM B 209 - Specification for Aluminum and Aluminum Alloy Sheet and Plate.
4. ASTM C 754 - Specification for Installation of Steel Framing Members to Receive Screw Attached Gypsum Panel Products.
5. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.

D. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA):

1. Architectural Sheet Metal Manual.

1.5 PERFORMANCE REQUIREMENTS

A. General: Provide metal wall panel assemblies meeting performance requirements as determined by application of specified tests by a qualified testing agency on manufacturer's standard assemblies.

B. Structural Performance: Provide metal wall panel assemblies capable of withstanding the effects of indicated loads and stresses within limits and under conditions indicated, per ASTM E 72:

1. Wind Loads: Determine loads based on uniform pressure, importance factor, exposure category, and basic wind speed indicated on drawings.
2. Limits of Deflection: Metal wall panel assembly shall withstand scheduled wind pressure with the following allowable deflection:
    a. Maximum allowable deflection
        1) Single Skin Panels Less than 1-inch (25-mm) in Depth: Limited to L/90 deflection of panel perimeter normal to plane of wall.
        2) Single Skin Panels greater than 1-inch (25-mm) in Depth: Limited to L/120 deflection of panel perimeter normal to plane of wall.

C. Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction.

1.6 QUALITY ASSURANCE

A. Manufacturer/Source: Provide metal wall panel and panel accessories from a single manufacturer.

B. Manufacturer Qualifications: Approved manufacturer listed in this Section with minimum 10 years' experience in manufacture of similar products in successful use in similar applications.

1. Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:
    a. Product data, including certified independent test data indicating compliance with requirements.
    b. Samples of each component.
    c. Project references: Minimum of 5 installations not less than 5 years old, with Owner and Architect contact information.
    d. Sample warranty.
2. Substitutions following award of contract are not allowed except as stipulated in Division 01 General Requirements.
3. Approved manufacturers must meet separate requirements of Submittals Article.

C. Installer Qualifications: Experienced Installer with minimum of 5 years' experience with successfully completed projects of a similar nature and scope.

1.7 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct preinstallation meeting at site attended by Owner, Architect, manufacturer's representative, and other trade contractors.

1. Coordinate building framing [and secondary framing] in relation to metal wall panel assembly.

1.8 ACTION SUBMITTALS

A. Product Data: Manufacturer's data sheets, for specified products.

1. Include data indicating compliance with performance requirements.

B. Shop Drawings: Provide shop drawings prepared by manufacturer or manufacturer's authorized Installer. Include full elevations showing openings and penetrations. Include details of each

condition of installation and attachment. Provide details at a minimum scale 1-1/2-inch per foot (1:8) of all required trim and extrusions needed for a complete installation.

1. Indicate points of supporting structure that must coordinate with metal wall panel assembly installation.
2. Note locations where separation of dissimilar materials is required and indicate method to be used.
3. Indicate adjacent material types and methods to be used to prevent staining effect on metal wall panels caused by water runoff.

C. Samples for Initial Selection: For each product specified. Provide representative color charts of manufacturer's full range of colors.

D. Samples for Verification: Provide 12-inch (300 mm) section of panel(s) showing finishes. Provide 12-inch (300 mm) long pieces of trim pieces and other exposed components.

1.9 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Indicating compliance of products with requirements, from a qualified independent testing agency.

B. Qualification Information: For Installer firm.

C. Manufacturer's warranty: Submit sample warranty.

1.10 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Protect metal wall panel products during shipping, handling, and storage to prevent staining, denting, deterioration of components or other damage.

1. Deliver, unload, store, and erect metal wall panel products and accessory items without misshaping panels or exposing panels to surface damage from weather or construction operations.

1.12 WARRANTY

A. Special Manufacturer’s Warranty: On manufacturer’s standard form, in which manufacturer agrees to repair or replace components of metal wall panel assemblies that fail in materials and workmanship within two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: CENTRIA, EcoScreen Perforated Screen Wall. Provide basis of design product, or comparable product approved by Architect prior to bid.

1. CENTRIA Architectural Systems; Moon Township, PA 15108-2944. Tel: (800)759-7474. Tel: (412)299-8000. Fax: (412)299-8317. Email: info@CENTRIA.com. Web: www.CENTRIA.com.

2.2 METAL WALL PANEL MATERIALS

A. Aluminum Face Sheet: Smooth surface coil-coated, ASTM B209, 3003-H14 alloy, 0.040 inch (1.0 mm) nominal thickness.

2.3 PERFORATED METAL WALL PANELS

A. Metal Wall Panels, General: Factory-formed, exposed fastener panels with interconnecting side joints, fastened to supports with exposed fasteners.

B. Panel Profile: Symmetrical rib profile with lap joint:

1. Basis of Design Product: CENTRIA, STYLE RIB ECOSCREEN ECONOLAP 3/4 .040 PMF
2. Panel Coverage: 36 inches (914 mm).
3. Panel Depth: 1.50 inches (38 mm).
4. Rib Spacing: 5 at 7.2 inches (183 mm) o.c.

C. Panel Pattern:

1. Pattern and Perforation: Staggered pattern, 3/8-inch (10 mm) perforations at 9/16 inch (14 mm) spacing, with 40 percent open area.

2.4 METAL WALL PANEL ACCESSORIES

A. Metal Wall Panel Accessories, General: Provide complete metal wall panel assembly incorporating trim, copings, fasciae, parapet caps, sills, inside and outside corners, and miscellaneous flashings. Fabricate accessories in accordance with SMACNA Manual. Provide manufacturer's factory-formed clips, shims, flashings, and caps for a complete installation.

B. Formed Flashing and Trim: Match material, thickness, and color of metal wall panel face sheets.

C. Fasteners: Self-tapping 300 series stainless steel screws, No. 14 minimum, hex-head, and other acceptable fasteners recommended by panel manufacturer.

2.5 METAL WALL PANEL FINISHES

A. Exposed Coil-Coated Finish System:

1. Fluoropolymer Two-Coat System: 0.8 mil nominal primer with 0.8 mil nominal 70 percent PVDF fluoropolymer color coat, AAMA 620.

a. Basis of Design: CENTRIA Duragard.

B. Color:

1. Exterior Surface: As selected by Architect from manufacturer's standard colors.
2. Interior Surface: Manufacturer's standard primer color.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine metal wall panel substrate with Installer present. Inspect for erection tolerances and other conditions that would adversely affect installation of metal wall panels.

B. Wall Substrate: Confirm that wall substrate is within tolerances acceptable to metal wall panel system manufacturer.

1. Maximum substrate and framing deviations from flat plane acceptable:

a. 1/4-inch in 20 feet vertically or horizontally.
b. 1/2-inch across building elevation.
c. 1/8-inch in 5 feet.

C. Framing: Inspect framing that will support metal wall panels to determine if support components are installed as indicated on approved shop drawings. Confirm presence of acceptable framing members at recommended spacing to match installation requirements of metal wall panels.

D. Openings: Verify that openings and penetrations match layout on shop drawings.

E. Advise G.C, in writing, of out-of-tolerance work and other deficient conditions prior to proceeding with metal wall panel system installation.

3.2 METAL WALL PANEL INSTALLATION

A. General: Install metal wall panels in accordance with approved shop drawings and manufacturer's recommendations. Install metal wall panels in orientation, sizes, and locations indicated. Anchor metal wall panels and other components securely in place.

B. Attach panels to metal framing using recommended screws, fasteners, sealants, and adhesives indicated on approved shop drawings.

1. Provide escutcheons for pipe and conduit penetrating panels.
2. Dissimilar Materials: Where elements of metal wall panel system will come into contact with dissimilar materials, separate faces and edges in contact with dissimilar materials utilizing non-metallic shims or closed cell foam material at each fastening point as recommended by manufacturer.

3.3 ACCESSORY INSTALLATION

A. General: Install metal wall panel accessories with positive anchorage to building. Coordinate installation with flashings and other components.

1. Install related flashings and sheet metal trim per requirements of Division 07 Section "Sheet Metal Flashing and Trim."
2. Install components required for a complete metal wall panel assembly, including trim, copings, corners, and similar items.
3. Comply with performance requirements and manufacturer's written installation instructions.
4. Set units true to line and level as indicated.

3.4 CLEANING AND PROTECTION

A. Remove temporary protective films. Clean finished surfaces as recommended by metal wall panel manufacturer. Maintain in a clean condition during construction.

B. Replace damaged panels and accessories that cannot be repaired by finish touch-up or minor repair.

END OF SECTION

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SECTION 074215 - METAL WALL PANELS (CORRUGATED)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Concealed fastener metal wall panels as part of the assembly described in Section 2.1.

1.3 RELATED REQUIREMENTS

A. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal copings, flashings, reglets and roof drainage items.

B. Division 07 Section "Joint Sealants" for field-applied joint sealants.

C. Division 07 Section “Air Barriers” for transition and flashing componets of air/moisture barrier.

D. American Architectural Manufacturer's Association (AAMA):

1. AAMA 620 - Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Aluminum Substrates.
2. AAMA 621 - Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates.

E. American Society of Civil Engineers (ASCE):

1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

F. ASTM International (ASTM):

1. ASTM A 653/A 653M - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
3. ASTM A 755/A 755M - Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
4. ASTM A 792/A 792 M - Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
5. ASTM B 209 - Specification for Aluminum and Aluminum Alloy Sheet and Plate.
6. ASTM C 754 - Specification for Installation of Steel Framing Members to Receive Screw Attached Gypsum Panel Products.
7. ASTM C 920 - Specification for Elastomeric Joint Sealants.
8. ASTM C 1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
9. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.

10. ASTM E 283 - Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences across the Specimen.
11. ASTM E 331 - Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

G. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA):

1. Architectural Sheet Metal Manual.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide metal wall panel assemblies meeting performance requirements as determined by application of specified tests by a qualified testing agency on manufacturer's standard assemblies.

B. Air Infiltration: When installed over Insulated Composite Backup Panels or Metal Liner Panels, maximum 0.06 cfm/sq. ft. (0.3 L/s per sq. m) per ASTM E 283 at a static-air-pressure difference of 1.57 lbf/sq. ft. (75 Pa), using minimum 10-by-10 foot (3050-by-3050 mm) test panel that includes side joints.

C. Water Penetration, Static Pressure: When installed over Insulated Composite Backup Panels or Metal Liner Panels, no uncontrolled water penetration per ASTM E 331 at a minimum static differential pressure of 6.24 lbf/sq. ft. (299 Pa), using minimum 10-by-10 foot (3050-by-3050 mm) test panel that includes side joints.

D. Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction.

1.5 QUALITY ASSURANCE

A. Manufacturer/Source: Provide metal wall panel and panel accessories from a single manufacturer.

B. Manufacturer Qualifications: Approved manufacturer listed in this Section with minimum 10 years experience in manufacture of similar products in successful use in similar applications.

1. Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:

    a. Product data, including certified independent test data indicating compliance with requirements.
    b. Load span tables including evaluation of panel clip and panel side joint interaction.
    c. Samples of each component.
    d. Project references: Minimum of 5 installations not less than 5 years old, with Owner and Architect contact information.
    e. Sample warranty.

2. Substitutions following award of contract are not allowed except as stipulated in Division 01 General Requirements.
3. Approved manufacturers must meet separate requirements of Submittals Article.

C. Wall Systems Installer Qualifications: Experienced Installer with minimum of 5 years experience with successfully completed projects of a similar nature and scope.

1.6 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct preinstallation meeting at site attended by Owner, Architect, manufacturer's representative, and other trade contractors.

1. Coordinate building framing in relation to metal wall panel assembly.
2. Coordinate installation of building air and water barrier behind metal wall panel assembly.
3. Coordinate window, door and louver, and other openings and penetrations of metal wall panel assembly.

1.7 ACTION SUBMITTALS

A. Product Data: Manufacturer’s data sheets, for specified products.

1. Include data indicating compliance with performance requirements.

B. Shop Drawings: Provide shop drawings prepared by manufacturer or manufacturer's authorized Installer. Include full elevations showing openings and penetrations. Include details of each condition of installation and attachment. Provide details at a minimum scale of 1-1/2-inch per foot (1:8) of all required trim and extrusions needed for a complete installation.

1. Indicate points of supporting structure that must coordinate with metal wall panel assembly installation.
2. Indicate details of fastening, including clip spacing, supported by load span tables that include an evaluation of clip and panel side joint interaction.

C. Samples for Initial Selection: For each product specified. Provide representative color charts of manufacturer's full range of colors.

D. Samples for Verification: Provide 12-inch (300 mm) section of panel(s) showing finishes. Provide 12-inch (300 mm) long pieces of trim pieces and other exposed components.

1.8 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Indicating compliance of products with requirements, from a qualified independent testing agency.

B. Qualification Information: For Installer firm.

C. Manufacturer's warranty: Submit sample warranty.

1.9 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Protect metal wall panel products during shipping, handling, and storage to prevent staining, denting, deterioration of components or other damage.

1. Deliver, unload, store, and erect metal wall panel products and accessory items without misshaping panels or exposing panels to surface damage from weather or construction operations.

1.11 WARRANTY

A. Special Manufacturer's Warranty: On manufacturer's standard form, in which manufacturer agrees to repair or replace components of metal wall panel assemblies that fail in materials and workmanship within two years from date of Substantial Completion.

B. Special Panel Finish Warranty: On manufacturer's standard form, in which manufacturer agrees to repair or replace metal wall panels that display evidence of deterioration of finish within 20 years from the date of substantial completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. **Metal Wall Panels over Multi-Component Framed Wall System**: Single-skin concealed fastener metal wall panels applied as exterior rainscreen cladding over wall framing specified in Division 05 Section "Cold-Formed Metal Framing" with exterior sheathing specified in Division 06 Section "Sheathing", an applied membrane that provides air, moisture, and water vapor control specified in Division 07 Section "Air Barriers", and insulation within the framing specified in Division 07 Section "Thermal Insulation". Metal wall panel installation specified in this Section includes **[**secondary metal subgirt framing and**]** mounting clips for panel attachment.

1. Air, moisture, and water vapor control membrane is provided under Division 07 Section "Air Barriers."

2.2 MANUFACTURERS

A. Basis of Design: **CENTRIA, Concept Series Metal Wall Panels**. Provide basis of design product, or comparable product approved by Architect prior to bid.

1. CENTRIA Architectural Systems; Moon Township, PA 15108-2944. Tel: (800)759-7474. Tel: (412)299-8000. Fax: (412)299-8317. Email: info@CENTRIA.com. Web: www.CENTRIA.com.

2.3 PANEL MATERIALS

A. Aluminum Face Sheet: Smooth surface coil-coated, ASTM B 209, 3003-H14 or 5052-H32 alloy.

1. Face Sheet: 22 ga. nominal thickness.
2. Surface: Smooth.

2.4 CONCEALED FASTENER METAL WALL PANELS

A. Metal Wall Panels, General: Factory-formed, concealed fastener panels with interconnecting side joints, fastened to supports with concealed fasteners, with factory-applied sealant in side laps when required to meet performance requirements.

B. Three-rib Profile :

1. Basis of Design Product: **CENTRIA, CS-260**.
2. Panel Coverage: 12 inches (305 mm).
3. Panel Height: 0.875 inch (22 mm).

C. Exposed Coil-Coated Finish System:

1. Fluoropolymer Three-Coat System: 0.8 mil primer with 0.8 mil 70 percent PVDF fluoropolymer color coat, and a 0.8 mil 70 percent PVDF fluoropolymer clear coat, AAMA 620 621.

    a. Basis of Design: **CENTRIA Duragard Plus**.

D. Color:

1. Exterior Surface: As selected by Architect from manufacturer's standard colors.
2. Interior Surface: As selected by Architect from manufacturer's standard colors.

2.5 METAL WALL PANEL ACCESSORIES

A. Metal Wall Panel Accessories, General: Provide complete metal wall panel assembly incorporating trim, copings, fasciae, parapet caps, soffits, sills, inside and outside corners, and miscellaneous flashings. Provide manufacturer's factory-formed clips, shims, flashings, lap tapes, and closure strips for a complete installation. Fabricate and install accessories in accordance with SMACNA Manual.

B. Extruded Trim: Manufacturer's complementary aluminum extrusions for head, jamb, sill, base, flush, reveal, inside and outside corner, endwall, and expansion joint details. Finish to match metal wall panels.

1. Basis of Design: CENTRIA, Microline Extrusions.

C. Mitered Corners: Structurally-bonded horizontal interior and exterior trimless corners matching metal wall panel material, profile, and factory-applied finish, fabricated and finished by metal wall panel manufacturer.

1. Welded, riveted, fastened, or field- fabricated corners do not meet the requirements of this specification.
2. Basis of Design: CENTRIA, MicroSeam Corners.

D. Formed Flashing and Trim: Match material, thickness, and color of metal wall panel face sheets.

E. Sealants: Type recommended by metal wall panel manufacturer for application, meeting requirements of Division 07 Section "Joint Sealants."

F. Flashing Tape: 4-inch wide self-adhering butyl flashing tape.

G. Fasteners, General: Self-tapping screws, bolts, nuts, and other acceptable fasteners recommended by panel manufacturer. Where exposed fasteners cannot be avoided for miscellaneous applications, supply corrosion-resistant fasteners with heads matching color of metal wall panels by means factory-applied coating.

H. Concealed Clips: Galvanized steel, 0.06 inch/16 ga. (1.52 mm) nominal thickness, designed to allow unimpeded thermal movement of panel and configured to hold panel minimum 1/2 inch (12.7 mm) from substrate.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine metal wall panel substrate with Installer present. Inspect for erection tolerances and other conditions that would adversely affect installation of metal wall panels.

B. Wall Substrate: Confirm that wall substrate is within tolerances acceptable to metal wall panel system manufacturer.

1. Maximum deviations acceptable:

a. 1/4-inch in 20 feet (6.4 mm in 6 m) vertically or horizontally from face plane of framing.
b. 1/2-inch (12.7 mm) across building elevation.
c. 1/8-inch in 5 feet (3.2 mm in 1.5 m).

C. Framing: Inspect framing that will support metal wall panels to determine if support components are installed as indicated on approved shop drawings. Confirm presence of acceptable framing members at recommended spacing to match installation requirements of metal wall panels.

D. Air/Moisture Barriers: Confirm that work has been completed, inspected, and tested as required.

E. Advise G.C., in writing, of out-of-tolerance work and other deficient conditions prior to proceeding with metal wall panel system installation.

F. Correct out of tolerance work and other deficient conditions prior to proceeding with insulated composite backup panel installation.

3.2 METAL WALL PANEL INSTALLATION

A. General: Install metal wall panels in accordance with approved shop drawings and manufacturer's recommendations. Install metal wall panels in orientation, sizes, and locations indicated. Anchor metal wall panels and other components securely in place. Provide for thermal and structural movement

3.3 ACCESSORY INSTALLATION

A. General: Install metal wall panel accessories with positive anchorage to building and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install related flashings and sheet metal trim per requirements of Division 07 Section "Sheet Metal Flashing and Trim."
2. Install components required for a complete metal wall panel assembly, including trim, copings, corners, lap strips, flashings, sealants, fillers, closure strips, and similar items.
3. Comply with performance requirements and manufacturer's written installation instructions.
4. Provide concealed fasteners except where noted on approved shop drawings.
5. Set units true to line and level as indicated.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a service representative authorized by metal wall panel manufacturer to inspect completed installation. Submit written report.

B. Correct deficiencies noted in manufacturer's report.

3.5 CLEANING AND PROTECTION

A. Remove temporary protective films. Clean finished surfaces as recommended by metal wall panel manufacturer. Clear weep holes and drainage channels of obstructions, dirt, and sealant. Maintain in a clean condition during construction.

B. Replace damaged panels and accessories that cannot be repaired by finish touch-up or minor repair.

END OF SECTION

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SECTION 074216 - MODULAR METAL WALL PANELS(ACM)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Concealed fastener, coil coated, rainscreen wall panel as part of the wall assemblies described in Section 2.1.

1.3 RELATED REQUIREMENTS

A. Division 07 air barrier section for transition and flashing components of building air/moisture barrier.

B. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal copings, flashings, reglets and roof drainage items.

C. Division 07 Section "Joint Sealants" for field-applied joint sealants.

1.4 REFERENCE STANDARDS

A. American Architectural Manufacturer's Association (AAMA):
   1. AAMA 620 - Voluntary Specification High Performance Organic Coatings on Coil Coated Architectural Aluminum.
   2. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

B. American Society of Civil Engineers (ASCE):

   1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

C. ASTM International (ASTM):
   1. ASTM B 209 - Specification for Aluminum and Aluminum Alloy Sheet and Plate.
   2. ASTM B 221 - Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   3. ASTM D 3359 - Standard Test Methods for Measuring Adhesion by Tape Tests.
   4. ASTM E 329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.
   5. ASTM E 72 – Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.

1.5 PERFORMANCE REQUIREMENTS

A. General: Provide modular metal wall panel system meeting performance requirements as determined by application of specified tests by a qualified testing agency on manufacturer's standard assemblies.

B. Structural Performance: Design modular metal wall panel system fabricated to withstand the effects of wind loads under conditions indicated below.

   1. Wind Loads: Determine loads based on uniform pressure, building category, exposure category, and basic wind speed indicated on drawings.

2. Air/Moisture Barrier: Refer to Division 07 "Air Barrier" section.

C. Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Approved manufacturer listed in this Section with minimum 10 years' experience in manufacture of similar products in successful use in similar applications.

1. Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:

   a. Product data, including certified independent test data indicating compliance with requirements.
   b. Samples of each component.
   c. Sample submittal from similar project.
   d. Project references: Minimum of 5 installations not less than 5 years old, with Owner and Architect contact information.
   e. Sample warranty.

2. Substitutions following award of contract are not allowed except as stipulated in Division 01 General Requirements.
3. Approved manufacturers must meet separate requirements of Submittals Article.

B. Wall Systems Installer Qualifications: Experienced Installer with minimum of 5 years' experience with successfully completed projects of a similar nature and scope.

C. Mockups: Build mockup in size and location indicated. Show details of modular metal panel system. Demonstrate methods and details of installation. Show details of vertical joints, penetrations, doors, windows, louvers, pipe openings, inside and outside corners, top and bottom of wall, horizontal and vertical joints.

1. Approval of mockup does not relieve Contractor of responsibility to comply with all requirements of contract documents.
2. Approved mockup may become part of installation if approved by Architect.

1.7 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct preinstallation meeting at site attended by Owner, Architect, manufacturer's technical representative, and other trade contractors.

1. Coordinate building framing in relation to modular metal panel system.
2. Coordinate installation of building air and water barrier behind composite wall panel system.
3. Coordinate window, door and louver, and other openings and penetrations of modular metal panel system.

1.8 ACTION SUBMITTALS

A. Product Data: Manufacturer's data sheets for specified products.

B. Shop Drawings: Provide shop drawings prepared by manufacturer or manufacturer's authorized dealer. Include full elevations showing openings and penetrations. Include details of each

condition of installation and attachment. Provide details at a minimum scale 3-inch per foot of all required trim and extrusions needed for a complete installation

1. Include data indicating compliance with performance requirements.
2. Indicate points of supporting structure that must coordinate with modular metal panel system installation.

C. Field Measurements: It is the panel installer's responsibility to verify locations of structural members, adjoining construction, and wall openings dimensions by field measurement before panel fabrication and indicate measurements on final shop drawings.

D. Samples for Initial Selection: For each product specified including sealants and gaskets. Provide representative color charts of manufacturer's full range of colors.

E. Samples for Verification: Provide 24-inch (600 mm) section of wall panel showing, horizontal joinery, vertical joint return, panel stiffener and anchoring details. Provide 12-inch (300 mm) long pieces of each extruded aluminum trim.

1.9 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Indicating compliance of products with requirements, from a qualified independent testing agency.

B. Qualification Information: For Installer and Installer's field supervisor.

C. Manufacturer's warranty: Submit sample warranty.

1.10 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Protect products of modular metal panel system during shipping, handling, and storage to prevent staining, denting, deterioration of components or other damage.

1. Deliver, unload, store, and erect modular metal wall panel system and accessory items without misshaping panels or exposing panels to surface damage from weather or construction operations.

1.12 WARRANTY

A. Special Manufacturer's Warranty: On manufacturer's standard form, in which manufacturer agrees to repair or replace metal wall panel assemblies that fail in materials and workmanship within two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 System Description

A. Modular metal wall panel system consisting of aluminum panels in a rainscreen application as part of the assembly described below.

1. **Modular Metal Wall Panels over Multi-Component Framed Wall System**: Modular metal wall panels applied as exterior rainscreen cladding over wall framing specified in Division 05 Section "Cold-Formed Metal Framing" with exterior sheathing specified in Division 06 Section "Sheathing", an applied membrane that provides air, moisture, and

water vapor control specified in Division 07 Section "Air Barriers", and insulation within the framing specified in Division 07 Section "Thermal Insulation". Metal wall panel installation specified in this Section includes secondary metal subgirt framing and mounting clips for panel attachment.

a. Water-resistive barrier is provided under Division 07 Section "Weather Barriers."

b. Air, moisture, and water vapor control membrane is provided under Division 07 Section "Air Barriers."

2.2 MANUFACTURERS

A. Basis of Design: CENTRIA Intercept Entyre Modular Metal Wall Panel System. Provide basis of design product, or comparable product approved by Architect prior to bid.

1. CENTRIA Architectural Systems; Moon Township, PA 15108-2944. Tel: (800)759-7474. Tel: (412)299-8000. Fax: (412)299-8317. Email: info@CENTRIA.com. Web: www.CENTRIA.com.

2.3 MATERIALS

A. Aluminum Sheet: Smooth surface coil-coated sheet, ASTM B209, 3105-H14 Alloy.

1. Aluminum Material: Tension-leveled
2. Thickness: 0.060" nominal
3. Weight: Approximately 1.5 lb. per square foot

2.4 Modular Metal Panels

A. Modular Metal Panels: Factory-formed, aluminum-faced panels fabricated from 0.60” thick aluminum coil coated sheet.

1. Panel Depth: 1-3/8"(35mm).
2. Panel Flatness: Maximum allowable distortion: 1/32 inch in 24 inches (0.813 mm in 610 mm) in any direction. Panel lines, breaks, and angles shall be sharp and true, and surfaces shall be free from warp or buckle.
3. Clips: Manufacturer's standard clips as required to meet performance requirements.
4. Panel Joints: 3/4"(19mm)
5. Panel Sizes: As indicated on drawings.

B. Sheet Surface: Smooth.

C. Aluminum Face Sheet Coil-Coated Finish:

1. Fluoropolymer Three-Coat System: 0.8 mil primer with 0.8 mil 70 percent PVDF fluoropolymer color coat, and a 0.8 mil 70 percent PVDF fluoropolymer clear coat, AAMA 621.

a. Basis of Design: **CENTRIA Duragard Plus.**

2. Color: As selected by Architect from manufacturer's standard colors.

D. Unexposed Finish: Manufacturer's standard nominal 0.5 mil nominal DFT backer coating.

E. Exposed Trim, flashings, and Fastener Finish: Match panel finish.
1. Thickness: 0.060" nominal
2. Refer to section 07 6200

2.5 ACCESSORIES

A. Provide manufacturer's factory-formed clips, shims, flashings, sealants, and tapes for a complete installation.

2.6 FABRICATION

B. General: Fabricate modular metal panels and accessories at factory identical to tested units using manufacturer's standard procedures and processes necessary to meet performance requirements.

1. Provide components of modular metal panel system that are products of one manufacturer, including modular metal panels, head and sill trim, bottom weep, starter flash, and metal copings.

C. Modular Metal Panels: Fabricate modular metal panels requiring no further fabrication or modification in field.

1. Horizontal Joints: Dry seal, drained and back ventilated.
2. Vertical Joints: Pre-formed returns
3. Reveals: 3/4"(19mm)
4. Standard System Depth: 1-3/8"(35mm)

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine modular metal panel system substrate with Installer present. Inspect for erection tolerances and other conditions that would adversely affect installation of modular metal panel system.

1. Inspect framing that will support modular metal panel system to determine if support components are installed as indicated on approved shop drawings and are within tolerances acceptable to modular metal wall panel system manufacturer.
    a. Maximum deviations acceptable to modular metal panel system manufacturer:
        1) 1/4-inch in 20 feet (6.4 mm in 6 m) vertically or horizontally from face plane of framing.
        2) 1/2-inch (12.7 mm) maximum deviation from flat substrate on any building elevation.
        3) 1/8-inch in 5 feet (3.2 mm in 1.5 m).
2. Confirm presence of acceptable framing members to match installation requirements of modular metal panel system.
    a. Confirm framing minimum .048 inch/18 ga. (1.22 mm) at maximum 24 inch (610 mm) spacing.
3. Verify that window, door, louver, and other penetrations match layout on shop drawings.

B. Advise General Contractor of out-of-tolerance work and other deficient conditions prior to proceeding with modular metal wall panel system installation.

3.2 MODULAR METAL PANEL SYSTEM INSTALLATION

A. General: Install modular metal panel system in accordance with approved shop drawings and manufacturer's recommendations.

B. Installation: Attach panels to metal sub-framing using recommended clips, screws, fasteners, sealants, and adhesives indicated on approved shop drawings.

1. Horizontal Joinery: Working from base of installation to top, connect upper panel to lower panel at joinery.

2. Vertical Joinery: Provide reveal between vertical ends of panels as shown on shop drawings.

3. Galvanic Action: Where elements of modular metal wall system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by manufacturer.

C. Rainscreen Installation: Proceed with installation of manufacturer's dry seal horizontal joinery. Keep open spaces in horizontal joinery intended to ventilate cavity behind system.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a service representative authorized by metal wall panel manufacturer to inspect completed installation. Submit written report. Correct deficiencies noted in report.

3.4 CLEANING AND PROTECTION

A. Remove temporary protective films within 2 weeks of erection. Clean finished surfaces as recommended by metal wall panel manufacturer. Clear weep holes and drainage channels of obstructions, dirt, and sealant. Maintain in a clean condition during construction.

B. Replace damaged panels and accessories that cannot be repaired by field repair.

END OF SECTION

SECTION 074646 – FIBER CEMENT PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DESCRIPTION OF WORK

A. Section Includes: The work of this Section includes fiber cement panels of the following types:

1. Through color high density fiber cement panels.

1.3 REFERENCES

A. ASTM International (ASTM):
1. ASTM C 1185 – 08.
2. ASTM C 1186 – 08.
3. ASTM E 84
4. ASTM E 2226-12
5. ASTM G 155-05a.
6. ASTM S905-08.
7. ICC-ES AC90.
8. NFPA 285.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include product specifications and manufacturer's written installation instructions.

B. Shop Drawings: Provide detailed drawings of non-standard applications of fiber cement materials which are outside the scope of the standard details and specifications provided by the manufacturer.

C. Code Compliance: Documents showing product compliance with local building code shall be submitted. These documents shall include, but not be limited to, appropriate Evaluation Reports and/or test reports supporting the use of the product.

D. Engineering Calculations: Submit engineering calculations as required by the local building code, showing that the installed panels and attachment system meets the wind load requirements for the project.

E. Selection Samples: For each finish product specified, two samples, size 5 ¼” x 2 ½” color chips representing manufacturer’s full range of colors and patterns available in the US shall be provided upon request.

F. Verification Samples: For each product specified, two samples, size 12”x12”, representing actual product, color, and patterns.

G. Operation and Maintenance Data: Submit operation, maintenance, and cleaning information for products covered under this section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: All products listed in this section are to be installed by a single installer trained and approved by the manufacturer or representative.

B. Color Evaluation: No visible change, 2000 hours of accelerated weathering with color evaluation when calculated to ASTM D 2244-9a.

C. Mock-Up: Provide a full-size mock-up 48” x 48” for evaluation of surface preparation techniques and application workmanship.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Moving panels that are stacked on pallets should be done with a forklift with wide fork setting or a crane. Ensure the panels are secured to the pallet in a way that will not cause damage. Stacks should be transported under a waterproof cover.

B. All panel materials must be stored flat on pallets, inside and undercover in dry conditions, protected from weather both rain and direct sunlight and other trades. Stack the pallets in a way so that the panels are ventilated.

C. Always lift panels off each other, never slide them over one another, since scratching may occur.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer’s absolute limits or which could involve life safety situations.

B. Field Measurements: Verify actual measurements/openings by field measurements performed by the installer prior to release for fabrication. The general contractor or installer shall be responsible for existing site dimensions. Recorded measurements shall be indicated on shop drawings based on field measurements provided by the installer. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.8 WARRANTY

A. Warranty: At project closeout, provide manufacturer’s limited ten (10) year warranty covering defects in materials. Warranty is only available when material is installed by an installation contractor trained and approved by the manufacturer’s representative.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. As a basis of design, Fiber Cement Panels shall be manufactured /supplied by

EQUITONE Inc.
1731 Fred Lawson Drive
Maryville, TN 37801
Tel. 1 865-268-2705 Email: info@equitone.com

B. Request for substitutions will be considered in accordance with provisions of Section 016000 – Product Requirements.

2.2 WALL PANELS

A. Through Color High Density Fiber Cement Panel
   1. Product: EQUITONE Fiber Cement Panel
   2. Application: Exterior.

2.3 MISCELLANEOUS CLADDING MATERIALS

A. Perforated Insect/Vermin Screen. Manufacturer's standard.

B. Building Wrap or Waterproof Membrane: See other specification sections for this material.

C. Aluminum Joint Closures and Decorative Corner Profiles: Manufacturer's standard products as detailed. Maximum thickness of non-structural finishing profile to be 0.8 mm or 21 gauge.

D. Panel Fastening Options: (Tergo+Mechanical Secret Fixing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean panel surfaces thoroughly prior to installation. Remove any cutting or drilling dust from the surface of the panel using a micro-soft cloth.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION, GENERAL

A. Install in accordance with manufacturer's instructions and approved submittals.

B. For exterior applications, comply with local codes and structural engineer's fastening calculations along with manufacturer's recommendations for fastener spacing.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

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SECTION 075423 MEMBRANE ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Install a 60-mil reinforced TPO (Thermoplastic Polyolefin) or a 60-mil PVC (polyvinyl chloride) membrane. Color: White.

2. Tapered or non-tapered insulation.

1.3 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 for definition of terms related to roofing work not otherwise defined in this Section.

1.4 PERFORMANCE REQUIREMENTS

A. General: Install sheet membrane roofing and base flashing that are watertight; will not permit the passage of liquid water; and will withstand wind loads, thermally induced movement, and exposure to weather without failure.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing system manufacturer based on testing and field experience.

C. Comply with ANSI/SPRI ES-1 Wind Uplift Requirements.

1.5 SUBMITTALS

A. Product Data: For each type of roofing product specified. Include data substantiating that materials comply with requirements.

B. Shop Drawings: Include plans, sections, and details of the following:

1. Base flashings and membrane terminations.

C. Samples for Verification: Of the following products:

1. 12-by-12-inch square of sheet roofing of color specified, including T-shaped side and end lap seam.
2. 12-by-12-inch square of roof insulation.
3. 12-inch length of metal termination bars.
4. 6 insulation fasteners of each type, length, and finish.

D. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install specified roofing system.

E. Manufacturer Certificates: Roofing manufacturer shall be required to provide documentation certifying that the roof design provided complies with the performance requirements for that system, as set forth in IBC Chapter 15 in Section 1504. This documentation shall be attached to the roof warranty provided at the close out of the project.

F. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

G. Product Test Reports: Based on evaluation of tests performed by manufacturer and witnessed by a qualified independent testing agency, indicate compliance of components of roofing system with requirements based on comprehensive testing of current product compositions.

H. Maintenance Data: For roofing system to include in the maintenance manuals specified in Division 1.

I. Warranty: Sample copy of standard roofing system manufacturer's warranty stating obligations, remedies, limitations, and exclusions of warranty.

J. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing roofing like that required for this Project and who is approved, authorized, or licensed by the roofing system manufacturer to install manufacturer's product.

B. Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method indicated below by UL, FM, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Exterior Fire-Test Exposure: UL Class A; ASTM E 108, for application and slopes indicated.
2. Fire-Resistance Ratings: ASTM E 119, for fire-resistance-rated roof assemblies of which roofing materials are a part.
3. Appropriate FM rating.

C. Impact Resistance: Roof coverings installed on low-slope roofs (roof slope <2:12) shall resist impact damage based on the results of tests conducted in accordance with ASTM D 3746, ASTM D 4272, CGSB 37-GP-52M or the resistance to Foot Traffic Test “FM 4470”.

D. All roof curbs and penetrations shall have a minimum height of 8” above the completed roof system.

E. Drainage: Provide a roof system with positive drainage where all standing water dissipates within 48 hours after precipitation ends.

F. Upon completion of the roof work, the contractor shall arrange for an inspection to be made by a non-sale’s technical representative of roofing membrane manufacturer to determine if the membrane has been installed as per manufacturer’s instructions and if any corrective work is needed.

G. A Pre-Roofing Conference is required before any roofing materials are installed. This conference shall be conducted by a representative of the Architect and attended by representatives of the Owner, General Contractor, Roofing Contractor, Manufacturer’s Representative, and the DCM Inspector.

H. The Pre-Roofing Conference is intended to clarify demolition (for renovation or re-roofing projects) and application requirements for work to be completed before roofing operations can begin. This would include a detailed review of the specifications, roof plans, roof deck information, flashing details, and approved shop drawings, submittal data, and samples. If conflict exists between the specifications and the Manufacturer's requirements, this shall be resolved. If this pre-roofing conference cannot be satisfactorily concluded without further inspection and investigation by any of the parties present, it shall be reconvened at the earliest possible time to avoid delay of the work. In no case should the work proceed without inspection of all roof deck areas and substantial agreement on all points.

The following are to be accomplished during the conference:

1. Review all Factory Mutual and Underwriter's Laboratories requirements listed in the specifications and resolve any questions or conflicts that may arise.
2. Establish trade-related job schedules, including the installation of roof mounted mechanical equipment.
3. Establish roofing schedule and work methods that will prevent roof damage.
4. Require that all roof penetrations and walls be in place prior to installing the roof.
5. Establish those areas on the job site that will be designated as work and storage areas for roofing operations.
6. Establish weather and working temperature conditions to which all parties must agree.
7. Establish acceptable methods of protecting the finished roof if any trades must travel across or work on or above any areas of the finished roof.

I. The Architect shall prepare a written report indicating actions taken and decisions made at this pre-roofing conference. This report shall be made a part of the project record and copies furnished the General Contractor, the Owner.

I. The Contractor shall engage the services of a Professional Roof Consultant. The Consultant must hold a minimum title of Registered Roof Observer (RRO) through the International Institute of Building Enclosure Consultants (IIBEC) and provide evidence of adequate insurance as required below. The Consultant should perform three (3) inspections during the installation of each new roof system type (1 – Start up inspection; 2 – Interim inspection; 3 – Final inspection). The Consultant must document all site visits with photographs and written reports. All reports shall be forwarded to the Architect with documentation of the roofing progress and any deficiencies noted during the inspections. Upon completion of all punch list items, the Consultant should provide a letter of roof completion advising the new roof systems meet and/or exceed the project requirements. (Note: Although the contractor will be paying the roof consultant from their proceeds, the roof consultant will be considered an agent of the owner and architect throughout the project and will perform the required inspections on behalf of the owner and architect. The above specification shall be applied to individual facilities when multiple site locations are included in the project.)

1. Roof Consultant Insurance Requirements:
   a. Gen. Liability - $1,000,000 each occurrence - $2,000,000 General Aggregate / Auto. Liability - $1,000,000 / Umbrella Liability. - $1,000,000 / Workers Compensation - $1,000,000 per statute / Professional Liability - $1,000,000
2. Approved Roof Consulting Firm:
   a. Roof Asset Management, Inc. | David Lee, RRO, CIT, FAA-107 | 4950 Woodfield Drive, Millbrook, Alabama 36054 | (334) 590-7999.
   b. Substitutions: Roof consulting firms must be pre-approved by the Architect.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid materials from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with roofing work only when existing and forecasted weather conditions permit roofing to be installed according to manufacturers' written instructions and warranty requirements.

B. The roofing contractor shall adequately protect building, paved areas, service drives, lawn, shrubs, trees, etc. from damage while performing the roofing work. The contractor shall repair or be responsible for costs to repair all property damaged during the roofing process.

C. During the roofing work the owner will not be occupying the buildings being re-roofed.

1.9 SAFETY

A. The contractor shall be responsible for all means and methods as they relate to safety and shall comply with all applicable local, state and federal requirements that are safety related. Safety shall be the responsibility of the contractor.

1.10 WARRANTIES

A. Standard manufacturer’s roofing guarantees which contain language regarding the governing of the guarantee by any state other than the State of Alabama, must be amended to exclude such language, and substituting the requirement that the Laws of the State of Alabama shall govern all such guarantees.

B. The Contractor shall provide, to the Owner, a 5-year guarantee which warrants the workmanship of all roofing material including the sheet metal installed in conjunction with the roofing. During this period the Contractor will respond within 24-hours to repair any leaks that may occur from faulty workmanship or material.

C. Standard Roofing Manufacturer's Warranty: Submit a written warranty, without monetary limitation, signed by roofing system manufacturer agreeing to promptly repair leaks resulting from defects in materials or workmanship for the following warranty period:

1. Provide manufacturer’s 20-year NDL total system warranty covering both labor and material with no dollar limitation and cover all penetrations

2. General Contractor’s Roofing Guarantee 5 - year Roofing Guarantee.

D. All roof warranties shall be provided to the Owner, by the Contractor at the Final Inspection.

PART 2 - PRODUCTS

2.1 GENERAL

A. All components of the roofing system shall be products of the manufacturer of the roofing system or accepted by the manufacturer as compatible.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Reinforced 60 mil Thermoplastic Sheet (TPO)

a. Firestone Roofing Prod.
b. Carlisle SynTec Inc.
c. GAF - Everguard
d. Versico Roofing Systems.
e. Johns Manville, Inc.

B. Manufactures: Subject to compliance with requirements, provide products by one of the following:

1. PVC 60 mil manufacturers:

a. Fibertite Roofing
b. Durolast Roofing
c. Johns Manville, Inc.
d. Sika Sarnafil
e. Versico Roofing

C. Walkway Pads: The following manufacturer is the Basis of Design. Other manufacturers will be considered as per specifications for submitted equal products.

1. Roof Trak III Walkway Pads as manufactured by Durolast. (If applicable or indicated on drawings)

a. Size: 30” x 60”.
b. Color: White
c. Install as per manufacturer’s recommendations.

D. Gravity Vents: (If applicable or indicated on drawings)

a. Flashvent Gravity Vent for single ply low slope systems as manufactured by FlashCo.

E. Perimeter Edge Flashing: Equal to the following:

a. 2-Piece Snap-On Compression as manufactured by Durolast /Exceptional Metals.

F. Insulation:

1. Install polyisocyanurate insulation (slope per roof plan). Must maintain a Minimum total R value of 25 at all roof areas at all replacement roofs.

PART 3 -EXECUTION

2.3 EXAMINATION

A. Examine substrates, areas, and conditions under which roofing will be applied, with Installer present, for compliance with requirements.

2.4 PREPARATION/INSTALLATION

A. Remove and dispose of existing roof ballast and flashing in its entirety. Existing roof and wood roof deck, to remain.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of the roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

C. The Contractor is to notify the Architect of any damaged /deteriorated roof decking. If directed by the Architect, the Contractor shall replace damaged portions of the decking per the Unit Price Schedule.

D. Install 60 mil single ply membrane fully adhered over insulation.

E. Install all new fascia, drip edge, gutters and downspouts per drawings and specifications.

. All existing deteriorated wood blocking must be replaced with new wood blocking/nailers.

2.5 ADHERED SHEET INSTALLATION

A. Install membrane over area to receive roofing according to roofing system manufacturer's written instructions. Unroll sheet and allow to relax for a minimum of 30 minutes.

2. Install sheet according to ASTM D 5036.

B. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

C. Apply bonding adhesive to substrate and underside of sheet at rate required by manufacturer and allow to partially dry. Do not apply bonding adhesive to seam area of sheet.

D. Mechanically fasten sheet securely at terminations and perimeter of roofing.

E. Apply roofing sheet with side laps shingled with slope of roof deck where possible.

F. Clean seam areas, overlap sheets, and weld side and end laps of sheets and flashings according to manufacturer's written instructions to ensure a watertight seam installation. Weld seam as follows:

1. Weld Method: Hot air as standard with roofing system manufacturer.

G. Test lap edges with probe to verify seam weld continuity. Apply seam calk to seal cut edges of sheet membrane.

H. Repair tears, voids, and lapped seams in roofing that does not meet requirements.

2.7 FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrate according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of flashing sheet at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with sheet flashing as recommended by manufacturer.

D. Clean seam areas, overlap sheets, and firmly roll flashings into the adhesive. Weld side and end laps to ensure a watertight seam installation.

E. Test lap edges with probe to verify seam weld continuity. Apply lap sealant and seal exposed edges of sheet flashing terminations.

F. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

2.8 FIELD QUALITY CONTROL

A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to consultant.

1. Notify Consultant or Owner one week in advance of the date and time of inspection.

2.9 PROTECTING AND CLEANING

A. Protect sheet membrane roofing from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Consultant and Owner.

B. Correct deficiencies in or remove roofing that does not comply with requirements, repair substrates, reinstall roofing, and repair sheet flashings to a condition free of damage and deterioration at the time of Substantial Completion and according to warranty requirements.

END OF SECTION

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SECTION 076310 - GUTTERS, DOWNSPOUTS & TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.1 SECTION INCLUDES

A. Custom Steel gutters and downspouts.

B. Custom Steel trim and flashings.

1.2 REFERENCES

A. National Roofing Contractors' Association - Roofing Manual (NRCA).
B. SMACNA 2012 Edition.

1.3 SUBMITTALS

A. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.

B. Product Data: Provide data on prefabricated components.

C. Samples: Submit two samples, 4-inch-long illustrating component design, finish, color, and configuration.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with NRCA standard details and requirements.

B. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack preformed and prefinished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.

B. Prevent contact with materials during storage which may cause discoloration, staining, or damage.

1.6 QUALIFICATIONS

A. Fabricator and Installer: Company specializing in sheet metal work with not less than five years' experience.

PART 2 - PRODUCTS

2.1 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers and gutter accessories from same metal as gutters. - SEE DRAWINGS FOR DETAILS.

1. Gutter Style: Custom Box Style Minimum 6" high 5" wide. 24-gauge pre-finished metal.
2. Expansion Joints: Lap Type with sealant.

B. Downspouts: Fabricate rectangular down spouts complete with mitered elbows. Furnish with metal, hangers, from same material as downspouts, and anchors. 4" x 4" square smooth 24-gauge pre-finished metal downspouts. No corrugated sections of downspouts allowed.

C. Provide a concrete splash block for each down spout.

2.2 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Fasteners same metal as flashing/sheet metal or, other non-corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.

B. Bituminous Coating: FS TT-C-494 or SSPC - Paint 12, solvent type bituminous mastic, nominally fee of sulfur, compounded for 15 mil dry film thickness per coat.

C. Mastic Sealant: Polyisobutylene; nonhardening, non-skinning, non-drying, nonmigrating sealant.

D. Epoxy Seam Sealer: 2-part non-crossive metal seam cementing compound, recommended by metal manufacturer for exterior/interior non-moving joints including riveted joints.

E. Adhesives: Type recommended by flashing sheet manufacturer for aterproof/weather-resistant seaming and adhesive application of flashing sheet.

F. Metal Accessories: Provide sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material being installed, non-crossive, size and gage required for performance.

G. Roofing Cement: Must be compatible with materials with which it comes in contact.

H. Steel sheets: 24 Ga. Steel sheet with Kynar Finish. Architect to select colors.

2.3 FABRICATED UNITS

A. General Metal Fabrication: Shop-fabricated work to greatest extent possible. Comply with

details shown, and with applicable requirements of SMACNA "Architectural sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.

B. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. For metal other than aluminum, tin edges to be seamed form seams, and solder. For aluminum seams with epoxy seam sealer; rivet joints for additional strength where required.

C. Expansion Provision: Where lapped or bayonet-type expansion provisions in work cannot be used, or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 2" deep, filled with mastic sealant (concealed within joints).

D. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.

E. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.

F. Finishing: 24 gauge - Steel with Kynar finish. Color to be selected by architect.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations, and with SMACNA "Architectural Sheet Metal Manual". Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints and seams which will be permanently watertight and weatherproof.

B. Install reglets to receive counterflashing in manner and by methods indicated. Where shown in concrete, furnish reglets to trades of concrete work for installation as work of Division-3 sections. Where shown in masonry, furnish reglets to trades of masonry work, for installation as work of Division-4 sections.

E. Install Counterflashing in reglets, either by snap-in seal arrangement, or by wedging in place for anchorage and filling reglet with mastic or elastomeric sealant, as indicated and depending on degree of sealant exposure.

3.2 CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes.

B. Protection: Installer shall advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction, to ensure that work will be without damage or deterioration, other than natural weathering, at time of substantial completion.

END OF SECTION 076310

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior Joints.
2. Exterior perimeter joints between adjacent materials and frames of doors and windows.
3. Flashing Joints.
4. Perimeter joints of plumbing fixtures.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Product test reports.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Provide joint sealants, joint fillers, and other related materials that are compatible with one another and joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors: Provide color of exposed joint sealants to comply with the following:
1. Provide selections from manufacturer's standard full range of colors for products specified.

2.2 LATEX JOINT SEALANTS

A. Interior joints in gypsum wall board, woodwork, joints between door and window frames and wall surfaces. Other interior joints not specified.

B. General: Provide manufacturer's standard one-part, non-sag, mildew resistant, paintable latex sealant of formulation indicated that is recommended for exposed applications on interior and protected exterior locations and that accommodates indicated percentage change in joint width existing at time of installation without failing either adhesively or cohesively.

C. Acrylic-Emulsion Sealant: Provide product complying with ASTM C 834 that accommodates joint movement of not more than 5 percent in both extension and compression for a total of 10 percent.

D. Silicone Emulsion Sealant: Provide product complying with ASTM C 834 and, except for weight loss measured per ASTM C 792 with ASTM C 920 that accommodates joint movement of not more than 25 percent in both extension and compression for a total of 50 percent.

E. Products: Subject to compliance with requirements, provide one of the following:
   1. Acrylic-Emulsion Sealant:
      a. "AC-20," Pecora Corporation.
      b. "Sonalac," Sonneborn Building Products
      c. "Tremco Acrylic Latex 834," Tremco, Inc.

2.3 ACOUSTICAL JOINT SEALANTS

A. Acoustical Sealant: Manufacturer's standard non-sag, non-staining, paintable sealant complying with ASTM C 834 and the following requirements:
   1. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies per ASTM E 90.
   2. Product has flame spread and smoke developed ratings of less than 25 per ASTM E 84.

B. Acoustical Sealant for Concealed Joints: Manufacturer's standard, nondrying, nonhardening, non-skinning, non-staining, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.

C. Products: Subject to compliance with requirements, provide one of the following:
   1. Acoustical Sealant:
      a. "SHEETROCK Acoustical Sealant", USG.
      b. "AC-2O FTR Acoustical and Insulation Sealant," Pecora Corporation.
   2. Acoustical Sealant for Concealed Joints:
      a. Pecora Corporation.
      b. "Tremco Acoustical Sealant," Tremco, Inc.

2.4 JOINT SEALANT BACKING

A. General: Provide sealant backings of material and type that are non-staining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, non-staining, non-waxing, non-extruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
   1. Open-cell polyurethane foam.
   2. Closed-cell polyethylene foam nonabsorbent to liquid water and gas, non-outgassing in unruptured state.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.5 MISCELLANEOUS MATERIALS:

A. Primer: Material recommended by joint sealant manufacturer for joint surfaces to be primed or sealed.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealants and sealant backing materials, free of oily residues or other substances capable of

staining or harming in any way joint substrates and adjacent non porous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.

C. Masking Tape: Non-staining, non-absorbent material compatible with joint sealants and surfaces to joints.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.

1. Remove laitance and form-release agents from concrete.
2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates were recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.2 INSTALLATION

A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

C. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

D. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

END OF SECTION

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SECTION 081100 HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Non-Rated and Fire-Rated standard fully welded hollow metal doors and frames.

B. Related Sections

1. Division 8 Section "Door Hardware" for door hardware for hollow metal doors.
2. Division 8 Section "Unit Masonry" for building anchors into and grouting frames in masonry construction.
3. Division 8 Section "Glazing" for glass in steel doors and sidelights.
4. Division 9 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.

C. Other Action Submittals:

1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

B. Fire-Rated Door Assemblies: NFPA 80.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.

1. Provide additional protection to prevent damage to finish of factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, but not limited to the following provide products by one of the following:

1. Ceco Door Products; an Assa Abloy Group company.
2. Curries Company; an Assa Abloy Group company.
3. Mesker Door Inc.
4. Steelcraft -Allegion.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, ASTM A 620 (ASTM A 620M) Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot dip galvanized according to ASTM A 153/A 153M, Class B.

D. Inserts, Bolts, and Fasteners: Hot dip galvanized according to ASTM A 153/A 153M.

E. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.

F. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.

G. Glazing: Comply with requirements in Division 8 Section "Glazing."

2.3 STANDARD HOLLOW METAL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI 100.

1. Interior Doors: 1 ¾" thick, Grade 2, heavy duty, Model 1, visible edge seam, 18 gauge minimum 0.0478-inch thick cold-rolled steel sheet faces. Full flush.

2. Exterior Doors: Grade 3, heavy-duty, Model 1, visible edge seam design, 16 gauge minimum 0.0635-inch thick A60 galvannealed steel sheet faces.

B. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

D. Low Profile Glazing Kits: All glazing kits shall be minimum 18 gauge cold rolled steel, mitered, and welded corners, welded reinforcing clips at corners, counter-sunk mounting screws-holes.

E. Door Louvers: (If Applicable or Indicated on drawings): Provide louvers according to SDI 111 C for interior doors.

F. STANDARD HOLLOW METAL FRAMES

F. General: Provide metal frames, transoms, sidelights, etc. that comply with ANSI/SDI 100 and with details indicated for type and profile.

G. Fabricate frames as following:

1. Fabricate frames as face welded unless otherwise indicated.

2. Interior Frames: 16- gauge.

3. Exterior Frames: 14-gauge A60 Galvanized.

H. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.4 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

C. Hollow Metal Doors:

1. Interior Doors: Honeycomb Core: Reinforced, stiffened, sound deadened and insulated with impregnated Kraft honeycomb core completely filling the inside of the doors and laminated to inside faces of both panels using contact adhesive applied to both panels and honeycomb core.

2. Exterior Doors: Insulated polystyrene.

3. Seal joints in top edges of doors against water penetration. Close top and bottom edges of doors galvanized steel channels. With channel webs placed even with top and bottom edges.

D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.

4. Floor Anchors: (If Applicable) Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.

5. Jamb Anchors: Provide number and spacing of anchors as follows:

a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1) Three anchors per jamb from 60 to 90 inches high.

b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1) Three anchors per jamb up to 60 inches high.

c. Compression Type: Not less than two anchors in each jamb.

6. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.

a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.

E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 8 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8 or ANSI/NAAMM-HMMA 861.

2. Reinforce doors and frames to receive non-templated, mortised and surface-mounted door hardware.

3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.

G. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pre-treating.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:

1. Squareness: Plus, or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.

2. Alignment: Plus, or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.

3. Twist: Plus, or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

4. Plumbness: Plus, or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive non-templated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

a. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.

b. Remove temporary braces necessary for installation only after frames have been properly set and secured.

c. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.

a. Floor anchors may be set with powder-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.

3. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

a. Squareness: Plus, or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.

b. Alignment: Plus, or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.

c. Twist: Plus, or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

d. Plumbness: Plus, or minus 1/16 inch, measured at jambs at floor.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.

b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.

c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.

d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

SECTION 081416 FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Non-Rated and Fire-Rated solid-core doors with wood-veneer faces.
2. Factory finished flush wood doors.

B. Related Sections:

1. Division 8 Section "Glazing" for glass view panels in flush wood doors.

1.3 SUBMITTALS

A. Product Data: For each type of door indicated. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.

C. Samples: For factory-finished doors.

1.4 QUALITY ASSURANCE

A. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated." WDMA I.S.1-A, "Architectural Wood Flush Doors." WI's "Manual of Millwork."

B. Fire-Rated Wood Doors: Comply with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing according to ASTM E 152.

C. At Stairwell enclosures, provide doors that have a temperature rise rating of 250 degree maximum in 30 minutes of fire exposure.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Masonite Architectural.
2. Chappell Door Co.
3. Oshkosh Architectural Door Company.

2.2 DOOR CONSTRUCTION, GENERAL

A. Low-Emitting Materials: Provide 5-ply doors made with adhesives and composite wood products that do not contain urea formaldehyde.

B. WDMA I.S.1-A Performance Grade:

1. Heavy Duty unless otherwise indicated.

C. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-2, made with binder containing no urea-formaldehyde resin.
2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.

D. Structural-Composite-Lumber-Core Doors:

1. Structural Composite Lumber: WDMA I.S.10.
    a. Screw Withdrawal, Face: 700 lbf.
    b. Screw Withdrawal, Edge: 400 lbf.

E. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.

1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
2. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Comply with specified requirements for exposed edges.

2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Premium, with Grade A faces.
2. Species: Natural birch.
3. Cut: Rotary cut.
4. Match between Veneer Leaves: Book match.
5. Assembly of Veneer Leaves on Door Faces: Running match.
6. Pair and Set Match: Provide for doors hung in same opening.
7. Core: Particleboard for non-rated doors and mineral core for fire rated doors.
8. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering.

2.4 LOUVERS AND LIGHT FRAMES

A. Metal Louvers (If applicable):

1. Metal and Finish: Hot-dip galvanized steel, 0.040-inch-thick, factory primed for paint finish.
2. Metal and Finish: Extruded aluminum with Class II, clear anodic finish, AA-M12C22A31.

B. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch- thick, cold-rolled steel sheet; with baked-enamel- or powder-coated finish; and approved for use in doors of fire-protection rating indicated.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with requirements in NFPA 80 for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied.

C. Openings: Cut and trim openings through doors in factory.

1. Light Openings: Trim openings with moldings of material and profile indicated.

2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 8 Section "Glazing."

2.6 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Finish doors at factory that are indicated to receive transparent finish. Field finish doors indicated to receive opaque finish.

C. Transparent Finish:

1. Grade: Premium.

2. Finish: WDMA TR-6 catalyzed polyurethane.

3. Staining: As selected by Architect from manufacturer's full range.

4. Sheen: Satin.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Hardware: For installation, see Division 8 Section "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.

1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.

a. Comply with NFPA 80 for fire-rated doors.

D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

END OF SECTION

NEW FIRE STATION NO. 10
COURT STREET
MONTGOMERY, ALABAMA 36108
CITY PROJECT NO. SP-5-21

SECTION 081613 - FIBERGLASS DOORS AND FRAMES

PART 1 - GENERAL

1.01 DESCRIPTION

A. WORK INCLUDED

1. Openings as shown in the schedule, on the plans and bound into these specifications.
2. The removal of existing doors, frames, glass, etc as noted. (OPTIONAL)
3. The installation of new opening systems that include aluminum frames, fiberglass doors, fiberglass panels, door hardware as scheduled in the specifications.
4. Heavy duty wide stile FRP doors.

1.02 QUALITY ASSURANCE

A. MANUFACTURER'S CERTIFICATION

1. Manufacturer is to have a minimum of 5 years' experience in the production of pre-hardware and pre-assembled door systems, using the type of materials specified for this project.

B. WARRANTIES

1. Wide Stile FRP doors will carry a 25 year limited warranty on doors structural integrity, main frame, and the lamination between face sheets and core.
2. The entire system (excluding hardware) will be guaranteed for 10 years.
3. Each door hardware component will carry its own manufactures warranty and should not be confused with the warranty of the FRP door and frame.

1.03 MANUFACTURERS

A. ACCEPTABLE MANUFACTURERS

1. Therma-Tru Doors
2. Plastpro Inc
3. JELD-WEN
4. Approved equal manufacturer.

B. SHOP DRAWINGS

1. Submit shop drawings for the fabrication and installation of the Doors and Frames, and associated components of the work. Included wall elevations and detail sections of every typical composite member.
2. Show frame anchoring, frame repairs to existing frames, glazing details, interior and exterior wall repairs and any other component or accessory required to complete each door opening.
3. Include details of main frame corner joint construction on doors, Stile and Rail size, Core material, Vision lite moldings, Louvers and Factory Finishing Specifications.
4. Details of HARDWARE REINFORCING Material, Size & Thickness, Locations on both door(s) and frame and Method of attachment.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. IDENTIFICATION

1. Each door, frame and any additional components will be tagged with a mark or number which correlates with the designation system used for shop drawings.

B. PROTECTION

1. All material will be protected during transit and storage from soiling and deterioration.

PART 2 - DOORS, FRAMES AND PANELS

2.01 MATERIALS

A. ALUMINUM MEMBERS

1. Doors, frames, miscellaneous components, and entrance systems accessories are to be from the same manufacturer. Splitting the source for these items will not be permitted.
2. Provide alloy and temper as recommended for resistance to corrosion and color control. Aluminum member references are ASTM B 221 for extrusions and ASTM B 209 for sheets

2.02 FIBERGLASS (FRP) PANELS

A. ALUMINUM EDGED FIBERGLASS (FRP) PANELS

1. CONSTRUCTION - Panels will be constructed of two sheets of .120 fiberglass sheets bonded to ¾" core material. Panel thickness will be 1". An aluminum frame surrounds the perimeter of the panel, and measures 1" x 1" x 1" with 1/8" wall thickness. WOOD EDGED PANELS WILL NOT BE ACCEPTED.
2. CORE material will be 24-psi density polystyrene with a FLAME SPREAD rating of no more than 25. CORE MATERIAL MUST HAVE A PROVEN RECORD FOR USE IN PANEL FABRICATION – WITHOUT DELAMINATING. URETHANE CORES WILL NOT BE ACCEPTED.
3. FRP face sheets will be .120 minimum thickness with a pebble like surface
4. COLOR will be selected from manufactures standard color chart.
5. Provide U.V. Protection equal to "Kal-Lite" premium greenhouse "Resin-Acrylic" modified as a U.V. Inhibitor.

2.03 EXTRA HEAVY DUTY FIBERGLASS WIDE STILE (FRP) DOORS

A. STRUCTURAL MAIN FRAME – Doors have an aluminum main frame constructed from extruded aluminum 6063 – T6 alloy. Doors are 1 ¾" thick. Main frame tube is to be a single extruded unit measuring 1 ½" x 5 ¾" (O.D.) on both side stiles and 6" (O.D.) Top and Bottom rails. Spliced extrusions that are joined together to measure 6" will not be accepted.

B. MAIN FRAME WALL THICKNESS

1. Side Stiles Minimum 3/16" thick hinge edge wall
2. Top and Bottom Rails Minimum 1/8" thick outside edge wall (tie rod spline built into tube)
3. All Rails and Stiles Minimum 1/8" thick face walls
4. All Rails and Stiles Minimum 1/8" thick inside edge wall

C. MAIN FRAME JOINERY – Assembly for the meeting joints of the Rails and Stiles on the main frame are to be MORTISE & TENON on all four joints. Secured with: 2 Tie Rods in Head Rail and 1 Tie Road in Bottom Rail. WELDED JOINTS WILL NOT BE ACCEPTED.

D. FACE SHEETS – Face sheets will be fiberglass reinforced polyester. .120" thick and have a pebble-like embossed finish. Face sheet color to be selected from manufacturer's standard color chart. FRP face sheets are MR84 high impact FRP MATERIAL that has been tested by ASTM D5420 Gardner Impact Test rating no lower than 413.72 in-lb (or equal)

E. CORE MATERIAL – will be 25 psi density polystyrene with a flame spread rating of no more than 25.

F. INTER-LOC EDGE TRIM – All aluminum trim is completely removable. All parts of the door are REPLACEABLE and REPAIRABLE in the field. No fastening devices are exposed on the Stile Edge Trims. SNAP-ON OR SCREW-ON STILE TRIM WILL NOT BE ACCEPTED.

G. HARDWARE REINFORCING – CLOSER reinforcing to be ¼" aluminum inserted into head rail. Other surface applied hardware is reinforced with the standard mainframe tube wall thickness of 1/8". Reinforcing for mortise and concealed hardware is to be done per template requirements.

END OF SECTION

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SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes access doors and frames for walls and ceilings.

1.2 SUBMITTALS

A. Product Data: For each type of access door and frame indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each door face material in specified finish.

D. Schedule: Types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

1.3 QUALITY ASSURANCE

A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. NFPA 252 or UL 10B for vertical access doors and frames.
2. ASTM E 119 or UL 263 for horizontal access doors and frames.

1.4 COORDINATION

A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Fire-Rated, Insulated, Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet.

C. Basis of Design: Williams Brothers Corporation: WB FR 800 Series Standard Flush Fire-Rated Access Door for Walls or Ceiling
1. Nystrom.

2. Milcor.

3. Babcock Davis.

2.2 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view, provide materials with smooth, flat surfaces without blemishes.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.

D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

1. For cylinder lock, furnish two keys per lock and key all locks alike for all access panels.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING AND CLEANING

A. Adjust doors and hardware after installation for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION

SECTION 083600 - SECTIONAL OVERHEAD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Glazed Aluminum Sectional Overhead Doors

B. Electric Operators and Controls.

C. Operating Hardware, tracks, and support.

1.2 RELATED SECTIONS

A. Section 03300 - Cast-In-Place Concrete: Prepared opening in concrete. Execution requirements for placement of anchors in concrete wall construction.

B. Section 04810 - Unit Masonry Assemblies: Prepared opening in masonry. Execution requirements for placement of anchors in masonry wall construction.

C. Section 05500 - Metal Fabrications: Steel frame and supports.

D. Section 06114 - Wood Blocking and Curbing: Rough wood framing and blocking for door opening.

E. Section 07900 - Joint Sealers: Perimeter sealant and backup materials.

F. Section 08710 - Door Hardware: Cylinder locks.

G. Section 09900 - Paints and Coatings: Field painting.

H. Section 11150 – Parking Control Equipment: Remote door control.

I. Section 16130 - Raceway and Boxes: Empty conduit from control station to door operator.

J. Section 16150 - Wiring Connections: Electrical service to door operator.

1.3 REFERENCES

A. ANSI/DASMA 102 - American National Standard Specifications for Sectional Overhead Type Doors.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

A. Wind Loads: Design and size components to withstand loads caused by pressure and suction of wind acting normal to plane of wall as calculated in accordance with applicable code.

B. Wiring Connections: Requirements for electrical characteristics.
   1. 208 volts, single phase, 60 Hz.

C. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.
B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: Indicate plans and elevations including opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.

D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

E. Operation and Maintenance Data.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.

B. Installer Qualifications: Authorized representative of the manufacturer with minimum five years documented experience.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened labeled packaging until ready for installation.

B. Protect materials from exposure to moisture until ready for installation.

C. Store materials in a dry, ventilated weathertight location.

D.

1.8 PROJECT CONDITIONS

A. Pre-Installation Conference: Convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Overhead Door Corp., 2501 S. State Hwy. 121, Suite 200, Lewisville, TX 75067. ASD. Tel. Toll Free: (800) 275-3290. Phone: (469) 549-7100. Fax: (972) 906-1499. Web Site: www.overheaddoor.com. E-mail: sales@overheaddoor.com.

B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 GLAZED ALUMINUM SECTIONAL OVERHEAD DOORS

A. Glazed Sectional Overhead Doors: 521 Series Aluminum Doors by Overhead Door Corporation.
   1. Door Assembly: Stile and rail assembly secured with 1/4-inch diameter through rods.
      a. Panel Thickness: 1-3/4 inches.
      b. Center Stile Width: 2-11/16 inches.
      c. End Stile Width: 3-5/16 inches.
      d. Intermediate Rail Pair Width: 3-11/16 inches.
      e. Top Rail Width:
         1) 3-3/4 inches.
      f. Bottom Rail Width:
         1) 4-1/2 inches.
      g. Aluminum Panels: 0.050 inch thick, aluminum.
      h. Stiles and Rails: 6063 - T6 aluminum.
      i. Springs:
         1) 25,000 cycles.
      j. Glazing:
         1) 1/4 inch (6 mm) Tempered glass.
   2. Finish and Color:
      a. Powder Coating Finish: Color as selected by Architect from manufacturer's standard colors (**Including Red**).
   3. Windload Design: Provide to meet the Design/Performance requirements specified.
   4. Hardware: Galvanized steel hinges and fixtures. Ball bearing rollers with hardened steel races.
   5. Lock: Interior galvanized single unit.
   6. Weatherstripping:
      a. Flexible bulb-type strip at bottom section.
      b. Flexible Jamb seals.
      c. Flexible Header seal.
   7. Track: Provide track as recommended by manufacturer to suit loading required and clearances available.
   8. Electric Motor Operation: Provide UL listed electric operator, size and type as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second. Operator shall meet UL325/2010 requirements for continuous monitoring of safety devices.
      a. Entrapment Protection: Required for momentary contact, includes radio control operation.
         1) Pneumatic sensing edge up to 18 feet (5.5 m) wide. Constant contact only complying with UL 325/2010.

2) Electric sensing edge monitored to meet UL 325/2010.
3) Photoelectric sensors monitored to meet UL 325/2010.

b. Operator Controls:
1) Push-button operated control stations with open, close, and stop buttons.
2) Key operated control stations with open, close, and stop buttons.
3) Push-button and key operated control stations with open, close, and stop buttons.
4) Flush mounting.
5) Surface mounting.
6) Interior location.
7) Exterior location.
8) Both interior and exterior location.

c. Special Operation:
1) Pull switch.
2) Vehicle detector operation.
3) Radio control operation.
4) Card reader control.
5) Photocell operation.
6) Door timer operation.
7) Commercial light package.
8) Explosion and dust ignition proof control wiring.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until openings have been properly prepared.

B. Verify wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

C. Verify electric power is available and of correct characteristics.

D. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install overhead doors and track in accordance with approved shop drawings and the manufacturer’s printed instructions.

B. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.

C. Anchor assembly to wall construction and building framing without distortion or stress.

D. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

E. Fit and align door assembly including hardware.

F. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

3.4 CLEANING AND ADJUSTING

A. Adjust door assembly to smooth operation and in full contact with weatherstripping.

B. Clean doors, frames, and glass.

C. Remove temporary labels and visible markings.

3.5 PROTECTION

A. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

B. Protect installed products until completion of project.

C. Touch-up, damaged coatings and finishes and repair minor damage before Substantial Completion.

END OF SECTION

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SECTION 084123 - ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.1 SECTION INCLUDES

A. Aluminum Storefront Frames, Windows & Doors, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of storefront units.

A. Refer to “Glass and Glazing” section of Division 8 for glazing requirements for aluminum entrances and storefronts.

1.2 REFERENCES

A. AAMA - Metal Curtain Wall, Window, Store Front and Entrance _ Guide Specifications Manual.

B. AAMA 605.2 - Specification for High Performance Organic Coatings on Architectural Extrusions and Panels.

C. AAMA SFM-1 - Aluminum Storefront and Entrance Manual.

D. ANSI A117.1 - Safety Standards for the Handicapped.

E. ANSI/ASTM E331 - Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

1.4 PERFORMANCE REQUIREMENTS

A. Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall as measured in accordance with ANSI/ASTM E330.

B. Limit mullion deflection to flexure limit of glass; with full recovery of glazing materials.

C. System to accommodate, without damage to components or deterioration of seals, movement within system, movement between system and peripheral construction, dynamic loading and release of loads, deflection of structural support framing.

D. Limit air leakage through assembly to 0.06 of wall area, measured at a reference differential pressure across assembly of 1.57psf as measured in accordance with AAMA 501 ANSI/ASTM E283.

E. Water Leakage: None, when measured in accordance with ASTM E331 with a test pressure difference of 2.86 lbf/sq ft.

F. Maintain continuous air and vapor barrier throughout assembly, primarily in line with inside pane of glass and heel bead of glazing compound.

G. System to provide for expansion and contraction within system components caused by a cycling temperature range of 170 degrees F (95 degrees C) over a 12-hour period without causing detrimental effect to system components.

H. Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to the exterior by a weep drainage network.

1.6 SUBMITTALS

A. Submit under provisions of Section 01300.

B Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work and expansion and contraction joint location and details.

C Product Data: Provide component dimensions describe components within assembly, anchorage and fasteners, glass and infill, door hardware, internal drainage details.

D. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with AAMA SFM-1 and AAMA - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.

B. Conform to requirements of ANSI A117.1.

1.8 QUALIFICATIONS

A. Manufacturer and Installer: Company specializing in manufacturing aluminum glazing systems with minimum three years' experience.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C) during and 48 hours after installation.

1.10 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on Drawings.

1.11 COORDINATION

A. Coordinate Work under provisions of Section 01039.

1.12 WARRANTY

A. Provide three-year warranty.

B. Warranty: Include coverage for complete system for failure to meet specified requirements.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Kawneer.

B. Other acceptable manufacturers offering equivalent Products.

1. YKK.

2. Vistawall.

3. U.S. Aluminum – C R Laurence.

C. Substitutions: Submit product literature to architect for review seven (7) days prior to bid.

2.2 MATERIALS (Kawneer: Basis of Design)

A. Stile and Rail Entrance Doors: Sizes, types and swings as indicated, equal to Kawneer Model 500, wide stile with 8” high horizontal cross rail, assembled and prepared for hardware. Bottom rail shall be 6” high as indicated. Stiles shall be beveled for SA doors. Join stiles and rails with welded interlocking joint, or with cadmium plated steel tie rods, to produce long-lasting joints which remain rigid and tight when door is operated.

Weatherstrip exterior SA doors with Kawneer semi-rigid polymeric strips installed in face of stop and in meeting edge stiles. Seal sill with a blade gasket sweep applied to door bottom rail with concealed fasteners.

B. Entrance and Sidelight Frames: Unless otherwise shown, employ Kawneer series 451 flush exterior glazed tubing of 1/8" minimum thickness, 2-3/4" x 5”, complete with special shapes as required for a finished job. No face joints permitted in verticals except at expansion mulls. Sight lines on glazing members shall be consistent.

2.3 GLASS AND GLAZING MATERIALS

A. Glass and Glazing Materials: See drawings for Glazing Schedule.

2.4 SEALANT MATERIALS

A. Sealant and Backing Materials: As specified in Section 07900.

2.5 HARDWARE

A. See Door Hardware Section 087100 for all Aluminum Storefront hardware. .

2.6 FABRICATION

A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly yet enabling installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

C. Prepare components to receive anchor devices. Fabricate anchors.

D. Arrange fasteners and attachments to conceal from view.

E. Prepare components with internal reinforcement for door hardware and door operator hinge hardware.

2.7 FINISHES

A. Anodized; Selected from manufacturers standard colors. **(Note that red should be an available choice**).

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify site opening conditions under provisions of Section 01039.

B. Verify dimensions, tolerances, and method of attachment with other work.

C. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.

3.2 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions and AAMA - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings.

G. Coordinate attachment and seal of perimeter air and vapor barrier materials.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Install flashings.

J. Set thresholds in bed of mastic and secure.

K. Install hardware using templates provided. Refer to Section 08712 and 08721 for installation requirements.

L. Install glass in accordance with Section 08800, to glazing method required to achieve performance criteria.

M. Install perimeter sealant to method required to achieve performance criteria.

3.3 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 1/16 inches per 10 ft, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.4 ADJUSTING

A. Adjust work under provisions of Section 01700.

B. Adjust operating hardware for smooth operation.

3.5 CLEANING

A. Clean work under provisions of 01700.

B. Remove protective material from pre-finished aluminum surfaces.

C. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

D. Remove excess sealant by method acceptable to sealant manufacturer.

3.6 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01500.

B. Protect finished Work from damage.

END OF SECTION

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SECTION 084523 - 2-3/4" INSULATED TRANSLUCENT FIBERGLASS SANDWICH PANEL WALL SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes the insulated, translucent sandwich panel system and accessories as shown and specified. Work includes providing and installing:

1. Flat insulated, translucent sandwich panels
2. Aluminum clamptite installation system
3. Aluminum sill flashing

1.3 SUBMITTALS

A. Submit manufacturer's product data. Include construction details, material descriptions, profiles, and finishes of components.

B. Submit shop drawings. Include plans, elevations, and details.

C. Submit manufacturer's color charts showing the full range of colors available for factory finished exposed aluminum.

1. When requested, submit samples for each exposed finish required, in same thickness and material indicated for the work and in size indicated below.
   a. Sandwich panels: 7" x 12" units
   b. Factory finished aluminum: 3" long sections

D. Submit Installer Certificate, signed by installer, certifying compliance with project qualification requirements.

E. Submit product reports from a qualified independent testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed reports will be acceptable if for current manufacturer and indicative of products used on this project.

1. Reports required (if applicable) are:
   a. Flame Spread and Smoke Developed (UL 723) – Submit UL Card
   b. Burn Extent (ASTM D 635)
   c. Color Difference (ASTM D 2244)
   d. Impact Strength (UL 972)
   e. Bond Tensile Strength (ASTM C 297 after aging by ASTM D 1037)
   f. Bond Shear Strength (ASTM D 1002)
   g. Beam Bending Strength (ASTM E 72)
   h. Insulation U-Factor (NFRC 100)
   i. NFRC System U-Factor Certification (NFRC 700)
   j. NFRC Visible Light Transmittance (NFRC 202)
   k. Solar Heat Gain Coefficient (NFRC or Calculations)
   l. Condensation Resistance Factor (AAMA 1503) (Thermally Broken, insulated panels only)

m. Air Leakage (ASTM E 283)
n. Structural Performance (ASTM E 330)
o. Water Penetration (ASTM E 331)
p. Fire Penetration of Exterior Wall Assemblies Using a Direct Flame Impingement Exposure (ASTM E2707)

1.4 CLOSEOUT SUBMITTALS

A. Provide field maintenance manual to include in project maintenance manuals.

1.5 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Material and products shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least ten consecutive years and which can show evidence of those materials being satisfactorily used on at least six projects of similar size, scope, and location. At least three of the projects shall have been in successful use for ten years or longer.
2. Panel system must be listed by an ANSI accredited Evaluation Service, which requires quality control inspections and fire, structural, and water infiltration testing of sandwich panel systems by an accredited agency.
3. Quality control inspections shall be conducted at least once each year and shall include manufacturing facilities, sandwich panel components, and production sandwich panels for conformance with AC177 "Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems" as issued by the ICC-ES.

B. Installer's Qualifications: Installation shall be by an experienced installer, which has been in the business of installing Translucent Wall Panel systems for at least two consecutive years and can show evidence of satisfactory completion of projects of similar size, scope, and type.

1.6 PERFORMANCE REQUIREMENTS

A. The manufacturer shall be responsible for the configuration and fabrication of the complete panel system.

1. When requested, include span analysis data.
2. Standard panel system shall have less than 0.01 cfm/ft² air leakage by ASTM E 283 at 6.24 PSF (50 mph) and no water penetration by ASTM E 331 at 15 PSF; and structural testing by ASTM E 330.
3. Structural Loads. Provide system capable of handling the following loads:

a. Positive Wind Load (PSF): As per current IBC.
b. Negative Wind Load (PSF): As per current IBC.

B. Deflection Limits:

1. Walls: Limited to L/60 of clear span for each assembly component.

C. Thermal Movements: Allow for thermal movements from ambient- and surface-temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 110 deg F, ambient; 150 deg F, material surfaces.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver panel system, components, and materials in manufacturer's standard protective packaging.

B. Store panels on the long edge; several inches above the ground, blocked and under cover in accordance with manufacturer's storage and handling instructions.

1.8 WARRANTY

A. Provide manufacturer's and installer's written warranties agreeing to repair or replace panel system work, which fails in material or workmanship, within one year from the date of delivery. Failure of material or workmanship shall include deterioration of finish on metal more than normal weathering; and defects in accessories; insulated, translucent sandwich panels; and other components of the work.

B. Extended Panel Warranty: 5 years from date of delivery.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. The basis for this specification is for products manufactured by Kalwall Corporation. Other manufacturers may bid this project subject to compliance with the performance requirements of this specification and submission of evidence thereof

B. Kalwall Corporation, Tel: (800) 258-9777 – Fax: (603) 627-7905 – Email: info@kalwall.com.

C. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than 10 days prior to bid opening.

2.2 PANEL COMPONENTS

A. Face Sheets:

1. Translucent faces: Manufactured from glass fiber reinforced thermoset resins, formulated specifically for architectural use.
   a. Thermoplastic (e.g., polycarbonate, acrylic) faces are not acceptable.
   b. Face sheets shall not deform, deflect, or drip when subjected to fire or flame.
2. Interior face sheets:
   a. Flame spread: Underwriters Laboratories (UL) listed, which requires periodic unannounced retesting, with flame spread rating no greater than 50 and smoke developed no greater than 250 when tested in accordance with UL 723.
   b. Burn extent by ASTM D 635 shall be no greater than 1".
3. Exterior face sheets:
   a. Color stability: Full thickness of the exterior face sheet shall not change color more than 3 CIE Units DELTA E by ASTM D 2244 after 5 years outdoor South Florida weathering at 5° facing south as measured on a white sample, with and without a protective film or coating to ensure long-term color stability. Color stability shall be unaffected by abrasion or scratching.
   b. Strength: Exterior face sheet shall be uniform in strength, impenetrable by handheld pencil and repel an impact minimum of 70 ft. lbs without fracture or tear when impacted by a 3-1/4" diameter, 5 lb. free-falling ball per UL 972.
   c. Erosion Protection: Integral, embedded-glass erosion barrier.
4. Appearance:

a. Exterior Face Sheets: Smooth, 0.070 thick and White in color.
b. Interior Face Sheets: Smooth, 0.070 thick and White in color.
c. Face sheets shall not vary more than ± 10% in thickness and be uniform in color.

B. Grid Core:

1. Aluminum, Thermally Broken Composite I-beam grid core shall be of 6063-T6 or 6005-T5 alloy and temper with provisions for mechanical interlocking of muntin-mullion and perimeter. Width of I-beam shall be no less than 7/16".

C. Laminate Adhesive:

1. Heat and pressure resin type adhesive engineered for structural sandwich panel use, with minimum 25-years field use. Adhesive shall pass testing requirements specified by the International Code Council "Acceptance Criteria for Sandwich Panel Adhesives".
2. Minimum tensile strength of 750 PSI when the panel assembly is tested by ASTM C 297 after two exposures to six cycles each of the aging conditions prescribed by ASTM D 1037.
3. Minimum shear strength of the panel adhesive by ASTM D 1002 after exposure to four separate conditions:
   a. 50% Relative Humidity at 68° F: 540 PSI
   b. 182° F: 100 PSI
   c. Accelerated Aging by ASTM D 1037 at room temperature: 800 PSI
   d. Accelerated Aging by ASTM D 1037 at 182° F: 250 PSI

2.3 PANEL CONSTRUCTION

A. Provide sandwich panels of flat fiberglass reinforced translucent face sheets laminated to a grid core of mechanically interlocking I-beams. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge.

1. Thickness: 2-3/4 inches
2. Panel U-factor by NFRC certified laboratory:
   a. 2-3/4" thermally broken grid 0.23U
3. Complete insulated panel system shall have NFRC certified U-factor of 0.28.
4. Solar heat gain coefficient 0.21.
5. Grid pattern: Nominal size 12 x 24; pattern Shoji.

B. Standard panels shall deflect no more than 1.9" at 30 PSF in 10'-0" span without a supporting frame by ASTM E 72.

C. Panels shall meet the conditions of acceptance according to

D. Thermally broken, insulated panels: Minimum Condensation Resistance Factor of 80 by AAMA 1503 measured on the bond line.

2.4 ALUMINUM CLAMPTITE INSTALLATION SYSTEM

A. Aluminum clamptite installation system:

1. Standard-Flat extruded aluminum 6063-T6 and 6063-T5 alloy and temper clamp-tite screw type closure system.

B. Sealing tape: Manufacturer's standard, pre-applied to aluminum clamptite installation system at the factory under controlled conditions.

C. Fasteners: 300 series stainless steel screws for aluminum clamptite installation system, excluding final fasteners to the building.

D. Finish:

1. Manufacturer's factory applied finish, which meets the performance requirements of AAMA 2604. Color to be selected from manufacturer's standards**.**

PART 3 - EXECUTION

3.1 EXAMINATION

A. Installer shall examine substrates, supporting structure, and installation conditions.

B. Do not proceed with panel installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Metal Protection:
1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by sealant manufacturer for this purpose.
2. Where aluminum will contact concrete, masonry, or pressure treated wood, protect against corrosion by painting contact surfaces with bituminous paint or method recommended by sealant manufacturer.

3.3 INSTALLATION

A. Install the panel system in accordance with the manufacturer's fabrication drawings and suggested installation instructions.

1. Anchor component parts securely in place by permanent mechanical attachment system.
2. Accommodate thermal and mechanical movements.
3. Seal aluminum clamptite installation system as shown on the manufacturer’s fabrication drawings and suggested installation instructions.

B. Install joint sealants at perimeter joints and within the panel system in accordance with manufacturers fabrication drawings and suggested installation instructions.

3.4 FIELD QUALITY CONTROL

A. Water Test: Installer to test a representative section of installed materials according to procedures in AAMA 501.2.

B. Repair or replace work that does not pass testing or that is damaged by testing and retest work.

3.5 CLEANING

A. Clean the panel system, interior and exterior, immediately after installation.

B. Refer to manufacturer's written recommendations.

END OF SECTION 084523

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SECTION 087100 – DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for hollow steel doors.

B. Hardware for fire-rated doors.

C. Electrically operated and controlled hardware.

D. Lock cylinders for doors for which hardware is specified in other sections.

E. Thresholds.

F. Weatherstripping.

1.02 RELATED SECTIONS

A. Section 08110 – Steel Doors and frames.

B. Section 08211 – Flush Wood Doors.

C. Section 08411 - Aluminum Doors.

1.03 REFERENCES

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 1998.

B. BHMA A156.18 - American National Standard for Materials and Finishes; Builders Hardware Manufacturers Association, Inc.; 2000 (ANSI/BHMA A156.18).

C. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; Door and Hardware Institute; 2001.

D. NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association; 1999.

E. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; National Fire Protection Association; 2006.

F. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

G. IBC – International Building Code; 2003.

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. The finish hardware supplier shall submit to the Architect, six (6) complete copies of the proposed finish hardware schedule for approval. The schedule shall be prepared using the "sequence and format" of the Door and Hardware Institute (DHI). After approval of the schedule the hardware supplier shall provide 3 copies of this approved schedule to the Contractor for file and distribution purposes. Hardware shall not be ordered by the hardware supplier until an approved schedule has been received.

C. When submitting schedules for approval, include two manufacturers' cut sheets on each hardware item proposed. Index it with the use of numbers or letters or a combination of both, with the hardware schedule. The index numbers/letters are to be in right hand column on the same line as the respective manufacturer's numbers. All manufacturers' numbers shall be indexed even when appearing more than once.

D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

E. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

F. Keys: Deliver with identifying tags to Owner by security shipment direct from hardware supplier.

G. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Hardware Supplier Qualifications: Company specializing in supplying commercial door hardware with three years of experience.

C. Hardware Supplier Personnel: Employ an Architectural Hardware Consultant (AHC) to assist in the work of this section.

D. This Section includes the furnishing of all items of finish hardware as hereinafter specified, or obviously necessary to complete the building, except those items that are specifically excluded from this section of the specification. The general contractor shall verify supplier's compliance with the specifications prior to procuring any materials of hardware for this project.

E. The key meeting shall be held with the owner and a representative of ASSA ABLOY present. Compatibility of all new hardware with the owner's existing parts and maintenance programs is essential to the Owner.

F. Supplier: A recognized builders hardware supplier who has been furnishing hardware in the project's vicinity for a period of not less than 2 years, and who is, or has in full time employment a certified Architectural Hardware Consultant (AHC) in good standing, and who is or represents a direct distributor of the products approved for warranty purposes. All schedules shall be signed by an AHC.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

1.07 COORDINATION

A. Coordinate selection and installation of security-related door hardware.

B. Coordinate the work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware.

C. Furnish templates for door and frame preparation.

D. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

E. Coordinate Owner's keying requirements during the course of the Work.

1.08 WARRANTY

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

B. Provide twenty-five year warranty for door closers.

C. Provide three year warranty for locksets and exit devices.

1.09 MAINTENANCE PRODUCTS

A. Provide special wrenches and tools applicable to each different or special hardware component.

B. Provide maintenance tools and accessories supplied by hardware component manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hinges:
1. Ives 5BB1/5BB1HW
2. Stanley FBB179/FBB168
3. Hager Companies BB1279/BB1168
4. Field verify hinge sizes required at existing door frames. Provide non-template hinges where required.

B. Mortise Locks:

1. Schlage L9000/ND Series, TLR (Tubular Lever x Rose) Design *
2. Falcon MA/T Series, BRK Design
3. Accurate 9000/9100 Series, 39L-1R Design
4. All above levers to be factory prepared for large format interchangeable cores.
5. Provide the lock series specified in the door hardware sets.

C. Closers:
1. LCN 4000/1460 Series
2. Norton 9500 Series
3. Corbin Russwin DC8000 Series
4. Provide series specified in the door hardware sets.

D. Overhead Holders:
1. Glynn-Johnson
2. Rixson
3. Sargent Manufacturing Company

E. Manual Bolts:
1. Ives
2. Hager Companies
3. Triangle Brass Manufacturing Co., Inc

F. Protection Plates:
   1. Ives
   2. Hager Companies
   3. Triangle Brass Manufacturing Co., Inc

G. Thresholds and Weatherstripping:
   1. Zero
   2. National Guard Products, Inc
   3. K. N. Crowder

H. Sound Seals:
   1. Zero
   2. National Guard Products, Inc
   3. K. N. Crowder

I. Exit Devices:
   1. Von Duprin 35A/98 Series
   2. Falcon 25 Series
   3. Detex 10 Series

J. Continuous Gear Hinges:
   1. Ives
   2. Select Products
   3. Markar

K. Electric Strikes:
   1. Von Duprin 6000 Series
   2. Folger Adams 300 Series

2.02 SUBSTITUTIONS

A. Substitutions requests must be received within 14 days of the originally scheduled bid date. Comply with the requirements of division 1.

2.03 GENERAL REQUIREMENTS FOR DOOR HARDWARE PRODUCTS

A. Provide products that comply with the following:
   1. Applicable provisions of Federal, State, and local codes.
   2. ANSI/ICC A117.1, American National Standard for Accessible and Usable Buildings and Facilities.
   3. Applicable provisions of NFPA 101, Life Safety Code.
   4. Fire-Rated Doors: NFPA 80.
   5. All Hardware on Fire-Rated Doors: Listed and classified by UL as suitable for the purpose specified and indicated.
   6. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

B. Finish of items shall conform to ANSI A156.18 and shall be as listed below, <u>unless otherwise indicated in the door hardware sets</u>:
   1. Butt Hinges – Exterior 630, Interior 626 or 652. Hinges at shower areas are to be 626 or 630 finish for rust resistance.
   2. Locksets – 626AM, satin chrome. AM=anti-microbial coatings.

3. Closers – 689, powder coat aluminum paint. Aluminum doors provide LCN RAL custom paint color for match of specified frame and door finish.
4. Kick Plates – 630.
5. Push & Pull Plates – 630AM.
6. Straight Pulls – 630AM.
7. Thresholds & Weather Stripping - 628 or 673.
8. Holders/Stops - 626 or 630.
9. Flush Bolts - 626 or 630.
10. Exit Devices – 626AM, satin chrome, with 630AM, satin stainless steel touch pads.
11. Continuous Gear Hinges – 628, clear anodized aluminum at wood and hollow metal doors. Aluminum doors: hinge finish shall be custom color anodized aluminum or custom color Kynar paint finish as required to match the specified aluminum frame and door finish.

C. Closers: All surface mount closers shall have full covers. All surface closers are to be throughbolt mounted using manufacturer supplied fasteners. All surface closers are to have case iron bodies. Closers at exterior doors and elsewhere as note in hardware sets shall have minimum 1 ½" piston diameter.

D. Kickplates and Mop Plates: 0.050 inch minimum thickness satin stainless steel. All screw holes are to be counter sunk with oval head fasteners. Pan head fasteners will not be acceptable. All plate edges are to be factory beveled.

E. Holder/Stops: Provide holder/stops with bronze base metal arms and channels at exterior openings. No floor stops shall be used. If wall stop is not applicable use stop arm on closer or overhead stop.

2.04 KEYING

A. All lock cylinders shall be grand master keyed into a new Schlage 29 Series, controlled access, utility patented, master key system. Owner letter of authorization required for order on materials from Schlage. All cylinders shall be 7-pin, large format interchangeable core type (LFIC). All lock cylinder permanent cores shall be factory keyed by Schlage Lock Company. All permanent keys shall be factory cut by Schlage Lock Company. Key all permanent cores as per the Owner's instructions.

B. Provide temporary brass construction cores for all locks. Construction cores are for use of the general Contractor during construction. General Contractor shall be responsible for the removal of brass construction cores and the installation of permanent cores at the completion of the project.

D. Change keys shall be stamped with key set symbol. All change keys except one of each cut (the file key) shall be stamped with the notation "Do Not Duplicate". Stamp permanent cores in a concealed location with their assigned key set symbol. Permanent change keys, master keys and permanent cores shall be shipped directly to the Owner via registered mail.

E. Supply keys in the following quantities:
1. 5 master keys per set.
2. 3 grand master keys.
3. 12 construction master keys.
4. 3 change keys for each lock, with room number stamped on each key.

5. 100 Key Blanks

F. Key Cabinet: Provide one surface wall mounted key cabinet, Lund Deluxe 1200 Series, two tag key system. Provide key cabinet with 150 IC core envelopes. Door hardware supplier shall tag and hang all file keys for future duplication use as needed by the owner. General contractor shall wall mount the key cabinet in the location provided by the architect.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Use templates provided by hardware item manufacturer.

C. Install hardware on fire-rated doors and frames in accordance with code and NFPA 80.

D. Mounting heights for hardware from finished floor to center line of hardware item: As listed in Schedule, unless otherwise noted:
1. For steel doors and frames: Comply with DHI "Recommended Locations for Architectural Hardware for Steel Doors and Frames."

E. Closers: All surface mount closers shall be mounted on interior side of rooms. Adjust closing force and speed of closers to conform to ADA requirements.

F. Thresholds: At exterior doors and elsewhere as indicated, set thresholds in a bed of joint sealant as specified in Section 07900 - JOINT SEALERS to completely fill concealed voids and exclude moisture from every source. Do not plug drain holes or block weeps. Remove excess sealant.

3.03 FIELD QUALITY CONTROL

A. Architectural Hardware Consultant, furnished by the hardware supplier, shall inspect installation and certify that hardware has been furnished and installed in accordance with manufacturer's instructions and as specified.

3.04 ADJUSTING

A. Adjust work under provisions of Section 01700.

B. Adjust hardware for smooth operation.

3.05 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01700.

B. Do not permit adjacent work to damage hardware or finish.

3.06 SCHEDULE –

a) The following schedule is furnished for whatever assistance it may afford the Contractor; do not consider it as entirely inclusive. Should any particular door or item be omitted in any scheduled hardware group, provide door or item with hardware same

as required for similar purposes. Quantities listed are for each pair of doors, or for each single door.

HARDWARE SET: 01

DOOR NUMBER:
181

EACH TO HAVE:

1	CONT. HINGE	224XY	IVE
1	STOREROOM LOCK	L9480T	SCH
1	FSIC CORE	23-030	SCH
1	SURFACE CLOSER	4040XP HCUSH TBSRT	LCN
1	THRESHOLD	65A	ZER
1	GASKETING	8144SBK PSA	ZER
1	DOOR SWEEP	8192AA	ZER
1	SECURITY ASTRAGAL	4343ST	ZER
1	RAIN DRIP CAP	142A	ZER

HARDWARE SET: 02 (FRP DOORS)

DOOR NUMBER:
109B 113B 113F 113G 113L 168

EACH TO HAVE:

1	CONT. HINGE	112XY FOR ALUMINUM FRAMES, 224XY FOR HOLLOW METAL FRAMES	IVE
1	EXIT DEVICE W/VISIBLE AT DISTANCE: LOCKED/UNLOCKED INDICATOR	CDSI-98-NL-990NL	VON
1	RIM CYLINDER	20-057 ICX	SCH
1	MORTISE CYLINDER	26-094- ICX	SCH
2	FSIC CORE	23-030	SCH
1	SURFACE CLOSER	4040XP SCUSH TBSRT	LCN
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	THRESHOLD	65A	ZER
1	GASKETING	8144SBK PSA	ZER
1	DOOR SWEEP	8198AA	ZER
1	RAIN DRIP CAP	142A	ZER

HARDWARE SET: 03

DOOR NUMBER:
140 153

EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 4.5 NRP	IVE
1	PANIC HARDWARE W/FLUID DAMPER CONTROL OF LATCH BOLT AND LEVER TRIM	QM-98-L-F-QM996-SNB	VON
1	RIM CYLINDER	20-057 ICX	SCH
1	SURFACE CLOSER	4111 EDA TBSRT	LCN
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
1	GASKET SEAL	188S-BK	ZER

HARDWARE SET: 04

DOOR NUMBER:
108 174A 174B 177B

EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 4.5 NRP	IVE
1	PANIC HARDWARE W/FLUID DAMPER CONTROL OF LATCH BOLT AND LEVER TRIM	QM-98-L-QM996-SNB	VON
1	RIM CYLINDER	20-057 ICX	SCH
1	SURFACE CLOSER	4111 EDA TBSRT	LCN
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
3	SILENCER	SR64	IVE

HARDWARE SET: 05

DOOR NUMBER:
113C 113D 113E 113H 113J 113K

ALL HARDWARE PROVIDED BY BIFILD DOOR SUPPLIER/MFG

HARDWARE SET: 06

DOOR NUMBER:
114

ALL HARDWARE PROVIDED BY ROLL UP DOOR SUPPLIER/MFG

HARDWARE SET: 07

DOOR NUMBER:
141

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	OFFICE/ENTRY LOCK	ND53TD 10-025 W/DUST BOX	SCH
1	FSIC CORE	23-030	SCH
1	SURFACE CLOSER	1461 RW/PA FC TBSRT	LCN
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
1	CONCEALED AUTO DOOR BOTTOM	350AA	ZER
1	GASKET SEAL	188S-BK	ZER

HARDWARE SET: 08

DOOR NUMBER:
138

EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 4.5	
1	OFFICE/ENTRY LOCK	ND53TD 10-025 W/DUST BOX	SCH
1	FSIC CORE	23-030	SCH
1	MOP PLATE	8400 6" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
3	SILENCER	SR64	IVE

HARDWARE SET: 09

DOOR NUMBER:
110 125A

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	OFFICE/ENTRY LOCK	ND53TD 10-025 W/DUST BOX	SCH
1	FSIC CORE	23-030	SCH
1	SURFACE CLOSER	1461 SCUSH FC TBSRT	LCN
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
3	SILENCER	SR64	IVE

HARDWARE SET: 10

DOOR NUMBER:

112	125B	121	104	116	135
136	137	155	167	169	175
176A	176B				

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	OFFICE/ENTRY LOCK	ND53TD 10-025 W/DUST BOX	SCH
1	FSIC CORE	23-030	SCH
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
3	SILENCER	SR64	IVE

HARDWARE SET: 11

DOOR NUMBER:

127A	131A

EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 4.5	
1	OFFICE/ENTRY LOCK	ND53TD 10-025 W/DUST BOX	SCH
1	FSIC CORE	23-030	SCH
1	MOP PLATE	8400 6" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	OVERHEAD STOP	90H SNB	GLY
3	SILENCERS	SR64	IVE

HARDWARE SET: 12

DOOR NUMBER:

111	171

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5 NRP	IVE
1	STOREROOM LOCK	ND80TD 10-025 W/DUST BOX	SCH
1	FSIC CORE	23-030	SCH
1	SURFACE CLOSER	1461 SCUSH FC TBSRT	LCN
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
3	SILENCER	SR64	IVE

HARDWARE SET: 13

DOOR NUMBER:
170

EACH TO HAVE:

1	CONTINUOUS GEAR HINGE	224XY	IVE
1	EXIT DEVICE	22NL 210NL 299 SNB 526	VON
1	RIM CYLINDER	20-057 ICX	SCH
1	FSIC CORE	23-030	SCH
1	SURFACE CLOSER	4111 CUSH TBSRT	LCN
1	THRESHOLD	560A	ZER
1	GASKETING	8144SBK PSA	ZER
1	SECURITY ASTRAGAL	4343ST	ZER
1	RAIN DRIP CAP	142A	ZER

HARDWARE SET: 14

DOOR NUMBER:

128	129	132	133	142	143
144	145	146	147	148	149
150	151	152	157	158	159
160	161	162	163		

EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 4.5	IVE
1	PRIVACY SET	ND40S 10-025 W/STRIKE BOX	SCH
1	MOP PLATE	8400 6" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	OVERHEAD STOP	90S SNB	GLY
1	DOOR BOTTOM SWEEP	8192AA	ZER
1	GASKET SEAL	188S-BK	ZER

HARDWARE SET: 15

DOOR NUMBER:

102	105	117	118	164	165
178					

EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 4.5	IVE
1	PRIVACY SET	ND40S 10-025 W/STRIKE BOX	SCH
1	SURFACE CLOSER	1461 RW/PA FC TBSRT (SCUSH ARM @ DOOR 102)	LCN
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
1	GASKET SEAL	188S-BK	ZER

HARDWARE SET: 16

DOOR NUMBER:
130 134 139

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	PRIVACY SET	ND40S 10-025 W/STRIKE BOX	SCH
1	MOP PLATE	8400 6" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
3	SILENCERS	SR64	IVE

HARDWARE SET: 17

DOOR NUMBER:
156A 156B 156C

EACH TO HAVE:

1	CONTINUOUS GEAR HINGE	224XY	IVE
1	PASSAGE SET	L9010 10-072 W/STRIKE BOX	SCH
1	SURFACE CLOSER	4040XP SCUSH SRI TBSRT	LCN
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
3	SILENCERS	SR64	IVE

HARDWARE SET: 18

NOT USED

HARDWARE SET: 19

DOOR NUMBER:
115 119

EACH TO HAVE:

2	CONT. HINGE	224XY	IVE
1	FLUSH BOLTS	458	IVE
1	DUST PROOF STRIKE	DP1	IVE
1	DEAD LOCK	L460T W/STRIKE BOX	SCH
1	FSIC CORE	23-030	SCH
2	PUSH PLATES	1820 4" X 16"	TRI
2	PULL PLATES	8303 10" 4" X 16"	IVE
2	SURFACE CLOSERS	1461 SCUSH TBSRT	LCN
2	ARMOR PLATES	8400 34" X 2" LDW B-CS	IVE
2	MEETING EDGE SEALS	328	ZER
1	GASKETING	8144SBK PSA	ZER
2	DOOR SWEEP	8192AA	ZER
1	THRESHOLD	544A	ZER

HARDWARE SET: 20

DOOR NUMBER:
180

EACH TO HAVE:

6	HINGE	5BB1 4.5 X 4.5	IVE
1	MANUAL FLUSH BOLT	FB458	IVE
1	DUST PROOF STRIKE	DP1	IVE
1	LOCKSET	ND53TD 10-025 W/STRIKE BOX	SCH
1	FSIC CORE	23-030	SCH
2	OH STOP	90S SNB	GLY
2	MOP PLATE	8400 6" X 2" LDW B-CS	IVE
2	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
2	SILENCER	SR64	IVE

HARDWARE SET: 21

DOOR NUMBER:
172

EACH TO HAVE:

6	HINGE	5BB1 4.5 X 4.5 NRP	IVE
1	MANUAL FLUSH BOLT	FB458	IVE
1	DUST PROOF STRIKE	DP1	IVE
1	LOCKSET	ND53TD 10-025 W/STRIKE BOX	SCH
1	FSIC CORE	23-030	SCH
1	OH STOP	90S SNB	GLY
1	SURFACE CLOSER	1461 SCUSH TBSRT	LCN
2	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
2	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
2	SILENCER	SR64	IVE

HARDWARE SET: 22

DOOR NUMBER:
166

EACH TO HAVE:

6	HINGE	5BB1HW 5 X 4.5	IVE
1	AUTOMATIC FLUSH BOLT	FB31P/FB41-TYPE AS REQ'D GIVEN DOOR MATERIAL	IVE
1	DUST PROOF STRIKE	DP1	IVE
1	LOCKSET	L9456T 10-072 W/STRIKE BOX	SCH
1	FSIC CORE	23-030	SCH
1	DOOR COORDINATOR	COR X FB	IVE
2	SURFACE CLOSER	1461 RW/PA FC TBSRT	LCN
2	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
2	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
2	SILENCER	SR64	IVE

HARDWARE SET: 23

DOOR NUMBER:
177A

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	PUSH PLATE	8200 4" X 16"	IVE
1	PULL PLATE	8303 10" 4" X 16"	IVE
1	SURFACE CLOSER	1461 RW/PA FC TBSRT	LCN
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
3	SILENCER	SR64	IVE

HARDWARE SET: 24

DOOR NUMBER:
120

EACH TO HAVE:

2	CONT. HINGE	224XY	IVE
1	STOREROOM LOCK	L9480T	SCH
1	FSIC CORE	23-030	SCH
2	SURFACE CLOSER	4040XP HCUSH TBSRT	LCN
2	ARMOR PLATES	8400 34" X 1 ½" LDW B-CS	IVE
1	THRESHOLD	655A-226	ZER
1	GASKETING	8144SBK PSA	ZER
2	DOOR SWEEP	8192AA	ZER
1	RAIN DRIP CAP	142A	ZER
1	SECURITY ASTRAGAL	4343ST	ZER

HARDWARE SET: 25

DOOR NUMBER:

156D	156E	156F	156G	156H	156I
156J	156K	156L	156M	156N	156O
156P	156Q				

EACH TO HAVE:

1	BUTT HINGE (TOP HINGE)	5BB1 4.5 X 4.5 X 630 FINISH	IVE
1	SPRING HINGE	3SP1 4.5 X 4.5 X 630 FINISH	IVE
1	DOOR BOLT W/OCCUPANCY INDICATOR	B571 10-094	SCH
1	DUMMY TRIM	ALX172	SCH
1	MOP PLATE	8400 6" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	COAT & HAT HOOK	508 626	IVE
1	WALL STOP	WS11/WS11X (FASTENERS AS REQ'D)	IVE

COORDINATEDOOR BOLT BACKSET 2 3/8" VERSUS 2 ¾" WITH FIBERGLASS DOOR SUPPLIER.
SPRING HINGE TENSION SHOULD BE SET TO HOLD THE DOOR AT ¾ OPEN

HARDWARE SET: 26
DOOR NUMBER:
113A
EACH TO HAVE:

CONT. HINGE	224XY	IVE
KEYED REMOVABLE MULLION	KR4954	VON
EXIT DEVICE	CD-98-DT-990DT-SNB	VON
EXIT DEVICE	CD-98-NL-990NL-SNB	VON
RIM CYLINDER	20-057 ICX	SCH
MORTISE CYLINDER	26-094- ICX	SCH
FSIC CORE	23-030	SCH
SURFACE CLOSERS	4040XP SCUSH TBSRT	LCN
KICK PLATE	8400 10" X 2" LDW B-CS	IVE
MULLION SEAL	139N PSA	ZER
THRESHOLD	655A-V3-226	ZER
SWEEPS	8192AA	ZER
WEATHER SEALS	8144S-BK	ZER

HARDWARE SET: AL-01 (ELECTRONIC LOCK ACCESS)

DOOR NUMBER:
101

EACH TO HAVE:

2	CONT. HINGE	112XY	IVE
1	KEYED REMOVABLE MULLION, FACTORY WIRED W/PLUG CONNECTORS	KR4854-FACTORY PREPARED FOR 6111-299-HANDED	VON
1	EXIT DEVICE W/VISIBLE AT A DISTANCE: LOCKED/UNLOCKED INDICATOR	CDSI-35A-EO	VON
1	EXIT DEVICE W/VISIBLE AT DISTANCE: LOCKED/UNLOCKED INDICATOR	CDSI-35A-NL-OP	VON
1	RIM CYLINDER	20-057 ICX	SCH
3	MORTISE CYLINDER	26-094- ICX	SCH
4	FSIC CORE	23-030	SCH
2	OFFSET LADDER PULL W/CONCEALED FASTENERS	9264F-24-18-A	IVE
2	CONCEALED OH STOPS	100S	GLY
2	SURFACE CLOSERS	4021 TBSRT	LCN
2	MOUNTING PLATES	4020-18G SRT	LCN
1	THRESHOLD	65A	ZER
1	ELECTRIC STRIKE W/MONITOR SWITCHES	6111-DS-CON	VON
1	WEATHER SEALS	PROVIDED BY ALUMINUM DOOR SUPPLIER/MFG	
2	DOOR CONTACT	BY SECURITY/ACCESS CTRL SYSTEMS	
1	POWER SUPPLY	BY SECURITY/ACCESS CTRL SYSTEMS	
1	CREDENTIAL READER	BY SECURITY/ACCESS CTRL SYSTEMS	

COORDINATE HARDWARE WITH ALUMINUM DOOR/FRAME MANUFACTURER/SUPPLIER.
COORDINATE HARDWARE WITH ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.
BALANCE OF EAC COMPONENTS BY ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.
OPERATION: CARD READER TO UNLOCK HARDWARE AND ALLOW PASSAGE MOMENTARILY. FREE EGRESS AT ALL TIMES.

HARDWARE SET: AL-02

DOOR NUMBER:
109A 126 173A

EACH TO HAVE:

1	CONT. HINGE	112XY	IVE
1	EXIT DEVICE W/VISIBLE AT A DISTANCE: LOCKED/UNLOCKED INDICATOR	CDSI-35A-NL-OP	VON
1	RIM CYLINDER	20-057 ICX	SCH
1	MORTISE CYLINDER	26-094- ICX	SCH
2	FSIC CORE	23-030	SCH
1	OFFSET LADDER PULL W/CONCEALED FASTENERS	9264F-24-18-A	IVE
1	CONCEALED OH STOP	100S	GLY
1	SURFACE CLOSERS	4021 TBSRT	LCN
1	MOUNTING PLATES	4020-18G SRT	LCN
1	THRESHOLD	65A	ZER
1	WEATHER SEALS	PROVIDED BY ALUMINUM DOOR SUPPLIER/MFG	

COORDINATE HARDWARE WITH ALUMINUM DOOR/FRAME MANUFACTURER/SUPPLIER.

HARDWARE SET: AL-03

DOOR NUMBER:
173B

EACH TO HAVE:

1	CONT. HINGE	112XY	IVE
1	DUMMY TOUCH BAR	350	VON
1	OFFSET LADDER PULL W/CONCEALED FASTENERS	9264F-24-18-A	IVE
1	CONCEALED OH STOP	100S	GLY
1	SURFACE CLOSERS	4021 TBSRT	LCN
1	MOUNTING PLATES	4020-18G SRT	LCN
1	WEATHER SEALS	PROVIDED BY ALUMINUM DOOR SUPPLIER/MFG	

COORDINATE HARDWARE WITH ALUMINUM DOOR/FRAME MANUFACTURER/SUPPLIER.

HARDWARE SET: AL- 04

DOOR NUMBER:
NONE

EACH TO HAVE:

2	CONT. HINGE	112XY	IVE
1	FIRE RATED EXIT DEVICE	9847-EO-F-SNB	VON
2	FIRE RATED EXIT DEVICE	9847-L-F-SNB	VON
2	RIM CYLINDER	20-057 ICX	SCH
2	FSIC CORE	23-030	SCH
2	OH STOPS	90S SNB	GLY
2	SURFACE CLOSERS	4040XP REG ARM W/DROP PLATE TBSRT	LCN
1	THRESHOLD	655A-V3-226	ZER
1	WEATHER SEALS	PROVIDED BY ALUMINUM DOOR SUPPLIER/MFG	

COORDINATE HARDWARE WITH ALUMINUM DOOR/FRAME MANUFACTURER/SUPPLIER.

HARDWARE SET: AL-05

DOOR NUMBER:
103

EACH TO HAVE:

2	CONT. HINGE	112XY	IVE
1	KEYED REMOVABLE MULLION	KR4954	VON
1	EXIT DEVICE W/VISIBLE AT A DISTANCE: LOCKED/UNLOCKED INDICATOR	CDSI-35A-EO-299	VON
1	EXIT DEVICE W/VISIBLE AT DISTANCE: LOCKED/UNLOCKED INDICATOR	CDSI-35A-NL-OP-388-299	VON
1	RIM CYLINDER	20-057 ICX	SCH
3	MORTISE CYLINDER	26-094- ICX	SCH
4	FSIC CORE	23-030	SCH
2	OFFSET LADDER PULL W/CONCEALED FASTENERS	9264F-24-18-A	IVE
2	CONCEALED OH STOPS	100S	GLY
2	SURFACE CLOSERS	4021 TBSRT	LCN
2	MOUNTING PLATES	4020-18G SRT	LCN
1	WEATHER SEALS/GASKETING	PROVIDED BY ALUMINUM DOOR SUPPLIER/MFG	

COORDINATE HARDWARE WITH ALUMINUM DOOR/FRAME MANUFACTURER/SUPPLIER.

Hardware MFG List

Mfg	Description
SCH	SCHLAGE
SCE	SCHLAGE ELECTRONICS
IVE	IVES
LCN	LCN CLOSERS
ZER	ZERO
VON	VON DUPRIN
GLY	GLYNN JOHNSON

END OF SECTION 08710

SECTION 088000 – GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Windows.
2. Doors.
3. Interior borrowed lights.
4. Fire-rated glazing materials installed as windows in fire-rated frames.

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit.

1.4 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Fire-rated glass ceramic clear and wireless glazing material listed for use in non-impact safety-rated locations such as transoms and borrowed lites with fire rating requirements ranging from 20 to 90 minutes with required hose stream test.

C. Passes positive pressure test standards UL 10C.

1.5 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.

B. Glazing Accessory Samples: For gaskets, sealants, and colored spacers, in 12-inch lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.

C. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Qualification Data: For installers, manufacturers of insulating-glass units with sputter-coated, low-e coatings, glass testing agency and sealant testing agency.

E. Product Certificates: For glass and glazing products, from manufacturer.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulating glass, glazing sealants and glazing gaskets.

1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

G. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

B. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

C. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

D. Source Limitations for Glass: Obtain ultra-clear float glass, coated float glass and insulating glass from single source from single manufacturer for each glass type.

E. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

F. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F (4.4 deg C).

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

2.2 GLASS PRODUCTS

A. See Window Schedule for types of glass.

B. If needed, insert other types of proprietary or special gasket systems by naming manufacturer and product, if not specified in the Section where the window or glazed curtain-wall system is specified.

C. Fire Rating: Fire rating classified and labeled by UL for fire rating scheduled at opening locations on drawings, when tested in accordance with [ASTM E2010-01] [ULC Standards CAN4 S-104 and CAN4 S-106] [NFPA 257] [UL 9 and UL 10B].

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches.

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking were indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION

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SECTION 089000 LOUVERS

PART 1- GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Fixed louvers and frames.

B. Insect screening.

1.3 RELATED SECTIONS

A Section 07900 - Joint Sealants.

1.4 SUBMITTALS

A Submit under provisions of General Conditions.

B Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, tolerances; head, jamb and sill details; blade configuration, screens, blankout areas required, and frames.

C Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials, and finishes.

1.5 QUALITY ASSURANCE

A Perform Work in accordance with AMCA Certification for fixed metal louvers.

1.6 QUALIFICATIONS

A Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years' experience.

1.7 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.8 COORDINATION

A Coordinate work under provisions of General Conditions.

B. Coordinate the Work with installation of masonry flashings.

C. Coordinate the Work with installation of mechanical ductwork.

1.9 WARRANTY

A Provide twenty-year warranty.

B Warranty: Include coverage for degradation of finish.

PART 2 - PRODUCTS

1.2 MANUFACTURERS

A. Airolite Product K609.

B. Airline Product XB-4.

C. Reliable Products.

D. Metal-Aire Louver Co.

E. American Warming and Ventilating

F. Construction Specialities, Inc.

G. Substitutions: Under provisions of General Conditions.

1.3 MATERIALS

A. Aluminum: .081" thick (12 guage) extruded aluminum, alloy 6063-T52. 4" thick, all welded construction, with inside mounted 4/4 mesh screen in folded frame and extruded sill piece as detailed.

1.4 ACCESSORIES

A. Fasteners and Anchors: Galvanized steel type.

B. Primer: Zinc chromate.

C. Flashings: See Section 07620.

D. Sealants: Type specified in Section 07900.

1.5 FINISHES

A. Exterior Aluminum Surfaces, Screen: Anodized to color as selected.

PART 3 - EXECUTION

3.3 EXAMINATION

A. Verify site conditions under provisions of Division 1 Sections.

B. Verify that prepared openings and flashings are ready to receive work and opening dimensions are as indicated on shop drawings.

3.4 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Install louvers level and plumb.

C. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

D. Secure louvers in opening framing with concealed fasteners, removable for maintenance purposes.

E. Install screen and frame to interior of louver.

F. Install perimeter sealant and backing rod in accordance with Section 07900.

G. Install sill flashing with end dams - like windowsill flashings.

3.5 ADJUSTING

A. Adjust work under provisions of General Conditions.

3.6 CLEANING

A. Clean work under provisions of 01700.

B. Strip protective finish coverings.

C. Clean surfaces and components.

END OF SECTION 089000

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SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes non-load-bearing steel framing members for the following applications:

1. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).
2. Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. Sound Transmission Characteristics: For STC-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

A. Recycled Content of Steel Products: Provide products with average recycled content of steel products such that postconsumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.

B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
2. Protective Coating: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized zinc coating, unless otherwise indicated.

2.2 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. Metal Studs and Runners: ASTM C 645.

1. Minimum Base-Metal Thickness: 22 gauge.

B. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: As indicated on Drawings 0.0312 inch.

C. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base Metal Thickness: As indicated on Drawings.
2. Depth: As indicated on Drawings.

2.3 AUXILIARY MATERIALS

A. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.
1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

3.2 INSTALLING FRAMED ASSEMBLIES

A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
    a. Install two studs at each jamb, unless otherwise indicated.
    b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
    c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

C. Direct Furring:
1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

D. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 from the plane formed by faces of adjacent framing.

END OF SECTION 092216

SECTION 092255 - DRYWALL SUSPENSION SYSTEM

PART 1 – GENERAL

1.1 SUMMARY

A. Description of Work: Work of this Section includes, but is not limited to, the following:
   1. Metal Suspension Systems framing members for Plaster and Gypsum Board Assemblies
   2. Main Tees, Cross Tees, Perimeter Angles, Perimeter Channels, Hanger Wire, and Accessories

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions with Project conditions and materials clearly identified or detailed for each required system.

1.3 SYSTEM REQUIREMENTS

A. Performance Requirements: Fabricate and install systems as indicated but not less than that required to comply with ASTM C754 under the following conditions:
   1. A pre-engineered drywall suspension system consisting of straight main tees (for Wall-to-Wall system) or straight main tees and straight furring cross tees, that join together to support screw attached (interior gypsum panels) (gypsum fiber panels) (gypsum base panels) and independently supported light fixtures, and air diffusers, where applicable. (*Where applicable, installed systems must conform to Underwriter's Laboratories, Inc. (UL) Fire Resistance Design No.*)
   2. Maximum deflection of l/360 of distance between supports.

1.4 QUALITY ASSURANCE

A. Reference Standards
   1. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
   2. ASTM A 645 Standard for Nonstructural Framing Members
   3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated, (Galvanized) by the Hot-Dipped Process
   4. ASTM C635, Standard Specifications for Metal Suspension Systems
   5. ASTM C636, Recommended Practice for Installation of Metal Suspension Systems
   6. CISCA Ceiling Systems Installation Handbook

7. ASTM C1186, Standard Specification for Flat Non-Asbestos Fiber-Cement Sheets. [Include if DUROCK panels are used, otherwise delete]
8. ASTM C1278, Standard Specification for Fiber-Reinforced Gypsum Panels [Include if FIBEROCK panels are used, otherwise delete]
9. ASTM C645, Standard Specification for Non-Bearing (Axial) Steel Studs, Runners, (Track), and Rigid Furring Channels for Screw Application of Gypsum Board
10. ASTM C754, Specification for Installation of Steel framing Members to Receive Screw-Attach Gypsum Boards
11. ASTM C840 Specification for Application & Finishing of Gypsum Board
12. (ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials)
13. (Underwriters Laboratories Inc. (UL) Fire Resistance Directory)
14. NOA # 17-09-19.03, TAS 202 and TAS 203

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery:
   1. Deliver material to site promptly without undue exposure to weather.
   2. Deliver in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade.
B. Inspection:
   1. Promptly inspect delivered materials, file freight claims for damage during shipment, and order replacement materials as required. Any damaged materials shall be promptly removed from the job site.
C. Storage:
   1. Store above ground in dry, ventilated space.
   2. Protect materials from soiling, rusting, and damage.
   3. Store board to be directly applied to masonry walls at 70°F for 24 hours prior to installation.
D. Handling:
   1. Handle in such a manner to insure against racking, distortion or physical damage of any kind.

1.6 PROJECT CONDITIONS

A. Environmental Requirements:
   1. Do not install gypsum board when ambient temperature is below 40°F.
   2. For adhesive attachment of gypsum board, and for finishing of gypsum board, maintain ambient temperature above 55°F from one week prior to attachment or joint treatment, and until joint treatment is complete and dry.

1.7 COORDINATION WITH OTHER WORK

A. General:
   1. Coordinate with other work including mechanical and electrical work and partition systems. Installation of conduit and ductwork above suspension system shall be complete before installation of suspension system.

B. Protection:
   1. Follow good safety and industrial hygiene practices during handling and installation of all products and systems, with personnel to take necessary precautions and wear appropriate personal protective equipment as needed. Read Material Safety Data Sheets and related literature for important information on products before installation. Contractor to be solely responsible for all personal safety issues during and subsequent to installation; architect, specifier, owner and manufacturer will rely on contractor's performance in such regard.

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. All manufactured by USG (United States Gypsum Company, USG Interiors), Chicago, IL, USA, or approved equal, in compliance with applicable ASTM Standards

2.2 MATERIALS - SUSPENSION SYSTEMS

A. USG Drywall Suspension Systems – Commercial quality, cold-rolled steel, hot dipped galvanized finish.
   1. Main Tees: Fire-Rated Heavy Duty classification 1.617" high x 144" long, integral reversible splice with knurled face. (DGLW-26 1-1/2" Face and 1.617" high)
   2. Cross Members: Fire-Rated members with knurled face. Cross Tees: DGLW-424 cross tee 1-1/2" high x 48" long with 1-1/2" wide face; DGLW-224 Fire-Rated: 1-1/2" high x 24" long with 1-1/2" face quick release cross tee ends for positive locking and removability without tools
   3. Accessory Cross Tees: Cross tees must have knurled faces and quick release cross tee ends for positive locking and removability without tools.
      a. DGW-6026DM: 1.617" high x 5' long with a 1-1/2" face
      b. DGW-7226DM: 1.617" high x 6' long with a 1-1/2" face
      c. DGW-8426DM: 1.617" high x 7' long with a 1-1/2" face
      d. DGW-9626DM: 1.617" high x 8' long with a 1-1/2" face
   4. Wall Moldings: Single web with knurled face
      a. DGWM-24: 1-1/2" x 1" x 144" long wall molding
      b. DGCM-27: 144" x 1-5/8" x 1" x 1" channel molding

c. DGLC-12: 144” x 1-3/4” x 1” x 1” index channel molding

5. Accessories
    a. DGSC-180: Splice Clip
    b. DGTC-90: Transition Clip
    c. DGWC: Wall Attachment Clip
    d. DGSP-180: Splice Plate
    e. DGHUB: Dome Hub
    f. CMAC-1: Close Mount Attachment Clip
6. Wire: Hanger Wire 12 ga., galvanized or as noted on drawings

B. USG Drywall Wall-to-Wall Suspension Systems – Commercial quality, cold-rolled steel, hot dipped galvanized finish for use in corridors and short span applications.
    1. Main Tees: Fire-Rated Heavy Duty classification 1.617” high x [6’] [8’] [10’] [12’] [14’] [Custom] long, integral reversible splice with 1-1/2” knurled face.
    2. Wall Moldings: Single web with knurled face, 1-1/2” x 1” x 12’ long, DGWM24
    3. Wall Channel: Single web with knurled face, 1-5/8” x 1” x 12’ long, DGCM27
    4. Locking Wall Channel: Single web with knurled face, 1-3/4” x 1” x 12’ long, DGLC-12
C. Grid Suspension Assemblies: Listed products establish standard of quality and are manufactured by United States Gypsum Company (USG), Chicago, IL

2.3 MATERIALS - BOARDS

A. Gypsum Board:
    1. ASTM C36, regular type except where Type X or Type C fire-resistant type is indicated or required to meet UL assembly types.
    2. Edges: Tapered
        a. SHEETROCK Brand Gypsum Panels have long edges tapered on the face side to form a shallow channel for joint reinforcement.
        b. SHEETROCK brand Gypsum Panels, SW Edge, have an exclusive tapered rounded edge design to help minimize ridging or beading and other joint imperfections and help compensate for extremes of temperature and humidity during construction. The SW system produces a stronger joint than with regular gypsum panels. Setting-type joint compound is recommended with this shape edge. Except for the rounded edge, SW Panels are tapered like, and otherwise identical to, regular tapered-edge gypsum panels.
        c. Typical thickness for different applications include:
        5/8 inch thick for commercial installations
        ½ inch thick for single-layer application in residential construction
        1/4 inch thick used as base layer for improving sound control in

double layer partitions, for use over old wall and ceiling surfaces and for forming curved surfaces with short radii

d. Where curved gypsum board construction is indicated, use 1/4 inch thick flexible facing board.

3. Acceptable products:
    a. Typical partitions and ceilings: Equivalent to SHEETROCK Brand UltraLight FC 30, SHEETROCK Brand SW, FIRECODE or FIRECODE "C" Gypsum Panels by USG.
        i. SHEETROCK brand Gypsum Panels, FIRECODE Core meet the definition of a Type X gypsum board for fire-rated assemblies in the Gypsum Association Fire Resistance Design Manual. Edges: SW tapered or tapered.
    b. OR [depends on edge condition option]: Equivalent to SHEETROCK Brand Regular, FIRECODE or FIRECODE "C" Gypsum Panels by USG.
        i. SHEETROCK brand Gypsum Panels, FIRECODE C Core provide improved fire protection over standard FIRECODE panels due to additives that enhance the integrity of the core under fire exposure. Comply with Type X requirements.
    c. Acceptable product for fire-rated walls: Equivalent to Ultracode Core, 3/4 inch thick, by USG.
        i. SHEETROCK brand Gypsum Panels, ULTRACODE Core, provide 1, 2, 3 and 4 hour fire ratings with fewer layers of gypsum panels than are usually required when used in approved designs.
4. Acceptable product for curved walls: 1/4" Flexible Gypsum Panels
    a. SHEETROCK brand 1/4 inch Flexible Gypsum Panels bend to fit tight curves without wetting. These 1/4 inch panels are much more flexible than standard SHEETROCK panels of the same thickness.
    b. SHEETROCK brand Gypsum Panels, are made by laminating special kraft-backed aluminum foil to back surface of regular or SW tapered panels with FIRECODE and FIRECODE C cores as indicated. Effective as a vapor retarder for walls and ceilings when applied with foil surface next to the framing in single-layer application or as the base layer in multi-layer systems. In tests per ASTM E96 (desiccant method), ½ inch foil-back panels showed a vapor permeance of 0.06 perm.
    c. Limitations: Not recommended as a base for ceramic or other tile or as base layer for SHEETROCK Vinyl-Faced Gypsum Panels or other highly moisture-resistant wall coverings. Also not to be used in hot, humid climates such as the Southern Atlantic and Gulf Coast areas.
5. Ceiling board

a. ASTM C36, non-sag type
b. Thickness: ½ inch
c. Acceptable product: Equivalent to SHEETROCK® Brand UltraLight Panels by USG
    i. SHEETROCK® Brand UltraLight Panels are re-engineered, lightweight gypsum wallboard panels with a high strength-to-weight ratio composite design. The panels have superior sag resistance that eliminates the need for traditional 1/2" sag-resistant ceiling panels. The noncombustible gypsum core is encased in 100% recycled face and back papers. The natural finish face paper is folded around the long edges to protect the core and the ends are cut square and even. The long edges of the panels are tapered, allowing joints to be reinforced with Sheetrock® Brand joint treatment systems. Thickness: ½, 5/8 inch, unless otherwise indicated.

6. Mold-resistant gypsum board
    a. ASTM C1396, regular except where Type X (FIRECODE) or Type C (FIRECODE C) indicated or required to meet UL assembly types
    b. Edges: Tapered
    c. Thickness: 1/2 [5/8](for FIRECODE only), [3/4] inch (ULTRACODE)
    d. Acceptable product: Equivalent to SHEETROCK brand MOLD TOUGH gypsum panels by USG
        i. SHEETROCK® brand MOLD TOUGH™ gypsum panels have a noncombustible, moisture- and mold-resistant gypsum core that is encased in moisture- and mold-resistant, 100 percent recycled green face and brown back papers. The panels feature tapered long edges for easy finishing. The 5/8” FIRECODE and 1/2" FIRECODE C Core panels are UL Classified for fire resistance (Type X or Type C).

B. Cement backer board
    a. Aggregated portland cement board with woven glass fiber mesh facing complying with ANSI A118.9
    b. Thickness: 1/2 [5/8] inch
    c. Acceptable product and manufacturer: Durock Cement Board by USG
        i. DUROCK Cement Board is vapor permeable and does not deteriorate in the presence of water. It is used as a substrate for tile. If a vapor retarder or waterproof construction is specified, a separate barrier must be applied over or behind the DUROCK Board.

ii. For steam rooms and saunas where temperatures exceed 120 degrees F for extended periods, set tile with dry-set or latex-portland cement mortar; do not use organic adhesive.

2.4 MATERIALS - ACCESSORIES

A. Metal trim for gypsum board
   1. Conform to profile and dimensions indicated
   2. Material for interior Work: Galvanized steel, 26 gauge minimum
   3. Corner beads: Equivalent to Dur-A-Bead No. 103 [104] [800] [900] by USG
   4. Casing beads (edge beads): Equivalent to 200A [200B] [401] [402] [P-1] [701-B] [801-A] [801-B] by USG
   5. Control joints
      a. Roll-formed zinc with perforated flanges
      b. Size: 1-3/4 inch wide, with 1/4 inch wide center channel
      c. Provide with removable tape strip over channel
      d. Acceptable product: Equivalent to No. 093 by others

B. Paper-faced metal trim for gypsum board
   1. Conform to profile and dimensions indicated
   2. Material for interior Work: Comply with ASTM C1047
   3. Outside corners: SHEETROCK Brand Paper Faced Metal Bead and Trim [81W] [B1XWEL] [B1 Super Wide] by USG
   4. Outside Bullnose corners: SHEETROCK Brand Paper Faced Metal Bead and Trim [SLOC] [Danish] [Santa Fe] by USG
   5. Inside corners: SHEETROCK Brand Paper Faced Metal Bead and Trim [B2] [SLIC] by USG
   6. Trims: L shape - B4 SERIES, J shape: B9 SERIES by USG

C. Special Trim and Reveals: Extruded aluminum alloy 6063-T5, profiles as indicated

D. Gypsum Board Screws: Self-drilling, self-tapping steel screws
   a. For steel framing less than 0.03 inch thick: Comply with ASTM C1002
   b. For steel framing from 0.033 inch thick to 0.112 inch thick: Comply with ASTM C954
   c. Provide Type S or Type S-12 screws

E. Backer Board Accessories: Provide accessories and corrosion-resistant-coated steel screws as recommended by backer board manufacturer and required for complete installation.

F. Acoustical Sealant: Equivalent to Acoustical Sealant by USG
   . SHEETROCK Acoustical Sealant is a highly elastic, water-based caulking for sound-rated partition and ceiling systems and sealing exterior walls to reduce infiltration. Non-bleeding and staining, pumpable and easily applied in beads. Provides excellent adherence to most surfaces,

permanent flexibility and lasting seal. Meets ASTM C919 and ASTM C834.

G. Sound Attenuation Blankets
   . Mineral fiber, conforming to ASTM C665, Type I
   a. Surface burning characteristics per ASTM E84:
      i. Flame spread: 15 or less
      ii. Smoke developed: 0
   b. Thicknesses: As indicated
   c. Sound Attenuation Fire Blankets (SAFB) are paperless, semi-rigid mineral fiber mats designed to improve STC ratings when installed in partitions.
   d. Acceptable product: Sound Attenuation Fire Blankets SAFB by others.[Fire Safety FS-15 Blankets]
H. Miscellaneous Accessories: Provide as required for complete installations.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates and adjoining construction and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions are corrected.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Standard reference: Install grid members in accordance with ASTM C636, CISCA installation standards, and other applicable references.
B. Manufacturer’s reference: Install in accordance with manufacturer’s current printed recommendations.
C. Drawing reference: Install in accordance with approved shop drawings and locate ceiling in accordance with main tee dimensions relative to elevations.
D. Install in accordance with reference standards and manufacturer's instructions [and as required to comply with seismic requirements].

3.3 APPLICATION INSTALLATION REQUIREMENTS

A. Flat Ceiling Applications
   1. Hanger Wire Installation: Secure hanger wires to upper structural elements and space hangers so that each hanger wire supports a maximum of 16 sq. ft.
   2. Space main tee members a maximum span of 48” on center (or as specified by the UL Fire Resistance Directory)
   3. Space cross tees recommended 16” o.c. (5/8” SHEETROCK Brand gypsum Board or 5/8” FIBEROCK Interior panels can span 24” o.c. Check USG AC3095, for maximum allowable spacing based on wind

load) (or as specified by the UL Fire Resistance Directory) Install extra cross tees where butt joints occur, 8" from each side of the butt joint.

4. Install compression struts per manufacturer's specifications and spacing, in accordance with wind load if applicable. Adjust main and cross tee spacing as necessary for loading conditions. (See AC3095, USG)
5. Install fiber glass insulation (R19) in plenum, resting on top of main tees and cross members.
6. Do not install insulation within 3" of light fixtures unless fixtures are approved for use with insulation.
7. Limit insulation thickness so that combined weight of supported panels and insulation on grid main tees does not exceed 16 plf
8. Attach (SHEETROCK gypsum Board) (FIBEROCK Interior panels) (DUROCK Cement Board) to the suspension system main runners, cross tees, and cross channels with (1-1/4" bugle head screws – single layer of board) spaced (16" o.c. – SHEETROCK gypsum Board) (8" o.c.- FIBEROCK) (6" o.c. – DUROCK) in the field and at the perimeter of the panels, locate 3/8" in from panel edges. Hold panels in firm contact with framing while driving fasteners. Drive fastener heads flush with, or slightly below surface of (SHEETROCK gypsum board) (FIBEROCK panels). (Drive fasteners so bottoms of heads are flush with surface of DUROCK cement boards.)
9. Install trim, and similar accessories as necessary and as applicable to meet project requirements where indicated on drawings.
10. Install control joints at locations of properly detailed control joints, including additional cross tees as necessary, per direction of architect and/or design professional.
11. Finish boards as described to achieve 'Level of Finish' specified.

B. Corridor (Wall-to-Wall) Applications

1. Hanger Wire Installation: Secure hanger wires to upper structural elements and space hangers so that each hanger wire supports a maximum of 16 sq. ft.
    a. Note:
    If using ½" single layer of drywall no hangers are required for spans up to 7'-0" (L/240 uniform load, single span design).
    If using 5/8" single layer of drywall no hangers are required for spans up to 6'-0" (L/240 uniform load, single span design).
    If using ½" single layer of drywall for spans over 7'-0" to 14'-0" one hanger at mid span per each main is required (L/240 uniform load, single span design).
    If using 5/8" single layer of drywall for spans over 6'-0" to 12'-0" one hanger at mid span per each main is required (L/240 uniform load, single span design).
    If using 5/8" single layer of drywall for spans over 12'-0" to 14'-0"

two hangers at 1/3 point per each main is required (L/240 uniform load, single span design).

2. Space main tee members as required by span and design load
    a. Note:

Maximum load (lbs/sf)	Unsupported span	Main tee spacing
18	4’-0”	16” o.c.
12	4’-0”	24” o.c.
9.2	5’-0”	16” o.c.
6.1	5’-0”	24” o.c.
5.3	6’-0”	16” o.c.
3.6	6’-0”	24” o.c.
3.4	7’-0”	16” o.c.

3. Attach (SHEETROCK gypsum board) (FIBEROCK interior panels) (DUROCK cement board) to the suspension system main runners, cross tees, and cross channels with (1-1/4” bugle head screws – single layer of board) spaced (16” o.c. – SHEETROCK gypsum Board) (8” o.c.- FIBEROCK) (6” o.c. – DUROCK) in the field and at the perimeter of the panels, locate 3/8” in from panel edges. Hold panels in firm contact with framing while driving fasteners. (Drive fastener heads flush with, or slightly below surface of (SHEETROCK gypsum board) (FIBEROCK panels). (Drive fasteners so bottoms of heads are flush with surface of DUROCK cement boards.)
4. Install trim, and similar accessories as necessary and as applicable to meet project requirements where indicated on drawings.
5. Install control joints at locations of properly detailed control joints, including additional cross tees as necessary, per direction of architect and/or design professional.
6. Finish boards as described to achieve ‘Level of Finish’ specified.

C. Curved, vaults, or dome applications
    1. Drawing reference: Install in accordance with approved shop drawings and locate ceiling in accordance with main tee dimensions relative to elevations.
    2. Hanger Wire Installation: Secure hanger wires to upper structural elements and space hangers so that each hanger wire supports a maximum of 12 sq. ft.
        a. Note: Note: Curved surfaces can be achieved with the attachment of panels, however, in order to achieve the best application, plaster is recommended. Due to the width of the grid flange (greater than ¾”) STRUCTO-BASE gypsum basecoat plaster should be used to reduce cracking. If other gypsum plasters or portland plaster are being used then it is recommended to secure narrow flanged

framing members or offset the metal lath to reduce cracking due to reduced mechanical key at framing/lath intersection.
Total weight of ceiling membrane plus overlaid insulation and surface finish material (e.g. ceramic tile) supported by the grid assembly should not exceed 4.0 psf. If the load exceeds 4.0 psf, then spacing of the hanger wires and/or main tees must be reduced (see sample calculation below). For guidance the following are design weights:

1/2" SHEETROCK Exterior Gypsum Ceiling Board	2.0 psf
5/8" SHEETROCK Exterior Gypsum Ceiling Board	2.5 psf
1/2" FIBEROCK Sheathing	2.2 psf
5/8" FIBEROCK Sheathing	3.0 psf
1/2" DUROCK Cement Board	3.0 psf
5/8" DUROCK Cement Board	3.75 psf

b. If main tee hanger wires are at 4' o.c., the mains' load capacity is: 4 FT * 4 psf = 16 #/LF.
By reducing the hanger wires to 3' o.c., the mains can carry 32 #/LF.
By reducing the hanger wires to 2' o.c., the mains can carry 64 #/LF.

3/4" of plaster wet would be about 8.75 #/SF + 5/8" FIBEROCK Sheathing at 3 #/SF for about 12 #/SF.
Mains are at 4 ft centers with 4' hangers; this load would be 12 #/SF * 4 FT = 48 #/LF.
If the Mains are at 2 ft centers with 4' hangers; this load would be 12 #/SF * 2 FT = 24 #/LF.

Therefore, there are two options:
1.) Space the main tees at 4' o.c. with the 12 ga. hanger wire at 24" o.c. and within 8" from any wall, cross tees at 16" o.c. with hanger wire support at midspan and/or within 8" from any wall.
2.) Space the main tees at 2' o.c. with the 12 ga. hanger wire at 36" o.c. and within 8" from any wall, cross tees at 16" o.c.

3. Space main and cross tee members so the maximum span of metal lath is (16") (12")
4. Secure self-furring metal lath to tee members with screws spaced 6" o.c. max., applied at lath dimples. Lap metal lath ends and edges and secure with 18 gauge tie wire spaced 6-inches o.c.
5. Mix STRUCTO-BASE Gypsum Plaster with sand in proportions of 2 cu. ft. of sand per 100 lbs. of plaster for scratch and brown coats. Apply

plaster to metal lath to a thickness of 5/8” (min.) Measured from the face of the lath.

6. Select a plaster mix for the finish coat to provide a smooth trowel or sand float (textured) finish. (Reference SA 920)
7. Use template(s) to insure uniform and even curvature of the finished surface.

END OF SECTION

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Interior gypsum board.
2. Trim Accessories, drywall finishing (joint tape and compound treatment)

1.3 QUALITY ASSURANCE

A. Fire Resistance Ratings: Where gypsum drywall systems have fire -resistance ratings are indicated, provide materials and installation as per ASTM E 119.

B. Provide Fire-Resistance Ratings as per GA-505 by Gypsum Association".

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.

1.5 STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet, or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PANELS, GENERAL

A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD

A. The following manufacturer's products are approved to establish minimum standards for materials:

1. Gypsum Board manufacturers:

   a. American Gypsum Co.
   b. Georgia-Pacific Company.
   c. National Gypsum Company.
   d. USG Corporation.

2.3 MATERIALS

A. Gypsum Wallboard: ASTM C 36, types, edge and thickness indicated below; in maximum lengths available.

1. Provide Type "X" fire-resistant at all locations unless otherwise noted on drawings.

2. Impact/Penetration Resistant Type "X" fire resistant at locations if indicated on drawings. Equal to Hi-Impact Brand 2000 Fire Shield by National Gypsum.,

3. "MR" moisture resistant, where gypsum board is shown at all wet areas (Restrooms, etc.). Install 5/8" thick Type X moisture resistant gypsum board at all wet walls where plumbing fixtures are indicated.

4. Thickness: 5/8" unless otherwise noted.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:

   a. Cornerbead.
   b. Casing bead.
   c. LC-Bead: J-shaped; exposed long flange receives joint compound.
   d. L-Bead: L-shaped; exposed long flange receives joint compound.
   e. U-Bead: J-shaped; exposed short flange does not receive joint compound.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use setting type, sandable topping compound.
4. Finish Coat: For third coat, use setting-type, sandable topping compound.
5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Acoustical Sealant: As specified in Division 07 Section "Joint Sealants."

1. Provide sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.

I. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
1. Type X: As indicated on Drawings.
2. Ceiling Type: As indicated on Drawings.
3. Type X: Moisture- and Mold-Resistant Type: As indicated on Drawings.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated.
3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners
2. LC-Bead: Use at exposed panel edges
3. L-Bead: Use where indicated
4. U-Bead: Use where indicated

D. Exterior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges

3.5 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.

2. All exposed gypsum board surfaces shall be Level 4 in accordance with GA 214: At panel surfaces that will be exposed to view.

a. Primer and its application to surfaces are specified in other Division 09 Sections.

3.6 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet, or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093000 – TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Porcelain Ceramic Wall Tile.
2. Porcelain Ceramic Floor Tile
3. Stone Thresholds at door and cased opening applications.

B. Related Sections:
1. Division 07 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
2. Division 09 Section "Gypsum Board" for cementitious backer units and water-resistant backer board.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.

D. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend.
2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches square, but not fewer than 4 tiles. Use grout of type and in color or colors approved for completed Work.
3. Full-size units of each type of trim and accessory for each color and finish required.
4. Stone thresholds in 6-inch lengths.

1.4 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain tile from one source or producer.

1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:

1. Stone thresholds.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of each type of floor tile installation.
2. Build mockup of each type of wall tile installation.

E. Pre-installation Conference: Conduct conference at Project site.

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained, and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.7 EXTRA MATERIALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

E. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by pre-coating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.2 TILE PRODUCTS

A. Tile Type: PCT to be STONEPEAK, SIMPLY MODERN COLLECTION. Equal products from DAL-TILE and Crossville will be acceptable.

B. Color: From manufacturers' standard color selections.

C. Floor Tile: Size: 12" x 24" Floor Tile unglazed with 1/4-inch grout joints.

D. Shower Floors: 2"x 2" Mosaic Tile squares (Cut to size as required for sloped floor to drain).

E. Wall Tile: 12" x 24" Wall Tile unglazed with 1/4-inch grout joints.

F. Base: 6" x 12" Coved Base with Schluter Dilex Series coved shaped profile for floor to wall transition.

G. Pattern: 50% Offset for floor tile and wall tile.

2.3 STONE THRESHOLDS

H. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.

I. Marble Thresholds: Provide marble thresholds complying with ASTM C 503.

1. Description: Uniform, fine-grained, white, as indicated and approved by Architect.

2.4 SETTING MATERIALS

J. Dry-Set Portland Cement Mortar (Thin Set): ANSI A108.1A.

2.3 GROUT MATERIALS

A. Two-component, chemical resistant, non-sagging epoxy grout, which is water cleanable, grout shall comply with ANSI A118.3.

1. Basis-of-Design Product: Subject to compliance with requirements, Laticrete "Spectralock Pro-Grout or comparable product.
2. Color to be selected from manufacturer's standard color selection.

2.4 ELASTOMERIC SEALANTS

A. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.

B. Two-Component Sealants: ASTM C 920, Type M, Grade 25, use T.

2.5 TILE-BACKING PANELS

A. Fiber-Cement Backer Boards: ASTM C1288, in maximum lengths available to minimize end-to-end butt joints.

B. Manufacturers:
1. James Hardie Building Products, Inc.
2. Certain Teed Corporation.
3. USG.

2.6 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.7 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors installed with thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.

a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot (1:50) toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not, factory blended, either return to manufacturer or blend tiles at Project site before installing.

D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 TILE INSTALLATION

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

B. Setting Beds:
1. Floor Tile: Thinset.
2. Wall Tile: Thinset.

C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

F. Joint Widths: Unless otherwise indicated, install tile with 1/4-inch joint widths.

G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

H. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.

1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thin set).

I. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, LVT, or other flooring.

3.4 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove urethane grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.

B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

END OF SECTION

SECTION 093050 - TILE SETTING MATERIALS AND ACCESSORIES

PART 1 GENERAL

1.0 GENERAL: Products listed in this specification are Basis-of-Design products. All other manufacturers must be approved prior to bid. Waterproofing systems described within shall be obtained from a single manufacturer for a complete system warranty.

1.1 SECTION INCLUDES

A. Edge-protection and transition profiles for floors.

B. Finishing and edge-protection profiles for walls and countertops.

C. Wall access panel system.

D. Movement joint and cove-shaped profiles.

E. Modular screed system.

F. Uncoupling membrane.

G. Waterproofing Membrane.

H. Floor drain, with integrated bonding flange.

I. Shower waterproofing: prefabricated substrates, waterproofing membrane, floor drain with integrated bonding flange, and sealant.

K. Drainage membranes.

L. Finishing and edge-protection profiles and gutters for balconies and terraces.

M. Setting materials: adhesives, mortars, grouts, and sealants.

1.2 RELATED SECTIONS

A. Section 033000 - Cast-In-Place Concrete.

B. Section 055500 - Metal Fabrications.

C. Section 061053 - Miscellaneous Rough Carpentry.

D. Section 079200 - Joint Sealants.

E. Section 092900 - Gypsum Board.

F. Section 093000 - Tiling

G. Section 220440 - Plumbing Fixtures

1.3 REFERENCES

A. CSA B79-08: Floor, Area, and Shower Drains, and Cleanouts for Residential Construction.

B. IAPMO IGC 195: Interim Guide Criteria for Floor Drain with Integrated Bonding Flange.

C. Tile Council of North America (TCNA) Handbook for Ceramic Tile Installation.

D. American National Standard Specifications for the installation of ceramic tile A108 / A118 / A136.1.

1.4 SUBMITTALS

A. Submit under provisions of Section 013000.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) long, representing actual product, color, and finish.

D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum ten years of experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years of experience.

C. Source Limitations for Setting Materials and Accessories: Obtain product of a uniform quality for each application condition from a single manufacturer.

D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Finish areas designated by Architect.
2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.

3. Refinish mock-up area as required to produce acceptable work.

E. Preinstallation Conference: Conduct conference at the Project site.

1.Convene one week prior to commencing work of this section.

2. Require attendance of installation material manufacturer, tile supplier, tile installer and installers of related work. Review installation procedures and coordination required with related work.

3. Meeting agenda includes but is not limited to:

a. Surface preparation.
b. Tile and installation material compatibility.
b. Edge protection, transition, and prefabricated movement joint profiles.
d. Waterproofing techniques.
e. Crack isolation techniques.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.
B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.
C. Store materials in a dry, warm, ventilated weathertight location.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 COORDINATION

A. Coordinate Work with other operations and installation of floor finish materials to avoid damage to installed materials.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: (Basis of Design)

1.Schluter Systems, L.P., 194 Pleasant Ridge Road, Plattsburgh, NY 12901 5841. ASD. Tel: (800) 472-4588. Fax (800) 477-9783. E-mail: specassist@schluter.com. Web: www.schluter.com. (Basis of Design)

2. Laticrete International, Inc., One Laticrete Park North, Bethany, Ct 06524-3423. Tel: (800) 243-4788

3. USG (Durock Shower System). Phone: 800-874-4968.

2.2 UNCOUPLING MEMBRANE FOR ALL FLOORS WITH PCT FINISH

A. Schluter-DITRA

1. Description: 1/8 inch thick, orange, high-density polyethylene membrane with a grid structure of 1/2 inch by 1/2-inch square cavities, each cut back in a dovetail

configuration, and a polypropylene anchoring fleece laminated to its underside. Conforms to definition for uncoupling membranes in the Tile Council of North America Handbook for Ceramic Tile Installation and is listed by UPC to meet or exceed the requirements of the "American national standard specifications for load bearing, bonded, waterproof membranes for thin-set ceramic tile and dimension stone installation A118.10 and is listed by cUPC, and is evaluated by ICC-ES (see Report No. ESR-2467).

2. Waterproofing seaming membrane:

a. Provide KERDI BAND Seams and Corners material 0.004 inch (0.1 mm) thick, orange polyethylene membrane, with polypropylene fleece laminated on both sides.

B. Prefabricated Movement and Expansion Joints

1. Prefabricated Corner Movement and Expansion Joints: Schluter®- DILEX DILEX-EKE prefabricated extruded rigid PVC joined by a soft CPE movement joint material. Profile includes integral perforated anchoring legs with trapezoidal openings. Height and color as required. Prefabricated Field Movement and Expansion Joint: Schluter®-DILEX DILEX-BWS, DILEX BWB, DILEX AKWS, and DILEX KS prefabricated extruded rigid PVC roll-formed stainless steel, or extruded aluminum profile, joined by a soft CPE movement joint material. Profile includes integral perforated anchoring legs with trapezoidal openings. Height and color as required.

C. Finishing and Edge-Protection Profiles for ceramic and stone tile base

1. Finishing and edge-protection profile: Schluter®-RONDEC; roll-formed stainless steel, Anodized Aluminum, or Color Coated Aluminum edge protection profile with integral perforated anchoring leg with trapezoidal openings, Material and finish as indicated; height as required.

2.3 WATERPROOFING MEMBRANE FOR SHOWER WALLS AND FLOORS

A. Schluter-KERDI

1. Description: 0.008 inch (0.2 mm) thick, orange polyethylene membrane, with polypropylene fleece laminated on both sides, which is listed by cUPC to meet or exceed requirements of the “American national standard specifications for load bearing, bonded, waterproof membranes for thin-set ceramic tile and dimension stone installation A118.10 and is listed by cUPC, and is evaluated by ICC-ES (see Report No. ESR-2467).

2. Corners and seals:
   a. Provide matching preformed inside corners.
   b. Provide matching preformed outside corners.
   c. Provide matching preformed pipe seals.
   d. Provide matching preformed mixing valve seals.

2.4 FLOOR DRAIN WITH INTEGRATED BONDING FLANGE

A. Schluter-KERDI-DRAIN, Stainless Steel:

1. Description: stainless steel floor drains 9-27/32-inch (250 mm) diameter

integrated bonding flange with 3 inch (75 mm) no-hub outlet, and grate assembly. Grate assembly includes stainless steel grate, height adjustment collar, and lateral adjustment ring with trapezoid perforations.

2. Drain listed by UPC to meet requirements of "International Association of Plumbing and Mechanical Officials Interim Guide Criteria for Floor Drain with Integrated Bonding Flange" (IGC 195), listed by CSA to meet requirements of the Canadian Standards Association standard, "Floor, Area, and Shower Drains, and Cleanouts for Residential Construction" (CSA B79), Drain detail as referenced in method B422 of the Tile Council of North America Handbook for Ceramic Tile Installation.

3. Drain Housing
Material: a. Stainless Steel.

4. Grate Material and Finish:

a. E - Stainless Steel Type 304 = V2A.

5. Nominal Grate Size:
a. 6-inch (150 mm) by 6-inch (150 mm) square.

2.5 PREFABRICATED SHOWER COMPONENTS

A. Schluter-KERDI-SHOWER-ST

1. Description: trapezoid-imprinted, prefabricated, sloped tiled shower tray base, made of 2.75 lb/ft3 (44 kg/m3) density, self-extinguishing (HF-1 rating per UL94) expanded polystyrene, with 12-5/16 inch (313 mm) diameter removable recessed section with 1/8 inch (3 mm) wide ribs on top and channels on the underside.

2.Size:
a. Shower Tray Size to be cut to fit as required for project.

B. Schluter-KERDI-SHOWER-SC

1. Description: trapezoid-imprinted, prefabricated, tiled shower curb base, made of 2.75 lb/ft3 (44 kg/m3) density, self-extinguishing (HF-1 rating per UL-94) expanded polystyrene.

2. Curb dimensions are 48 inches by 6 inches by 4-1/2 inch.

Schluter-KERDI-SHOWER-SR

1. Description: trapezoid-imprinted, prefabricated, tiled shower ramp base, made of 2.75 lb/ft3 (44 kg/m3) density, self-extinguishing (HF-1 rating per UL-94) expanded polystyrene.

2. Ramp dimensions are 48 inches by 15-7/8 inch with slope from maximum thickness of 1-1/2 inch to minimum thickness of 1/4 inch.

D. Schluter-KERDI-BOARD-SN

1. Description: Prefabricated waterproof niche, constructed of rigid extruded polystyrene foam building element panel, with reinforcement material and

polypropylene fleece webbing laminated on both sides for thin-set ceramic tile and dimension stone Installations.

2. Size:

a. KB 12 SN 305 152 A - 12 inches by 6 inches by 3 inches.
b. KB 12 SN 305 305 A - 12 inches by 12 inches by 3 inches.
c. KB 12 SN 305 508 A1 - 12 inches by 20 inches by 3 inches.
d. KB 12 SN 305 711 A1 - 12 inches by 28 inches by 3 inches.

E. Schluter-KERDI-FIX

1. Description: single-component, elastomeric, waterproof sealing and bonding compound with a silane-modified polymer base. Compound is free of solvents and odorless.

2.Color: Grey.

2.6 FINISHING AND EDGE-PROTECTION PROFILES

A. Schluter-BARA-RW

1. Description: L-shaped profile with a 3-1/2 inch (90 mm) wide integrated trapezoid-perforated anchoring leg.

a. Provide with straight anchoring leg.
b. Provide with special radius anchoring leg for radius applications.
b. Provide with matching connector.

2.Material and Finish:

a. E - Stainless Steel Type 304 = V2A.
1) Height as required.

2.7 SETTING MATERIALS

A. Installation methods as specified in Section 093000 – Tile.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of Unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.
B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.4 PROTECTION

A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 093050

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SECTION 095123 - ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes suspended acoustical lay-in ceiling panels in an exposed metal grid system.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For each exposed finish.
   1. Sample of each acoustical panel type.
   2. Set of 12” long samples of exposed runners. Samples of each type, finish, and color.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics:

   1. Fire-Resistance Characteristics: Where indicated, provide acoustical tile ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

      a. Identify materials with appropriate markings of applicable testing and inspecting agency.

   2. Surface-Burning Characteristics: Acoustical tiles complying with ASTM E 1264 for Class A materials, when tested per ASTM E 84.

      a. Smoke-Developed Index: 450 or less.

B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.

1.5 EXTRA STOCK

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

   1. Acoustical Ceiling Tile: Furnish one box for each type of ceiling panel.

1.6 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The following manufacturers are approved:
   1. Armstrong World Industries
   2. USG
   3. Certainteed

B. Equal products from other manufacturers may be used provided they have been approved by the Architect, not less than Ten days prior to bid.

2.2 ACOUSTICAL PANELS, GENERAL

A. Acoustical Lay-In Ceiling Panels
   1. Equal to Armstrong Ultima 2’ x 2’ Lay-In Tegular 1911.
   2. Edge: Tegular
   3. Size: 24” x 24”
   4. Thickness: 5/8”
   5. Color: White

2.3 METAL SUSPENSION SYSTEM FOR ACOUSTICAL TILE CEILING

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

B. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong XL Prelude 15/16” or a comparable product by one of the following:

   1. USG Interiors, Inc.

   2. Certainteed

C. Direct-Hung Suspension System: Intermediate-duty structural classification.

D. Color: White

2.4 ACOUSTICAL SEALANT

A. Products: See Section 079200- Joint Sealants.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. Comply with ASTM C 636.

B. Suspend ceiling hangers from building's structural members, plumb and free from contact with insulation or other objects within ceiling plenum. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers, use trapezes or equivalent devices. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.

1. Do not support ceilings directly from permanent metal forms or floor deck, anchor into concrete slabs.
2. Do not attach hangers to steel deck tabs or to steel roof deck.
3. Locate hangers within 6” from each end and spaced 4’-0” along each direct hung runner.

C. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical tiles. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.

D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

E. Install acoustical tiles in coordination with suspension system and exposed moldings and trim. Place splines or suspension system flanges into kerfed edges so tile-to-tile joints are closed by double lap of material.

END OF SECTION

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SECTION 096513 - RESILIENT RUBBER BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Resilient Rubber Base.
2. Resilient Rubber Stair Tread with Riser
3. Resilient Rubber Stair Stringer

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.5 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive resilient products.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.

C. Install resilient products after other finishing operations, including painting, have been completed.

1.6 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Furnish not less than 10 linear feet of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following, but not limited to, the following:
1. Roppe Corporation
2. Tarkett USA

3. Mannington Commercial
4. Flexco Corpooration
5. Armstrong Flooring

2.2 MATERIALS - RUBBER BASE

A. Resilient Rubber Base complying with FS SS-W-40, Type II, with matching end stops and pre-formed or molded corner units.
   1. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
   2. ASTM E648 Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source
   3. ASTM F1861 Standard Specification for Resilient Wall Base.
   4. ASTM E662 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.

B. Minimum Thickness: 1/8 inch.

C. Height: 4 inches.

D. Lengths: Coils in manufacturer's standard length.

E. Outside Corners: Molded.

F. Inside Corners: Molded.

G. Finish: Matte.

H. Colors and Patterns: As selected by Architect from full range of industry colors.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until they are same temperature as the space where they are to be installed.
   1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

D. Cover single wood with ½ inch underlayment plywood.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.2 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. Install base at outside corners using preformed corners.

G. Install base at inside corners using pre-formed corners.

3.3 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Cover resilient products until Substantial Completion.

END OF SECTION

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SECTION 096520 – LVT FLOORING (LUXURY VINYL TILE FLOORING)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Luxury Vinyl Tile Flooring and accessories as indicated on Room Finish Schedule.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

C. Samples: Full-size units of each color and pattern of floor tile required.

D. Maintenance data.

1.4 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive floor tile.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. The following manufacturers are approved:
1. Patcraft
2. Mannington Commercial

B. Equal products of other manufacturers may be submitted for review provided product has been reviewed and approved by the Architect ten days prior to bid date.

2.2 MATERIALS

A. LVT: Basis of Design J+J Framework V5001 modular.
1. Thickness: 5mm.
2. Wear Layer: 20 mil.
3. Nominal Dimensions: 9”x48”.
4. 10-year commercial warranty.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
4. Moisture Testing: Perform tests recommended by floor covering manufacturer. Proceed with installation only after substrates pass testing.

    a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 5 lb/1000 sq. ft. of in 24 hours.
    b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 80**%** relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until they are same temperature as space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.2 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay planks square with room axis. (Verify with Designer)

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles with grain running in one direction.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, non-staining marking device.

G. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.3 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.

B. Cover floor tile until Substantial Completion.

END OF SECTION

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SECTION 096723

BROADCAST QUARTZ RESINOUS FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes resinous flooring systems.

1.3 PREINSTALLATION MEETINGS

A. Pre installation Conference: Conduct conference at project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.

B. Samples for Initial Selection: For each type of exposed finish required.

C. Samples for Verification: For each resinous flooring system required, 6 inches square, applied to a rigid backing by Installer for this Project.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each resinous flooring component, from manufacturer.

B. Material Test Reports: For each resinous flooring system, by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Experienced in application of specified coatings for a minimum of 5 years on projects of similar size and complexity to this Work. The installer shall provide the Engineer with a list of at least 5 projects of similar size and scope that have been in service for at least five years. The installer shall provide the following information:
   1. Project Name
   2. Owner Contact and Phone Number
   3. Engineer/Architect Contact and Phone Number

B. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

   1. Apply full-thickness mockups on 96-inch- square floor area selected by Engineer.

      a. Include 96-inch length of integral cove base with inside and outside corner.

2. Simulate finished lighting conditions for Engineer's review of mockups.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Engineer specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.

C. Close spaces to traffic during resinous flooring application and for 48 hours after application unless manufacturer recommends a longer period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Obtain secondary materials, including joint sealant and aggregates of type and from manufacturer recommended in writing by manufacturer of primary materials.

2.2 RESINOUS FLOORING

A. Resinous Flooring System: Abrasion-, impact-, and chemical-resistant, aggregate-filled, and resin-based monolithic floor surfacing designed to produce a seamless floor and integral cove base.

B. Basis of Design:
1. Tnemec Company, Inc., 6800 Corporate Drive, Kansas City, MO 64120

C. Product Distribution and Technical Representation:
1. SteelCon Coating Systems, Inc.
2100 3rd Ave South
Irondale, AL 35210
Phone: 205-725-0333
E Mail: dparnell@tnemec.com

D. Substitutions:
1. Products of Tnemec Company are specified as the basis of design and standard of quality by which any substitution submittals shall be evaluated.

2. No substitution submittal which alters the generic components that makeup the specified systems, the total number of coats to be applied, or the total dry film thickness of the installed systems will be approved.
3. Substitution submittals shall include all pertinent product data, product samples and side by side comparisons of independent test data of the substitution to the specified products in order to be considered complete for evaluation by the Architect. Incomplete submittals will not be evaluated.
4. Substitution submittals must be received by the Engineer not later than ten (10) business days prior to the date set for receipt of bids. No extension of the bid date shall be considered to accommodate evaluation of a late substitution submittal.

E. System Characteristics:

1. Color and Pattern: Match Engineer's sample.
2. Wearing Surface: Textured for slip resistance.
3. Overall System Thickness: 1/8 inch (Nominal)

F. MVT Primer Coat:

1. Tnemec Series 241 MVT
2. Formulation Description: 88% Solids MVT Primer
3. Performance Criteria:
   a. Adhesion: ASTM D 7234
   b. Moisture Vapor Transmission Mitigation: ASTM F 1869 – Up to 20 pounds per 1,000 SF per 24 Hours
   c. Relative Humidity Tolerance: ASTM F 2170 – Up to 99%

G. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

H. Broadcast Coat(s) and Grout Coat:

1. Tnemec Series 222 Deco-Tread
2. Formulation Description: Modified Polyamine Epoxy
3. Performance Criteria:
   a. Abrasion: ASTM D 4060 (CS-17 Wheel, 1,000-gram load)
   b. Adhesion: ASTM D 4541
   c. Coefficient of Friction: ASTM D 2047
   d. Compressive Strength: ASTM C 579
   e. Critical Radiant Flux: ASTM E 648
   f. Flexural Strength & Modulus of Elasticity: ASTM C 580, Method A/ASTM D 790
   g. Hardness: ASTM D 2240 (Shore D Durometer)/ASTM D 3363
   h. Impact: ASTM D 2794
   i. Rate of Burning: ASTM D 635
   j. Shrinkage: ASTM C 531
   k. Tensile Strength, Elongation & Modulus of Elasticity: ASTM D 638/ASTM C 307
   l. Thermal Expansion: ASTM C 531
   m. Water Absorption: ASTM C 413

I. Aliphatic Moisture Cured Urethane: Semi-Gloss Sealing or finish coat.

1. Tnemec Series 248 Everthane

2. Formulation Description: Aliphatic Moisture Cured Polyurethane
3. Performance Criteria:
   a. Abrasion: ASTM D 4060 (CS-17 Wheel, 1,000-gram load) – 1,000 Cycles
   b. Adhesion: ASTM D 4541
   c. Coefficient of Friction: ASTM D 2047
   d. Flexibility & Elongation: ASTM D 522 (Method A Conical Mandrel Bend)
   e. Hardness: ASTM D 3363 (Pencil)
   f. Chemical Resistance: 30% Sulfuric Acid, 10% Hydrochloric Acid, 50% Phosphoric Acid, 10% Acetic Acid, 50% Sodium Hydroxide, 10% Ammonium Hydroxide, Methyl Ethyl Ketone, Ethyl Alcohol, Hexane, Xylene, Gasoline, Ethylene Glycol, Skydrol, Brake Fluid, Transmission Fluid, Aviation Gas, Jet Fuel (JP4).

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.

1. Roughen concrete substrates as follows:
   a. Shot-blast surfaces with an apparatus that abrades the concrete, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
   b. Clean referencing SSPC SP13/NACE No. 6, Surface profile referencing ICRI CSP value indicated for each coating system.
2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.
3. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions. Moisture vapor emissions testing shall be performed by a third-party testing agency with suitable qualifications, experience and equipment to conduct specified procedures.
   a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with application of high moisture vapor emissions resinous flooring only after substrates have maximum moisture-vapor-emission rate as indicated for each system.

C. Patching and Filling: Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.

1. Control Joint Treatment: Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.

D. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

3.2 APPLICATION

A. Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.

1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
3. Expansion and Isolation Joint Treatment: At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.

B. High-build MVT Primer: Apply high-build moisture vapor transmission primer coat in thickness indicated for flooring system.

C. Broadcast Coat(S): Apply double broadcast coats in thickness indicated.

D. Grout Coat: Apply grout coat as indicated for flooring system and at spreading rates recommended in writing by manufacturer to produce wearing surface indicated.

E. Aliphatic Moisture Cured Urethane: Apply pigmented urethane topcoat as indicated for flooring system and at spreading rates recommended in writing by manufacturer and to produce aesthetic and wearing surface indicated.

3.3 PROTECTION

A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

3.4 RESINOUS FLOORING SYSTEM SCHEDULE:

A. High-build Moisture Vapor Mitigation Quartz Broadcast, MCU Topcoat

1. Surface Preparation: SSPC SP-13/NACE No. 6, ICRI CSP 4-5 Surface Profile
   Allowable MVT: Up to 20 pounds per 1,000 square feet per 24 hours as measured referencing ASTM F 1869.
   Allowable Relative Humidity: Up to 99% as measured referencing ASTM F 2170.
2. Rolled Radius Cove: Install 4” rolled radius cove at all floor to wall intersections.
3. Primer & First Broadcast Coat: Tnemec Series 241 Ultra-Tread MVT applied at 1/8” (Nominal) DFT in accordance with manufacturer’s application instructions and broadcast to refusal with 30-50 sand aggregate or Flint Aggregate.
4. Grout Coat: Tnemec Series 222 Deco-Tread applied at 10.0 – 15.0 mils DFT as required to achieve desired texture.
5. Topcoat: Tnemec Series 248 Everthane applied at 2.0 to 3.0 mils DFT (500 square feet per gallon). Add 220 Grit White Aluminum Oxide for non-skid finish for extra wear protection.

END OF SECTION 096723

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SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following exterior substrates:
   1. Steel.
   2. Galvanized metal.
   3. Aluminum (not anodized or otherwise coated).
   4. Plastic trim fabrications.
   5. Exterior Portland cement (stucco). (If applicable)
   6. Fiberglass Fabrications (If applicable)

B. Related Sections include the following:
   1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
   2. Division 06 Sections for shop priming carpentry with primers specified in this Section.
   3. Division 09 Section "Interior Painting" for surface preparation and the application of paint systems on interior substrates.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of topcoat product indicated.

C. Samples for Verification: For each type of paint system and each color and gloss of topcoat indicated.
   1. Submit Samples on rigid backing, 12 inches square.
   2. Step coats on Samples to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:
   1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
   2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.4 QUALITY ASSURANCE

A. MPI Standards:
   1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."

2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on benchmark samples.

a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Benjamin Moore
2. PPG
3. Sherwin-Williams Company (The)

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: As selected by Architect from manufacturer's full range.

2.3 EXTERIOR FINISHES (Where applicable or indicated on the drawings)

A. Schedule:

P-1 Iron and Steel Surfaces:
First Coat: B66W01310 – Pro Industrial Pro-Cryl Universal Metal Primer.
Second Coat: B53W01051 – Pro Industrial Waterbased Alkyd Urethane Enamel
Third Coat: B53W01051- Pro Industrial Waterbased Alkyd Urethane Enamel.

P-2 Galvanized Steel & Aluminum Surfaces:
First Coat: B66W01310 – Pro Industrial Pro-Cryl Universal Metal Primer.
Second Coat: B53W01051 – Pro Industrial Waterbased Alkyd Urethane Enamel
Third Coat: B53W01051- Pro Industrial Waterbased Alkyd Urethane Enamel.

P-3 Painted Stucco, Fiber Cement Siding, Concrete Surfaces, Masonry:
First Coat: LX02W0050 - Loxon Concrete & Masonry Primer.
Second Coat: B82W00151 - A-100 Exterior Latex Satin.
Third Coat: A82W00151 - A-100 Exterior Latex Satin.

Optional System: Flat
First Coat: LX02W0050 - Loxon Concrete & Masonry Primer.
Second Coat: LX13W0051 – Loxon Self-Cleaning Acrylic Coating
Third Coat: LX13W0051 - Loxon Self-Cleaning Acrylic Coating

P-4 CMU Surfaces:
First Coat: LX01W0200 - Loxon Acrylic Block Surfacer.
Second Coat: A82W00151 - A-100 Exterior Latex Satin.
Third Coat: A82W00151 - A-100 Exterior Latex Satin.

Optional System: Flat
First Coat: LX01W0200 - Loxon Acrylic Block Surfacer.
Second Coat: B82W00151 - Loxon Self-Cleaning Acrylic Coating.
Third Coat: A82W00151 - Loxon Self-Cleaning Acrylic Coating.

P-5 Painted Wood Surfaces (Opaque Finish):
First Coat: B42W08041- Exterior Latex Wood Primer.
Second Coat: A08W00151- A-100 Exterior Latex Gloss.
Third Coat: AO8W00151 - A-100 Exterior Latex Gloss.

P-6 Painted Wood Surfaces (Semi-Transparent Finish):
First Coat: A15T00005 - Woodscapes Exterior Polyurethane Semi-Transparent Stain.
Second Coat: AT1500005 - Woodscapes Exterior Polyurethane Semi-Transparent Stain.

P-7 Painted Plywood Surfaces:
First Coat: B42W08041 – Exterior Latex Wood Primer *(If tannin Bleed occurs, use Exterior Oil Base Primer Y24W08020).*
Second Coat: A08W00151 - A-100 Exterior Latex Gloss.
Third Coat: A08W00151 - A-100 Exterior Latex Gloss.

B. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Wood: 15 percent.
4. Plaster: 12 percent.
5. Gypsum Board: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and re-prime substrate with compatible primers as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

H. Aluminum Substrates: Remove surface oxidation.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:

1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will perform tests for compliance of paint materials with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following interior substrates:

1. Concrete masonry units (CMU).
2. Steel.
3. Galvanized metal.
4. Aluminum (not anodized or otherwise coated).
5. Wood.
6. Gypsum board.
7. Plaster. (If applicable)

B. Related Sections include the following:

1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
2. Division 06 Sections for shop priming carpentry with primers specified in this Section.
3. Division 08 Sections for factory priming windows and doors with primers specified in this Section.
4. Division 09 Section "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.
5. Division 09 Section "Staining and Transparent Finishing" for surface preparation and the application of wood stains and transparent finishes on interior wood substrates.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of topcoat product indicated.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.4 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
    a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft.
    b. Other Items: Architect will designate items or areas required.
2. Apply benchmark samples after permanent lighting and other environmental services have been activated.
3. Final approval of color selections will be based on benchmark samples.
    a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Sherwin Williams (Basis of Design)

C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Benjamin Moore & Co.
2. PPG.
3. Sherwin-Williams Company (The)

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:

1. Flat Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
2. Non-flat Paints, Coatings, and Primers: VOC content of not more than 150 g/L.
3. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
4. Floor Coatings: VOC not more than 100 g/L.
5. Shellacs, Clear: VOC not more than 730 g/L.
6. Shellacs, Pigmented: VOC not more than 550 g/L.
7. Flat Topcoat Paints: VOC content of not more than 50 g/L.
8. Nonflat Topcoat Paints: VOC content of not more than 150 g/L.
9. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
10. Floor Coatings: VOC not more than 100 g/L.
11. Shellacs, Clear: VOC not more than 730 g/L.
12. Shellacs, Pigmented: VOC not more than 550 g/L.
13. Primers, Sealers, and Undercoaters: VOC content of not more than 200 g/L.
14. Dry-Fog Coatings: VOC content of not more than 400 g/L.
15. Zinc-Rich Industrial Maintenance Primers: VOC content of not more than 340 g/L.
16. Pre-Treatment Wash Primers: VOC content of not more than 420 g/L.

C. Chemical Components of Field-Applied Interior Paints and Coatings: Provide topcoat paints and anti-corrosive and anti-rust paints applied to ferrous metals that comply with the following chemical restrictions; these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:

1. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
2. Restricted Components: Paints and coatings shall not contain any of the following:

    a. Acrolein.

b. Acrylonitrile.
c. Antimony.
d. Benzene.
e. Butyl benzyl phthalate.
f. Cadmium.
g. Di (2-ethylhexyl) phthalate.
h. Di-n-butyl phthalate.
i. Di-n-octyl phthalate.
j. 1,2-dichlorobenzene.
k. Diethyl phthalate.
l. Dimethyl phthalate.
m. Ethylbenzene.
n. Formaldehyde.
o. Hexavalent chromium.
p. Isophorone.
q. Lead.
r. Mercury.
s. Methyl ethyl ketone.
t. Methyl isobutyl ketone.
u. Methylene chloride.
v. Naphthalene.
w. Toluene (methylbenzene).
x. 1,1,1-trichloroethane.
y. Vinyl chloride.

D. Colors: As selected by Architect from manufacturer's full range.

SCHEDULE INTERIOR FINISHES (Sherwin Williams Basis of Design) (Use where applicable)

P-1 Iron & Steel Surfaces:
First Coat: B66W01310 – Pro Industrial Pro-Cryl Universal Metal Primer.
Second Coat: B53W01051 – Pro Industrial Waterbased Alkyd Urethane Enamel
Third Coat: B53W01051 – Pro Industrial Waterbased Alkyd Urethane Enamel

P-2 Iron & Steel Surfaces: Alkyd Dryfall:
First Coat: B50WZ0004- Kem Bond HS High Solids Alkyd Universal Metal Primer.
Second Coat: B48W60 – Dry Fall Alkyd Flat

P-3 Iron & Steel Surfaces: Acrylic Dryfall:
First Coat: B66W00011 – Pro Industrial DTM Acrylic Primer/Finish
Second Coat: B42W00181 – Pro Industrial Waterborne Acrylic Dryfall

P-4 Galvanized Steel & Aluminum Surfaces:
First Coat: B66W01310 – Pro Industrial Pro-Cryl Universal Metal Primer.
Second Coat: B53W01051 – Pro Industrial Waterbased Alkyd Urethane Enamel
Third Coat: B53W01051 – Pro Industrial Waterbased Alkyd Urethane Enamel

P-5 Plaster & Concrete Surfaces:
First Coat: LX02W0050 - Loxon Concrete & Masonry Primer

Second Coat: B31W02651- ProMar 200 Zero VOC Interior Latex Semi-Gloss
Third Coat: B31W02651- ProMar 200 Zero VOC Interior Latex Semi-Gloss

P-6 Wood Surfaces to be Painted (Opaque Finish):
First Cost: B28W08111 – Premium Wall & Wood Primer.
Second Coat: B34W02251 – ProMar 200 Interior Alkyd Semi-Gloss.
Third Coat: B34W02251 – ProMar 200 Interior Alkyd Semi-Gloss.

P-7 Wood Surfaces to Receive Natural Finish (Stained):
First Coat: MinWax Performance Series Interior Oil Stain.
Second Coat: MinWax Performance Series Polyurethane Varnish.
Third Coat: MinWax Performance Series Polyurethane Varnish.

P-8 Drywall Surfaces (Dry Areas):
First Coat: A63W00100 - Builders Solution System Interior Primer Surfacer
Second Coat: B20W12651- ProMar 200 Zero VOC Interior Latex Eg – Shel.
Third Coat: B20W12651- ProMar 200 Zero VOC Interior Latex Eg – Shel.

Optional System:
First Coat: A63W00100 - Builders Solution System Interior Primer Surfacer
Second Coat: B20W01951 - ProMar 200 HP Zero VOC Interior Acrylic EgShel.
Third Coat: B20W01951 - ProMar 200 HP Zero VOC Interior Acrylic EgShel.

P-9 Drywall Surfaces (Wet Areas):
First Coat: A63W00100 - Builders Solution System Interior Primer Surfacer.
Second Coat: B70W00211 - Water Based Catalyzed Epoxy (Part A & B)
Third Coat: B70W00211 – Water Based Catalyzed Epoxy (Part A & B)

P-10 CMU & Brick Surfaces (Dry Areas):
First Coat: LX01W0200 Loxon Acrylic Block Surfacer.
Second Coat: B34W02252 – ProMar 200 Interior Alkyd Semi- Gloss.
Third Coat: B34W02252 – ProMar 200 Interior Alkyd Semi- Gloss.

P-11 CMU & Brick Surfacers (Wet Areas):
First Coat: LX01W0200 Loxon Acrylic Block Surfacer.
Second Coat: B70W00211 – Waterbased Catalyzed Epoxy (Part A & B).
Third Coat: B70W00211 – Waterbased Catalyzed Epoxy (Part A & B).

P-12 Concrete Floor Sealer:
2 Coats: B67C02000 – ArmorSeal 1000 Epoxy (Parts A & B).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU):12 percent.
3. Wood: 15 percent.
4. Gypsum Board: 12 percent.
5. Plaster: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and re-prime substrate with compatible primers as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Clay Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content of surfaces or alkalinity of mortar joints to be painted exceed that permitted in manufacturer's written instructions.

F. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

G. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

I. Aluminum Substrates: Remove surface oxidation.

J. Wood Substrates:

1. Scrape and clean knots and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood. 9If applicable or noted on drawings.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

K. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

L. Plaster Substrates: Do not begin paint application until plaster is fully cured and dry.

M. Spray-Textured Ceiling Substrates: Do not begin paint application until surfaces are dry.

N. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:

1. Mechanical Work:

a. Uninsulated metal piping.
b. Uninsulated plastic piping.
c. Pipe hangers and supports.
d. Tanks that do not have factory-applied final finishes.
e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

2. Electrical Work:

    a. Switchgear.
    b. Panelboards.
    c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

3.4 FIELD QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:

1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

C. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION

SECTION 099600 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This section includes surface preparation and application of high-performance polyfunctional aliphatic urethanes on exterior metals.

1.2 QUALITY ASSURANCE

A. Material Performance Criteria:

1. Products: Provide certified test reports when submitting products other than those specified herein the specification. Test reports shall indicate the test method, system and requirements for those products being submitted, and shall meet or exceed the test criteria and performance values of the specified coatings herein.

B. Applicator Qualifications:

1. Preparation and Workmanship: A firm or individual with a minimum of (5) years experience in applying coatings similar in material design, whose work has resulted in applications with a record of successful in-service performance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Tnemec Company, Inc.
6800 Corporate Drive
Kansas City, MO 64120
Toll Free: (800) TNEMEC1
Fax: (816) 483-3969
Web Site: http://www.tnemec.com

B. Substitutions must be submitted to Architect at least 10 days prior to bid.

2.2 MATERIALS

A. Urethane Primer, Zinc-Rich

1. Tnemec Series 94-H_2O Hydro-Zinc
   a. Generic Type: Aromatic Urethane, Zinc-Rich
   b. Solids by Volume: 62%
   c. Zinc Dust Content: 83% by weight in dried film
   d. Volatile Organic Compounds, Unthinned: 0.8 lbs/gallon (96 grams/liter)
   e. Curing Time at 75ºF (24ºC)
      1) To Handle: 2 hours
      2) To Recoat: 8 hours

B. Epoxy, Pigmented Intermediate Coat

1. Tnemec Series L69 Hi-Build Epoxoline II
    a. Generic Type: Polyamidoamine Epoxy
    b. Finish: Satin
    c. Solids by Volume: 65%
    d. Volatile Organic Compounds, Unthinned: 0.82 lbs/gallon (98 grams/liter)
    e. Curing Time at 70ºF (21ºC)
        1) To Handle: 6 hours
        2) To Recoat: 9 hours (For faster curing and low-temperature applications, add Series 44-700 Epoxy Accelerator.)

C. Urethane, Pigmented Topcoat

1. Tnemec Series 750 UVX
    a. Generic Type: Polyfunctional Aliphatic Urethane
    b. Finish: Semi-gloss
    c. Solids by Volume: 72%
    d. Volatile Organic Compounds, Unthinned: 0.82 lbs/gallon (99 grams/liter)
    e. Curing Time at 75ºF (24ºC)
        1) To Handle: 6–8 hours
        2) To Recoat: 8 hours (For faster curing and low-temperature applications, add Series 44-712 Urethane Accelerator.)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PROTECTION OF SURFACES NOT SCHEDULED TO BE COATED

A. Protect surrounding areas and surfaces not scheduled to be coated from damage during surface preparation and application of coatings.

B. Immediately remove coatings that fall on surrounding areas and surfaces not scheduled to be coated.

3.3 SURFACE PREPARATION OF STEEL

A. Prepare steel surfaces in accordance with manufacturer's instructions.

B. Fabrication Defects:

1. Correct steel and fabrication defects revealed by surface preparation.
2. Remove weld spatter and slag.
3. Round sharp edges and corners of welds to a smooth contour.
4. Smooth weld undercuts and recesses.
5. Grind down porous welds to pinhole-free metal.
6. Remove weld flux from surface.

C. Ensure surfaces are dry.

D. Remove visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter in accordance with SSPC-SP 6/NACE 3, unless otherwise specified.

E. Abrasive Blast-Cleaned Surfaces: Coat abrasive blast-cleaned surfaces with primer before visible rust forms on surface. Do not leave blast-cleaned surfaces uncoated for more than 8 hours.

F. Coordination of shop-applied prime coats is critical.

1. Remove incompatible primers and re-prime substrate with compatible primer as required to produce coating systems indicated.

3.4 APPLICATION

A. Exterior Exposed Steel, Semi-Gloss Finish

1. Surface Preparation: SSPC-SP6 Commercial Blast Cleaning.
2. Primer: Tnemec Series 94-H_2O at 2.5 to 3.5 mils DFT. Shop Applied
3. Intermediate Coat: Tnemec Series L69 Hi-Build Epoxoline II at 4.0 to 6.0 mils DFT. Field Applied
4. Finish Coat: Tnemec Series 750 UVX at 4.0 to 6.0 mils DFT. Field Applied
5. Total Dry Film Thickness: 10.5 to 15.5 mils

END OF SECTION 099600

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SECTION 101400 – SIGNAGE

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Standard Braille Interior Wall Mounted Panel Signs.
B. Cast Aluminum Plaque.

1.2 SUBMITTALS

A. Product Data: Include manufacturer's construction details relative to materials, dimensions of individual components, profiles, and finishes for each type of sign required.

B. Shop Drawings: Provide shop drawings for fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, reinforcement, accessories, layout, and installation details.

1. Provide message list for each sign required, including large-scale details of wording and layout of lettering.
2. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions of installation of anchor bolts and other anchors to be installed as a unit of Work in other Sections.
3. Furnish full-size rubbings for metal plaques.

C. Samples: Provide the following samples of each sign component for initial selection of color, and pattern and surface texture as required and for verification of compliance with requirements indicated.

1. Samples for verification of color, pattern, and texture selected, and compliance with requirements indicated:

a. Cast Acrylic Sheet and Plastic Laminate: Provide a sample panel not less than 8 ½ inches by 11 inches for each material indicated. Include a panel for each color, texture and pattern required. On each panel include a representative sample of the graphic image process required, showing graphic style, and colors and finishes of letters, numbers, and other graphic devices.

1.3 ENVIRONMENTAL REQUIREMENTS

A. Do not install signs when ambient temperature is below 70 degrees F degrees C). Maintain this minimum during and after installation of signs.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Signage to be equal to APCO Sign Systems "Elevate".

1. Best Sign Systems approved equal.

B. Cast Aluminum Plaque: Provide one building 24”x 36” Cast Aluminum Plaque.
1. Equal to A.R.K. Ramos with the following specification:
a. Border: #513
b. Mounting: No. 1
c. Finish: AL-200
d. Texture: Matte
e. Lettering: Helvetica Medium

C. Cast Aluminum Letters: Equal to A.R.K. Ramos F-1 Cast Aluminum.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer’s instructions.

1. Install sign levels, plump, and at the height indicated, with sign surfaces free from distortion and other defects in appearance.

B. Wall Mounted Braille Panel Signs:
1. Attach panel signs to wall surfaces using the methods indicated below:
Silicone-Adhesive Mounting: Use liquid silicone adhesive recommended by the sign manufacturer to attach sign units to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended by the sign manufacturer to hold the sign in place until the adhesive has fully cured.

3.2 CLEANING AND INSPECTION

At completion if the installation, clean soiled sign surfaces in accordance with the manufacturer’s instructions. Protect units from damage until acceptance by the Owner.

END OF SECTION

CHAPTER 7: COMMUNICATION ELEMENTS AND FEATURES

701 General

701.1 Scope. The provisions of Chapter 7 shall apply where required by Chapter 2 or where referenced by a requirement in this document.

702 Fire Alarm Systems

702.1 General. Fire alarm systems shall have permanently installed audible and visible alarms complying with NFPA 72 (1999 or 2002 edition) (incorporated by reference, see "Referenced Standards" in Chapter 1), except that the maximum allowable sound level of audible notification appliances complying with section 4-3.2.1 of NFPA 72 (1999 edition) shall have a sound level no more than 110 dB at the minimum hearing distance from the audible appliance. In addition, alarms in guest rooms required to provide communication features shall comply with sections 4-3 and 4-4 of NFPA 72 (1999 edition) or sections 7.4 and 7.5 of NFPA 72 (2002 edition).

EXCEPTION: Fire alarm systems in medical care *facilities* shall be permitted to be provided in accordance with industry practice.

703 Signs

703.1 General. Signs shall comply with 703. Where both visual and *tactile characters* are required, either one sign with both visual and *tactile characters*, or two separate signs, one with visual, and one with *tactile characters*, shall be provided.

703.2 Raised Characters. Raised *characters* shall comply with 703.2 and shall be duplicated in braille complying with 703.3. Raised *characters* shall be installed in accordance with 703.4.

> **Advisory 703.2 Raised Characters.** Signs that are designed to be read by touch should not have sharp or abrasive edges.

703.2.1 Depth. Raised *characters* shall be 1/32 inch (0.8 mm) minimum above their background.

703.2.2 Case. *Characters* shall be uppercase.

703.2.3 Style. *Characters* shall be sans serif. *Characters* shall not be italic, oblique, script, highly decorative, or of other unusual forms.

703.2.4 Character Proportions. *Characters* shall be selected from fonts where the width of the uppercase letter "O" is 55 percent minimum and 110 percent maximum of the height of the uppercase letter "I".

703.2.5 Character Height. *Character* height measured vertically from the baseline of the *character* shall be 5/8 inch (16 mm) minimum and 2 inches (51 mm) maximum based on the height of the uppercase letter "I".

EXCEPTION: Where separate raised and visual *characters* with the same information are provided, raised *character* height shall be permitted to be ½ inch (13 mm) minimum.

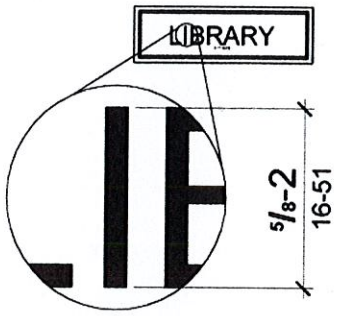

Figure 703.2.5
Height of Raised Characters

703.2.6 Stroke Thickness. Stroke thickness of the uppercase letter "I" shall be 15 percent maximum of the height of the *character*.

703.2.7 Character Spacing. *Character* spacing shall be measured between the two closest points of adjacent raised *characters* within a message, excluding word *spaces*. Where *characters* have rectangular cross sections, spacing between individual raised *characters* shall be 1/8 inch (3.2 mm) minimum and 4 times the raised *character* stroke width maximum. Where *characters* have other cross sections, spacing between individual raised *characters* shall be 1/16 inch (1.6 mm) minimum and 4 times the raised *character* stroke width maximum at the base of the cross sections, and 1/8 inch (3.2 mm) minimum and 4 times the raised *character* stroke width maximum at the top of the cross sections. *Characters* shall be separated from raised borders and decorative *elements* 3/8 inch (9.5 mm) minimum.

703.2.8 Line Spacing. Spacing between the baselines of separate lines of raised *characters* within a message shall be 135 percent minimum and 170 percent maximum of the raised *character* height.

703.3 Braille. Braille shall be contracted (Grade 2) and shall comply with 703.3 and 703.4.

703.3.1 Dimensions and Capitalization. Braille dots shall have a domed or rounded shape and shall comply with Table 703.3.1. The indication of an uppercase letter or letters shall only be used before the first word of sentences, proper nouns and names, individual letters of the alphabet, initials, and acronyms.

Table 703.3.1 Braille Dimensions

Measurement Range	Minimum in Inches Maximum in Inches
Dot base diameter	0.059 (1.5 mm) to 0.063 (1.6 mm)
Distance between two dots in the same cell[1]	0.090 (2.3 mm) to 0.100 (2.5 mm)
Distance between corresponding dots in adjacent cells[1]	0.241 (6.1 mm) to 0.300 (7.6 mm)
Dot height	0.025 (0.6 mm) to 0.037 (0.9 mm)
Distance between corresponding dots from one cell directly below[1]	0.395 (10 mm) to 0.400 (10.2 mm)

1. Measured center to center.

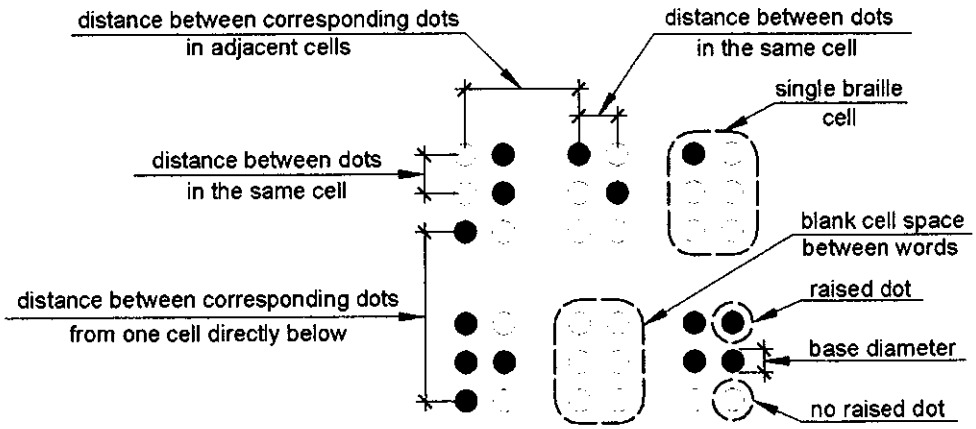

Figure 703.3.1
Braille Measurement

703.3.2 Position. Braille shall be positioned below the corresponding text. If text is multi-lined, braille shall be placed below the entire text. Braille shall be separated 3/8 inch (9.5 mm) minimum from any other *tactile characters* and 3/8 inch (9.5 mm) minimum from raised borders and decorative *elements*.

EXCEPTION: Braille provided on elevator car controls shall be separated 3/16 inch (4.8 mm) minimum and shall be located either directly below or adjacent to the corresponding raised *characters* or symbols.

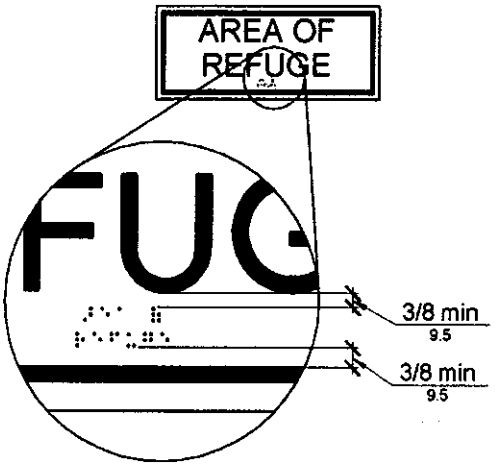

Figure 703.3.2
Position of Braille

703.4 Installation Height and Location. Signs with *tactile characters* shall comply with 703.4.

703.4.1 Height Above Finish Floor or Ground. *Tactile characters* on signs shall be located 48 inches (1220 mm) minimum above the finish floor or ground surface, measured from the baseline of the lowest *tactile character* and 60 inches (1525 mm) maximum above the finish floor or ground surface, measured from the baseline of the highest *tactile character*.

EXCEPTION: *Tactile characters* for elevator car controls shall not be required to comply with 703.4.1.

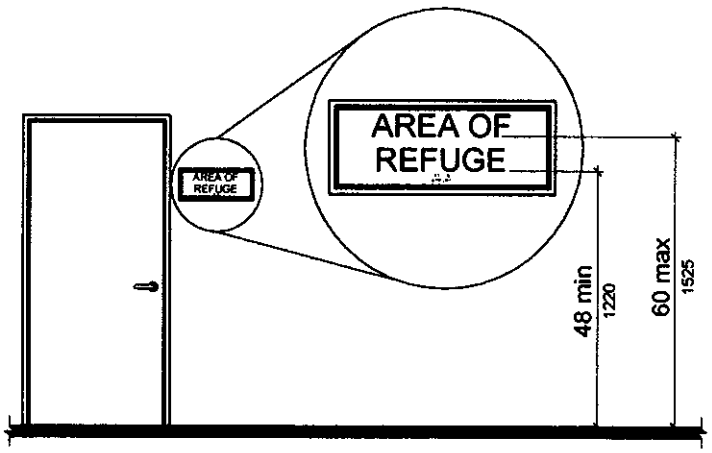

Figure 703.4.1
Height of Tactile Characters Above Finish Floor or Ground

703.4.2 Location. Where a *tactile* sign is provided at a door, the sign shall be located alongside the door at the latch side. Where a *tactile* sign is provided at double doors with one active leaf, the sign shall be located on the inactive leaf. Where a *tactile* sign is provided at double doors with two active leafs, the sign shall be located to the right of the right hand door. Where there is no wall *space* at the latch side of a single door or at the right side of double doors, signs shall be located on the nearest adjacent wall. Signs containing *tactile characters* shall be located so that a clear floor *space* of 18 inches (455 mm) minimum by 18 inches (455 mm) minimum, centered on the *tactile characters*, is provided beyond the arc of any door swing between the closed position and 45 degree open position.

EXCEPTION: Signs with *tactile characters* shall be permitted on the push side of doors with closers and without hold-open devices.

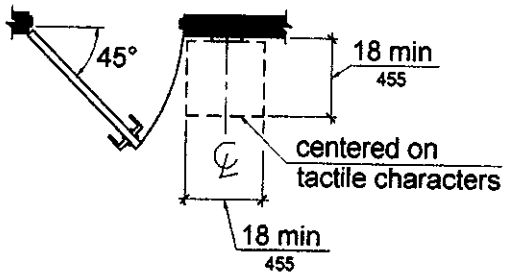

Figure 703.4.2
Location of Tactile Signs at Doors

703.5 Visual Characters. Visual *characters* shall comply with 703.5.

EXCEPTION: Where visual *characters* comply with 703.2 and are accompanied by braille complying with 703.3, they shall not be required to comply with 703.5.2 through 703.5.9.

703.5.1 Finish and Contrast. *Characters* and their background shall have a non-glare finish. *Characters* shall contrast with their background with either light *characters* on a dark background or dark *characters* on a light background.

Advisory 703.5.1 Finish and Contrast. Signs are more legible for persons with low vision when characters contrast as much as possible with their background. Additional factors affecting the ease with which the text can be distinguished from its background include shadows cast by lighting sources, surface glare, and the uniformity of the text and its background colors and textures.

703.5.2 Case. *Characters* shall be uppercase or lowercase or a combination of both.

703.5.3 Style. *Characters* shall be conventional in form. *Characters* shall not be italic, oblique, script, highly decorative, or of other unusual forms.

703.5.4 Character Proportions. *Characters* shall be selected from fonts where the width of the uppercase letter "O" is 55 percent minimum and 110 percent maximum of the height of the uppercase letter "I".

703.5.5 Character Height. Minimum *character* height shall comply with Table 703.5.5. Viewing distance shall be measured as the horizontal distance between the *character* and an obstruction preventing further approach towards the sign. *Character* height shall be based on the uppercase letter "I".

Table 703.5.5 Visual Character Height

Height to Finish Floor or Ground From Baseline of Character	Horizontal Viewing Distance	Minimum Character Height
40 inches (1015 mm) to less than or equal to 70 inches (1780 mm)	less than 72 inches (1830 mm)	5/8 inch (16 mm)
	72 inches (1830 mm) and greater	5/8 inch (16 mm), plus 1/8 inch (3.2 mm) per foot (305 mm) of viewing distance above 72 inches (1830 mm)
Greater than 70 inches (1780 mm) to less than or equal to 120 inches (3050 mm)	less than 180 inches (4570 mm)	2 inches (51 mm)
	180 inches (4570 mm) and greater	2 inches (51 mm), plus 1/8 inch (3.2 mm) per foot (305 mm) of viewing distance above 180 inches (4570 mm)
greater than 120 inches (3050 mm)	less than 21 feet (6400 mm)	3 inches (75 mm)
	21 feet (6400 mm) and greater	3 inches (75 mm), plus 1/8 inch (3.2 mm) per foot (305 mm) of viewing distance above 21 feet (6400 mm)

703.5.6 Height From Finish Floor or Ground. Visual *characters* shall be 40 inches (1015 mm) minimum above the finish floor or ground.

EXCEPTION: Visual *characters* indicating elevator car controls shall not be required to comply with 703.5.6.

703.5.7 Stroke Thickness. Stroke thickness of the uppercase letter "I" shall be 10 percent minimum and 30 percent maximum of the height of the *character*.

703.5.8 Character Spacing. *Character* spacing shall be measured between the two closest points of adjacent *characters*, excluding word *spaces*. Spacing between individual *characters* shall be 10 percent minimum and 35 percent maximum of *character* height.

703.5.9 Line Spacing. Spacing between the baselines of separate lines of *characters* within a message shall be 135 percent minimum and 170 percent maximum of the *character* height.

703.6 Pictograms. *Pictograms* shall comply with 703.6.

703.6.1 Pictogram Field. *Pictograms* shall have a field height of 6 inches (150 mm) minimum. *Characters* and braille shall not be located in the *pictogram* field.

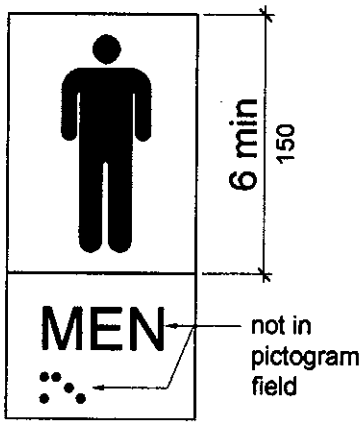

Figure 703.6.1
Pictogram Field

703.6.2 Finish and Contrast. *Pictograms* and their field shall have a non-glare finish. *Pictograms* shall contrast with their field with either a light *pictogram* on a dark field or a dark *pictogram* on a light field.

Advisory 703.6.2 Finish and Contrast. Signs are more legible for persons with low vision when characters contrast as much as possible with their background. Additional factors affecting the ease with which the text can be distinguished from its background include shadows cast by lighting sources, surface glare, and the uniformity of the text and background colors and textures.

703.6.3 Text Descriptors. *Pictograms* shall have text descriptors located directly below the *pictogram* field. Text descriptors shall comply with 703.2, 703.3 and 703.4.

703.7 Symbols of Accessibility. Symbols of *accessibility* shall comply with 703.7.

703.7.1 Finish and Contrast. Symbols of *accessibility* and their background shall have a non-glare finish. Symbols of *accessibility* shall contrast with their background with either a light symbol on a dark background or a dark symbol on a light background.

Advisory 703.7.1 Finish and Contrast. Signs are more legible for persons with low vision when characters contrast as much as possible with their background. Additional factors affecting the ease with which the text can be distinguished from its background include shadows cast by lighting sources, surface glare, and the uniformity of the text and background colors and textures.

703.7.2 Symbols.

703.7.2.1 International Symbol of Accessibility. The International Symbol of *Accessibility* shall comply with Figure 703.7.2.1.

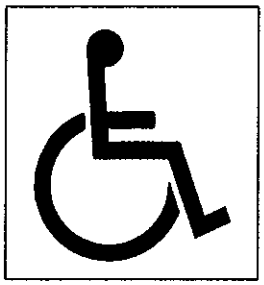

Figure 703.7.2.1
International Symbol of Accessibility

703.7.2.2 International Symbol of TTY. The International Symbol of *TTY* shall comply with Figure 703.7.2.2.

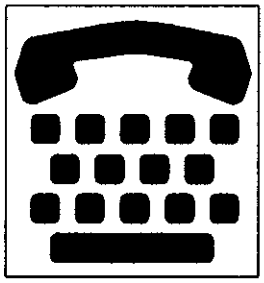

Figure 703.7.2.2
International Symbol of TTY

703.7.2.3 Volume Control Telephones. Telephones with a volume control shall be identified by a *pictogram* of a telephone handset with radiating sound waves on a square field such as shown in Figure 703.7.2.3.

Figure 703.7.2.3
Volume Control Telephone

SECTION 102800 – TOILET and BATH ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Public-use washroom accessories.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:

1. Construction details and dimensions.
2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Material and finish descriptions.
4. Features that will be included for Project.
5. Manufacturer's warranty.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated on Drawings.
2. Identify products using designations indicated on Drawings.

C. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same articles in Part 2, provide products of same manufacturer unless otherwise approved by Architect.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.6 WARRANTY

A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch (0.8-mm) minimum nominal thickness, unless otherwise indicated.

B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.0359-inch (0.9-mm) minimum nominal thickness.

C. Galvanized Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.

D. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot dip galvanized after fabrication.

E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

F. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

G. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.2 WASHROOM ACCESSORIES

A. Approved manufacturers for all products:

1. Bradley Corporation.

2. Bobrick Washroom Equipment.

3. ASI – American Specialties Inc.

SCHEDULE OF ACCESSORIES:

1. Wall Mounted Soap Dispenser: Equal to Bradley Model No. 6562.

2. Toilet Tissue Dispenser: Equal to Bradley Model No. 5084.

3. Semi-Recessed -Mounted Combination Paper Towel Dispenser/Disposal: Equal to Bradley Model No. 234-10.

4. Framed Plate Glass Mirror: Equal to Bradley Model No. 781-2032.

4a. Framed Plate Glass Mirror: Equal to Bradley Model No. 781-2060.

5. 36” Grab Bar: Equal to Bradley Model No. 812.

6. 42” Grab Bar: Equal to Bradley Model No. 812.

7. 18” Vertical Grab Bar: Equal to Bradley Model No. 812.

8. Stainless Steel Shelving in Common Bath 156B: Equal to Stainless Supply (877.484.0088).

Stainless steel shelving 304 alloy 14" deep solid shelves w/backsplash with Designer brackets at 3'-0" on center.

9. Baby Changing Station: Equal to Koala Kare Products KB200-01SS (Stainless Steel).

10. Shower Curtain and Hooks: Bobrick Vinyl Shower Curtain 2014-2 or 204-3. Hooks: Bobrick 204-1, Shower curtain rod- Bobrick- 6107. Install at Showers.

11. Not used.

12. Not used.

13. Shower Grab Bar: Equal to Bobrick B 6861.

14. Shower Seat: Equal to Bobrick Model No. 5191.

15. Robe Hook: Equal to Bradley Model No. 9119 (See also Sheet A3.3 and Detail C/A3.3).

16. Mop and Broom Holder: Equal to Bradley Model No. 9933. Install at Janitors Closets.

2.3 FABRICATION

General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equipment units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units' level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lb, when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800

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SECTION 104400 – FIRE EXTINGUISHER CABINETS & FIRE EXTINGUISHERS

PART1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.1 SUMMARY

A. Section includes surface mounted fire protection cabinets and fire extinguishers.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each exposed product and for each color and texture specified.

D. Maintenance data.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

B. Tempered Break Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 1.5 mm thick.

2.2 FIRE PROTECTION CABINET

A. Cabinet Type: Surface mounted suitable for fire extinguisher.

1. Products: Subject to compliance with requirements, provide the following:
Basis of Specification: Potter Roemer Model No. 1754 DV.

2. Equal products from the following will be accepted.

(a) J. L. Industries, Inc., a division of Activar Construction Products Group.
(b) Kidde Residential and Commercial Division, Subsidiary of Kidde plc.
(c) Larsen's Manufacturing Company.

B. Cabinet Material: Steel sheet.

C. Surface Mounted Cabinet: Cabinet box surface mounted on walls

D. Door Material: Steel sheet.

E. Door Style: Vertical duo panel with frame.

F. Door Glazing: Tempered break glass.

G. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

H. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Break-Glass Strike: Manufacturer's standard metal strike, complete with chain and mounting clip, secured to cabinet.
3. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
4. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.

a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."

1.) Location: Applied to cabinet door.
2.) Application Process: Silk-screened.
3.) Lettering Color: Red.
4.) Orientation: Vertical.

I. Fire Extinguisher: Equal to Potter Roemer 10 lb Model No. 3010.

J. Finishes:

1. Manufacturer's standard baked-enamel paint for the following:

a. Exterior of cabinet door, and trim, except for those surfaces indicated to receive another finish.
b. Interior of cabinet and door.

2. Steel: Baked enamel or powder coat.

a. Color and Gloss: As selected by Architect from manufacturer's full range.

2.3 FABRICATION

A. Fire Protection Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Miter and weld joints and grind smooth.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Examine walls and partitions for suitable framing depth and blocking where cabinets will be installed and prepare as required by type and size of cabinet and trim style.

B. Install fire protection cabinets in locations and at mounting heights indicated, if not indicated, at heights acceptable to authorities having jurisdiction.

C. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.

D. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

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SECTION 107500 - FLAGPOLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes ground-mounted flagpole made from aluminum.

B. Owner-Furnished Material: Flag.

C. Related Sections:
1. Division 26 Section "Exterior Lighting" for site lighting fixtures.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand the effects of gravity loads, and the following loads and stresses within limits and under conditions indicated according to the following design criteria:
1. Base flagpole design on nylon or cotton flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.

B. Shop Drawings: For flagpoles. Include plans, elevations, details, and attachments to other work. Show general arrangement, jointing, fittings, accessories, grounding, anchoring, and support.

1. Include section, and details of foundation system for ground-mounted flagpoles.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

D. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain flagpole as complete unit, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. General: Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
   1. American Flagpole and Flag Co.
   2. Concord Industries, Inc.
   3. Eder Flag Manufacturing Company, Inc.
   4. Ewing Flagpoles.
   5. Morgan-Francis; Division of Original Tractor Cab Co., Inc.
   6. Flagpoles, Etc.U.S.

2.2 FLAGPOLES

A. Flagpole Construction, General: Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:

   1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
   2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.
   3. Provide self-aligning, snug-fitting joints.

B. Exposed Height:30 feet.

C. Aluminum Flagpoles: Provide entasis-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B 241/B 241M, Alloy 6063, with a minimum wall thickness of 3/16 inch.

D. Metal Foundation Tube: Manufacturer's standard corrugated-steel foundation tube, not less than 0.064-inch nominal wall thickness. Provide with 3/16-inch steel bottom plate and support plate; 3/4-inch diameter, steel ground spike; and steel centering wedges welded together. Galvanize steel after assembly. Provide loose hardwood wedges at top of foundation tube for plumbing pole.

   1. Provide flashing collar of same material and finish as flagpole.

E. Sleeve for Aluminum Flagpole: foundation sleeve, made to fit flagpole, for casting into concrete foundation.

   1. Provide flashing collar of same material and finish as flagpole.

2.3 FITTINGS

A. Finial Ball: Manufacturer's standard flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.

   1. 6-inch spun aluminum.

B. External Halyard: Equal to Morgan Francis #10 Polypro Halyard & Chrome Plated Swivel Snap.

2.4 MISCELLANEOUS MATERIALS

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107.

B. Drainage Material: Crushed stone or crushed or uncrushed gravel; coarse aggregate.

C. Sand: ASTM C 33, fine aggregate.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

A. Natural Satin Finish: AA-M32, fine, directional, medium satin polish; buff complying with AA-M20; seal aluminum surfaces with clear, hard-coat wax.

2.7 FLAGPOLE INSTALLATION

A. General: Install flagpoles were shown and according to Shop Drawings and manufacturer's written instructions.

B. Ground Set: Place foundation tube center, and brace to prevent displacement during concreting. Place concrete. Plumb and level foundation tube and allow concrete to cure. Install flagpole, plumb, in foundation tube.

1. Foundation Tube: Place tube seated on bottom plate between steel centering wedges and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch layer of elastomeric joint sealant and cover with flashing collar.

C. Baseplate: Cast anchor bolts in concrete foundation. Install baseplate on washers placed over leveling nuts on anchor bolts and adjust until flagpole is plumb. After flagpole is plumb, tighten retaining nuts and fill space under baseplate solidly with nonshrink, nonmetallic grout. Finish exposed grout surfaces smooth and slope 45 degrees away from edges of baseplate.

D. Mounting Brackets and Bases: Anchor brackets and bases securely through to structural support with fasteners as indicated on Shop Drawings.

END OF SECTION 107500

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SECTION 123200

MANUFACTURED CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A . Section Includes:

1. Cabinet units.
2. Countertops.
3. Hardware.
4. Factory integrated components.
5. Site integrated components.

1.2 DEFINITIONS

A . Factory Integrated Components: Materials or components specified in other sections for factory assembly within manufactured casework.

B . Site Integrated Components: Materials or components specified in other sections for site assembly within manufactured casework.

1.3 ADMINISTRATIVE REQUIREMENTS

A . Preinstallation Meeting: Convene before starting installation work

1. Attendees: Owner's representative, Architect, Contractor, and all Subcontractors interfacing with manufactured casework.
2. Review preparation, sequencing, and installation procedures of the manufactured casework to coordinate the work of this section with other impacted sections.

1.4 SUBMITTALS

A . Submit the following in accordance with submittal procedures.

B . Submittals must be reviewed and approved by the Contractor before sending to the Architect for review.

C . Sample: Submit two samples for verification of selected finish as scheduled upon request unless noted otherwise. All wood veneer and non-standard custom finishes must be reviewed and approved by the Architect.

1. Anodized: 3 x 6 inch (76mm x 153mm) on metal.
2. Chroma Coat:
    a. Standard Color: 2 x 2 inch (51mm x 51mm) paint chip.
    b. Custom Color: 4 x 6 (102mm x 153mm) inch on MDF.
3. Powder Coat: 2 x 4 inch (51mm x 102mm) on metal.
4. Glass: 4 x 4 inch (102mm x 102mm).
5. Thermofoil: As provided by thermofoil manufacturer.
6. Willow Glass:
    a. Standard Color: 4 x 4 inch (102mm x 102mm) on MDF.
    b. Custom Color: 8 x 8 inch (203mm x 203mm) on MDF.
    c. Graphics: 12 x 12 inch (305mm x 305mm) on MDF.
7. Wood Veneer: [4 x 4 inch (102mm x 102mm)] [8 x 8 inch (203mm x 203mm)] on MDF.

D . Product Data: Provide manufacturers standard tech sheets applicable to the project for hardware, accessories and integrated components.

E . Pre-Manufacture Submittal: Provide the following information to the manufacturer prior to development of shop drawings.

1. Field measurements of existing construction, future construction, finished width and height of walls and associated components, as well as design team provided plans, elevations, and schedules.
    a. Where field measurements are not possible, hold-to and control dimensions must be coordinated and agreed upon by all parties who interface with the manufactured casework through the Shop Drawing process before manufacturing begins.
2. Casework and Countertops: Include finishes, dimensions and layouts.
3. Factory Integrated Components: Provide make, model, size, configuration, materials and any additional pertinent product data for factory assembly.
4. Site Integrated Components: Provide make, model, size, configuration and any additional pertinent product data for site installation.

F . Shop Drawings: Submit shop drawings for review prior to commencing any fabrication of the manufactured casework. Coordinate as required until scope is confirmed by all affected stakeholders. Include manufacturer provided plans, elevations, isometric drawings, connection and attachment methods, and finish schedule.

1. Prior to shop drawing submittal review the drawings for obvious drafting and detailing errors.
2. Indicate finishes, component profiles, dimensions of individual components, mounting types, hardware and accessories.
3. Indicate locations of integrated components.

G . Manufacturer's Installation Instructions: Indicate any special preparation of base building conditions, installation and attachment methods.

H . Operation and Maintenance Data: Provide maintenance data for incorporation into operation and maintenance manuals.

I . Warranty Documentation: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

A . Qualifications:

1. Manufacturer Qualifications: Company specializing in the manufacture of work specified in this section, of the quality and complexity required for this project for a minimum 9 years. Show production facilities capable of meeting contract requirements for single-source responsibilities and warranty.
2. Installer Qualifications: Company specializing in performing the work of this section with minimum of 2 years of experience.

B . Source Limitations: Obtain products specified herein from a single source.

1.6 DELIVERY, STORAGE, AND HANDLING

A . Do not deliver or install manufactured casework until spaces are enclosed and weather-tight, wet work is complete and dry, work above ceilings is substantially complete, and HVAC system is operational and able to maintain ambient temperature and humidity conditions between 60 and 90 degrees Fahrenheit (15.5 and 32.2 Celsius) with Relative Humidity maintained between 25 and 60 percent.

B . Do not allow packaging to get wet or develop condensation.

C . Store in a clean, dry, secure area to protect from damage. Minimize or eliminate storage prior to install by coordinating delivery with construction schedule.

D . Comply with the manufacturer’s requirements for a warrantable installation of the installed products to meet the Performance and Design Criteria.

1.7 WARRANTY

A . Manufacturer Warranty: Provide 10 year warranty on manufactured casework for failures in materials or workmanship as indicated by the manufacturer standard warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A . Specification is based on products listed below by DIRTT Environmental Solutions.

2.2 DESCRIPTION

A . Custom designed, frameless casework and countertops made of manufacturers standard core materials and factory applied finishes including associated accessories, hardware and integrated components.

2.3 PERFORMANCE AND DESIGN CRITERIA

A . Provide manufactured casework that is factory finished on all surfaces.

B . Provide cabinet units including base cabinets capable of being wall hung to provide a clear open space between the bottom of the cabinet unit and the finished floor.

2.4 CABINET UNITS

A . Configurations and Dimensions: As indicated on Drawings.

B . Cabinet Sides, Door and Drawer Fronts: Thickness 3/4 inch (19 mm).

1. Core Material: No Added Formaldehyde Medium Density Fiberboard Core (NAF MDF).

C . Drawer Bodies: Thickness 5/8 inch (16 mm).

1. Core Material: No Added Formaldehyde Particle Core.
2. Low profile drawer features:
    a. Manufacturers standard metal sides painted [white] [black].

D . Edges: Unless noted otherwise, Self-Edge to match specified finish with minimal visible seaming.

E . Finish Materials: Manufacturer shall provide the following standard options. See Finish Schedule below for additional information.

1. Chroma Coat (PNT-#): Water based paint sprayed onto substrate.

2. Thermofoil (THRM-#): 3D laminate film vacuum formed to substrate.
3. Wood Veneer (VEN-#): Natural and reconstituted wood adhered to substrate.
4. Doors and Drawers Features:
    a. Aluminum Framed Glass: [Clear Anodized] [Bronze] [Powder Coat per finish schedule below]
    b. Tempered glass (GLS-#): Architectural flat glass per ASTM C1048, Kind FT (fully tempered), Condition A (uncoated), Type 1, Class 1 (transparent), Quality q3.
        1 Thickness: [1/8 inch (4mm)] [1/4 inch (6mm)]
    c. Willow Glass (WGLS-#): Corning® ultra-thin glass laminated to substrate on door and drawer fronts only. All other panel surfaces shall be manufacturers standard paint.
        1 Paint Color: TBD Determined by Architect

F . Interior and non-visible finishes: Type based upon exterior visible finish.
1. Manufacturer's standard Low Pressure Laminate (LPL) at Thermofoil panels.
    a. Color: TBD Determined by Architect
2. Chroma Coat on all sides and edges at Chroma Coat panels.
3. Wood veneer on all sides and edges at wood veneer panels.
4. Drawers: Manufacturer's standard LPL.
    a. Color: TBD Determined by Architect

G . Toe Kick: Manufacturer standard un-finished plywood base frame with integrated leveling hardware for floor mounted base cabinet units.
1. Material: Manufacturer standard plywood.
2. Thickness: 3/4 inch (19 mm).
3. Height: As indicated on drawings.
    a. Minimum: 2-1/2 inch (64mm).
    b. Maximum: 9 inch (229mm).
4. Finish: [Raw/Unfinished] [Mechanically fastened MDF with finish indicated on drawings]

2.5 COUNTERTOPS

A . Finish Materials: Manufacturer shall provide the following standard options. See Finish Schedule below for additional information.

B . Plastic Laminate Countertops: High pressure decorative laminate sheet bonded to substrate.

1. Specification is based on [Wilsonart] laminate.
2. Core Material: Medium Density Fiberboard Core (MDF).
    a. Thickness: [1 inch (25mm)] [1-1/4 inch (32mm)].
3. Performance Criteria:
    a. Laminate sheet, Unless Otherwise Noted: NEMA LD 3 Grade HGS, 0.048 inch (HGS, 1.2mm) nominal thickness.
    b. Surface burning characteristics: Flame Spread 25, maximum; smoke developed 450, maximum; when tested in accordance with ASTM E84.
4. Edges: Unless noted otherwise, Self-Edge to match specified finish with minimal visible seaming.
5. Back and End Splashes: Same construction and finish material.
    a. Profile: Square top.
    b. Height: Minimum 4 inch (102mm).
    c. Thickness: 3/4 inch (19mm).
6. Interior and non-visible finishes: Manufacturer’s standard wood fiber veneer unless otherwise indicated on Shop Drawings.
    a. Color: TBD Determined by Architect

2.6 HARDWARE

A . General: All manufactured casework hardware located as indicated by shop drawings.

B . Door Hinges:

1. Type: Manufacturer standard 107 degree full overlay.
    a. Features: [Free swing] [Self closing].

C . Drawer and Door Pulls:

1. Bow Pull: Manufacturer standard
    a. Length: [4-9/16 inch (115mm)] [6 inch (153mm)] [7-1/2 inch (190mm)] [8-3/4 inch (221mm)] [12-3/4 inch (324mm)] [15-1/2 inch (394mm)]
    b. Finish: TBD Determined by Architect
2. Rod Pull: Manufacturer standard

a. Length: [6-1/8 inch (156mm)] [6-15/16 inch (176mm)] [8-3/16 inch (208mm)] [10-11/16 inch (272mm)]

b. Finish: TBD Determined by Architect

3. Tab Pull:

a. Manufacturer and Part #: Schenk 1051-4ALU

b. Size: [1-3/4 inch (44.45mm)] [3 inch (76.2mm)] [6 inch (152.4mm) [9 inch (228.6mm)]

c. Finish: [Satin Aluminum] [Powder Coat per finish schedule below]

D . Drawer Slides:

1. Type: Slide for LPL Drawer Box.

a. Manufacturer and Model #: Tandem 560H

b. Weight Capacity: Rated for 66 lbs (30kg).

c. Features:

1 Undermount.

2 Full extension.

3 Self-close, stay closed.

d. Finish: TBD Determined by Architect

2. Type: Slide for low profile drawer box.

a. Manufacturer standard formed metal rail.

b. Weight Capacity: Rated for 100 lbs (45.36kg).

c. Features:

1 Undermount.

2 Full extension.

3 Self-close, stay closed.

E . Locks:

1. Type: Keyed

a. Manufacturer Standard

2. Type: Keyless

a. Manufacturer and Part #: StealthLock SL-100

b. Features: Concealed, Programmable, RF Remote Controlled

2.7 ACCESSORIES

A . All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.

B . Integrated recessed LED luminaire:

1. Wiring: Manufacturer provided cable with NEMA 1-15P (non-polarized) 45° low profile plug for every 19 continuous linear feet (5.79m) of luminaire.
2. Driver/Power Supply: One 12V constant, 0-40W “Power Pack” for every 19 continuous linear feet (5.79m).
3. Color Temperature: [Warm (3000K)] [Cool (4000K)].
4. Switch Type: [Touchless Sensor] [Push Button] [Door Sensor] [Wall Switch provided in accordance with Division 26 requirements].

C . File Bars: Manufacturers standard integrated aluminum flat bar hanging file rail.

1. Orientation: [Left to Right] [Front to Back]
2. Paper Size: [Letter, 8-1/2 x 11 inches (216 x 279mm)] [Legal, 8-1/2 x 14 inches (216 x 356 mm).
3. Finish: Manufacturers standard “Shimmer” color powder coat. See finish schedule below.

D . Grommet: Manufacturers standard plastic grommet for cabling.

1. Color: Black.
2. Diameter: 3 inch (76mm).

E . Waste Bin: Manufacturers standard metal container with plastic lid.

1. Finish: Manufacturers standard white

2.8 FABRICATION

A . Cabinet Units:

1. Cabinet units shall be factory assembled with concealed fasteners at panel to panel connections.
2. Cabinet units shall have no raw unfinished surfaces and all surfaces shall be factory finished.

B . Countertops:

1. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
2. Join lengths of tops using best method recommended by manufacturer.

3. Fabricate fronts and ends of cabinets with a minimum 1/2 inch overhang except where top butts against cabinet or wall.
4. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
5. Finish all visible and non-visible surfaces with manufacturer standard finishes suitable for the application of the countertop.
6. Wall-Mounted Counters: Provide skirts, aprons, brackets, and braces as indicated on drawings, finished to match.
7. Solid Surfacing: Fabricate up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

C . Back or Side Splash: Provide back or side splash wherever counter edge abuts vertical surface unless otherwise indicated.

1. Secure to countertop with concealed fasteners and secure finish surfaces with a waterproof glue.
2. Height: 4 inches, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A . Verify existing conditions meet the manufacturer's requirements before starting work.

B . Examine all adjoining work including work by others.

C . Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A . Prepare surfaces to receive work in accordance with manufacturer's instructions.

B . Locations to receive manufactured casework shall be inspected for compliance with manufacturers requirements.

C . Field conditions and pre-existing installations by others which may adversely affect installation or exceed the manufacturers limitations shall be corrected before installing manufactured casework.

3.3 INSTALLATION

A . General: Install all materials in accordance with manufacturer's instructions based on conditions present and pre-installation meeting.

B . Install toe kicks in locations as indicated by drawings and adjust levelers in preparation of base cabinet units.

C . Install base cabinet units on top of manufacturer provided toe kicks per shop drawings.

D . Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

E . Seal joint between back or side splashes and vertical surfaces.

F . Manufacturer provided drawer pulls ship mounted to inside of cabinet unit. Installer to remove and install in final position per shop drawings.

3.4 TOLERANCES

A . Variation From Horizontal, cabinet units and countertops: 1/8 inch in 10 feet, maximum.

B . Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.

C . Field Joints: 1/8 inch wide, maximum

3.5 ADJUSTING

A . Adjust and lubricate hardware for proper operation in accordance with manufacturer’s instructions.

3.6 CLEANING

A . Dispose of all waste material and project's Waste Management Plan.

B . Upon completion of installation clean finishes in accordance with the manufacturer’s instructions. Avoid alkaline or abrasive agents. Avoid scratching or marring finishes.

3.7 PROTECTION

A . Protect installed work as required by the manufacturer to maintain product performance, design criteria, warranty, and to avoid scratching or marring of finishes.

3.8 FINISH SCHEDULE

A . (ANO-1) Anodized:

1. Type: Manufacturer Standard AAMA 611, AAM12C22A31, Class I
2. Color: Clear.

B . (PNT-#) Chroma Coat Paint:

1. Type: [Manufacturer Standard] [Color Match].
2. Manufacturer: [DIRTT] [insert manufacturer].
3. Grade: [1] [2].
4. Color Name: [insert color and/or number].
5. Notes: [insert items like, Doors/ Accent Color/ Custom Graphics].

C . (THRM-#) Thermofoil:

1. Type: Manufacturer Standard
2. Grade: [1] [2] [3] [4] [7]
3. Color Name: [insert color and/or number].
4. Grain Direction: [Vertical] [Horizontal]
5. Notes: [insert items like, Doors/ Accent Color/ Field Color/ Micro-Perforated].

D . (PWD-#): Powder Coat

1. Type: [Manufacturer Standard] [Color Match].
2. Grade: [1] [2] [3].
3. Texture: [Smooth] [Metallic] [Textured]
4. Color Manufacturer: [DIRTT] [insert manufacturer].
5. Color Name: [insert color and/or number].
6. Notes: [insert items like, Door Frames/ Drawer Tab Pulls].

E . (VEN-#) Wood Veneer:

1. Type: [Natural] [Reconstituted].
2. Grade: [1] [2] [3] [4].
3. Species: [insert wood veneer species].
4. Sheen: [Low] [Satin]
5. Stain Finish: [insert finish].
6. Grain Direction: [Vertical, Flat] [Horizontal, Quarter].

7. Notes: [insert any unique or special instructions].

F . (GLS-#) Glass:

1. Type: Tempered
2. Color/Finish: [Manufacturer Standard Clear] [Manufacturer Standard Starphire] [Manufacturer Standard Etched] [Manufacturer Standard Back Painted] [Back Painted Color Match].
3. Thickness: [1/8 inch (4mm)] [1/4 inch (6mm)]
4. Color Manufacturer: [DIRTT] [insert manufacturer].
5. Color/Finish Name: [insert color and/or number].
6. Notes: [insert items like, Upper Cabinets Only/ Custom Graphics].

G . (WGLS-#) Willow Glass by Corning:

1. Type: [Manufacturers Standard Graphic] [Manufacturers Standard Solid Color] [Custom Graphic] [Custom Solid Color].
2. Pattern: [insert pattern name]
3. Color: [insert color name]
4. Notes: [insert items like, Custom Graphics].

H . (CRN-#) Solid Surface:

1. Mounting: [Center Mounted] [Face Mounted].
2. Finish: CRN-#.
3. Notes: [insert items like, Custom laser cut graphics/ Accent Wall].

END OF SECTION

SECTION 123450 - CASEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 1 - Specification sections, apply to work of this section.

1.2 SUMMARY

A. The Contractor shall refer to the Contract Documents for the locations of casework to be installed on this project. The Contractor shall furnish and install all fixed casework, accessories, components, fillers and other related items. Additionally, the Contractor shall provide and install all locks for cabinet doors and drawers (if applicable) from the cabinet manufacturer. Unless specified on the elevations and details all countertops and backsplashes shall be plastic laminate.

1.3 SUBMITTALS

A. Product Data:

1. In addition to the requirements of the general conditions as it relates to prior approvals, submittals of manufacturer's data, installation instructions, and samples are required upon architect's request.

B. Samples:

1. Submit samples of casework manufacturer’s standard decorative laminate colors, patterns, and textures for exposed and semi-exposed materials for the Architect’s approval. The cabinet manufacturer shall also submit samples of other materials or hardware as requested by the Architect.

2. Architect may request representative full-size samples for evaluation prior to approval. Samples may be impounded by architect/owner until completion of project to ensure compliance with specifications. Casework Manufacturer will deliver and pick-up full-size sample if requested at no additional cost to the Owner.

3. Submit copy of Seismic testing report.

C. Shop Drawings:

1. The Contractor shall submit production drawings for all casework systems and countertops and required equipment, ends, cross-sections, face modular values, service run spaces and location of services

2. The shop drawings shall include layout of units with relation to surrounding walls, doors, windows, and other building components.

3. The Contractor shall coordinate production drawings with other work involved.

D. Mockups:

1. Approved products specified in this section shall be included in interior assembly mockup and shall comply with Specification Section 01400 – "Quality Requirements". The Contractor shall provide full-size units for use in construction of mockup as indicated on Drawings. Approved mockup shall become the standard for appearance and workmanship for project.

2. Mockups shall not remain as part of the completed Work. At Architect's direction, demolish mockups and remove debris.

1.4 QUALITY ASSURANCE

1. Source Limitations: Obtain all casework, countertops, and accessories from single source manufacturer.

2. Pre-Installation Conference: The Contractor shall have a Pre-Installation Conference with the Architect and Casework Manufacturer to ensure that the areas to receive casework are ready for installation.

3. All manufactured casework shall be pre-engineered and cataloged in a nationally published catalog. Manufacturers submitting for approval must provide printed catalog information documenting this performance feature; no exceptions will be allowed. The Casework Manufacturer shall also assure with this required documentation the physical and dimensional integrity of the system and the Owner's ability to have ready access to additional system components for a minimum of (10) ten years after the completion of this contract.

4. All manufacturers herein listed, shall show evidence of a minimum of five (5) years experience in providing manufactured casework systems for similar types of projects.

5. Manufacturer shall produce evidence of adequate facilities and personnel required to perform on this project. Financial stability of manufacturer shall be evidenced by readily providing a material performance bond if required.

6. The casework manufacturer must provide the following test results as tested by an independent testing firm 10 days prior to bid date (no exceptions): All proposed casework shall meet these minimums.

Racking Test (must exceed 975 lbs.)
Front Joint Load Test (must exceed 635lbs.)
Uniform Load Shelf Test (must exceed 1140 lbs.)
Isolated Shelf Clip Load Test (must exceed 640 lbs.)
Static Load Test (must exceed 1800 lbs with no cabinet failure)
Draw Side Joint Test (must exceed 425 lbs.)
Draw Front Joint Test (must exceed 925lbs.)

7. The Casework Manufacturer (10) ten days prior to bidding shall provide the Architect independent laboratory testing documentation that the supports rail and interfacing components when tested in strict accordance with the requirements of seismic construction codes, all components. It should meet or exceed the requirements as set forth by the codes.

8. The owner requires the following minimal depths for the plastic laminate cabinets to allow certain items needing to be stored to fit completely inside the cabinets. These measurements shall be determined from the inside back of the cabinet, to the front side edge of the cabinet.

   All 13" deep open cabinets & 14" deep door cabinets shall have a 12-1/2" inside clear dimension.

   All 15" deep open cabinets & 16" deep door cabinets shall have a 14-1/2" inside clear
   All 17" deep open cabinets & 18" deep door cabinets shall have a 16-1/2" inside clear dimension.

   All 23" deep open cabinets & 24" deep door cabinets shall have a 23-1/2" inside clear dimension.

   All 28" deep open cabinets & 29" deep door cabinets shall have a 27- 1/2" inside clear dimension.

   All drawer depths shall be two inches or less from the back of the cabinet.

   All bidders must provide documentation to the Architect stating their casework follows these requirements ten (10) days prior to the bid date.

9. The Architect reserves the right to randomly select one 36" wide base cabinet and one 36" wide wall cabinet and one 36" wide tall cabinet during installation and cut apart to determine if the product installed meets the written specification. The casework manufacturer shall include the price to replace these units in his bid. If the product fails to meet the specification, then the casework supplier shall be responsible to make all necessary corrections.

1.5 DELIVERY, STORAGE, AND HANDLING

1. Deliver the casework to the project site, wrapped, boxed or crated to provide optimum protection during transit and project site storage.

2. All casework shall be delivered at the proper time for installation that will not interfere with other trades operating in the building.

3. The Contractor shall ensure that if casework is stored on the project site prior to installation that all protective measures are taken to ensure that the casework is not damaged. If damage occurs, then the repair or replacement (the greater of the two)

shall be the sole cost of the Contractor not the Owner. Do not store on project site until all wet operations are complete.

4. Store completed casework and countertops in a ventilated place, protected from the weather, with relative humidity range of 20% to 50%.

1.6 JOB CONDITIONS

A. Humidity and Temperature Controls:

Before the delivery and installation of casework and equipment, building conditions shall be as follows:

1. The building shall be secure and weather tight, with windows and doors installed, heat and air conditioning systems functional.

2. Walls and openings shall be plumb, straight and square. Concrete floors shall be level within acceptable trade tolerances. Specifically, the floor must be within 1/8" of level per 10-foot run, non-accumulative, when tested with a straight edge in any one direction. The Contractor is responsible for the accurate fit of project site conditions. The Casework Manufacturer will be required to field verify project conditions with the Contractor. Any defects which may influence satisfactory completion of the casework systems shall be corrected by the Contractor. Any conditions not reported to the Contractor prior to installation which would cause unsatisfactory completion or performance shall become the cost of both Contractor and Casework Manufacturer to correct the condition.

3. Flooring required to be placed under casework and equipment must be installed.

4. Wood or metal blocking (wall grounds) shall be installed within partitions prior to delivery of casework and furnishings to allow for immediate installation on delivery.

5. General Contractor shall have heat and air conditioning systems operational providing consistent temperature and humidity conditions as required. Related humidity must be maintained at not less than 25%, nor more than 55%. Temperatures must not range lower than 65 degrees F, not to exceed 80 degrees F in areas of material installation.

6. All overhead mechanical, electrical or plumbing rough-in work shall be complete.

7. Any “wet” operation performed by other trades must be complete prior to delivery.

8. Ceiling grids (with or without ceiling tiles), overhead soffits, duct work and lighting shall be installed.

9. Painting shall be complete.

10. The Contractor shall provide a secure storage area within the building that is clean, dry well ventilated, and protected from direct sunlight and broom clean and comply with Subsection 1.5, Item 3 of this section.

1.7 COORDINATION

1. Coordination of the installation of all casework, countertops, and accessories shall be done directly with the Contractor and the Casework Manufacturer. All items need to be delivered to the project site in time for installation and to meet the Contractor's construction schedule.

2. The Casework Manufacturer shall coordinate with the Contractor on any and all appliances that are specified to be installed in conjunction with the casework specified.

3. The Casework Manufacturer shall coordinate with the Contractor on furnishing, installing, and connecting all service supply lines and conduits within equipment and casework and all final connections.

4. The Casework Manufacturer shall coordinate with the Contractor on installing all utility service outlet accessory fittings and fixtures furnished by the casework specified in this section and shown on the Contract Drawings. This includes pulling of wire and connecting of electrical fixtures in service lines, provision of ground fault protection for circuits requiring such.

5. The Casework Manufacturer shall coordinate with the Contractor for the installation of all base moulding to be installed where casework is to be installed.

6. The Casework Manufacturer shall coordinate with the Contractor on the installation of sinks and service fixtures, service and waste lines and all connections, vents, electrical service fixtures, hoods and ducting within or adjacent to casework, or otherwise required in all areas.

7. The Casework Manufacturer shall coordinate with the Contractor on furnishing, installing, and connecting all traps, tailpieces, backflow prevention devices and special plumbing fittings and piping of unusual nature to meet local codes even though not specifically called for in the specifications or shown on the Contract Drawings.

8. The Casework Manufacturer shall coordinate furnishing and installing of all framing, bucks, metal grounds or reinforcements in walls, floors, ceilings to adequately support and anchor the casework and related equipment.

9. The Casework Manufacturer shall coordinate furnishing and installing all rigid or flexible conduit, wire, pulling of wire, fittings, special electrical equipment, data and accessories including boxes, and receptacles.

PART 2 – PRODUCTS

2.1 MANUFACTURERS – Stevens (Basis of Design)

A. Subject to compliance with the requirements, the Contractor shall provide the casework, countertops, and casework accessories to be equal to the basis of design.

1. TMI Systems Design Corporation

2. LSI

3. Case Systems

B. The manufacturers approved if these manufacturers meet all of the requirements of this specification and submitting all documents required prior to bidding to the Architect. If there are any deviations from this specification, they shall list all deviations to the Architect (10) ten days prior to bidding.

1. Any additional Casework Manufacturers that comply with the specification section must have submitted written documentation to the Architect (10) ten days prior to the bid date as an approved equal. All approved equals with be released in an addendum from the Architect.

C. Substitutions:

1. It is the intent of this specification to establish performance and quality criteria consistent with pre-established standards of design and function herein described. Casework systems not meeting these minimum standards will not be accepted.

2. Where specific materials finish options, construction details, modularity, hardware and test data are specified herein, the casework storage system will be held in strict compliance. Substitutions will be considered prior to bid date provided request is submitted to the Architect, in writing, no later than ten (10) days prior to bid date; substitution request shall list any and all deviations from this specification. Requests later than ten (10) days prior to bid will not be considered. Acceptable substitutions will be identified in future addenda.

3. All manufacturers must submit the following items to the Architect (10) ten days prior to bid date to be qualified to bid: Final approvals will be listed per addendum

A. Copy of Manufacturer’s Warranty

B. ADA Brochure depicting ADA requirements and compliance.

C. A copy of Independent Casework Testing showing the proposed casework meets or exceeds the testing set forth in Paragraph 1.4; Quality Assurance; Item No. 6 of this specification.

D. A letter and test data stating and showing the proposed casework meets or exceeds the required minimum cabinet depths in Paragraph 1.4; Quality Assurance; Item No. 8.

E. All required independent test reports.

F. A sample base cabinet of fixed base cabinet with required hardware. A sample wall cabinet of fixed wall cabinet with required hardware.

G. A sample of the actual specified required top support bracket and the rail mounted support bracket. No approvals will be issued until these actual samples are delivered to the Architect at least (10) ten days prior to bid date. The Architect will keep the bracket samples of the successful bidder to verify those furnished at the job site meet those approved prior to bidding.

H. A detailed deviation list addressing where the requested product deviates from the requirements of the specified product.

I. Complete written specifications and catalogs of each manufacturer with items requested for approval marked and indicated.

2.2 MATERIALS

A. Core Materials:

1. Particleboard up to 7/8-inch-thick: Industrial Grade average 47-pound density particleboard, ANSI A 208.1-1993, M-3.

2. Particleboard 1 inch thick and thicker: Industrial Grade average 47-pound density particleboard, ANSI A 208.1-1993, M-2.

3. MR Moisture Resistant Particleboard: Average 47-pound density particleboard, ANSI A 208.1 1-1993, M-3.

4. Medium Density Fiberboard: Average 47-pound density grade, ANSI A 208.2.

5. Grade AB Plywood

B. Hardboard:

1. 1/4-inch-thick prefinished hardboard, CS-251.

C. Decorative Laminates:

1. High-pressure decorative laminate VGS (.028), NEMA Test LD 3-1995. for vertical surfaces.

2. High-pressure decorative laminate HGS (.048), NEMA Test LD 3-1995 for horizontal surfaces.

3. High-pressure decorative laminate HGP (.039), NEMA Test LD 3-1995 for post formed tops.

4. High-pressure cabinet liner CLS (.020), NEMA Test LD 3-1995.where required for balance construction of closed cabinets and herein specified.

5. High-pressure backer BKH (.048), (.039), (.028), NEMA Test LD3-1995. where required for balance construction of closed cabinets.

6. Thermally fused melamine laminate, NEMA Test LD 3-1995 where required for open and closed cabinet interiors to create balance construction.

7. Laminate Color Selection: Maximum 1 color per unit face and 5 colors per project.

D. Edging Materials:

A. 3 mm PVC banding, where required and herein specified. All of the cabinet doors, drawers, and shelf edges shall be edged with 1mm PVC.

2.3 SPECIALTY ITEMS

A. Metal Parts:

1. Countertop support brackets, under-counter support frames, legs and miscellaneous metal parts shall be furniture steel, welded, degreased, cleaned, treated and epoxy powder painted. Color shall be selected by the Architect from these three-color offerings: Dove Grey, Frosty White, or Light Beige.

2. Side panels, back, top, drawer fronts, and doors shall be of 3/4-inch-thick particleboard, laminated on the exterior with high pressure decorative laminate GP28 and on the interior with high pressure cabinet liner CL20 in dove grey, frosty white or light beige. Cabinet liner color to be selected by the Architect. All exposed edges shall be finished with machine applied PVC banding 1mm thickness, Casework Manufacturer shall submit available color for PVC binding to the Architect for selection.

B. Hinges:

1. Furnish five knuckle, epoxy powder coated, institutional grade, 2-3/4-inch overlay type with hospital tip.0.095 inch thick. ANSI-BHMA standard A156.9, Grade 1.

    A. Doors 48 inch and over in height shall have 3 hinges per door.

    B. Provide a magnetic door catch with maximum 5-pound pull provided, attached with screws and slotted for adjustment.

C. Pulls:

1. Door and drawer front pulls shall be epoxy powder coated metal wire style, 96mm spacing on screws. Pull design shall comply with the Americans with Disability Act (ADA)

D. Drawer Slides:

1. Regular, knee space and pencil slides shall be 100-pound load rated epoxy coated steel, bottom corner mounted with smooth and quiet nylon rollers and have a positive stop both directions with self-closing feature. Paper storage units shall have 150-pound load rated epoxy coated steel slides.

2. File: Full extension, shall have 150-pound load rated epoxy coated steel, bottom corner mounted with smooth and quiet nylon rollers and have positive stop both directions with self-closing feature.

E. Adjustable Shelf Supports:

1. Injection molded transparent polycarbonate friction shall fit into cabinet end panels and vertical dividers, adjustable on 32mm centers. Each shelf support shall have 2 integral support pins, 5mm diameter, to interface pre-drilled holes, and to prevent accidental rotation of support. The support shall automatically adapt to 3/4 inch or 1-inch thick shelving and provide a non-tip feature for shelving. Supports may be field fixed if desired. Structural load to 1200 pounds (300 pounds per support) without failure.

F. Locks:

1. Shall be National #M49054, removable core, disc tumbler, cam style lock with strike. Furnish 2 keys. Lock for sliding 3/4-inch doors shall be a disc type plunger lock, sliding door type with strike. Lock for sliding glass/acrylic doors shall be a ratchet type sliding showcase lock.

2. Automatic door bolt shall be Hafele #530-1604, used to secure inactive door on all locked cabinets.

G. Coat Rods:

1. Shall be 1-inch diameter, 14-gauge chrome plated steel installed in captive mounting hardware.

H. Closet rods & closet Shelves:

1. Closet rods shall be 1-inch diameter plated steel. The shelves shall be 3/4-inch Melamine covered plywood with 1 mm PVC edging all four sides.

I. File Suspension System:

1. Shall be extruded plastic file suspension rails. File followers, or other split bottom hardware, will not be acceptable. Provide one file suspension system for every required file drawer.

J. Mirrors: To be 1/4-inch-thick polished mirror plate.

2.4 FABRICATION:

A. Fabricate casework, countertops and related products to dimensions, profiles, and details shown.

B. Cabinet Body Construction:

1. Tops and bottoms are glued and doweled to cabinet sides and internal cabinet components such as fixed horizontals, rails and verticals. Minimum 6 dowels each joint for 24-inch-deep cabinets and a minimum of 4 dowels each joint for 12-inch-deep cabinets.

A. Tops, bottoms, and sides of all cabinets are 3/4-inch-thick particleboard core.

2. Cabinet backs: 1/4-inch-thick pre-finished hardboard. Wall and tall cabinets are provided with a 1-inch x 1-3/4-inch PVC mounting strip used to secure the cabinet to the wall.

A. Exposed back on fixed or movable cabinets: 3/4-inch particleboard with the exterior surface finished in VGS laminate as selected.

B. Flexible rail mounted cabinet backs: 3/4-inch-thick particleboard structurally doweled into cabinet sides and top panels.

3. Fixed base and tall units have an individual factory-applied base, constructed of 3/4-inch exterior grade plywood. Base is 96mm (nominal 4 inch) high unless otherwise indicated on the drawing.

4. Base units, except sink base units: Full sub-top. Sink base units are provided with open top, a welded steel/epoxy painted sink rail full width at top front edge concealed behind face rail/doors, a split back removable access panel.

5. Side panels and vertical dividers shall receive adjustable shelf hardware at 32mm line boring centers. Mount door hinges, drawer slides and pull-out shelves in the line boring for consistent alignment.

6. Exposed and semi exposed edges

   A. Edging: 1mm PVC

7. Adjustable shelf core: one-inch-thick particleboard for all shelves

   A. Front edge: 1mm PVC.

8. Interior finish, units with open Interiors:

   A. Top, bottom, sides, horizontal and vertical members, and adjustable shelving faces with thermally fused melamine laminate with matching prefinished back.

9. Interior finish, units with closed Interiors:

   A. Top, bottom, sides, horizontal and vertical members, and adjustable shelving faces with thermally fused melamine laminate with matching prefinished back.

10. Exposed ends:

    A. Faced with VGS high-pressure decorative laminate.

11. Wall unit bottom:

    A. Faced with thermally fused melamine laminate.

12. Wall and tall unit tops:

    A. Top surface is faced with thermally fused melamine laminate.

13. Balanced construction of all laminated panels is mandatory. Unfinished core stock surfaces, even on concealed surfaces (excluding edges), not permitted.

C. Drawers:

1. Sides, back and sub front: Minimum 1/2-inch-thick particleboard, laminated with thermally fused melamine doweled and glued into sides. Top edge banded with 1mm PVC.

2. Drawer bottom: Minimum 1/2-inch-thick particleboard laminated with thermally fused melamine, screwed directly to the bottom edges of drawer box.

3. Paper storage drawers: Minimum 3/4-inch-thick particleboard sides, back, and sub front laminated with thermally fused melamine. Minimum 1/2inch thick particleboard drawer bottoms screwed directly to the bottom edges of the drawer box. Provide PVC angle retaining bar at the rear of the drawer.

D. Door/Drawer Fronts:

1. Core: 3/4-inch-thick particleboard.

2. Provide double doors in opening in excess of 24 inches wide.

3. Faces:

A. Exterior: VGS High-pressure decorative laminate.

B. Interior: High-pressure cabinet liner CLS.

4. Door/drawer edges: 1mm PVC, external edges and outside corners machine profiled to 1/8-inch radius.

5. Miscellaneous Shelving:

A. Core material: 3/4 inch or 1-inch particleboard.

B. Exterior: VGS High-pressure decorative laminate.

C. Edges: 1mm PVC, external edges and outside corners machine profiled to inch radius

2.5 COUNTERTOPS: See Section 064200 Solid Surface Countertops.

2.6 COLOR SELECTION:

A. Laminate Color Selection: Exteriors

1. The Architect shall select from the full range of Wilsonart® stock color charts for cabinet faces, exposed ends, open interiors, and countertops.

B. Hinge and Pull Color Selection:

1. The Architect shall select from the Casework Manufacturer's choice of stock colors.

C. Miscellaneous Hardware Color Selection (support brackets, table frames, rail):

1. The Architect shall select from the Casework Manufacturer's choice of stock colors.

D. 1mm PVC Edge Banding Color Selection:

1. The Architect shall select from the Casework Manufacturer's 1mm PVC stock colors or a color matching Wilson-Art Stock VGS laminates, if available.

E. The interior cabinet material color for all cabinets shall be selected by the Architect. The Architect shall have the option to pick ONE open interior cabinet color for this entire project to match ONE exterior color choice of the surrounding cabinets on the entire project.

2.7 WARRANTY

A. All plastic laminate casework and all other products of manufacturers herein specified in this specification section and the manufacturers supplying products, shall guarantee to replace or repair, at no expense to the owner, all materials and workmanship of this contract found to be defective within one (1) year of acceptance, due to defective materials and/or workmanship.

PART 3- EXECUTION

3.1 SCOPE OF WORK

A. The Casework Manufacturer shall install all casework, countertops, casework accessories and quartz windowsills under the direction of the Contractor, in a manner satisfactory to the Architect, and the job turned over to the Owner with all casework installed and ready to be used.

3.2 EXAMINATION

A. Verify that each space is ready for the installation of the casework specified and previous measured field measurements are in compliance with what has been manufactured and ordered for installation.

B. The Casework Manufacturer shall examine the job site and the conditions under which the work under this section is to be performed and notify the Contractor in writing of unsatisfactory conditions. Do not proceed with work under this Section until satisfactory conditions have been corrected in a manner acceptable to the Casework Manufacturer.

3.3 PREPARATION

A. The Casework Manufacturer and the Contractor shall condition casework to average prevailing humidity conditions installation areas prior to installing.

3.4 METHOD OF INSTALLATION

A. Erect casework, plumb, level, true and straight with no distortions. Shim as required. Where laminate clad casework abuts other finished work, scribe and cut to accurate fit.

B. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind.

C. Repair minor damage per plastic laminate manufacturer's recommendations. Replace other damaged cabinets or materials.

3.5 ADJUST AND CLEAN

A. Remove all miscellaneous debris from the work premises.

B. Leave cabinets broom clean inside and out. Wipe off fingerprints, pencil marks, and surface soil etc., in preparation for final cleaning by the Contractor.

C. Test all doors, drawers, and miscellaneous equipment under normal conditions.

END OF SECTION

SECTION 131200 PRE-ENGINEERED METAL BUILDINGS (P.E.M.B.)

PART 1 GENERAL

RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 1 - Specification sections, apply to work of this section.

1.1 SUMMARY

A. Pre-engineered buildings, extent as shown on drawings.

B. Building Type: The pre-engineered buildings shown is a one story, single span, rigid frame type metal building of the nominal length, width, eave height and roof pitch indicated. Exterior walls are metal siding.

C. Manufacturer's standard components may be used, provided components, accessories, and complete structure conform to architectural design appearance shown and to specified requirements.

D. Pre-engineered metal building manufacturer shall provide anchor bolt setting plan. Anchor bolts shall be supplied by the General Contractor.

E. Sealants and caulking are specified in Section 07900.

1.2 RELATED SECTIONS

A. Section 05500 - Metal Fabrications.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's product information, specifications and installation instructions for building components and accessories.

B. Shop Drawings: Submit approval drawings prior to building manufacturing. Submit complete erection drawings showing anchor bolt settings, sidewall, endwall, and roof framing; transverse cross sections, covering and trim details, and accessory installation details to clearly indicate proper assembly of building components. Clearly identify all wall openings & details/ Design all opening structural requirements.

C. Certification: Submit written certification prepared and signed by a Professional Engineer, registered to practice in the State of Alabama, verifying that building design meets indicated loading requirements and codes of authorities having jurisdiction.

1.4 QUALITY ASSURANCE

A. Design Criteria:

1. Structural Framing: Design primary and secondary structural members and exterior

covering materials for applicable loads and combinations of loads in accordance with the Metal Building Manufacturer Association's (MBNA) "Design Practices Manual", and IBC 2015.

2. Structural Steel: For design of structural steel members, comply with requirements of the American Institute of Steel Construction's (AISC) "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings" for design requirements and allowable stresses.

3. Light Gage Steel: for design of light gage steel members, comply with requirements of the American Iron and Steel Institute's (AISI) "Specification for the Design of Cold Formed Steel Structural Members" and "Design of Light Gage Steel Diaphragms" for design requirements and allowable stresses.

4. Welded Connections: Comply with requirements of the American Welding Society's (AWS) "Standard Code for Arc and Gas Welding in Building Construction" for welding procedures.

B. Design Loads: Basic design loads are indicated on the drawings, but must meet 2015 I.B.C.

1. Basic design loads include live load, wind load and up-lift, in addition to the dead load.

2. Collateral loads include additional dead loads over and above the weight of the metal building system, such as finished ceilings, light fixtures, conduits, ductwork, piping, etc.

3. Design each member to withstand stresses resulting from combinations of loads that produce the maximum allowable stresses in that member as prescribed in MBMA's "Design Practices Manual" and IBC 2006.

C. Manufacturer's Qualifications: Provide pre-engineered metal buildings as produced by a manufacturer with not less than five (5) years successful experience in the fabrication of pre-engineered metal buildings of the type and quality required. Manufacturer shall have a registered Structural Engineer on staff; full time Engineer must be registered in the State of Alabama.

D. Erector's Qualifications: Pre-engineered metal building shall be erected by a firm that has not less than five (5) years successful experience in the erection of pre-engineered buildings similar to those required for this project, and that has been licensed by the manufacturer of the building system.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver and store prefabricated components, sheets, panels and other manufactured items so they will not be damaged or deformed.

B. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weather tight ventilated covering. Store materials so that water accumulations will drain freely.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. The following manufacturer's products have been used to establish minimum standards for materials, workmanship and function:

1.	Mesco Building Solutions	7.	Gulf States
2.	Inland Buildings	8.	Dean Steel Building
3.	Nucor Building Systems	9.	Global Steel Industries
4.	Frontier Steel Buildings Corp.	10.	American Buildings
5.	Bigbee Steel Building	11.	CECO
6.	Kirby Building Systems	12.	Reeds Metals

B. Equal products of other manufacturers may be used in the work in accordance with Section 01600.

2.2 MATERIALS

A. Metals:

1. Hot-rolled Structural Shapes: Comply with requirements of ASTM A36 or A529.

2. Tubing or Pipe: Comply with requirements of ASTM A500, Grade B, ASTM A501 or A53.

3. Members Fabricated by Plate or Bar Stock: Provide 42,000 psi minimum yield strength. Comply with requirements of ASTM A529, A570 or A572.

4. Members Fabricated by Cold Forming: Comply with requirements of ASTM A607, Grade 50.

5. Galvanized Steel Sheet: Comply with requirements of ASTM A446 with G90 coating. "Class" to suit building manufacturer's standards.

6. Bolts for Structural Framing: comply with requirements of ASTM A307 or A325 as necessary for design loads and connection details.

7. Panels:
   a. Roof Panels: See Section 074200

2.3 STRUCTURAL FRAMING

A. Rigid Frames shall be fabricated from hot-rolled structural steel. Provide built-up "I-beam" shape type rigid frames consisting of parallel flange beams and straight columns. Provide frames

factory welded and shop painted. Furnish frames complete with attachment plates, bearing plates and splice members. Factory drill frames for bolted field assembly.

1. Provide length of span and spacing of frames indicated.

B. Wind Bracing: Provide adjustable bracing using threaded steel rods or steel cable sufficient to meet or exceed wind loading requirements; comply with requirements of ASTM A36 or A572, Grade D. Bracing shall remain in place until framing is complete.

C. Secondary Framing:

1. Provide not less than 16 gage shop painted rolled formed sections for the following secondary framing members:

a. Purlins

b. Flange bracing

c. Sag bracing

d. Wall Opening Framing & Bracing

2. Provide not less than 14 gage cold-formed galvanized steel sections for the following secondary framing members:

a. Base channels

b. Sill angles

c. Purlin spacers

d. Eave struts

D. Bolts: Provide zinc-plated or cadmium-plated bolts.

E. Shop Painting: Clean surfaces to be primed of loose mill scale, rust, dirt, oil, grease, and other matter precluding paint bond. Follow procedures of SSPC-SP3 for power tool cleaning, SSPC-SP7 for brush-off blast cleaning, and SSPC-SPI for solvent cleaning.

1. Prime structural steel primary and secondary framing members with the manufacturer's standard lead-free, rust-inhibitive primer.

2. Prime galvanized members after phosphoric acid pretreatment with manufacturer's standard zinc dust/zinc oxide primer.

2.4 FABRICATION

A. General: Design prefabricated components and necessary field connections required for erection to permit easy assembly and disassembly. Fabricate components in such a manner that once assembled, they may be disassembled, repackaged and reassembled with a minimum amount of labor.

1. Clearly and legibly mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.

B. Structural Framing: Shop fabricated structural framing components to the indicated size and section complete with base plates, bearing plates and other plates required for erection, welded in place. Provide required holes for anchoring or connections either shop drilled or punched to template dimensions.

1. Shop Connections: Provide power riveted, bolted or welded shop connections.

2. Field Connections: Provide bolted field connections.

PART 3 - EXECUTION

3.1 ERECTION

A. Framing: Erect structural framing true to line, level and plumb, rigid and secure. Level base plates to t true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use a non-shrinking grout to obtain uniform bearing and to maintain a level base line elevation. Moist cure grout for not less than seven (7) days after placement.

B. Purlins and Girts: Provide rake or gable purlins with tight fitting closure channels and fascias. Secure purlins and girts to structural framing and hold rigidly to a straight line by sag rods.

C. Bracing: Provide diagonal rod or angle bracing in roof as recommended by building manufacturer.

D. Framed Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical or electrical work. Securely attach to building structural frame.

END OF SECTION 131200

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SECTION 15010 - GENERAL MECHANICAL PROVISIONS

PART 1. GENERAL

1.1. **General Requirements:** Carefully and completely read all the specifications, review all plans and all related construction documents. Pay particular attention to submittal requirements and note the ramifications of providing incomplete or incorrectly formatted and submitted submittals.

No consideration will be given after bid opening for alleged misunderstanding regarding the specifications, plans, utility connections, permits, fees, etc...

Division One is applicable in full hereto. Where the words, "provide", "furnish", "include" or "install" are used in the specifications and on the Drawings, it shall mean to furnish, install, and test, complete and ready for operation as specified and required.

No materials or products that contain asbestos, formaldehyde, polychlorinated biphenyl (PCB), lead or mercury, in excess of limits mandated and defined by OSHA, LEED and the EPA, shall be utilized.

Manufacturers not named in the specifications require prior approval. Follow procedures set forth in Division 1 of the specifications. All prior approvals shall be submitted through the Architect. Where substitutions are proposed, unless the Contractor states in writing, on a separate recap/summary sheet in the front of the respective submittal, the differences of the substituted equipment or material, he shall be responsible to replace such items any time discrepancies are found.

Where conflicts occur between a Code, Standard or Listing and the contract drawings or contract specifications, the most stringent requirements shall govern and be applied.

The Architect and Engineer shall interpret the meaning of the drawings and specifications and will reject all work and materials, which in their judgment, is not in full accordance therewith.

1.2. **Spare Parts:** Manufacturer of any equipment specified shall have a wholesale outlet for readily available replacement parts in the nearest major USA city.

1.3. **Codes and Standards and Listings:** Unless specified otherwise, comply with all current editions of all referenced publications within these specifications and all current editions of applicable NFPA, ASME, OSHA, IBC, ASHRAE, ASTM, ASME, ANSI, SMACNA, Americans with Disabilities Act (ADA), 2010 ADA Standards for Accessible Design, with Local Building Codes, Mechanical Codes, Gas Codes, Plumbing Codes, ANSI/ASHRAE/IESNA Standard 90.1 (2013), International Energy Conservation Code (IECC), International Fuel Gas Code (IFGC), International Fire Code (IFC), Americans with Disability Act Accessibility Guidelines (ADA) and with all applicable local ordinances and codes. Equipment

shall bear Underwriters Laboratories Inc. (UL) listing label, Canadian Standards Association (CSA) listing label or ETL approved rating. All electrical components and products shall also comply with the respective Code of Federal Regulations (CFR).

Where conflicts occur between a Code, Standard or Listing and the contract drawings or contract specifications, the most stringent requirements shall govern and be applied. Advisory provisions listed in all Codes referenced in the Contract Documents are mandatory and the word "should" shall be interpreted as "shall".

1.4. **Permits:** Provide all permits, pay all fees and arrange for inspections as required by all applicable Governing Authorities. Furnish certificates of all inspections and approvals from all Governing Authorities to the Architect. Include certificates of all inspections and approvals from all Governing Authorities in the Plumbing, Fire Protection and HVAC closeout documents. Provide additional materials, parts, methods, etc. and modify the work as required by Governing Authorities' Inspections and Regulations. Correct all deficiencies required by Code officials at no additional cost to the Owner or the Owner's Project Design Professionals.

The Plumbing Contractor, as applicable, shall arrange and pay for the State of Alabama Boiler and Pressure Vessel Safety Division inspector to visit job site to inspect water heater installation and obtain written approval and certification as required. Correct all deficiencies required by the Inspector without additional cost to the Owner or the Owner's Project Design Professionals, using materials and methods, as directed by, the State of Alabama Boiler and Pressure Vessel Safety Division Inspector.

1.5. **Site Visits:** It is the contractor's responsibility to have the job ready for site visits when they are scheduled. If the project is not ready for the requested site visit and the Architect, any governmental agency or any other entity requires a re-inspection with the Engineer present, the contractor shall pay Zgouvas, Eiring & Associates a re-inspection fee of $750. The payment shall be made directly to Zgouvas, Eiring & Associates 5 days prior to the scheduled re-inspection.

The Contractor is urged to carefully review the extensive requirements of Paragraph "Identification" in this Section 15010 of the specifications and note that certain identification is required to be completed before certain site visits. There are specific identification requirements prior to the above ceiling and final site visits, respectively, that are mandatory. Failure to comply with this provision will be cause for cancellation of the site visit, and a fee imposed for the additional site visit, with all costs of the additional site visit to be borne by the respective Contractor responsible.

1.6. **Drawings and Specifications:** The Architect and Engineer shall interpret the meaning of the drawings and specifications and will reject all work and materials, which in their judgment, is not in full accordance therewith. Where doubt arises as to the meaning of the plans and specifications, obtain the Architect's decision, in writing, before proceeding with parts affected; otherwise assume liability for damage to other work and for making necessary corrections to work in question.

All drawings are diagrammatic and are intended to quantify the materials specified

and indicate their intended relationship to each other. The drawings and specifications are complementary, and work shown, but not specified, or specified, but not shown, shall be the same as though required by both.

The Contractor shall carefully examine the contract documents during the bidding phase. Any missing information in the contract documents that is required for obtaining accurate pricing shall be brought to the attention of the Architect, **prior to bid date**, so all may be clarified and/or corrected. Failure to identify and resolve the issues prior to bid shall require the Contractor to provide said items, complete, without additional cost to the Owner or the Owner's Project Design Professionals, using materials and methods specified by, and as directed by, the Owner's Design Professionals.

The Contractor shall carefully investigate the conditions that would affect the work to be performed and shall arrange such work as necessary to comply with the intent of the construction documents.

DO NOT SCALE the Plumbing, Fire Protection and HVAC drawings. In the interest of clearness, the work is not always shown to scale or exact location. Refer to Architectural drawings for dimensions and verify scale shown on the drawings. The various scales used on the drawings do not allow for all fittings, offsets and accessories that may be required to complete the work. Check all measurements, location of pipe, all required and specified appurtenances for duct and piping, ducts, and equipment with the architectural and electrical drawings, and lay out work to fit in with ceiling grids, lighting, and other parts. All wiring, piping, ductwork, etc., shall be concealed unless specifically specified otherwise. Adjust in the field as required to provide the optimum result to facilitate ease of service, efficient operation, and best appearance.

1.7. **Conflicts, Coordination and Changes:** If interferences or conflicts occur, the Architect shall decide which equipment shall be relocated regardless of which was first installed. In the interest of avoiding such conflicts, each Sub-Contractor who is using common space, etc., shall coordinate his work with all other trades and other parts of his own work. If, during this coordination, it is discovered that necessary or desirable changes should be made, advise the Architect, and secure his decision in writing. Do not fabricate any duct nor install any pipe until all coordination has been accomplished.

Coordinate location of all Division 15 work with Division 16. Do not run piping, ductwork and similar Division 15 work in NEC dedicated service areas for electrical equipment, including above panel boards, starters, communication panels, control panels, telephone backboards, data panels and similar electrical elements.

1.8. **Coordination Drawings:** Follow procedures set forth in Division 1. Before starting work, submit for approval, coordination shop drawings showing proposed arrangement of equipment, all piping, ducts, floor drains, power requirements, and controls. As a minimum, submit detail layouts of potential conflicts at plumbing risers, equipment rooms, limited ceiling space, etc. Refer to subsequent Sections for additional specific requirements.

Coordinate with submission of shop drawings and refer questionable locations to

Architect/Engineer for resolution prior to installation. Failure to coordinate all items, and correct non-conforming installed work, shall be provided at no additional cost to the Owner or the Owner's Project Design Professionals.

Failure to submit shop drawings will make the Contractor responsible for changes required to facilitate installation of, and the proper operation of, all systems at no additional cost to the Owner or the Owner's Project Design Professionals.

1.9. **Maintenance, Replacement and Service Access:** Locate equipment as shown on the plans. The Contractor shall install equipment, valves, piping, etc. with the maintenance, service and replacement access required by the Manufacturer of the respective installed item. All items shall be installed to provide maximum safety, service, replacement, and maintenance access.

All piping with valves, any equipment, and any other items that may require maintenance, service or replacement, shall be located no more than 12" above the finished ceiling and no more than 14'-0" above finish floor in areas without ceilings, to ensure proper access.

Coordinate all questionable access or location of items that may present a problem, if installed as specified above, with the Engineer or the Architect's field representative prior to installing any item; else, relocation will be at the Contractor's expense once discovered.

1.10. **Warranty:** Refer to Division 1. Additionally, guarantee in writing to make good without cost any defects in materials and workmanship for one year following the date of substantial completion of the project as determined by the Architect. Provide free maintenance and service during the guarantee period.

All air conditioning equipment compressors, chiller compressors and other refrigerant based compressors shall be provided with a minimum of five (5) years warranty. Refer to other Division 15 Sections for additional warranty requirements.

1.11. **Submittal Data:** Within 25 days after award of the contract, submit for approval a **complete** schedule of material and equipment proposed. Variations from the specifications must be explicitly indicated in the submittal; otherwise, it will be assumed the product will conform to the specifications in all respects. Include catalog data, scheduled capacities, fan curves, sound data, etc. **Partial or incomplete submittals will be held without review until the entire submittal package from the respective Contractor has been submitted.**

All submittals shall be separately bound in pdf format. Submittals shall be electronically indexed and tabbed. Refer to the Architectural General Conditions and Division 1 for the format required by the Architect.

A cover sheet shall be provided in the front of the submittal package which states, as a minimum, the Project name and location, the name of the Owner, the Architectural firm, the Engineering firm, the Engineer's Project number located in the Engineer's logo on the plans, the General Contractor, the Mechanical Contractor and each Contractors' point of contact, with phone number. A recap/summary sheet shall be inserted at the beginning of each tabbed section to summarize the contents of each

respective tabbed section. The recap/summary sheet shall include any items that have been changed or removed due to Project cost constraints, addendums, or Value Engineering (VE). **Failure to include items changed or removed due to Project cost constraints, addendums or VE items that require an additional review by the Engineer will require the Contractor to reimburse the Engineer a minimum of $500 for time involved to review the corrected submittal.**

Submittals shall include materials used, methods of installation, product manufacturer, equipment capacities, etc. HVAC equipment items shall follow the identical tabular format, category by category, nomenclature, etc., as shown on the HVAC equipment schedules. As a minimum, the recap/summary sheet shall indicate the submitted values compared to each of the specified values. **Failure to provide the submittals in the format specified will be cause for automatic rejection without review.** Plumbing and Fire Protection submittals shall follow the identical procedure specified for the Mechanical Contractor.

The General Contractor shall review and approve all submittals prior to submitting them to the Architect. **Submittals without the General Contractor's approval will be rejected without review.**

1.12. **Submittal Rejection and Resubmittal:** The Contractor shall carefully review the submittal data requirements specified above. Pay attention to specific items within the specifications that are cause for immediate rejection when submittals are not provided to the Engineer as specified. Any submittal or portions thereof that are rejected TWICE and resubmitted a third, fourth, etc. time for review will require the Contractor to reimburse the Engineer each time for his effort. The minimum fee for each review is $500.

1.13. **Site and Existing Conditions:** Bidders shall visit the site and become acquainted with all job conditions. Report to the Architect, prior to bid, any conditions that are required to accomplish the installation of all systems. Provide for required adjustments to complete the intent of the work. No consideration will be given after bid opening for alleged misunderstanding regarding job conditions, utility connections, permits, fees, etc.

1.14. **Line Locators:** Before proceeding with excavating or trenching, arrange with the Owner, all utility companies, and line locating firm(s) to describe and mark all the systems which might be damaged by construction operations.

1.15. **Phasing:** Interrupt existing services only at times approved by the Architect and the Owner. The General Contractor shall provide a written request to the Architect and the Owner for permission to interrupt services to the facility. The request shall be provided a minimum of seven (7) days prior to the desired date of the interruption. Hold interruptions to a minimum in duration and frequency.

1.16. **Contractor Requested Electronic Drawing Files:** Drawing files may be provided if requested by the Contractor. If desired, the Contractor may obtain CAD files from the Engineer for a fee of $100 per sheet. Prior to obtaining the files from the Engineer, the Contractor will be required to sign a letter of agreement pertaining to the use of the electronic files and the Contractor's responsibilities for the use of those electronic files. The ACAD files will be provided to the Contractor "As Is". The Contractor is

responsible for providing and showing all changes to the drawings that are different from the original contract drawings, including but not limited to addendums, change-orders, VE items, RFI's, etc. Request for drawing files shall be made directly to the Engineer.

1.18. **Record Documents:** Provide in such detail, as is set forth under General and Supplemental Conditions.

Keep an accurate record of changes made during construction. The respective Contractor shall take as-built measurements, including all depths, prior to commencement of backfilling operations. It will not be sufficient to check off line locations. Definite measurements shall be taken for each service line. The location of buried piping shall be shown on the drawings and dimensioned from fixed points.

The Plumbing Contractor shall take as-built measurements, including all depths, inverts, etc., prior to commencement of backfilling operations. It shall not be sufficient to check offline locations. Definite measurements shall be taken for each line entering and leaving the facility. The location of buried piping shall be shown on the record drawings and dimensioned from fixed points. Additionally, the Plumbing Contractor shall indicate the location of all cleanouts and dielectric unions on record/as-built drawings.

The respective Contractor shall complete the Record Documents, using the As-Built Drawings from the General Contractor's construction site office. Transfer these changes to a set of reproducible copies of original drawings that the Architect will sell to Contractor at printing cost. The drawings will be provided to the Contractor "As Is". The final drawing set within the Record Documents shall be labeled "Record Documents" in the Title Block and shall not include "clouds" or other indications of the changes during the project process. The Contractor shall provide hard copies and an electronic set of all documented modifications to the contract documents.

The Contractor is responsible for providing and showing all changes to the drawings that are different from the original contract drawings, including but not limited to addendums, change-orders, VE items, RFI's, test reports, field observations/site visit reports, etc. Hard copy plans may be a set of reproducible copies of the final corrected contract drawings. When work is completed, submit corrected reproducible drawings to the Architect for record and include copies in the Owner's Operating and Maintenance Manual.

Record documents shall also be provided in PDF digital format on CD-R type CD(s). Include a CD of the documents in the Owner's Operating and Maintenance Manual.

PART 2. WORK RELATED TO OTHER TRADES

2.1. **Foundations and Supports:** The Plumbing, Fire Protection and Mechanical Contractor, as applicable, shall provide foundations, supports, etc. not specified under other Divisions, and as required to mount all items in a safe, professional and structurally sound manner. The respective Contractor shall provide all supplemental steel between various types of structural members, including between bar joists, purloins, wood trusses, miscellaneous structural items, etc. as required for the item(s)

proper support. All supports and related components and assemblies shall be sized for minimum of 300% (3 times) the anticipated load carried by the respective item. Where the Contractor has doubt as to proper supporting requirements, he shall consult with, and seek the guidance of, the Architect and the project Structural Engineer. Consult all contract documents pertaining to other trades to determine extent of their work.

Concrete pads for outside equipment are specified under other Sections. Concrete work shall meet requirements of Division 3. Respective Contractor shall provide all concrete pads not indicated or specified on the Architectural, Civil or Structural plans. Refer to the various equipment specifications for requirements in the absence of requirements by the various disciplines and provide as specified.

2.2. **Pipe Sleeves:** Refer to Section 15700 for ductwork sleeves. Do not route control wiring through sleeves in partitions containing piping. All control wiring penetrating any exterior wall, interior partition, floor, and similar construction shall be in conduit. See HVAC Controls in Section 15700 for conduit requirements.

Only one pipe is allowed within each sleeve. Do not route multiple pipes through a singular pipe sleeve. Fit all pipes passing through walls, partitions, and floors (except slabs on grade construction) with sleeves. Sleeves shall be built-in as work progresses. Sleeves in existing construction shall be core drilled and firmly grouted in place.

All floor sleeves, except slab on grade, shall be cast-in-place Schedule 40 steel pipe. Floor sleeves shall terminate 2" above finish floor or housekeeping pad as applicable, and flush on the bottom side of the concrete foundation.

All penetrations made in the field shall be core drilled large enough to allow all sleeves and pipe insulation to continue uninterrupted, and to provide proper firestopping of the penetration. A firestopping assembly shall be provided for **all** penetrations as specified below in Part "Miscellaneous Requirements", Paragraph "Firestopping".

Sleeves for any piping passing through interior walls or partitions shall be 16 gage galvanized steel, 1/2" larger in diameter than pipe or piping covering and shall extend a minimum of 2" on each side of the interior partition and firestopped. **Do not route multiple pipes through a singular pipe sleeve.** See plan details for additional requirements. A firestopping assembly shall be provided for **all** penetrations as specified below in Part "Miscellaneous Requirements", Paragraph "Firestopping".

Sleeves for piping passing through exterior walls or exterior partitions shall be Schedule 40 PVC pipe, 1" larger in diameter than piping and piping covering, neatly sawed off flush with the exterior wall, sealed water tight and vermin proof and exposed edge painted to match building, unless specified otherwise. **Spray foam is NOT an approved sealant.** Refrigerant piping suction and liquid lines routed through a singular pipe sleeve in an exterior wall is acceptable only in this circumstance.

Any pipe that passes through a below grade foundation wall shall be provided with a relieving arch, or a pipe sleeve pipe cast in place into the foundation wall. The sleeve

shall be two pipe sizes greater than the pipe passing through the wall. Example: A 6" uninsulated pipe shall require an 8" sleeve.

Piping installed through a foundation wall shall be structurally protected from any transferred loading from the foundation wall. The annular space between pipe and sleeve shall be filled with backing material and sealants in the joint between the pipe and concrete or masonry wall. Sealant selected for the earth side of the wall shall be compatible with damp proofing/waterproofing materials that are specified in Architectural section of the specifications to be applied over the joint sealant.

2.3. **Access Panels and Doors:** Do not locate serviceable items above inaccessible, hard ceilings without written approval from the Architect. Coordinate all items locations with the Architectural ceiling plans before installing any items. Furnish access panels and doors located in finished spaces to the General Contractor for installation for access to valves, controllers, actuators, motorized dampers, air vents, cleanouts, smoke detectors, fire dampers and any other items requiring maintenance access.

Doors/panels shall be suitable for wall or ceiling finish involved, 16" x 16" unless otherwise indicated, required or specified to permit removal of equipment and provide acceptable maintenance access.

Access panels and doors shall be fire rated where rated assemblies are penetrated. Access panels and doors for items located outdoors or in damp environments shall be weatherproof.

See specification section 15010, "Miscellaneous Requirements, Identification" for materials and methods required. Access panels and doors shall be as manufactured by Milcor, Philip Carey, Zurn, Mifab or other approved equivalent. The Architect must approve the use of, and type of, panels and doors to be installed in areas that are exposed to view or in finished areas. Exposed access panels and doors shall be factory cleaned and primed for painting in the field. Colors shall be as selected by the Architect. Refer to Architectural Section, Painting, for additional information.

Where device occurs above a lift-out acoustical ceiling panel, provide engraved plastic labels of type specified in "Miscellaneous Requirements, Identification" below.

In addition to identification of items above the ceiling, provide engraved plastic labels below the item, on the ceiling grid. Engraved plastic labels shall match ceiling grid color and be neatly glued to the ceiling grid adjacent to the ceiling tile that should be removed for access to the item. The label shall have engraved on it the item being identified and its designation as shown on the plans, valve chart, etc. Refer to Section "Identification" below for additional requirements.

2.4. **Cutting and Patching:** All openings shall be laid out. Furnish detailed layout shop drawings to other trades in advance of their work. Failure to furnish layout shop drawings to the General Contractor shall make the applicable Mechanical/Plumbing/Fire Protection Contractor responsible to rebuild openings as directed by the Architect. Where openings have not been laid out or built in, or they occur in existing partitions, floors, etc., they shall be core drilled or saw cut large enough to allow all penetrating items with or without insulation to continue

uninterrupted, with clearances specified.

Piping and duct within walls or behind walls shall be installed before wall is erected otherwise, walls, floors, ceilings, etc., affected shall be reworked by the trade which erected it at expense of the respective Contractor. Chasing and cutting of new work is not allowed without written permission from the Architect.

2.5. **Coatings and Finishes:** All damaged or rusted black steel pipe and, hangers or support assemblies shall be cleaned and painted with two coats of black enamel, rustproof paint. Include black steel pipe, uncoated cast iron pipe, hangers, brackets, etc. All paint and coatings shall have a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E84. Also, see specification section, "Identification" for additional requirements.

Painting of ducts, piping, piping insulation, grilles, diffusers, and other surfaces in finished areas is specified in Architectural Section "Painting" or similar section. Refer to those sections for requirements. If not specified in other sections, paint as directed by the Architect. Where the Architectural specifications require items to be painted, the Contractor shall furnish it with a Manufacturer provided, factory applied prime coat.

Where factory finished items are marred, scratched, or damaged, replace the item, or upon approval from the Architect or Owner, refinish or touch-up as required or specified to bring to a like new condition.

PART 3. EXCAVATION, TRENCHING & BACKFILLING

3.1. **Broken Pavement:** In public streets or on the project site, backfill and repair to satisfaction of authorities having jurisdiction and the Architect.

PART 4. PIPE HANGERS AND SUPPORTS

4.1. **General: Below requirements do not apply to refrigerant piping.** Refer to Section 15700, Refrigerant Piping and Accessories for refrigerant piping support requirements.

Provide factory fabricated galvanized pipe hangers and supports for all piping of type and properly sized bolts, washers, etc. as required for a complete and safely functioning installation. Material items, methods and general requirements not covered in this specification shall be provided in strict accordance with current edition of Manufacturer's Standardization Society Specification MSS SP-58 and Manufacturer's Published Product Information.

All hangers, supports and related components and assemblies shall be sized for minimum of 300% (3 times) the anticipated load carried by the respective item. Where the Contractor has doubt as to proper supporting requirements, he shall consult with, and seek the guidance of, the Architect and the project Structural Engineer.

4.2. **Coatings and Finishes:** All damaged or rusted black steel pipe and, hangers or support assemblies, shall be cleaned and painted with two coats of black enamel paint. Include black steel pipe, uncoated cast iron pipe, hangers, brackets, etc. All paint and coatings shall have a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E84. Also, see specification section, "Identification" for additional requirements.

4.3. **Spacing:** Install supports as required or specified to prevent sags, bends or vibration. Provide additional building supports and attachments where support is required or specified for additional concentrated loads, including valves, in-line pumps, flange guides, strainers, expansion joints and at all changes in direction of piping.

At no-hub pipe, support as specified below for cast iron piping.

In all cases, provide on all sides of, and within 6 inches of, all elbows, take-off fittings, joints, valves, any change in direction of item supported, at ends of branches over 5 feet long and on centers not exceeding the following:

Piping Material	Pipe Size	Maximum Spacing
Copper tubing	1 1/4" or less	6 ft. Horizontal 8 ft. Vertical
	1 1/2" or larger	8 ft. Horizontal 8 ft. Vertical
Steel pipe	All	6 ft. Horizontal 8 ft. Vertical
Cast Iron	All	4 ft. Horizontal 10 ft. Vertical

Where cast iron pipe is installed in 10ft. lengths, spacing may be increased to 8ft. In addition to specified cast iron support requirements, provide additional support for cast iron pipe within 6" of each fitting on all sides of the fitting.

Schedule 40 PVC	All	4 ft Horizontal 8 ft. Vertical

For Schedule 40 PVC pipe sizes 2" and smaller, a guide shall be installed midway between the specified or required vertical supports. Such guides shall prevent pipe movement in a direction perpendicular to the axis of the pipe.

4.4. **At Typical Single Suspended Horizontal Pipe:** Galvanized adjustable clevis or split-ring type equal to Elcen Fig. 12 or 10c. see other specifications and plan details for additional requirements. See part "Hanger Rods" below for limitations on use of clevis hangers.

Do not use clevis hangers for refrigerant piping. See refrigerant piping support requirements in Section 15700, Refrigerant Piping and Accessories.

4.5. **Roof Mounted Piping Supports:** Supports for pipe shall be MAPA Products A-Series Supports. Support shall be manufactured of extruded aluminum with an integrated industry standard strut designed to allow for a free-standing, non-penetration installation that can incorporate readily available strut accessories. Supports shall be 6, 8 10 or 12" length as required. Provide support with adhered isolation pads as required by the roofing manufacturer. Coordinate requirements with Architect's roofing specifications and provide as required.

4.6. **Anchorage and Sway Bracing:** Rigid support sway bracing and piping anchorage shall be provided for all drainage piping greater than 4 inches. Restraints shall be provided for drain pipes at all changes in direction and at all changes in diameter greater than two pipe sizes. Braces, blocks, rodding and other suitable methods as required by the coupling manufacturer shall be utilized. Sway bracing shall be Eaton/Cooper B-Line Tolco Steel Pipe Clamps for Sway Bracing, transitional fittings, bracing, etc. as required for a complete sway braced assembly.

The entire bracing assembly shall be selected and sized by the Manufacturer. Provide complete manufacturer approved shop drawing showing all required components layout showing locations of all items. All components of the finished assembly shall be of a single manufacturer, resulting in a UL listed and FM approved sway bracing assembly. Eaton/Cooper B-Line is basis of design. Equivalents by Anvil International, Rilco Manufacturing Co and Piping Technology and Products will be considered.

4.7. **Manifolds and Parallel Runs:** At his option, Contractor may provide a Unistrut system complete with standard fittings, clamps and accessories required. Pipes shall all be secured to each Unistrut hanger. Note that the assembly shall be provided with coatings or finishes specified hereinbefore. Refer to "Hanger Rods" below for locations that require a Unistrut assembly. Furnish for approval proposed system components. Regardless of system used, piping insulation shall be continuous and not cut away for installation of clamps, etc.

Unistrut assemblies shall also be provided for refrigerant piping. Refer to Section 15700, Refrigerant Piping and Accessories for additional requirements.

4.8. **Where in Contact with Copper Pipe:** Same as above except assembly shall be copper plated.

4.9. **Hanger Rods:** Shall be mild steel, threaded as required. Rods shall be selected as specified hereinbefore. Use not smaller than 3/8" rods for pipe 2" and under, 1/2" rods for pipes 2 1/2" through 4", 3/4" rods for 5" through 12" and 1" rods for piping over 12". Support rods with threaded Underwriters' listed inserts, expansion shields or beam clamps shall be all galvanized. Beam clamps shall be equal to Elcen Fig. 34 or 36 with rod and eye end.

At bar joists, support from bottom chord at panel points. For piping over 6" provide supplemental steel angle supports and welding to span 3 joists when running parallel to joists and welded angle between two panel points for piping running perpendicular to joists. Concrete inserts shall be equal to Grinnell Figure 282.

Wherever piping hanger support rods heights exceed 36" length from top of the

supported item to the structure above, Contractor shall provide a Unistrut support assembly and bracing of the assembly with minimum 1"x1"x1/4" angle iron or as required for the weight of the supported item, whichever is greater, and anchor to structure above to prevent swaying. Assembly shall be welded at connection to Unistrut and building structural assembly. Follow welding procedures set forth in the structural division of the specifications.

4.10. **Bracing:** Where hanger rods heights exceed 36", provide sway bracing as specified above in "Hanger Rods". Bracing shall be provided at each Unistrut assembly and attached to the building structural system.

4.11. **Approved Equivalents:** By Grinnell, Elcen, Stockham or Crane will be accepted.

PART 5. MISCELLANEOUS REQUIREMENTS

5.1. **Materials and Equipment:** New and of best quality in every respect. Pipe and fittings shall conform to the ASTM Standard designated for pipe of each material. Equipment shall bear Underwriters Laboratories Inc. (UL) listing label, Canadian Standards Association (CSA) listing label or ETL approved rating.

All electrical components and products shall also comply with the respective Code of Federal Regulations (CFR). All pressure vessels shall be constructed and tested in accordance with applicable ASME Codes and shall bear ASME stamps unless specified otherwise. Minimum pressure rating shall satisfy job conditions.

Where two or more units of the same class of equipment are required or specified, these units shall be products of a single manufacturer, however, the component parts of each unit need not be. No mix matching of equipment Manufacturers is allowed unless specified as such.

No materials or products that contain asbestos, formaldehyde, lead or mercury, in excess of limits mandated and defined by OSHA, LEED and the EPA, shall be utilized.

Where conflicts occur between a Code, Standard, Listing and the contract drawings or contract specifications, the most stringent requirements shall govern and be applied.

5.2. **Workmanship:** First class, premium and in accordance with best practice. Work shall be executed by experienced mechanics and shall present a neat and professional appearance. Exact location of pipe, duct, equipment, etc., shall be determined in field, considering work of other trades. Lines required to be sloped have right of way over those not required to be sloped. Lines whose elevations cannot be changed have right of way over lines whose elevations can be changed. Lines and equipment whose locations are dimensioned have precedence over lines and equipment not dimensioned. Except in unfinished areas and where specifically indicated on the drawings or approved in writing, ductwork, piping, conduit, wiring, and similar items shall be concealed in the construction.

Pipe shall be clean, cut clean, properly reamed, threaded or soldered, erected plumb

and secure. Make changes in pipe size with reducing fittings without the use of bushings. Install all items in accordance with manufacturer's recommendations. Absolute coordination is required with the other Contractors on the project before proceeding with installation of any system or item.

At all stages of installation, protect pipe openings, fixtures, ductwork, condenser coils and equipment against the entrance of foreign materials and from damage by the elements, mortar, paint, etc. Plugs of rags, wool, cotton, waste or similar materials are not acceptable.

If air moving equipment must be used during construction, temporary filtration media with a Minimum Efficiency Reporting Value (MERV) of 11, as determined by ASHRAE 52.2, current edition, and shall be installed at each return air grille, return air register, exhaust grille, exhaust register, and unit return air inlet. ALL open portions of ductwork and equipment shall be covered with a self-adhesive film (not Visqueen) or airtight sheet metal caps to prevent the intrusion of contaminates.

All equipment openings, duct taps, duct take-offs, etc., shall be protected immediately after the tap, take-off, etc. has been fabricated in the field. In effect, there shall be no ductwork opening or equipment opening that is exposed to the ambient air. The material shall be a minimum of 3 mils thick and have a minimum tensile strength of 10 psi. It shall be waterproof and recyclable. Material shall be DuroDyne Dyn-O-Wrap or approved equivalent.

Where bare sheet metal is delivered unassembled to the job site, all ductwork shall be covered and protected with Visqueen. After fabricating the duct in the field, the interior bare metal shall be wiped clean with a clean damp cloth before erection in the field. After erection, duct shall be protected as specified above. Any ductwork discovered to be unprotected as specified is subject to immediate rejection for use on this project.

5.3. **Testing Documentation:** Throughout the Division 15 specifications, there are various tests required and specified. Provide the Architect written certification and results of all tests specified, including those indicating failure. The absence of written testing certification and results will be considered the same as if testing was never done. Include all testing documentation in the Operating and Maintenance Manuals.

5.4. **Factory Finishes:** Furnish to the Architect, color cards for standard and premium colors available. The Architect shall select color where choices exist. Provide Manufacturer’s standard color where color choices are not available. Coordinate all color selections with appropriate Architectural specification sections.

5.5. **Expansion:** Provide for expansion and contraction of all piping, ductwork, etc. and make proper provisions so that excessive strain will not occur on piping, ductwork or other parts. Provide flexible connections for all piping and ductwork at all building expansion joints.

5.6. **Safety Provisions:** Provide covers or guards on all hot, moving and projecting items that could be construed as a hazard to occupants of the building or to service personnel.

5.7. **Cleaning and Adjusting:** Upon completion of work, clear all drains, traps, fixtures, ducts and pipe. Adjust all valves, remove rubbish and leave work in clean and excellent operating condition. Install final permanent type filters only after cleaning of building is completed.

5.8. **Escutcheons:** Where pipes pass through floors, walls and ceilings of finished rooms provide pressed chrome-plated brass or stainless steel plates securely fastened in place. Pack penetrations with insulation or firestopping compound as specified. Caulk pipe openings behind escutcheons to prevent passage of smoke and make vermin proof.

5.9. **Identification:** **All above ceiling identification specified, including firestopping identification, shall be completed prior to the above ceiling site visit. All remaining identification shall be completed prior to the final site visit.**

Failure to comply with this provision will be cause for cancellation of the site visit, and a fee imposed for the additional site visit, with all costs of the additional site visit to be borne by the respective Contractor responsible.

All identification shall follow nomenclature used on the plans.

All equipment, smoke detectors, fire dampers, filter access locations, access panels, access doors, motor starters, disconnects, thermostats, humidistats, sensors, valves, control systems components, control switches, and related devices shall be equipped with engraved laminated plastic nameplates, as described below. Filter access locations' identification shall include the size and number of filters required for that specific piece of equipment.

Permanently affixed warning labels shall be attached to all equipment, on a highly visible location on the equipment, which can be automatically started. The warning label shall read as follows: ***"CAUTION!! This equipment is operating under automatic control and may start or stop at any time without warning. Switch disconnect switch to "OFF" position before servicing or attempting to work on equipment."***

Permanently affixed warning labels shall be attached to all motor starters and all control panels which are connected to multiple power sources utilizing separate disconnect switches. The warning labels shall read as follows: ***"This equipment is fed from more than one power source with separate disconnects. Disconnect all power sources before servicing or working on this item."***

Access openings/panels/doors to fire dampers shall be permanently identified on the exterior of the access panel and on the ceiling grid below by a label having letters not less than 3/4" in height and reading: ***"FIRE DAMPER – DO NOT OBSTRUCT ACCESS. "***

Identify all access openings/panels/doors to indicate item for which access is provided. Ex. Motorized damper, smoke detector, filters, valves, etc. Additionally, add the following to each access identifier: "ACCESS - DO NOT BLOCK." Refer to Paragraph "Access Panels and Doors" above for additional requirements.

Labels shall be a minimum of 4" x 3" x 1/16" thick, laminated plastic labels (larger if needed) with 1" high x 1/4" stroke numerals and all capital letters to identify all equipment furnished under this Section. Labels attached to the ceiling grid shall be the same width as the ceiling grid it is attached. Properly adjust lettering height to fit within the smaller width label. Red with white lettering or white with red lettering as required for maximum contrast with color of the equipment. In finished areas where identification is attached to the ceiling grid, the Architect shall select colors of materials. Engrave equipment designation and numbers as shown on plan and drawings on upper half of tag, leaving lower half of tag for future engraving by Owner. Where equipment is typed (HP-A, HP-B, EF-A, etc.) rather than numbered (HP-1, HP-2, EF-1, etc.) the tag shall include the room number(s) of the area served. Room numbers shall be as designated by the Owner. In absence of Owner's room numbers, numbers shall be as indicated on the architectural plans. Each piece of equipment, item or device (in-line fan, VAV terminal, access door, fire damper, etc.) located above the ceiling shall be identified with an engraved laminated label, of the type specified above, and neatly glued to the ceiling tile grid below the item. Neatly attach identification with permanent adhesive.

Where the tag, label or marker occurs in a plenum (return air) space, the plastic employed shall carry a Class A Flame Spread Rating per ASTM E84 and shall meet ASTM D-635 (such as Westinghouse Micarta engraving stock). If plastic does not meet the Class A Flame Spread Rating per ASTM E84, provide custom laser engraved, 0.029" thickness, red, 316 Stainless Steel. Sizes, letter heights, etc., and colors shall be as specified for the laminated plastic labels specified hereinbefore.

Identify all piping, including refrigerant suction lines, refrigerant liquid lines, refrigerant hot gas reheat coil lines, condensate drainage piping located in concealed areas above ceilings and exposed to view in finished spaces (not mechanical rooms), water, fire sprinkler piping, jacket of all insulated pipe and all pipe exposed to view and/or accessible through removable ceilings, attics, access panels, etc., with Seton "Snap-Around" or Seton "Strap-Around" pipe line markers, Marking Services Inc (MSI) Series MS-970 or approved equivalent. Pipe labels shall be flat wrap-around markers that completely go around the pipe. The markers shall comply with IBC/IPC/IMC requirements and ANSI Standard A13.1, current edition. Sanitary vent piping above the ceiling and condensate drainage piping on the floor in mechanical rooms are not required to be identified.

Identification shall be visible from all sides of the piping, bear name of pipe contents and show direction of flow and in the case of gas/air systems, shall indicate pressure of the pipe contents. **"Stick-on" type markers are unacceptable.**

Install identification within 12" of all valves, flanges, fittings, elbows, change in piping direction, both sides of floor and wall penetrations, at each branch take-off and along all runs of pipe, and not further apart than 15 feet on straight runs of piping.

Gas piping identification shall be provided as specified above except intervals shall be a maximum of 5 feet for straight runs of piping. Piping with gas pressure exceeding 6" W.C. shall be provided with metal wrap around tags equal to GasTite EMPT-1-100, indicate direction of flow and pressure of piping contents and placed at intervals and locations specified.

Provide piping identification over every space, including small areas (closets, storage rooms, etc.) above accessible ceilings. All piping identification shall be provided such that the Owner or maintenance personnel can remove any ceiling tile and visually identify any overhead piping with the specified identification markers. All piping systems piping identification shall comply with IBC/IPC/IMC requirements and ANSI Standard A13.1, current edition.

Exposed piping and jacket of insulated piping in finished spaces shall be painted with two coats of enamel paint, with color selected by the Architect.

All piping and jacket of insulated piping exposed to view in mechanical rooms, janitor/housekeeping and similar type spaces shall be painted with two coats of enamel paint in accordance with IBC/IPC/IMC requirements and ANSI Standard A13.1, current edition. After painting, identify with pipe markers as specified hereinbefore.

Painting of the jacket of the insulated piping is not required where a protective aluminum jacket is specified and provided. Refer to other parts of Sections 15400 and Section 15700 for piping requiring aluminum jacket.

Fit all Plumbing dielectric unions, all gas valves and plumbing valves (except equipment service valves and sprinkler valves) with a custom laser engraved brass valve tag at each valve and include in specified valve chart. Number tags in sequence, starting with number 1; prefix the number with "P" for plumbing items. Tag shall be 1-1/2 inches diameter, 18-gauge polished brass tags with 3/16-inch chain hole and 1/4-inch-high stamped, black-filled service designation. All gas valve identification shall indicate gas pressure.

In addition to valves identification specified, provide an engraved laminated label, of the type specified above, and glue to the ceiling tile grid below the valve for each valve concealed from view. Where there is more than one valve located within a span of eight (8) feet, above the ceiling, it is not necessary to provide multiple identifiers on the ceiling grid. It will be acceptable to place a single identifier on the ceiling grid reading as, "Valves". However, each valve above the ceiling is still required to have its own, individual valve tag and identified on the specified valve chart. Example: Over the toilets ceiling, there may be multiple shut-off valves to each individual fixture instead of a bank of fixtures. Where there are multiple valves for each fixture, the Contractor may attach a single identifier that states, "water valves", or similar description, on the ceiling grid. Each individual valve still requires its own engraved valve brass tag as originally specified. The intent is to NOT have multiple individual identifiers for each valve exposed to view on the ceiling grid and thereby creating an undesirable appearance.

Provide a valve chart framed under glass or plastic which shows the number and location of each valve and type of service. Locate a valve chart in each equipment room and each janitor closet. Permanently attach each chart to the wall as directed by the Architect. Include a copy of the valve chart in the Owner's Operation and Maintenance Manuals.

5.10. **<u>Refrigerant Piping Identification:</u> All refrigerant piping shall be identified**. The pipe identification shall be located at intervals not exceeding 15 feet on the

refrigerant piping or pipe insulation. Provide piping identification over every space, including small areas (closets, storage rooms, etc.) above accessible ceilings. All piping identification shall be provided such that the Owner or maintenance personnel can remove any ceiling tile and visually identify any overhead refrigerant piping with the specified identification markers. Minimum height of lettering of the identification label shall be 3/4".

The identification shall indicate the refrigerant designation and safety group classification of refrigerant used in the piping system. For Group A2, A3, B2 and B3 refrigerants, the identification shall also include the following statement: “DANGER - Risk of Fire or Explosion. Flammable Refrigerant.” For any Group B refrigerant, the identification shall also include the following statement: “DANGER - Toxic Refrigerant.”

5.11. **Firestopping:** Provide either factory built (Firestop Devices) or field erected (Through-Penetration Firestop Systems) to form a specific building system maintaining required integrity of the fire barrier and stop the passage of gases or smoke. Firestop systems shall accommodate building movements without impairing their integrity. Through-penetration firestop systems and firestop devices tested in accordance with ASTM E814 or UL 1479 using the "F" or "T" rating to maintain the same rating and integrity as the fire barrier being sealed. Provide a seal to prevent passage of fire, smoke, toxic gases and water through openings, and prevent transmission of sound and vibration from the penetrating element to the structure. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation. Provide in accordance with ASTM E 814 or UL 1479.

Wherever pipes, ducts, etc. penetrate any type of construction that extends to the underside of the structure above it, **regardless if the wall, partition or floor is a rated assembly or not,** the space between the penetrating member and the building construction shall be sealed with a ASTM E814 or UL 1479 approved firestop assembly that provides an effective barrier against the spread of fire, smoke and gas, equal to the rating of the respective wall, partition or floor. Where partitions are not indicated as fire rated, the firestopping assembly used shall provide a minimum of one-hour resistance. All fire stop material employed on the project must be same brand throughout. Refer to Paragraph, “Pipe Sleeves”, above for additional information and requirements. A firestopping assembly shall be as manufactured by Hilti, 3M, USG or other **pre-approved** Manufacturer.

Where walls or partitions do not extend to the structure above, firestopping material is not required for the penetration. Instead, pack the respective openings with insulation and seal on both sides with material equal in characteristics of the penetrated partition.

5.12. **Delivery and Storage:** All equipment and materials delivered and placed in storage shall be protected from the weather, humidity and temperature variations, dirt and dust, and other contaminants. See Section 15700 and this Section 15010 for additional requirements for ductwork and equipment.

5.13. **Dielectric Isolation:** Provide dielectric isolation where dissimilar metals are joined, at supports, etc. For pipe sizes 2” through 6”, copper piping flanges shall be drilled

to ANSI B 16.5 150/125 Standard and powder coated, with an EPDM insulator adhered to the plate steel flange protruding inside of the steel flange to prevent contact with the copper flange adapter. The copper component of the flange adapter shall be Third Party Classified by Underwriters Laboratories, Inc. Minimum working pressure shall be 300 psi at 272°F.

Wherever any bare metallic piping or conduit is in contact with externally insulated duct or bare sheet metal duct, there shall be dielectric separation provided. The Contractor shall provide 1/2" thickness, unslit AP Armaflex insulation of sufficient inside tubular diameter to snuggly and completely cover the respective piping. The insulation shall extend the full length of the affected area. Where channel shapes are used, orient the open side, down. Refer to Section 15700, Part "Pipe and Miscellaneous Insulation Work" for AP Armaflex material specification.

END OF SECTION

SECTION 15400 - PLUMBING

PART 1. GENERAL & MISCELLANEOUS

1.1. **General Provisions:** Section 15010 is applicable in full hereto. No building materials or products that contain asbestos, formaldehyde, polychlorinated biphenyl (PCB), lead or mercury, in excess of limits mandated and defined by OSHA, LEED and the EPA, shall be utilized.

1.2. **Qualifications:** Shall be properly licensed and established as a Plumbing Contractor at location of the work and shall maintain locally adequate service facilities. He shall have had previous experience in the satisfactory installation of at least six (6) systems of this type, size and scope.

1.3. **General Scope:** Include all equipment, material and labor required for a complete operating plumbing system even though every item involved is not indicated. Refer to architectural drawings and verify all plumbing fixtures, locations and mounting heights. Notify the architect prior to bid of any discrepancies. Do not attach any items to other trades' assemblies. Items shall be attached to building structural system.

Advisory provisions listed in all Codes referenced in the Contract Documents are mandatory. Where conflicts occur between a Code, Standard, the contract drawings or specifications, the more stringent requirements shall govern and be applicable.

Arrange and install piping systems sizes as shown, as close as practical, straight, properly supported and run as directly as possible forming right angles or running parallel with building lines, true to line and grade, free of sags and bends. Locate piping as high as practical and in parallel groups as close together as practical.

All piping shall be clean when it is installed. Before installation, it shall be checked, upended and swabbed. All rust or dirt from materials in storage or from lying on the ground shall be removed. Any installed dirty piping shall be cleaned. Any rusted piping shall have the rust removed and painted with two coats of black compatible rustproof paint. Refer to gas piping specification for additional requirements for gas piping. Paint shall comply with the requirements of ASTM E84 for flame spread and smoke development.

The Plumbing Contractor shall take as-built measurements, including all depths, inverts, etc., prior to commencement of backfilling operations. It shall not be sufficient to check offline locations. Definite measurements shall be taken for each line entering or leaving the facility. **The location of buried piping shall be shown on the record drawings and dimensioned from fixed points**.

Manufacturers not named in the specifications require prior approval, seven (7) days prior to bid date. Follow procedures set forth in Division 1 of the specifications. All prior approvals shall be submitted through the Architect.

1.4. **Record Documents:** Provide in such detail, as is set forth under General and Supplemental Conditions and in Section 15010. **Note that the Plumbing Contractor**

shall take as-built measurements, including all depths, inverts, etc., prior to commencement of backfilling operations. It shall not be sufficient to check offline locations. Definite measurements shall be taken for each line entering or leaving the facility. The location of buried piping shall be shown on the record drawings and dimensioned from fixed points. Also, show locations of all dielectric unions and cleanouts on the record documents.

1.5. **Access Panels and Doors:** Do not locate serviceable items above inaccessible, hard ceilings without written approval from the Architect. Coordinate all items locations with the Architectural ceiling plans before installing any items. Furnish access panels and doors to the General Contractor for installation wherever required for access to valves, controllers, actuators, trap primer assemblies, water hammer arrestors, air vents and similar devices requiring maintenance access.

Doors/panels shall be suitable for wall or ceiling finish involved, 16" x 16" unless otherwise indicated or as required to permit removal of equipment and acceptable maintenance access. Access panels and doors shall be fire rated where rated assemblies are penetrated. Access panels and doors for items located outdoors shall be weatherproof.

Access panels and doors shall be as manufactured by Milcor, Elmdor, Zurn, Mifab or other approved equivalent. The Architect must approve the use of, and type of, all panels and doors to be installed in areas that are exposed to view or in finished areas. Exposed access panels and doors shall be factory cleaned and primed for painting in the field. Colors shall be as selected by the Architect. Refer to Architectural Section, Painting, for additional information.

1.6. **Warranty:** Guarantee work as set forth in Section 15010 and Division 1. Guarantee in writing to make good without cost any defects in materials and workmanship for one year following the date of substantial completion of the project as determined by the Architect, unless specified otherwise. Provide free maintenance and service during the guarantee period. Refer to other parts for additional requirements and extended warranty requirements.

1.9. **Site Visits:** It is the contractor's responsibility to have the job ready for site visits when they are scheduled. If the project is not ready for the requested site visit and the Architect, any governmental agency or any other entity requires an additional site visit with the Engineer present, the contractor shall pay Zgouvas, Eiring & Associates a re-visit fee of $750. The payment shall be made directly to Zgouvas, Eiring & Associates 5 days prior to the scheduled site visit.

The Contractor is urged to carefully review the extensive requirements of Paragraph "Identification" in Section 15010 of the specifications and note that certain identification **is required to be completed before certain site visits. There are specific identification requirements prior to the above ceiling and final site visits, respectively, that are mandatory. Failure to comply with this provision will be cause for cancellation of the site visit, and a fee imposed for the additional site visit, with all costs of the additional site visit to be borne by the respective Contractor responsible.**

1.10. **Miscellaneous:** The Contractor shall carefully examine the contract documents during the bidding phase. Any missing information in the contract documents that is

required for obtaining accurate pricing shall be brought to the attention of the Architect, **prior to bid date**, so all may be clarified and/or corrected. Failure to identify and resolve the issues prior to bid shall require the Contractor to provide said items, complete, without additional cost to the Owner or the Owner's Project Design Professionals, using materials and methods specified by, and as directed by, the Owner's Design Professionals.

1.11. **Spare Parts:** Manufacturer of any equipment specified shall have a wholesale outlet for readily available replacement parts in the nearest major USA city.

1.12. **Electrical Work:** All electric power wiring required for installation of equipment under this Section is specified under Electrical Division. Plumbing Contractor shall furnish and install all controls and control wiring as specified or required to properly complete the installation. Control conduit is specified under Electrical Division or shown on electrical drawings; all other control conduit shall be provided under this Section of the work.

All control conduit, power wiring, relays, transformers, contactors, etc. which are required and are not shown on the electrical drawings or specified in the Electrical Division of the specifications, shall be provided under this Plumbing Section.

Coordinate all requirements with the Electrical Sub-Contractor prior to bid. Electrical work performed under this Section shall meet requirements set forth in the Electrical Division and the National Electric Code (NEC), current edition.

1.13. **Submittals:** Refer to Section 15010 for **strict** requirements especially as it applies to Project cost constraints, addendums and Value Engineering (VE) items.

1.14. **Identification:** The Contractor is urged to carefully review the extensive requirements of Paragraph "Identification" in Section 15010 of the specifications and note that certain identification is required to be completed before certain site visits. **There are specific identification requirements prior to the above ceiling and final site visits, respectively, that are mandatory. Failure to comply with this provision will be cause for cancellation of the site visit, and a fee imposed for the additional site visit, with all costs of the additional site visit to be borne by the respective Contractor responsible.**

1.15. **Firestopping:** Refer to Section 15010 for requirements. **Note that Division 15 firestopping specifications require firestopping of all penetrations regardless of wall/ceiling/floor construction. Refer to Division 1 for additional requirements.** Where there is a conflict between Division 1 specifications and Division 15 specifications, the most stringent requirements shall govern, be applicable and shall be provided.

1.16. **Motors:** All motors shall be provided with overload protection and phase protection on all legs. Do not run motors until correct overload elements are installed in starters, as applicable.

All motors serving outdoor equipment exposed to weather shall have TEFC motors meeting the requirements set forth previously.

Premium efficient motors shall be **warranted for 36 months** from date of substantial

completion of the project, as determined by the Architect. Motors shall be by Allis Chalmers, General Electric Goulds, Louis Allis, and Westinghouse or approved equivalent.

1.17. **Bound and Framed Instructions: Two weeks before final site visit**, furnish three complete sets of operating and maintenance instructions, bound in hard cover, indexed and tabbed.

a. The first sheet in the bound instructions shall be a listing of: The Owner/Project Title, Architect, Engineer, General Contractor and Subcontractor.
b. Second page shall be a Table of Contents listing all products numbers in the order which they appear in the specifications and label the tab accordingly. Include all "P" numbers.
c. Provide a summary page that lists each item with its respective warranty listed.
d. All warranty information to be filled in by the Plumbing Contractor (Serial numbers, Model Numbers and any other information required by the Equipment Manufacturer).
e. Provide copies of all filled in warranty cards.
f. Local source of supply for parts and replacement, including names and telephone numbers of parts suppliers
g. A general maintenance summary section shall be included. Provide a list of each piece of equipment using equipment designations as shown on the plans, and the routine maintenance procedures based on the respective manufacturer's recommended intervals. As a minimum, maintenance shall be grouped and individually tabbed to indicate maintenance operations required:

    1. Once a month
    2. Quarterly
    3. Once every six months
    4. Once a year

h. Provide drawings of system and wiring diagrams, condensed operating instructions and include in binder. All components shall be numbered and identified on diagram.
i. Record drawings of the Plumbing drawings in hard copy and PDF format on CD. Refer to Section 15010, Part 1, General, Paragraph, Record Drawings for additional requirements.
j. Provide copy of Section 15400 Specifications
k. Provide written results of all tests specified.
l. Copies of all Site Visit Reports including Contractor's written response that items listed were corrected.
m. Copies of all certificates of all site visits and approvals from all Governing Authorities.
n. Provide domestic water samples testing and results specified.
o. Provide copy of valve chart required in Section 15010, Identification. Include all dielectric unions on chart.
p. All cleanouts and dielectric unions shall be indicated on record/as-built drawings.

Additionally, the Contractor shall provide all the aforementioned information, in digital Adobe Acrobat PDF format, on a CD-R CD. The PDF file shall be provided with an embedded index for each item specified. It shall appear in the left-hand window of the opened document so that the Owner or his maintenance personnel can

"click" on the indexed item and move immediately to that specific item.

PART 2. TESTS

2.1. **General: Do not test when freezing conditions exist or are anticipated. Test when freezing conditions have subsided.** Perform all tests in the presence of the Architect. Refer to Division One for Fuel, water and power required, therefore. In absence of specific testing procedure comply with code requirements and/or nationally acceptable industry standards. Furnish written reports of all tests results specified to Architect.

2.2. **Drainage and Vent System:** A water test shall be applied to the drainage system in its entirety. All openings in the piping, except the highest opening, shall be tightly closed. The system shall then be filled with water to the point of overflow. Hold for a minimum of twenty-four (24) hours without pressure loss before inspection. System shall remain full during the test without leakage. Each vertical stack with its branches may be tested separately, but any portion tested shall have minimum ten-foot head. Do not perform test when ambient temperature is below freezing.

2.3. **Rainwater System:** Test same as drainage and vent systems.

2.4. **Water Supply System:** Test and secure acceptance of entire system before the piping or hot water storage heaters are insulated or otherwise concealed. Test as follows: disconnect and cap all outlets to plumbing fixtures and all other equipment not designed for the full test pressure. Fill the system with water; apply 150 psi hydrostatic pressure and hold for a minimum of twenty-four (24) hour period without pressure loss. All piping throughout shall be tight under test. Water piping shall remain under normal water pressure during construction except when freezing weather is expected.

2.5. **Fixtures:** Test for soundness, stability of support and satisfactory operation.

2.6. **Gas System:** Apply 75 psi air test for a twenty-four (24) hour period without pressure loss through leakage. After completing pressure tests, and before testing a gas-contaminated line, purge line with nitrogen at junction with main line to remove all air and gas. Test before tanks, equipment, appliances, etc. are connected.

PART 3. SANITARY PIPING

3.1. **General Scope:** Provide a system of soil, waste and vent piping connecting all plumbing fixtures, equipment, etc. to the house sewer, with **consolidated vent connections** extending through the building roof, all as shown on the drawings and as required for complete installation. All piping shall be concealed below grade, within walls, chases, above ceilings, etc., unless specifically noted otherwise. Waste and vent piping shall be sloped in accordance with the applicable codes.

The Contractor shall consider pipe-grading requirements when coordinating pipe routing for the project. **Do not begin work until elevation of final connection point is verified and grading of entire system can be determined (even if final connection is specified under another Section).**

Do not route the sewer line in the same trench with the domestic water line. Maintain a

minimum of six (6) feet of separation between the two utilities.

Rework existing waste roughing as required to facilitate renovation work as applicable.

Each length of pipe and each pipe fitting, trap, fixture, material and device utilized in the plumbing system shall bear the identification of the manufacturer and any markings required by the applicable referenced standards.

3.2. **Utility Connection:** Utility connection is specified under Division 2. Connect to temporarily capped main as indicated on the plumbing plans.

3.3. **Soil, Waste and Vent Piping Underground, Inside the Building Walls and to Points Outside the Building as Indicated:** Provide service weight hub-and spigot cast iron soil pipe and fittings for underground service and hubless for above ground service, meeting ASTM A-74 for hub and spigot and ASTM A-888 for hubless, coated inside and out. Pipe exposed within the building shall be uncoated outside, primed and left clean for painting. Fittings to receive screwed pipe arms shall be recessed drainage type. Soil and waste pipe shall have long sweep connections. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

Joints for hub and spigot pipe shall be made with compression gaskets meeting ASTM C-564. Joints for hubless pipe and fittings shall be equivalent to MG couplings meeting ASTM A-48 and C-564, or Anaco Husky SD 4000, super-duty, shielded couplings of Type 304 AISI stainless steel, meeting ASTM C1540 standard or equivalent by Ideal Tridon Heavy Duty HD or Mission Rubber Company, Heavy Weight, shielded.

Option: Contractor may use solid wall PVC Schedule 40 DWV pipe and fittings meeting ASTM Standard D2665 and 1785 for above ground service and underground service with the following exceptions. Use cast iron as specified hereinbefore or PVDF (Polyvinylidene Fluoride) piping and fittings in areas used as return air plenums, return air platforms, all piping associated with a grease trap, commercial dishwasher, commercial washer, and when passing through or within a fire rated assembly.

PVDF piping and fittings, where specified and required, shall be Orion Super Blue PVDF (Polyvinylidene Fluoride) or equivalent products as manufactured by Enfield, Zurn, GEO or Fisher. The PVDF material shall conform to ASTM D3222 ASTM F1673, ASTM E-84 and UL 723. Pipe shall be marked with its UL Classification to indicate compliance with UL723 (ASTM E84). All fittings shall meet or exceed Schedule 40 dimensions.

All vents thru roof shall be cast iron pipe (minimum 12" both sides of the roof). Secure the cast iron VTR to structure with heavy gauge 1-hole strap. **THE CAST IRON PIPING THROUGH THE ROOF DOES NOT APPLY TO GAS FIRED APPLIANCES. Vents through the roof for gas appliances shall be as specified for the appliance in its respective specification section.**

All floor drains shall have cast iron deep seal p-traps. Piping and fittings above the floor shall be solid wall PVC Schedule 40 DWV pipe and fittings or PVDF as specified hereinbefore and with exceptions as noted.

THE USE OF "CELLCORE" OR "FOAMCORE" TYPE PIPING IS EXPRESSLY FORBIDDEN.

3.4. **Laying Out Work:** Vents from any fixture, when connected to a vent line serving other fixtures, shall be extended at least 6 inches above flood level rim of highest of such fixtures to prevent use of vent lines as a waste. Make changes in direction by appropriate use of 45-degree Y's, 1/2 Y's, or long sweep 1/4, 1/6, 1/8 or 1/16 bends. Sanitary T's or short 1/4 bends may be used on vertical stacks or drainage lines where change in direction of flow is from horizontal to vertical; except that long-radiused TY's shall be used when two fixtures are installed back-to-back with common drain. Straight T's, Ells and Crosses may be used on vent lines. Make no change in direction of flow greater than 90 degrees. Where different sizes of drainage pipe or fittings are connected use standard increasers and reducers of proper size. Do not reduce size of drainage piping in direction of flow. Drilling and tapping of house drains, soil, waste or vent pipes, and use of saddle hubs and bands are prohibited. **All plumbing vents through the roof shall be located a minimum of 10'-0" away from all outside air intakes**. Coordinate all plumbing vents locations with the HVAC plans.

3.5. **Hangers and Sway Bracing:** Refer to Section 15010 for requirements.

3.6. **Grading:** Uniform and not less than 1/8" PLF for pipe 4" and over, and not less than 1/4" PLF for 2" and 3" piping.

3.7. **Roof Flashing:** Roof penetrations are to be flashed by the roofing contractor, using materials as recommended by the roofing manufacturer and approved by the Architect. Coordinate work with Roofing Contractor. Offset vents as required to clear gravel guards and flashing courses. Extend vents 6" to 8" above roof level.

3.8. **Waste Arms:** Type K copper or IPS brass pipe typical; Schedule 40 PVC or IPS brass pipe at urinals.

3.9. **Test Fittings:** Not shown on the drawings; provide where required for partial tests.

PART 4. DRAINAGE SPECIALTIES

4.1. **Manufacturers:** Except as noted, catalog numbers are from J.R. Smith and/or Zurn. Equivalents by Josam, Sioux Chief, Watts or Wade will be considered.

4.2. **Cleanouts:** Provide in sanitary piping at all changes in direction, at ends of branches, at intervals not exceeding 40 feet on straight runs, and elsewhere as shown. Cleanouts shall be full opening type and completely accessible without obstruction. Size same as lines in which they occur, but not larger than 4 inch. Tees and extensions shall be of same weight as soil pipe. Plugs countersunk or raised head type with lead-free seals. **Provide flashing clamps and flashing flanges in all areas where cleanouts are accessible from floor below or above, as applicable. All cleanouts shall be indicated on the record/as-built drawings.**

In Tile Floors: J.R. Smith 4052L, Zurn Model ZN1400-T-BP, adjustable, cast iron body with bronze plug and satin finished square scoriated nickel bronze top. Where soft tile occurs, provide 4172L, Zurn ZN1400-TX-BP, recessed square nickel bronze cover.

In Concrete Floors: J.R. Smith 4238L, Zurn Model Z1400-BP, adjustable head, cast iron head and ferrule with bronze plug, round loose-set scoriated tractor cover.

In Outside Lines: J.R. Smith 4262L-NB, Zurn Model Z1474-N-BP, cast iron head and ferrule with bronze plug. Terminate at grade in 18"x18"x12" deep concrete pad with tooled edges or flush in pavement as applicable.

In Accessible Unfinished Spaces: J.R. Smith 4400 or 4511-S, Zurn Model ZS1468, cast iron with bronze plug, as appropriate.

In Finished Walls: J.R. Smith 4530S, Zurn Model Z1446-BP cast iron cleanout tee with bronze plug and 16 ga., 304 stainless steel, flat, wall plate cover. Where distance from plug to finish wall will exceed 4 inches provide extension from sanitary tee to bring plug within 4 inches.

In Terrazzo Floors: J.R. Smith 4192L, Zurn Model ZN1400-Z-BP, adjustable cast iron head and ferrule, bronze plug and round nickel bronze cover and rim.

In Carpeted Floors: J.R. Smith 4032L-X, Zurn Model ZN1400-CM-BP, adjustable head, cast iron, round polished bronze top with carpet clamping device.

4.3. **Roof Drains:** Zurn FloForce ZC100-DR-VP as required, powder coated cast iron drain with outlet, removable vandal resistant cast iron dome, flashing clamp and Top-Set drain riser, drain riser flange and Top-Set deck plate. Size outlets same as downspouts to which they connect. Zurn FloForce roof drains will be used as basis of design in the storm drainage systems calculations utilizing Zurn's FloForce provided GPM charts/graphs. Contractor to furnish factory approved drainage calculations for review by the Engineer when submitting roof drains for approval.

4.4. **Typical Drains:** Size outlets same as pipe to which they connect. Install temporary closures during construction. **Each drain connected to sanitary sewer shall have cast iron deep seal P-trap.** Provide trap primer connections on floor drains and trap primers as specified below.

Where drains occur above finished spaces, furnish with clamping collar to secure waterproof membrane.

Floor Drain (FD): J.R. Smith Series 2005B-05, Zurn Models ZN415-5S-P, J.R. Smith 2005B-06, ZN415-6S-P, J.R. Smith 2005B-08, ZN415-8S-P (as required) two-piece cast iron drains with gasketed outlet and adjustable nickel bronze strainer and rim. Strainer tops for 2" drains 5" x 5" (ZN415-5S-P), for 3" drains 6" x 6" (ZN415-6S-P), for 4" drains 8" x 8" (ZN415-8S-P) . Provide PO5 trap primer connection as indicated on the plans.

Shower Drain (SD): Where not specified with the shower, provide J.R. Smith Series 2005B-05, -06 NBSS with PO5 trap primer connection, Zurn ZS415SS-P, two-piece cast iron drains with gasketed type outlet and adjustable stainless-steel strainer and rim. Provide clamping collar to secure waterproofing membrane. Strainer tops for 2" drains shall be 5" square (Zurn ZS415-5SS-P) for 3" drains, 6" square (Zurn ZS415-6SS-P) ; and for 4" drains, 8" square (Zurn ZS415-8SS-P).

Commercial Washer Trough Drain Lint Interceptor: J.R. Smith Series 8910-50, Zurn Model ZS1185-E-KC-XX, all stainless steel, anchor flange, extension, flashing flange with flashing clamp, primary and secondary stainless steel lint screens, 2" threaded vent connection, 3/16" thickness diamond plate cover (secured and gasketed) and with inlet and outlet connections as required for PVDF or cast iron piping as specified hereinbefore. Contractor shall carefully coordinate depth of trough required with inverts on site, prior to bid. Modify interceptor depth as required to allow for ease of removal of the lint screens.

Mechanical Room Drain (MFD): J.R. Smith Series 2005G, Zurn Model Z541-P, galvanized cast iron body drain with adjustable strainer head, gasketed outlet, P05 trap primer connection, sediment bucket and cast-iron grate.

Floor Sinks (FS): J.R. Series 3120, Zurn ZN1901-KC-32, with nickel bronze strainer clamp, grid and rim, aluminum dome, acid-resisting enameled inside finish. Provide 3/4 grate for sinks receiving single waste and no grate when under equipment. Provide deep seal cast iron p-trap.

4.5. **Downspout Nozzles:** No. 1770 rough cast brass nozzles.

4.6. **Emergency Roof Drains:** Same as typical roof drains. Secondary roof drain shall be same as typical with 2" high water dam Zurn FloForce Model ZC100-89-DR-VP. Zurn FloForce roof drains will be used as basis of design in the storm drainage systems calculations and utilizing Zurn's FloForce provided GPM charts/ graphs. Contractor to provide factory approved selections for Engineer's approval.

PART 5. RAINWATER DRAINAGE SYSTEM

5.1. **General:** Provide a system of roof drains, downspouts, emergency overflows, insulated, etc., as required and as shown on the Architectural and Plumbing plans and as required for proper drainage. All piping shall be concealed below grade, within walls, chases, above ceilings, etc., unless specifically noted otherwise. Refer to Section 15010 for hanger rods, hangers, spacing and sway bracing and similar requirements.

5.2. **Roof Drains, etc.:** Refer to Drainage Specialties.

5.3. **Piping Within Building:** Service weight cast iron pipe with joints, hangers, grading, etc. as specified for sanitary piping. First 18 inches of pipe immediately below roof drain shall be Schedule 40 galvanized steel with threaded connection to drain outlet or cast iron. Refer to Section 15010 for hanger rods, hangers, spacing, sway bracing and uni-strut support assembly requirements.

Use cast iron in areas used as return air plenums, return air platforms and when passing through or within a fire rated assembly.

5.4. **Option:** Contractor may use solid wall PVC Schedule 40 DWV pipe and fittings meeting ASTM Standard D2665 and 1785 for above ground service and underground service from 12" above the finished floor to the underground connection to the exterior storm line. Use cast iron as specified hereinbefore or PVDF (Polyvinylidene Fluoride) piping and fittings in areas used as return air plenums, return air platforms

and when passing through or within a fire rated assembly.

PVDF piping and fittings, where specified and required, shall be Orion Super Blue PVDF (Polyvinylidene Fluoride) or equivalent products as manufactured by Enfield, Zurn, GEO or Fisher. The PVDF material shall conform to ASTM D3222 ASTM F1673, ASTM E-84 and UL 723. Pipe shall be marked with its UL Classification to indicate compliance with UL723 (ASTM E84). All fittings shall meet or exceed Schedule 40 dimensions.

THE USE OF "CELLCORE" OR "FOAMCORE" TYPE PIPING IS EXPRESSLY FORBIDDEN.

5.5. **Flashing:** Use material as recommended by roofing contractor and approved by the Architect. Provide flashing for each drain extending at least eight (8) inches from clamping ring in all directions. Coordinate work with roofing contractor.

5.6. **Anchorage and Sway Bracing:** Rigid support sway bracing and piping anchorage shall be provided for all drainage piping greater than 4 inches. Restraints shall be provided for drain pipes at all changes in direction and at all changes in diameter greater than two pipe sizes. Braces, blocks, rodding and other suitable methods as required by the coupling manufacturer shall be utilized. Sway bracing shall be Eaton/Cooper B-Line Tolco Steel Pipe Clamps for Sway Bracing, transitional fittings, bracing, etc. as required for a complete sway braced assembly.

The entire bracing assembly shall be selected and sized by the Manufacturer. **Provide complete manufacturer approved shop drawing showing all required components layout showing locations of all items.** All components of the finished assembly shall be of a single manufacturer, resulting in a UL listed and FM approved sway bracing assembly. Eaton/Cooper B-Line is basis of design. Equivalents by Anvil International, Rilco Manufacturing Co and Piping Technology and Products will be considered.

5.7. **Insulation:** Insulate all horizontal rainwater piping above slab within the structure same as cold water piping, including emergency overflow piping. Insulate roof drain sumps and associated elbow, and trap same as piping.

5.8. **Emergency Overflow Drainage:** Piping same as rainwater drainage piping. Stub piping 2" above roof and provide flashing. Extend piping through wall and provide downspout nozzle.

5.9. **Downspout (Lamb's Tongue) Nozzle:** Provide Jay R Smith Model 1770, Zurn ZAB199-SS, cast bronze nozzle with threaded outlet, wall flange, stainless steel screen and all other items required for a complete installation

5.10. **Downspouts Thru Soffit:** Short lengths of galvanized steel pipe. Connect to roof drain and extend through soffit to sheet metal downspout against wall. Sheet metal downspout Zurn model ZS199-DC. Sheetmetal downspout specified in Div. 7.

PART 6. WATER PIPING

6.1. **General Scope:** Connect to water main as indicated and extend to all plumbing fixtures, hose bibbs, water heaters, etc.; and to HAC, kitchen, laundry and special equipment as indicated or required. All piping shall be concealed below grade, within walls, chases, above ceilings, etc., unless specifically noted otherwise.

Refer to Section 15010 for hanger rods, hangers, spacing and uni-strut support assembly requirements.

6.2. **General Workmanship: All water piping shall be routed within the building insulation envelope unless specifically noted otherwise.** Cut accurately to measurements established at site and work into place without springing or forcing, clearing all openings, finished ceilings, etc. All piping not in an accessible attic or similar spaces that contain valves and other items which may require maintenance access shall be located no more than 12" above the finished ceiling and no more than 14'-0" in areas without ceilings. Piping located in attics shall be supported such that maintenance access can be accomplished without the use of a ladder.

Route all piping through previously built-in sleeves and avoid excessive cutting or other weakening of the structure. Make changes in direction and size with fittings. Cap or plug open pipe ends during installation to keep out foreign material. Make connections carefully to ensure unrestricted flow, eliminate air pockets, and to permit complete drainage of the systems.

Supply piping to fixtures, faucets, hydrants, showerheads, and flush valves shall be anchored to prevent movement. Install all buried piping with at least 36" of earth cover. Do not route the water line in the same trench with the sewer/sanitary piping. Maintain a minimum of six (6) feet of separation between the two utilities.

Uninsulated pipes passing through concrete or cinder block walls and floors, or other corrosive material shall be protected against external corrosion by a protective sheathing or wrapping that will withstand any reaction from the lime and acid of concrete, cinder block or other corrosive material. Sheathing or wrapping shall allow for movement including expansion and contraction of piping. The wall thickness of the sheathing material shall be not less than 0.025 inch thickness. The protective wrapping/sheathing is not an alternative where sleeves are specified and required. Coordinate requirement with sleeves specifications and provide as specified and required.

All piping below slab-on-grade construction shall be installed in plastic jacket equivalent to Plasti-sleeve, as manufactured by Plastic Products Co. of Stanton, California.

6.3. **Freeze Protection: Do not install piping or any device in spaces subject to freezing. Install piping within building insulation envelope.**

6.4. **Grading:** The Contractor shall consider pipe-grading requirements when coordinating pipe routing for the project. All piping shall be carefully installed to eliminate traps and pockets in pressurized lines. Where air pockets and traps cannot be avoided, provide valved hose connections for water traps and valved automatic air vents for air traps. Pipe slope shall be maintained throughout the project. Pressurized

plumbing piping systems shall be sloped to drain points. Grade pipe upward from source to facilitate drainage and air relief. Where low points are required because of long runs or where sections may be valved off, provide with 3/4" globe valve and hose nipple for drainage at low point. **Make all connections to risers and fixtures from top of mains.**

6.5. **Nipples:** Of same material as pipe in which they are installed; provide extra strong when unthreaded portion is less than 1 inch long. Steel nipples are not allowed.

6.6. **Piping and Fittings:** ProPress or similar type joints and fittings are not allowed. Typical lines to be of copper tubing meeting ASTM B-88, Type "L" hard above ground and Type "K" soft below ground. Cut copper pipe square and ream to remove burrs. Clean fitting socket and pipe ends with sand cloth, No. 00 cleaning pads or wire brush. No acids shall be used to clean either pipe or fittings or as a flux in sweating joints. Make up joints with sweat fittings of wrought copper, and 0.25% of the total wetted surface area, lead free solder complying with ASTM B-32 and The Safe Drinking Water Act. Surfaces shall be prepared for soldering as required by ASTM B828. Do not make joints or branch connections below a slab on grade.

6.7. **Hangers and Sway Bracing:** Refer to Section 15010 for requirements.

6.8. **House Supply Connection:** Utility connection at street, meter installation, etc. is specified under Division 2. Connect to temporarily capped main as indicated. Where shut-off valve is indicated outdoors on the plumbing plans, provide a concrete or steel valve box with hinged medium duty, traffic rated cover, minimum 16x16, larger as required for proper access to valve. Provide valve extension as required so that top of valve handle is within 8” of top of hinged cover.

6.9. **Water Pressure:** Supply system is designed for static pressure of 50 to 75 psi. Gauge city water supply adjacent to building to verify that pressure is within those limits. Submit report in writing. Provide water pressure reducing valve, if required, to meet designed water pressure. See Water Piping Specialties for pressure reducing valve specification.

6.10. **Disinfection:** New potable water systems shall be purged of deleterious matter and disinfected prior to utilization. The method to be followed shall be that prescribed by the health authority or water purveyor having jurisdiction or, in the absence of a prescribed method, the procedure described in either AWWA C651 or AWWA C652, or as described in this section. The pipe system shall be flushed with clean, potable water until dirty water does not appear at the points of outlet. The system or part thereof shall be filled with a water/chlorine solution containing not less than 50 parts per million of chlorine, and the system or part thereof shall be valved off and allowed to stand for 24 hours; or the system or part thereof shall be filled with a water/chlorine solution containing not less than 200 parts per million of chlorine and allowed to stand for 3 hours. Following the required standing time, the system shall be flushed with clean potable water until the chlorine is purged from the system. Upon completion of the disinfection procedure, the Plumbing Contractor shall engage the services of the Alabama Department of Public Health Clinical Laboratories or a certified, licensed, testing laboratory to provide a lead and bacteriological water analysis to include a standard heterotrophic plate count (HPC), microbial, bacterial, pathogens and coliform count. Test a minimum of two (2) samples of domestic water from two (2) separate locations within the facility. Where the project has multiple

buildings indicated, the requirement shall be two (2) samples for EACH building. If multiple buildings are finalized and turned over for the Owner's use and tested portion of the system is interrupted to plumb in remaining buildings, water shall be re-tested after each building release. Test each sample for Coliform Present, Fecal Present, E. Coli and lead present. Test locations shall be selected by the Architect and shall be noted on the Testing Laboratory's report. In addition to the two (2) locations required for testing, the supply line feeding the kitchen sink shall also be tested, thereby requiring a total of three (3) test locations. If the lab results indicate positive results for Total, Fecal, or E. Coli coliform per 100 ml respectively, or an HPC greater than 500 CFU/mL, or lead maximum contaminant level goal (MCLG) greater than zero, the Contractor shall disinfect the system in its entirety, as specified above, and obtain new test results as outlined hereinbefore until levels are reached as required by AWWA C651 or AWWA C652. If maximum contaminant level goal (MCLG) of lead is greater than zero, immediately notify the Architect in writing and furnish copy of test results.

Prior to the final site visit, the Contractor shall provide to the Architect, certified test results on the testing facility letterhead. The report shall indicate the name of the project, the locations from where the samples were taken, the testing laboratory findings and indication whether the water is safe for consumption. **No Certificate of Occupancy will be provided to the Owner without the required lab results indicating the potable water system is safe for consumption.**

6.11. **System Drainage:** Provide valves and hose nipple to allow for drainage of all risers and other system low points.

PART 7. WATER PIPING SPECIALTIES

7.1. **General:** Seal the opening where the stem, nipple, etc., penetrates the insulation as required to maintain the continuity of the insulation and vapor barrier. All specialties in potable water distribution shall be certified "lead free" as required by Code, Regulations and Standards.

Provide a custom laser engraved brass valve tag at each valve. Tag shall be 1-1/2 inches diameter, 18-gauge polished brass tags with 3/16-inch chain hole and 1/4 inch high stamped, black-filled service designation. Refer to Section 15010, Identification and provide all as specified.

Valves shall be Nibco, Jomar, Watts, Apollo, Kitz, Hammond/Milwaukee, Matco-Norca or Mueller.

7.2. **Unions:** 150 lb. rated; cast brass ground-joint type in copper pipe, galvanized malleable iron in wrought iron or galvanized pipe. Provide in all sizes of threaded pipe, and in sweat-jointed pipe over 1 inch, to facilitate easy repairs. In such lines, install adjacent to water heaters, pumps, tanks, etc. into which piping is terminated; and on at least one side of valves, cocks, strainers, etc. and other devices that occur in piping runs.

7.3. **Dielectric Unions:** Provide dielectric unions between ferrous and non-ferrous piping as required, including piping and water heater stubs where different and stainless-steel water hammer arrestors. Dielectric unions shall be constructed using lead free

materials as required by all Governmental Agencies, Codes and Standards and shall comply with ASTM 1545. Dielectric unions shall be Watts Series LF or equivalent by Mueller or Matco Norca. Where dielectric unions are installed, they shall be provided with factory fabricated brass tag. 1-1/2 inches diameter, 18-gauge polished brass tags with 3/16-inch chain hole and 1/4 inch high stamped, black-filled service designation. Indicate valve tags on the record drawings. **Contractor shall provide a ball valve on other side of each dielectric union to allow for proper maintenance of the union.**

7.4. **Valves and Extended Valve Operators:** Provide where shown and/or specified, including all fixtures or equipment not furnished with stops. Arrange and install valves to be readily accessible for servicing. **All valves shall be bronze or heat-treated CW511L brass, lead free** and shall be the product of one American Manufacturer and shall meet the Buy American Act 41, USC 10a-10d as specified hereinbefore. Nibco and Jomar units are basis of design.

Coordinate handle height requirement with specified insulation thickness. Provide height extension as required to clear insulation and properly operate without causing damage to piping insulation. All handles shall comply with UL 2043 and shall be UL listed for installation in return air plenums.

7.5. **Globe Valves 2" and Smaller:** Nibco #S-235-Y or Jomar Terminator G, bronze solder-type with replaceable disc, T-235-Y for threaded pipe, 150 WSP.

7.6. **Check Valves 2" and Smaller:** Nibco T-473-B or Jomar T-511G, bronze threaded, Y-Pattern swing check, 200 WSP.

7.7. **Ball Valves for Water Piping in Size 1/2" through 3":** Valve shall be "Lead-Free" forged bronze or heat treated CW511L brass, 600 PSI CWP, 150 PSI WP, two-piece body, full port, blowout proof stem, stainless steel ball, stainless steel stem, PTFE seats and 2" minimum valve extension to bring valve handle beyond insulation. Valve shall meet NSF, ANSI, FM, UL and MSS SP-110 standards. Note that ball valves are also required on one side of each dielectric union.

7.8. **Strainers 2" and Smaller:** Crane No. 988-1/2, iron body screwed, Y-Pattern, 125 WSP sediment separators with a 20-mesh model screen.

7.9. **Thermometers:** Shall be Trerice Model SX9, Solar Therm, 7" adjustable angle, digital thermometer with cast aluminum, epoxy finished NEMA-4X/IP 65 case. Thermometer shall have 9/16" LCD digits with push button min/max readings and reset. Provide with thermowell for easy removal of the thermometer and bi304 SS and bi-metal stem with appropriate dielectric separation. Mercury thermometers are not allowed. Approved equivalent by Weiss, Weksler, March or Maxwell Moore will be accepted. Stem height shall be as required to clear insulation thickness. Trerice is the basis of design.

7.10. **Wall Hydrants (Typical):** Bronze, nickel plated, quarter turn, self-draining, non-freeze hydrant with hose connection, integral vacuum breaker, loose "T" handle key, stainless steel recessed box, with full 180°, polished bronze face, integral cylinder lock, and "Water" inscribed on the face. Seal all interior joints, seams, gasket seams/closures including around the hydrant box flange with an appropriate sealant recommended by a sealant manufacturer. Wall hydrant shall be JR Smith 5519 QT,

Zurn Z1320XL-EZ or approved equivalent. Install approximately 24 inches above finished grade.

7.11. **Roof Hydrant:** Freezeproof, MAPA MPH-24, J.R. Smith 5907, Woodford SRH-MS, Zurn, ASSE 1057 listed, with ASSE 1052 double check backflow preventer, stainless steel shroud, 3/4" hose connection, manufacturer furnished mounting system and all accessories required for a proper installation. MAPA is basis of design.

7.12. **Water Hammer Arrestors (Shock Absorbers):** Certified by the American Society of Sanitary Engineers and in compliance with current edition of ASSE 1010, ANSI A112.26.1M, Plumbing and Drainage Institute Standard PDI-WH201, heavy-duty construction and designed for a minimum 150-PSI working pressure. Arrestors shall consist of a Type 304 stainless steel casing and bellows. The device shall be pre-charged and sealed at the factory. Install on both hot and cold-water branch lines in an upright position as close as possible to the valve or valves being served. Arrestors shall be installed at all solenoids, remote operated or quick closing valves and at each plumbing fixture or battery of plumbing fixtures as recommended by the Manufacturer. Plumbing Contractor shall provide a dielectric union at connection of this device to the copper water piping. Arrestors shall be Zurn Z1700, J.R. Smith Hydrotrol Series 5005-5050, Watts Series SS, Sioux Chief Series 660-G2B or MIFAB Series WHB.

7.13. **Automatic Drain Trap Primer Units Where Water Closets Occur:** Trap primers shall comply with International Plumbing Code and local codes. Allow for required modifications to meet local codes. Units shall be accessible for service. Provide required piping and drainage. Provide trap primer line to every floor drain and hub drain. Provide isolation valve above ceiling. Water saver type trap primers that attach to lavatory p-traps or any other type of assemblies that use grey water are not allowed. Trap primers shall be Sloan VBF-72-A1, Zurn P6000-TPO or American Standard 6065 or equivalent by Watts or MIFAB.

7.14. **Automatic Trap Primer Units Where Water Closets Do Not Occur:** Automatic type trap primers shall be provided **ONLY** where there are no water closets in the area. Units shall be lead-free, UPC/IAPMO listed, and ASSE certified to the ASSE 1018. It shall be provided with copper or brass body distribution unit (as required), copper waterway, vacuum breaker, brass ball type stop valve, union to allow for removal of the trap primer for cleaning, brass FIP/MIP fittings, integral strainer, air gap, and all required accessories. Units shall comply with International Plumbing Code and Local Codes. Allow for required modifications to meet local codes. Units shall be accessible for service and located within the building insulation envelope to prevent freezing. Provide required piping and drainage. Provide trap primer line to each floor drain, hub drain, etc. as shown or required by Code. Provide isolation valve for each trap primer line. Unit shall be Sioux Chief Prime Perfect Series 695, Precision Plumbing Products, Inc. Series PR-500 or equivalent by Watts or MIFAB.

7.15. **Pressure-Reducing Valve and Strainer:** Zurn/Wilkins 500XL-YSBR or equivalent by Apollo or Watts. Provide full size valved bypass around PRV, two pressure gauges, hose bibb and a valve and union on each side of PRV. Provide if required to meet designed water pressure (not to exceed 75 psi).

7.16. **Backflow Preventer:** Provide where indicated or required by Local or International Plumbing Code.

Units shall be Watts LF009, Zurn Wilkins Model 975XL2-S-AG or equivalent by Apollo complete with strainer, air gap, double check valves and ball valves.

The backflow preventer shall be tested at job site by an individual certified by the American Backflow Prevention Association (ABPA). Testing procedure shall be as published in the Manual of Cross-Connection Control, Tenth Edition by the Foundation for Cross-Connection Control and Hydraulic Research. Furnish test results to the Architect. Testing results shall include the tester's name, ABPA certificate, certificate number and expiration date.

PART 8. PIPE HANGERS AND SUPPORTS

8.1. **General:** Refer to Section 15010 and Pipe Insulation below.

8.2. **Coatings and Finishes:** All hangers whose coating has been damaged or is rusted shall be cleaned, primed and painted with two coats of black enamel paint. All paint and coatings shall have a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E84. Also, see specification section, "Identification" for additional requirements.

PART 9. NATURAL GAS DISTRIBUTION SYSTEM

9.1. **Scope:** Make house supply connection as indicated and extend to all gas fired equipment as well as other locations shown. Refer to Section 15010 for painting and identification of gas piping.

9.2. **Utility Connection:** Arrange with local Gas Company for service, with meter and regulator to be located as shown on the plans. Meter and all piping upstream of meter/regulator by Gas Company. Verify gas company pressure available at the site and provide meter/regulator assembly as required. Pay for all costs in connection with the installation. Provide main cut-off valve and dielectric insulating union in service lines to building.

9.3. **Installation Generally:** In complete accordance with local gas code, requirements of local utility company, AGA, International Fuel Gas Code and NFPA Standard 54. Cut pipe accurately to measurements established at site and work into place without springing or forcing. Avoid runs through solid walls or floors. Route through previously built in sleeves and avoid excessive cutting or other weakening of the structure. Ream all pipes to remove burrs. Make changes in direction and size with fittings. **Make take-offs from top or sides of mains, not from bottoms**. Cap or plug open pipe ends during installation to keep out foreign material. Lay out and grade work (1/4" in 15 feet min.) to avoid trapped lines; where unavoidable provide 4-inch drip leg with removable cap at low point. Provide complete system testing per NFPA 54. Provide combination stop valve and insulating union at each point piping drops to underground or rises above grade from underground.

Gas piping shall enter and exit the installation at a point above grade. The annular space between the pipe and the wall shall be sealed air and water tight. When passing through an outside wall, the piping shall also be protected against corrosion by

coating or wrapping with an inert material. Piping installed outdoors shall be elevated not less than 4 inches above the ground. Where installed across roof surfaces, piping shall be elevated not less than 4 inches nor higher than required to allow for future re-roofing of the facility. Coordinate required height to allow for future reroofing with the current roofer before installing piping.

Piping installed above ground, outdoors, and installed across the surface of roofs shall be securely supported and located where it will be protected from physical damage. All roof mounted gas supports shall be as required by the roofing contractor.

Where gas piping is located within a framing member and is less than 2 inches from the framing member face to which wall, ceiling or floor membranes will be attached, the piping shall be protected by shield plates that cover the full width and length of the piping. Where the piping is located outside of a framing member and is located less than 2 inches from the nearest edge of the face of the framing member to which the membrane will be attached, the piping shall be protected by shield plates that cover the full width and length of the piping. Shield plates shall be of steel material having a thickness of not less than 0.0575 inch (16 gage).

All gas pipe, tubing and fittings shall be clear and free from cutting burrs, defects in structure or threading. Piping shall be thoroughly brushed, and chip and scale blown. Defects in pipe, tubing, and fittings shall not be repaired. Defective pipe, tubing, and fittings shall be replaced.

Flare joints are forbidden and shall not be used.

Metallic pipe and fitting threads shall be taper pipe threads and shall comply with ANSI/ASME B1.20.1, Pipe Threads, General Purpose, Inch. Pipe with threads that are stripped, chipped, corroded, or otherwise damaged shall not be used. Where a weld opens during the operation of cutting or threading, that portion of the pipe shall not be used.

Provide unions and hangers same as specified under Water Piping Specialties except AGA rated for natural gas. Refer to Section 15010 for pipe hangers, supports, rods and uni-strut requirements.

9.4. **Roof Mounted Gas Piping Supports:** Refer to Section 15010 for requirements.

9.5. **Interior and Above Grade Piping:** ASTM A53/A53M, Type as required by welding method, Grade B, seamless or ERW, Schedule 40 black steel pipe with black malleable iron screwed fittings.

9.6. **Lines Installed Under Slab or In Any Unventilated Areas or Spaces:** Gas piping shall not penetrate building foundation walls at any point below grade. Gas piping shall enter and exit a building at a point above grade. The annular space between the pipe and the wall shall be sealed air and water tight. Gas piping installed concealed in walls, chases, below slab on grade, or any unventilated area or spaces shall be installed in welded Schedule 40, airtight, steel piping and vented to the outside atmosphere through the roof. Suitable internal spacers shall be provided. Inaccessible piping shall be all-welded connections. Socket type weld fittings may be used for gas piping within the airtight steel enclosure. Termination point of vented steel piping

shall be 24” above the roof with a gooseneck and shall be located a minimum of 10’-0” clear from all outside air intakes.

9.7. **Gas Piping Within Schedule 40 Steel Vent Piping:** Gas piping system shall be metallically shielded corrugated flexible gas piping system with valves, fittings, terminations and all components required for the installation, all furnished by the manufacturer. Using components from other flexible gas piping systems other than those specified as part of the FlashShield+ system is not allowed. The system shall comply with ANSI LC 1 "Fuel Gas Piping Systems Using CSST". It shall have CSA Certificate 2728525, ICC-ES Report No. PMG and IAMPO Report No. 3250 and Report No. 0239 listings. It shall be rated for maximum of 25 psi operating range, -40°F to 160°F temperature range, UV resistant, electrically insulated polymer covering complying with ASTM E84 and ASTM A240 Type 304 stainless steel corrugated tubing. Manufacturer shall be GasTite FlashShield+ or equivalent by JM Eagle or Dura-Line. GasTite is the basis of design.

9.8. **Gas Piping Identification:** Gas piping identification shall be provided as specified in Section 15010, Identification, except intervals shall be a maximum of 15 feet for straight runs of piping. Piping with gas pressure exceeding 6” W.C. shall also be provided with metal wrap around tags equal to GasTite EMPT-1-100, indicate direction of flow and pressure of piping contents and placed at intervals and locations specified.

9.9. **Electrical Bonding and Grounding:** The gas piping system shall be bonded to the electrical service grounding electrode system or, when provided, lightning protection grounding electrode system, at the point where the gas service enters the building, all as required by NFPA 54. The bonding jumper shall not be smaller than 4 AWG copper wire and shall be a maximum of 75 feet in length. Devices used for the bonding connection shall be listed for the application in accordance with ANSI/UL 467, Grounding and Bonding Equipment. Where a lightning protection system is installed, the bonding of the gas piping shall be in accordance with NFPA 780, Standard for the Installation of Lightning Protection Systems. Bonding of gas piping systems is electrical work and shall be provided by a qualified licensed Electrical Contractor who is recognized by the Authority Having Jurisdiction as capable of doing such work. Point of connection shall comply with the current edition of NFPA 70, National Electric Code. **It is the responsibility of the Plumbing Contractor to engage a qualified, licensed Electrical Contractor to provide the bonding and grounding as specified**. **Coordinate prior to bid and provide as specified.**

9.10. **Gas Valve and Connections:** Provide UL, CGA and AGA listed and approved, ASTM A-126, Class B, 200 PSI WOG, 125 PSI SWP, lubricated plug valve and pipe union in supply connection to each piece of equipment, Resun R-1430 semi-steel or equivalent for line sizes 2" and smaller.

Provide R-1431, UL, CGA and AGA listed and approved, ASTM A-126, Class B, 200 PSI WOG, 125 PSI SWP, Grade I, flanged, lubricated plug valve and pipe union in supply connection to each piece of equipment for line sizes over 2". Use flat face when connected to flat face companion flange

Where final connection is specified under another Section, cap off within 3 feet of input point.

Provide a custom laser engraved brass valve tag at each regulator identifying gas pressure and pipe contents. Tag shall be 1-1/2 inches diameter, 18-gauge polished brass tags with 3/16-inch chain hole and 1/4 inch high stamped, black-filled service designation.

Equivalents by Flowserve/Nordstrom or Homestead are acceptable.

9.11. **Gas Pressure Regulators:** Provide a regulator at each gas fired appliance/device. Standard service type gas regulators for indoor or outdoor use as applicable, meeting project and Local Gas Company requirements with automatic safety shut-off valves, overpressure protection device (OPD) as required, leak/vent limiting device, cast iron body, with automatic safety shut-off valves, aluminum orifice and chromate covered casting, e-coated or primed with enamel topcoat and tamper proof seals. Verify supply (inlet) pressure prior to selecting regulators. Regulators shall be Maxitrol or equivalent by Sensus, Emerson/Fisher, Security or American.

Contractor shall provide to the Engineer a letter from the local gas company attesting to the maximum pressure drift to the facility downstream of the local gas company's meter/regulator assembly. If the local gas company states that pressure will exceed 2 psi at **any** time, for **any** length of time, the regulator furnished at each appliance within the facility shall be equivalent to Maxitrol Series 325-5L with OPD or equivalent by Sensus, Emerson/Fisher, Security or American as required by job conditions.

Failure to provide the required letter from the local gas company will be cause for automatic rejection of the regulator submittal.

Provide a custom laser engraved brass valve tag at each regulator identifying gas pressure and pipe contents. Tag shall be 1-1/2 inches diameter, 18-gauge polished brass tags with 3/16-inch chain hole and 1/4 inch high stamped, black-filled service designation.

9.12. **Shutoff Valve:** Main gas shutoff valve controlling the gas piping system shall be easily accessible for operation and shall be installed in each service line as indicated and protected from physical damage.

Provide a custom laser engraved brass valve tag identifying gas pressure main on house side of the meter. Tag shall be 1-1/2 inches diameter, 18-gauge polished brass tags with 3/16-inch chain hole and 1/4 inch high stamped, black-filled service designation. Piping with gas pressure exceeding 6" W.C. shall also be provided with metal wrap around tags equal to GasTite EMPT-1-100, indicate direction of flow and pressure of piping contents.

PART 10. PIPE INSULATION

10.1. **General: Plumbing Contractor shall not install piping insulation.** All work shall be by an experienced insulation subcontractor whose primary business is the installation of insulating materials in accordance with insulation manufacturers' recommendations. Piping shall be clean, dry and pressure tested before covering is applied. Size pipe hangers to fit insulated pipe size. **No installation of pipe hangers for insulated piping will be allowed to be in contact with piping or penetrate the**

piping insulation. Piping insulation shall be continuous through partitions/sleeves and shall not be cut away for installation of clamps, valves, fittings, etc. Refer to details on plans and Section 15010, "Pipe Hangers and Supports" for additional requirements. Cover fittings, valves and flanges with insulation material as hereinafter specified to same thickness as adjacent pipe covering except screwed unions and other specifically named items. Neatly bevel covering edges adjacent to unions, valves and other points of termination and seal insulation. All insulation materials (including coatings, mastics, jackets and adhesives) shall have a composite flame spread rating not to exceed of 25/50 rule as determined by ASTM E-84, NFPA 255 and UL 723.

10.2. **General Scope:** Insulate all hot and cold-water piping except that below grade and excluding plated brass fixture connections. All piping shall be routed within the building insulation envelope to prevent freezing. Insulate all p-traps and related piping located in return air plenums, return air platforms, all horizontal overhead drain lines, including p-traps and drain sumps from mechanical room floor drains, ice machine drains, cooler drains, condensate drainage piping, hub drains and other condensate receiving drains, as specified below.

Insulate rainwater drainage system as noted in that Part.

10.3. **Installation of Fiberglass Insulation:** No installation of pipe hangers for insulated piping will be allowed to be in contact with piping or penetrate the piping insulation. Refer to details on plans for additional requirements. Size hanger loops to fit **over** insulation. Insulate with Owens-Corning SSL II with ASJ Max Fiberglass pipe insulation, thickness as shown below, thermal conductivity of k= 0.23 Btu-in/hr-ft2-ºF at 75ºF mean temperature. Insulation shall comply with ASTM C547, ASTM C585, ASTM C1136, ASTM C795, NFPA 90A and 90B and be UL Labeled for Flame Spread Index of 25 or less and Smoke Developed Index of 50.

Adhere SSL by removing release paper after the insulation is installed on pipe and sealing the lap starting in the center of each section, working towards ends. Lap shall be pressurized by rubbing with a plastic sealing tool. Install 3" butt strips in the same manner at the joint between sections and at 3'-0" on center. Staple jacket flaps with nominal 3/4" wide stainless steel or Monel outward-clinching insulation staples on 8" centers. Insulation staples shall have a vapor retarder coating or covered with greater than 3 ply laminate jacket (less than 0.0001 perms) adhesive tape or vapor barrier mastic that conceals the entire staple.

Insulate all fittings and elbows with premolded fiberglass fittings containing **rigid** insulation of equal thickness and density of the adjacent piping and are UL Labeled for Flame Spread Index of 25 or less and Smoke Developed Index of 50.

In lieu of premolded PVC covers at elbows and fittings, which contain rigid insulation as specified hereinbefore, Contractor may at his option miter the insulation. Thereafter, seal staples and cover ends on both sides of fitting with butt strip, staple and seal staples with insulating sealant. Where applicable, finish open ends of sectional covering by rounding off with insulating cement, glass cloth and lagging adhesive.

Cold Water/Domestic Water Insulation thickness:
All pipe sizes 1" thickness

Hot Water Insulation thickness:
For pipe sizes up to 1-1/4" – 1.0" thickness
For pipe sizes 1-1/2" to 6" – 1.5" thickness

10.4. **Insulation for Piping Within Concrete Block Walls:** Insulate with 1" or 1.5" thickness insulation for the respective piping as specified above. Insulation shall be black, flexible foamed, elastomeric, closed cell pipe insulation with a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E84. It shall be GreenGuard certified tubular insulation with Microban antimicrobial protection. Insulation shall have a 'k' factor of not more than 0.26 at 90°F mean temperature and a water vapor transmission rate of 0.05 perm-inches or less. Slip insulation onto pipe prior to installation. **Longitudinal cutting of the insulation is prohibited. Do not stretch or bend insulation.** Insulate sweat fittings with miter-cut pieces of insulation as recommended in Armaflex installation instructions, the same size as on adjacent piping. Seal all butt joints with Armaflex BLV, Black, low VOC, air drying contact adhesive. After gluing joints, wrap joint with 3" wide, 1/8" thick AP/Armaflex self-adhering tape. Insulation shall be AP Armaflex or equivalent by K-Flex or Aerocel AC EPDM.

10.5. **Fiberglass Insulation Fittings:** Insulate with Fiberglas insulation mitered to fit snugly or with PVC covers with integral **rigid** fiberglass insulation of the same thickness and density as the adjacent pipe insulation. **Loose insulation in premolded covers is not allowed.** Premolded PVC covers shall have a flame spread index of 0-25 and a smoke developed index of 0-50 when tested in accordance with ASTM E84.

10.6. **Exposed Ends:** Finish open ends of sectional covering by rounding off with cement, and sizing with fiberglass cloth jacket around the pipe and finish with Foster 30-36 mastic cement.

10.7. **Partitions and Floors:** Refer to Section 15010 Pipe Sleeves. In any case, insulation shall extend through floors, partitions and walls and firestopped. Note that Section 15010, Firestopping, requires firestopping of all penetrations, regardless of rating. Refer to Section 15010, Firestopping, for specifics and additional requirements.

10.8. **Electric Water Coolers:** Insulate drain connections and traps with 1/8" thick insulating tape by AP Armaflex, K-Flex or Aerocel AC EPDM or 1/2" thick fiberglass insulation as specified for piping insulation.

10.9. **Underground Hot and Cold Water Piping:** Insulate with 2" thickness Armstrong Armaflex or equivalent pipe insulation. Seal all joints with Armaflex 520 sealer and 1/8" thickness, 3" wide Armaflex tape.

10.10. **Clevis Hanger Saddle Requirements:** For all piping suspended with clevis hangers, provide a factory fabricated pre-formed, pre-insulated saddle assembly consisting of an **integral** G-90 metal saddle per the table below. **Do not use loose saddles.** The assembly shall be a 360-degree section of 3.0 PCF density top section of polyisocyanurate pipe insulation and 6.0 PCF density bottom section of

polyisocyanurate pipe insulation, with both sections a minimum of 45-psi compressive strength in compliance with ASTM D1622 and ASTM C518 for thermal conductivity (K-Factor). The assembly shall have a 6-mil thickness, industrial grade vapor retarder film in compliance with ASTM D-374 and 0.01 perm rating in compliance with ASTM E-96. The assembly shall also be provided with an insulation lock joint longitudinal seam. The insulation jacket shall have a hazard rating not to exceed 25 flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E-84, NFPA 255 and UL 723. Insulation thickness required shall be same as specified above.

Installation shall be in strict accordance with the Manufacturer's requirements. After installation, install 3" butt strips at the joint between sections where fiberglass insulation and the polyisocyanurate insulation butt together. Staple insulation jacket flaps and seal staples as specified above for fiberglass insulation.

Clevis Hanger Saddle Requirements

Nominal Pipe Size	Insulation Length	Saddle Length	Saddle Gauge
1/2" - 1-1/2"	9"	6"	22 Ga.
2" - 5"	18"	12"	18 Ga.
6" - 10"	18"	14"	16 Ga.

The assembly shall be Tru-Balance Model 3300E or equivalent by Thermal Pipe Shields, Inc, Pipe Shields, Inc. Carpenter & Paterson, Inc. or Clement Support Services. Tru-Balance is the basis of design.

10.11. **<u>Unistrut Support Saddle Requirements</u>:** For all piping supported by Unistrut assembly, provide a preformed, G-90 galvanized metal saddle per the table below and in compliance with ASTM A-527. The saddles shall be pre-formed to fit the exact specified fiberglass insulation diameters per ASTM C-585. The assembly shall be a 2-piece, upper and lower unit for complete self-clamping 360-degree insulation protection. Insulation thickness required shall be same as specified above.

Unistrut Saddle Requirements

Nominal Pipe Size	Saddle Length	Saddle Gauge
1/2" - 3-1/2"	12"	18 Ga.
4"	12"	16 Ga.
5" - 6"	18"	16 Ga.
8" - 10"	24"	14 Ga.

The assembly shall be Buckaroos 58 Series Saddle or equivalent by Thermal Pipe Shields, Inc, Pipe Shields, Inc. Carpenter & Paterson, Inc. or Clement Support Services. Buckaroos is the basis of design.

10.12. **<u>Painting</u>:** Paint exposed insulation after insulation is completed as specified in Section 15010.

10.13. **<u>Identification</u>:** Refer to Section 15010 for identification of piping systems.

PART 11. GAS FIRED CONDENSING TYPE WATER HEATERS (WH-1 and WH-2)

11.1. **General:** Water heaters shall be A.O. Smith Model BTH Series Cyclone Mxi (WH-1) and shall bear an ASME stamp. WH-2 shall be Series HE without ASME stamp. Equivalents by Rheem Triton SU, Bradford-White or Lochinvar will be acceptable. Water heaters shall be of the seamless glass lined steel tank construction in which the glass coating is applied to the water-side surfaces of the tank after the tank has been assembled and welded. The condensing flue coil shall be coated on the flue gas side with acid resistant glass lining designed for use in condensing heaters.

Each water heater shall be provided with Manufacturer furnished commercial grade condensate neutralizing kit, neutralizing agent anti-scale system and all required accessories

Condensate piping from the combustion chamber of the condensing type water heater to the neutralizing tank shall be solid wall PVDF acid resistant piping as specified hereinbefore. Piping from discharge of neutralizing tank to drain shall be Schedule 80 solid wall PVC piping and fittings meeting ASTM Standard D1785 unless Manufacturer recommends otherwise.

The heater shall be furnished with minimum 2" legs and suitable for venting with the venting/combustion air system specified below for the job conditions and in sizes recommended by the water heater Manufacturer. The heater shall be suitable for sealed combustion direct venting and terminated through the wall or roof as shown on the plans. The heater shall be factory assembled and tested. The power burner shall be of a design that requires no special calibrations on start-up. **The heater shall be approved for 0" clearances to combustibles.**

The control shall be an integrated solid-state temperature and ignition control device with integral diagnostics, LED fault display capability and digital display of temperature settings.

The tanks shall be foam insulated and equipped with an ASME rated temperature pressure relief valve. The water heater shall bear an ASME stamp, be UL listed and exceed the minimum efficiency requirements of ASHRAE/IES 90.1.b-1991.

NOTE: The Plumbing Contractor shall arrange and pay for the State of Alabama Boiler and Pressure Vessel Safety Division inspector to visit job site to inspect water heater and/or boiler installation and obtain written approval and certification as required. Correct all deficiencies required by the Inspector without additional cost to the Owner or the Owner's Project Design Professionals, using materials and methods, as directed by, the State of Alabama Boiler and Pressure Vessel Safety Division Inspector.

11.2. **Vent / Combustion Air System: ASTM Standard D2665 PVC nor CPVC pipe are allowed**. The system and each of its components shall be a zero clearance to combustibles, factory fabricated, single solid wall, ETL listed to UL 1738, flame resistant polypropylene with integrated gaskets or ETL listed to UL 1738 piping and solvent weld cement. It shall be designed for use in conjunction with Category II, or Category IV condensing gas fired appliances, rated for a maximum continuous flue

gas temperature of 149°F and listed for maximum positive pressure rating of 20" W.C.

The vent system shall be continuous from the appliance's flue outlet and combustion air inlet to the concentric vent termination outside the building. All systems components shall include vent horizontal and vertical supports, roof or wall penetrations, terminations, appliance connectors, fittings, drain fittings, etc., required and shall be UL listed and provided by the vent manufacturer. All systems components shall include a factory-installed gasket in their female-end to render the vent air and watertight when the male/female ends are pushed together as per manufacturer's instructions. All pipe, fittings, terminations and solvent weld cement (where required by the Manufacturer) shall be third party marked as listed to UL 1738 and assembled to the manufacturer's instructions.

Provide a test port section immediately above the appliance for testing of the flue gases, horizontal drain tee at location specified by the assembly Manufacturer, stainless steel flashing with PPs-gray or ETL listed to UL 1738 UV protected end pipe and bird screen. Vent systems requiring field installed sealants or compounds are not acceptable unless specifically required by the system manufacturer.

Installer shall be certified by the vent system Manufacturer to install the venting system. Contractors who are not certified by the venting system Manufacturer are not allowed. Contractor shall submit his Letter of Certification with the Project Plumbing Submittals.

The vent layout shall be designed and installed in compliance with assembly manufacturer's installation instructions, the water heater manufacturer requirements, its UL listing and all applicable local codes. The assembly and its required components shall be selected by the vent manufacturer. Furnish for approval a Manufacturer approved diagram for each venting system required for this project.

All items furnished that extend thru the roof shall adhere to roofing manufacturer's requirements so as not to void the roofing warranty.

Each gas fired appliance requires its own assembly. Do not combine multiple vents into a single vent. The venting system shall be approved for use by the appliance Manufacturer.

DIFFERENT MANUFACTURERS HAVE DIFFERENT JOINT SYSTEMS AND ADHESIVES. DO NOT MIX PIPE, FITTINGS OR JOINING METHODS FROM DIFFERENT MANUFACTURERS. JOINING METHODS SHALL BE AS REQUIRED BY THE SPECIFIC SYSTEM MANUFACTURER.

Note that the requirement of cast iron vent through the roof is NOT applicable to condensing type water heaters.

The system shall be Centrotherm Commercial SW, IPEX System 1738 PVC or DuraVent PolyPro.

11.3. **Relief Valve:** The vacuum relief valve shall comply with ANSI Z21.22 and CSA/ASME rated temperature and pressure relief valve on the water heater with copper relief line piped as indicated on the plans. Temperature and pressure relief valves, or combinations thereof devices shall bear the label of an approved agency and shall have a temperature setting of not more than 210°F and a pressure setting not exceeding the tank or water heater manufacturer's rated working pressure or 150 psi, whichever is less. The relieving capacity of each pressure relief valve and each temperature relief valve shall equal or exceed the heat input to the water heater or storage tank. Do not pipe/connect relief discharge line and auxiliary drain pan lines together. Manufacturer shall be Watts, Apollo or McDonnell and Miller.

11.4. **Expansion Tank:** Provide diaphragm type with NSF liner, designed for 150 psig working pressure and shall bear an ASME stamp. Tank shall have a minimum acceptance as recommended by heater manufacturer. Expansion tank shall be supported at the wall by a QS-5 or QS-12 Quick Strap tank stainless steel and galvanized assembly as manufactured by HoldRite or approved equivalent.

11.5. **Circulating Pump:** Furnish and install, as shown on the plans an all lead-free bronze (0.25% or less lead content of all wetted surfaces) or stainless steel construction, pipe-mounted centrifugal pump with high efficiency ECM motor in eight (8) modes of control and stainless steel flanges. Pump shall be ETL or UL listed and be NSF 372 compliant. Provide a strap-on aquastat and wire to control the pump. Provide required control wiring. Pump power shall be as shown on the electrical plans. Pump shall be Armstrong Series Compass H or equivalent by Taco or Grundfos.

11.6. **Miscellaneous:** Heaters shall be placed on 4" concrete housekeeping pad with rounded corners.

PART 12. FIXTURES SUPPORTS AND CONNECTIONS

12.1. **General:** Verify exact size and location of water, vents, waste and supply connections from approved rough-in drawings and/or catalog data sheets. Allow for modifications required by the shop drawings without additional cost to the Owner or the Owner's Project Design Professionals.

All fixtures including lavatories, urinals, water closets, electric water coolers, etc., shall be securely fastened to the walls or floor. **Coordinate all mounting heights and fixture types required with Architectural plans prior to rough-in and ordering fixtures.**

12.2. **Wall Mounted Fixtures:** Support all wall mounted fixtures that are specified without carriers using 1/4" thick 6" high plates full length and width of fixture, mounted behind wall. Where fixtures are back to back on a solid wall, mount with bolts from fixture hanger to fixture hanger. Do not use toggle bolts or expansion bolts unless noted on the plans or specified.

Hangers for wall supported water closets are specified with fixtures.

Where fixtures are mounted on solid (single wythe) walls finished both sides, install fixtures with plated toggle bolts.

Where fixtures are mounted on wood or light gauge steel studs, employ pressure treated blocking of 2" x 12" nominal size well secured into stud line with non-corrosive, dielectric separation fasteners. Fit behind stud flanges, using especially placed studs as required.

Provide wall carriers where specified and required by the fixture Manufacturer.

Coordinate demolition and repairing of existing walls with General Contractor prior to bid to allow for installation of carriers as applicable.

12.3. **Floor Connections:** Provide cast iron or galvanized malleable iron floor flanges at least 3/16" thick, screwed or caulked to drainage pipe. Bolt the connection and make tight to fixture with plumbing fixture setting compound, wax setting ring or polyethylene gasket flange. Offset flanges for water closets are not allowed.

12.4. **Water Supply Connections:** Provide rigid, lead-free brass nipple from water riser to fixture stop valve threaded connections. Steel pipe is unacceptable. Exposed portion of nipple shall be chromium plated. **Stops' risers shall be lead-free, threaded with chrome over copper pipe. Quick connect fittings or braided supplies are not allowed**.

12.5. **Waste Arms to Fixtures:** As specified hereinbefore. Where copper or brass pipe is specified, all joints downstream from the trap shall be soldered joints.

PART 13. SCHEDULED FIXTURES AND MISCELLANEOUS ITEMS

13.1. **Acceptable Manufacturers:** Fixtures listed are from American Standard (AS), Zurn and Elkay Catalogs. Equivalent products by Toto, Kohler, Just or Sloan will be accepted. Where three (3) Manufacturers are listed for fixtures below, use only those Manufacturers. Manufacturers not listed require 7-day prior approval. All prior approvals shall be submitted through the Architect.

13.2. **Fixture Trim:** Exposed metal parts to be of heavy weight polished brass, heavily chromium plated, of best quality as regularly furnished by the plumbing fixture manufacturer. Provide stop valve in supply to all fixtures and equipment.

13.3. **Compliance with Americans Disabilities Act:** All fixtures, faucets, flush valves, etc., specified or shown to be ADA type shall be manufactured and installed in complete compliance with the current requirements of the Americans Disabilities Act.

13.4. **Guarantee:** Guarantee in writing to make good without cost any defects in materials and workmanship for one (1) year. Manual and sensor operated flush valves shall be provided with a five (5) year replacement warranty. Warranty/guarantee shall start on the date of substantial completion of the project as determined by the Architect. Provide free maintenance and service during the first 12 months of the guarantee period.

13.5. Scheduled Items:

P – 1 Water Closet: American Standard Madera 3461.160, Comfort height, EverClean, Zurn Model Z5655-BWL1, 1.6 GPF vitreous china, siphon jet, elongated bowl with 1-1/2" top spud, fully glazed trapway, china bolt caps, Zurn Z6000AV-WS1 flush valve and Bemis 1655SSCT or Zurn Z5955SS-EL-STS white open-front seat with self-sustaining stainless steel check hinge, closet bolt, wax ring kit and all other items required for a complete installation. Provide YJ chrome plated split-ring wall bracket for supply pipe. Provide Zurn Z5972-COMB closet bolt and wax ring kit for installation.

P – 2 ADA Water Closet: American Standard Madera 3461.160, EverClean, Zurn Model Z5615-BWL, 1.6 GPF 17" high vitreous china, siphon jet, fully glazed trapway, elongated bowl with 1-1/2" top spud, china bolt caps, Zurn Z6000-AV-WS1 flush valve and Bemis 1655SSCT, Zurn Z5955SS-EL-STS or approved equivalent white open-front seat with self-sustaining stainless steel check hinge. Provide chrome plated YJ split-ring wall bracket for supply pipe. Coordinate flush valve installation with grab bar. Flush valve control/handle shall be mounted for use from the wide side of the toilet stall.

P – 3 Sink: Elkay ELUH 191610, 21-1/2" x 18-1/2" x 10", single compartment 18 gauge undermount, stainless steel sink complete with Z826B1-XL-2F with swing spout faucet, LK-35 crumb cup strainer and tail piece, Zurn Z8702PC 1-1/2" P- Trap and Zurn Z8804XL-LR-PC supplies and stops. Provide lead-free mixing valve (ASSE 1070) with tempered water line to faucet. Mixing valve shall be provided with wall bracket, dual check valves and 40-mesh stainless steel screen. Mixing valve shall be Watts LFUSG-B-SC-M2, Zurn Wilkins ZW3870XLT or Leonard 170D-LF.

P – 4 ADA Lavatory: American Standard Lucerne 0355.012, Zurn Model Z5364, 20" x 18", wall hung vitreous china lavatory complete with Zurn Z81000-XL-3M single control faucet, 1.5 GPM vandal resistant aerator, McGuire #LF2167, Zurn Z8803-XL-LRLK-PC, 1/2" supplies with stops, McGuire #155WC, Zurn Z8746-PC offset drain, McGuire 8872 p-trap and heavy-duty floor supported JR Smith Series 0710, Z1231EZ chair carrier with concealed arms. Where lavatory manufacturer drain outlet complies with ADA requirements, offset drains are not required. Supplies shall be lead-free, AB1953 certified by recognized authority and bear manufacturer and testing mark. Provide lead-free mixing valve (ASSE 1070) with tempered water line to faucet. Mixing valve shall be provided with wall bracket, dual check valves and 40-mesh stainless steel screen. Mixing valve shall be Watts LFUSG-B-SC-M2, Zurn Wilkins ZW3870XLT or Leonard 170D-LF. The entire assembly shall comply with ADA and ANSI standards. Insulate supplies, trap and drain with premolded ADA compliant protectors with internal fasteners as Manufactured by Truebro Lav Guard 2, Oatey/Dearborn or McGuire Pro-Wrap only. Refer to Architectural plans for mounting heights.

P – 5 Mop Basin: American Standard 7741.000 Florwell, Zurn Model Z5850-D3-RG-HH-MH-WG, acid resisting enameled cast iron corner model floor type service sink, complete with American Standard 8354.112, Zurn Z843M1-XL-CS, wall mounted faucet with offset shanks and integral stops, levered vandal resistant handles, vacuum breaker, integral check valves, adjustable wall brace, pail hook, 3/4" hose thread on spout, four foot rubber hose, Bradley 9933-00 combination utility

shelf/broom holder and utility shelf constructed of 18 ga. 304 stainless steel with 16 ga. stainless steel gussets and hooks, 7745.811 rim guard, strainer for 3" screw connection, 304 stainless steel wall guards and silicone sealant at all points where basin meets wall and floor.

P – 6 Washing Machine Connection Box: Guy Grey, no lead, Catch-A-Drip or Safety Drip, washing machine connection box with 2-inch trapped standpipe and quarter turn, Watts Duo-Cloz, lead-free bronze or brass valve (washing machine NIC) and water hammer arrester. Box and faceplate shall be 20 ga., powder coated galvanized steel. Equivalents by Oatey, SharkBite or LSP will be acceptable.

P – 7 Shower: Willoughby TPV ASSE 1016 thermostatic / pressure balanced shower valve with check stops, CSH 2.5 conical shower head with metal trim, service stops, chrome plated brass shower head. Equals by Chicago or Powers will be considered.

P – 8 ADA Shower Unit: Shower enclosure shall be equivalent to Comfort Designs Model SSS 6239 BF, COL .75 solid surface finish, ADA compliant transfer shower with ADA compliant HDPE fold up seat, stainless steel L-Bar, vertical bar and additional vertical bar required by current ANSI A117.1 Standard. Outside dimensions shall be 62" x 39-1/2" x 72-3/4". Verify all dimensions piping requirements and grab bar locations with Architectural plans prior to ordering shower. Furnish no caulk drain and curtain rod. Equal units by Watermark or Aquarius will be considered.

Furnish Willoughby Industries Model WRS-FA-ADA-(L or R) – TPV-2.5-FX-HL fully recessed, front access, stainless steel panel with temperature and pressure balanced shower valve (T/P ASSE 1016), hand held shower bracket, hand held shower with shut-off and 69" stainless steel hose, two wall hooks, recessed soap dish, mounting frame and in-line vacuum breaker. Equivalents by Chicago, Powers or Acorn will be considered.

When the shower is placed directly on a concrete floor (no tile), it shall be provided with a pre-leveled barrier free base.

All exposed trim, handles, drains, etc., shall be metal with polished nickel chrome plated surface.

Coordinate wall, floor and ceiling finishes with Architectural plans and provide as required.

P – 9 Refrigerator Icemaker Water Connection Box: Unit shall be NSF-372 compliant; IAMPO listed and accommodate supply line from above. Supply box shall include a 1/4-turn; chrome plated, forged brass, lead-free, ASME A112.18.1 ball valve with stainless steel water hammer arrester and inlet water sweat fitting. Valve shall accommodate all common industry inlet connections. Box shall be 20 ga. stainless steel, fire rated frame if required, and outlet connection shall be 1/4". Every unit shall include frame and a debris cover for protection during rough-in. Unit shall be Sioux Chief OxBox or equivalent by Guy Grey or Watts.

P – 10 Dishwasher by Others: Rough in and connect.

P – 11 ADA Lavatory: American Standard Aqualyn 0476.028, Zurn Model Z5114, ADA compliant, 20" x 17" vitreous china oval self-rimming lavatory with Zurn Z81000-XL-3M single control faucet, 1.5 GPM vandal proof aerator and Zurn Z8743-PC grid drain, McGuire #LF2165, Z8802-XL-LRLK-PC supplies with stop and McGuire 8872C, Zurn Z8700-8-PC, 1-1/4", 17 ga., chrome plated cast brass, seamless tubular wall bend, p-trap with neoprene gasketed cleanout and cast brass, chrome plated slip nuts and 17 ga. chrome wall escutcheon. Supplies shall be lead-free, AB1953 certified by recognized authority and bear manufacturer and testing mark. Provide lead-free mixing valve (ASSE 1070) with tempered water line to faucet. Mixing valve shall be provided with wall bracket, dual check valves and 40-mesh stainless steel screen. Mixing valve shall be Watts LFUSG-B-SC-M2, Zurn Wilkins ZW3870XLT or Leonard 170D-LF. Insulate supplies, trap and drain with premolded ADA compliant protectors with internal fasteners as Manufactured by Truebro Lav Guard 2, Oatey/Dearborn or McGuire Pro-Wrap only.

P – 12 Sink: Elkay LR-3321, 33" x 21" double compartment 18 gauge stainless steel sink with self-rimming construction complete with one LKD- 232-SBH5C faucet, two LK-35 crumb cup strainers and tail pieces, McGuire 8912, Zurn Z8702-9B-PC, 1-1/2" p-trap 17 gauge continuous waste, and two Brasscraft XR1720A, Zurn Z8803-XL-LRLK-PC angle stops.

P – 13 ADA Sink: Elkay LRAD 2219, 22" x 19" x 6" deep, single compartment 18 gauge stainless steel sink with self-rimming construction complete with one LKD-LKGT4083 faucet with deck plate and escutcheon, LK-35 crumb cup strainer and offset tail piece, 8912 1-1/2" P-trap 17 gauge continuous waste and two Brasscraft XR1720A angle stops. Sink shall have drain at rear of the compartment as required to meet ADA regulations. Verify cabinet depth and slope with Architectural plans prior to ordering sink.

P – 14 Bi-Level Indoor Electric Water Cooler With Bottle Filler: Elkay #LZSTLG8WSSK, filtered, bi-level, wall mounted, front and side bubbler push bar, electronic bottle filler sensor on lower unit, ADA and ICC A117.1 compliant with cane apron, stainless steel cabinet and receptor, safety bubbler and 5-year warranty. It shall provide 8 gal/hr of filtered water at 50°F based on 80ºF inlet water and 90ºF ambient temperature, per ASHRAE 18 testing. Unit shall be certified to UL 399 and CAN/CSA C22.2 No. 120 and NSF/ANSI 61 & 372 for lead free design. Furnish with 1-1/4" rough brass p-trap, 17-gauge brass tailpiece and waste with wheelless stop valve, concealed J.R. Smith 0834 or Zurn Z1225-BL Bi-Level floor mounted support, related 70085-86-6 support plates and base as required for applicable wall construction. Refer to Architectural plans for wall type. Provide three (3) 51300C Water Sentry Plus Replacement Filters, certified to NSF 42, NSF 53 and NSF 372 (Lead free) for each set of water coolers provided. Upon completion of the project, turn over replacement filters to Architect for transfer to Owner. Equivalent units by Halsey Taylor, Oasis or Murdock will be considered.

P – 15 Ice Machine: Furnished by others. Rough-in and connect. See miscellaneous items below for additional requirements.

P – 16 Shower Unit: Comfort Designs Model SSS 3636 SH 4.0-1 or equivalent by Hamilton or Aquarius with outside dimensions of 35-3/4" x 36" x 77-1/4". Finish surface shall be of a sanitary grade solid surface with minimum thickness of 55 mils and a finished cured Barcoal hardness of 80-90 as tested by ASTM D-2583 and no

caulk drain. Unit shall meet CSA B45.5-11 and be HUD-UM73 compliant. Shower to have 1.0" diameter stainless steel curtain rod, molded leg ledge, recessed soap dish and 4" threshold. **Verify all dimensions with Architectural plan prior to ordering shower and provide size as required**. Equal units by Watermark or Aquarius will be considered.

Shower shall be furnished with Willoughby Industries Model WRS-FA-TPV-2.5-UBJ-RD, fully recessed, front access, stainless steel panel with temperature and pressure balanced shower valve (T/P ASSE 1016), check stops, ball joint multi stream 2.5 gpm head, arm and escutcheon. Equivalent units by Chicago, Powers or Acorn will be considered.

When the shower is placed directly on a concrete floor (no tile), it shall be provided with a pre-leveled barrier free base.

All exposed trim, handles, drains, etc., shall be metal with polished nickel chrome plated surface.

Coordinate wall, floor and ceiling finishes with Architectural plans and provide as required.

PART 14. MISCELLANEOUS EQUIPMENT FURNISHED UNDER OTHER SECTIONS

14.1. **General:** Equipment indicated hereunder is to be furnished and set in place under another Section of the Specifications (or is to be so provided under a separate contract). Verify exact size and location of water, vents, waste, supply and gas connections from approved rough-in drawings and/or catalog data sheets. All water and gas connections are to be complete with stop valves.

Allow for modifications required by the shop drawings without additional cost to the Owner or the Owner's Project Design Professionals.

Ice Machine: Provide cold water supply with stop, PDI Symbol "A" shock absorber and ASSE 1012 backflow preventer equal to Watts Model LF-9D. Pipe the vent discharge line from vent outlet to floor sink or another safe place of disposal. Provide drain line to floor sink and insulate with 3/4" thick "Armaflex" by Armstrong. Seal all joints.

END OF SECTION

SECTION 15500 - FIRE PROTECTION

A. GENERAL:

1. Section 15010, 15400 are applicable in full.

B. SHOP DRAWINGS:

1. Prepare hydraulic calculations and a working pipe shop drawing layout showing precise locations, elevations and sizes of sprinkler piping. Prepare a sprinkler head layout on a reflected ceiling plan. Indicate on the reflected ceiling plan sprinkler heads, lights, exit lights, smoke detectors, HVAC ceiling devices and any other items that are attached to the ceiling. In hard ceilings, heads shall follow the general arrangement and pattern of lights and air devices. *In lift out ceilings, sprinkler heads shall be centered in ceiling tiles.* After review by Architect, make adjustments as noted by Architect. Coordinate location of piping and sprinkler heads with other work, including piping, ducts, diffusers and light fixture layout. When submitted to Architect, drawings and calculations shall bear the stamps of approval from Owner's Underwriter and local Fire Marshal's Office and any authorities having jurisdiction.

2. Hydraulic Calculation are to be prepared utilizing a current water flow test (maximum 90 days old). If a current Water Flow Test is not available, obtain a current test and pay for all fees required.

3. Fire protection shop drawings shall be designed under the supervision of an Engineer licensed in the State of Alabama, and drawings shall bear their seal and dated signature.

C. CODES:

1. Provide all equipment, piping, valves, switches and complete operating system to standard of NFPA, Pamphlets 13, 14, 20 and 24 (latest editions) and in compliance with local, county and state authorities, Owner's Underwriter, and these Specifications.

D. SERVICE:

1. Connect to site fire service provided under the Civil Section. Verify exact location in filed prior to beginning work.

E. FIRE PROTECTION SYSTEM:

1. The building is to be provided with an NFPA 13 compliant automatic sprinkler system providing automatic sprinkler coverage for entire building.

2. Refer to Electrical Drawings and Specifications for wiring alarms of supervisory switches and related equipment.

3. All wiring other than power wiring, supervisory switches, flow switches and alarm wiring shall be the responsibility of this Section. Wiring shall conform to the requirements of the Electrical Section.

4. Provide one (1) wall mounted sprinkler head cabinet with 12 heads of each type utilized together with required wrenches.

F. SPRINKLER HEADS:

All sprinkler heads located in ceilings shall be 'concealed' type with factory ceiling white cover plate. All sprinkler heads to be quick response. Provide upright pendants for areas without ceilings.

1. Upright: Reliable Model F1FR, bronze finish.

2. Pendant: Reliable Model F1FR with one (1) piece chrome plated with shallow escutcheon, Reliable Model F1FR with one (1) piece chrome plated cup assembly for recessed applications, Reliable Model F4FR with factory painted cover plate in color selected by Architect for concealed applications. Install in center of lift-out ceiling tiles. Recessed and semi-recessed sprinkler heads only to be used in normally unoccupied areas.

3. Sidewall: Reliable Model F1FR horizontal extended coverage with one (1) piece chrome plated escutcheon, Reliable Model G horizontal extended coverage with one (1) piece chrome plated cup for recessed applications, Reliable Model F1FR upright for upright applications.

4. Dry: Pendant Reliable Model F3QR with one (1) piece plated escutcheon, Reliable Model F3QR with one (1) piece chrome plates recessed cup for recessed applications, Reliable Model F3QR with factory painted cover plate in color selected by Architect for concealed applications.

5. Dry Sidewall: Reliable Model DH56 horizontal extended coverage with one (1) piece chrome plated escutcheon for recessed applications, Reliable Model DH56 horizontal extended coverage with factory painted cover plate in color selected by Architect for concealed applications.

G. FIRE PROTECTION PIPING:

1. System shall comply with NFPA Pamphlets 13, 14, and 20.

2. All Fire Protection Piping within building black steel. All Fire Protection Piping outside of building - ductile iron.

3. Ductile iron pipe: Cement lined, ANSI A-21.50.

4. Schedule 40 black steel for all piping 2" and smaller or for cut grooving. Schedule 10 black steel for roll grooving for pipe 2-1/2" and larger.

5. Joints on black steel screwed piping: Make up with Teflon tape applied to male threads only.

6. Joints on ductile iron piping: Standard mechanical joint ANSI A-21.11. Provide retainer glands, on all fittings. Provide concrete thrust black, minimum 1 cubic yard, at all fittings.

7. Joints on black steel grooved piping: Victaulic or Gustin Bacon couplings, ASTM A-47.

8. Connect to fire service, provided and installed under Civil Section. Verify exact size and location with Civil Section prior to beginning work.

9. Support all pipe in accordance with Section 1510 “General Mechanical Provisions”.

H. VALVES:

1. Fire Protection Valves:

a. Gate Valves 2" and Smaller: All bronze, 175 psig WP, UL listed, OS&Y, solid disc, Stockham B-133, Crance 459, Nibco T-104-O, Milwaukee valve BB-SC100.

b. Gate Valves 2-1/2" and Larger: Iron body, bronze trim, flanged, 175 psig WP, UL listed, OS&Y, Stockham G6343, Crane 467, Nibco F-607-0.

c. Check valves: Iron body, bronze trim, 175 psig WP, UL listed, Stockham G-939, Crane 375, Nibco F-908-B.

2. Dry Pipe Valve if required: Reliable Model D flanged valve complete with Model B1 accelerator, gages, drains, electrical flow switches and all accessories necessary for proper installation and operation. Properly size valve for system. Verify electrical characteristics with Electrical Section. Pipe drains to mop sink or floor drain.

I. SWITCHES:

1. Flow Switch: Notifier Sprinkler Equipment group WFD Series.

2. Supervisory Switches: Notifier Sprinkler equipment group OS&Y two (2) for OS&Y gate valves or Pibur for post indicator/butterfly valves.

K. FIRE DEPARTMENT CONNECTION:

1. Potter/Roemer 5000 Series flush mount, coordinate requirements with local Fire Marshal.

L. SUBSTITUTE MANUFACTURERS:

1. Where Croker is listed above Potter/Roemer, Elkhart, Guardian or Sierra may be substituted.

2. Where Aurora is listed above Allis Chalmers, Patterson or Peerless may be substituted.

M. SPRINKLER HEAD INSTALLATION:

1. Installation of sprinkler heads shall be made using factory recommended and approved wrenches only.

2. Install sprinkler heads in the center of lift-out ceiling titles.

N. PIPING INSTALLATION:

1. Provide drain piping to approved locations for all low points. Provide inspectors test piping to the building exterior at approved locations.

2. Install using tradesmen regularly engaged in fire protection piping.

3. Fire protection piping may be factory cut to lengths, but field modifications will be required to coordinate with other trades.

O. EQUIPMENT:

1. Valves, Fire Department Connections and any point that the fire department may connect to and shall be compatible with the local fire department.

P. PERIODIC INSPECTION:

1. Make two (2) periodic inspections within the first year after completion and acceptance of the work. Furnish a complete written report of each inspection to the Architect and the Underwriter.

Q. FIRE PROTECTION PIPING TEST:

1. Test in accordance with NFPA Pamphlets 13, 14, 20 and 24. Architect's, Owner's Underwriters and local fire marshall shall witness tests. Provide certificate of inspection to the Architect/Engineer including the name of those witnessing the test.

2. On completion of roughing-in and before connection to existing piping, cap all outlets, make connections with house supply line, and put under full water pressure. Test by applying additional pressure, by temporary pump or compressed air connection, to total hydrostatic pressure 1-1/2 times street pressure, but not less than 200 psig for a period of not less than four (4) hours. Immediately and completely stop all leaks. Retest when system is watertight.

3. After testing, leave general pressure on until ready to install sprinkler heads and fire department valves, etc. except when necessary to drain to avoid freezing during construction.

R. COMPLETION OF TEST:

1. Upon completion of all testing, Contractor shall provide to the Architect copies of test results and including a listing of all personnel witnessing the tests.

S. WATER SUPPLY

Hydraulic design shall be based on the following available water supply at the point of connection to the existing water main.

Contractor shall provide flow test at site for basis of design and make adjustments without additional cost to owner.

END OF SECTION 15500

SECTION 15700 - HEATING, VENTILATING AND AIR CONDITIONING

PART 1. GENERAL

1.1. **General Provisions:** Section 15010 is applicable in full hereto. No materials or products that contain asbestos, formaldehyde, polychlorinated biphenyl (PCB), lead or mercury, in excess of limits mandated and defined by OSHA, LEED and the EPA, shall be utilized.

Manufacturers not named in the specifications require prior approval, seven (7) days prior to bid date. Follow procedures set forth in Division 1 of the specifications. All prior approvals shall be submitted through the Architect.

1.2. **Qualifications of Subcontractor:** Shall be properly licensed and established as a Heating and Air Conditioning Contractor at location of the work. He shall have had previous experience in the satisfactory installation of at least six (6) systems of this type, size and scope. The Sub-Contractor shall have an adequate service facility to provide complete service and maintenance of the facility within 100 miles of the installation.

1.3. **General Scope:** Include all equipment, material, and labor required for complete and proper installation and operation of HVAC systems, even though not every item involved is indicated. Do not attach any items to other trades' assemblies. Items shall be attached to building structural system.

Advisory provisions listed in all Codes referenced in the Contract Documents are mandatory. Where conflicts occur between a Code, Standard, the contract drawings or specifications, the most stringent requirements shall govern and be applied.

Refer to other sections of this specification and Section 15010 for additional information and requirements.

1.4. **Site Visits:** It is the contractor's responsibility to have the job ready for site visits when they are scheduled. If the project is not ready for the requested site visit and the Architect, any governmental agency or any other entity requires an additional site visit with the Engineer present, the contractor shall pay Zgouvas, Eiring & Associates a re-visit fee of $750. The payment shall be made directly to Zgouvas, Eiring & Associates 5 days prior to the scheduled site visit.

The Contractor is urged to carefully review the extensive requirements of Paragraph "Identification" in Section 15010 of the specifications and note that certain identification is required to be completed before certain site visits. **There are specific identification requirements prior to the above ceiling and final site visits, respectively, that are mandatory. Failure to comply with this provision will be cause for cancellation of the site visit, and a fee imposed for the additional site visit, with all costs of the additional site visit to be borne by the respective Contractor responsible.**

1.5. **Miscellaneous:** The Contractor shall carefully examine the contract documents during the bidding phase. Any missing information in the contract documents that is required for obtaining accurate pricing shall be brought to the attention of the Architect, **prior to bid date**, so all may be clarified and/or corrected. Failure to identify and resolve the issues prior to bid shall require the Contractor to provide said items, complete, without additional cost to the Owner or the Owner's Project Design Professionals, using materials and methods specified by, and as directed by, the Owner's Design Professionals.

1.6. **Identification:** The Contractor is urged to carefully review the extensive requirements of Paragraph "Identification" in Section 15010 of the specifications and note that certain identification is required to be completed before certain site visits**. There are specific identification requirements prior to the above ceiling and final site visits, respectively, that are mandatory. Failure to comply with this provision will be cause for cancellation of the site visit, and a fee imposed for the additional site visit, with all costs of the additional site visit to be borne by the respective Contractor responsible.**

1.7. **Painting and Colors:** Furnish to the Architect, color cards for standard and premium colors available. **The Architect shall select color where choices exist**. Refer to Architectural Painting Section of the specifications for additional requirements.

1.8. **Safety Provisions:** Provide covers or guards on all hot, moving and projecting items that may be deemed by the Engineer, Architect or Owner to be a hazard to occupants of the building or to service personnel.

1.9. **Spare Parts:** Manufacturer of any equipment specified shall have a wholesale outlet for readily available replacement parts in the nearest major USA city.

1.10. **Submittals:** Refer to Section 15010 for **strict** submittal requirements, and especially as it applies to Project cost constraints, addendums or Value Engineering (VE) items.

1.11. **Firestopping:** Refer to Section 15010 for requirements. **Note that Division 15 firestopping specifications require firestopping of all penetrations regardless of wall/ceiling/floor construction. Refer to Division 1 for additional requirements.** Where there is a conflict between Division 1 specifications and Division 15 specifications, the most stringent requirements shall govern, be applicable and shall be provided.

1.12. **Service, Charges, Lubrication, Filters, etc**.: Furnish complete first charges of refrigerant, lubrication, oils, etc., and be responsible for such full charges for the guarantee period. Provide service and maintenance for all equipment and systems during the guarantee period. As a minimum, quarterly service calls and reports are required. Make last service call two weeks prior to year-end site visit. All quarterly service shall include lubrication of all motors, bearings, calibration and adjustment of all controls and equipment, full refrigerant charge, new filters, belts, etc.

The Contractor is responsible for quarterly filter changes, and cleaning of washable filters, during the guarantee period and shall inscribe onto the filters' casing the date filters were installed/replaced.

The Contractor shall furnish to the Architect and the Owner individual written service reports for all work done under this warranty. Failure to provide the Architect with the Owner's written acknowledgement of service calls shall be construed to mean that the service calls have not been accomplished and are still required.

1.13. **Field Instructions:** The Contractor shall operate all systems for a period of six (6) days after completion of the work. During this time, provide competent personnel to thoroughly instruct representatives of the Owner in the proper operation and care of all equipment and control systems. Secure written acknowledgement of such training from the Owner. Failure to provide the Architect with the Owner's written acknowledgement of this training shall be construed to mean that the instructions have not been accomplished and are still required.

1.14. **Bound and Framed Instructions: Two weeks before the final site visit**, furnish three complete sets of operating and maintenance instructions, bound in hard cover, indexed and tabbed.

a. The first sheet in the bound instructions shall be a listing of: The Owner/Project Title, Architect, Engineer, General Contractor and Subcontractor.
b. Second page shall be a Table of Contents listing all products numbers in the order which they appear in the specifications and label the tab accordingly.
c. All warranty information shall be filled in by the Mechanical Contractor (Serial numbers, Model Numbers and all other information required by the Equipment Manufacturer).
d. Provide copies of all filled in warranty cards.
e. Provide a summary page that lists each item with its respective warranty listed.
f. Provide a copy of the Contractor's Warranty
g. Local source of supply for parts and replacement, including names and telephone numbers of parts suppliers
h. Provide wiring and control diagrams with explanatory data; control sequences of operation, start-up, operation and shutdown; operating and maintenance instructions for each piece of equipment; manufacturer's bulletins and catalog data; parts list and recommended spare parts. Fold in large sheets of drawings and enclose.
i. A general maintenance summary section shall be included. Provide a list of each piece of equipment using equipment designations as shown on the plans, and the routine maintenance procedures based on the respective manufacturer's recommended intervals. As a minimum, maintenance shall be grouped and individually tabbed to indicate maintenance operations required:

    1. Once a month
    2. Quarterly
    3. Once every six months
    4. Once a year

j. Provide drawings of system control and wiring diagrams, condensed operating instructions, and lubricating schedule and include in binder. All components shall be numbered and identified on diagram. Place in the binder. Also, frame under glass or plastic and mount in each mechanical room in an optimally viewed location.

k. Record drawings of the HVAC drawings, including HVAC Controls drawings, in hard copy and PDF format on CD. Refer to Section 15010, Part 1, General, Paragraph, Record Drawings for additional requirements.
l. Copy of Test and Balance Report.
m. Provide copy of results of all tests specified.
n. Provide copy of test results of the refrigerant systems that contain greater than 55 pounds of refrigerant as specified.
o. Copies of all Site Visit Reports including Contractor's written response that items listed were corrected.
p. Provide copy of all start-up reports specified.
q. Provide Owner's letter certifying training of Owner's personnel in the operations of the HVAC systems has been accomplished.
r. Provide copy of hoods certification
s. Provide DVDs of HVAC Controls systems training of Owner's personnel

Additionally, the Contractor shall provide all of the aforementioned information, in digital Adobe Acrobat PDF format, on a CD-R CD. The PDF file shall be provided with an embedded index for each item specified. It shall appear in the left hand window of the opened document so that the Owner or his maintenance personnel can "click" on the indexed item and move immediately to that specific item.

1.15. **Warranty:** Guarantee work as set forth in Section 15010 and Division 1. Guarantee in writing to make good without cost any defects in materials and workmanship for one year following the date of substantial completion of the project, as determined by the Architect, and unless specified otherwise a 5-year warranty on all air conditioning compressors. Provide free maintenance and service during the guarantee period to **include furnishing and replacing of filters.** Refer to other parts for additional requirements and extended warranty requirements.

PART 2. ELECTRICAL WORK AND EQUIPMENT

2.1. **Power:** All power wiring required for installation of equipment is specified under Electrical Division. Electrical equipment shall be compatible with the current shown on electrical drawings. **Contractor shall verify all voltage and power requirements with Electrical Contractor, Electrical plans, and at the project site, prior to ordering equipment.**

2.2. **Motors:** All motors furnished shall be designed, manufactured, and tested in accordance with the current applicable standards of NEMA, ANSI, IEEE, and ASTM. As a minimum requirement, all motors shall conform to the current applicable sections of NEMA Standard No. MG-1, Part 3. Motors must meet or exceed The Consortium for Energy Efficiency (CEE) Premium Efficiency™ full load efficiencies. All motors 1 HP and over shall be premium efficiency. All motors 1 HP or less shall have ECM motors.

All motors shall be listed under UL recognized component file as applicable. All motors shall be suitable for installation according to the requirements of NEC. Motors shall be wound for the specified voltage and a 1.5 service factor, 1750-RPM open drip proof construction and minimum of Class "F" insulation unless otherwise shown or specified.

The bearings shall have a rated fatigue life of B-10 of 150,000 hours for direct-coupled applications and 50,000 hours for belted applications minimum. Belted rating shall be based on radial loads and pulley sizes called out in NEMA MG 1. Load on motors shall not exceed 100% nominal horsepower. Routine factory testing shall be conducted in accordance with Method B of IEEE 112 (current edition), Standard Test Procedure for Polyphase Induction Motors and Generators and shall be as described in Article 12.55 of NEMA MG1, Motors and Generators. **Premium efficient motors shall be warranted for 36 months from date of substantial completion of the project as determined by the Architect.**

Where shown, specified or required, furnish increment wound motors for two-step starting. All motors shall be provided with overload protection and phase protection on all legs. Do not run motors until correct overload elements are installed in starters. Trading overload elements for elements of correct size for motors actually furnished shall be included in this Section.

All motors serving outdoor equipment exposed to weather shall have TEFC motors meeting the requirements set forth previously.

Motors shall be by Allis Chalmers, General Electric Goulds, Louis Allis, Westinghouse or approved equivalent.

2.3. **Fusing:** Provide factory installed fuses in all equipment requiring fusing for branch circuit protection.

2.4. **Motor Starters:** To be furnished under this Section; installation thereof is specified under Electrical Division, except for those which are specified to be factory assembled. Starters shall be Cutler-Hammer, Allen-Bradley, Square D or General Electric. Starters shall be U.L. and NEMA approved. Where required for interlocks provide built-in step down transformer. Motors for VFD drives shall be designed for NEMA MG-1, Part 30.

Motor starters shall be mounted on wall at accessible height standing from floor. Equipment mounted or Uni-strut type frame mounting is not acceptable.

Provide for each motor or group of motors requiring a single control (and not controlled from a motor-control center), a suitable controller and devices that will function as specified for the respective motors.

Provide overload protection for each ungrounded conductor to each motor 1/8 HP or larger (manual reset type unless indicated otherwise). The overload-protection device shall be integral with the motor or controller. Unless indicated otherwise, furnish pilot lights with all remote starters. Where auxiliary control devices are connected into control circuit, these devices shall not bypass safety controls (motor-overload protective devices, high-pressure cutouts, low pressure cutouts, etc.). Provide "Hand - Off - Auto" switches, auxiliary contacts, etc. for all starters.

2.5. **Unit Protection:** All fan motors, indoor units, outdoor units, condensing units, packaged units, etc., shall be provided with surge protection and phase protection to insure against voltage unbalance, over/under voltage, phase loss, reversal, incorrect

sequencing and rapid short cycling. Protection shall be provided for all 3-phase equipment utilizing ICM Controls Model 450 A Plus+ or equivalent. All single phase equipment with horsepower greater than or equal to 1/8 HP shall be provided with protection utilizing ICM Controls Model ICM 492 or equivalent. The Contractor shall consult with the Owner's maintenance personnel and set up all programmable options based on the Owner's requirements, within the device's capabilities. Phase protection is not required on equipment being controlled via a variable speed frequency drive; if the specified protection is inherent with the variable speed drive furnished.

2.6. **Controls:** All control cables and wiring shall be in EMT conduit (no "whips"). Do not route control wiring through sleeves containing piping. All control wiring penetrating any exterior wall, interior partition, floor, and similar construction shall be in EMT conduit. EMT control conduit shall be as specified in the Electrical Division of the specifications and/or as shown on electrical drawings. Minimum HVAC Controls conduit size shall be 3/4" in size. All control conduit, power, relays, contactors, transformers, wiring, etc., required for a complete functional system as specified, shown on the plans, or as required to accomplish the specified sequences of operation, which is not shown or specified by the Electrical Division, shall be furnished and installed by the HVAC Controls Contractor. This shall include all power, interlock control wiring between the various components of the heating, ventilating and air conditioning system, lighting interlocks and all smoke detection system electrical wiring. Electrical work performed under this Section shall conform to requirements set forth in the Electrical Division of the specifications. All wiring shall be in accordance with the National Electrical Code, and all State and local codes. Coordinate all requirements with the Electrical Sub-Contractor prior to bid and provide all as required.

All thermostat and humidistat boxes shall be mounted 46" A.F.F. to the center of the box (ADA height). Where wall mounted CO_2 Sensors are indicated, they shall be mounted 58" A.F.F to the center of the box. Electrical work performed under this Section shall conform to requirements set forth in the Electrical Division of the specifications. All wall-mounted devices shall be provided with hinged, locking metal covers with rounded edges.

All work shall be done by an approved, independent HVAC Controls Subcontractor whose primary business is the installation and servicing of HVAC controls systems. Refer to Section 15920, Building Automation System (BAS) for detailed requirements.

2.7. **Controls and Instrumentation Cable:** Instrumentation cable shall be minimum AWG as recommended by the equipment Manufacturer or the HVAC controls system Manufacturer. The most stringent shall be provided. All wiring, cabling, conduit, connections, etc., shall be plenum rated and rated for use at temperatures and conditions expected in the location of mounting

2.8. **Wiring Diagrams:** Furnish to the Electrical Contractor for the specific makes and models of electric-motor operated equipment to be installed. **Contractor shall verify all voltage and power requirements with Electrical Contractor, Electrical plans, and at the project site, prior to ordering equipment.**

2.9. **Modifications:** The cost of any modifications of the electrical power wiring, breakers, and/or control wiring conduit, etc. that is required for any items specified in this Section 15700, or controls having electrical power requirements differing from that shown on the electrical drawings and/or as specified, shall be the responsibility of the Mechanical Contractor.

PART 3. VIBRATION AND NOISE CONTROL

3.1. **General:** Elimination of objectionable vibration and noise is the responsibility of the Contractor, who must provide all foundations, isolators, flexible connections, air chambers, curbs, etc. required thereby. Pay special attention to vibration problems at year end site visit and correct all deficiencies noted.

All items of mechanical equipment shall be properly isolated from the structure by means of the Engineer's approved vibration absorbing accessories, foundations or supports. Each foundation shall include an adequate number of standard isolation units. Foundations for each piece of equipment shall be submitted for approval.

Isolator units shall be standard catalog products with printed loading rating. Manufacturer shall be TR Finn and Co., Inc. or equal product by Amber-Booth, Consolidated Kinetics, Korfund Dynamics, Mason Industries or Vibro-Acoustics.

3.2. **Vibration Isolation Pads - Indoor Units:** One layer of 3/4" thick, fire/heat resistant, continuous neoprene pad. Coordinate with details on plans.

3.3. **Roof Mounted Condensing Units Supports for Individual CCHP and DHP Mini-Split Heat Pump Systems:** Provide factory fabricated equipment supports as required to properly mount units to roof structure. **Coordinate this requirement with the Architect and Roofing Contractor prior to bid.** The assembly (condensing unit attached to curb) shall be furnished and installed by the Contractor to withstand the minimum wind loads prescribed in IBC Section 1609 and IMC 301.12. Supports shall be equal to Thybar Series "TEMS" complete with flashing, wood nailer, bulkhead reinforcing, etc. Prefabricated equipment mounting supports to be of prime G-90 galvanized steel construction, 14 ga. meeting ASTM A653/653M, with welded corners with seams joined by continuous welds. Supports shall be internally reinforced with bulkheads 24" on center, factory installed 2" x 4" wood nailer and 18-gauge counter flashing cover. Height to be NRCA 10" above roof deck. Equipment supports shall span a minimum of two (2) joists and not cantilever more than 12". Support shall be level at the top with pitch built-in when deck slopes per building specification of an inch per foot or greater. All items furnished shall adhere to roofing manufacturer's requirements so as not to void the roofing warranty. Coordinate with architectural and structural plans for required slope. Coordinate roof curb and interface to the building roofing system and verify minimum net height to be as required by Code and Architect. Provide 1/2" thick neoprene vibration isolation and anchor units to curbs.

3.4. **Packaged Rooftop Heat Pump Units (PHP) and Packaged Rooftop Heating and Air Conditioning Units (PHAC) and Packaged Rooftop VAV Heating and Air Conditioning Units (PAC) and MAU-1:** Provide factory fabricated equipment supports as required to properly mount units to roof structure. **Coordinate this**

requirement with the Architect and Roofing Contractor prior to bid. The assembly (packaged unit attached to curb) shall be furnished and installed by the Contractor to withstand the minimum wind loads prescribed in IBC Section 1609 and IMC 301.12. Coordinate all requirements with the Structural Engineer prior to installation. Frame shall be steel, designed to mate the bottom perimeter of the equipment, to receive the roof flashing, and to form a weatherproof duct connection and entry into the conditioned space. It shall have pressure treated wood nailers to receive the roof flashing. The top of all roof curbs shall be level with pitch built into curb when deck slopes 3/8 of an inch per foot or more. Coordinate with architectural and structural plans for required slope. Coordinate roof curb and interface in the building roofing system and verify minimum net height to be as required by Code and the Architect. Coordinate all curb requirements with roofing contractor and provide as recommended so as not to void roofing warranty.

3.5. **Sound Levels:** Sound levels caused by operation of pumps, fans, air handling systems, etc., whether generated within rooms or transmitted to rooms through ducts, walls or floors, pipes, etc., shall not exceed specified NC rating at any point within room not more than 6 feet from an air outlet in accordance with ASHRAE octave band method. Offices, classrooms, conference rooms and similar spaces shall have maximum NC-32; corridors, and lobbies, NC-40; toilets, NC-45, Sleeping Spaces; NC-30.

PART 4. TESTING, START-UP, BALANCING, ETC.

4.1. **General:** Conduct tests upon completion of the heating, ventilation and air conditioning installations, and at times as designated by the Architect. Furnish written reports to the Architect of all tests results. Provide copies of all test results in the Bound and Framed Instructions specified hereinbefore. Furnish all necessary personnel, test instruments, power, fuel, etc., as required to complete the specified requirements.

4.2. **Refrigerant Piping:** Test with CO_2 gas and prove tight. Test high and low side of system at 500 psi. After evacuating the system and charging with refrigerant, test piping with a halide torch and prove tight under actual operating conditions.

The installing contractor shall issue on his company letterhead, to the Local Code Official and the Authority Having Jurisdiction, a certificate of testing for all systems containing 55 pounds or more of refrigerant. The certificate shall give the unit number as shown on the plans, the test date, name of the refrigerant, test medium and the field test pressure applied to the high pressure side and the low-pressure side of the system. The certification of the test shall be signed by the installing contractor.

4.3. **Ductwork for Systems Less Than 2,000 CFM:** Test all supply, return, relief and outside air, exhaust ducts, plenums and casings and make substantially airtight before covering with external insulation or concealing masonry. Substantially airtight shall be construed to mean that no air leakage is noticeable to the senses of touch or sound at joints.

4.4. **Ductwork for Systems 2,000 CFM or Greater:** Test all supply, return, relief and outside air, exhaust ducts, plenums and casings and make airtight before covering with external insulation or concealing in masonry. Test supply ductwork under the

positive pressure for the respective system. Test return and exhaust ducts, plenum and casing under a positive pressure of 0.75"WG. Maximum allowable leakage shall be 10%. Vacuum clean ducts, plenums, casings and coils. Demonstrate operation of fire dampers before testing and starting. Check that flexible connections are installed in folds (not pulled tight) and not transmitting vibration.

4.5. **Type I Kitchen Hood Exhaust Ductwork:** Two tests shall be performed as outlined below.

A smoke machine shall be provided to generate a non-corrosive effluent at the bottom of the duct system, whereby natural upwards drafts will pull the smoke to the top of the duct system. **DO NOT USE SMOKE BOMBS.** Once the smoke has reached the top of the duct run, cap the duct securely and inspect all joints for leakage. Upon detection of smoke leakage, weld all leakage points and re-test the entire system.

Additionally, a light test shall be performed to determine that all welded joints are liquid/air tight. The light test shall be performed by passing a lamp having a power rating of not less than 150 watts or 1,800 lumens LED light through the entire section of ductwork to be tested. The lamp shall be open so as to emit light equally in all directions perpendicular to the duct walls. The test shall be performed for the entire duct system, including the hood-to-duct connection. The ductwork may be tested in sections, provided that every joint is tested.

4.6. **Testing of all Fire Dampers:** The Mechanical Contractor and the Testing and Balancing Contractor shall test all fire dampers and verify installation of access panels to each damper. Test all fire dampers by releasing holding mechanism. Test activation of smoke dampers with smoke. Certify in writing that all dampers have been checked and perform correctly. Notify the Architect one week prior to final testing.

4.7. **Domestic Water Circulating System:** Test and adjust domestic water recirculation system to ensure hot water circulation in all mains. Provide flow rate of pump and determined head.

4.8. **Performance Tests:** After cleaning, balancing, and testing are completed as specified, test each system as a whole to see that all items perform as integral parts of the system, and that temperatures and conditions are evenly controlled throughout the building. Verify all sequences of operation and report. Make corrections and adjustments as necessary to produce the indicated conditions. All work shall be performed by an independent test and balancing agency whose primary business is the testing and balancing of heating and air conditioning systems and its related components.

The Test and Balancing Contractor shall hold a current NEBB, NBC or AABC certification. **Proof of certification shall be provided at the submittal stage.** The test shall cover a period of not less than three days and shall demonstrate that the entire system is functioning properly. Provide the following:

Date of testing, space temperature and humidity, outdoor air temperature (DB & WB), air temperature entering condenser coil; refrigerant suction temperature and

pressure at compressor evaporator coil; condensing temperature and pressure and load amperes for all motors. Also, provide CFM readings at all grilles, registers and diffusers and entering and leaving air temperatures at each evaporator coil.

Provide typed list indicating job setting of all automatic controls. Include settings of thermostats, humidity controls, CO_2 sensors, safety controls, minimum damper settings, fire-safety thermostats, pressure controls, temperature controls, and other similar items. Tabulate to show type of control, location, setting and function. Verify that all safety settings and limits are appropriate and comply with current safety Codes and Regulations for the respective system.

After building is occupied, make adjustments as requested by Owner.

4.9. **Balancing:** Check airflow at all supply, return and exhaust grilles, all diffusers and outside air intakes with a recently calibrated direct-reading velocity instrument. Adjust systems to deliver, supply air, return air, outside air or exhaust air quantities to within 10 percent of the indicated amounts. Provide instruments and otherwise assist Architect in checking balancing at final site visit.

4.10. **Unit Protection Verification:** The Test and Balance Contractor, with cooperation from the Mechanical Contractor, shall verify that all phase protection specified has been installed where specified, and installed per the Manufacturer's requirements. The verification of this requirement shall be furnished in tabular form with findings included in the test and balance report. The summary shall list all equipment specified to have the protection, verification that the device is installed per the Manufacturer's recommendation and has been programmed to the Owner's requirements.

4.11. **Test Data:** Submit typewritten report as specified above. Include schedules of readings taken during the testing and balancing operations and a line diagram or plan of the system indicating specified quantities and final balanced quantities **two weeks prior to final site visit**. **Failure to comply with this provision will be cause for cancellation of the site visit, and a reinspection fee imposed, with all costs of the re-inspection to be borne by the Contractor responsible. No final site visit will be made without this data.** Report the required or specified reading, the first reading taken, and final balanced reading for the following items:

Fans: Size, type, speeding rpm, outlet velocity in fpm, static pressure inches water, air quantity in cfm, and motor load in amperes.

Air Handling Equipment: Size, type, fan speed in rpm, outlet velocity in fpm, external static pressure inches water, total static pressure inches water, air quantity cfm, and motor load in amperes.

All Air Outlets and Inlets: Size, velocity in fpm, and air quantity in cfm.

Coils: CFM, size, face velocity in fpm; air temperature entering coil and air temperature leaving coil, wet-bulb and dry-bulb degrees F.

Refrigerant Hot Gas Reheat Coil: Adjust humidistat so that valve opens. Verify modulation of the coil valve. Provide coil size, face velocity in fpm; air temperature entering coil and air temperature leaving coil, wet-bulb and dry-bulb degrees F.

Ducts: Size, velocity in fpm, and air quantity in cfm.

Heat Pump Units Auxiliary Heaters: Provide heater capacity (KW), number of stages of heat and load amperes.

Air Cooled Condensing Units: Air temperature entering condenser coil; refrigerant suction temperature and pressure at compressor and evaporator coil; condensing temperature and pressure and load amperes for all motors.

Kitchen Hood and Related Fans: CFM, size, face velocity at exhaust entry into filters with filters installed and with filters removed, CFM to A/C and make-up air plenum for each run out and exhaust CFM at each hood collar. Include duct and collar pressure drops.

4.12. **Control Settings:** In cooperation with the HVAC Controls subcontractor or the mechanical subcontractor as applicable, calibrate, adjust, and verify sequences of operation and the control systems, including the refrigerant hot gas reheat coils, to show that the requirements of these specifications have been met.

Verify all specified sequences of operation and provide report. Provide a tabulation of setting on all controls indicating set point and throttling range, etc. after controls and systems have been finally adjusted. Include settings on safety controls and cutouts. Verify that all safety settings and limits are appropriate and comply with current safety Codes and Regulations for the respective system. Provide typed list indicating job setting of all automatic controls. Include settings of thermostats, humidity controls, CO_2 sensors, safety controls, minimum damper settings, fire-safety thermostats, pressure controls, temperature controls, and other similar items. Tabulate to show type of control, location, setting and function. Verify that all safety settings and limits are appropriate and comply with current safety Codes and Regulations for the respective system.

4.13. **Notification:** Notify the Architect one week prior to all testing. The Contractor shall provide all testing equipment and shall furnish written reports to Architect of all tests results. Additionally, provide copies in the Bound and Framed Instructions specified hereinbefore.

PART 5. SHEET METAL DUCT WORK (LOW VELOCITY 2" S.P.)

5.1. **General Scope:** Provide as shown and as required for the air conditioning, heating and ventilation systems. Make changes in dimensions, offsets or crossovers as necessary to clear piping, lights and structural members, and to maintain scheduled headroom. Provide all accessories required. Refer to architectural drawings and specifications.

All exposed internally lined or double wall ductwork shall have paint grip finish or shall be primed in the field to receive paint. Refer to Architectural section “Painting”

for painting of exposed ductwork. In case of the absence of painting requirements in the aforementioned Specification Section(s), the interior and exterior of ductwork visible from any finished space shall be cleaned, primed and painted as directed by the Architect. Ductwork visible through all grilles, registers, diffusers, ceilings, etc. shall be painted flat black with paint having a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E84.

5.2. **Protection of Interior of Duct from Debris:** ALL open portions of ductwork shall be covered with a self-adhesive film or airtight sheet metal caps to prevent the intrusion of contaminates. All duct taps, duct take-offs, etc., shall be protected immediately after the tap, take-off, etc. has been fabricated in the field. When sections of sheet metal are delivered to the facility for fabrication in the field, which cannot be protected with the specified material, the sheet metal shall be covered with Visqueen. Prior to erecting same, ductwork shall be manually cleaned to remove all dust, dirt and construction debris. All ductwork shall be erected clean. After each section of ductwork is erected, immediately protect all openings as specified herein before. In effect, there shall be no ductwork opening that is exposed to the ambient air. The material shall be a minimum of 3-mil thickness and have a minimum tensile strength of 10 psi. It shall be UV resistant, waterproof and recyclable. Material shall be DuroDyne Dyn-O-Wrap or approved equivalent. **Any ductwork discovered to be unprotected as specified is subject to immediate rejection for use on this project.**

5.3. **Protection of Interior of Ductwork When Any Air Moving Equipment is Operating During Construction and Prior to Owner's Occupancy:** If air moving equipment must be used during construction, temporary filtration media with a Minimum Efficiency Reporting Value (MERV) of 8, as determined by ASHRAE 52.2 and shall be installed at each return air grille, return air register, exhaust grille, exhaust register, and unit return air inlet. The General Contractor shall provide a written request to the Architect for permission to temporarily operate any HVAC equipment during construction. The request shall be provided a minimum of seven (7) days prior to the desired date of the interruption. Do not operate any equipment without the Architect's written approval.

5.4. **Sizes:** Take measurements at job and fit work into available space. Report to the Architect any unworkable conditions encountered and alter layout or duct sizes as directed without additional cost to the Owner or the Owner's Project Design Professionals. Unless otherwise approved, conform to dimensions indicated. Duct dimensions shown indicate NET FREE AREA after installation of duct liner; increase sizes indicated to allow, therefore.

5.5. **Sheet Metal:** ARMCO, or equal, prime quality, G-90 galvanized sheet steel. Unless indicated otherwise on the plans, gauges shall be as recommended in the current edition of current SMACNA "Duct Construction Standards" **but in no case shall be less than listed in the table below for the respective duct largest dimension or diameter**.

Up to 30 inches	24 ga.
31 to 54 inches	22 ga.
55 to 84 inches	20 ga.
85 to 96 inches	18 ga.

5.6. **General Fabrication:** Construct and erect in a skillful manner, meeting requirement of the current SMACNA "Duct Construction Standards" for 2" static pressure unless noted or specified otherwise. **Where conflicts occur between current SMACNA requirements and the contract drawings or specifications, the most stringent requirements shall apply. In general, the heaviest gauge metal and the strictest installation/fabrication methods shall be provided.** Form straight and smooth on the inside, with joints neatly finished. Make up in sections of such length that mechanic can reach thru open end to seal insulation at previous joint. Assemble and anchor to be completely free from vibration and drumming under all conditions of operation. Make takeoffs at round ducts with prefabricated round-to-rectangular and rectangular-to-round transitions.

Where ductwork penetrates non-rated partitions above the ceiling or insulation support/attic air barriers, draft stops and similar partitions, the openings shall be sized as required for duct and insulation, plus 1". Provide duct supports as specified within 12" of each side of the partition penetrated. **DO NOT ALLOW DUCT TO REST ON PARTITION WALLS**. Openings shall be saw cut or properly blocked out and present a neat appearance. Where penetration occurs at rated assemblies, provide appropriate fire damper and install as specified and detailed. Where penetration occurs at non-rated assemblies, fill void between assembly and duct with fire retardant mineral wool insulation and seal with fire stopping material to prevent the passage of smoke and fire. After closing and filling the annular space, provide 4" wide, 16 gauge galvanized steel closure plates around the penetration, completely covering the opening. Closure plates shall fit snugly to duct, shall be secured to assembly and sealed airtight.

Provide additional supports to raise ductwork off any metallic piping. Wherever any bare metallic piping is in contact with externally insulated duct or bare sheet metal duct, there shall be dielectric separation provided. The Contractor shall provide 1" thickness, **unslit** AP Armaflex insulation of sufficient inside tubular diameter to snuggly and completely cover the respective piping. The insulation shall extend the full length of the affected area plus 6" on both sides. Refer to Part "Pipe and Miscellaneous Insulation Work" in this division for AP Armaflex material specification. The use of Rubatex insulation between piping and the ductwork shall only be allowed when providing the proper supports is not an option.

Refer to Paragraph "Hangers and Supports" for additional requirements.

5.7. **Exposed Ductwork:** Install tight against the wall, overhead structure or ceiling with drive slip joints and other supports as required. Refer to Architectural plans for duct locations. If duct locations are not shown on the Architectural plans, coordinate locations with the Architect prior to fabricating or installing any ductwork.

Provide 4" wide, 16 gauge galvanized steel closure plates, except at grilles and registers, where exposed ducts pass through walls and partitions. Fill void between wall penetration and duct with fire retardant mineral wool insulation and then seal with fire stopping compound prior to installing closure plate. Closure plates shall fit snugly to duct and shall be secured to wall. All ductwork and closure plates that are exposed to view in finished areas shall be primed and painted as directed by the

Architect. Do not install closure plates until Engineer or Architect has verified the proper sealing on the penetration.

All exposed rectangular ductwork traverse joints shall be made with all metal DuctMate joints system as manufactured by DuctMate Industries, Inc., Quikduc Transverse Duct Connection Systems, Duro Dyne Dyn-O-Mate or approved equivalent. DuctMate system shall be installed in strict accordance with current SMACNA and manufacturer's recommendations and instructions.

All exposed internally lined or double wall ductwork shall have paint grip finish or shall be primed in the field to receive paint. Refer to Architectural section “Painting” for painting of exposed ductwork. In the absence of painting requirements in the aforementioned Specification Section(s), the exterior of ductwork visible from any finished space shall be cleaned, primed and painted as directed by the Architect. Ductwork visible through all grilles, registers, diffusers, ceilings, etc. shall be painted flat black with paint having a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E84.

5.8. **Branch Ducts to Diffusers:** Round runouts to diffusers, up to and including 14” round, shall be 24 ga., G-60 galvanized, DuctMate Series GreenSeam +Snap Lock pipe with factory sealed longitudinal and transverse gaskets. Gasket for GreenSeam +Snap Lock pipe shall contain antioxidants, fungicides, adhesion promoters, zero VOCs and shall meet or exceed ASTM E-84 test requirements. 16” round to 20” round runouts shall be 24 ga. and equal to DuctMate Series Reeves Lock Pipe, G-60 galvanized pipe.

5.9. **Return Air Platforms:** Return air platforms shall be constructed with 1-1/2”x1-1/2”x1/4” steel angle iron frame and 18 ga. G-90 galvanized steel all sides, top and bottom, then sealed airtight. Insulate all sheet metal sides, top and bottoms with 2” thickness, 1.5 lb. density, unfaced duct liner, same as internally lined ductwork. Provide angle iron supplemental supports and pedestal type pipe columns to support the units and allow individuals to stand on the platform without platform deformation or failure. Platforms shall be a minimum of 24” tall, or as space permits. **No combustibles are allowed in the return air plenum.**

5.10. **Cross-Joints, Seams and Stiffening:** Join and stiffen with combination of joint types and structural angles as recommended in current SMACNA "Duct Construction Standards". **Cross break all flat areas over 35 inches wide.** Install internal ends of slip joints in the direction of flow.

All transverse joints with long dimension over 24" shall be made with all metal DuctMate joints system as manufactured by DuctMate Industries, Inc., Quikduc Transverse Duct Connection Systems or Dyn-O-Mate with roll-formed flanges, corner pieces, gasket, and cleat. System used shall be installed in strict accordance with current SMACNA and manufacturer's recommendations and instructions.

Make all cross joints and all branch, grille and diffuser take-offs, except DuctMate joints, air tight by applying fibrated, low VOC, LEED IEQ 4.1 compliant duct sealer. Sealer shall meet and pass ASTM D-2202, ASTM C-731 and EPA regulations. Sealer shall meet the requirements for the pressure classification of the ductwork

installed. Sealer shall be Hardcast Iron Grip 601 with 10-year or equivalent by Foster or Childers.

5.11. **Turns and Transitions:** Fabricate turns with an inside radius equal to width of duct. At 90-degree turns, Contractor may substitute square elbows, with standard factory-made, multiple, double-blade constructed vanes. Vanes shall be a double wall, true airfoil contour with smoothly rounded entry nose with extended trailing edge. Vanes shall be formed from a single piece of 26 ga., hot dipped galvanized steel and shall be 3" radiused vanes on 2.4" centers. Vanes shall be provided with two (2) tie rods and continuous internal tubes for stiffening and rigidity. Maximum pressure drop shall be .06" W.G. at 1500 FPM. Generated sound power level shall not exceed 54 decibels in band 4 at 2000 FPM (24"x24" duct size). **Single wall turning vanes are not allowed.** Vanes shall be as manufactured by Aero/Dyne Series HEP, Duro Dyne HTV/DHV, Hamlin Sheetmetal or approved equivalent by DuctMate. Avoid abrupt changes in shape, with a slope of 4:1 the minimum allowed.

5.12. **Branch Duct Take-Off:** Provide at all points where branch ducts take off from trunks, and where ducts divide. Refer to details on the drawings. Damper shall be minimum 22 Ga., G-90 Galvanized steel with 2" build out. Body shall be a minimum of 24 Ga., G-90, galvanized steel with 4" W.G. construction. Fitting shall have 1" flange with corner clips, pre-punched mounting holes and adhesive coated gasket. Take-off shall be Flexmaster LDS, BO3, GSI HETO (high efficiency take-off) HTS2, Elgen HET or approved equivalent.

5.13. **Fire Dampers:** Provide as shown on drawings and in each duct passing through firewalls, floors, and other fire barriers in accordance with NFPA Code 90A. Install in such manner that fusible links can be replaced. Employ UL listed links rated at 165 degrees F (212 degrees where within 10 feet of a heating coil).

Typical dampers shall be UL labeled, minimum 1-1/2 hour rated, (higher where required), equal to Prefco #5500, with Type B, 21 gauge galvanized steel wrap around low resistance frame, 21 gauge galvanized steel blades and 16 ga. factory sleeves. Equivalent products by Air Balance, Ruskin, Pottorff or Airstream Products will be accepted. Where damper is installed behind wall grilles or registers use No. 5500-E6-LPB.

Install in accordance with all applicable conditions of the UL listing, for which data sheets must be submitted for approval. At typical ducts, provide 16 ga. sleeves secured in opening with 1-1/2" x 1-1/2" x 14 ga. (min.) angles, bolt angles and damper sleeve with galvanized bolts. Size structural openings so that space between sleeve and masonry is not less than 1/8" per linear foot of duct or more than 1/2". Secure ducts to sleeve per detail and current SMACNA requirements. After installation release holding mechanism and verify proper closure of each damper.

Ductwork in fire-rated floor-ceiling or roof-ceiling assembly system with air ducts that pierce the ceiling of the assembly shall be constructed in conformance with designs in UL Fire Resistance Directory. In general, ducts shall be encased in fire rated material.

At internally insulated ducts, size dampers for gross duct size, so that liner butts into

damper frame surround.

5.14. **Volume Dampers Used with Automatic Controls:** See Controls at end of Section 15700.

5.15. **Volume Dampers:** For round ducts less than 12" diameter and rectangular ducts less than 12" in height in either dimension: Single leaf, constructed with 18-gauge galvanized metal with locking type control quadrant, single center U-bolt and pivot rod extending through opposite side of duct with brass bushing at both ends.

5.16. **Volume Dampers:** For round ducts greater than or equal to 12" diameter or rectangular ducts greater than or equal to 12" height in either direction, provide opposed blade, airfoil blades of 16 ga.-galvanized steel mounted in steel frames by 3/8" steel trunnions riding in brass bushing with dual U-bolts. Blade width shall not exceed 10 inches and individual blade length shall not exceed 48 inches. Extend one trunnion to permit operation from outside the duct. Provide manually operated dampers with cadmium plated steel locking quadrant. Dampers opening to the outside shall have felted edges.

5.17. **Stand-Off Mounting Brackets:** Locking-type quadrant operators for dampers, when installed on ducts to be externally insulated, shall be provided with standoff mounting brackets, bases or adapters to provide clearance between the duct surface and the operator not less than the thickness of the insulation. Standoff mounting items shall be integral with the operator or standard accessory of the damper manufacturer.

5.18. **Access Panels/Doors:** Provide double wall access door in the side of the duct for each fire damper, motorized damper, on each side of duct mounted coils and duct heaters, smoke detectors and elsewhere indicated, specified or required for proper maintenance. Size and position to provide maximum access to all items. Typical doors shall be double metal faced, 22 ga. steel door panels and 22 ga. frame, internally insulated same as duct (1" minimum) fiberglass insulation, neoprene gasket seal and full length plated steel piano hinges with cam lock. Provide access panels/doors with cam locks only, where hinged access panels/doors cannot be completely opened without obstruction. When access panels/doors are provided with cam locks only, they shall be provided with a safety chain. Access panels/doors shall be rated for the anticipated duct pressure, plus 1". All access doors located outside shall be airtight and weatherproof.

For ducts 10" round and smaller, provide a removable section of duct to provide required access. Refer to other sections for access doors required in kitchen hood exhaust ducts, moisture-laden ductwork, etc.

Hinged access doors shall be Ruskin Series ADH22. Removable access doors/panels with cam locks shall be Ruskin Series ADC22 with minimum of two cam locks and safety chain. Nailor Industries Model 08SCL/Model 08SH, Kees ADH/ADC or Pottorff Series HAD/CAD will be acceptable.

Hinged access doors for round ductwork shall be flush mounted, flat oval, 1" insulated, low leakage, 22 ga. steel door panels and frame, except with two large hand knobs or cam locks with safety chain, and equivalent to Ruskin Model ADR2

for round ducts 10" round, up to and including, 16" round duct. Nailor Series 0800 or Pottorff Series DMR will be acceptable.

Refer to Section 15010 for additional access door/panel requirements including identification.

5.19. **Duct Instrument Test Holes:** Provide for each system four test holes (two in supply duct and two in return air plenum) at opposite ends near air handling units with screwed caps. In addition, at duct mounted coils and electric duct heaters provide one on either side of the coil or duct heater.

5.20. **Flexible Connections and Bonding Jumpers:** Install so that the cloth is in folds (not drawn tight). Connect all ducts to air handling units and fans, excepting dome type fans, with preassembled flexible connection. Fabric width shall be 6" for all air handling equipment. Ceiling mounted exhaust fans and VAV terminal units whose total scheduled CFM is less than or equal to 1,200 CFM may be 4" width.

Connectors for all air handling equipment, including VAV terminals, shall be a factory fabricated and assembled unit with 6" dual fabric, heavy duty, 20 oz/sq. yd polyester/polyester fabric with flame resistant coating and mildew resistant per ASTM G-21. The assembly shall comply with NFPA 701, NFPA 90A, NFPA 90B and ASTM E-84. The unit shall be constructed of minimum 24 ga. galvanized steel meeting ASTM A-653-94-G60. Metal to fabric connectors shall be double locked, airtight and waterproof to 10" W.C. positive pressure and 10" W.C. negative pressure. Assembly shall be DuctMate PROflex with power lock connection or approved equivalent by DuroDyne.

Flexible connections for ceiling exhaust fans and VAV terminal of capacity specified above shall be preassembled flexible connection of 29 ounce fire-resistant, neoprene coated glass fiber cloth equal to Ventfabrics "Ventglas" (4" fabric width), as manufactured by Ventfabrics, Wiremold or Thermaflex.

Provide preassembled flexible connections for all ducts that cross building expansion joints. Flexible connections shall be 6" in width as specified hereinbefore. Coordinate requirement with Architectural plans and provide as required.

Externally insulate all flexible connectors to prevent condensation with 2" thickness external duct insulation as specified later in this section. **Do not insulate flexible connectors until installation of the below specified bonding jumper has been verified.**

Provide copper jumpers across all flexible connectors taking care that jumpers do not bind flexible connections. Provide compression lug and grounding connector screwed into the duct with two (2) screws, on both side of the flexible connector. Bonding wire shall be shielded 12 AWG.

5.21. **Register and Grille Connections:** Where take-offs are in side of a duct, clinch lock short tee sections onto trunk. Install collars with slip joints and 3/4" flange at outlet end. At sheetrock and other hard surfaces, set collars exactly flush with surface.

Install boots above lay-in ceilings simultaneously with ceiling work.

At return air, relief air and exhaust air grilles 48" or more in either dimension, collars shall be 1" x 2" x 1/8 inch steel angle frames with corners mitered, welded and ground smooth. Frames in ceiling shall be independently suspended from the ceiling structure, or the duct shall have special reinforcing to prevent sagging of the boot. Interior of ductwork visible through grilles and diffusers shall be painted flat black with paint having a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E84.

5.22. <u>Hangers and Supports:</u> Duct hangers shall NOT penetrate the external insulation vapor barrier. All duct hanger materials shall be external of the insulation materials, insulation jacket and vapor barriers. All vapor barriers shall be continuous and without penetrations.

"Sammy" bolts are prohibited. Contractor shall provide supplemental steel between structural purloins, bar joists, etc., for duct support as required to meet support spacing specified. Supplemental steel shall be welded in place as directed and specified by the Structural Engineer. Support small (less than 40 united (w+h) inches) horizontal ducts without external insulation with 1-1/4" x 20 ga. band hangers. Provide in pairs close to each transverse joint and in no case more than six feet apart. Bands shall be turned 3" under the lower corner of ductwork and fastened with two (2) self-tapping screws into the bottom of the duct surface. Bands shall be attached up the sides of the ductwork at a maximum of 6" intervals and in the bottom of the duct. Seal all screws with duct sealer as specified for ductwork.

Support vertical runs larger than 40 united (w + h) inches with structural brackets with welded joints.

Support all non-externally insulated horizontal ducts larger than or equal to 40 united (w+h) inches on trapeze type hanger assembly same as specified above for externally insulated duct except without Armaflex surround on the Unistrut. Install inserts or clamps as required to accommodate overhead construction. Spacing shall not exceed 6 feet.

All 14" or less concealed round ducts with external insulation shall be provided with band hangers and saddles. Suspend ducts, at six (6) foot intervals with 8" long, 3" wide, 22 gauge galvanized metal saddles hung from structure with 22 gauge, 1" wide straps. Bands shall pass completely under and around round ducts. Loop strap under duct and attach to strap with two (2) galvanized bolts. Thereafter, loop top end of hanger over steel structural members above and fasten with two (2) galvanized bolts. Where concrete joists occur overhead, secure straps to side of joist with galvanized expansion or ramset bolts. Where flat concrete surface occurs overhead, secure with ramset or expansion bolt fasteners. See other Specification Sections in the Contract Documents for limitations on use of power driven fasteners.

All concealed and externally insulated rigid round metal ducts greater than or equal to 16", all externally insulated rectangular ductwork, all externally insulated square ductwork, and all externally insulated flat oval ductwork that is specified to have external insulation with a vapor sealed facing **shall be supported with trapeze hangers consisting of Unistrut, threaded rods and inserts or clamps as required to accommodate overhead construction.** Threaded rods shall be of size required to

provide support of three (3) times the anticipated load of the assembly. Trapeze hanger assembly spacing shall not exceed 8 feet.

Where ducts are specified to have external insulation with a vapor sealed facing, support duct on trapeze hangers consisting of a Unistrut assembly with threaded rods.

On externally insulated ducts, install 3/4" thickness, **unslit** AP Armaflex insulation of sufficient inside tubular diameter to slide over the Unistrut support, completely cover and snuggly fit to the bottom horizontal Unistrut duct support. The insulation shall extend the full width of the duct plus a minimum of 6", each side. Where channel shapes are used, orient the open side, down. Refer to Part Pipe and Miscellaneous Insulation Work for AP Armaflex material specification. Space hangers a minimum of 6" (maximum of 12") from the sides of the duct to permit the duct to be placed within the trapeze hangers.

All concealed internally insulated round ducts shall be supported as specified above for externally insulated ductwork except without saddle. Coordinate exposed duct support requirements with plan details.

Where ducts pass through floors, seal as specified hereinbefore, support duct and close opening with minimum 2"x2"x1/8" steel angles on all sides and, secured to both floor and duct. At plenums and risers just above the floor, provide suitable chair assemblies of welded structural shapes.

Wherever any duct hanger support exceeds 36" length from the top of the supported duct to the structure above, Contractor shall provide a Unistrut support assembly and provide bracing of the assembly with minimum 1"x1"x1/4" angle iron, or as required for the weight of the particular duct. Weld angle iron to the Unistrut and attach to the overhead structure, as specified and directed by the structural engineer, to prevent swaying

Where ducts rise at the outside walls, the contractor shall provide a chair assembly and required supports to carry the weight of the duct weight. The Contractor shall seek the guidance of the structural engineer and provide a proper assembly. Duct riser at the outside wall shall maintain a distance between the wall and the finished insulated assembly as required to insulate the back side of the ductwork.
Where horizontal ducts with standing joints exceed 72 inches in width they shall be provided with additional hangers at the mid-point of their width, consisting of a support bolted to an interior 1/8 x 1-1/2 inch strap that shall, in turn, be bolted to the duct. Internal straps and hangers shall be spaced one for each duct section.

Where trapeze type hangers or DuctMate is used to support exposed ductwork in finished areas, the width of the support shall not exceed the duct width by more than six (6) inches on either side of the duct.

5.23. **Roof Exhaust Caps:** For exhaust ducts up to and including 12x12, shall be low profile, sloped, galvanized steel construction with built-in bird screen, integral flashing flange and all accessories required for a complete installation. Cap shall be Greenheck Series RJ, Cook Series RJ or Penn-Barry SL as required for sloped shingle roofs. Provide similar device for standing seam metal roofs as required by the

roofing manufacturer. All items furnished shall adhere to roofing manufacturer's requirements so as not to void the roofing warranty. Hoods shall be factory primed for painting in the field or factory baked enamel finish. Coordinate finish and color requirement with Architect prior to ordering.

5.24. **Roof Intake and Relief Hoods:** Greenheck Model FGI/FGR or approved equivalent by Loren-Cook, aluminum or galvanized steel construction unit with welded joints, complete with 1/2" aluminum bird screen, rain gutter, weather baffle, 10" high (exhaust/relief) or 14" high (intake) height NRCA approved roof curb with built-in cant strip, integral fiberglass insulation and wood nailer. Hood sizes smaller than 24"x24" shall be hinged type. All intakes, relief or exhaust vents greater than 12x12 shall be 125 MPH rated. Maximum intake throat velocity of 250/500 FPM and .05" WC maximum pressure drop. Maximum relief throat velocity of 600 FPM and .05" WC maximum pressure drop. Hood, throat and curb cap shall be minimum 18ga.

Roof curbs shall be painted with two coats of non-reflective paint. Paint type and color as selected by Architect. All roof curbs furnished shall adhere to the roofing manufacturer's requirements so as not to void the roofing warranty. The top of all roof curbs shall be level with pitch built into curb when deck slopes 3/8 of an inch per foot or more. Coordinate with architectural and structural plans for required slope. Coordinate roof curb and interface in the building roofing system and verify minimum net height to be as required by code or as required by Architect. Refer to architectural specification and plans for additional requirements. All roof curbs interfacing shall comply with the Architectural requirements. Coordinate prior to bid and provide as required.

5.25. **Range Hood Exhaust Ducts:** Ducts for hoods over cooking equipment used in processes producing smoke or grease-laden vapors shall be constructed of 14 ga. black steel with welded joints and installed in accordance with NFPA Standard No. 96. All ducts shall be installed without forming dips or traps. All seams, joints, penetrations, and duct-to-hood collar connections shall have a liquid tight continuous external weld. Butt welded connections are prohibited. Duct-to exhaust fan connections shall be flanged and gasketed at the base of the fan for vertical discharge fans and fans mounted on an exterior wall. Gasket and sealing materials shall be rated for continuous duty at a temperature of not less than 1,500ºF. All ducts shall be installed with a minimum 2 percent slope on horizontal runs up to 75 ft and a minimum 8 percent slope on horizontal runs greater than 75 ft. If not easily accessible from a 10 ft. stepladder, openings on grease duct systems shall be provided with safe access and a work platform. Support systems for horizontal grease duct systems 24 inches and larger in any cross-sectional dimension shall be designed for the weight of the ductwork plus 800 pounds at any point in the duct systems.

Exposed ducts shall be constructed of 18 ga. stainless steel with welded joints and brushed finish.

An access door shall be provided at each change in direction of the duct and 10 feet on center maximum spacing for purposes of inspection and cleaning. Access doors shall be at the sides and large enough to permit cleaning. In horizontal sections, the lower edge of the opening shall not be less than 1-1/2" from the bottom of the duct. All ducts shall be installed without forming dips or traps. For hoods with dampers in the exhaust or supply collar, an access panel for cleaning and inspection shall be

provided in the duct within 18 inches of the damper. Doors shall be constructed of the same material and thickness as the duct and shall be grease tight when in place. Access panels shall have a gasket or sealant that is rated for 1500ºF and shall be grease tight. Fasteners, such as bolts, weld studs, latches, or wing nuts, used to secure the access panels shall be carbon steel or stainless steel and shall not penetrate duct walls. Access doors shall be UL 1978 listed, hinged, black iron, weld on, DuctMate Ultimate Door II or approved equivalent.

All access doors shall be neatly and clearly identified using plastic label of type specified under "Identification" in specification Section 15010. The sign shall be 2" smaller than the access door and shall be inscribed with the following: "ACCESS PANEL – DO NOT OBSTRUCT".

5.26. **Flexible Air Ducts:** Flexible duct for connections shall be Thermaflex M-KE, GreenGuard Level 4 certified, ATCO UPC #031 or Flexmaster Type 1M. Duct shall be rated for a maximum pressure of 16" (4-10 in. ID) or 10" (12-16 in. ID) water column positive and 2" water column maximum negative pressure and 5000 FPM maximum velocity and Listed by Underwriters Laboratories, Inc., under UL Standard 181 as a Class 1 air duct and complying with NFPA Standards 90A and 90B. Duct shall have a maximum flame spread of 25 and a maximum smoke developed rating of 50. Flexible air duct shall be factory made and composed of an inner duct of woven and coated fiberglass providing an air seal and permanently bonded to coated steel wire helix, a fiberglass insulating blanket and low permeability outer vapor barrier of fiberglass reinforced metallized film laminate. R-value shall be a minimum R=8 per ASTM C-518.

Flexible duct length shall not exceed six (6) feet. Supply each duct with **stainless steel worm gear driver and stainless steel band** at take-off fitting and supply fixture connections. Zip tying is not allowed. Suspend ducts, at three (3) foot intervals with 8" long, 3" wide, 22 gauge galvanized metal saddles hung from structure with 22 gauge 1" wide straps. Loop strap under duct and attach to strap with two (2) galvanized bolts. Thereafter, loop top end of hanger over steel structural members above and fasten with two (2) galvanized bolts. Branch duct connectors for connecting round low velocity branches to rectangular low velocity trunks shall be rectangular to round take-off fittings as detailed on the drawings with damper and standoff mounting bracket.

Provide a full size radiused, galvanized sheet metal elbow transition piece from flexible duct connection to each diffuser boot. Elbow gauge shall be as specified hereinbefore in Part, "Sheet Metal Ductwork" for respective duct size.

5.27. **Factory Fabricated Duct and Fittings:** All exposed round, rectangular, flat oval, and ductwork associated with PAC-1 and PAC-2 (indicated by slashes on the plans), supply air ducts, return air ducts, and all fittings shall be factory fabricated and insulated duct and fittings with perforated inner liner shall be equal to United McGill Acousti-K27 and rated for 2" static pressure. All taps/take-offs to be factory installed. **Do not use saddle taps.** Insulation shall be Acousti-Line with EPA registered anti-microbial, erosion-resistant acrylic coating. The coating shall resist the growth of fungus and bacteria as determined by ASTM C 1071, ASTM G21 and ASTM G22. The insulation thickness shall be 1" where exposed within the conditioned space and 2" thickness where concealed. Ductwork shall comply with NFPA 90A.

Construction and installation shall comply with current SMACNA Standards. Where conflicts occur between current SMACNA requirements and the contract drawings or specifications, the most stringent requirements shall apply. In general, the heaviest gauge metal and the strictest installation/fabrication methods shall be provided. All duct-to-duct connections or duct to fitting connections for exposed double wall ductwork, regardless of size, shall be provided with factory-fabricated couplings to provide a neat, smooth appearance. All factory-fabricated ducts shall be shipped from the factory with factory installed heavy duty protective plastic to cover duct and all openings.

Where ductwork is indicated or specified to be exposed to view in occupied spaces, provide materials which are free from visual imperfections, including pitting, dents and other imperfections including those which would impair post painting. Exposed to view ductwork shall be as outlined in part a above. Any ductwork installed, which is damaged, shall be replaced at no cost to the Owner, at the discretion of the Architect. Provide as shown and as required for the air conditioning, heating and ventilation systems. Make changes in dimensions, offsets or crossovers as necessary to clear piping, lights and structural members, and to maintain scheduled headroom. Provide all accessories required. Provide additional supports to raise ductwork off any piping or as a minimum, provide Rubatex insulation between ductwork and piping. The use of Rubatex insulation between piping and the ductwork shall only be allowed when providing supports is not an option.

Refer to architectural drawings and specifications. Refer to Architectural section "Painting" for painting of exposed ductwork. In case of the absence of painting requirements in the aforementioned Specification Section(s), the interior and exterior of ductwork visible from any finished space shall be cleaned, primed and painted as directed by the Architect. Ductwork visible through all grilles, registers, diffusers, ceilings, etc. shall be painted flat black with paint having a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E84.

PART 6. CLOTHES DRYER VENT

6.1. **General:** Exhaust ducts shall have a smooth interior finish and shall be constructed of metal minimum 0.022-inch thick, aluminized steel with cap and backdraft damper. The exhaust duct size shall be 4 inches nominal in diameter. Exhaust ducts shall be supported at 4-foot intervals and secured in place. The insert end of the duct shall extend into the adjoining duct or fitting in the direction of airflow. Vents shall not be joined with screws or similar fasteners that protrude into the inside of the duct. Furnish submittal of vent and elbows for approval.

6.2. **Wall Cap for 4" Dryer Vent:** Shall be Seiho Model SFB-P, all aluminum with backdraft damper and anodized finish. Equivalent unit by Broan or Luxury Metals will be acceptable.

PART 7. DUCT INSULATION WORK (EXTERNAL)

7.1. **General: All work by Insulating Sub-Contractor whose primary business is the installation of insulation materials** with experienced applicators in accordance with manufacturer's recommendations. Duct must be clean, dry and pressure tested before covering is applied. Cover flexible connections with insulation material as hereinafter specified to same thickness as adjacent duct. All insulation materials (coatings and mastics) shall be fire resistive per NFPA Pamphlet No. 90, ASTM C 411, shall be UL listed and shall have a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E84, NFPA No. 255 or UL 723. Finished insulation system shall provide complete thermal barrier throughout the equipment and air distribution system, including effective and durable vapor barriers and vapor stops for any system or condition potentially subject to condensation. Insulation system shall be provided to prevent condensation or potential thereof, to prevent transmission of water vapor into the insulation system (vapor barriers), and to prevent transmission of water vapor within the insulation system should vapor barrier compromises occur during operation and/or maintenance of the building (vapor stops).

Refer to Section Sheet Metal Ductwork, Paragraph Hangers and Supports, for miscellaneous insulating requirements for externally insulated ductwork.

7.2. **Material:** Provide GreenGuard certified glass fiber duct insulation with reinforced foil kraft laminate jacket, formaldehyde-free.

All **supply air and return air ducts** located in the attic, mechanical mezzanine or outside the building insulation envelope shall be provided with a total of 3.5" thickness external insulation, in addition to the specified acoustical liner. The first layer shall be **1.5" thickness, 0.75 lb. density, without reinforced foil kraft laminate jacket** and with characteristics specified above. The second layer shall be **2" thickness, 1.5 lb. density, with reinforced foil kraft laminate jacket** and with characteristics specified below.

OPTION: In lieu of providing two layers of insulation for supply and return air ducts as specified above, the Contractor may substitute one layer of 4.25" thickness, 0.75 lb. density **with reinforced foil kraft laminate jacket** with characteristics specified below.

All **supply air** and **return air** ductwork located above the ceiling within the building insulation envelope, in chases, in the return air plenum and other similar areas, but not in the attic or a mechanical mezzanine, shall be provided with **2" thickness, 1.5lb. density, duct wrap with reinforced foil kraft laminate jacket** as specified below. Note that this requirement does not apply to ductwork that is exposed to view in finished areas. Refer to internal duct insulation requirements for duct exposed to view in finished areas. Supply air ductwork associated with PAC-1 and PAC-2 supply air distribution only requires external ductwork from point of termination of the factory fabricated and insulated supply air duct to the point of connection of the supply air duct to the last VAV terminal. Return air duct work for PAC-1 and PAC-2 at respective unit is specified as factory fabricated and insulated double wall duct and does not require duct wrap within the return air plenum.

All **outside air** and **exhaust air** ductwork shall be provided with **1.0" thickness, .75lb. density, with reinforced foil kraft laminate jacket** as specified below. Note that this requirement does not apply to ductwork that is exposed to view in finished areas. Refer to internal duct insulation requirements for certain duct exposed to view in finished areas. Note that all exposed supply air and return air ductwork is specified as factory fabricated and insulated duct and fittings.

Thermal conductivity for **1.0" thickness** per ASTM C-518, **0.75 lb. density** shall be not less than k=0.27 BTU·in/(hr·ft²·°F) and minimum installed R=3.0 at 75°F mean temperature with test based on material thickness compressed 25%.

Thermal conductivity for **1.5" thickness** per ASTM C-518, **0.75 lb. density** shall be not less than k=0.27 BTU·in/(hr·ft²·°F) and minimum installed R=4.2 at 75°F mean temperature with test based on material thickness compressed 25%.

Thermal conductivity for **2" thickness** per ASTM C-518, at its rated thickness, and **1.5 lb. density** shall be not less than k=0.24 BTU·in/(hr·ft²·°F) and minimum installed R=6.3 at 75°F mean temperature with test based on material thickness compressed 25%.

Thermal conductivity for **4.25" thickness** per ASTM C-518, **0.75 lb. density** shall be not less than k=0.27 BTU·in/(hr·ft²·°F) and minimum installed R=12.0 at 75°F mean temperature with test based on material thickness compressed 25%.

See "Duct Insulation (Internal)" for internal acoustical insulation required in addition to the external insulation specified hereinbefore.

Supply air, return air, relief air and outside air ducts within enclosed mechanical rooms do not require flexible, external, duct insulation. Instead, supply air, return air, relief air and outside air ducts in all mechanical rooms shall be insulated with 1" thickness, 3.0 lb. density, rigid glass fiber duct insulation to a point above the ceiling of the adjacent conditioned space. Facing shall be aluminum foil reinforced with fiberglass yarn and laminated with fire resistant adhesive to Kraft paper. Thermal conductivity value shall be per ASTM C-612, Type 1B, at its specified thickness, shall be not less than k=0.24 BTU·in/ (hr·ft²·°F) at 75°F mean temperature. Insulation shall meet or exceed the requirements of ASTM E 84, UL 723, ASTM C 1136-Type II, NFPA 90A, NFPA 90B, FHC 25/50 and ASTM C 795. Moisture sorption shall be less than 5% by weight and maximum moisture vapor transmission of 0.02 perms.

Insulation shall be Owens-Corning Series 1400 FR Spin-Glas Board or equal material by Knauf, Schuller, Owens-Corning or CertainTeed. Note that rigid board insulation is not required in the attic or mechanical mezzanine.

7.3. **Thickness:** Toilet/shower and janitor closet/housekeeping exhaust ducts, back panels of ceiling diffusers and outside air ducts: 1.0" thickness, 3/4 lb. density with reinforced foil kraft laminate jacket. All other locations: Minimum 2.0" thickness and density specified above with reinforced foil kraft laminate jacket. Coordinate with variations specified above for additional layers or 4.25" thickness and provide as required.

Where 2" internal acoustical insulation is specified for ductwork located above the ceiling within the building insulation envelope, in chases and other similar areas, but not in the attic or a mechanical mezzanine, the respective external insulation may be reduced by 1" total thickness with respective density previously specified. **No reduction in insulation thickness shall be taken for any ductwork located in the attic, mechanical mezzanine or outside of the building insulation envelope**. See limits of acoustical insulation in Part Duct Insulation Work (Internal) below. Where duct board is specified within the mechanical rooms, external duct wrap insulation is not required.

7.4. **Manufacturer:** Johns-Manville Micro-Lite EQ, Type 150 or Type 75 with thickness and density as specified above. Equivalent material by Knauf, Schuller, Owens Corning or CertainTeed will be accepted.

7.5. **Ducts to be Insulated Externally:** Supply air and return air ducts including ducts with acoustical liner, PAC-1 and PAC-2 supply air ductwork as specified above, outside air ducts, kitchen hood make-up air ducts, make-up air ducts, toilet/shower/housekeeping/janitor closet areas exhaust ducts, short branch duct collar connections to grilles, registers and diffusers, all flexible canvas connectors and exterior rim/cone of all ceiling diffusers. **Do not externally insulate flexible canvas connectors until installation of the specified bonding jumper has been verified by the Engineer or the Authority having jurisdiction.** See Part "Duct Insulation Work (Internal)" for sound attenuating insulation requirements of externally insulated ductwork.

7.6. **Application:** Sheet metal duct shall be clean, dry and tightly sealed at all joints and seams before applying duct wrap. Adhere insulation to metal with 4" strips of Foster 85-60, ITW Miracle-Kingco M595 Ultratack or Childers CP-127, low VOC insulation bonding adhesive meeting ASTM C916 at 8" on center on circumferential joints. Wrap insulation tightly on the ductwork with all circumferential joints butted and longitudinal joints overlapped a minimum of 2". The 2" flange of the facing shall be secured using 9/16" flare-door staples applied 6" on center and taped as specified hereinafter. On longitudinal joints, the overlap shall be secured using 9/16" flare-door staples applied 6" on center and taped as specified hereinafter. For rectangular ducts wider than 23", additionally support insulation with weld pins and speed clips 18" on center. **Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.** Insulate standing seams and stiffeners that protrude through the insulation with 2" thick, faced, flexible blanket insulation. Cover with reinforcing mesh and coat with vapor barrier finish coating. Vapor seal all seams, joints, pin penetrations, other breaks, circumferential and longitudinal joints with reinforcing mesh and coat with vapor barrier facing. Mesh shall be **4" wide pre-sized glass cloth** adhered and finished with two (2) coats of a white vapor barrier coating, Foster 30-33, Vimasco 749 or Childers CP-33. **No FSK tape will be allowed.** Fiberglass cloth shall be Great Lakes Textiles Style GL1658, 20x10 thread count per square inch, 0.004-inch thickness and 1.60 oz. /sq. yd., Childers Chil Glas #10 glass mesh, Foster Mast-A-Fab polyester mesh or equivalent product by 3M.

Any externally insulated duct with metallic vapor barrier that is in contact with sprinkler piping or metallic conduits shall be provided with a section of Rubatex insulation between ductwork and piping/conduits. Rubatex shall be 3/4" thickness,

AP Armaflex insulation of sufficient inside tubular diameter to slide over, completely cover and snuggly fit the contacted pipe. The insulation shall extend the full width of the duct plus a minimum of 6", each side of the duct. Refer to Part Pipe and Miscellaneous Insulation Work for AP Armaflex material specification. Slit Armaflex may be used in lieu of unslit. If slit Armaflex is used, glue the longitudinal joint and butt joint with Armaflex glue and follow with 3" wide, 1/8" thickness Armaflex across all glued joints. The use of Rubatex insulation between piping and the ductwork shall only be allowed when raising the effected duct is not an option.

7.7. **Insulation Pins and Washers: The use of adhesives for attaching pins and washers to the ductwork is prohibited.** Pins shall be cupped-head, capacitor-discharge-weld pins, zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135 inch diameter shank, length to suit depth of insulation specified with integral 1-1/2 inch galvanized carbon-steel washer. Insulation retaining washers shall be self-locking type formed from 0.016-inch thick galvanized steel with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

7.8. **Kitchen Hood Exhaust Ducts:** Prior to insulating kitchen hood or kiln exhaust ducts, a light test and a smoke test shall be accomplished by the Mechanical Contractor. Refer to Section "Testing", hereinbefore, for the required procedure. The Code Authority having jurisdiction will require his witnessing of this testing prior to insulating the respective ductwork. Insulation shall not be installed until the Code Authority having jurisdiction has accepted the installation.

Upon acceptance of the light test and the smoke test by the Code Authority having Jurisdiction, install a zero clearance, single layer fire resistant wrap for grease duct, consisting of an inorganic blanket encapsulated with a scrim-reinforced foil. The wrap shall be a single layer, non-asbestos type and contain a safe fiber construction to provide a zero clearance to combustibles, 2-hour fire resistive rating. The wrap shall have been tested and passed in accordance with ASTM C 411, ASTM C 518, ASTM E 84, ASTM E 119, ASTM E 136 and ASTM E 814. Internal surface burning characteristics (ASTM E 84) for the foil encapsulated blanket shall be Flame Spread: 0, Smoke Developed: 0, Blanket Flame Spread: 0, Smoke Developed: 0 and shall comply with the requirements of NFPA 96, Uniform Mechanical Code, International Mechanical Code and Uniform Building Code. The entire installation shall be in strict accordance with the manufacturer's recommendation and the U.L. label. Material shall be 3M Fire Barrier Duct Wrap 15A or approved equivalent. Provide hinged metal encased double wall with insulation access doors at duct cleaning access doors. Install insulated access doors over the 14 gauge duct access doors. Access doors shall be DuctMate Ultimate Door II, weld on, or approved equivalent.

7.9. **Hot Gas Reheat Coil and Cabinet:** Where hot gas reheat coils are specified and the coil is not within the insulated Heat Pump or Air Handling Unit equipment cabinet, externally insulate the hot gas reheat coil cabinet with 1.5" thickness duct board equal to Owens Corning 800 FR. Protect external insulation with open weave glass or polyester cloth by Johns-Manville Duramesh, Childers Chil Glas #10 or Foster Mast-A-Fab, embedded between two 1/8" coats of Foster 60-91 (gray) Monolar Mastic or Childers Encacel X-1 (gray). Coordinate coil requirements with Mechanical Contractor prior to bid and provide as required.

7.10. **Ducts From Outdoor Packaged Equipment to Point Inside Building:** Shall be insulated externally (in addition to duct liner) with 2" thickness duct board equal to Owens Corning 1400 FR. Protect external insulation with open weave glass or polyester cloth by Johns-Manville Duramesh, Childers Chil Glas #10 or Foster Mast-A-Fab, embedded between two 1/8" coats of Foster 60-91 (gray) Monolar Mastic or Childers Encacel X-1 (gray). After insulating, cover all ductwork with 24 ga. prefinished Kynar 500 sheet metal. Sheet metal cover shall be cross-broken to provide additional strength. **The Architect shall select color**.

7.11. **Ducts From Outdoor Packaged Equipment to Point Inside Building (OPTION):** At his option, the Contractor may substitute non-fibrous, closed cell ductwork with minimum insulation value of R-12 as manufactured by Thermaduct or approved equivalent. The panels shall be manufactured of CFC-free Kingspan Kooltherm closed cell rigid thermoset resin thermally bonded on both sides to a factory applied .001" aluminum foil facing reinforced with a fiberglass scrim. It shall have an added UV stable, IR reflective 1000-micron high impact resistant titanium infused vinyl that is factory bonded using a full lamination process. The lamination process shall permanently bond the vinyl clad to the outer surfaces of the phenolic foam panel to provide a zero-permeability watertight barrier and to form a structurally insulated panel (SIP) in which to form duct segments. Processes that do not employ a full lamination process are not acceptable. Self-applied adhesives such as tapes, caulks or cladding that incorporate pressure sensitive or spray adhesives are not acceptable**.** **Ductwork color shall be selected by the Architect.**

Duct Leakage Class shall be SMACNA Leakage Class 3 or less. Thermaduct shall incorporate a Kingspan KoolDuct fortified inner liner compliant to UL (C-UL) 181 Standard for Safety Listed, Class 1 system, with included testing and passing the Test for Surface Burning Characteristics, Flame Penetration Test, Burning Test, Mold Growth and Humidity Test, Low Temperature Test and High Temperature Test, Puncture Test, Static Load Test, Impact Test, Pressure Test and Collapse (negative pressure) Test, High Temperature and Humidity for 90 days, Cone Calorimeter, ASTM E2257 Standard Test Method for Room Fire Test of Wall and Ceiling Materials and Assemblies, ASTM E 84 tested, Tunnel Test, Does not exceed 25 flame spread, 50 smoke developed, DW144, Class B, NRTL product approval, (Subpart S of 29 CFR Part 1910, OSHA), ASTM C 423 noise reduction, ASTM E 96/E 96M Procedure A for permeability, ASTM C 1071 for erosion, ASTM C 518: 2004, Standard Test Method for Steady–State Thermal, Transmission Properties by Means of the Heat Flow Meter Apparatus, UL 723, Test for Surface Burning Characteristics of Building Materials, NFPA 90A, "Installation of Air Conditioning and Ventilating Systems", NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems", NFPA 255, "Standard Method of Test of Surface Burning Characteristics of Building Materials. Thermaduct outer shell shall be a UV stable 1000 micron high impact resistant titanium infused vinyl with included testing UL-94 Flammability V-0, ASTM D-638 Tensile Strength of 6250 psi, ASTM D-790 Flexible Strength of 11,000 psi, ASTM D-4226 Drop Impact Resistance, ASTM D-4216 Cell Classification.

Material shall have continuous rating of 185 degrees F inside ducts or ambient temperature surrounding ducts. Maximum Thermal Conductivity shall be 0.146 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature and permeability: 0.00 perms maximum when tested according to ASTM E 96/E 96M, Procedure A. Product shall

pass UL bacteria growth testing procedures. Noise-Reduction Coefficient shall be 0.05 minimum when tested according to ASTM C 423, Mounting A. All interior duct liner shall bear UL label and other markings required by UL 181 on each full sheet of duct panel; UL ratings for internal closure materials. All insulation materials shall be closed cell with a closed cell content of >90%. Duct shall be double wall thick panel with R=12.0.

Closure materials shall be V-Groove adhesive, silicone (interior only). It shall be UV stable 1000 micron high impact resistant titanium infused vinyl (exterior), factory manufactured seamless corners for zero perms, cohesive bonded over-lap at corner seam covers for zero perms. It shall have water resistant titanium infused welded vinyl seams and shall be mold and mildew resistant.

It shall have a polymeric sealing system. It's structural membrane shall be aluminum scrim with woven glass fiber with UV stable vinyl clad applied. Minimum Seam Cover Width shall be 2-7/8" inches. Sealant shall be low VOC. **Color shall be selected by the Architect.** The entire assembly shall be water, mold and mildew resistant. Duct connectors shall be factory furnished galvanized 4-bolt flanges

The outdoor ductwork shall incorporate UV stable 1000-micron high impact resistant titanium infused vinyl. Flange coverings shall be field sealed airtight before flange covers are installed. Flange covering shall consist of foam tape insulation with molded 39 mil covers and air gap with molded 39 mil covers.

Reinforcement shall be factory designed and built with adequate reinforcement to both; withstand air pressure forces from within the duct from blower pressure where the Thermaduct is being installed. Thermaduct shall employ Airtruss reinforcement system when both specified static pressure and duct sizes dictate the need. This is a factory installed system and no field installation of the reinforcement system shall be required. Hangers, supports and tie-downs shall be detailed on the manufacturer's installing contractors detail drawings prior to installation and designed to carry the weight and wind load of the ductwork as prescribed in IBC Section 1609 and IMC 301.12.

Ducts shall be detailed and fully factory manufactured by an authorized Thermaduct, LLC facility system. All fabrication labor will be certified "yellow label" building trade professionals, compliant to SMWIA and SMACNA labor guidelines.

Fabricated joints, seams, transitions, reinforcement, elbows, branch connections, access doors and panels, and damage repairs shall be according to manufacturer's written and detailed instructions. Fabricated 90-degree mitered elbows shall include turning vanes. Fabricated duct segments shall be in accordance with manufacturer's written details. Duct Fittings shall include 6 inches of connecting material, as measured, from last bend line to the end of the duct. Connections on machine manufactured duct may be 4 inches. Fabricated duct segments utilizing v-groove method of fabrication. Factory welded or cohesively bonded seams shall apply to fully manufactured ductwork and fittings. Internal seams will be supplied with an unbroken layer of low VOC silicone or bonding. Each duct segment will be factory supplied with either aluminum grip pro-file or pre-insulated duct connectors in accordance with manufacturer's detailed submittal guide. Applied duct reinforcement to protect against side deformation from both positive and negative pressure per

manufacturer's design guide based on specified ductwork size, and system pressure. The ductwork shall be designed and fabricated duct segments and fittings in accordance with "SMACNA Duct Construction Standards" latest edition. Both positive and negative pressure ductwork and fittings shall be constructed to incorporate a UL Listed as a Class 1 air duct to Standard for Safety UL 181 liner with an exterior clad for permanent protection against water intrusion. Duct shall be constructed to meet requirements to withstand the minimum wind loads prescribed in IBC Section 1609 and IMC 301.12.

Install ducts and fittings to comply with manufacturer's installation instructions. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines." Use prescribed duct support spacing as described in this specification and manufacturer's recommendations. Manufacturer's recommendations shall take precedence over specifications. Duct air leakage rates shall be in compliance with "SMACNA HVAC Duct Construction Standards" latest version per applicable leakage class based on pressure.

The Contractor shall arrange for manufacturer's representative to inspect completed installation and provide written report that installation complies with manufacturer's written instructions. Remove and replace duct system where inspection indicates that it does not comply with specified requirements. Perform additional testing and inspecting, at the Contractor's expense, to determine compliance of replaced or additional work with specified requirements.

Outdoor ducts and fittings shall have minimum panel thickness of 1-1/4". Cladding shall be minimum as required for specified insulation thickness or 0.038 inch, whichever is greater.

PART 8. DUCT INSULATION WORK (INTERNAL)

8.1. **General:** All work by experienced applicators in accordance with manufacturer's recommendations. Duct liner, mastics and materials shall comply with all requirements and other building code requirements. All insulation materials (coatings and mastics) shall be fire resistive per NFPA Pamphlet No. 90A and 90B and shall be UL listed and shall have a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E84. Liner materials shall conform to the performance based ASTM C1071, which includes ASTM C518 Thermal Conductivity, ASTM C411 Temperature Resistance, ASTM C665 Corrosiveness, ASTM E84 Surface Burning Characteristics, ASTM C1338 Fungi Resistance, ASTM C1304 Odor Emissions and ASTM C1104 Moisture Vapor Sorption.

8.2. **Material:** Liner shall be a GreenGuard certified, low VOC, Type I liner as defined by ASTM C1071 and characteristics complying with ASTM E 84, UL 723, NFPA 255, NFPA 259 and ASHRAE 62. It shall have an acrylic coating formulated with an immobilized, EPA registered, protective agent to protect against growth of fungi and bacteria as required by ASTM C1071 and tests conducted in accordance with ASTM C 1338, ASTM G21 and ASTM G 22. It shall not support microbial growth and have glass fibers bonded with a thermosetting resin. The airstream surface shall be protected with a reinforced coating with flexible glass cloth reinforcement. The liner

shall have a reinforced factory applied edge coating and operate in an environment of a maximum of 250°F and maximum of 6,000 fpm air velocity. Thermal conductivity per ASTM C-518, at its rated thickness, shall be not less than k=0.16 BTU·in/(hr·ft²·°F) and R=6.3 at 75 F mean temperature in accordance with ASTM C18. Sound absorption coefficients for the liner shall be per ASTM C 423 and ASTM E 795 test methods and the table below. **Furnish sound characteristics for approval with the material submittal.**

Sound Absorption Coefficient at Frequency

Thickness (In)	(Cycles per Second) 125	250	500	1000	2000	4000	NRC
1.5	0.10	0.47	0.85	1.01	1.02	0.99	0.80
2.0	0.25	0.66	1.00	1.05	1.02	1.01	0.95

8.3. **Manufacturer:** Shall be Johns Manville Linacoustic RC or equivalent material by Schuller, Knauf, Pittsburgh, CSG, Owens Corning or CertainTeed.

8.4. **Thickness:** 1.5 inches thickness. Return air platforms/plenums 2.0" thickness.

8.5. **Ducts and Equipment to be Insulated Internally:** Exposed supply air, exposed return air and exposed outside air ducts in areas without ceilings, return air plenums/platforms, transfer air (jumper and ATD) ducts, all ducts downstream of VAV terminal units and relief air ducts. Refer to specification above for factory fabricated and insulated double wall ductwork related to PAC-1 and PAC-2.

8.6. **Acoustical Duct Lining:** Line the first ten (10) linear feet of all single wall, supply and return air ducts downstream of all heat pumps, packaged units, all ducts downstream of VAV terminal units and transfer air (jumper and ATD) ducts with insulation equal to Johns Manville Linacoustic RC and **2.0" thickness.** Sound absorption characteristics shall be as specified above.

Provide metal nosing as specified below when transitioning from 2" thickness to 1.5" thickness internal liner. See detail on plans.

8.7. **Application:** Adhere insulation to the entire surface of the sheet metal with fire resistive, low VOC, UL labeled, fire resistive, water based, ASTM C 916, Type II compliant adhesive before the metal is broken. Adhesive shall be Foster 85-60 or Childers CP-127. Secure all sheets wider than 24 inches with sheet metal screws and washers or stud pins and clips 16 inches on center, each way. Joints shall be straight and smooth and shall be buttered with adhesive to prevent erosion and improve airflow. Product shall have factory applied edge coating to assure sealing of transverse edges per current SMACNA and NAIMA installation standards.

Damage to the liner shall be repaired using Johns Manville SuperSeal products as required or equivalent materials by other manufacturers with their specific equivalent products.

8.8. **Metal Nosings: All exposed leading and trailing edges shall be secured with sheet metal nosings to protect insulation edges**. Metal nosings shall be securely

installed over all transversely oriented liner edges facing the airstream at forward and rear discharge towards coils, dampers, ducts, plenums, changes of insulation thicknesses of adjoining insulation, any exposed insulation ends and at any point where lined duct is preceded by unlined duct. See detail on the plans. All remaining miscellaneous exposed edges shall be sealed/coated. There shall be no exposed fiberglass ends in the airstream.

PART 9. REGISTERS, GRILLES AND DIFFUSERS

9.1. **General:** All grilles, registers and diffusers shall be product of a single manufacturer; shall baked enamel finish with color as selected by the Architect. Architect may require painting of the diffusers, grilles, registers, etc., in the field. Where field painting is required, diffusers, grilles and registers shall be factory primed for painting in the field. Refer to Architectural Section "Painting", coordinate requirements and provide finish as required. Where lay-in type panels and frames are specified, check ceiling suspension system and coordinate interfacing. All grilles, registers and diffusers not in integral lay-in metal panels shall be mounted with aluminum-countersunk screws with finish to match respective items.

All ceiling diffusers back panels shall be insulated with 1" thickness, foil backed insulation and securely attached. Contractor has the option of insulating manually or furnishing the diffuser with factory furnished insulation from the diffuser manufacturer. Factory provided insulation shall be attached as shown on the plan details.

All grilles, registers and diffusers shall be ADC or approved equivalent Agency certified.

9.2. **Square Ceiling Diffusers with Round Neck:** Titus Model TMSA-AA, Price ASCDA, removable core type, aluminum construction, with baked enamel finish color selected by the Architect, designed for four-way diffusion complete with Titus AG-85, Price VCR8E steel butterfly blade damper. Diffuser face shall be 24" x 24" with type frame to interface with ceiling system. Use lay-in type frame where lay-in ceilings occur.

9.3. **Square and Rectangular Neck Ceiling Diffusers:** Titus Model TDCA-AA 6-95-125-25, Price Model AMDA-6-3LAL, removable core type, extruded aluminum construction, with baked enamel finish color selected by the Architect, designed for one, two, three and four-way diffusion as indicated on plans, complete with AG-95 aluminum opposed blade damper, AG-125 Dua-Trol and adjustable vanes. Where lay-in ceiling occurs, diffusers shall have integral 2' x 2' or 2' x 4' aluminum modular lay-in ceiling panel with finish to match diffuser.

9.4. **Food Service/Kitchen Areas:** Titus series PMC, Price Series APDN, diffuser shall have a flush aluminum face with steel back pan, hinged, removable and perforated face screen with quick release spring latches, aluminum opposed blade damper and equalizing grid. Additionally, the diffuser shall be provided with a louvered, adjustable steel pattern controller in the inlet neck of the diffuser and be field adjustable for the deflection pattern indicated on the plans. Diffuser face shall be 24"

x 24" with type frame as required to interface with ceiling system. Use lay-in type frame where lay-in ceilings occur.

9.5. **Wall Supply Air Registers:** Titus Model 300 FS-5-D-65, Price 620DAL-F-S-D-A-SW all aluminum adjustable 4-way deflection type. Provide with AG 35B aluminum opposed blade damper with worm gear, Allen Key operators and AG-225 extractors with No. 1 operator, auxiliary mounting frame and baked enamel finish color selected by the Architect.

9.6. **Wall Return Air Registers:** Titus Model 33R-PF, Price Model 91-L-D-A-VCS3 gymnasium heavy duty steel register with 38 degree deflection 14 ga. blades, support bars on 6" centers Allen key operated aluminum opposed blade damper and auxiliary mounting frame all finished with baked enamel finish color to be selected by the Architect.

9.7. **Wall Return Air / Wall Exhaust Air & Double Face Wall Grilles:** Same as wall return air registers except without dampers.

9.8. **Ceiling Mounted Exhaust Air and Return Air Registers:** Titus Model 50-F-0-5-D-25, Price Model 80DAL-F-SW-A all-aluminum fabricated egg-crate type with baked enamel finish color to be selected by the Architect, Allen key operated aluminum opposed blade damper and lay-in type frame. Where lay-in ceilings occur, each register shall have integral 2' x 2' or 2' x 4' aluminum modular lay-in ceiling panel with finish to match diffuser.

9.9. **Ceiling Mounted Return Air or Relief Air Grilles and Air Transfer (Jumper Duct) Grilles:** Same as return air registers except without dampers.

9.10. **Brick Vents for Exhaust Fan Discharge:** Extruded aluminum, Reliable #RBV brick and block vent with 1/4" mesh removable aluminum screen and integral water stop and 50% minimum Kynar finish. Finish shall be factory paint color to be selected by the Architect.

9.11. **Expanded Metal Grilles:** Provide metal grille equal to McNichols Co., flattened expanded metal, galvanized, hot dipped, 3/4, #16 flattened, minimum 70% open (free) area with U-Edging to protect occupants from injury. Grille shall be factory primed for painting in the field as directed by the Architect.

9.12. **Equal Products:** By Titus, Price, Krueger and Metalaire will be accepted.

PART 10. CONDENSATE DRAINAGE PIPING

10.1. **General:** Cut accurately to measurements established at site and work into place without springing or forcing, properly clearing all building features. Arrange and install piping systems sizes as shown, as close as practical, straight, properly supported and run as directly as possible forming right angles or running parallel with building lines, true to line and grade, free of sags and bends. Route through previously built-in sleeves and avoid cutting or other weakening of the structure. Make changes in direction and size with fittings (no bushings will be allowed). Cap or plug open pipe ends during installation to keep out foreign material.

Before installation, piping shall be checked, upended, swabbed, and all dirt from storage or from lying on the ground shall be removed. Any installed dirty piping shall be cleaned. All piping shall be clean when it is installed.

Make all connections to equipment using screwed unions. Install unions in all piping connections to each piece of equipment, including traps, pumps, coils, etc.

All piping shall be concealed within walls, chases, above ceilings, etc., unless specifically noted otherwise.

10.2. **Condensate Drain Piping and Drain Pipe from Drip Pans to Floor Drains, Hub Drains and Miscellaneous Condensate Receivers:** The condensate drainage assembly shall be made up of p-trap, air bleeder/open vent with 1/8" screen over open portion, as required by the equipment Manufacturer. In absence of the Manufacturer's requirements, condensate drainage assembly shall be as shown on the plans. Condensate drainage piping material shall be Type M hard copper tubing with wrot copper solder joint fittings with 45° or 90° offset fittings. ProPress or similar type fittings/joints are not allowed.

All cooling coils and evaporator coils horizontal condensate drainage piping shall be sloped a minimum of 1/8" per foot. Condensate waste and drain line size shall be full size of unit condensate outlet and in no case, less than 3/4 inch. Condensate drain lines shall be configured to permit the clearing of blockages and performance of maintenance without requiring the drain line to be cut. Refer to the details on the plans and the requirements below for unions required in the condensate piping.

Outdoor packaged units shall be provided with Schedule 80 solid wall PVC pipe and fittings meeting ASTM Standard D1785 with UV protective coating or painted on UV protection.

Provide a trap in each drain line as specified above. **Running traps are not allowed.** Trap depth shall be as required by the equipment Manufacturer. In absence of the equipment Manufacturer's trap requirements, traps shall be equal to the total system pressure plus one inch. Provide an electric switch, conforming to UL 508, to shut down the unit and alarm to the building energy management system operator console should the line become obstructed.

10.3. **Copper Joints:** Make assemblies with tin-antimony (95-5) solder and non-corrosive flux (this does not apply to refrigerant piping). Clean and polish the tube and the inside of the fittings, using No. 60 steel wool. Apply flux and place fitting on the tube. Heat joint evenly but take care not to overheat fitting. Apply solder until a solder line shows completely around the joint. Remove surplus solder and allow joint to cool. ProPress or similar type fittings/joints are not allowed.

10.4. **Escutcheons:** Provide all pipes passing through the floors, walls or ceilings of finished rooms with chrome plated brass escutcheon plates securely fastened in place with round head set screws.

10.5. **Unions:** Unions shall be of the following types:

Schedule 80 PVC: Solid wall PVC schedule 80 DWV pipe and fittings meeting ASTM Standard D1785 for above ground service and underground service.

Dielectric Unions: Provide where copper pipe joins to steel pipe, EPCO or approved equivalent. Contractor shall provide a globe valve on each side of each dielectric union to allow for replacement of the union.

10.6. **Expansion:** Provide for expansion and contraction of all piping and make proper provisions so that there will be no undue strain on any pipe or equipment.

10.7. **Sleeves:** Refer to Section 15010, Para. B. 4. Pipe Sleeves.

PART 11. REFRIGERANT PIPING AND ACCESSORIES

11.1. **General:** Cut accurately to measurements established at site and work into place without springing or forcing, properly clearing all building features. Arrange and install piping systems, as close as practical, straight, properly supported and run as directly as possible forming right angles or running parallel with building lines, true to line and grade, free of sags and bends. Locate piping as high as practical and in parallel groups as close together as practical. Route through previously built-in sleeves and avoid cutting or other weakening of the structure. All condensing units mounted slab on grade shall enter the building at the respective building finish floor or crawl space level and at a maximum of 12" above finish floor of the facility. Contractor shall coordinate final refrigerant piping entrance into the building with the Architect's Field Representative prior to installing any refrigerant piping.

All refrigerant piping, including mini-split piping, shall be Type L hard drawn, ACR copper refrigerant tubing with wrot copper solder joint fittings. **Coiled copper and precharged line sets are NOT allowed unless specifically noted or specified.** All offsets and changes in direction shall be made with 90º or 45° elbows as required. System shall be complete and sized to conform to current ACRMA standards, except that refrigerant suction risers shall be sized for a gas velocity not less than 2000 fpm.

Where refrigerant piping is shown rising in the wall cavity and requires modifications to the block wall due to the size of the piping and insulated assembly, the block shall be neatly saw cut. Provide reinforcing to the affected portions of the wall as indicated on the structural drawings and details, the same as required at window and door openings. See the structural drawings for specifics. Extreme coordination is required prior to the erection of the structural slab and wall. Coordinate with the General Contractor.

Refer to Section 15010 and provide wall sleeves and escutcheons as specified for typical piping. Sleeves for pipe passing through exterior walls that contain refrigerant piping shall be Schedule 80, ASTM D1785 PVC pipe, 1/2" larger in diameter than piping and piping covering. Refer to Section 15010, Sleeves and Firestopping for additional requirements. **Taping or zip tying of liquid lines to suction lines is not allowed.** Refer to Section 15010 and below for requirements. Coordinate wall sleeve sizes required for refrigerant piping with insulation and aluminum jacket requirements. Piping within wall cavities shall be seamless type with no joints.

11.2. **Refrigerant Piping Testing:** Test with CO_2 gas or dry nitrogen and prove tight. Test high and low side of system at 500 psi. Evacuate the system and charging with refrigerant. Test piping with a halide torch and prove tight under actual operating conditions.

The installing contractor shall issue on his company letterhead, to the Local Code Official and the Authority Having Jurisdiction, a certificate of testing for all systems containing 55 pounds or more of refrigerant. The certificate shall give the unit number as shown on the plans, the test date, name of the refrigerant, test medium and the field test pressure applied to the high pressure side and the low-pressure side of the system. The certification of the test shall be signed by the installing contractor.

11.3. **Joints:** Brazed joints only. Flare joints are not allowed. Make up with high temperature silver solder suitable for twice (2x) the working pressure, at maximum capacity, of the system. Pass dry nitrogen gas through pipe while joints are brazed. No joints shall be allowed within any masonry walls or any other inaccessible area. Solder shall be Sil-Fos 15 or approved equivalent. All soldering or brazing, materials and methods used shall be as recommended by the unit manufacturer. Piping within wall cavities and other inaccessible areas shall be seamless type with no joints.

11.4. **Piping Diagram:** Various manufacturers of heat pump, mini-split, VRF and DX systems have different reasons for the use of loops, traps, accumulators, receivers, etc., in piping arrangements, therefore, submit for approval, the air conditioning equipment Manufacturer's recommended, dimensioned plan view and isometric piping diagram proposed for use for each system, showing all valves, loops, pipe sizes and all appurtenances, required for the proper operation of the respective system. Secure approval of compressor and air conditioning unit manufacturer before submitting. **Failure to provide a manufacturer approved diagram will make the contractor responsible for all required changes to the piping system without additional cost to the Owner or his Design Professionals.** Submit catalog data and manufacturer's ratings for all valves, catch-alls, etc. with diagram for each system. Identify all items for respective system and list capacities, pressure drops, etc.

11.5. **Solenoid Valves (Where Required):** Install in liquid refrigerant connection to the evaporators. Valves shall be designed for the operating pressure and capacity as listed in manufacturer's catalog with a pressure drop not exceeding 2 psi, and shall be sufficient for the requirements of the installation. Install in horizontal runs with body vertical.

11.6. **Expansion Valves (Where Required):** Properly sized diaphragm or bellows type, with external superheat adjustment set for 10 degrees F. superheat. Install in the liquid refrigerant supply lines to the evaporators. Expansion valves up to and including 7-1/2 tons capacity shall be Sporlan Type "S" or approved equivalent. Expansion valves over 7-1/2 ton capacity shall be Sporlan Type "O" or approved equivalent. Install Sporlan full size catch-all filter-drier ahead of valve.

11.7. **Refrigerant Service Valves:** Provide for the proper servicing of the equipment. All refrigerant circuit access ports located outdoors shall be fitted with color coated, all brass, and locking type tamper resistant caps. The locking caps shall be color coded for the refrigerant used. Caps shall be Novent Series 8668 for R-410 refrigerant with

86698 NV Multikey unlocking mechanism for R-410 refrigerant or equivalent by JB Industries Series Shield and DiversiTech Series Sentry. Provide owner with minimum of six (6) spare keys.

11.8. **Refrigerant Filter Drier (Catch-all):** Install in refrigerant line on the inlet side of each thermostatic expansion valve a Sporlan, three desiccants type filter drier. Filter driers up to and including 10-ton capacity shall be sealed type. Filter driers over 10-ton capacity shall be replaceable core type. Units shall have minimum surface filtering area and capacity not less than that shown in Sporlan Valve Company Bulletin 40 10 under sizes for "field replacement or field built up sizes". Careful attention must be given to providing the correct type of filter drier as it pertains to type of refrigerant used in the respective system.

11.9. **Pipe Sleeves:** See Section 15010 for requirements.

PART 12. PIPE HANGERS AND SUPPORTS

12.1. **General:** Refer to Section 15010. **This does not apply to refrigerant piping.** Refer to Part Pipe and Miscellaneous Insulation Work below for refrigerant piping support requirements.

12.2. **Painting of Hangers and Supports:** All non-galvanized exposed ferrous metal parts of hangers, Unistrut and other assemblies used for supporting of ducts (except hanger straps and threaded rods), piping and plumbing related items in mechanical rooms, crawl space, above ceilings, etc., including black steel pipe, uncoated cast iron pipe, hangers, brackets, etc. shall be coated. All exposed ferrous metal parts of hangers, Unistrut and other assemblies used for supporting of ducts (except hanger rods, duct straps/band hangers), piping and related items in mechanical rooms, crawl space, above ceilings, etc. Include black steel pipe, uncoated cast iron pipe, hangers, brackets, etc. All finishes and coatings shall have a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E84. Also, see specification section, "Identification" for additional requirements. Refer to Section 15010 for additional requirements.

PART 13. PIPE AND MISCELLANEOUS INSULATION WORK

13.1. **General Provisions:** All work by experienced applicators in accordance with manufacturer's recommendations. Installation shall be as recommended by the Manufacturer. Where specified installation conflicts with the Manufacturers recommendations, the strictest application shall be provided. Piping must be clean, dry and pressure tested before covering is applied. Size pipe hangers to fit over insulated pipe size. **Hangers shall not be in contact with bare pipe and shall not penetrate the vapor barrier**. See hangers and supports for requirements. Cover fittings, valves and flanges with insulation material as hereinafter specified to same thickness as adjacent pipe covering except screwed unions in hot and chilled piping and other specifically named items. Neatly bevel covering edges adjacent to unions and other points of termination or provide factory fabricated beveled insulation fitting. All insulation materials including coatings and mastics shall have a composite rating for insulation, jacket or facing, including adhesives, not to exceed 25 flame

spread and 50 for fuel contributed and smoke developed as determined by ASTM E-84, NFPA 255 and UL 723.

13.2. **Refrigerant Suction Lines and All Hot Gas Reheat Coils' Hot Gas Lines, Various Liquid Lines and Mini-Split System Liquid Lines:** Insulate with UL fire and smoke rated unslit, black, flexible foamed, elastomeric, closed cell pipe insulation by AP Armaflex or equivalent by K-Flex or Aerocel AC EPDM. It shall be GreenGuard certified tubular insulation with Microban antimicrobial protection. Insulation shall have a 'k' factor of not more than 0.256 at 90°F mean temperature, water absorption percent by volume of 0.2 and a water vapor transmission rate of 0.05 perm-inches or less.

Slip insulation onto pipe prior to erecting. **Do not stretch or bend insulation at any turn, nor slide insulation over sweat fittings.** Insulate sweat fittings, tee joints, p-traps and elbows with prefabricated fittings as manufactured by the insulation manufacturer, the same size as the adjacent piping. Fitting cover shall be long enough to overlap the pipe insulation by a minimum of one inch on each side. Glue the 1" overlap and seal to the adjacent pipe insulation with same adhesive and tape specified below.

Seal all butt joints of insulation and butt joints at the specified refrigerant piping clamp with Armaflex BLV, Black, low VOC, air-drying contact adhesive. After gluing joints, wrap joint with 3" wide, 1/8" thick AP/Armaflex self-adhering tape.

Longitudinal cutting of the insulation is prohibited.

All insulated piping shall be continuous without cutting at clamp/support assemblies. All refrigerant liquid lines which are not associated with a hot gas reheat coil or liquid lines NOT required to be insulated by the equipment Manufacturer shall not be insulated except, they shall be provided with insulated insert at clamps to Unistrut assemble as specified below.

Refrigerant liquid lines and hot gas reheat coil refrigerant supply line insulation shall be 1" thickness.

Note that Various Manufacturers of mini-split systems require the insulating of refrigerant liquid lines. When required by the Manufacturer, they shall be insulated using materials specified above and in thickness required by the respective Manufacturer. Where the mini-split system Manufacturer requires less than 1" insulation, install thickness recommended with materials specified above using methods specified below.

Preinsulated refrigerant piping is not allowed unless insulation meets the requirements specified above. Note also that coiled refrigerant piping is not allowed unless specifically noted. Refer to other portions of this specification for refrigerant piping requirements.

13.3. **Refrigerant Pipe Supports and Clamp Assembly: Do not use clevis hangers for refrigerant piping.** All refrigerant piping, regardless of size, shall be supported with Unistrut assemblies. Provide Unistrut assembly, supporting horizontal refrigerant piping on intervals not exceeding 10 feet. Provide dielectric separation between

dissimilar metals. Support piping so that no vibration will be transmitted to the building structure.

Provide an insulated piping clamp assembly at each Unistrut hanger, including the liquid line, suction line and any bare copper line attached to the assembly. The insulated clamp shall provide a crush resistant airtight seal and shall consist of a rigid, closed cell, foam insulation to support tubing and absorb vibration. The outer cover shall consist of a rubber coating that seals the cushion completely after installation to prevent condensation. Clamps shall be steel with electrodichromate finish. Rated assembly temperature range shall be -50ºF to +250ºF. It shall be self-extinguishing as tested under ASTM D 635. After installing device, glue each butt joint and tape each joint with 3" wide, 1/8" thick AP/Armaflex self-adhering tape Armaflex tape.

Insulated lines shall use ZSi Series Cush-A-Therm, ArmaFix Eco Light or approved equivalent.

For units on concrete pad, support piping on concrete pad with rustproof coated, 1-1/2" x 1-1/2" x 1/8" galvanized steel angle supports anchored to pad with steel base plate and bolts. Refrigerant piping shall be attached to the support with the insulating assembly specified above.

13.4. **Roof Mounted Refrigerant Piping Supports:** Supports shall be MAPA Products A-Series Supports. Support shall be manufactured of extruded aluminum with an integrated industry standard strut designed to allow for a free-standing, non-penetration installation that can incorporate readily available strut accessories. Supports shall be 6, 8 10 or 12" length as required. Provide support with adhered isolation pads as required by the roofing manufacturer. Coordinate requirements with Architect's roofing specifications and provide as required.

13.5. **Refrigerant Piping and Condensate Drainage Piping Aluminum Jacket:** Do not install aluminum jacket until refrigerant piping insulation installation has been inspected by the Engineer. All insulated exterior refrigerant piping, insulated exterior hot gas reheat coils hot gas piping and all insulated condensate drainage piping terminating in janitor sink, floor sink and hub drains in finished areas and any location that would subject the piping insulation to damage shall be covered with an aluminum jacket.

Where refrigerant piping rises within the wall cavity to above the ceiling, attic or similar space, the aluminum jacket shall terminate within the exterior wall cavity and sealed weather tight to the sleeve in the wall. Where the refrigerant piping extends from the outside, directly into the mechanical room, the aluminum jacket shall terminate a minimum of 8" into the space and sealed weather tight on both sides of the wall and sleeve.

The aluminum jacket shall be 20 mil (.02") thick, smooth finish, 3003 and 3105 series aluminum conforming to ASTM B-209 standards. Fittings shall be 20-mil (.02") thick, die shaped, and smooth finish, Type 1100 aluminum jacket meeting ASTM C585. Provide 1/2" wide, 20-mil (.02") thick, Type 3003 aluminum bands on maximum 24" centers but not less than two bands per jacket section. **Venture Clad or similar product is prohibited.**

13.6. **Condensate Drain Lines:** To include discharge lines on all equipment specified with or provided with air conditioning condensate drainage pumps. Insulate using same methods and materials as specified for refrigerant piping except 1/2" thickness.

13.7. **Painting and Identifying:** Paint and identify after installation is completed as specified in Section 15010. Where piping is specified with an aluminum jacket, painting is not required. Refer to Section 15010, Identification and note special refrigerant piping identification requirements.

13.8. **Submittal Data:** Submit for approval complete data on materials and application methods proposed.

13.9. **Manufacturers:** Approved equivalents by Pittsburgh Corning, CertainTeed, Baldwin-Ehret-Hill, Manville, Owens Corning, Armstrong Childers and 3M Company will be accepted.

PART 14. VARIABLE AIR VOLUME TERMINAL UNITS

14.1. **General:** Units shall be factory-packaged pressure independent with capacity and performance as scheduled on the drawings. Unit performance data must SP rated in accordance with ARI Standard 880 and must display the ARI symbol on all units.

14.2. **Construction:** Air volume damper, fans and controls shall be factory assembled into a single cabinet (field assembly will not be allowed). Cabinets shall be constructed of not lighter than 22 gauge, zinc-coated steel.

Plenum air inlets shall be rectangular or square. Primary air inlets shall have round/oval flanged connection. Discharge shall have 611 collar round or rectangular depending on unit size for duct attachment.

Internal surfaces shall be acoustically and thermally insulated 0.50" thick fiberglass free material having UL approval meeting NFPA 90A.

Units shall be provided with full bottom access panel equipped with ¼" turn fasteners for complete access to internal components.

The air volume damper assembly shall be located inside the unit casing and shall be constructed from exactly dimensioned extruded anodized aluminum or galvanized steel components. Damper blades shall have galvanized steel or extruded ribs which key into a grooved shaft to insure permanent attachment of damper. All internal damper pivot points shall be nylon fitted for noiseless operation and shall require no lubrication.

Air volume dampers shall be constructed to prevent air leakage in excess of 2% of air rated quantity at 2" inlet static pressure.

14.3. **Performance Rating:** Performance of units shall be based on test conducted using ASHRAE Standards and ADC Standards as guidelines where applicable with no ductwork between the unit discharge and the sound room.

14.4. **Electric Heating Coil:** Shall be factory mounted, UL listed resistance open type heater with disc type automatic reset thermal cutout primary safety device, load carrying manual reset thermal cutout, secondary safety in load circuit. Heater elements shall be open construction, 80 percent nickel and 20 percent chromium. Terminal connections shall be stainless steel with ceramic insulators. Integral terminal panel designed to house contactors and be factory installed. Each heater shall be provided SCR control.

Disconnect switch with interlocking door handle on terminal box door to disconnect all power to the entire unit. The units shall be factory circuited/wired as required by Local and National Electrical Codes. The power/control terminal box shall be gasket for tight seal. Each unit shall have fused disconnect switch with fuses sized per nameplate of the unit.

14.5. **Controls:** Controls shall be electronic DDC pressure independent, with adjustable minimum-maximum limits with velocity reset. Factory mounted controls shall be provided to accomplish the specified sequence of operation including damper actuator, pressure switch, electronic thermostat, transducer, damper position switch transformer, etc. Refer to Section 15920. Automatic Temperature Controls and Building Automation System BAS and coordinate all work with control subcontractor.

14.6. **Wiring:** Factory mounted control power transformer and internal power wiring, regardless of control type shall be provided so that only a single point power connection is required. Provide manual disconnect. **Contractor shall verify all voltage and power requirements with Electrical Contractor, Electrical plans, and at the project site, prior to ordering equipment.**

14.7. **Factory Tests:** Fan/motor combinations, volume dampers and controls shall be run tested, sequence of operation checked, and cfm limit preset at the factory prior to shipment.

14.8. **Acceptable Manufacturers:** Price, Trane, Carrier, Titus or Enviro-Tec.

PART 15. VENTILATION

15.1. **General:** Provide all fans complete with ducts, grilles, curbs and required accessories. **All roof mounted fans, curbs and related assemblies shall be tested and certified by an independent, recognized third party testing agency and shall comply with all three Miami-Dade test protocols for static loading, missile impact and cyclic loading. Installation shall be as required by the Manufacturer to comply with the aforementioned test protocols.** Roof fans and curbs shall be painted with two coats of non-reflective paint. Paint type and color as selected by Architect. All roof curbs, etc., furnished shall adhere to the roofing manufacturer's requirements so as not to void the roofing warranty. The top of all roof curbs shall be level with pitch built into curb when deck slopes 3/8 of an inch per foot or more. Coordinate with architectural and structural plans for required slope. Coordinate roof curb and interface in the building roofing system and verify minimum net height to be as required by code or as required by Architect. Refer to architectural

specification. Furnish sound absorbing curbs required to obtain noise levels specified. See Part "Vibration and Noise Control" for additional requirements. Provide for all fans to be interlocked with air handling units a "hand" – "auto" – "off" switch. All fans shall be AMCA certified in accordance with Standards #210 and 300. Fans wheels shall be balanced in accordance with AMCA Standard 204-05. Fans shall be UL 705 listed and shall bear the UL Label. Furnish for approval capacity and sound power ratings. All motors 1/2 HP and smaller shall have built-in overload protection. All motors 1 HP and below shall be provided with ECM motors. All belt driven fans shall have v-belt drive sized for 150% of the installed motor horsepower, adjustable pitch cast iron sleeves for motor and adjustable motor base. All motors shall also be premium efficiency type. Refer to Section Motors for additional requirements. Scheduled static pressures are external to sound curbs

15.2. **Power:** Contractor shall verify all voltage and power requirements with Electrical Contractor, Electrical plans and at the site, prior to ordering equipment.

15.3. **Roof Centrifugal Exhaust Fans:** Fans shall be centrifugal power roof ventilators with AMCA certified air and sound ratings. Fans shall be belt or direct driven as shown and shall have permanently lubricated and sealed flanged bearings rated for L50 life in excess of 200,000 hours at maximum cataloged operating speed. All aluminum wheels statically and dynamically balanced backward curved blade wheels and spun aluminum housing with curb cap; disconnect switches, backdraft damper and outlet bird screen. For each fan furnish an 18 gauge galvanized steel insulated prefabricated curb with integral cant and continuous welded joints. Fans shall be equal to Cook Series "ACE".

15.4. **Ceiling Mounted Cabinet Fans:** Penn Ventilator Company Model Zephyr, Series Z-3H thru Z-15H with RA right angle arrangement or TDA arrangement as shown on the plans, or approved equivalent, complete with all accessories, including unit mounted solid state speed control switch, factory baked enamel white metal ceiling grille, metal flanged inlet and outlet connections, acoustically insulated metal housing, direct drive, ECM motors, internally isolated centrifugal fan, integral backdraft damper and terminal cap, cast aluminum brick vent or soffit grille as shown on the plans. Fan wheel shall be steel. Provide aluminum wheel where fan exhausts shower areas. Fan shall be supported from the structure with 1/4" hanger rods, rubber in shear vibration isolators and Manufacturer furnished bracket for attaching rods to the fan and structure above.

15.5. **Kitchen Hood Exhaust Fans:** By Kitchen hood manufacturer. Direct driven, centrifugal vertical discharge powered exhausters designed specifically for kitchen hood exhaust systems as manufactured by CaptiveAire, or approved equivalent. See plans for discharge arrangement. Housing shall incorporate upper and lower exterior wind bands to enable velocity to discharge above the roof surface. Housing shall be of mill finish spun aluminum construction and be provided with a factory installed cleanout port to provide a means of cleaning the fan blades.

Motor compartment shall incorporate Pyrotrol heat shield and Garlock shaft seal for belt driven units.

Fans shall be provided with roof or wall curb as shown on the plans and hinged base with integral stops. A drainage port and extension tube with Grease Terminator 2

capture device shall also be provided. **Provide integral 4" tubing cleanout on the fan housing to facilitate cleaning of the fan blades.** Fans shall be belt or direct driven as shown and shall have permanently lubricated and sealed flanged bearings rated for L50 life in excess of 200,000 hours at maximum cataloged operating speed. Fans shall meet UL 762 listed for grease exhaust and temperatures to 400°F. Other accessories shall include moisture proof curb to comply with NFPA 96, forced motor cooling, and integral residue trough to meet NFPA Standard 96 requirements and disconnect switch.

15.6. **Cabinet In-Line Centrifugal Fans:** Loren-Cook Series "SQ" in-line centrifugal type fan as shown on the fans schedule. Fan shall have 18 ga. galvanized steel cabinet with integral duct collars, bolted access doors on 3-sides which are sealed with closed cell neoprene gasketing, disconnect switch, centrifugal, backward inclined extruded aluminum fan wheel and cast aluminum hub, supports for ceiling suspension, permanently lubricated drip proof motor, and gravity type discharge damper and Manufacturer furnished speed controller. Bearings shall be heavy duty, L50 life in excess of 200,000 hours at maximum cataloged operating speed. Bearings shall be regreaseable ball type with extended fittings in a pillow block cast iron housing. Coordinate fan arrangement required (top, side and bottom) at the site, prior to ordering fan.

15.7. **Acceptable Manufacturers:** Cook, Acme, Greenheck, Penn Barry.

PART 16. PACKAGED GAS FIRED ROOF/PAD MOUNTED MAKE-UP AIR UNIT (MAU-1)

16.1. **General:** An Indirect-fired gas heating and ventilating unit, as indicated on the drawings shall be furnished. Orientation shall be Horizontal discharge. Unit shall be factory assembled, tested and shipped as a complete packaged assembly, outdoor mounting, with gas furnace, centrifugal blower, forward-curved double width/double inlet, motor starter with thermal overload protection, motor and belt driven or direct driven as shown on the equipment schedule, fuel burning and safety equipment, temperature control system, gas piping and discharge air temperature sensor.

Unit assembly shall be tested in accordance with Standard, ANSI Z83.8-2006 and CSA 2.6-2006 and shall bear the ETL or UL label. The duct furnace shall be certified by the American Gas Association and approved by the Canadian Gas Association.

The unit shall have double-wall construction consisting of at least two layers of 20 gauge G-90 galvanized steel. The wall panels and roof panels shall be fabricated by forming double-standing, self-locking seams that require no additional support. The floor and wall panels shall be caulked air tight with a silicone caulk. All casing panels shall be attached with sheet-metal screws or rivets, which can be removed to field service large components. The unit base shall be suitable for curb or flat mount. The base shall be constructed of galvanized steel for improved rigidity. Base shall be structurally reinforced to accommodate the blower assembly and burner. Housing construction should be suitable for outdoor or indoor installation. All doors and at least one side of every sheet metal surface of the unit separating two air-masses of different air temperatures shall be faced with properly secured 1" aluminum-faced insulation for condensation prevention. The discharge of the unit shall be internal to

the heating module containing the furnaces. All electrical controls on the control board shall be mounted in an isolated, fully enclosed and insulated vestibule, completely separated from any combustion air, but accessible for servicing needs. All furnace exhaust flues shall be of double-wall construction. All furnace exhaust flue connections and roof-penetration seams shall be sealed with High-Temp Fire-Barrier 2000+ type silicone caulking. All unit housings shall be equipped with Internal Air Distribution Screens on the upstream side of each furnace heat-exchanger. High wind rain caps shall be installed at the termination of the furnace discharge flues.

Blower door shall provide easy access to blower, motor and drives. Access doors shall be provided on both front and back side of unit providing full access to every part of the unit.

The unit base shall be suitable for mounting on the concrete pad. Housing construction should be suitable for the outdoors.

All controls and electrical components shall be mounted within the control vestibule. The vestibule shall be an integral part of the unit and not extend outside the exterior casing of the unit, nor be exposed to the main air stream. A full-size door shall provide easy access to the controls. The blower door shall provide easy access to the blower, motor, and drives. Access doors shall be provided on both ends of the unit providing full access to every part of the unit. The base shall be constructed of galvanized steel for improved rigidity. The base shall be structurally reinforced to accommodate the blower assembly.

Blower(s) shall be forward-curved, centrifugal, Class I or II, (as required for this installation), double width, double inlet, and constructed of G-90 galvanized steel. Unit shall have a heavy-duty, solid-steel shaft. Wheels shall be balanced in accordance with AMCA standard 204-96. The blower assembly shall be isolated from the fan structure with vibration isolators. Motors shall be heavy-duty ball bearing type and furnished at the specified voltage, phase, and enclosure. Motor mounting plate shall be constructed of heavy gauge galvanized steel. Shafts shall be precision ground and polished. Heavy duty, pre-lubricated bearings shall be selected for a minimum (L50) life in excess of 200,000 hours of operation at maximum cataloged operating speed. They shall be designed for, and individually tested, specifically for use in air handling applications. Belts shall be oil and heat resistant, non-static, grip-notch type. Drives shall be cast type, precision machined and keyed, and securely attached to the fan and motor shafts. Fan operating speed shall be factory set using adjustable pitch motor pulleys. Blower drives shall be fully adjustable. All drives shall be a minimum of two grooves above two HP.

Provide with filter section with 1” thickness, cleanable aluminum filters, motorized inlet-air damper and transformer, insulated roof curb 16-gauge galvanized exhaust and supply air ducts with welded joints. Unit shall have weatherproof epoxy coated finish.

The gas burner shall be an indirect-fired, push-through type, using natural gas at specified inlet-supply pressure to the unit. The burner shall be capable of heating the entire air supply. Burner shall be a tubular in-shot fired design capable of using natural gas. Each burner ignition shall be of the direct-spark design with remote flame sensing at inlet of the last firing tube of the gas manifold. Each burner ignition

module shall be pre-programmed with an ignition sequence comprised of a 1 minute pre-purge, 1 min inter-purge, 2 minute post-purge, 15 second ignition, 3 trials for ignition, and 60 min lockout. Direct-sparking sequence shall last through the complete trial for ignition period for guaranteed light-off. Burner shall always be lit at maximum gas flow and combustion airflow for guaranteed light-off. Each burner ignition module shall have LED indicators for troubleshooting and a set of exposed prongs for testing flame indication signal. All furnaces shall be controlled by an electronic vernier-type fully modulating control system capable of achieving 92% combustion efficiency over the entire gas firing range of the unit.

Furnace shall have a minimum turndown ratio of 5:1 for natural gas and minimum 80% efficiency. The furnace heat exchanger shall be a bent-tube style design made entirely of type 409 stainless steel. The furnace shall include a blocked vent safety airflow switch with high temperature silicone tubing operating off of absolute pressure measured inside of the power-vent blower housing. The furnace shall include a high temperature auto-recycling limit with a maximum non-adjustable set-point of 200F. The furnace shall include a manual reset high temperature flame roll out switch with a non-adjustable set-point of 325F. The furnace shall be accessible from both sides of unit. The furnace shall include a power-vent assembly for exhausting flue gases with a PSC type motor that is securely mounted with rubber vibration isolators and easily accessible/removable for service. The heat-exchanger shall have a manufacturer-backed 10-year pro-rated warranty. Each power-vent blower motor and housing shall have a standard 1-year manufacturer-backed warranty.

Each furnace module gas inlet shall be equipped with a 0-35”w.c. gas pressure gauge. A 0-10”w.c. gas pressure gauge shall be installed on the gas manifold of each furnace.

The gas equipment shall conform to local-Code requirements and provided with modulating-gas valve, on/off redundant gas valve, burner, main-gas shut-off valve, main-gas regulator, high gas pressure regulator and two solenoid valves. All gas manifold components shall be piped and wired at the factory.

Unit shall be provided with motor starter with adjustable overloads, main air-flow safety switch, electronic flame-safety relay, high-temperature limit switch, non-fused disconnect, flame roll-out switch, main-gas regulator, two solenoid valves, modulating-gas valve, combustion air-proving switch, high gas-pressure switches to open circuit to electronic flame-safety relay, if gas pressure is too high, low gas-pressure switch to open circuit to electronic flame safety relay, if gas pressure is too low and adjustable low temperature blower-safety control with bypass timer to shut down unit, if discharge temperature drops below setting, and firestat.

Manufacturer shall provide and install on unit a two-position, motor-operated damper with internal end switch to energize the blower-starter circuit, when damper is 80% open. Blades shall be a maximum of 6" wide 16 Gauge G-90 galvanized steel shall be made to guarantee the absence of noticeable vibration at design air velocities. Damper blades shall be mounted on friction-free synthetic bearings. Damper edges shall have PVC coated polyester fabric mechanically locked into blade edge. Jamb seals to be flexible metal, compression type.

Unit shall be provided with 2" thick, aluminum mesh, coated with super-filter adhesive. Aluminum-mesh filters shall have aluminum frames with media to be layers of slit and expanded aluminum, varying in pattern to obtain maximum depth loading. Washable 2" filters shall be enclosed in two-piece, die-cut frame with diagonal supports. Frame shall be constructed of heavy-duty beverage board. Filter media shall be supported on the air leaving side by a metal grid. Filter section shall be insulated and constructed of G-90 galvanized steel with filters supported by internal slides and with removable access panels. The unit shall be provided with fresh air inlet hood/filter combination. It shall be constructed of G-90 galvanized steel with bird screen and 2" cleanable filters supported by internal slides mounted in the inlet face of the hood.

Unit shall be provided with factory installed variable frequency drive (VFD).

Unit shall be provided with discharge air sensor to maintain discharge air temperature of 90°F (adj).

The control circuit voltage shall be 24 volts. A control transformer shall be provided. Unit shall have standing 120 Vac power. The control wiring shall be carried in wire channel or conduit.

Wiring in control enclosures shall be in accordance with the National Electrical Code and the local code.

Unit shall be complete with all required items such as relays, starters, switches, safety controls, conduit and wire as previously specified, and as required for proper operation. All factory-mounted controls shall be factory prewired to the unit control panel. Unit shall be provided with single point electrical connection, blower-on delay timer to pre-heat the heat-exchanger prior to energizing the main blower, convenience outlet on the control board with 120 Vac service, freeze-stat with adjustable temperature set point to shut down the main blower in case of burner failure, fire stat with adjustable set-point temperature, dirty filter airflow switch with LED indicator light on remote panel and variable frequency drive for main blower motor.

Unit shall be operated, tested and set at the factory using job-site conditions for electrical and gas input. All operating and safety controls shall be tested and set at the factory. Adjustable, or fixed sheaves shall be set for proper RPM at specified conditions. Gas-pressure regulator shall be set for specified burning rate at specified inlet pressure.

The supplier shall furnish gas piping schematics, as built wiring connection and control-circuit diagrams, dimension sheets and a full description of the unit(s). Service manuals, showing service and maintenance requirements, shall be provided with each unit.

The Contractor shall provide for a factory-trained technician, employed by the unit manufacturer and not a sales representative, to check out all equipment and furnish written report indicating equipment is installed in strict accordance with manufacturer's recommendations.

The entire unit shall be factory wired for single point power connection. **Contractor shall verify all voltage and power requirements with Electrical Contractor, Electrical plans, and at the project site, prior to ordering equipment.**

The Contractor is responsible for quarterly filter cleaning during the guarantee.

Unit shall also be provided with surge protection and phase protection to insure against voltage unbalance, over/under voltage, phase loss, reversal, incorrect sequencing and rapid short cycling. Protection shall be provided for all 3-phase equipment utilizing ICM Controls Model 450 A Plus+ or equivalent. All single phase equipment with horsepower greater than or equal to 1/8 HP shall be provided with protection utilizing ICM Controls Model ICM 492 or equivalent. Where phase protection device cannot be mounted within the respective equipment, provide a NEMA 4x or NEMA enclosure appropriate for the installation. The Contractor shall consult with the Owner's maintenance personnel and set up all programmable options based on the Owner's requirements, within the device's capabilities. Phase protection is not required on equipment being controlled via a variable speed frequency drive.

16.2. **Roof Mounting:** Refer to Part Vibration and Noise Control for roof mounted equipment requirements. All items furnished shall adhere to roofing manufacturer's requirements so as not to void the roofing warranty. Coordinate with architectural and structural plans for required slope. Coordinate roof curb and interface in the building roofing system and verify minimum net height to be as required by Code and Architect. All roof-mounted equipment shall be designed by the Manufacturer and installed by the Contractor to withstand the minimum wind loads prescribed in IBC Section 1609 and IMC 301.12. Coordinate all requirements with the Structural Engineer prior to installation.

16.3. **Factory Start-up Service:** The Contractor shall provide a factory-trained technician, employed by the unit manufacturer and not a sales representative, to check out all equipment and furnish written report indicating equipment is installed in strict accordance with manufacturer's recommendations. Also, provide temperature, pressure and amp readings taken during testing to substantiate unit performance.

16.4. **Acceptable Manufacturers:** Captive-Aire Series A-IBT, Hastings, Sterling or Modine. Captive-Aire is the basis of design.

PART 17. SPLIT SYSTEM HEAT PUMP UNITS

17.1. **General:** Furnish and install split system heat pump systems as manufactured by the Trane Company. All equipment (condenser/compressors) scheduled cooling capacities are based on 95°F ambient temperature. Indoor units shall be Series TEM6 for units with scheduled cooling capacity of 48MBH or less. Indoor units with scheduled cooling capacities of greater than or equal to 54 MBH shall be Trane Odyssey Series TWE. Outdoor units shall be Trane series TWA. Equivalent units/systems by Carrier or Lennox will be considered.

Each unit shall be completely factory assembled and tested, and shall include hermetic compressor, outdoor condenser coil, indoor evaporator coil, condensate switch to shut unit down should condensate drain line become obstructed, fan and

high static ECM motor drives (Series TEM6) or belt drive motor with variable pitch pulley, high static drive and permanently lubricated ball bearing motor (Series TWE), interconnecting wiring, low voltage control transformer, prewired control panel and other necessary components mounted in weather resistant steel cabinet with baked on enamel finish. The unit shall be UL or ARL (Applied Research Labs) listed and labeled accordingly. The heat pump shall be sound rated per ARI Standard 270 and operation sound level shall not exceed acceptable limits. Heating and cooling capacities shall not be less than those indicated on the drawings. Indoor unit shall be provided with single point power connections (fan and heater). **Contractor shall verify all voltage and power requirements with Electrical Contractor, Electrical plans, and at the project site, prior to ordering equipment.**

17.2. **Special Considerations:** The equipment manufacturer shall size the refrigerant piping for all the units and shall furnish all accessories and auxiliaries required for a complete and proper installation for the specific application shown on the drawings and the specified sequence of operation. Refer to Section Refrigerant Piping and Accessories for additional requirements.

17.3. **Cabinet:** Heavy duty plastic (1-ton through 5-tons) and heavy gauge galvanized steel cabinet with weather resistant baked enamel finish for all other units. Access to the electrical controls and compressor shall be made by removing two service panels.

17.4. **Compressor System:** The unit shall contain a hermetic compressor. The compressor shall have high and low pressure protection, sump heat and compressor overload protection. Refrigerant circuit shall include service valves, pressure tap ports, check valves, switch over valve, refrigerant line filter-driers, and factory furnished holding charge of R-410a. All units with scheduled cooling capacity greater than 60 MBH shall be provided with multiple compressors or 2-stage compressors as required by ASHRAE 90.1.

All refrigerant circuit access ports located outdoors shall be fitted with color coated, all brass locking type tamper resistant caps. The locking caps shall be color coded for the refrigerant used. Caps shall be Novent Series 8668 for R-410 refrigerant with 86698 NV Multikey unlocking mechanism for R-410 refrigerant or equivalent by JB Industries Series Shield and DiversiTech Series Sentry. Provide owner with minimum of six (6) spare keys.

Compressor shall be designed, manufactured and warranted for five years by the air conditioning unit manufacturer.

17.5. **Outdoor Coil:** The outdoor coils shall be constructed of aluminum fins or Spine Fin mechanically bonded to seamless aluminum or copper tube and shall be protected by a unit manufacturer furnished, heavy-duty metal hail guard. The outdoor coil shall have expansion valve refrigerant control during heating operation, and automatic time and temperature actuated defrost control system. Unit shall, as factory shipped, cycle fan motor on outdoor thermostat for low ambient cooling down to 45°F outdoor temperature. Provide heavy-duty metal condenser coil hail guard.

17.6. **Controls:** Controls shall be factory wired and readily accessible. Compressor shall have overload protection; high and low pressure cutouts, 24-volt control transformer and magnetic contactor.

17.7. **Air Handler:** Air handler cabinet shall be constructed of heavy gauge steel with baked enamel finish and be internally lined with foil laced fiberglass insulation. The indoor coil shall be constructed of aluminum plate fins mechanically bonded to seamless copper tubes. The indoor (evaporator) coil shall have expansion valve control and be equipped with defrost control and provided with stainless steel drain pan. Air handler shall be provided with low voltage terminal board and fan motor relay. Refer to drawings for specific drive requirements.

17.8. **Electric Heaters:** Provide electric heater with a total heating output not less than indicated on the drawings. Heater assembly shall include power supply fusing, automatic resetting limit switches and heat limiters for thermal protection. Heater shall be provided with factory disconnect switch and fusing all per National Electrical Code and UL. The auxiliary heater cabinet shall be factory-sealed air tight and insulated to prevent condensation.

Units with a specified cooling capacity of less than 40 MBH shall use the auxiliary resistance heater for reheat. Where the auxiliary resistance heater is specified for maintaining space temperature during dehumidification, the auxiliary resistance heater shall be provided in a minimum of two stages.

17.9. **Hot Gas Reheat Coil:** Each unit with scheduled cooling capacity greater than or equal to 40 MBH shall be provided with a refrigerant hot gas heating coil in the reheat position for humidity control. The coil shall be of sufficient size to reheat all of the supply air. Provide, complete, with all necessary valves, controls, etc., as required for a complete and properly functioning installation. Provide manual isolation valves for each hot gas and liquid lines. Furnish for approval air conditioning equipment manufacturer approved refrigerant piping and controls diagram, and statement by the air conditioning manufacturer on company letterhead that use of the hot gas reheat coil with the equipment is acceptable to the manufacturer and does not affect any warranty or guarantee. **Equipment submittal will not be reviewed without a manufacturers' approved diagram and referenced statement**. Minimum reheat capacity for supply air shall be 10ºF. Maximum coil pressure drop is 0.10" static pressure.

17.10. **Indoor Thermostat:** Provide hinged metal guard with rounded corners, lock and key for each thermostat. Refer to Section 15920 for additional requirements

17.11. **Outdoor Thermostat:** Provide mounting box. Provide one outdoor thermostat for control of second stage of electrical heaters.

17.12. **Factory Start-up Service:** The Contractor shall provide a factory-trained technician, employed by the unit manufacturer and not a sales representative, to check out all equipment with scheduled cooling capacity greater than or equal to 60,000 Btuh and/or are provided with hot gas reheat coils or UV-C lights, and furnish written report indicating equipment is installed in strict accordance with manufacturer's recommendations. Also, provide temperature, pressure and amp readings taken during testing to substantiate unit performance including the range of the refrigerant hot gas reheat coil as applicable.

17.13. **Power Wiring:** Unit shall be factory wired for power supply indicated on the electrical drawings. Any variation will be the responsibility of the contractor.

17.14. **Filter Frame and Filters:** Provide 2" thick, MERV 11, pleated filters equal to 30/30/ Farr Series. All filters shall be common industry standard size filters that are readily available and do not have to be fabricated. Cutting and taping of filter segments to make a proper filter is prohibited. Where indoor section sits on R.A. platform or is horizontally mounted in an attic space and the manufacturer does not provide a filter access with thumbscrew access in the bottom of the unit, provide a filter frame that is designed to mount to the bottom (R.A. inlet) of the air unit. Frame shall be hinged and have thumbscrews or wing nuts to open the access door. Filter frame shall be as manufactured by E-Z Filter Base Mfg., Inc. or approved equivalent. **The Contractor is responsible for quarterly filter changes during the guarantee period and shall inscribe onto the filters' casing the date filters were installed/replaced.**

17.15. **Ultraviolet (UV-C) Lights:** Mechanical Contractor is responsible for wiring the devices and providing power for the UV-C lights if not shown by the Electrical plans. Devices shall be hardwired, and UL labeled for the installation. Plug-in devices are not allowed.

Comply with UL / C-UL or ETL for Ultraviolet Fixturing. Store UV-C Fixturing in a clean, dry place and protect from weather and construction traffic. UV-C products supplier shall provide proof of 100% inbound and outbound testing of equipment. The UV-C Power supply shall have been tested, listed and labeled as compliant with UL, CSA and CE. Plenum wiring loom shall meet UL Subject 13 and UL 1581, Article 725 of the NEC and meet UL VW-1 material ratings. There shall be a metallic Loom cladding and it shall be UL recognized DXUZ2 and constructed of flexible galvanized steel and cover the entire Loom. Each lamp shall contain no more than 5 milligrams of mercury consistent with current environmental practices. Lamp Watts shall be printed on all lamps, no exceptions. Lamps shall not produce ozone and shall be hermetically sealed within a layer of UV-C transmissible FEP to protect against lamp breakage and to contain lamp contents should breakage occur.

Power supply and fixturing shall be warranted to be free from defects for a period of five (5) years. Lamps shall be warranted to be free from defects for a period of one (1) year.

Lamps shall be installed in sufficient quantity and in such a manner to provide an equal distribution of UV-C energy. When installed, the UV-C energy produced shall be of the lowest possible reflected and shadowed-losses and shall produce 360-degree UV-C irradiance from the lamps within the UV cavity. Lamp Watts shall be printed on all lamps, no exceptions. Each lamp shall contain less than 5 milligrams of mercury, consistent with current environmental practices. Lamp useful life shall be a minimum of 9,000 hours with no more than a 15% output loss at the end of the lamps life (12 months of continuous use). Lamps shall be constructed with UV-C resistant bases and shall not produce ozone. Lamps shall produce the specified output in moving air of up to 1000 fpm and temperatures of 0-200°F. Lamps shall be hermetically sealed within a layer of UV-C transmissible FEP to provide protection against lamp breakage and to ensure Lamp contents from a broken Lamp, are contained.

Fixture modeling shall be included in the submittal and must contain the necessary calculations to demonstrate that a minimum of 6 lamp watts, as recommended by ASHRAE, are distributed equally to each square foot of coil surface area to achieve a minimum of 100 microwatts per square centimeter equally distributed to the surfaces at the plenum sides, top and bottom. All calculations are to be at 55 degrees F and 500 fpm air velocity, no exceptions.

The power supply housing shall be capable of installation within or outside of the air stream, secondary compartment or NEMA enclosure. Lamps shall be mounted to irradiate the intended surfaces as well as all of the available line of sight airstream through proper placement, 360° irradiation and incident angle reflection.

To protect personnel, all access panels and doors to the UV-C assembly and/or within view of the UV-C assembly shall include mechanical interlock switches to ensure that the UV-C assembly will be de-energized when any of these accesses are opened. A redundant disconnect service switch shall be installed on the unit exterior, next to the unit access door, in plain sight to provide a method to more specifically de-energize the UV-C lamp circuits prior to entering the lamp plenum.

17.16. **Unit Protection:** All indoor and outdoor equipment shall also be provided with surge protection and phase protection to insure against voltage unbalance, over/under voltage, phase loss, reversal, incorrect sequencing and rapid short cycling. Protection shall be provided for all 3-phase equipment utilizing ICM Controls Model 450 A Plus+ or equivalent. All single phase equipment with horsepower greater than or equal to 1/8 HP shall be provided with protection utilizing ICM Controls Model ICM 492 or equivalent. Where phase protection device cannot be mounted within the respective equipment, provide a NEMA 4x or NEMA enclosure appropriate for the installation. The Contractor shall consult with the Owner's maintenance personnel and set up all programmable options based on the Owner's requirements, within the device's capabilities.

17.17. **Pad Mounted Supports:** Units shown on finished grade shall be anchored to the concrete pad. Concrete pads are specified under Division 2. Where concrete pads are not specified or not shown elsewhere, the Mechanical Contractor shall provide a minimum 4” thickness, 3,000-psi concrete pad with rounded edges and corners. Pad shall extend a minimum of 12” around three (3) sides of the unit and terminate at the building outside wall. Provide a strip of asphalt expansion joint between the concrete pad and the building exterior wall. Expansion joint shall be full width by full depth of concrete pad, 1” thickness, non-absorbing, self-sealing, ASTM D 994 compliant as manufactured by W.R. Meadows Inc. or approved equivalent.

17.18. **Warranty:** General warranties are specified in Section "General Mechanical Provisions". The Contractor and equipment Manufacturer shall provide a non-prorated, total of five years, warranty on the unit compressor(s). The manufacturer's warranty shall provide for the repair and/or replacement of the equipment compressor(s) that become inoperative because of defects in material or workmanship. The Contractor is responsible for any parts and labor not provided by the equipment Manufacturer. The warranty shall include refrigerant and all other costs associated with the compressor(s) removal and replacement, shipment to the Contractor or Facility, installation and returning the equipment to its proper operating condition.

The Contractor shall respond within 24 hours upon notification that a compressor has failed under the terms of the warranty. "Respond" shall mean having a Manufacturer certified technician onsite to evaluate the extent of the needed repairs and ordering of all items required for repair. Shipping of the replacement compressor shall be via maximum of 2-day delivery of the compressor(s) if the unit is inoperable.

The warranty period shall begin on the same date as substantial completion of the installation, as determined by the Architect, and shall continue for the full product warranty period specified above.

PART 18. PACKAGED ROOFTOP HEATING AND AIR CONDITIONING UNITS (PHAC)

18.1. **General Description:** One-piece, high efficiency, combination air-to-air DX mechanical cooling system and natural gas fired (electric resistance) heating system, premium efficiency motors, powered exhaust/relief, complete with automatic controls and powered GFI convenience power outlet. All equipment (condenser/compressors) scheduled cooling capacities are based on 95°F ambient temperature. Unit shall be provided with color touchscreen interface with USB port to indicate data trending, historical alarm messages, real-time sensor measurements, on board system setpoints and customized reports. The unit shall be designed for direct, bottom (side) handling of the conditioned air as shown on the plans. **Any unit with arrangement different from shown on the plans requires prior approval.** The equipment shall be shipped completely assembled, pre-charged, piped and wired internally ready for field connections. The manufacturer shall test operate the unit before shipment. Units shall have heavy-duty metal condenser coil hail guards. The entire unit shall be factory wired for single point power connection. **Contractor shall verify all voltage and power requirements with Electrical Contractor, Electrical plans, and at the project site, prior to ordering equipment.**

18.2. **Roof Supports:** Refer to Part Vibration and Noise Control for roof mounted equipment requirements. All items furnished shall adhere to roofing manufacturer's requirements so as not to void the roofing warranty. Coordinate with architectural and structural plans for required slope. Coordinate roof curb and interface in the building roofing system and verify minimum net height to be as required by Code and Architect. All roof-mounted equipment shall be designed by the Manufacturer and installed by the Contractor to withstand the minimum wind loads prescribed in IBC Section 1609 and IMC 301.12. Coordinate all requirements with the Structural Engineer prior to installation.

18.3. **Economizer Package:** All units whose scheduled cooling capacity is 54 MBH or greater shall be provided with a 100% outside air economizer. The economizer shall be provided complete with all controls, powered exhaust/relief, and air mixing damper assembly consisting of an enthalpy controller, fresh air, recirculated air and exhaust air dampers and protective cover over relief/exhaust unit discharge. The fresh air section shall be equipped with 1" thick disposable air filters. All filters shall be common industry standard size filters that are readily available and do not have to be fabricated. Cutting and taping of filter segments to make a proper filter is prohibited. The assembly shall mount within the confines of the unit casing. The system shall be

interlocked so that when room thermostat calls for cooling or heating the outside air dampers will return to minimum position. **The Contractor is responsible for quarterly filter changes during the guarantee period and shall inscribe onto the filters' casing the date filters were installed/replaced.**

18.4. **Cooling System:** Total certified cooling capacity not less than indicated. Coils shall be of non-ferrous construction with aluminum fins mechanically bonded to seamless copper tubes. Condenser coils shall have sub-cooling rows. The compressors shall be resiliently mounted - have built-in three mode crankshaft lubrication, crankcase heater, discharge temperature limiter, current and temperature sensing motor overloads, and 5-year guarantee. The system shall be protected by high and low pressure switches, a five minute compressor timed off cycle controller, lockable refrigerant charging valves, and head pressure controls down to 45°F ambient. All units with scheduled cooling capacity greater than 60 MBH shall be provided with multiple compressors or a two stage compressors as required by ASHRAE 90.1. Compressors over 10-ton capacity shall have oil failure switches. Compressors shall operate with R-410a refrigerant.

All refrigerant circuit access ports located outdoors shall be fitted with color-coded, all brass, locking type tamper resistant caps. The locking caps shall be color coded for the refrigerant used. Caps shall be Novent Series 8668 for R-410 refrigerant with 86698 NV Multikey unlocking mechanism for R-410 refrigerant or equivalent by JB Industries Series Shield and DiversiTech Series Sentry. Provide owner with minimum of six (6) spare keys.

18.5. **Gas Heating System:** Output capacity as indicated. Automatic controls furnished shall give minimum 2-1 turndown operation. Heat exchanger shall be constructed of aluminized steel. Heat exchanger shall be capable of handling 100 percent outdoor air and any temperature and have a 10-year warranty when handling uncontaminated air. Stainless steel power burner shall use 100 percent secondary air and have intermittent spark ignition and 100 percent safety shutoff electronic flame sensing controls. Visual inspection of burner flame shall be possible without removing casing panels.

18.6. **Fans and Motors:** Supply air fans shall be multi-speed, centrifugal type with premium efficiency motors and permanently lubricated ball bearings, adjustable belt or, high static direct drive with cfm capacity as specified.

All units with scheduled cooling capacity of 72,000 BTUH or less shall be provided with direct driven fans with ECM motors. All units with scheduled cooling capacities greater than 73,000 BTUH, up to and including 240,000 BTUH, shall be provided with belt drives.

All units with scheduled cooling capacity greater than 75,000 BTUH shall be 2-speed as required by ASHRAE 90.1.

All motors with scheduled capacity of less than 1 HP shall be provided with ECM motors with minimum motor efficiency of 70% when rated in accordance with DOE 10 CFR 431

Condenser fans shall be direct driven. All motors shall have inherent protection devices on all legs.

18.7. **Ultraviolet (UV-C) Lights:** Mechanical Contractor is responsible for wiring the devices and providing power for the UV-C lights if not shown by the Electrical plans. Devices shall be hardwired, and UL labeled for the installation. Plug-in devices are not allowed.

Comply with UL / C-UL or ETL for Ultraviolet Fixturing. Store UV-C Fixturing in a clean, dry place and protect from weather and construction traffic. UV-C products supplier shall provide proof of 100% inbound and outbound testing of equipment. The UV-C Power supply shall have been tested, listed and labeled as compliant with UL, CSA and CE. Plenum wiring loom shall meet UL Subject 13 and UL 1581, Article 725 of the NEC and meet UL VW-1 material ratings. There shall be a metallic Loom cladding and it shall be UL recognized DXUZ2 and constructed of flexible galvanized steel and cover the entire Loom. Each lamp shall contain no more than 5 milligrams of mercury consistent with current environmental practices. Lamp Watts shall be printed on all lamps, no exceptions. Lamps shall not produce ozone and shall be hermetically sealed within a layer of UV-C transmissible FEP to protect against lamp breakage and to contain lamp contents should breakage occur.

Power supply and fixturing shall be warranted to be free from defects for a period of five (5) years. Lamps shall be warranted to be free from defects for a period of one (1) year.

Lamps shall be installed in sufficient quantity and in such a manner to provide an equal distribution of UV-C energy. When installed, the UV-C energy produced shall be of the lowest possible reflected and shadowed-losses and shall produce 360-degree UV-C irradiance from the lamps within the UV cavity. Lamp Watts shall be printed on all lamps, no exceptions. Each lamp shall contain less than 5 milligrams of mercury, consistent with current environmental practices. Lamp useful life shall be a minimum of 9,000 hours with no more than a 15% output loss at the end of the lamps life (12 months of continuous use). Lamps shall be constructed with UV-C resistant bases and shall not produce ozone. Lamps shall produce the specified output in moving air of up to 1000 fpm and temperatures of 0-200°F. Lamps shall be hermetically sealed within a layer of UV-C transmissible FEP to provide protection against lamp breakage and to ensure Lamp contents from a broken Lamp, are contained.

Fixture modeling shall be included in the submittal and must contain the necessary calculations to demonstrate that a minimum of 6 lamp watts, as recommended by ASHRAE, are distributed equally to each square foot of coil surface area to achieve a minimum of 100 microwatts per square centimeter equally distributed to the surfaces at the plenum sides, top and bottom. All calculations are to be at 55 degrees F and 500 fpm air velocity, no exceptions.

The power supply housing shall be capable of installation within or outside of the air stream, secondary compartment or NEMA enclosure. Lamps shall be mounted to irradiate the intended surfaces as well as all of the available line of sight airstream through proper placement, 360° irradiation and incident angle reflection.

To protect personnel, all access panels and doors to the UV-C assembly and/or within view of the UV-C assembly shall include mechanical interlock switches to ensure

that the UV-C assembly will be de-energized when any of these accesses are opened. A redundant disconnect service switch shall be installed on the unit exterior, next to the unit access door, in plain sight to provide a method to more specifically de-energize the UV-C lamp circuits prior to entering the lamp plenum.

18.8. **Frame and Casing:** The frame shall be of welded construction. The casing shall be of hinged galvanized access panels with a baked on outdoor acrylic finish. The cabinet bottom shall be insulated with Styrofoam; cabinet panels shall be insulated with 1" fiberglass. All components, wiring and inspection areas shall be completely accessible through hinged panels with quarter turn latching handles.

18.9. **Filters:** Provide 2" thick, MERV 11, disposable type filters for each filter location. All filters shall be common industry standard size filters that are readily available and do not have to be fabricated. Cutting and taping of filter segments to make a proper filter is prohibited. **The Contractor is responsible for quarterly filter changes during the guarantee period and shall inscribe onto the filters' casing the date filters were installed/replaced.**

18.10. **Smoke Detectors:** See Controls.

18.11. **Hot Gas Reheat Coil:** Each unit with scheduled cooling capacity greater than or equal to 40 MBH shall be provided with a refrigerant hot gas heating coil in the reheat position for humidity control. The coil shall be of sufficient size to reheat all of the supply air. Provide, complete, with all necessary valves, controls, etc., as required for a complete and properly functioning installation. Provide manual isolation valves for each hot gas and liquid lines. Furnish for approval air conditioning equipment manufacturer approved refrigerant piping and controls diagram, and statement by the air conditioning manufacturer on company letterhead that use of the hot gas reheat coil with the equipment is acceptable to the manufacturer and does not affect any warranty or guarantee. **Equipment submittal will not be reviewed without a manufacturers' approved diagram and referenced statement**. Minimum reheat capacity for supply air shall be 10ºF. Maximum coil pressure drop is 0.10" static pressure.

18.12. **Energy Recovery Module (PHAC-3 and PHAC-4 Only):** The rotor media shall be made of aluminum which is coated to prohibit corrosion. All surfaces will be coated with a non-migrating adsorbent specifically developed to maximize latent recovery. Equal sensible and latent recovery efficiencies shall be clearly documented through a certification program conducted in accordance with ASHRAE 84-78P and ARI 1060 standards. The media shall be cleanable with low temperature steam, hot water or light detergent, without degrading the latent recovery. Dry particles up to 600 microns shall freely pass through the media. Wheel media shall be independently tested and shown to conform with the requirements of NFPA-90A, documenting a flame spread of less than 25 and a smoke generation rating of less than 50. The rotor cassette shall be a sheet metal framework which limits the deflection of the rotor due to air pressure. The cassette shall be made of galvanized steel to prevent corrosion. Unit casing panels shall be 20-gauge galvanized steel, lined with 1/2 inch thick neoprene insulation. The exterior of the unit shall be coated with an alkyd enamel painting system. The housing shall be supported by a formed structural base that forms a pan to ensure weather tight construction. Units will have a weatherproof, sloped sheet metal roof. The outdoor air intake opening shall be protected by a

galvanized steel sheet metal weather hood and include an automatic shutoff damper with electric operator. The exhaust air discharge shall be covered with a gravity backdraft damper and weather hood with protective covering.

Access to components shall be provided through a large, hinged, tightly sealed and easily removable access door. Access doors will be constructed of the same materials as the unit casing. The wheel cassette shall be easily removable from the unit. The roof of the unit shall also be removable for access.

The supply air inlet and exhaust air outlet shall be oriented at opposite ends of the Energy Recovery System to maximize the distance between the two airstreams in order to minimize the risk of short circuiting exhaust air into the supply air intake.

Fans shall be double width double inlet design with forward curve type wheels. The blades shall be designed for maximum efficiency and quiet operation. Impellers shall be statically and dynamically balanced.

Fans shall be driven by direct drive motors located at the fan inlet or by motors using belts and sheaves. Motors shall be standard NEMA frame with open drip-proof enclosures. V-belt drives shall be designed for a minimum 1.2 service factor.

The outdoor air and return air filters shall be 1-inch thick permanent aluminum washable type with aluminum holding frames.

Units shall be provided with a factory installed single point power connection. The electrical panel will consist of individual motor contactors, short circuit and overload protection, brownout and phase reversal protection and control power transformer.

The electrical panel shall be mounted interior to the unit behind the access door. Unit shall be ETL, or UL listed and labeled. An integral start/stop relay shall be provided to link the energy recovery unit operation with the packaged unit.

The recovery wheel shall operate at a constant speed with no economizer control and shall include a freeze protection thermostat to automatically shut down the entire recovery system during extreme cold weather conditions and restart the system upon a rise in setpoint.

Unit shall be provided with an integral airflow monitoring station to read both ventilation and exhaust airflow expressed in CFM. Monitor gauge shall be flush mounted on unit exterior and water tight.

Unit shall be provided with a non-fused safety disconnect switch sized to provide a suitable disconnecting means for the unit.

Unit shall be warranted for a minimum of 18 months for materials, labor, parts and workmanship. Warranty shall start on the date of substantial completion as determined by the Architect.

Unit shall be Series FVT as manufactured by Semco. Equivalent by Airxchange or Renewaire will be considered. Semco is the basis of design.

18.13. **Temperature Controls:** Refer to Section 15920, Building Automation System (BAS).

18.14. **Unit Protection:** All indoor and outdoor equipment shall also be provided with surge protection and phase protection to insure against voltage unbalance, over/under voltage, phase loss, reversal, incorrect sequencing and rapid short cycling. Protection shall be provided for all 3-phase equipment utilizing ICM Controls Model 450 A Plus+ or equivalent. All single phase equipment with horsepower greater than or equal to 1/8 HP shall be provided with protection utilizing ICM Controls Model ICM 492 or equivalent. Where phase protection device cannot be mounted within the respective equipment, provide a NEMA 3R or NEMA enclosure appropriate for the installation. The Contractor shall consult with the Owner's maintenance personnel and set up all programmable options based on the Owner's requirements, within the device's capabilities. Phase protection is not required on equipment being controlled via a variable speed frequency drive.

18.15. **Factory Start-up Service:** The Contractor shall provide a factory-trained technician, employed by the unit manufacturer and not a sales representative, to check out all equipment with scheduled cooling capacity greater than or equal to 60,000 Btuh and/or are provided with hot gas reheat coils or UV-C lights, and furnish written report indicating equipment is installed in strict accordance with manufacturer's recommendations. Also, provide temperature, pressure and amp readings taken during testing to substantiate unit performance including the range of the refrigerant hot gas reheat coil.

18.16. **Warranty:** General warranties are specified in Section "General Mechanical Provisions". The Contractor and equipment Manufacturer shall provide a non-prorated, total of five years, warranty on the unit compressor(s). The Manufacturer's warranty shall provide for the repair and/or replacement of the equipment compressor(s) that become inoperative because of defects in material or workmanship. The Contractor is responsible for any parts and labor not provided by the equipment Manufacturer. The warranty shall include refrigerant and all other costs associated with the compressor(s) removal and replacement, shipment to the Contractor or Facility, installation and returning the equipment to its proper operating condition.

The Contractor shall respond within 24 hours upon notification that a compressor has failed under the terms of the warranty. "Respond" shall mean having a Manufacturer certified technician onsite to evaluate the extent of the needed repairs and ordering of all items required for repair. Shipping of the replacement compressor shall be via maximum of 2-day delivery of the compressor(s) if the unit is inoperable.

The warranty period shall begin on the same date as substantial completion of the installation, as determined by the Architect, and shall continue for the full product warranty period specified above.

18.17. **Manufacturers:** Trane is the basis of design. Trane Series Precedent. Equivalents by Carrier or Lennox will be considered.

PART 19. PACKAGED ROOFTOP VAV HEATING AND AIR CONDITIONING UNIT (PAC)

19.1. **General Description:** One-piece, high efficiency, true VAV, combination air-to-air DX mechanical cooling system and electric resistance heating system, premium efficiency motors with factory VFD, powered exhaust/relief, complete with automatic controls and powered GFI convenience power outlet. All equipment (condenser/compressors) scheduled cooling capacities are based on 95°F ambient temperature. Unit shall be provided with color touchscreen interface with USB port to indicate data trending, historical alarm messages, real-time sensor measurements, on board system setpoints and customized reports. The unit shall be designed for direct, bottom (side) handling of the conditioned air as shown on the plans. **Any unit with arrangement different from shown on the plans requires prior approval.** The equipment shall be shipped completely assembled, pre-charged, piped and wired internally ready for field connections. The manufacturer shall test operate the unit before shipment. Units shall have heavy-duty metal condenser coil hail guards. The entire unit shall be factory wired for single point power connection. Where units are shown to be located on the roof, do not route power through the curb. Coordinate requirement with the electrical plans and electrical contractor and provide as specified. **Contractor shall verify all voltage and power requirements with Electrical Contractor, Electrical plans, and at the project site, prior to ordering equipment.**

19.2. **Roof Mounted Supports:** Refer to Part Vibration and Noise Control for roof mounted equipment requirements. All items furnished shall adhere to roofing manufacturer's requirements so as not to void the roofing warranty. Coordinate with architectural and structural plans for required slope. Coordinate roof curb and interface in the building roofing system and verify minimum net height to be as required by Code and Architect. All roof-mounted equipment shall be designed by the Manufacturer and installed by the Contractor to withstand the minimum wind loads prescribed in IBC Section 1609 and IMC 301.12. Coordinate all requirements with the Structural Engineer prior to installation. Refer to plan details. Where units are shown to be located on the roof, do not route power through the curb. Coordinate requirement with the electrical plans and electrical contractor and provide as specified.

19.3. **Economizer Package:** All units whose scheduled cooling capacity is 54 MBH or greater shall be provided with a 100% outside air economizer. The economizer shall be provided complete with all controls, powered exhaust/relief, and air mixing damper assembly consisting of an enthalpy controller, fresh air, recirculated air and exhaust air dampers and protective cover over relief/exhaust unit discharge. The fresh air section shall be equipped with 1" thick disposable air filters. All filters shall be common industry standard size filters that are readily available and do not have to be fabricated. Cutting and taping of filter segments to make a proper filter is prohibited. The assembly shall mount within the confines of the unit casing. The system shall be interlocked so that when room thermostat calls for cooling or heating the outside air dampers will return to minimum position. **The Contractor is responsible for quarterly filter changes during the guarantee period and shall inscribe onto the filters' casing the date filters were installed/replaced.**

19.4. **Cooling System:** Total certified cooling capacity not less than indicated. Coils shall be of non-ferrous construction with aluminum fins mechanically bonded to seamless copper tubes. Condenser coils shall have sub-cooling rows. The compressors shall be resiliently mounted - have built-in three mode crankshaft lubrication, crankcase heater, discharge temperature limiter, current and temperature sensing motor overloads, and 5-year guarantee. The system shall be protected by high and low pressure switches, a five minute compressor timed off cycle controller, lockable refrigerant charging valves, and head pressure controls down to 45°F ambient. All units with scheduled cooling capacity greater than 60 MBH shall be provided with multiple compressors or a two stage compressors as required by ASHRAE 90.1. Compressors over 10-ton capacity shall have oil failure switches. Compressors shall operate with R-410a refrigerant.

All refrigerant circuit access ports located outdoors shall be fitted with color-coded, all brass, locking type tamper resistant caps. The locking caps shall be color coded for the refrigerant used. Caps shall be Novent Series 8668 for R-410 refrigerant with 86698 NV Multikey unlocking mechanism for R-410 refrigerant or equivalent by JB Industries Series Shield and DiversiTech Series Sentry. Provide owner with minimum of six (6) spare keys.

19.5. **Electric Heating System:** The electric heater shall have SCR control and with all components built-in at the factory and shall carry the UL label. Each coil shall have double thermal protection, consisting of a thermal overload Klixon device and heat limiters in the power legs, current sensing relay, transformer, and time delay relay. Primary fusing, branch circuit fusing per U.L. and NEC requirements. If back-up contactors are used as secondary thermal overload protection in lieu of the fused elements, these contactors shall be built in and pre-wired at the factory.

Resistance wire used in each coil shall be 80% nickel and 20% chromium with no iron content. Wire shall be supported by ceramic bushings, mounted in a galvanized steel frame on not more than 4" centers. The entire unit shall be factory wired for power connections as shown on the Electrical Drawings.

Unit shall be provided with discharge air sensor to provide 65°F (adj.) discharge air temperature.

19.6. **Fans and Motors:** Supply air fans shall be multi-speed, centrifugal type with premium efficiency motors and permanently lubricated ball bearings, adjustable belt or, high static direct drive with cfm capacity as specified.

All units with scheduled cooling capacity of 72,000 BTUH or less shall be provided with direct driven fans with ECM motors. All units with scheduled cooling capacities greater than 73,000 BTUH, up to and including 240,000 BTUH, shall be provided with belt drives.

All units with scheduled cooling capacity greater than 75,000 BTUH shall be 2-speed as required by ASHRAE 90.1.

All motors with scheduled capacity of less than 1 HP shall be provided with ECM motors with minimum motor efficiency of 70% when rated in accordance with DOE 10 CFR 431

Condenser fans shall be direct driven. All motors shall have inherent protection devices on all legs.

19.7. **Ultraviolet (UV-C) Lights:** Mechanical Contractor is responsible for wiring the devices and providing power for the UV-C lights if not shown by the Electrical plans. Devices shall be hardwired, and UL labeled for the installation. Plug-in devices are not allowed.

Comply with UL / C-UL or ETL for Ultraviolet Fixturing. Store UV-C Fixturing in a clean, dry place and protect from weather and construction traffic. UV-C products supplier shall provide proof of 100% inbound and outbound testing of equipment. The UV-C Power supply shall have been tested, listed and labeled as compliant with UL, CSA and CE. Plenum wiring loom shall meet UL Subject 13 and UL 1581, Article 725 of the NEC and meet UL VW-1 material ratings. There shall be a metallic Loom cladding and it shall be UL recognized DXUZ2 and constructed of flexible galvanized steel and cover the entire Loom. Each lamp shall contain no more than 5 milligrams of mercury consistent with current environmental practices. Lamp Watts shall be printed on all lamps, no exceptions. Lamps shall not produce ozone and shall be hermetically sealed within a layer of UV-C transmissible FEP to protect against lamp breakage and to contain lamp contents should breakage occur.

Power supply and fixturing shall be warranted to be free from defects for a period of five (5) years. Lamps shall be warranted to be free from defects for a period of one (1) year.

Lamps shall be installed in sufficient quantity and in such a manner to provide an equal distribution of UV-C energy. When installed, the UV-C energy produced shall be of the lowest possible reflected and shadowed-losses and shall produce 360-degree UV-C irradiance from the lamps within the UV cavity. Lamp Watts shall be printed on all lamps, no exceptions. Each lamp shall contain less than 5 milligrams of mercury, consistent with current environmental practices. Lamp useful life shall be a minimum of 9,000 hours with no more than a 15% output loss at the end of the lamps life (12 months of continuous use). Lamps shall be constructed with UV-C resistant bases and shall not produce ozone. Lamps shall produce the specified output in moving air of up to 1000 fpm and temperatures of 0-200°F. Lamps shall be hermetically sealed within a layer of UV-C transmissible FEP to provide protection against lamp breakage and to ensure Lamp contents from a broken Lamp, are contained.

Fixture modeling shall be included in the submittal and must contain the necessary calculations to demonstrate that a minimum of 6 lamp watts, as recommended by ASHRAE, are distributed equally to each square foot of coil surface area to achieve a minimum of 100 microwatts per square centimeter equally distributed to the surfaces at the plenum sides, top and bottom. All calculations are to be at 55 degrees F and 500 fpm air velocity, no exceptions.

The power supply housing shall be capable of installation within or outside of the air stream, secondary compartment or NEMA enclosure. Lamps shall be mounted to irradiate the intended surfaces as well as all of the available line of sight airstream through proper placement, 360° irradiation and incident angle reflection.

To protect personnel, all access panels and doors to the UV-C assembly and/or within view of the UV-C assembly shall include mechanical interlock switches to ensure that the UV-C assembly will be de-energized when any of these accesses are opened. A redundant disconnect service switch shall be installed on the unit exterior, next to the unit access door, in plain sight to provide a method to more specifically de-energize the UV-C lamp circuits prior to entering the lamp plenum.

19.8. **Frame and Casing:** The frame shall be of welded construction. The casing shall be of hinged galvanized access panels with a baked on outdoor acrylic finish. The cabinet bottom shall be insulated with Styrofoam; cabinet panels shall be insulated with 1" fiberglass. All components, wiring and inspection areas shall be completely accessible through hinged panels with quarter turn latching handles.

19.9. **Filters:** Provide 2" thick, MERV 11, disposable type filters for each filter location. All filters shall be common industry standard size filters that are readily available and do not have to be fabricated. Cutting and taping of filter segments to make a proper filter is prohibited. **The Contractor is responsible for quarterly filter changes during the guarantee period and shall inscribe onto the filters' casing the date filters were installed/replaced.**

19.10. **Smoke Detectors:** See Controls.

19.11. **Temperature Controls:** Coordinate and provide as required with Section 15920, Building Automation System (BAS).

19.12. **Unit Protection:** All indoor and outdoor equipment shall also be provided with surge protection and phase protection to insure against voltage unbalance, over/under voltage, phase loss, reversal, incorrect sequencing and rapid short cycling. Protection shall be provided for all 3-phase equipment utilizing ICM Controls Model 450 A Plus+ or equivalent. All single phase equipment with horsepower greater than or equal to 1/8 HP shall be provided with protection utilizing ICM Controls Model ICM 492 or equivalent. Where phase protection device cannot be mounted within the respective equipment, provide a NEMA 3R or NEMA enclosure appropriate for the installation. The Contractor shall consult with the Owner's maintenance personnel and set up all programmable options based on the Owner's requirements, within the device's capabilities. Phase protection is not required on equipment being controlled via a variable speed frequency drive.

19.13. **Factory Start-up Service:** The Contractor shall provide a factory-trained technician, employed by the unit manufacturer and not a sales representative, to check out all equipment with scheduled cooling capacity greater than or equal to 60,000 Btuh and/or are provided with hot gas reheat coils or UV-C lights, and furnish written report indicating equipment is installed in strict accordance with manufacturer's recommendations. Also, provide temperature, pressure and amp readings taken during testing to substantiate unit performance including the range of the refrigerant hot gas reheat coil.

19.14. **Warranty:** General warranties are specified in Section "General Mechanical Provisions". The Contractor and equipment Manufacturer shall provide a non-prorated, total of five years, warranty on the unit compressor(s). The Manufacturer's

warranty shall provide for the repair and/or replacement of the equipment compressor(s) that become inoperative because of defects in material or workmanship. The Contractor is responsible for any parts and labor not provided by the equipment Manufacturer. The warranty shall include refrigerant and all other costs associated with the compressor(s) removal and replacement, shipment to the Contractor or Facility, installation and returning the equipment to its proper operating condition.

The Contractor shall respond within 24 hours upon notification that a compressor has failed under the terms of the warranty. "Respond" shall mean having a Manufacturer certified technician onsite to evaluate the extent of the needed repairs and ordering of all items required for repair. Shipping of the replacement compressor shall be via maximum of 2-day delivery of the compressor(s) if the unit is inoperable.

The warranty period shall begin on the same date as substantial completion of the installation, as determined by the Architect, and shall continue for the full product warranty period specified above.

19.15. **Manufacturers:** Trane is the basis of design. Trane Series Precedent for units with scheduled cooling capacities up to and including 120,000 BTUH. Trane Series Voyager for units with scheduled cooling capacities greater than 120,000, up to and including, 600,000 BTUH. Equivalents by Carrier or Lennox will be considered.

PART 20. WALL MOUNTED DUCTLESS SPLIT HEAT PUMP SYSTEM UNIT (DHP)

20.1. **General:** Provide ductless, wall mounted, split system type heat pump unit, equal to Mitsubishi Electric Series MSZ/MUZ for units with specified cooling capacity up to 9 MBH and PKA/PUZ units with specified cooling capacity of 12 MBH to 36 MBH complete with all accessories including wall hung evaporator blower unit, pad mounted outdoor condensing unit with lockable refrigerant charging valves, filter frame, filter, fixed, wall mounted, 7-day programmable, microprocessor electronic thermostat and control module, adjustable discharge louvers, factory installed heavy duty condensate pump (if drainage indicated on plumbing and HVAC plan is not gravity type), alarm for obstructed condensate line, low ambient indoor coil thermistor, low ambient control to 14º F, outdoor microprocessor control, heavy duty metal condenser coil hail guard and other accessories required for a complete functional installation. Unit shall be provided with sensor to shutdown unit and sound alarm if condensate line becomes obstructed. If BAS system is part of the project, provide output contacts to show alarm at BAS system Operator Console. Coordinate with BAS Contractor and provide as required for proper interface. Refrigerant shall be R-410a. Compressors shall be warranted for 5 years.

All refrigerant circuit access ports located outdoors shall be fitted with color-coded, all brass, locking type tamper resistant caps. The locking caps shall be color coded for the refrigerant used. Caps shall be Novent Series 8668 for R-410 refrigerant with 86698 NV Multikey unlocking mechanism for R-410 refrigerant or equivalent by JB Industries Series Shield and DiversiTech Series Sentry. Provide owner with minimum of six (6) spare keys.

20.2. **Refrigerant Piping:** Coiled line sets and preinsulated line sets are not allowed. See other parts of 15700 for piping and insulation requirements. The equipment manufacturer shall size the refrigerant piping for all the units and shall furnish all accessories and auxiliaries required for a complete and proper installation for the specific application shown on the drawings and the specified sequence of operation. Refer to Section Refrigerant Piping and Accessories for additional requirements.

All condensate and refrigerant piping that cannot be concealed in the walls in finished spaces shall be provided with Mitsubishi Line-Hide Linset Cover System. Note that this provision shall not be used to cover piping that can be otherwise concealed

20.3. **Condensate Pump (As Required):** Condensate pumps for all indoor units shall be Blue Diamond, Series MaxiBlue or approved equivalent. Pump shall be thermally protected, up to 3.7 GPH flow rate, 23 ft. head, 15 ft. suction, self-priming, powered by the indoor unit and maximum 21-db sound level. Pump shall be provided with mounting feet, extension cables and multi-tank configuration as required. Mechanical Contractor to coordinate power requirements for pump, prior to bid, and provide as required.

20.4. **Condensate Switch:** Unit shall be provided with sensor to shutdown unit and sound alarm if condensate line becomes obstructed. Provide output contacts to alarm at BAS system Operator Console. Coordinate with BAS Contractor and provide as required for proper interface

20.5. **Power Wiring Connection:** Coordinate wiring requirements (separate power for each indoor and outdoor unit or indoor unit powered by outdoor unit) with electrical plans and provide as required.

20.6. **Roof Mounted Supports:** Refer to Part Vibration and Noise Control for roof mounted equipment requirements. All items furnished shall adhere to roofing manufacturer's requirements so as not to void the roofing warranty. Coordinate with architectural and structural plans for required slope. Coordinate roof curb and interface in the building roofing system and verify minimum net height to be as required by Code and Architect. Provide 1/2" thick neoprene vibration isolation and anchor units to curbs. Coordinate all requirements with roofing contractor and provide as recommended so as not to void roofing warranty. All roof-mounted equipment shall be designed and shall be installed by the Contractor to withstand the minimum wind loads prescribed in IBC Section 1609 and IMC 301.12. Coordinate all requirements with the Structural Engineer prior to installation.

20.7. **Unit Protection:** All indoor and outdoor equipment shall also be provided with surge protection and phase protection to insure against voltage unbalance, over/under voltage, phase loss, reversal, incorrect sequencing and rapid short cycling. Protection shall be provided for all 3-phase equipment utilizing ICM Controls Model 450 A Plus+ or equivalent. All single phase equipment with horsepower greater than or equal to 1/8 HP shall be provided with protection utilizing ICM Controls Model ICM 492 or equivalent. Where phase protection device cannot be mounted within the respective equipment, provide a NEMA 4x or NEMA enclosure appropriate for the installation. The Contractor shall consult with the Owner's maintenance personnel

and set up all programmable options based on the Owner's requirements, within the device's capabilities.

20.8. **Warranty:** General warranties are specified in Section "General Mechanical Provisions". The Contractor and equipment Manufacturer shall provide a non-prorated, total of five years, warranty on the unit compressor(s). The Manufacturer's warranty shall provide for the repair and/or replacement of the equipment compressor(s) that become inoperative because of defects in material or workmanship. The Contractor is responsible for any parts and labor not provided by the equipment Manufacturer. The warranty shall include refrigerant and all other costs associated with the compressor(s) removal and replacement, shipment to the Contractor or Facility, installation and returning the equipment to its proper operating condition.

The Contractor shall respond within 24 hours upon notification that a compressor has failed under the terms of the warranty. "Respond" shall mean having a Manufacturer certified technician onsite to evaluate the extent of the needed repairs and ordering of all items required for repair. Shipping of the replacement compressor shall be via maximum of 2-day delivery of the compressor(s) if the unit is inoperable.

The warranty period shall begin on the same date as substantial completion of the installation, as determined by the Architect, and shall continue for the full product warranty period specified above.

20.9. **Manufacturers:** Mitsubishi or equivalent by Trane, Lennox, Samsung or Carrier. **Mitsubishi is the basis of Design.**

PART 21. SPLIT SYSTEM CASSETTE TYPE HEAT PUMP (CCHP)

21.1. **General:** The heat pump air conditioning system shall be equal to Mitsubishi Electric Series PLA/PUZ split system operating with R-410a refrigerant. The system shall consist of a slim silhouette; compact ceiling mounted packaged evaporator section and matching slim line outdoor unit with **lockable refrigerant charging valves** and wall mounted 7-day programmable thermostat with occupancy sensor override. The units shall be listed by Electrical Laboratories (ETL) and/or Underwriters Lab (UL) and bear the ETL and/or UL label. All wiring in accordance with the National Electrical Code (N.E.C.). The units shall be rated in accordance with ARI Standard 240 and bear the ARI label. All units shall be provided with phase protection.

21.2. **Occupancy Sensor:** Provide ‘I-see Sensor’ occupancy sensor.

21.3. **Refrigerant Piping:** Coiled line sets and preinsulated line sets are not allowed. See other parts of 15700 for refrigerant piping and insulation requirements. The equipment manufacturer shall size the refrigerant piping for all the units and shall furnish all accessories and auxiliaries required for a complete and proper installation for the specific application shown on the drawings and the specified sequence of operation. Refer to Section Refrigerant Piping and Accessories for additional requirements.

All condensate and refrigerant piping that cannot be concealed in the walls in finished spaces shall be provided with Mitsubishi Line-Hide Linset Cover System. Note that this provision shall not be used to cover piping that can be otherwise concealed

21.4. **Description:** Capacities and characteristics shall be as specified on the drawings. The indoor unit shall be factory assembled and wired. The casing shall be galvanized sheet metal with insulation. This unit shall fit in the ceiling. The evaporator fan shall be a high performance, fan direct driven by a single motor. The fan shall be statically and dynamically balanced and run on permanently lubricated bearings. The indoor unit shall have an adjustable air outlet system with 4-way deflection airflow. Return air shall be filtered with factory furnished filter. The coil shall be of nonferrous construction with smooth plate fins bonded to copper tubing. All tube joints shall be brazed with phos-copper or silver alloy. The coil shall be pressure tested at the factory. A condensate pan and auxiliary drain pan shall be provided and extend under the coil and piping. Unit shall be provided with sensor to shutdown unit and sound alarm if condensate line becomes obstructed. If BAS system is part of the project, provide output contacts to show alarm at BAS system Operator Console. Coordinate with BAS Contractor and provide as required for proper interface. The control system shall consist of low voltage room thermostat to control heating and cooling. Provide metal thermostat guard with lock and key.

21.5. **Condensate Switch:** Unit shall be provided with sensor to shutdown unit and sound alarm if condensate line becomes obstructed. Provide output contacts to alarm at BAS system Operator Console. Coordinate with BAS Contractor and provide as required for proper interface.

21.6. **Outdoor Unit:** Shall be completely factory assembled, piped, wired and **lockable refrigerant charging valves.** The unit shall be furnished with one (1) direct drive, propeller type fan arranged for horizontal or vertical. The motors shall have inherent protection, be of the permanently lubricated type, and resiliently mounted for quiet operation. The compressor shall be of the high-performance rotary type with crankcase heater, accumulator and internal thermal overloads. The refrigeration system shall be equipped with high-pressure switch. Refrigerant flow from the condenser shall be controlled by means of a capillary tube. The condenser coil shall be of nonferrous construction with smooth plate fins bonded to copper tubing. The coil shall be protected with smooth plate fins bonded to copper tubing. The condenser coil shall be protected with an integral heavy-duty metal hail guard. The unit shall be controlled by the microprocessor located in the indoor matching unit. A built-in, low-ambient controller shall allow cooling to 0 degrees F outdoor temperature.

All refrigerant circuit access ports located outdoors shall be fitted with color-coded, all brass, locking type tamper resistant caps. The locking caps shall be color coded for the refrigerant used. Caps shall be Novent Series 8668 for R-410 refrigerant with 86698 NV Multikey unlocking mechanism for R-410 refrigerant or equivalent by JB Industries Series Shield and DiversiTech Series Sentry. Provide owner with minimum of six (6) spare keys.

21.7. **Power Wiring Connection:** Coordinate wiring requirements (separate connection for each indoor and outdoor unit or indoor unit powered by outdoor unit) with electrical plans and provide as required.

21.8. **Roof Mounted Supports:** Refer to Part Vibration and Noise Control for roof mounted equipment requirements. All items furnished shall adhere to roofing manufacturer's requirements so as not to void the roofing warranty. Coordinate with architectural and structural plans for required slope. Coordinate roof curb and interface in the building roofing system and verify minimum net height to be as required by Code and Architect. Provide 1/2" thick neoprene vibration isolation and anchor units to curbs. Coordinate all requirements with roofing contractor and provide as recommended so as not to void roofing warranty. All roof-mounted equipment shall be designed and shall be installed by the Contractor to withstand the minimum wind loads prescribed in IBC Section 1609 and IMC 301.12. Coordinate all requirements with the Structural Engineer prior to installation.

21.9. **Unit Protection:** All indoor and outdoor equipment shall also be provided with surge protection and phase protection to insure against voltage unbalance, over/under voltage, phase loss, reversal, incorrect sequencing and rapid short cycling. Protection shall be provided for all 3-phase equipment utilizing ICM Controls Model 450 A Plus+ or equivalent. All single phase equipment with horsepower greater than or equal to 1/8 HP shall be provided with protection utilizing ICM Controls Model ICM 492 or equivalent. Where phase protection device cannot be mounted within the respective equipment, provide a NEMA 4x or NEMA enclosure appropriate for the installation. The Contractor shall consult with the Owner's maintenance personnel and set up all programmable options based on the Owner's requirements, within the device's capabilities.

21.10. **Warranty:** General warranties are specified in Section "General Mechanical Provisions". The Contractor and equipment Manufacturer shall provide a non-prorated, total of five years, warranty on the unit compressor(s). The Manufacturer's warranty shall provide for the repair and/or replacement of the equipment compressor(s) that become inoperative because of defects in material or workmanship. The Contractor is responsible for any parts and labor not provided by the equipment Manufacturer. The warranty shall include refrigerant and all other costs associated with the compressor(s) removal and replacement, shipment to the Contractor or Facility, installation and returning the equipment to its proper operating condition.

The Contractor shall respond within 24 hours upon notification that a compressor has failed under the terms of the warranty. "Respond" shall mean having a Manufacturer certified technician onsite to evaluate the extent of the needed repairs and ordering of all items required for repair. Shipping of the replacement compressor shall be via maximum of 2-day delivery of the compressor(s) if the unit is inoperable.

The warranty period shall begin on the same date as substantial completion of the installation, as determined by the Architect, and shall continue for the full product warranty period specified above.

21.11. **Manufacturers:** Mitsubishi or equivalent by Trane, Lennox or Carrier. **Mitsubishi is the basis of Design.**

PART 22. ELECTRIC UNIT HEATERS

22.1. **General:** Heaters shall be UL listed, have integral safety controls, remote low voltage thermostat, control transformer, circuit breaker and washable filter. Coordinate thermostat requirements with Section 15920 Building Automation System (BAS). Capacities shall be as scheduled on the plans. All heaters shall be installed in accordance with manufacturer's recommendations. Heaters shall be securely mounted to building structure. Provide any additional structural framing necessary for proper heater installation. Unit heaters shall be provided with single point power connections (fan and heater). **Contractor shall verify all voltage and power requirements with Electrical Contractor, Electrical plans, and at the project site, prior to ordering equipment.** See below for basis of design units. Equivalents by Trane, Reznor, Modine, Markel, Chromalox or Indeeco will be considered.

22.2. **Ceiling Mounted Recessed Unit:** Unit shall be constructed with heavy gauge steel housing and rest in factory furnished 2'x2' lay-in metal panel. Finish shall be baked on powder coat in ceiling white color. Heater shall have low speed 700-RPM motor with vane axial blower and factory installed unit-mounted thermostat. Provide factory installed fan purge circuit and manual reset capillary type thermal limit protection. Basis of design is Markel Series 3380.

22.3. **Propeller Type:** Heater shall be horizontal discharge type, complete with integral controls, remote low voltage thermostat, control transformer, and circuit breaker. Basis of design is Trane model UHEC.

PART 23. KITCHEN HOOD

23.1. **General:** The unit shall be a complete factory-built package as manufactured by Captive Aire Series ND-PSP island style as shown on the plans. The unit shall be provided with factory insulated AC-PSP plenum and integral LED lights or approved equivalent. Entire hood shall be constructed of 18 ga., 430 stainless steel with #4 finish including behind filters, etc. No galvanized steel shall be used.

Provide stainless steel panels from hood top to above ceiling. All exterior seams shall be continuously welded, liquid tight as required by UL, ground and polished to match the original finish of the material. Hood(s) shall be fabricated in accordance with National Fire Protection Association (NFPA) Bulletin No. 96, shall be National Sanitation Foundation (NSF) listed, bear the NSF seal, and shall be Underwriters Laboratories (UL) listed and UL labeled. UL listed exhaust air fire dampers shall be provided if required by local code or by the hood manufacturer. Hood shall include a UL listed fire damper for each supply collar.

Hoods shall be provided with controls to automatically start the hood supply air fan(s) and exhaust fan(s) as required by IMC 507.1.1 in case of high temperature under the hood or in the kitchen space. Hood shall be provided with those controls as a factory installed items.

Provide factory-mounted controls to enable the exhaust fan(s) to automatically run, and the make-up air fan(s)/unit(s) shut down during a fire condition. i.e., when the fire suppression system is engaged.

The entire full-length filter housing with pitched grease trough shall be of 18-gauge, Type 304, #3 polish stainless steel complete with removable stainless steel grease container. Filters shall be UL classified, 18 ga., 430 stainless steel, 2" thick baffle type with removal handles and 85% efficient filter equal to Captrate Grease-Stop Solo Filter or approved equivalent.

Coordinate all power and control wiring with the Electrical Contractor and provide as required for proper interface with lighting, switches, fuel shut-off devices, controls, fire suppression system, fire alarm system, UDS system (if applicable), etc., for system operation as specified.

23.2. **Lights:** Shall be UL listed, integral, recessed LED tube type and pre-wired to a junction box on top of the hood and lights/fans control panel on hood face. Lamps shall be 3'-0" long each and in the quantity shown in the equipment schedule. Lamps shall be T8, warm white color and 3,300° K. Wiring shall conform to the National Electric Code (NEC). Provide control panel integral with hood face and wired to control the hood lights, ACPSP integral lights and the supply and exhaust fans individually.

23.3. **AC Perforated Plenum:** The AC Perforated Supply Plenum (ACPSP) shall provide make-up air through a dual stream perforated stainless steel plenum with integral 3.5-watt LED light fixtures with quantity shown in the hoods schedule. Light fixtures shall be controlled through the integral hood light switch. All seams shall be welded and have stainless steel on exposed surfaces. Unexposed surfaces shall be constructed of aluminized steel. Perforated diffuser plates shall be included in the design and to provide even air distribution. The air-conditioned portion of the plenum shall be insulated to prevent condensation. The make-up air plenum shall be located nearest the hood and the air-conditioned plenum away from the hood. The make-up air stream and the air-conditioned stream shall not be permitted to mix until leaving the dual plenum.

23.4. **Ductwork:** Refer to Part Sheet Metal Ductwork for requirements. Factory prefabricated ductwork is not allowed.

23.5. **Fire Suppression System:** Shall be installed by personnel trained by the system manufacturer. It shall be located in a matching stainless steel cabinet integral with the hood. It shall be the pre-engineered type with a fixed nozzle agent distribution network. Distribution piping shall be stainless steel pipe conforming to ASTM A120, A53, or A106. The system shall be of automatic detection and actuation with local and remote manual actuation. It shall be an Underwriters Laboratories, Inc. UL Standard 300 listed R-102, wet chemical agent system with a pH range of 7.7 to 8.7, designed for flame knockdown and foam securement of grease related fires. Provide accessories as required for proper interface to the fire alarm system and energizing the gas shut-off valve.

The regulated release mechanism shall be compatible with a fusible link detection system. The fusible link shall be selected and installed according to the operating

temperature in the ventilating system. The fusible link shall be supported by a detector bracket/linkage assembly.

Provide manual activation switch(s) where shown on the plans. Manual activation switch(s) shall be ADA compliant and mounted at ADA compliant height (46" to center of the device). Identification shall be uniquely different to distinguish between a kitchen hood fire and a normal fire alarm pull station. The manual release shall have a sign indicating the method of operation. Sign shall be same type as specified in Section 15010, Identification. Provide accessories as required for proper interface to the fire alarm control system and energizing the mechanical gas shut-off valve.

23.6. **Fuel Shut-Off Device:** Furnish electric type gas shut-off valve to Plumbing Contractor for installation in gas supply to range line. Connect valve to operate automatically upon activation of extinguishing system. Coordinate location of valve with other trades and secure approval of valve location from Architect before installing. Coordinate requirement with Food Service Specifications and utility distribution system (UDS) and provide as required.

23.7. **Safety Sign:** Provide on each long side of the hood(s) a sign stating, "***This hood is protected by an automatic fire extinguisher system. If activated, chemical may cause breathing difficulty and reduce visibility. Personnel should evacuate immediately***." Sign shall be of red phenolic plastic 10" x 4" x 1/8", with 3/8" high white engraved lettering and neatly glued to each hood on all sides.

23.8. **Micro-Switch:** Provide on cylinder rack and arrange to open contact automatically upon operation of extinguishing system. Switch shall be 125v, 2-pole double-throw.

23.9. **Fire Suppression System Test:** Test and demonstrate to the Owner, Owner's designated personnel, the Authority having jurisdiction and Architect the actual operation of the system. Testing shall also be as required by the Authority having jurisdiction. Furnish written acknowledgement to the Architect that this has been accomplished.

23.10. **Certification:** The installer shall be trained and certified by the Manufacturer for the installation of the hood. The hood supplier shall inspect the installation and provide written certification to the authority having jurisdiction and the Architect that the installation is in agreement with the terms of its UL and NFPA listing and the manufacturer's instructions.

PART 24. CARBON MONOXIDE (CO) AND NITROGEN DIOXIDE (NO2) MONITORING SYSTEM

Carbon Monoxide (CO) and Nitrogen Dioxide (NO2) Detection System: Provide central controllers and sensors with CO and NO2 detection cartridges as shown on the plans. Provide return air duct mounted sensors and wall mounted sensors as shown on the plans. The devices and controller shall provide centralized gas detection monitoring with real time gas reading and alarm activation. The panel shall include BacNet output, alarms, gas concentrations, faults, real time clock, voting, time since calibration, password protected and 122x32 dot matrix display. The panel shall take readings from each sensor shown on the plans and shall alarm and operate

as indicated in the sequence of operation shown on the plans. Sensors shall be wall mounted and duct mounted types as shown on the plans. Each sensor, strobe and horn shall be provided with splashguards and wire guards. Sensors shall be E^{3}Point with 301C Controller, outputs/inputs as required to accomplish the sequence of operation, all as Manufactured by Honeywell Analytics. Equivalent units by Opera Inc. or Armstrong Monitoring will be considered. Refer to Section 15920, Building Automation System (BAS) and plans for controls schematic on plans for additional information. Coordinate and provide all as specified to accomplish the specified sequence of operation.

The Contractor shall provide for a factory-trained technician, employed by the unit manufacturer and not a sales representative, to test and check out all equipment and furnish written report indicating equipment is installed in strict accordance with manufacturer's recommendation.

PART 24. AUTOMATIC CONTROLS

24.1. **General:** Furnish and install a complete system of automatic temperature controls, as specified herein, as shown on the Drawings and as required for a complete installation. All temperature control equipment shall be of the electric type. All specified Sequences of Operation are subject to all equipment built-in safety requirements. Equipment safety requirements shall not be overridden. **Refer to the Specifications Section 15920, Building Automation System (BAS) and the plans for detailed requirements.**

24.2. **Submittals:** The temperature control contractor shall submit a complete set of temperature control diagrams with written "sequence of operation" and factory-printed specification data sheets covering each control device proposed to be used for Engineer's approval prior to installation of any equipment or part of system. Submittal data shall include a schedule of all devices to be installed.

24.3. **Installation:** By trained and experienced mechanics. All work shall be done by an approved, independent HVAC Controls Subcontractor whose primary business is the installation and servicing of HVAC controls systems. The HVAC Controls Sub-Contractor shall have an adequate service facility to provide complete service and maintenance of the facility within 100 miles of the installation.

24.4. **Identification:** Provide permanent nameplates for all control components and for all motor starters. Nameplates shall be engraved laminated plastic with letters sufficiently large to be legible under normal operating conditions. Refer to Section 15010, Identification for additional requirements, nameplate materials, etc.

24.5. **Conduit, Controls Wiring and Instrumentation Cable:** The HVAC Controls Contractor shall be responsible for the furnishing and installation of a complete and functional system as specified, shown on the plans and as required to accomplish the specified sequences of operation.

All control cables and wiring shall be in EMT conduit (no “whips”). Do not route control wiring through sleeves containing piping. All control wiring penetrating any exterior wall, interior partition, floor, and similar construction shall be in EMT

conduit. EMT control conduit shall be as specified in the Electrical Division of the specifications and/or as shown on electrical drawings. Minimum HVAC Controls conduit size shall be 3/4" in size. All control conduit, power, relays, contactors, transformers, wiring, etc., required for a complete functional system as specified, shown on the plans, or as required to accomplish the specified sequences of operation, which is not shown or specified by the Electrical Division, shall be furnished and installed by the HVAC Controls Contractor. This shall include power, all interlock control wiring between the various components of the heating, ventilating and air conditioning system, lighting interlocks and all smoke detection system electrical wiring. Electrical work performed under this Section shall conform to requirements set forth in the Electrical Division of the specifications. All wiring shall be in accordance with the National Electrical Code, and all State and local codes. Coordinate all requirements with the Electrical Sub-Contractor prior to bid and provide all as required.

Instrumentation cable shall be minimum AWG as specified or heavier AWG as recommended by the controls system manufacturer.

All thermostat and humidistat boxes shall be mounted 46" A.F.F. to the center of the box (ADA height). Where wall mounted CO_2 Sensors are indicated, they shall be mounted 58" A.F.F to the center of the box.

24.6. **Carbon Dioxide Sensors:** Shall be of the non-dispersive infrared type (NDIR) diffusion sampling, repeatable to +/- 8 PPM with a measurement range 0 – 2000 PPM and be user adjustable. It shall have the following accuracy; from 0-1500 PPM +/- 75 PPM; +/- 5% with an operating range of 32 degrees F to 130 degrees F with a response time of less than 90 seconds.

Sensors shall be provided with all options, inputs and outputs required to control the motorized return air and outside air dampers to accomplish the specified Sequence of Operation. Duct mounted sensors shall be mounted where shown on the plans. Wall mounted sensors shall be mounted 58" A.F.F to the center of the box.

Duct mounted sensors shall be Veris Industries Series CDE or approved equivalent by Johnson Controls or Honeywell. Wall mounted sensors shall be Veris Industries Series CWE or approved equivalent by Johnson Controls or Honeywell.

24.7. **Humidistats:** Heavy-duty industrial type. Provide metal guard as specified for thermostats. All humidistat boxes shall be mounted 46" A.F.F. to the center of the box (ADA height). All humidistat boxes in walls or partitions shall be sealed/caulked to prevent the passage of air and smoke thru the device.

24.8. **Smoke Detectors:** Smoke detectors operating on the ionization principles shall be furnished by the Electrical Contractor and installed where shown on the plans by the Mechanical Subcontractor.

The Mechanical Contractor shall provide an access door/panel, watertight where required, adjacent to each smoke detector to allow for maintenance and visual inspection. Access panels shall be as specified hereinbefore.

Where any rooftop units' duct mounted smoke detectors are not accessible from the floor via a maximum 12'-0" ladder, the Equipment Manufacturer shall provide factory installed smoke detectors in the supply and return air streams within the unit.

Prior to bid, coordinate with fire alarm system provider, Electrical Contractor, Electrical Engineer and Mechanical Contractor, and provide smoke detectors that can be completely and seamlessly interfaced with the specified facility central fire alarm system and function per NFPA 72. The Contractor shall take all measures required to keep the smoke detectors clean and protected from construction debris.

24.9. **Condensate Drain Obstruction Alarm:** Provide an electric switch, conforming to UL 508. Upon detection of blockage, the unit shall shutdown. Sensor shall also alarm to the building energy management system operator console. Coordinate with Section 15920 and provide as required for proper interface.

24.10. **Time Delay Controls:** Provide time delay control systems as required to stage units starting to prevent more than three units from starting at the same time.

24.11. **Miscellaneous Controls:** Provide all other miscellaneous controls, wiring, dampers, valves, etc., as required for a complete functional control system.

24.12. **Service and Guarantee:** After completion of the installation, adjust all control equipment and place the complete system in operation subject to the approval of the Engineer. Guarantee the control system to be free of defects and adequate to provide required control functions for a period of one year after acceptance of project. Provide free service and maintenance during the guarantee period.

END OF SECTION

SECTION 15920 - BUILDING AUTOMATION SYSTEM (BAS)

1.0 BUILDING AUTOMATION SYSTEM - GENERAL DESCRIPTION

A. Provide a new Building Automation System (BAS) to integrate and control all mechanical equipment associated with this project.

1. Sections 15010, 15700 and Division 16 specifications are applicable in full. Where requirements conflict between the specifications, the strictest application shall apply.

2. The Building Automation System shall be as indicated on the drawings and described in these specifications. System shall be fully integrated and coordinated with mechanical equipment DDC controllers furnished and installed in the equipment manufacturer's factory as specified in those sections. The intent of the BAS is to integrate all mechanical equipment into one system for global monitoring, control, and alarming associated with the building. It is the BAS manufacturer's responsibility to provide all the design, engineering, and field coordination required to ensure all equipment sequence of operations are met as specified and the designated BAS operators have the capability of managing the building mechanical system to ensure occupant comfort while maintaining energy efficiency.

3. The BAS shall meet open standard protocol communication standards to ensure the system maintains "interoperability" to avoid proprietary arrangements that will make it difficult for the Owner to consider other BAS manufacturers in future projects.

4. Direct Digital Control (DDC) technology shall be used to provide the functions necessary for control of mechanical systems and terminal devices on this project.

5. The BAS shall accommodate simultaneous multiple user operation. Access to the control system data should be limited only by the security permissions of the operator role. Multiple users shall have access to all valid system data. An operator shall be able to log onto any workstation on the control system and have access to all appropriate data.

6. Controls shall be hardwired. No wireless controls allowed.

1.1 APPROVED CONTROL SYSTEM MANUFACTURES

A. Approved BAS Manufacturers. Others require preapproval

1. Trane Tracer

2. Carrier

3. JCI

1.2 QUALITY ASSURANCE

A. BAS Manufacturer Qualifications

1. The BAS manufacturer shall have an established business office within 50.00 miles of the project site and shall provide 24 hours/day, 7 days/week response in the event of a customer warranty or service call.

2. The BAS Manufacturer shall have factory trained and certified personnel providing all engineering, service, startup, and commissioning field labor for the project from their local office location. BAS manufacturer shall be able to provide training certifications for all local office personnel upon request.

3. The BAS shall be provided by a single manufacturer and this manufacturer's equipment shall consist of operator workstation software, Web-based hardware/software, Open Standard Protocol hardware/software, Custom application Programming Language, Graphical Programming Language, Building Controllers, Custom Application Controllers, and Application Specific Controllers. All other products specified herein (i.e., sensors, valves, dampers, actuators, etc.) need not be manufactured by the BAS manufacturer listed in this specification.

4. Independent representatives of BAS manufacturers are not acceptable. BAS vendor shall be corporate owned entity of BAS manufacturer.

1.3 CODES AND STANDARDS

A. Codes and Standards: Meet requirements of all applicable standards and codes, except when more detailed or stringent requirements are indicated by the Contract Documents, including requirements of this Section.

1. Underwriters Laboratories: Products shall be UL-916-PAZX listed.

2. National Electrical Code -- NFPA 70.

3. Federal Communications Commission -- Part J.

4. ASHRAE/ANSI 135-2012 (BACnet) - (System Level Devices) - Building Controllers shall conform to the listed version of the BACnet specification in order to improve interoperability with various building system manufacturers' control systems and devices.

5. ASHRAE/ANSI 135-2012 (BACnet) - (Unit Level Devices) - Unit Controllers shall conform to the listed version of the BACnet specification in order to improve interoperability with various building system manufacturers' control systems and devices.

1.4 SYSTEM PERFORMANCE

A. Performance Standards. The BAS system shall conform to the following:

1. Graphic Display. The system shall display a graphic with a minimum of 20 dynamic points. All current data shall be displayed within 10 seconds of the operator's request.

2. Graphic Refresh. The system shall update all dynamic points with current data within 10 seconds.

3. Object Command. The maximum time between the command of a binary object by the operator and the reaction by the device shall be 5 seconds. Analog objects shall start to adjust within 5 seconds.

4. Object Scan. All changes of state and change of analog values shall be transmitted over the high-speed network such that any data used or displayed at a controller or workstation shall be current within the prior 10 seconds.

5. Alarm Response Time. The maximum time from when an object goes into alarm to when it is annunciated at the workstation shall not exceed 10 seconds.

6. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 seconds. The Contractor shall be responsible for selecting execution times consistent with the mechanical process under control.

7. Programmable Controllers shall be able to execute DDC PID control loops at a selectable frequency from at least once every 5 seconds. The controller shall scan and update the process value and output generated by this calculation at this same frequency.

8. Multiple Alarm Annunciations. All workstations on the network shall receive alarms within 5 seconds of each other.

9. Reporting Accuracy. Table 1 lists minimum acceptable reporting accuracies for all values reported by the specified system.

1.5 SUBMITTAL REQUIREMENTS

A. Refer to Section 15010 for additional requirements. BAS manufacturer shall provide shop drawings and manufacturers' standard specification data sheets on all hardware and software being provided for this project. No work may begin on any segment of this project until the Engineer and Owner have reviewed submittals for conformity with the plan and specifications.

1. Submittals shall be provided in PDF digital format.

B. Provide the Engineer any additional information or data which is deemed necessary to determine compliance with the specifications or which is deemed valuable in documenting and understanding the system to be installed.

C. All shop drawings shall be provided to the Owner electronically as .dwg file formats once they have been approved and as-built drawings have been completed.

D. Submit the following within 30 days of contract award:

1. A complete bill of materials of equipment to be used indicating quantities, manufacturers and model numbers.

2. A schedule of all control dampers including damper size, pressure drop, manufacturer, and model number.

3. Provide all manufacturers' technical cut sheets for major system components. When technical cut sheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Include:

a. Building Controllers

b. Custom Application Controllers

c. Application Specific Controllers

d. Auxiliary Control Devices

4. Provide proposed Building Automation System architectural diagram depicting various controller types, workstations, device locations, addresses, and communication cable requirements

5. Provide detailed termination drawings showing all required field and factory terminations, as well as terminal tie-ins to DDC controls provided by mechanical equipment manufacturers. Terminal numbers shall be clearly labeled.

6. Provide a sequence of operation for each controlled mechanical system and terminal end devices.

7. Provide a BACnet Protocol Implementation Conformance Statement (PICS) for each BACnet system level device (i.e. Building Controller & Operator Workstations) type. This defines the points list for proper coordination of interoperability with other building systems if applicable for this project.

E. Project Record Documents: Upon completion of installation, submit three (3) copies of record (as-built) documents. The documents shall be submitted for approval prior to final completion and include:

1. Project Record Drawings - These shall be as-built versions of the submittal shop drawings. One set of electronic media including CAD .dwg and .pdf drawing files shall be provided.

2. Testing and Commissioning Reports and Checklists signed off by trained factory (equipment manufacturers) and field (BAS) commissioning personnel.

3. Operating and Maintenance (O & M) Manuals - These shall be as-built versions of the submittal product data. In addition to the information required for the submittals, Operating & Maintenance manual shall include:

a. Procedures for operating the BAS including logging on/off, alarm management, generation of reports, trends, overrides of computer control, modification of setpoints, and other interactive system requirements.

b. Explanation of how to design and install new points, new DDC controllers, and other BAS hardware.

c. Documentation, installation, and maintenance information for all third party hardware/software products provided including personal computers, printers, hubs, sensors, valves, etc.

d. Original issue media for all software provided, including operating systems, programming language, operator workstation software, and graphics software.

e. Licenses, Guarantee, and Warranty documents for all equipment and systems.

F. Training Manuals: The BAS manufacturer shall provide a course outline and copies of training manuals at least two weeks prior to the start of any corporate training class to be attended by the Owner.

All training sessions shall be recorded and placed on standard DVD for the Owner's future use. Provide a minimum of three (3) copies on standard DVD and place in the O&M manuals as specified hereinbefore.

1.6 WARRANTY REQUIREMENTS

A. Warrant all work as follows:

1. BAS system labor and materials shall be warranted free from defects for a period of twelve (12) months after final the date of substantial completion as determined by the Architect. BAS failures during the warranty period shall be adjusted, repaired, or replaced at no charge to the Owner. The BAS manufacturer shall respond to the Owner's request for warranty service within 24 hours of the initiated call and shall occur during normal business hours (8AM-5PM).

2. At the end of the final start-up/testing, if equipment and systems are operating satisfactorily to the Owner and Engineer, the Owner shall sign certificates certifying that the BAS is operational and has been tested and accepted in accordance with the terms of this specification. The date of substantial completion shall be the start of the warranty period.

3. To ensure that the owner shall have the most current operating system provided by the manufacturer, the BAS manufacturer shall include licensing and labor costs to facilitate software/firmware updates for a period of two (2) years at no charge to the owner. These updates shall include upgrades for functional enhancements associated with the following: operator workstation software, project specific software, graphics, database, firmware updates, and all security related service packs. Written authorization by the Owner shall be granted prior to the installation of these updates.

4. The BAS manufacturer shall provide a web-accessible Users Network for the proposed System and give the Owner free access to question/answer forum, user tips, upgrades, and training schedules for a one year period of time correlating with the warranty period.

1.7 SYSTEM MAINTENANCE AND REMOTE ANALYSIS

A. The BAS Manufacture shall provide Building Automation System remote support and system analysis for a period of 1 year beginning the date of substantial completion as determined by the Architect.

B. The BAS manufacturer shall setup a secure remote connection for data collection, analytics and remote technical support for the HVAC systems included in this contract.

1. Provide technician support during the warranty period to diagnose issues remotely through the secure remote connection.

2. The building owner is responsible for providing adequate internet access. Coordinate this requirement prior to bid else this Contractor shall be responsible for these requirements.

C. Connectivity / Remote Access / Network Security

1. Provide and maintain secure remote access to the facilities Building Automation System (BAS) or other building systems. Users accessing service through this connection shall not have access to the building owners' network. Secure remote access to the BAS shall not require ANY inbound ports on a firewall to be "exposed" or "forwarded".

2. Secure remote access to the BAS shall be available anywhere, anytime, using a compatible client device (PC/tablet/phone)

3. The Owner shall provide up to Three (3) IP drops and IP addresses on the owner's network to gain access to the internet. Coordinate this requirement with the Electrical Engineer, Electrical Contractor and the City of Montgomery IT department prior to bid else be responsible for providing as specified. The BAS manufacture shall coordinate with the Owners IT team, verify the proposed system shall meet all network security requirements and any other network configuration information necessary to each control contractor for the purpose of configuring each Area Controller on the network. It shall be the responsibility of the BAS manufacture to coordinate with the owner for network connectivity.

D. The BAS Manufacture shall provide a professional analysis for the facility HVAC systems.

1. The analysis shall consist of an evaluation of HVAC systems including charts and graphs which indicate both current building performance and opportunities for building and HVAC system performance improvement.

E. The following shall be provided after substantial completion of the project:

1. Orientation meeting with the building owner's representative to identify the HVAC systems that shall be evaluated.

2. System setup for data collection and analytics. BAS Manufacture to setup a secure remote data collection and analytics for identified systems.

3. Assessment analysis shall be performed by trained personnel with relevant professional credentials in HVAC systems, energy management and building optimization methodologies.

4. Consultation meeting with owner to review performance reports and improvement opportunities.

F. Do not assign or transfer maintenance service to agent or subcontractor without prior written consent of owner.

1.8 OWNERSHIP OF PROPRIETARY MATERIAL

A. Project specific software and documentation shall become the owner's property upon project completion. This includes the following:

1. Operator Graphic files

2. As-built hardware design drawings

3. Operating & Maintenance Manuals

4. BAS System software database

PART 2 PRODUCTS

2.0 SYSTEM COMMUNICATION:

A. System Communications

1. Each workstation, building controller, and equipment/plant controller communication interface shall utilize the BACnet™ protocol with an Ethernet (IEEE 802.3) or RS485 (EIA-485) physical interface and an appropriate data link technology as defined in ANSI®/ASHRAE® Standard 135-2012. (e.g. BACnet over IP, BACnet over IPv6, BACnet SC, BACnet over MS/TP).

2. All system controllers shall be BTL listed as a BACnet Building Controller (B-BC) as defined in ANSI®/ASHRAE® Standard 135-2012.

3. All documented status and control points, schedule, alarm, and data-log services or objects shall be available as standard object types as defined in ANSI®/ASHRAE® Standard 135-2012.

4. Each System Controller shall communicate with a network of Custom Application and Application Specific Controllers utilizing one or more of the interfaces documented within Field Bus Communications below.

5. All Operator Workstations (B-OWS, B-AWS) and Building Controllers (B-BC) shall support BACnet Secure Connect (BACnet SC), a secure and encrypted datalink layer specifically designed for those networks.

B. Field Bus Communications

1. BACnet™

a. All equipment and plant controllers shall be BTL listed as a BACnet Application Specific Controller (B-ASC) or a BACnet Advanced Application Controller (B-AAC) as defined in ANSI®/ASHRAE® Standard 135-2012.

b. All communication shall conform to ANSI®/ASHRAE® Standard 135-2012.

c. System Controller shall function as a BACnet router to each unit controller providing a globally unique BACnet Device ID for all BACnet controllers within the system.

d. Communication between System Controller and equipment/plant controllers shall utilize BACnet MS/TP as defined in ANSI®/ASHRAE® Standard 135-2012.

2.1 OPERATOR INTERFACE:

A. Provide Building Operator Web Interface

1. Manufacturer shall provide a user interface with time-of-day schedules, data collection, dashboards, reports and building summary, system applications, and self-expiring timed overrides. Manufacturer shall provide a published user and applications guide(s) that detail the system application operation, configuration, setup and troubleshooting.

2. The building operator web interface shall be accessible via a web browser without requiring any "plug-ins" (i.e. JAVA Runtime Environment (JRE), Adobe Flash).

3. User Roles

a. The system shall include pre-defined "roles" that allow a system administrator to quickly assign permissions to a user.

b. User logon/logoff attempts shall be recorded.

c. The system shall protect itself from unauthorized use by automatically logging off following the last keystroke. The delay time shall be user definable.

4. On-Help and Training

a. Provide a context sensitive, on line help system to assist the operator in operation and configuration of the system.

b. On-line help shall be available for all system functions and shall provide the relevant data for each particular screen.

5. Equipment and Application Pages

a. The building operator web interface shall include standard pages for all equipment and applications. These pages shall allow an operator to obtain information relevant to the operation of the equipment and/or application, including:

1) Animated Equipment Graphics for each major piece of equipment and floor plan in the System. This includes:

a) Each Air Handler, VAV Terminal, Fan Coil, exhaust fans, etc., These graphics shall show all points dynamically as specified in the points list.

b) Animation capabilities shall include the ability to show a sequence of images reflecting the position of analog outputs, such as valve or damper positions. Graphics shall be capable of launching other web pages.

2) Alarms relevant to the equipment or application without requiring a user to navigate to an alarm page and perform a filter.

3) Historical Data (As defined in Trend Logs section of CONTROLLER SOFTWARE) for the equipment or application without requiring a user to navigate to a Data Log page and perform a filter.

6. System Graphics. Building operator web interface shall be graphically based and shall include at least one graphic per piece of equipment, unoccupied or occupied zone, graphics for each system.

a. Graphic imagery – graphics shall use 3D images for all standard and custom graphics. The only allowable exceptions shall be photo images, maps, schematic drawings, and selected floor plans.

b. Animation. Graphics shall be able to animate by displaying different Image lies for changed object status.

c. Alarm Indication. Indicate areas or equipment in an alarm condition using color or other visual indicator.

7. Graphics Library. Furnish a library of standard HVAC equipment such as air handlers, fan coils, exhaust fans, rooftop units, and VAV boxes, in 3-dimensional graphic depictions. The library shall be furnished in a file format compatible with the graphics generation package program.

8. Manual Control and Override

a. Point Control. Provide a method for a user to view, override, and edit if applicable, the status of any object and property in the system. The point status shall be available by menu, on graphics or through custom programs.

b. Temporary Overrides. The user shall be able to perform a temporary override wherever an override is allowed, automatically removing the override after a specified period of time.

c. Override Owners. The system shall convey to the user the owner of each override for all priorities that an override exists.

d. Provide a specific icon to show timed override or operator override, when a point, unit controller or application has been overridden manually.

9. Scheduling. - The scheduling application shall provide graphical representation of the day, week, month and exception events.

10. Alarm/Event Notification

a. Alarm/Event Log. The operator shall be able to view all logged system alarms/events from any building operator web interface.

1) The operator shall be able to sort and filter alarms from events. Alarms shall be sorted in a minimum of 4 categories based on severity.

2) The operator shall be able to acknowledge and add comments to alarms

3) Alarm/event messages shall use full language, easily recognized descriptors.

b. Alarm Suppression. Alarms shall be able to be suppressed based on load/source relationships to present the likely root cause to the building operator as described in ASHRAE Guideline 36. Load/Source relationships shall be configurable by the user through a web interface.

11. Reports and Logs.

a. The building operator web interface shall provide a reporting package that allows the operator to select reports.

b. The building operator web interface shall provide the ability to schedule reports to run at specified intervals of time.

c. The following standard reports shall be available without requiring a user to manually configure the report:

1) All Points in Alarm Report: Provide an on demand report showing all current alarms.

2) All Points in Override Report: Provide an on demand report showing all overrides in effect.

3) Commissioning Report: Provide a one-time report that lists all equipment with the unit configuration and present operation.

4) Points report: Provide a report that lists the current value of all points

d. The controls vendor shall provide a hardening report that summarizes the port configuration details to ensure sites have not been exposed to the Internet in alignment with Cyber Security best practices.

B. Provide Mobile App Interface

1. Provide mobile (smart phone and tablet) interfaces to the building automation system, compatible with iOS and Android™ operating systems as desired by the Owner.

2. Controls manufacturer shall provide a phone/tablet interface with the ability to view/override status and setpoints, view/change schedules, view/acknowledge/comment on alarms, and view graphics for all spaces and equipment.

3. This phone/tablet interface shall resize itself appropriately for the size of the interface (i.e. no "pinching and zooming" required).

4. This phone/tablet interface shall function remotely from the facility while following IT security best practices (e.g. no ports exposed to the internet).

5. The operator interface shall support system access on a mobile device via a mobile app to:

a. Alarm log

b. System Status

c. Equipment status

d. Space Status

e. Standard Equipment graphics

f. Override set points

g. Override occupancy

h. Acknowledge Alarms

i. Add Comment(s) to Alarms

2.2 BUILDING CONTROLLER SOFTWARE:

A. Manufacturer shall provide standard applications to deliver HVAC system control. Standard applications include Time of Day Scheduling with Optimal Start/Stop, VAV Air Systems Control, Rooftop Unit Control, Split system units' control, exhaust fans control, etc., as shown on the plans. Historical Trend Logs and Trim and Respond. Manufacturer shall provide system optimization strategies for functions such as fan pressure optimization and ventilation optimization.

B. Furnish the following applications software for building and energy management. All software applications shall reside and run in the system controllers. Editing of applications shall occur at the building operator interface.

1. Trend Logs

a. The system shall harvest trend logs for defined key measurements for each controlled HVAC device and HVAC application. Trend logs shall be captured for a minimum of 5 key operating points for each piece of HVAC equipment and HVAC application and stored for no less than 1 year at 15-minute intervals. Data Logs shall be capable of being configured on an interval or change of value basis.

1) Fan Coil / Split Systems

a) Discharge Air Temperature

b) Space Temperature Active

c) Space Temperature Setpoint Active

d) Air Flow Setpoint Active

e) Discharge Air Flow

f) High temperature Alarm (IT Rooms, Pantry and Electrical Rooms)

2) Air Handling Unit/Rooftop (VAV)

a) Discharge Air Temperature

b) Discharge Air Temperature Setpoint Active

c) Space Temperature Active

d) Cooling Capacity Status

e) Discharge Air Flow

3) Air Handling Unit/Rooftop (CV)

a) Discharge Air Temperature

b) Space Temperature Active

c) Space Temperature Setpoint Active

d) Cooling Capacity Status

e) Heating Capacity Primary Status

f) Outdoor Air Damper Position

4) VAV Terminal Unit

a) Discharge Air Temperature

b) Space Temperature Active

c) Space Temperature Setpoint Active

d) Air Flow Setpoint Active

e) Discharge Air Flow

5) Variable Air System (VAS)

a) VAS Operating Mode

b) Duct Static Optimization Duct Static Setpoint

c) Duct Pressure Optimization Maximum

d) Space Temperature Average

e) Ventilation Optimization Air Setpoint

2.3 **BUILDING / SYSTEM CONTROLLERS:**

A. There shall be one or more independent, standalone microprocessor based System Controllers to manage the global strategies described in CONTROLLER SOFTWARE section.

1. The controller shall provide a USB communications port for connection to a PC.

2. The operating system of the Controller shall manage the input and output communications signals to allow distributed controllers to share real and virtual point information and allow central monitoring and alarms.

3. All System Controllers shall have a real time clock and shall be able to accept a BACnet time synchronization command for automatic time synchronization.

4. Data shall be shared between networked System Controllers.

5. Serviceability – The System Controller shall have a display on the main board that indicates the current operating mode of the controller.

B. Controls manufacturer shall provide secure remote access to the Building Automation System (BAS). Secure remote access shall not require IP ports to be "exposed" (i.e. port-forwarded or external public IP addresses) to the Internet. Controls manufacturer shall update secure remote access software as necessary to follow cyber security best practices and respond to cyber security events.

2.4 ADVANCED APPLICATION CONTROLLERS:

A. Advance Application Controllers shall be used to control all equipment or applications of medium and high complexity, including but not limited to Air Handlers, Rooftop Units, Split Systems, Exhaust fans and unit heaters.

B. The Advanced Application Controller shall be capable of operating as a stand-alone controller or as a member of a Building Automation System (BAS).

C. When the Advanced Application Controller is operating as a member of a Building Automation System (BAS), the application controller shall operate as follows:

1. Application Controller shall receive operation mode commands from the BAS network controller. The BAS commands shall include but not be limited to the follow: Occupied Heat/Cool, Unoccupied Heat/Cool, Morning Warm-up, / Pre-cool, Occupied Bypass).

2. Application Controller shall provide equipment status parameters to the BAS through BACnet communication.

3. Application Controller shall operate as a stand-alone controller in the event of communication failure with the BAS.

4. In case of communications failure, stand-alone operation shall use default values or last known values for remote sensors read over the network such as outdoor air temperature.

D. For Stand-Alone Operation of Advanced Application Controllers:

1. Shall operate a schedule in a standalone application using a Real Time Clock with a 7 day power backup.

a. The Controller shall have a built in schedule (assessable with or without a display)

b. Support shall be for at least 3 schedules with up to 10 events for each day of the week.

c. Each of the 3 schedules can be Analog, Binary or Multi-State

d. The controller shall support a minimum of 25 exceptions each with up to 10 events.

E. For ease of troubleshooting, the Controller shall support data trend logging.

1. With a minimum of 20,000 trending points total on a controller

2. Trends shall be capable of being collected at a minimum sample rate of once every second

3. Shall be capable of trending all BACnet points used by controller

4. Trends shall be capable of being scheduled or triggered.

F. To meet the sequence of operation for each application, the Controller shall use library programs provided by the controller manufacturer that are either factory loaded or downloaded with service tool to the controller.

G. Environment. Controller hardware shall be suitable for the anticipated ambient conditions.

1. Operating conditions:

a. Temperature: -40°F to 158°F

b. Relative Humidity: 5% to 100% RH (non-condensing)

2. Controllers used indoors shall be mounted in a NEMA 1 enclosure at a minimum.

3. Controllers used outdoors and/or in wet ambient shall be mounted within NEMA 4 type waterproof enclosures, and shall be rated for operation at -40° F to 158° F.

H. Input/Output: The Controller shall have on board or through expansion module all I/O capable of performing all functionality needed for the application. Controls provided by the equipment manufacture shall supply the required I/O for the equipment. In addition other controls shall meet the following requirements:

1. Shall support flexibility in valve type, the controllers shall be capable of supporting the following valve control types: 0-10VDC, 0-5VDC, 4-20mA, 24VAC - 2 position.

2. Shall support flexibility in sensor type, the Controller shall be capable of reading sensor input ranges of 0 to10V, 0 to 20mA, 50ms or longer pulses, 200 to 20Kohm and RTD input.

3. Shall support flexibility in sensor type, all Analog Outputs shall have the additional capability of being programmed to operate as Universal Inputs or Pulse Width Modulation Outputs.

4. Shall support flexibility in sensor type, the Controller and/or expansion modules shall support dry and wetted (24VAC) binary inputs.

5. The controller shall support pulse accumulator for connecting devices like energy meters.

6. In order to support a wide range of devices, the Controller's binary output shall be able to drive at least 10VA each.

7. For future needs, any unused I/O that is not needed for the functionality of the equipment shall be available to be used by custom programs on the Controller and by any other controller on the network.

8. The Controller shall provide 24VAC and 24VDC power terminals sensors and other devices required.

9. The Controller shall provide a dedicated static pressure input.

I. Input/Output Expandability – The Controller shall provide the following functionality in order to meet current and future application needs:

1. For the application flexibility, the Controller shall be capable of expanding to a total of at least 100 hardware I/O terminations.

2. Expansion I/O can be mounted up to 650 ft. (200m) from control.

3. For optimized system operation, expansion I/O shall communicate via an internal controller communication bus (point expansion via the BACnet MS/TP network is not allowed).

J. Serviceability – The Controller shall provide the following in order to improve serviceability of the Controller.

1. Diagnostic LEDs for power/normal operation/status, BACnet communications, sensor bus communications, and binary outputs. All wiring connections shall be clearly labeled and made to be field removable.

2. Binary and analog inputs and outputs shall use removable connectors or be connected to terminal strip external to the control box.

3. Software service tool connection through the following methods: direct cable connection to the Controller, connection through another controller on BACnet link

4. For safety purposes, the controller shall be capable of being powered by a portable computer's USB port for the purposes of configuration, programming and testing programs so that this work can be accomplished with the power off to the associated equipment.

5. The Controller software tool service port shall utilize standard off-the-shelf USB printer cable.

6. Capabilities to temporarily override the BACnet point values with built-in time expiration in the Controller.

7. To aid in service replacement, the Controller shall easily attach to standard DIN rail mounting.

8. For future expansion, the Controller shall be capable of adding sequence of operation programming utilizing service tools software with a graphical programming interface (editing or programming in line code is not permissible).

9. To aid in service replacement, the Controller shall allow for setting its BACnet address via controller mounted rotary switches that correspond to the numerical value of the address. (DIP switch methodologies are not allowed). Setting of the address shall be accomplished without the need of a service tool or power applied to the controller.

10. Controller data shall be maintained through a power failure.

K. Software Retention: All Controller operating parameters, setpoints, BIOS, and sequence of operation code shall be stored in non-volatile memory in order to maintain such information for months without power.

L. Controller shall meet the following Agency Compliance:

1. UL916 PAZX, Open Energy Management Equipment

2. UL94-5V, Flammability

3. FCC Part 15, Subpart B, Class B Limit

4. BACnet Testing Laboratory (BTL) listed as BACnet Advanced Application Controller (B-AAC)

2.5 APPLICATION SPECIFIC CONTROLLERS:

A. General Description

1. Application Specific Controllers (ASC) shall be microprocessor-based DDC controllers which, through hardware or firmware design, control specified equipment. They are not user programmable, but are customized for operation within the confines of the equipment they are designed to serve.

2. Zone Controllers are controllers that operate equipment that control the space temperature of single zone. Examples are controllers for VAV, Fan coil, Blower Coils, Unit Ventilators, Heat Pumps, Packaged Rooftop VAV and CV units, and unit heaters.

B. The Application Specific Controller shall be capable of operating as a stand-alone controller or as a member of a Building Automation System (BAS).

C. When the Application Specific Controller is operating as a member of a Building Automation System (BAS), the application controller shall operate as follows:

1. Application Controller shall receive operation mode commands from the BAS network controller. The BAS commands shall include but not be limited to the follow: Occupied Heat/Cool, Unoccupied Heat/Cool, Morning Warm-up, / Pre-cool, Occupied Bypass).

2. Application Controller shall provide equipment status parameters to the BAS through BACnet communication.

3. Application Controller shall operate as a stand-alone controller in the event of communication failure with the BAS.

4. In case of communications failure stand-alone operation shall use default values or last known values for remote sensors read over the network such as outdoor air temperature.

D. Stand-Alone Operation: Each piece of equipment specified in section “A” shall be controlled by a single controller and provide stand-alone control in the event that a BAS is not present.

E. Software

1. To meet the sequence of operation for each zone control, the controller shall use programs developed and tested by the controller manufacturer that are either factory loaded or downloaded with service tool to the controller.

2. For controlling ancillary devices and for flexibility to change the sequence of operation in the future, the controller shall be capable running custom programs written in a graphical programming language.

F. Environment: Controller hardware shall be suitable for the anticipated ambient conditions.

1. Storage: -55° to 203° F and 5 to 95% Rh, non-condensing.

2. Operating: -40° to 158° F and 5 to 95% Rh, non-condensing.

3. Controllers used indoors shall be mounted in a NEMA 1 enclosure at a minimum.

4. Controllers used outdoors and/or in wet ambient shall be mounted within NEMA 4 type waterproof enclosures, and shall be rated for operation at -40° to 158° F.

G. Input/Output:

1. For flexibility in selection and replacement of sensors, the controllers shall be capable of reading sensor input ranges of 0 to10V, 0 to 20mA, pulse counts, and 200 to 20Kohm.

2. For flexibility in selection and replacement of binary devices, the controller shall support dry and wetted (24VAC) binary inputs.

3. For flexibility in selection and replacement devices, the controller's shall have binary output which are able to drive at least 12VA each.

4. For flexibility in selection and replacement of motors, the controller shall be capable of outputting 24VAC (binary output), DC voltage (0 to 10VDC minimum range) and PWM (in the 80 to 100 Hz range).

5. For future needs, any I/O that is unused by functionality of equipment control shall be available to be used by custom program on the controller and by another controller on the network.

6. For future expansion and flexibility, the controller shall have either on board or through expansion, 20 hardware input/output points. Expansion points shall communicate with the controller via an internal communications bus. Expansion points shall be capable of being mounted up to 650ft. (200 m) from the controller. Expansion points that require the BACnet network for communication with the controller are not allowed.

H. Serviceability – The controller shall provide the following in order to improve serviceability of the controller.

1. Diagnostic LEDs shall indicate correct operation or failures/faults for all of the following: power, sensors, BACnet communications, and I/O communications bus.

2. All binary output shall have LED's indicating the output state.

3. All wiring connectors shall removable without the use of a tool.

4. Software service tool connection through all of the following methods: direct cable connection to the controller, connection through another controller on BACnet link

5. For safety purposes, the controller shall be capable of being powered by a portable computer for the purposes of configuration, programming, and testing programs so that this work can be accomplished with the power off to the equipment.

6. Capabilities to temporarily override of BACnet point values with built-in time expiration in the controller.

7. BACnet MAC Address shall be set using decimal (0-9) based rotary switches.

a. Configuration change shall not be made in a programming environment, but rather by a configuration page utilizing dropdown list, check boxes, and numeric boxes.

8. For ease of troubleshooting, the Controller shall support BACnet data trend logging.

a. With a minimum of 20,000 trending points total on controller

b. Trends shall be capable of being collected at a minimum sample rate of once every second.

c. Shall be capable of trending all BACnet points used by controller

d. Trends shall be capable of being scheduled or triggered

I. Software Retention: All Zone Controller operating parameters, setpoints, BIOS, and sequence of operation code shall be stored in non-volatile memory in order to maintain such information for months without power.

J. Application controller shall meet the following Agency Compliance:

1. UL916 PAZX, Open Energy Management Equipment

2. UL94-5V, Flammability

3. FCC Part 15, Subpart B, Class B Limit

4. BACnet Testing Laboratory (BTL) listed as BACnet Application Specific Controller (B-ASC)

2.6 APPLICATION CONTROLLER FOR PACKAGED ROOFTOP UNITS

A. The Rooftop Unit (RTU) Application Controller shall be a microprocessor based DDC controller which, through hardware or firmware design, controls specified equipment. The controller is not user programmable but is customized for operation within the confines of the equipment it is designed to serve.

B. The Application Controller shall be capable of operating as a stand-alone controller or as a member of a Building Automation System (BAS).

C. When the Application Controller is operating as a member of a Building Automation System (BAS), the application controller shall operate as follows:

1. Application Controller shall receive operation mode commands from the BAS network controller. The BAS commands shall include but not be limited to the follow: Occupied Heat/Cool, Unoccupied Heat/Cool, Morning Warm-up, / Pre-cool, Occupied Bypass).

2. Application Controller shall provide equipment status parameters to the BAS through BACnet communication.

3. Application Controller shall operate as a stand-alone controller in the event of communication failure with the BAS.

4. In case of communications failure stand-alone operation shall use default values or last known values for remote sensors read over the network such as outdoor air temperature.

D. Software

1. To meet the sequence of operation for each zone control, the controller shall use programs developed and tested by the controller manufacturer that are either factory loaded or customized with use of service tool native to the controller.

E. Environment: Controller hardware shall be suitable for the anticipated ambient conditions.

1. Storage: -55° to 203° F (-48° to 95° C) and 5 to 95% Rh, non-condensing.

2. Operating: -40° to 158° F (-40 to 70° C) and 5 to 95% Rh, non-condensing.

3. Controllers used indoors shall be mounted in a NEMA 1 enclosure at a minimum.

4. Controllers used outdoors and/or in wet ambient shall be mounted within NEMA 4 type waterproof enclosures, and shall be rated for operation at -40° to 158° F [-40° to 70° C].

F. Controller Input/Output: The controller shall have on board capable of performing all functionality needed for the application. Controls provided by the equipment manufacture shall supply the required I/O for the equipment.

1. For flexibility in selection and replacement of valves, the controllers shall be capable of supporting all of the following output types; 0-10VDC, 0-5VDC, 4-20mA, Binary.

2. For flexibility in selection and replacement of sensors, the controllers shall be capable of reading sensor input ranges of 0 to10V, 0 to 20mA, Pulse counts, and 200 to 20Kohm.

G. Serviceability – The controller shall provide the following in order to improve serviceability of the controller.

1. Diagnostic LEDs shall indicate correct operation or failures/faults for all of the following: power, sensors, BACnet communications, and I/O communications bus.

2. All binary output shall have LED’s indicating the output state.

3. All wiring connectors shall removable without the use of a tool.

4. Software service tool connection through the following methods: direct cable connection to the controller, connection through another controller on BACnet link.

H. Software Retention: All Zone Controller operating parameters, setpoints, BIOS, and sequence of operation code shall be stored in non-volatile memory in order to maintain such information for months without power.

I. Controller shall meet the following Agency Compliance:

1. UL916 PAZX, Open Energy Management Equipment

2. UL94-5V, Flammability

3. FCC Part 15, Subpart B, Class B Limit

4. BACnet Testing Laboratory (BTL) listed

2.7 VARAIBLE AIR VOLUME TERMINAL UNIT CONTROLLERS

A. General Description

1. Variable Air Volume (VAV) controllers shall be microprocessor-based DDC controllers which, through hardware or firmware design, control specified equipment. They are typically not user programmable, but are configurable for operation of VAV terminal units.

2. Variable Air Volume (VAV) controllers are controllers that operate equipment that control the space temperature of single zone.

B. The VAV controller shall be capable of operating as a stand-alone controller or as a member of a Building Automation System (BAS).

C. When the VAV controller is operating as a member of a Building Automation System (BAS), the application controller shall operate as follows:

1. The VAV controller shall receive operation mode commands from the BAS network controller. The BAS commands shall include but not be limited to the following: Occupied Heat/Cool, Unoccupied Heat/Cool, Morning Warm-up, / Pre-cool, Occupied Bypass).

2. The VAV controller shall provide equipment status parameters to the BAS through BACnet communication.

3. The VAV controller shall operate as a stand-alone controller in the event of communication failure with the BAS.

4. In case of communications failure stand-alone operation shall use default values or last known values for remote sensors read over the network such as outdoor air temperature.

D. Stand-Alone Operation: Each VAV Terminal Unit shall be controlled by a single controller and provide stand-alone control in the event that a BAS is not present.

E. The VAV controller shall communicate to the building automation system via BACnet™ MS/TP as defined in ANSI®/ASHRAE® Standard 135-2020.

1. BACnet™ MS/TP

a. To allow maximum communications speed and co-existence with other controllers, the controller shall support at a minimum the following BACnet MS/TP manager baud rates: 9600, 19200, 38400, 76800.

F. Each VAV terminal unit shall use a space zone sensor(s) to measure the space condition it is serving.

1. Each zone sensor communication interface shall be capable of many-to-one sensors per controller to support averaging, monitoring, and multiple zone applications. Sensing options shall include temperature, relative humidity, CO2, and occupancy.

G. Software

1. To meet the sequence of operation for each zone control, the controller shall use programs developed and tested by the controller manufacturer that are either factory loaded or downloaded with service tool to the controller.

2. For controlling ancillary devices and for flexibility to change the sequence of operation in the future, the controller shall be capable running custom programs written in a graphical programming language.

H. Environment: Controller hardware shall be suitable for the anticipated ambient conditions.

1. Storage: -55° to 203° F and 5 to 95% Rh, non-condensing.

2. Operating: -40° to 158° F and 5 to 95% Rh, non-condensing.

3. Controllers used indoors shall be mounted in a NEMA 1 enclosure at a minimum.

4. Controllers used outdoors and/or in wet ambient shall be mounted within NEMA 4 type waterproof enclosures, and shall be rated for operation at -40° to 158° F.

I. Input/Output:

1. For flexibility in selection and replacement of sensors, the controllers shall be capable of reading sensor input ranges of 0 to10V, 0 to 20mA, and 200 to 20Kohm.

2. For flexibility in selection and replacement of binary devices, the controller shall support dry and wetted (24VAC) binary inputs.

3. For flexibility in selection and replacement devices, the controller shall have binary output which are able to drive at least 12VA each.

4. For flexibility in selection and replacement of motors, the controller shall be capable of outputting 24VAC (binary output), DC voltage (0 to 10VDC minimum range) and PWM (in the 80 to 100 Hz range).

J. Serviceability – The controller shall provide the following in order to improve serviceability of the controller.

1. Diagnostic LEDs shall indicate correct operation or failures/faults for all of the following: power, sensors, BACnet communications, and I/O communications bus.

2. All binary output shall have LED’s indicating the output state.

3. All wiring connectors shall removable without the use of a tool.

4. Software service tool connection through all of the following methods: direct cable connection to the controller, connection through another controller on BACnet link and through the controller’s zone sensor.

5. For safety purposes, the controller shall be capable of being powered by a portable computer for the purposes of configuration, programming, and testing programs so that this work can be accomplished with the power off to the equipment.

6. Capabilities to temporarily override of BACnet point values with built-in time expiration in the controller.

7. BACnet MAC Address shall be set using decimal (0-9) based rotary switches.

a. Configuration change shall not be made in a programming environment, but rather by a configuration page utilizing dropdown list, check boxes, and numeric boxes.

8. For ease of troubleshooting, the Controller shall support BACnet data trend logging.

a. Trends shall be capable of being collected at a minimum sample rate of once every second.

b. Shall be capable of trending all BACnet points used by controller

c. Trends shall be capable of being scheduled or triggered

K. Software Retention: All Zone Controller operating parameters, setpoints, BIOS, and sequence of operation code shall be stored in non-volatile memory in order to maintain such information for months without power.

L. Controller shall meet the following Agency Compliance:

1. UL916 PAZX, Open Energy Management Equipment

2. UL94-5V, Flammability

3. FCC Part 15, Subpart B, Class B Limit

4. AS/NZS CISPR 32:2016

5. VCCI-CSPR 32:2016

6. CAN ICES-003(B)/NMB-003(B)

7. To ensure integration to the building automation system the controller shall be BTL (BACnet Testing Lab) listed. The following BACnet profiles are in order of most functionality (B-BC) to least functionality (B-ASC).

a. BACnet Building Controller (B-BC)

b. BACnet Advance Applications Controller (B-AAC)

c. BACnet Application Specific Controller (B-ASC)

2.8 **INPUT/OUTPUT INTERFACE:**

A. Hardwired inputs and outputs may tie into the system through building, custom application, or ASCs.

B. All input points and output points shall be protected such that shorting of the point to itself, to another point, or to ground shall cause no damage to the controller. All input and output points shall be protected from voltage up to 24V of any duration, such that contact with this voltage shall cause no damage to the controller.

C. Binary inputs shall allow the monitoring of on/off signals from remote devices. The binary inputs shall provide a wetting current of at least 12 mA to be compatible with commonly available control devices and shall be protected against the effects of contact bounce and noise. Binary inputs shall sense “dry contact” closure without external power (other than that provided by the controller) being applied.

D. Pulse accumulation input objects. This type of object shall conform to all the requirements of binary input objects and also accept up to 10 pulses per second for pulse accumulation.

E. Analog inputs shall allow the monitoring of low voltage (0 to 10 VDC), current (4 to 20 mA), or resistance signals (thermistor, RTD). Analog inputs shall be compatible with and field configurable to commonly available sensing devices.

F. Binary outputs shall provide for on/off operation or a pulsed low-voltage signal for pulse width modulation control. Binary outputs on building and custom application controllers shall have status lights. Outputs shall be selectable for either normally open or normally closed operation.

G. Analog outputs shall provide a modulating signal for the control of end devices. Outputs shall provide either a 0 to 10VDC or a 4 to 20 mA signal as required to provide proper control of the output device. Analog outputs shall not exhibit a drift of greater than 0.4% of range per year.

H. Tri-State Outputs. Provide tri-state outputs (two coordinated binary outputs) for control of three-point floating type electronic actuators without feedback. Use of three-point floating devices shall be limited to zone control and terminal unit control applications (VAV terminal units, duct-mounted heating coils, zone dampers, radiation, etc.). Control algorithms shall run the zone actuator to one end of its stroke once every 24 hours for verification of operator tracking.

I. System Object Capacity. The system size shall be expandable to at least twice the number of input/ output objects required for this project. Additional controllers (along with associated devices and wiring) shall be all that is necessary to achieve this capacity requirement. The operator interfaces installed for this project shall not require any hardware additions or software revisions in order to expand the system.

2.9 **POWER SUPPLIES:**

A. Control transformers shall be UL listed. Furnish Class 2 current-limiting type or furnish overcurrent protection in both primary and secondary circuits for Class 2 service in accordance with NEC requirements. Limit connected loads to 80% of rated capacity.

1. DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100-microsecond response time for 50% load changes. Unit shall have built-in overvoltage and overcurrent protection and shall be able to withstand a 150% current overload for at least three seconds without trip-out or failure.

a. Unit shall operate between 32°F and 120°F. EM/RF shall meet FCC Class B and VDE 0871 for Class B and MIL-STD 810C for shock and vibration.

b. Line voltage units shall be UL recognized and CSA approved.

2.10 **AUXILLARY CONTROL DEVICES:**

A. Motorized dampers, unless otherwise specified elsewhere, shall be as follows:

1. Damper frames shall be 16 gauge galvanized sheet metal or 1/8" extruded aluminum with reinforced corner bracing.

2. Damper blades shall not exceed 8" in width or 48" in length. Blades are to be suitable for medium velocity performance (2,000 fpm). Blades shall be not less than 16 gauge.

3. Damper shaft bearings shall be as recommended by manufacturer for application.

4. All blade edges and top and bottom of the frame shall be provided with compressible seals. Side seals shall be compressible stainless steel. The blade seals shall provide for a maximum leakage rate of 10 CFM per square foot at 2.5" w.c. differential pressure.

5. All leakage testing and pressure ratings shall be based on AMCA Publication 500.

6. Individual damper sections shall not be larger than 48" x 60". Provide a minimum of one damper actuator per section.

B. Electric damper actuators

1. The actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator.

2. Where shown, for power-failure/safety applications, an internal mechanical, spring return mechanism shall be built into the actuator housing.

3. All rotary spring return actuators shall be capable of both clockwise or counter clockwise spring return operation. Linear actuators shall spring return to the retracted position.

4. Proportional actuators shall accept a 0-10 VDC or 0-20 ma control signal and provide a 2-10 VDC or 4-20 ma operating range.

5. All non-spring return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring return actuators with more than 60 in-lb. torque capacity shall have a manual crank for this purpose.

6. Actuators shall be provided with a conduit fitting and a minimum 1m electrical cable and shall be pre-wired to eliminate the necessity of opening the actuator housing to make electrical connections.

7. Actuators shall be Underwriters Laboratories Standard 873 listed.

8. Actuators shall be designed for a minimum of 60,000 full stroke cycles at the actuator's rated torque.

C. Binary Temperature Devices

1. Low-voltage space thermostat shall be 24 V, bimetal-operated, mercury-switch type, with either adjustable or fixed anticipation heater, concealed setpoint adjustment, 55°F to 85°F setpoint range, 2°F maximum differential, hinged and vented metal with rounded edges.

2. Line-voltage space thermostat shall be bimetal-actuated, open contact type, or bellows-actuated, enclosed, snap-switch type or equivalent solid-state type, with heat anticipator, UL listed for electrical rating, visible setpoint adjustment, 55°F to 85°F setpoint range, 2°F maximum differential, and vented ABS plastic cover.

3. Low-limit thermostats. Low-limit airstream thermostats shall be UL listed, vapor pressure type, with an element of 20 ft minimum length. Element shall respond to the lowest temperature sensed by any 1 ft section. The low-limit thermostat shall be manual reset only.

D. Wired Temperature Sensors

1. Temperature sensors shall be RTD or thermistor.

2. Duct sensors shall be single point or averaging as shown. Averaging sensors shall be a minimum of 1.5 m (5 ft) in length per 1 m2 (10 ft2) of duct cross section.

3. Space sensors shall be equipped with setpoint adjustment, override switch, display, and/or communication port.

4. Provide matched temperature sensors for differential temperature measurement.

E. Wired Humidity Sensors

1. Duct and room sensors shall have a sensing range of 20% to 80%.

2. Duct sensors shall be provided with a sampling chamber.

F. Static Pressure Sensors

1. Sensor shall have linear output signal. Zero and span shall be field-adjustable.

2. Sensor sensing elements shall withstand continuous operating conditions plus or minus 50% greater than calibrated span without damage.

2.11 WIRING AND RACEWAYS:

A. General: Provide copper wiring, plenum cable, and raceways as specified in the applicable sections of this specification. Control wiring shall be mounted on J-hook assemblies. See end of Section 1570 for requirements.

B. All insulated wire to be copper conductors, UL labeled for 90°C (194°F) minimum service.

C. Fiber Optic Cable. Optical cables shall be duplex 900 mm tight-buffer construction designed for intra-building environments. The sheath shall be UL Listed OFNP in accordance with NEC Article 770. The optical fiber shall meet the requirements of FDDI, ANSI X3T9.5 PMD for 62.5/125 µm.

PART 3 EXECUTION

3.1 EXAMINATION:

A. The Contract Documents shall be thoroughly examined for coordination of control devices, their installation, wiring, and commissioning. Coordinate and review mechanical equipment specifications, locations, and identify any discrepancies, conflicts, or omissions that shall be reported to the Architect/Engineer for resolution before rough-in work is started.

B. The BAS manufacturer shall inspect the jobsite in order to verify that control equipment can be installed as required, and any discrepancies, conflicts, or omissions shall be reported to the Architect/Engineer for resolution before rough-in work is started.

4.0 PROTECTION:

A. The BAS installation contractor shall protect all work and material from damage by their work or personnel and shall be liable for all damage thus caused.

B. The BAS manufacturer shall be responsible for their work and equipment until final inspection, testing, and acceptance. The BAS installing contractor shall protect their work against theft or damage and shall carefully store material and equipment received on site that is not immediately installed. The Contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

4.1 COORDINATION:

A. Site

1. Where the mechanical work will be installed in close proximity to, or will interfere with, work of other trades, the contractor shall assist in working out space conditions to make a satisfactory adjustment. If the contractor installs his/her work before coordinating with other trades, so as to cause any interference with work of other trades, the contractor shall make the necessary changes in his/her work to correct the condition without extra charge as determined by the Architect.

2. Coordinate and schedule work with all other work in the same area, or with work that is dependent upon other work, to facilitate mutual progress.

B. Submittals. Refer to the “Submittals,” sections of this specification and Section 15010 for requirements.

C. Test and Balance

1. The contractor shall furnish a single set of all tools necessary to interface to the control system for test and balance purposes.

2. The contractor shall provide training in the use of these tools. This training shall be planned for a duration of 8 hours.

3. In addition, the contractor shall provide a qualified technician to assist in the test and balance process, until the first 20 terminal units are balanced.

4. The tools used during the test and balance process shall be returned to the contractor at the completion of the testing and balancing.

D. Life Safety

1. Duct smoke detectors required for units shutdown shall be supplied under Division 16 of the specifications. The contractor shall interlock smoke detectors to air handlers for shutdown as described in the Sequences of Operation for this project.

E. Coordination with Controls Specified in Other Sections or Divisions:

1. Other sections and/or divisions of this specification include controls and control devices that are to be part of or interfaced to the control system specified in this section. These controls shall be integrated into the system and coordinated by the contractor as follows:

a. All communication media and equipment shall be provided as specified in the "Communication" section of this specification.

b. Each supplier of a controls product is responsible for the configuration, programming, start-up, and testing of that product to meet the sequences of operation described in this section.

c. The Contractor shall coordinate and resolve any incompatibility issues that arise between the control products provided under this section and those provided under other sections or divisions of this specification.

4.2 **GENERAL WORKMANSHIP:**

A. Refer to Sections 15010, 15700 and Division 16 for additional requirements. Note that where requirements conflict, the strictest application shall apply.

B. Install equipment, piping, wiring/conduit, parallel to building lines (i.e. horizontal, vertical, and parallel to walls) wherever possible.

C. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.

D. Install all equipment in readily accessible locations as defined by National Electric Code (NEC). Control panels shall be attached to structural walls or properly supported in a free-standing configuration, unless mounted in equipment enclosure specifically designed for that purpose. Panels shall be mounted to allow for unobstructed access for service.

E. Verify integrity of all control wiring to ensure continuity and freedom from shorts and grounds prior to commencing the startup and commissioning procedures.

F. All control device installation and wiring shall comply with Contract Documents, acceptable industry specifications, and industry standards for performance, reliability, and compatibility. Installation and wiring shall be executed in strict adherence to local codes and standard practices referenced in Contract Documents.

4.3 FIELD QUALITY CONTROL:

A. All work, materials, and equipment shall comply with the rules and regulations of applicable local, state, and federal codes and ordinances as identified in Contract Documents.

B. BAS manufacturer shall continually monitor the field installation for building code compliance and quality of workmanship. All visible piping and or wiring runs shall be installed parallel to building lines and properly supported.

C. BAS installing Contractor(s) shall arrange for field inspections by local and/or state authorities having jurisdiction over the work.

4.4 COMMUNICATION WIRING:

A. All cabling shall be installed in a neat and workmanlike manner in J-Hooks as specified in Section 15700, following manufacturer's installation recommendations for all communication cabling.

B. Do not install communication wiring in raceway and enclosures containing Class 1 or other Class 2 wiring.

C. Maximum pulling, tension, and bend radius for cable installation, as specified by the cable manufacturer shall not be exceeded during installation.

D. Contractor shall verify the integrity of the entire network following cable installation. Use appropriate test measures for each particular cable.

E. When a cable enters or exits a building, a lighting arrestor shall be installed between the line and ground.

F. All runs of communication wiring shall be unspliced length when the length is commercially available.

G. All communication wiring shall be labeled to indicate origin and destination.

4.5 FIBER OPTIC CABLE:

A. All cabling shall be installed in a neat and workmanlike manner. Minimum cable and unjacketed fiber bend radii as specified by cable manufacturer shall be maintained.

B. Maximum pulling tensions as specified by the cable manufacturer shall not be exceeded during installation. Post installation residual cable tension shall be within cable manufacturer's specifications.

C. Fiber optic cabinets, hardware, and cable entering the cabinet shall be installed in accordance with manufacturers' instructions. Minimum cable and unjacketed fiber bend radii as specified by cable manufacturer shall be maintained.

4.6 INSTALLATION OF SENSORS:

A. Sensors required for mechanical equipment operation shall be factory installed and wired as specified in mechanical equipment specifications. BAS manufacturer shall be responsible for coordinating these control devices and ensuring the sequence of operations shall be met. Installation and wiring shall be in accordance with the BAS manufacturer's recommendations.

B. Sensors that require field mounting shall meet the BAS manufacturer's recommendations and be coordinated with the mechanical equipment they will be associated.

C. Mount sensors rigidly and adequately for the environment the sensor will operate.

D. Room temperature sensors shall be installed on concealed junction boxes properly supported by the block wall framing. For installation in dry wall ceilings, the low voltage sensor wiring can be installed exposed and shall meet applicable National and Local Electrical Codes.

E. All wires attached to wall mounted sensors shall be sealed off to prevent air from transmitting in the associated conduit and affecting the room sensor readings.

F. Install duct static pressure tap with tube end facing directly down-stream of air flow.

G. Install space static pressure sensor with static sensing probe applicable for space installation where applicable.

H. Sensors used in mixing plenums shall be of the averaging type. Averaging sensors shall be installed in a serpentine manner horizontally across duct. Each bend shall be supported with a capillary clip.

I. Wiring for space sensors shall be concealed in building drywall. EMT conduit is acceptable within mechanical equipment and service rooms.

J. Install outdoor air temperature sensors on north wall complete with sun shield at manufacturer's recommended location and coordinated with Engineer.

4.7 **FLOW SWITCH INSTALLATION:**

A. Coordinate installation of flow switch with Mechanical Contractor who shall be responsible for installing a thread o let in steel piping applications. Copper pipe applications shall require the use CxCxF Tee, and no pipe extensions or substitutions will be allowed.

B. Mount a minimum of 5 pipe diameters upstream and 5 pipe diameters downstream, or two feet, whichever is greater, from pipe fittings and other inline potential obstructions.

C. Install in accordance with manufacturers' instructions, which shall require proper flow direction, horizontal alignment with flow switch mounting on the top of pipe.

4.8 WARNING LABELS:

A. Permanent warning labels shall be affixed to all equipment that can be automatically started by the BAS system. Refer to Section 15010, Identification for requirements and verbiage.

B. Permanent warning labels shall be affixed to all motor starters and all control panels that are connected to multiple power sources utilizing separate disconnects.

4.9 IDENTIFICATION OF HARDWARE AND WIRING:

A. All field wiring and cabling, including that within factory mounted, and wired control panels and devices for mechanical equipment, shall be labeled at each end within 2" of termination with a cable identifier and other descriptive information for troubleshooting, maintenance, and service purposes. BAS manufacturer to coordinate this labeling requirement with mechanical equipment manufacturer as it relates to controls.

B. Permanently label or code each point of field terminal strips to show the instrument or item served and correlate them to the BAS design drawings.

C. Identify control panels with minimum 2” letters on laminated plastic nameplates.

D. Identifiers shall match record documents. All plug-in components shall be labeled such that removal of the component does not remove the label.

4.10 CONTROLLERS:

A. Provide a separate DDC Controller for each individual piece HVAC mechanical equipment including the ability to pull in all points for the CO/NO2 system panel and alarming to the BAS console as specified. BAS manufacturer shall furnish and coordinate DDC controllers and control devices and ensure that installation and wiring adhere to BAS manufacturer’s design recommendations. For those mechanical equipment units that do not have factory installed controls specified, the BAS manufacturer shall field mount controls and coordinate all installation and termination information to ensure the specified sequence of operations are met.

B. Building Controllers and Custom Application Controllers shall be selected to provide a minimum of 15% spare I/O point capacity for each point type (analog or digital) found at each location. If input points are not universal, 15% of each type is required. If outputs are not universal, 15% of each type is required. A minimum of one spare is required for each type of point used in each controller.

1. Future use of spare I/O point capacity shall require providing the field instrument and control device, field wiring, engineering, programming, and commissioning. No additional Controller boards or point modules shall be required to implement use of these spare points.

4.11 PROGRAMMING:

A. Provide sufficient internal memory for all controllers to ensure specified sequence of operations, alarming, trending, and reporting requirements are achieved. BAS manufacturer shall provide a minimum of 25% spare memory capacity for future use.

B. Point Naming: System point names shall be modular in design, allowing easy operator interface without the use of a written point index.

C. Software Programming

1. Provide programming for individual mechanical systems to achieve all aspects of the sequence of operation specified. It is the BAS manufacturer's responsibility to ensure all mechanical equipment functions and operates as specified in sequence of operations. Provide sufficient programming comments in controller application software to clearly describe each section of the program. The comment statements shall reflect the language used in the sequence of operations.

D. BAS Operator's Interface

1. When Operator Workstation is specified, provide color graphics for each piece of mechanical equipment depicting sufficient I/O to monitor and troubleshoot operation. Operator color graphics shall include Air Handling Heat pump units, cassettes, DHP's, Rooftop Units, VAV Terminal Boxes, Fan Coil Units, Exhaust Fans, etc. These standard graphics shall depict all points dynamically as specified in the points list and/or indicated in sequence of operation.

2. The BAS manufacturer shall provide all the labor necessary to install, initialize, start up, and trouble-shoot all operator interface software and their functions as described in this section. This includes any operating system software, the operator interface data base, and any third party software installation and integration required for successful operation of the operator interface.

3. As part of this execution phase, the BAS manufacturer shall perform a complete test of the operator interface.

4.12 **CONTROL SYSTEM CHECKOUT AND TESTING:**

A. Start-up testing. All testing in this section shall be performed by the contractor and shall make up part of the necessary verification of an operating control system. This testing shall be completed before the owner's representative is notified of the system demonstration.

1. The contractor shall furnish all labor and test apparatus required to calibrate and prepare for service all of the instruments, controls, and accessory equipment furnished under this specification.

2. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.

3. Enable the control systems and verify calibration of all input devices individually. Perform calibration procedures according to manufacturer's recommendations.

4. Verify all binary output devices (relays, solenoid valves, two-position actuators, magnetic starter, etc.) operate properly and normal positions are correct.

5. Verify all analog output devices (I/Ps, actuators, etc) are functional, that start and span are correct, and that direction and normal positions are correct. The contractor shall check all automatic dampers to ensure proper action and closure. The contractor shall make any necessary adjustments to damper blade travel.

6. Verify the system operation adheres to the sequences of operation. Simulate and observe all modes of operation by overriding and varying inputs and schedules. Tune all DDC loops and optimal start/stop routines.

7. Alarms and Interlocks

a. Check each alarm separately by including an appropriate signal at a value that shall trip the alarm.

b. Interlocks shall be tripped using field contacts to check the logic, as well as to ensure that the fail-safe condition for all actuators is in the proper direction.

c. Interlock actions shall be tested by simulating alarm conditions to check the initiating value of the variable and interlock action.

4.13 CLEANING:

A. The BAS manufacturer's installing contractor(s) shall clean up all debris resulting from their installation activities on a daily basis. The installation contractors shall remove all cartons, containers, crates, etc. under his control as soon as their contents have been removed. Waste shall be collected and placed in a location designated by the Owner, Construction Manager, General Contractor, and/or Mechanical Contractor.

B. At the completion of work in any area, the installation contractor shall clean all of their work, equipment, etc., making it free from dust, dirt and debris.

C. At the completion of work, all equipment furnished under this Section shall be checked for paint damage. Any factory finished paint that has been damaged shall be repaired to match the adjacent areas. Any metal cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

4.14 TRAINING:

A. Provide minimum of (8) hours of operator training throughout the contract period. The training shall be provided for personnel designated by the Owner and at the facility location.

B. These objectives shall be divided into logical groupings; participants may attend one or more of these, depending on level of knowledge required:

1. Day-to-day BAS Operators
2. BAS Troubleshooting & Maintenance

4.15 SEQUENCES OF OPERATION

See plans

END OF SECTION

SECTION 16100

ELECTRICAL

PART 1 - GENERAL

1.01. RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections apply to work specified in this section.

1.02. QUALIFICATIONS OF ELECTRICAL CONTRACTORS:

A. Electrical contractor must be properly established as an electrical contractor by the State of Alabama. Electrical contractor shall have had previous experience in the satisfactory installation of at least three systems of this type and size in the State of Alabama.

1.03. CODES, PERMITS AND INSPECTIONS:

A. Comply with applicable laws of the community, with latest edition of National Electrical Code (NEC), NFC 70, and the International Building Code(IBCC) or the edition adopted by the local authority having jurisdiction, where not in conflict with those laws, and with the service rules of the local utility company.

B. Obtain and pay for all permits and deposits, and arrange for inspections as required.

C. After completion of the work, submit certificate of final inspection and approval from the local electrical inspector, certifying that the installation complies with all regulations governing same.

1.04. MATERIALS:

A. All materials shall be new, and UL approved where a standard has been established.

B. Manufacturers' names and model numbers shown on the plans and in the specifications are given to indicate the type and general quality of items to be provided. Equal products by other manufacturers will be accepted.

C. Material substitutions will be considered only when evidence of equality and suitability, satisfactory to the Architect/Engineer has been presented in writing, with samples if requested by the Architect/Engineer. All prior approvals must have the approval of the engineer of record at the offices of Gunn and Associates, P.C. located at 3102 Highway 14, Millbrook, AL 36054, Phone: 334-285-1273

D. All proposed substitutions shall be approved in writing at least ten (10) days prior to the bid date.

E. It shall be understood that the Architect/Engineer has the authority to reject any material or equipment used which is not specified or approved, or showing defects of manufacture or workmanship, before or after such material or equipment is installed.

1.05. WORKMANSHIP:

A. Execute all work so as to present a neat and workmanlike appearance when completed.

1.06. DESCRIPTION OF WORK:

A. Furnish all labor and materials required to complete the electrical work indicated on the drawings or herein specified. Major work included in Section 16 shall be:

B. Prior to bid it is the contractor's responsibility to re-affirm with the power company the service requirements to the facility as indicated on the electrical drawings. If any changes or additions to the service lateral installation indicated on the drawings is required by the utility company the contractor shall include the cost of these changes in his/her bid. Additionally, any/all charges for electrical service to the facility (aid-to-construction) by the utility company shall be included in the contractor's bid price.

C. Remove or relocate all electrical or electronic services located on or crossing through the project property, either above or below grade, which would obstruct the construction of the project or conflict in any manner with the complete project or any code pertaining thereto.

D. Furnish and install a complete electrical light and power system including but not limited to the connection of all meters, switchboards, panelboards, circuit breakers, power outlets, convenience outlets, lighting fixtures, switches, and/or other equipment forming part of the electrical system.

E. Furnish and install a complete system of outlet boxes, face plates, conduit raceways, backboard, and service entrance conduit for the communications system.

F. Furnish and install a complete system of outlet boxes, face plates, conduit raceways, Category 6 cables, backboards, patch panels, and fiber optic cables and patch panels for the Data System.

G. Connect all electrical equipment whether furnished by this contractor or by others.

H. Furnish and install all disconnect switches not included as an integral part of equipment.

I. Furnish and install a complete Lighting Control System.

J. Furnish and install a complete Fire Alarm System compliant with applicable provisions of the International Building Code (IBC) and the National Fire Protection Association (NFPA) Standard No. 72.

K. Furnish and install a complete Intercom System.

L. Complete the alterations, additions, and renovations to the electrical system in the existing building as specified herein or as shown on the drawings.

M. Procure and pay for permits and certifications as required by local and state ordinances and Fire Underwriters certificate of inspection.

N. Visit the site and determine conditions that affect this contract. Failure to do so will in no way relieve the Contractor of his responsibility under his contract.

O. Submit to the Architect a certificate of final inspection from local and/or state inspection authorities.

P. Establish and maintain temporary electrical services for construction purposes.

1.07. DRAWINGS AND SPECIFICATIONS:

A. This Contractor shall examine drawings and Specifications relating to the work of all trades and become fully informed as to the extent and character of work required and its relation to all other work in the project prior to submission of bid and prior to the start of any construction.

B. Drawings and Specifications shall be considered as complementary each to the other. What is called for by one shall be as binding as if called for by both. Where conflicts occur, secure clarification from the Architect in advance of bidding; otherwise incorporate the more stringent conditions into the bid price.

C. Omissions from the drawings and specifications or the mis-description of details of work which are evidently necessary to carry out the intent of the drawings and specifications, or which are customarily performed, shall not relieve the Contractor from performing such omissions and details of work; they shall be performed as if fully and correctly set forth and described in the drawings and specifications.

D. The drawings indicate diagrammatically the extent, general character, and the approximate location of the work to be performed. In the interest of clearness, the work is not always shown to scale or exact location. Check all measurements, locations of conduit, fixtures, outlets, and equipment with the detailed architectural, structural, and mechanical drawings, and lay out work so as to fit in with ceiling grids, ductwork, sprinkler piping and heads, and other parts. Take finished dimensions at the job site in preference to using scale dimensions.

E. Where the work is indicated but with minor details omitted, furnish and install the work complete so as to perform its intended functions.

F. Where doubt arises as to the meaning of the plans and specifications, obtain the Architect's decision before proceeding with parts affected; otherwise assume liability for damage to other work and for making necessary corrections to work in question.

G. Except as noted above, make no changes in or deviations from the work as shown or specified except on written order of the Architect.

1.08. EXISTING CONDITIONS:

A. Before submitting a bid, visit the site and ascertain all existing conditions.

B. Make such adjustments in work as are required by the actual conditions encountered.

C. No consideration will be given after bid opening for alleged misunderstandings regarding utility connections, integration of work with existing system, or other existing conditions.

1.09. SUBMITTALS:

A. Follow procedure outlined in Division 1.

B. Submittals shall be bound together and shall include a coversheet indicating the following:
   1. Project name
   2. Trade contractor's name
   3. Supplier's name
   4. Name and phone number of supplier's contact person
   5. A list of each item submitted with manufacturers' names and model numbers.

C. Within 20 days of award of contract and prior to beginning any work on the project submit six (6) copies of manufacturer's drawings/data sheets for the following items to the Engineer for review:
   1. Conductors
   2. Cable Pulling tensions. Provide cable pull tension calculations (lateral and longitudinal) on all underground cable runs over 150 feet for cables sized #1 and larger. Provide one line diagram indicating pulling tensions on each run and number and size of each pull box along anticipated route. Calculations shall include changes in direction or elevation of feeder runs.
   3. Wiring Devices
   4. Conduit Wrapping Tape
   5. Switchboards
   6. Panelboards
   7. Power system breaker coordination. Submit proper breaker settings recommendations with breaker coordination study.
   8. Contractor shall coordinate with mechanical/plumbing shop drawings prior to submitting power package to engineer. Adjust overcurrent devices accordingley.
   9. Disconnect Switches
   10. Dry Type Transformers
   11. Motor Starters
   12. Fire Stopping
   13. Lighting Control System: Include conduit and cable layout, terminal to terminal wiring showing color code and wire numbers, and complete technical data on each system component. Furnish the Owner one set of as built drawings at completion of the project. Coordinate with lighting control riser on drawings for further shop drawings requirements.
   14. Lighting Fixtures (include photometric data for each fixture)
   15. Fixture Support Equipment
   16. Lighting Standards (Poles)
   17. Data/Telecommunications System
       a. Cable
       b. Equipment
       c. Installer qualifications
       d. Makes and Model Numbers of Testing Equipment to be used.
   18. Secondary Surge Arresters
   19. Transient Voltage Surge Suppressors(Surge Protective Devices)

20. **Fire Alarm System: The fire alarm shop drawings shall bear the approval of the fire protection provider to ensure all supervisory valves and flow switches are being monitored by the fire alarm system. Coordinate with fire protection provider prior to bid and provide monitoring for all supervisory valves and flow switches for entire building. Bid accordingly. Include conduit and cable layout, battery calculations, terminal to terminal wiring showing color code and wire numbers, and complete technical data on each system component. Additionally, the contractor or his/her fire alarm system vendor shall provide audibility calculations indicating compliance with all applicable provisions of NFPA 72 and the IBC. The contract drawings indicate a minimum design required to comply with applicable codes. However, since devices vary from manufacturer to manufacturer the contractor shall be responsible for furnishing any/all additional devices as required to provide audibility and visibility levels that comply with applicable sections of NFPA 72 and IBC. Furnish the Owner one set of as built drawings at completion of the project. Provide a copy of the fire alarm contractor's State Fire Marshal's Permit with the submittals for approval.**
21. J-Hooks

D. Submit samples upon request.

E. The Contractor is responsible for verifying all quantities and for verifying and coordinating dimensional data with the available space for items other than the basis of design.

F. Provide a ½"= 1'- 0" scale drawing of all electrical rooms containing more than a single panelboard section or containing a panelboard and other electrical and/or mechanical equipment. These drawings shall be submitted along with equipment data sheets.

G. The contractor shall review and approve, or make appropriate notations on each item prior to submittal to the architect. Submittals without contractor's approval will be rejected.

1.10. COORDINATION OF SERVICE WITH OTHER TRADES:

A. It shall be the responsibility of the Electrical Contractor to coordinate the electrical service characteristics to each piece of electrically operated equipment with all trades providing electrically operated equipment.

B. Within ten (10) working days of notification to proceed with construction from the Architect, the Electrical Contractor shall notify, in writing, all trades providing electrically operated equipment the characteristic of the electrical power being supplied to each piece of electrically operated equipment.

C. A copy of this notification shall be provided to the General Contractor and the Architect.

D. Be informed as to equipment being furnished by other trades, but not liable for added cost incurred by equipment substitutions made by others which require excess electrical wiring or equipment above that indicated on drawings or specified.

E. The contractor providing the equipment shall be responsible for the additional costs.

1.11. PROGRESS OF WORK:

A. Schedule work as necessary to cooperate with other trades, Do not delay other trades. Maintain necessary competent mechanics and supervision to provide an orderly progression of the work.

1.12. PROTECTION OF PERSONS AND PROPERTY DURING CONSTRUCTION:

A. Take all precautions necessary to provide safety and protection to persons and the protection of materials and property.

B. Protect items of equipment from stains, corrosion, scratches, and any other damage or dirt, whether in storage, at job site or installed. No damaged or dirty equipment, lenses, or reflectors will be accepted.

C. Live panelboards, outlets, switches, motor control equipment, junction boxes, etc., shall be protected against contact of live parts and conductors by personnel.

1.13. CLEANING UP:

A. During the progress of work, keep the Owner's premised in a neat and orderly condition, free from accumulation of debris resulting from this work. At the completion of the work, remove all material, scrap, etc. not a part of this Contract.

1.14. AS-BUILT DRAWINGS, AND OPERATING AND MAINTENANCE INSTRUCTIONS:

A. Prior to the Final Acceptance Inspection the Contractor shall turn over to the Architect one set of reproducible "as built" drawings, including corrected fire alarm system shop drawings, three (3) sets of all equipment catalogs and maintenance data, manufacturers' warranties, and three (3) sets of shop drawings on all equipment.

1.15. TESTING:

A. Upon completion of the work, conduct a thorough test in the presence of Architect or his representative, and demonstrate that all systems are in perfect working condition.

1.16. INSPECTIONS:

A. The contractor shall have all systems ready for operation and an electrician available to remove panel fronts, coverplates, fixture doors, etc., at the final inspection and any other scheduled inspections.

B. It is the contractor's responsibility to have the job ready for inspections when they are scheduled. We will perform inspections as required by our contract. If project is not ready during inspection and requires a re-inspection by Gunn & Associates, then the contractor shall pay Gunn & Associates, P.C. for the re-inspection. The payment shall be made directly to Gunn & Associates, P.C. in the amount to be determined by engineer. Not to exceed $1,500 for single re-inspection fee. Payment must be received by Gunn & Associates prior to scheduling re-inspection.

C. Inspections for Temporary or Permanent Power required by any utility companies are not in our scope of work. If contractor needs Gunn & Associates, P.C. to perform inspections, contractor must include an inspection cost of $500 per inspection in their base bid. Payment must be received by Gunn & Associates prior to scheduling inspection.

1.17. DEMONSTRATION:

A. By on-off, stop-start operation, demonstrate to the Owner or his representative, the use, working, resetting, and adjusting of each and every system. Submit statement initialed by the Owner that such demonstration has been made.

1.18. WARRANTY:

A. Warrant the entire electrical system in proper working order. Replace, without additional charge, all work or material that may develop defects (ordinary wear and tear or damage resulting from improper handling excepted) within a period of one year from date of final to general contractor. Provide the owner with two bound copies of all manufacturers' warranties.

B. Data and Telecommunications system cabling shall be warranted for a minimum of 15 years.

1.19. TEMPORARY SYSTEMS:

A. The Electrical Contractor shall be responsible for furnishing and installing equipment and materials necessary for providing electrical power and lighting where needed for the construction of the project.

B. Electrical Contractor will be responsible for paying for and providing temporary construction power and lighting for entire job site. Coordinate with local jurisdictions and utility companies and pay all fees necessary to get temporary power to the job site. General Contractor shall be responsible for all monthly utility cost for duration of project or date of substantial completion.

1.20. SERVICE INTERRUPTION CLEARANCE WITH OWNER:

A. Before submitting a proposal, check with the Owner concerning interruption of service to the existing electrical systems. No interruption shall be made except at such time and for such

duration as approved by the Owner. The Contractor's bid shall include all necessary over-time and weekend work.

1.21. DEFINITIONS:

"AWG" - American Wire Gauge
"ADA" – Americans with Disabilities Act
"As required" - Any and all items required to complete the installation of an item so as to perform its intended function.
"Circuiting" - Conductors, raceways, raceway fittings, and associated hardware.
"EMT" – Electrical Metallic Tubing, "thin wall"
"IBC" – International Building Code
"Install" - furnish, install, and make all necessary connections to and/or for the item(s) indicated or specified.
"NEC" - National Electrical Code, ANSI/NFPA 70, latest edition or the edition adopted by the authority having jurisdiction.
"Necessary" - Any and all items required to complete the installation of an item so as to perform its intended function.
"NEMA"- National Electrical Manufacturers' Association
"NFPA" - National Fire Protection Association
"PVC Conduit" – Rigid Nonmetallic Polyvinyl Chloride conduit
"RGS Conduit" – Rigid galvanized steel conduit
"UL" - Underwriters' Laboratories, Inc.

PART 2 - MATERIALS

2.01. GENERAL:

A. This section includes all basic materials for raceways, fittings, busways, conductors, panelboards, switchboards, lighting fixtures and accessories, etc., as required for a complete installation.

B. All materials shall be new and listed by the Underwriters Laboratories. Material substitutions will be considered only when evidence of equality and suitability, satisfactory to the Architect has been presented in writing, with samples if requested by the Architect.

C. It shall be understood that the Architect/Engineer has the authority to reject any material or equipment used which is not specified or approved, or showing defects of manufacture or workmanship, before or after such material or equipment is installed.

2.02. CONDUITS:

A. Rigid Metal (Galvanized Steel-RGS) Conduit: Rigid metal conduit shall be mild steel piping, galvanized inside and outside, and conform to ASA Specification 080.1 and Underwriters' Laboratories Specifications. By Sprang, Republic, Wheatland, Triangle or Pittsburgh.

B. Intermediate Metal Conduit (IMC): IMC shall be hot dipped galvanized inside and outside and manufactured in accordance with U.L. Standard #6 or #1242. By Allied or approved equal.

C. Electrical Metallic Tubing (EMT): EMT shall be high grade steel electro-galvanized outside and lacquer or enamel coating inside and conform to ASA Specifications 080.1 and Underwriters' Laboratories Specifications. By Sprang, Republic, Wheatland, Triangle or Pittsburgh.

D. Rigid Nonmetallic Conduit (PVC): PVC conduit where exposed shall be high impact Schedule 80; below grand and below or in slab PVC shall be of high impact Schedule 40 PVC and shall conform to Underwriters' Laboratories Standard UL-651. By Carlon, Kraley Pittsburgh, R.G. Sloan or Southwestern.

E. Rigid Aluminum: Rigid Aluminum conduit shall be manufactured from 6063, t-1 aluminum alloy and shall meet the requirements of Federal Spec. WW-C-540c and ANSI C80.5 and shall be U.L. listed in accordance with UL-6. Equal to products by V.A.W. of America.

2.03. COUPLINGS, FITTINGS, AND CONNECTORS:

A. RGS & IMC: By Appleton, Crouse-Hinds, Efcor, O-Z/Gedney, Raco, or Republic.

B. EMT: EMT fittings shall be all steel type setscrew or insulated throat compression type. Pressure indented or slip fit type will not be accepted. All connectors to be insulated. By Appleton, Efcor, Raco Steel City, or Thomas & Betts.

C. PVC: PVC fittings shall be of high impact PVC Schedule 40 or Schedule 80 to match the installed conduit. Joints shall be made with PVC solvent cement as recommended by manufacturer. By Pittsburgh, R.G. Sloan or Carlon.

D. Rigid Aluminum: Fittings used with Rigid Aluminum conduit shall be formed of the same alloy as the conduit or shall be copper free cast aluminum unless specifically indicated otherwise.

2.04. CONDUIT BODIES:

A. Conduit bodies shall be shall be malleable iron except in kitchen, dishwashing, and waste water treatment areas conduit bodies shall be copper free cast aluminum with stamped aluminum covers.

B. Covers shall be screw retained with wedge nut or threaded body. Covers on bodies installed outdoors shall be approved and rated for installation outdoors.

C. Bodies shall comply with NEC 370 and 373.

D. RGS & IMC: By Appleton, Crouse-Hinds, Efcor, O-Z/Gedney, Raco, or Republic.

E. Conduit cannot be used as ground. Provide separate insulated green grounding wire.

2.05. BUSHINGS:

A. Bushings up to and including 1” shall have a tapered throat.

B. Bushings 1-1/4" and larger shall be the insulating type.

C. Grounding bushings shall be specification grade insulated grounding type bushings with tin plated copper grounding saddles and shall be equal to O-Z/Gedney Type BLG or HBLG.

D. Bushings shall be zinc plated malleable iron or copper free cast aluminum.

E. Bushings for terminating Data, Telecommunications, control, CATV, and similar conduits above ceilings and at backboards may be PVC or Polyethylene insulating bushings equal to those manufactured by Arlington Industries and Bridgeport Fittings.

2.06. EXPANSION FITTINGS:

A. Conduit Expansion Joints shall be UL Listed.

B. Expansion joints in rigid metal conduits shall consist of a threaded malleable iron body, pressure bushing, watertight packing, pressure ring, gasket, insulating bushing, and external grounding jumper, and shall be equal to O-Z Gedney Type AX with Type BJ bonding jumper.

C. Expansion joints for EMT conduit shall be same as above with additional EMT couplings and connectors, and shall be equal to O-Z Gedney Type TX with Type BJ bonding jumper.

D. Expansion joints in PVC conduit shall be equal to Carlon Series E945.

E. Expansion joints shall provide a minimum of 4” of conduit movement.

2.07. BELOW GRADE THRU WALL WATER SEALS:

A. Thru wall water seals for conduits penetrating exterior below grade concrete walls shall be seal systems by O-Z/Gedney or The Metraflex Company.

B. Thru wall water seals for conduits penetrating exterior below grade concrete walls shall be Metraseal thru wall water seals by The Metraflex Company.

2.08. CONDUIT ACCESSORIES:

A. Conduit clamps and supports for metallic conduit shall be galvanized steel by Efcor, Steel City, or Mineralac. Conduit fittings by Appleton, Crouse-Hinds, O-Z/Gedney, Pyle-National or approved equal.

B. Conduit clamps and supports for nonmetallic conduit shall be nonmetallic high impact PVC by Carlon, Pittsburg, or Sloan.

C. Conduit clamps for aluminum conduits shall be stainless steel or cast copper free aluminum with stainless steel fasteners.

2.09. FLEXIBLE CONDUIT:

A. Liqudtight flexible metal conduit:
   1. Neoprene-jacketed liquidtight flexible metal conduit.
   2. Equal to Anaconda Sealtite.

2.10. ELECTRICAL TAPES:

A. General use electrical tape shall be 8 mil (.008") thick, minimum, premium grade, pressure sensitive, flame retardant, vinyl electrical tape meeting UL 510, ASTM-D-3005, and MIL-I-24391C. The tape shall be equal to 3M No. 88 or Plymouth Premium 85 CW.

B. Rubber tape used as primary tape shall be a 30 mil (.030") thick, minimum self-amalgamating, low voltage rubber tape rated for use through 600 V. Rubber tape shall be equal to 3M No. 2150 or Plymouth 122 Rubber Tape.

C. Electrical filler tape shall be a 125 mil (.125") thick, minimum, self-amalgamating, low voltage insulating compound rated for use through 5 kV. Filler tape shall be equal to 3M SCOTCHFILL or Plymouth 125 Electrical Filler Tape.

2.11. PIPE WRAPPING TAPE:

A. Pipe wrapping tape shall be a 10 mil (.010") thick, minimum, pressure sensitive, vinyl tape manufactured for pipe wrapping applications.

B. The tape shall be UV, bacteria, and fungus resistant.

C. The manufacturer's name and tape type shall be printed on the back of the tape.

D. Pipe wrapping tape shall be equal to Plymouth Rubber Co. PLYWRAP 11, or 3M No. 50.

2.12. WIRE NUTS:

A. Wire nuts for conductor splicing shall be winged type connectors with a square, plated steel spring and flame retardant thermoplastic shell.

B. The connector shall be rated for the number and size conductors being connected.

C. The Wire Nuts shall be rated for 105^{o}C. And UL 486C listed.

D. Wire nuts shall be equal to connectors by Ideal/Buchanan, 3M/Scotch, or T & B,

2.13. SPLIT BOLT CONNECTORS:

A. Split bolt connectors for splicing conductors shall be UL 486A listed, shall be tin plated copper, and shall have a hexagonal head and nut.

B. Split bolt connectors for conductors size AWG #4 and larger shall have a serrated spacer bar between conductors.

C. Split bolt connectors for splicing conductors AWG #12 through #6 shall be equal to Ilsco Type SEL and Type SK for AWG #4 and larger conductors.

2.14. MULTI-TAP CONNECTORS:

A. Multi-tap connectors shall be insulated type

B. Multi-tap connectors shall be rated for the conductor sizes indicated on the drawings.

C. The connectors shall be provided for the number of conductors indicated, including any future taps shown, plus a minimum of one additional tap.

D. Multi-tap connectors shall be equal to Ilsco Type PCT or Type PED-CP.

2.15. WATERPROOF WIRE JOINTS:

A. Splices made below grade shall be made connectors, UL listed as waterproof, for below grade applications.

B. Waterproof Twist On Connectors for Up to2#6 W/1#12 tap Conductors: Single piece wire nut pre-filled with silicone sealant. Sealant shall be rated for 45-400 degrees F. Connectors shall have same insulation rating as conductors. Sizes shall be available for connecting up to 2 #6 w1#12 tap conductors. Connectors shall be UL listed as waterproof for below grade

applications and equal to Ideal Buchannan B-Cap Twist and Seal Wire Connectors, King Safety Products, Tyco/Raychem GelCap SL, or equal.

C. Waterproof Stub Splice Kit for up to #2/0 Conductors: Kit containing connector block, outer waterproof sleeve, and lubricant. Sleeve shall have same insulation rating as conductors. Kit shall be rated for feeder wire sizes #14 through #2/0 and tap wire sizes of #14 through #6. Connectors shall be UL listed as waterproof for below grade applications and equal to Tyco/Raychem GelCap SL.

D. Waterproof In-line Splice Kit for up to #2/0 Conductors: Kit containing connector block, outer waterproof sleeve, and lubricant. Sleeve shall have same insulation rating as conductors. Kit shall be rated for wire sizes #6 through #350 kcm. Connectors shall be equal to Tyco/Raychem GTAP.

E. Waterproof Splice Kit for Conductors above #2/0: Kit containing connector block, outer waterproof sleeve, and lubricant. Sleeve shall have same insulation rating as conductors. Kit shall be rated for wire sizes #14 through #2/0. Connectors shall be equal to Tyco/Raychem GHFC.

2.16. PLASTIC MARKING TAPE FOR MARKING UNDERGROUND CABLES AND CONDUITS:

A. Plastic marking tape shall be acid and alkali-resistant polyethylene film, 6 inches wide with minimum thickness of 0.004 inch.

B. Tape shall have a minimum strength of 1750 psi lengthwise and 1500 psi crosswise.

C. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 3 feet deep.

D. The tape shall be of a type specifically manufactured for marking and locating underground utilities.

E. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion.

F. Tape color shall be as specified in the table below and shall bear a continuous printed inscription describing the specific utility.

Red:	Electric
Orange:	Data, Telephone, Television,

2.17. FIRE STOPPING:

A. Fire sealant shall be intumescent caulk, putty, sheet and/or wrap/strip as required to attain the proper rating.

B. Caulk shall be equal to 3M CP25 N/S and/or S/L.

C. Putty shall be equal to 3M Fire Barrier Moldable Putty.

D. Sheet equal to 3M CS195.

E. Wrap/strip equal to 3M FS195.

F. Equal products by Dow Corning, Hilti, and Metacaulk will be accepted.

2.18. SPACERS FOR CONCRETE ENCASED ELECTRICAL DUCTS:

A. Spacers shall be interlocking high impact plastic assemblies, which provide horizontal and vertical spacing, and hold the ducts and re-bar, where applicable, in place.

B. The spacers shall be equal to Carlon Snap-Lok Spacers.

2.19. JUNCTION BOXES (THRU 4-11/16"):

A. Sheet Metal: To be standard type with knockouts made of hot dipped galvanized steel, By Steel City, Raco, Appleton or approved equal.

B. Cast: To be type FS, FD, JB, GS or SEH as required for application.

2.20. JUNCTION AND PULL BOXES (LARGER THAN 4-11/16"):

A. Shall be cast metal for all below grade exterior use and where indicated on plans. All other shall be oil tight, JIC boxes not less than 16 gauge, equal to Hoffman type "CH" boxes.

2.21. PULL BOXES:

A. Galvanized sheet metal screw-cover type with UL label as produced by Austin, B & C Metal Stamping Company, E-Box, Hoffman, Wiegmann, or approved equal.

2.22. JUNCTION AND TERMINAL BOXES FOR AUXILIARY SYSTEMS:

A. Junction boxes for auxiliary system circuiting splicing shall be formed of galvanized steel.

B. Boxes shall have hinged front, locking door(s).

C. Metal back plates shall be provided for mounting terminal strips or other devices.

D. Screw terminal strips shall be provided with a minimum of 25 percent spare terminals.

E. Boxes shall be sized to accommodate the terminal blocks and conductors, providing code required bending space.

F. Boxes for auxiliary systems shall be manufactured by Austin, E-Box, Hoffman, or Wiegmann.

G. Provide complete back boxes for all surface mounted devices. Back box shall have knockout on top and bottom as needed. Surface mounted junction boxes with devices mounted to it will not be accepted. Wiremold boxes will be accepted.

2.23. AUXILIARY GUTTERS (WIRING TROUGHS):

A. Gutters shall be of sizes shown and/or required by the NEC (whichever is larger), constructed of code gauge, galvanized sheet steel, painted ANSI 61 gray.

B. Gutters shall be UL listed and shall be of NEMA 3R construction in wet or damp locations or shall be as indicated on the drawings.

C. Gutters shall be as produced by Austin, B & C Metal Stamping Company, E-Box, Hoffman, Wiegmann, or approved equal.

2.24. STRUT SYSTEM FOR SUPPORT OF ELECTRICAL EQUIPMENT:

A. Strut shall be 1-5/8” except where heavier strut is required to support the load, for rigidity, or where specifically indicated otherwise.

B. Cold-formed steel, ASTM A 570 or A 446 GR A.

C. Stainless Steel Strut: Type 304, ASTM A 240.

D. Hot Dipped Galvanized Steel Strut: Zinc coated after manufacturing operations are complete, ASTM A 123 or A 153

E. Electro-galvanized Steel Strut: Electrolytically zinc coated, ASTM B 633 Type III SC 1.

F. Fittings: Same material as strut, ASTM A 575, A 576, A 36, A 635, or A 240.

G. Zinc Primer: As recommended by strut manufacturer.

H. Strut Systems shall be as manufactured by B-Line, Erico, Globe, Kindorf, MasterStrut, Power Strut, T&B SuperStrut, or Unistrut.

2.25. OUTLET BOXES:

A. General: Except as noted, boxes shall be standard hot dipped galvanized steel at least 1-1/2" deep, of metal at least 1/16" thick; sized to accommodate devices and conductors per NEC Article 370; product of Appleton, National, Steel City, or approved equal.

B. Ceiling and Wall Bracket Outlets: 4" octagonal boxes with plaster rings appropriate for finish surface.

C. Typical boxes (for switches, receptacles and auxiliary systems):
   1. 4" square boxes ganged as required. Box volume shall be in accordance with NEC Section 370 – provide extensions as required.
   2. Furnish with 3/4" plaster rings where employed in plaster, 1" tile covers where used in ceramic tile, 1" plaster rings where set in exposed concrete, and otherwise appropriate for surface and construction.
   3. Use 4-11/16” square, 2-1/8” deep boxes where more than 10 conductors enter the boxes. Provide extensions as required to provide volume per NEC.

4. Where existing walls are furred out with shallow hatch channel and sheet rock then the contractor will be required to use a shallow junction as required.
5. All exposed junction boxes for receptacles, communications devices, switches, and fire alarm devices shall be provided with back boxes. Do not use standard junction boxes when exposed. No exposed edges of devices plates will be allowed. No knockouts on the side of the box. Boxes shall be similar to Wiremold 500 & 700 Series.

D. Boxes in Exposed (or Thin-Coat Plastered) Masonry: Where conduit connections permit, employ solid flush-type, square-cornered, masonry boxes with turned-in device holders; otherwise employ typical box with 1-1/2" square-cut tile cover.

E. Boxes used with Exposed Conduit: 4" square utility boxes.

F. Exterior Boxes: Galvanized cast-metal boxes, Crouse-Hinds Type FS or FD as appropriate. Make weatherproof with gasketed covers. Equal products by Appleton, Killark, O-Z/Gedney, or approved equal will be accepted.

G. Exterior Boxes: All receptacle boxes shall be recessed unless specifically called out not to be. This includes exterior receptacles in all masonry type walls including but not limited to Pre-cast, Brick, Block, etc.

H. Boxes used with Recessed Lighting Fixtures: Provide a 4" square box with blank cover.

I. Boxes in Dry Wall Construction: Sectional type switch boxes at least 2-1/2" deep may be used instead of typical box (but not where dry wall finish is applied over masonry back-up and not where multi- gang devices occur).

J. Boxes installed exposed in kitchen and dishwashing areas shall be copper free cast aluminum with gasketed cast coverplates, without lift cover, unless specifically indicated otherwise on the drawings.

2.26. CONDUCTORS AND CABLES:

A. Power Conductors
1. The ungrounded conductors (phase) and the grounded conductor (neutral) of each voltage system being installed shall be phase identified the full length of the conductor with the color characteristics manufactured in the insulation of cable from the cable manufacturer. Required color cable will then be installed for the specific voltage system as identified in these specifications.
2. All conductors shall be copper with not less than 98% conductivity and with current carrying capacities per N.E.C. for 60^{o}C. for sizes through #1 AWG and 75^{o}C for conductors #1/0 and above.
3. All conductors shall have manufacturer's name, type insulation, and conductor size imprinted on jacket at regular intervals.
4. Conductors of size #10 and smaller shall be solid copper conductors with 600 volt type THHN or THWN insulation.
5. Conductors of size #8 and larger shall be stranded copper conductors with 600 volt type THHN or THWN insulation.
6. All motor branch circuits, HVAC, and plumbing equipment shall be stranded copper conductors with 600 volt type RHH-RHW insulation.
7. All conductors installed in conduit below grade shall be rated for wet location.
8. Manufacturer: Conductors shall be products of GE, Triangle, Phelps- Dodge, Anaconda, Rome, Habirshaw, General Cable, or approved equal.
9. Fixture Wire:
   a. Conductors feeding into fixtures, other than fluorescent fixtures, of 300 watts or less shall be #14, 200^{o}C., type SF-2, for fixtures of more than 300 watts #12, 200 ^{o}C., type SF-2 shall be used.
   b. Conductors pulled through fluorescent fixtures shall have Type TFN or TFFN fixture wire, rated 90oC.
   c. Conductors shall be by Dodge, Anaconda, Rome General Cable or Southwire.

B. Control and Signal Wire: Conductor type TFF, minimum size #16 copper and fully color-coded, shall be used. Conductors shall be by Anaconda, Houston Wire & Cable, General Cable, Phelps Dodge, Rome, or Southwire.

2.27. WIRING DEVICES:

A. General: Manufacturer's and catalog numbers listed are used to establish style, type and quality. Unless otherwise indicated on drawings, all wiring devices shall be UL listed, side-wired specification grade.

B. Manufacturers: Equal devices by Hubbell, Leviton, and P & S will be accepted. All devices shall have plaster ears.

C. Wall switches: 120/277V, 20A, AC, flush enclosed, quiet type switches with thermoplastic body and polycarbonate toggles. Switches shall meet Federal Specification WS-896. Switches shall be, Hubbell 1200 series, Leviton 1200 series, or P & S PS20AC series single pole, 2-pole, 3-way, or 4-way as required.

D. Duplex receptacles (general purpose): 125V/20A flush duplex back and side wired hard use specification grade receptacles, NEMA 5-20R configuration, with nylon face and body, grounding terminal and break-off fins for converting to 2-circuit use. Receptacles shall meet Federal Specification WC-596. Color to match wall switches. Equal to P & S 5362, Hubbell CR20, or Leviton 5362.

E. Tamper Resistant Duplex receptacles,: 125V/20A flush duplex, hospital grade, tamper resistant receptacles, NEMA 5-20R configuration, with nylon face and body, grounding terminal. Receptacles shall meet Federal Specification WC-596. Color to match wall switches. Equal to P & S TR62-H, or Hubbell HBL8300SGDuplex combination 125/250 volt receptacles: receptacles shall be 20 amp, combination 125 volt(NEMA 5-20R)/250 volt(NEMA 6-20R) grounding receptacles.

F. Isolated Ground Receptacles: 125V/20A, NEMA 5-20R configuration, equal to Hubbell #IG5362, Leviton #5362-1g, or P & S IG6300. IG receptacles shall be same color as general purpose receptacles with an orange triangle on the face – fully orange colored receptacles shall not be acceptable.

G. Ground Fault Circuit Interrupt Receptacles: 125V/20 amp ground fault circuit interrupting receptacle for personnel protection, NEMA 5-20R configuration, Equal to Hubbell #GF5362, Leviton #6599, or P & S 2091. Each GFCI symbol on drawing indicates a GFCI type receptacle. Do not through-wire non-GFCI receptacles from GFCI receptacles where ground fault protection is required. All exterior receptacles shall be ground fault interrupting type with weatherproof coverplates.

H. Faceless Ground Fault Circuit Interrupter: 125V, 20 amp ground fault circuit interrupter UL listed for personnel protection, equal to Hubbell GFR5350 Series, Leviton 6490, or Pass & Seymour Series 2081.

I. Single Receptacles: Flush Bakelite receptacles with side wiring and grounding terminal, voltage, amperage, and configuration as required for circuit indicated.

J. Each single or multi outlet receptacle, other than straight blade, 15 or 20 amp, 120 volts, NEMA 5-15R or NEMA 5-20R, shall be provided with matching cord plugs.

K. Multioutlet Assemblies, Strip outlets, 15 amp, 125V, grounded, outlets on 6” centers, equal to Wiremold V20GBx06. Where x = length indicated on the drawings.

L. Plugs for kitchen equipment to be plugged into wall mounted straight blade receptacles shall be angled type.

M. Wiring devices shall be of color as directed by Architect. Devices must be available in ivory, brown, black, white, and gray. Devices connected to the emergency generator shall be red in color.

N. All receptacles shall be tamper proof type receptacles where required by the National Electrical Code.

2.28. DEVICE PLATES:

A. Type appropriate for the associated wiring device, equal to Sierra Stainless Steel Smoothline. Device plates shall be of color as directed by Architect. Devices must be available in ivory, brown, black, white, and stainless steel. Provide single plate of proper gang where more than one device occurs (do not gang dimmers with rocker switches).

B. Damp Location: 20 amp,125 and 250 volt receptacles - Covers shall be weatherproof when plugs are not installed, provide cast aluminum weatherproof coverplates with single lift cover and gasket equal to Hubbell CWP26H.

C. Wet Locations, 20 amp, 125 and 250 volt receptacles: Covers shall be weatherproof In-Use covers, rated NEMA 3R when in use and shall be constructed of cast aluminum with sealing gasket. Covers shall be equal to products by Hubbell, Leviton, Steel City, T & B, and Taymac.

D. Coverplates for exposed cast aluminum boxes in kitchen and dishwashing areas shall be cast coverplates, without lift cover, unless specifically indicated otherwise on the drawings.

E. Color: Wiring device cover plates shall be of color as indicated on drawings or directed by Architect. Devices must be available in ivory, brown, black, white, gray, and stainless steel.

F. Jumbo and Mini-Jumbo plates will not be accepted.

2.29. TELE-POWER POLES:

A. Tele-power poles shall be two compartment, power and data/communications poles.

B. Poles shall be 3" x 2-3/4" steel.

C. Each poles shall contain two (2) or three (3), as indicated by the number of circuits on the drawings feeding the pole, 20 amp, 125 volt, duplex receptacles, and a modular data outlet capable of holding up to six (6) data/telephone jacks.

D. Poles shall be equal to device indicated on drawings.

2.30. OCCUPANCY SENSORS AND ACCESSORIES FOR LIGHTING CONTROL:

A. Occupancy sensors shall be totally passive in nature, in that the sensors shall not emit of interfere with any other electronic device, or human characteristic. Sensors shall be dual technology, i.e.: Passive Infrared (PIR) and Microphonic.

B. PIR shall initiate an "on" condition and the PIR or microphones shall maintain the load "on".

C. Upon detection of human activity by the detector the lights shall come on and a time delay shall be initiated to maintain the lights on for a pre-set time period. The time delay shall be factory set and field adjustable from 30 seconds to 20 minutes.

D. All devices shall be factory warranted for 5 years.

E. All sensors shall be low voltage, 12 to 24 volts and shall work in conjunction with remote power packs.

F. Occupancy sensors shall be as shown on drawings.

2.31. GROUNDING:

A. Ground Rods shall be ¾" x 10' copperclad steel.

B. All grounding conductors shall be copper.

2.32. LIGHTING FIXTURES

A. General:

1. All Lighting Fixtures shall be UL labeled.
2. Fixtures installed in fire rated ceilings or ceiling assemblies shall be rated for installation in fire rated ceilings.
3. Furnish fixtures complete with lamps, ballasts and internal wiring factory installed.
4. Fixtures shall be furnished as specified herein and as shown on the fixture schedule on the plans. Catalog numbers shown are for basic units; furnish all fixtures complete with flexible connections, trim, plaster frames, and all other appurtenances necessary to the installation.
5. Substitutions: Reference to a specific manufacturer's product is made to establish a standard of quality and design, and to give a general description of the basic type desired.

Equal products by the listed manufacturers will be accepted subject to the Engineer's approval.

6. It shall be the responsibility of the contractor to verify the exact type ceiling, type fixture mounting and trim, and recessing depth of all recessed fixtures prior to purchasing any fixtures.
7. Stems on stem mounted fixtures shall be approved ball aligner type, swivel 30 degrees from vertical with swivel below canopy. Paint stems the same color as the fixture trim. Stems in unfinished areas may be unpainted conduit.
8. High and low bay fixtures shall be equipped with safety chains. Every suspended fixture in Gymnasium shall have safety chains.
9. Fixtures installed on the exterior of buildings, on poles, or on pedestals shall be rated for wet location installation.
10. All lighting fixtures installed in gymnasiums, hangars or similar use areas shall be provided with wire guard.

B. Emergency and Exit lighting Fixtures shall be equipped with a Self-testing module which shall perform the following functions:
   1. Continuous monitoring of charger operation and battery voltage with visual indication of normal operation and of malfunction.
   2. Monthly discharge cycling of battery with monitoring of transfer circuit function, battery capacity and emergency lamp operation with visual indication of malfunction. The battery capacity test may be conducted by using a synthetic load.
   3. Manual test switch to simulate a discharge test cycle.
   4. Modules shall have low voltage battery disconnect (LVD) and brownout protection circuit.
   5. All lighting fixtures and exit signs shown as emergency on drawings shall be provided with a minimum 1100 lumen emergency battery ballast capable of 90 minutes of illumination. No exceptions.

C. Lamps: Type and Lumen Output as scheduled.
   1. LED bulb shape shall comply with ANSI C79.1. Lamp base shall comply with ANSI C81.61.
   2. Minimum CRI of LED lamps shall be 80 with a color temperature as shown on drawings.
   3. Rated life of all LED lamping shall me a minimum of 50,000 hours failure to 75% of lamp output.
   4. LED lamping shall be capable of dimming from 100% to 0%.

2.33. LIGHTING STANDARDS:

A. Lighting Standards(Poles) shall be as specified on light fixture schedule anchor base poles rated for sustained wind's for the wind chart of this specific job's location and a 1.3 gust factor.

B. Poles shall be of the length required to provide the scheduled fixture mounting height.

C. Poles shall be factory predrilled for arm and fixture mounting.

D. Hand holes shall be provided at the base end of the pole for wiring access. Handholes shall be a minimum of 3" x 5" with gasketed, weatherproof covers and stainless steel mounting hardware.

E. A grounding lug shall be provided inside the handhole.

F. The poles shall be furnished with a dark bronze, corrosion resistant finish, applied after fabrication.

G. The base plate shall be furnished with slotted holes for pole alignment.

H. A base cover shall be furnished with the pole with matching finish.

I. Anchor bolts shall be 36" long.

J. Contractor shall include concrete bases for all exterior pole mounted and grade mounted lighting.

2.34. PANELBOARDS:

A. General: All panelboards shall be dead front type manufactured and installed in accordance with UL and NEMA standards, and shall carry a UL label. Ampacity, service voltage, and configuration shall be as indicated on drawings. Panelboards shall be clearly marked with ampacity, voltage, and maximum short current ratings.

B. Manufacturer: Panelboards shall be as manufactured by Cutler-Hammer, GE, Square D or Siemens.

C. Enclosure:
   1. Panelboard enclosures shall be as indicated on drawings.
   2. Unless otherwise indicated, all boxes shall be constructed of galvanized (or equivalent rust-resistant) sheet steel with hinged front trim.
   3. Fronts shall be door in door with two lockable latches to open door, lock, and latch. All panelboard locks shall be keyed alike. Piano hinges with screw latches will not be permitted.
   4. Fronts shall be finished with gray baked enamel over a rust-inhibiting phosphatized coating.
   5. All dual section panels shall be equal in size. Sub-Feed circuit breakers will not be allowed to feed second section.
   6. Sub-Feed circuit breakers feeding additional panels or equipment shall be branch mounted.
   7. Provide permanent numbering of the panelboards. Stickers are not considered permanent.
   8. Any panelboard schedule that indicates more than 42 circuits shall be provided in two equally sized panelboards.
   9. Main circuit breakers shall be centered mounted. Main breaker cannot be mounted on buss bars with other circuit breakers.

D. Buss Assembly:
   1. Bussing shall be copper.
   2. The buss assembly A.I.C. shall be rated as indicated on drawings. Ratings shall be established by heat rise tests, in accordance with UL Standard 67.
   3. All bussing shall accept bolt on circuit breakers.
   4. Current carrying parts of all bussing shall be plated. In lighting and receptacle panels, bussing shall be designed for connection to the branch circuit breakers in the phase sequence format. Distribution panelboards shall be fully bussed.
   5. Ground bars shall be provided in all panelboards.
   6. Neutral bar shall be fully sized with lugs suitable for incoming and outgoing conductors.
   7. Provide insulated ground buss where indicated on the panelboard schedules.

E. Circuit Breakers:
   1. Circuit breakers shall be quick-make, quick-break, thermal magnetic, molded case, bolt on type.
   2. Circuit Breakers shall be numbered and arranged as indicated on the panelboard schedules and/or single line wiring diagrams. Numbers shall be permanently attached to trim.
   3. SWD Circuit Breakers: Single pole circuit breakers rated 15 and 20 amperes and intended to switch 277 volts or less fluorescent lighting loads shall be UL rated for switching duty and shall be marked "SWD”.
   4. HACR Circuit Breakers: Circuit breakers 60 amperes or below, 240 volts, 1-, 2-, or 3-pole, intended to protect multi-motor and combination-load installations involved in heating, air conditioning, and refrigerating equipment shall be UL listed as HACR type and shall be marked "Listed HACR Type."
   5. Circuit breakers serving fire alarm systems, dedicated emergency/exit lighting circuits, and area of rescue communications systems shall be equipped with a screw-on, mechanical handle blocking device which locks the circuit breaker in the “ON” position.
   6. Circuit breakers serving circuits in residential bedrooms shall be Arc Fault Interrupting(AFI) type circuit breakers and shall be UL 1699 listed.

F. Directories:

1. Each panelboard shall be equipped with a metal directory frame with a clear cover welded to the inside of the door.

G. Equipment Short Circuit Rating: Short Circuit Interrupting Ratings shall be as indicated on the plans and schedules. Unless specifically indicated otherwise all rating are “Fully Rated” capacities. Where no rating is given, the contractor shall verify the available short current with the serving utility and provide equipment rated accordingly.

H. Lighting panelboard cans shall be a maximum of 20” wide and 5 ¾” deep. Cans of multi-section panelboards shall be the same size.

I. Provide nameplate as called out on drawings.

J. All circuit breakers 1200-amp and up shall comply with NEC Article 240.87 Arc Energy Reduction.

K. All flush mounted panel shall be provided with six (6) ¾” conduit stubbed up above accessible ceiling.

2.35. DISTRIBUTION PANELBOARDS:

A. Furnish and install distribution and power panelboards as indicated in the panelboard schedule(s) or single line wiring diagrams and where shown on the plans.

B. Panelboards shall be dead front, safety type equipped with thermal magnetic, molded case circuit breakers with trip ratings as indicated on the schedule(s).

C. Panelboard bussing shall be copper.

D. Panelboard buss structure and main lugs or main breaker(s) shall have the fault current ratings as indicated on the drawings. Ratings shall be established by heat rise tests conducted according to UL Standard UL67.

E. Circuit breakers shall be equipped with individually insulated, braced and protected connectors. The front faces of all circuit breakers shall be flush with each other.

F. Main circuit breakers shall be centered mounted. Main breaker cannot be mounted on buss bars with other circuit breakers.

G. An engraved phenolic label shall be permanently attached to the front of the panelboard adjacent to each circuit breaker identifying the load served by the circuit breaker.

H. Automatic tripping shall be clearly shown by the breaker handle taking a position between ON and OFF when the breaker is automatically tripped.

I. Provisions for additional breakers shall be such that no additional connectors or hardware will be required to add breakers.

J. The panelboard assembly shall be enclosed in a steel cabinet. The rigidity and gauge of steel shall be as specified in UL Standards. End walls shall be removable. The size of wiring gutters shall be in accordance with the National Electrical Code, NEMA, and UL Standards for panelboards.

K. Cabinets shall be equipped with four piece fronts.

L. The panelboard interior assembly shall be dead front with panelboard front removed.

M. Main lugs or main breaker shall be barriered on live sides.

N. The barrier in front of the main lugs shall be hinged to a fixed part of the interior. The end of the buss structure opposite the mains shall be barriered.

O. Circuit breakers serving Fire Alarm Systems, Security Systems, and/or Emergency/Exit lights shall be equipped with mechanical, screw-on type, locking devices. These devices shall not be padlock type devices.

P. Panelboards shall be listed by Underwriters' Laboratories and to bear UL label. Panelboards shall be rated for use as Service Entrance Equipment where required by the National Electrical Code. Panelboards shall be by Cutler-Hammer, General Electric, Square D, or Siemens.

Q. Provide nameplate as called out on drawings.

R. All circuit breakers 1200-amp and up shall comply with NEC Article 240.87 Arc Energy Reduction.

S. All flush mounted panel shall be provided with six (6) ¾" conduit stubbed up above accessible ceiling.

T. All service entrance main circuit breakers shall be 100% rated.

2.36. SWITCHBOARDS:

A. Construction.

1. The Switchard shall consist of the required number of vertical sections, bolted together to form a rigid assembly. Provide ventilators located on the top of the switchgear over the breaker and bus compartments to ensure adequate ventilation within the enclosure.
2. Each vertical steel unit, forming part of the switchgear line-up, shall be a self-contained housing having one or more individual breaker or instrument compartments, a centralized bus compartment, and a rear cabling compartment.
3. The switchgear shall be suitable for use as service entrance equipment and be labeled in accordance with UL requirements.

B. Bussing

1. Switchboard buss structure and main lugs or main breaker(s) shall have the fault current ratings as indicated on the drawings. Ratings shall be established by heat rise tests conducted according to UL Standard UL67.
2. All bus bars shall be tin-plated copper. Main horizontal bus bars shall be mounted with all three phases arranged in the same vertical plane. Bus sizing shall be based on ANSI standard temperature rise criteria of 65 degrees C over a 40 degrees C ambient (outside the enclosure).
3. Provide a full capacity neutral bus.
4. A copper ground bus shall be furnished firmly secured to each vertical section structure and shall extend the entire length of the switchgear. The ground bus short time withstand rating shall meet that of the largest circuit breaker within the assembly.
5. All hardware used on conductors shall be high-tensile strength and zinc plated. All bus joints shall be provided with Belleville-type washers.

C. Wiring/Terminations

1. A termination system shall be provided such that no additional cable bracing, tying or lashing is required to maintain the short circuit withstand ratings of the assembly through 200 kA.
2. Lugs shall be provided in the incoming line section for connection of the main grounding conductor. Additional lugs for connection of other grounding conductors shall be provided as indicated on the drawings.

D. An engraved phenolic label shall be permanently attached to the front of the switchboard adjacent to each circuit breaker identifying the load served by the circuit breaker.

E. Automatic tripping shall be clearly shown by the breaker handle taking a position between ON and OFF when the breaker is automatically tripped.

F. Provisions for additional breakers shall be such that no additional connectors or hardware will be required to add breakers.

G. Circuit breakers shall be provided with the ratings indicated on the drawings.

H. Switchboards shall be listed by Underwriters' Laboratories and to bear UL label.

I. Switchboards shall be rated for use as Service Entrance Equipment where required by the National Electrical Code.

J. All circuit breakers 1200-amp and up shall comply with NEC Article 240.87 Arc Energy Reduction.

K. Switchboards shall be by Cutler-Hammer, General Electric, Square D or Siemens.

L. Provide electronic metering on the main for voltage, amps, kVA, & KW.

M. All service entrance main circuit breakers shall be 100% rated.

2.37. LIGHTING CONTROL SYSTEM:

A. System description

1. Install a lighting control system consisting of control panel(s), control switches, photocell and other controlling devices connected by low voltage and network wiring. The general operation of lighting and controlled loads shall include:
   a. Interior lighting – manual switch control on/off with automatic time scheduled shut off for each space
   b. Timed on/off loads – time on, time off
   e. Exterior lighting – photocell or astronomic on/time off, time on/photocell or astronomic off.
   f. Exterior security lighting – photocell or astronomic on, photocell or astronomic off.
   g. Requirements are indicated elsewhere in the specifications for work including, but not limited to, raceways and electrical boxes and fitting required for installation of control equipment and wiring.

B. Submittals

1. Shop Drawings: Submit dimensional drawings of all lighting control system components and accessories.
2. One Line Diagram: Submit a one-line diagram of the system configuration proposed if it differs from that illustrated in the riser diagram included in the contract drawings.
3. Complete drawings: Submit shop drawings showing all components including, but not limited to, lighting control panels, relays, contactors, photocells, swtiches, occupancy sensors, and interconnecting control wiring. Submittals will be rejected without this.

C. Manufacturers

1. The basis of the specified system is the Nexlight System. Any other system wishing to be considered must submit descriptive information 10 days prior to bid. Prior approval does not guarantee final approval by the Engineer.
2. Manufacturer shall have a factory-trained technician within 150 miles of job site.Include in the bid at least three trips by the factory trained technician to the job site.One visit shall be for the beginning of construction. Second visit shall be to insure lighting control system is being installed correctly. The third site visit shall be for final programming and factory training for the Owner. Coordinate with owner representatives for final programming requirements.Coordinate final training with trainees,contractor,and engineer prior to site visit. Manufacturer shall provide additional site visits as needed to get their system working correctly at no additional cost to owner.Bid accordingly.

D. Modular Relay Panels shall be UL listed and consist of the following:

1. Can: NEMA 1 enclosure that can accept an interior sized to accept up to 24 or 48 mechanically latching relays.
2. Power Supply: Transformer assembly with two 40VA transformers with separate secondaries. Transformers include internal overcurrent protection with automatic reset and metal oxide varistor protection against power line spikes. Single unit provides either 115 or 277 VAC as required, 60 Hz +/- 10%.
4. Cover: Surface or Flush as required, with captive screws in a hinged, lockable configuration.
5. Interior: Bracket and intelligence board backplane with pre-mounted relays. Interiors shall be provided with up to 24 or 48 installed and tested relays.
6. Panel shall be provided with an integral DIN rail mounting bar for easy installation of other system components.
7. Features
   a. Relays shall be individual relays with 20 Amp load contacts for ballast (including HID, magnetic or electronic type ballasts), tungsten, and general use, and shall be rated for 200,000 operations at full load. Relays shall use quick connectors and be individually replaceable to facilitate ease of use.

b. The lighting control panel shall be able to house multi-pole contactors for control of multi-circuit or multi-phase loads. Contactors shall be rated for 20 Amps tungsten, 30 Amps for ballast or general use and shall be compact, rail mount style for easy installation and use.
c. Lighting control panels shall provide a stagger up delay, override push buttons, pilot light outputs, and LED status light indicators for each relay.
d. For every 8 relays there shall be 8 standard, 2 master, and 1 after-hour switch inputs. Standard switch inputs shall have a one-for-one default assignment to relays. Master inputs shall be unassigned.
e. Switch inputs shall be self-configuring and shall not require programming to accept momentary on/ momentary off, push button (cycling), maintained, or 3 to 24VDC signal. Using any of these switch types shall not sacrifice the number of switch inputs available. Switch inputs shall allow switch wiring distances of up to 5000 feet on 20-gauge wire.
f. After-hour shut off control shall provide a true override time with a warning blink five minutes prior to shutting the relay output off. Any relay output's impending shut off will be canceled and the override period re-initialized through the operation of an assigned switch input. The override function shall be performed by the local control switch or telephone switch module and shall not require turning lights off and back on to reset the override time period regardless of the switch type used. The system shall provide the full after-hour override time period beginning from the moment of switch ON operation. After-hour shut off shall not be accomplished by repetitively sweeping relay outputs off by time schedule.

E. ETHERNET MULTI-USER CONNECTIVITY – Automation Appliance (AA-BASE)
1. System Description
a. A network appliance will provide multi-user, simultaneous access to the lighting system using standard TCP/IP and Web-browser software for user interface
b. The network appliance will include Ethernet, Serial ports and optional 56K BAUD internal modem.

G. Features
a. Multiple users will be able to simultaneously connect to the IP address of the AA-BASE.
b. Users may be connected via an Intranet, or Internet depending upon network security limitations.

F. System Clock
a. The system time clock shall be installed in the main or central panel of a multiple panel system or in each panel when individual panel time control is desired. The system clock shall provide time-based control with eight-year time back-up, non-volatile memory program storage, automatic daylight savings adjustment, selectable 12/24-hour time formats, and selectable date formats. All clock programming shall be accessible from the clock front display/keypad or via the Lighting Control Software.

G. Features
1. Control of 32 channels shall be available on the clock for control of any lighting control panel or relay pack connected on the network. Provide status and manual on/off control of each channel from the front display and keypad.
2. Schedules shall be assigned to any combination of days of the week and/or 3 holiday day types. Other scheduling features shall include:
a. Temporary schedules – schedules that execute on an assigned day then automatically delete themselves from memory.
b. Duration on/off – turn channels on or off for a time period adjustable from 1 second to 18 hours.
c. Repeating schedules – repeat a schedule at intervals that are adjustable from 5 minutes to 10 hours.
3. 32 perpetual holidays assigned to any one of three holiday day schedules and continuing for 1 to 120 days. Holiday dates shall be specific day/month/year, or perpetual dates

including day/month/all years or day of the week in a given month every year, or self-calculating Easter Sunday.

4. Astronomic capability for calculating sunrise and sunset based on time, latitude, longitude, and time zones. All scheduled astronomic/time operations shall be interlocked so loads are not turned on when astronomic off times are earlier than scheduled on times or astronomic on times are later than scheduled off times. Each schedule shall have an independent astronomic offset of ± 120 minutes.
5. Following a power outage, the system clock shall run a start-up process that executes schedules that would have been missed during the power outage.

H. Lighting Control System Software

1. Lighting control system software that is Windows and PC based shall be provided for system configuration and operation. The software shall have on-line programming and off-line programming for later upload/down load. PC and software are not required to remain on-line with the system for normal operation.
3. The software shall have password protection (which can be enabled/disabled) and four functional access levels and shall support multiple site operation by either direct connect to the network or via phone line modem dial-in.
4. Lighting control system software shall be capable of linking switch inputs to relay outputs, retrieving links, viewing relay output status, controlling relay outputs, simulating the operation of switch inputs, setting device addresses, and assigning switch input and relay output personality attributes.
5. System clock operation from the software shall provide programming of schedules, programming of holidays, setting clock preferences, and controlling clock channels. Multiple clock schedule profiles shall be available allowing easy programming of new clock schedules for changing shifts, special schedules or events.
6. In the software, system devices, switch inputs, relay outputs, controlled circuits and system clock channels shall have alphanumeric descriptor fields providing user defined labels for easy identification.
7. Reports from the software shall generate complete device listings including all switch inputs and outputs, switch input to relay output linking report, system clock scheduling report, system clock holiday scheduling report, and control panel schedule reports. All reports shall be easily printed in a readable format.

I. Ethernet Router

1. Ethernet tunneling router that provides the capability of the lighting control system to communicate over a standard TCP/IP Ethernet system. This system may be a Local Area Network or Wide Area Network that supports standard TCP/IP communication.

2.38. SAFETY SWITCHES:

A. Furnish and install safety switches as indicated on the drawings.

B. Switches installed on 277/480 volts systems shall be rated for 600 volts and those installed on 120/208 volt or 120/240 volt systems shall be rated for 240 volts.

C. Switches shall be NEMA Heavy Duty Type HD and Underwriters' Laboratory listed. Safety switches shall be Cutler Hammer, Siemens, Square D, or GE.

D. General Duty disconnects will not be accepted.

E. Enclosures for switches mounted outdoors shall be NEMA 3R or as indicated on the plans.

F. Enclosures for switches installed in kitchen and dishwashing areas shall be NEMA 4X stainless steel or as indicated on the plans.

G. All safety switches for equipment with remote controls shall be equipped with a control circuit disconnect interlock.

H. Switches shall be lockable in the “ON” and in the “OFF” positions.

I. Provide each disconnect with a nameplate that indicates equipment name, voltage/phase, and feed from location.

J. Provide keyed brass locks on all disconnects that is located on the exterior of the building or in any area that is accessible to children or the public. All the brass locks shall be keyed the same, and turn over 10 sets of keys to the owner at substantial completion.

K. Disconnect locations shown on drawings is diagrammatically shown. Disconnects shall be coordinated with other trades and placed in the optimal locations to serve equipment and shall be installed in the least obtrusive location. Disconnects will have to be moved at the cost of the contractor when there is conflicts with NEC clearances, access to space, or servicing of equipment. Architect/Engineer will have final judgment of proper location.

2.39. MOTOR RATED SWITCHES (WITHOUT OVERLOAD PROTECTION):

A. Motor Rated Switches without overload switches shall be rated for motor starting operation.

B. Switches shall be 20 or 30 amp, two or three pole as required for the application.
   1. 20 amp two pole switches shall be 277 volt rated equal to Pass & Seymour #20AC2-HP.
   2. 30 amp two pole switches shall be 277 volt rated equal to Pass & Seymour #30AC2-HP or #7802 for higher HP applications.
   3. Three pole switches shall be 30 amp, 600 volt switches equal to Pass & Seymour #7803.

C. Switches installed for site disconnect switches shall be equipped with padlocking provisions.

D. Motor Rated Switches shall be equal to Pass & Seymour #7801 or #7830 outdoor locations, installed with tamper proof screws.

2.40. MANUAL MOTOR STARTERS (TUMBLER SWITCH TYPE WITH OVERLOAD PROTECTION):

A. Starting and thermal overload protection for single phase motors 1/8 Hp to 1 HP shall be provided by manual motor starters with overload units rated as required by the specific motor to be served.

B. Switches installed for site disconnect switches shall be equipped with padlocking provisions.

C. Starters shall be by Cutler Hammer, General Electric, or Siemens with NEMA Type 1 enclosure or NEMA Type 3R enclosure where installed outdoors.

2.41. INTEGRAL HORSEPOWER MANUAL MOTOR STARTERS:

A. General: Manual motor starters for three phase motors shall be Integral Horsepower type sized as required for the motor served. Unless otherwise indicated, starters shall be full line voltage, single speed, and non-reversing type with push-button start-stop operation.

B. Enclosures: Starters shall be furnished with NEMA 1 surface mount enclosure or NEMA 3R enclosures for outdoor installation unless otherwise indicated.

C. Thermal protection: Each starter shall be equipped with thermal overload protection in all ungrounded phases. Protection shall consist of thermal overload relays meeting NEMA ICS 2, mounted within the starter. The proper size and number of heater elements shall be installed in each starter.

D. Starters shall be by Cutler Hammer, General Electric, or Siemens with NEMA Type 1 enclosure or NEMA Type 3R enclosure where installed outdoors.

2.42. TRANSIENT VOLTAGE SURGE PROTECTORS (SURGE PROTECTIVE DEVICES):

A. Provide transient voltage surge protectors (Surge Protective Devices) where indicated on the plans. At a minimum provide on all service entrance panelboards/switchboards and any panelboard/switchboards on the secondary side of a dry-type transformer.

B. Service Entrance Panelboards and at Subpanel Protectors shall be listed and labeled and components recognized in accordance with UL 1283 and UL 1449 Second Edition, including highest fault current of Section 37.3.

C. All devices shall meet or exceed the following:
   1. NEMA LS 1-1992.
   2. Minimum surge current capability, single pulse rated, per mode:
      a. Service Entrance – 100 kA (200 kA per phase)
      g. Distribution and branch panelboards – 80 kA (160 kA per phase)

3. UL 1449, Second Edition, Listed and Labeled, and Recognized Component Suppressed Voltage Ratings shall not exceed (1.2x50□s, 6kV open circuit and 8x20□s, 500A short circuit test wave forms at end of 6" lead):

Voltage	L-N	L-G	N-G	L-L
208Y/120v	400	400	330	700
480Y/277V	800	800	800	1500

4. Testing shall be done at the end of 6" leads with the complete unit including any fuses and all other components making up the unit.

D. The devices shall have a minimum EMI/RFI filtering of –50dB at 100kHz with an insertion ratio of 50:1 using MIL-STD-220A methodology.

E. Devices shall utilize MOV's of 25 mm diameter or larger, shall have pilot lights visible on the outside of the enclosure to indicate device operating condition, and shall provide contacts for remote monitoring of device condition.

F. Devices shall be modular in design with individual module fusing and thermal protection.

G. Devices shall incorporate visual alarm signals that indicate the failure of a single MOV and total loss of protection.

H. Wye connected devices shall provide L-L, L-N, L-G, and N-G surge diversion with L-N/L-G bonded at service entrance devices. Delta connected devices shall provide L-L and L-G protection.

I. Data Line Surge Protectors: Data Line Surge Protectors shall be UL 497B listed and labeled. The units shall be heavy duty devices utilizing a combination of silicone diodes and gas tube technology to provide surge protection.

J. All devices shall have a minimum warranty period of five years, incorporating unlimited replacement of suppressor parts if they fail during the warranty period.

K. Transient voltage surge suppressors shall be manufactured by AC Data Systems, Advanced Protection Technologies, Current Technologies, Cutler-Hammer, General Electric, Joslyn, Liebert, or MCG.

2.43. SECONDARY SURGE ARRESTERS:

A. Secondary surge arresters shall be UL listed under UL Classification (Lightning Protection) Surge Arresters(OWHX).

B. Surge arresters shall be rated at same voltage and phase configuration as service.

C. Arresters shall be equal to Cooper Power Systems ASZH Series, Cutler-Hammer, GE Tranquell, Joslyn Electronic Systems, Leviton, models as required to match the voltage of the system served.

2.44. FUSES:

A. General: Fuses shall be UL listed time delay types with a minimum interrupting rating of 100,000 amps symmetrical.

B. 200 amps and below: Provide Class RK-5 current limiting, time delay, rejection type as manufactured by Busman Manufacturing, Ferraz Shawmut, or Littlefuse.

C. 201 to 600 amps: Class RK-1, current limiting, time delay, rejection type as manufactured by Bussman, Ferraz Shawmut, or Littlefuse.

D. Above 600 amps: Class L current limiting, time delay, as manufactured by Busman Manufacturing, Ferraz Shawmut, or Littlefuse.

2.45. DRY TYPE TRANSFORMERS:

A. Manufacturer: Transformers shall be as manufactured by Cutler-Hammer, GE, Square D, or Siemens.

B. General: Transformers shall be constructed in conformance with IEEE, NEMA and ANSI standards.

C. Transformers shall be dry type with copper windings, rated as scheduled on drawings.

D. Transformers rated at 15 KVA and below shall be Class 185 (115 degree Celsius rise); transformers rated above 15 KVA and above shall be Class 200 (150 degree Celsius rise).

E. Transformers shall have ventilated code gauge steel enclosure. Enclosures shall be for indoor installation unless indicated otherwise

F. Units shall be equipped with four (4) 2-1/2% full capacity taps, two above and two below rated primary voltage.

G. Core and coils shall be mounted on vibration pads and sound level of enclosed units shall be in conformance with NEMA standards.

2.46. LABELING:

A. Provide laminated plastic nameplates for each panelboard, equipment enclosure, relay, switch, and device.

B. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic 0.125 inch thick, white with black center core.

C. Provide red laminated plastic label with white center core where indicated.

D. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core.

E. Minimum size of nameplates shall beone by 2.5 inches.

F. Lettering shall be a minimum of 0.25 inch high normal block style.

G. See Panelboard details for proper labeling of all panelboards.

2.47. PHOTOCELLS, TIME SWITCHES AND CONTACTORS:

A. Photocells: Units shall have 1" diameter, hermetically sealed, cadmium sulfide sensing cell with 3-prong NEMA locking plug, rated for wet locations. Units shall have built-in time delay. Units shall be equal to Tork 5231 of correct voltage to match load or use with matching receptacle equal to Tork 2421.

B. Time switches:
   1. Unless otherwise indicated on drawings, time switches shall be 24 hour electromechanical type having synchronous motor drive with two single pole double throw contacts rated 20 amps minimum.
   2. Unit shall have spring back up, with automatic rewind, capable of providing 16 hours minimum of reserve power upon electric power failure.
   3. Units shall be furnished in an enclosure, NEMA 1 indoor and NEMA 3 outdoors. Enclosures shall be flush mount unless otherwise indicated on drawings.
   4. Units shall be Tork 7120L, or equal by Paragon or Sangamo.
   5. Time switch(es) shall be digital, seven day format, two channel time switches with 9v lithium battery 30 day back-up and with metal indoor enclosure. The controllers shall be equal to Tork #DW200A-Y.

C. Contactors: Units shall be electrically held or electrically operated mechanically held, as indicated on drawings, and shall be recommended by manufacturer for type of load served.

D. Contacts shall double-break type of same ampere rating as line side circuit wiring.

E. Contacts shall be field-convertible to normally open or normally closed.

F. Contactor coils shall be encapsulated. Electrically held contactors shall have continuously rated coils. Mechanically held contactors shall be equipped with coil-clearing contacts to energize coils only when switching.

G. Units shall be furnished in an enclosure, NEMA 1 indoor and NEMA 3 outdoors.

H. Units shall be equal to GE CR460 series in NEMA 1 or NEMA 3R enclosure as indicated.

2.48. FIRE ALARM SYSTEM (ADDRESSABLE):

A. General: The contractor shall furnish and install a complete power limited automatic and manual fire alarm system, as specified herein and indicated on the drawings. The system shall include a central control panel, power supply, signal initiating devices, audible and visual alarm

devices, provisions for connection of remote monitoring, a wiring system, and all necessary devices required to provide a complete operating system. The system shall comply with the applicable provisions of the National Fire Protection Association Standard Number 72 and meet all requirements of the local authorities having jurisdiction. The Underwriter's Laboratories, Incorporated, or approved by the Factory Mutual Laboratories shall list all equipment and devices. The equipment shall be FCI, EST, Silent Knight, or Simplex. No deviation will be considered unless submittals are received and approved in writing, not less than ten days prior to bid date.

B. Fire Alarm Document Box: The contractor shall furnish and install a fire alarm document enclosure as mandated by NFPA 72 Chapter 7.7.2.1. The system records documents box shall be constructed of 18 gauge cold rolled steel. It shall have a red powder coat epoxy finish. The cover shall be permanently screened with 1" high lettering and read "FIRE ALARM DOCUMENTS" with white indelible ink. The access door shall be locked with a ¾" barrel lock which is keyed the same as the manufacturer's fire alarm panel. The enclosure shall supply 4 mounting holes to securely fasten to the wall. Inside the enclosure will accommodate standard 8.5" x 11" manuals and loose document records that may be placed in a three ring binder. All documents & software will be protected within the enclosure. A legend sheet will be permanently attached to the door for system required documentation, key contacts, and system information. The fire alarm document will have securely mounted inside the enclosure a minimum of 4 Gigabyte digital flash memory drive with a standard USB type B connector for uploading and downloading electronic information. The drive shall not be accessible without tools to any person whom gains access to the enclosure. The enclosure shall also provide 2 Key ring holders with a location to mount standard business type cards for key contact personnel. The password to the fire alarm programming shall be provided to the owner in the fire alarm document box. The password must be provided, fire alarm contractors that refuse to give password will not be accepted. Contractor will be responsible for replacing the entire fire alarm system at their cost and cost of delaying the project if password is not provided.

C. Control Panel: The control panel shall be an addressable type panel capable of handling up to 256 devices, with 60 hour minimum standby battery. The panel shall provide for the connection of alarm circuits as indicated and shall include the following features.
   1. The fire alarm panel shall detect the operation of any initiating device, indicate by annunciator lamps the area of the alarm condition, and operate all alarm auxiliary devices.
   2. A pilot light shall normally be on, indicating that the system is receiving power from the building service supply. A failure of the building service supply shall cause the lights to go out.
   3. A trouble light and trouble buzzer, operating together, shall signal any trouble condition. Failure of the building service supply, disarrangement in the system wiring, or alarm condition shall cause that trouble light to come on and the trouble buzzer to sound. A self restoring silencing switch shall be provides to silence the trouble buzzer, which shall be arranged so the trouble light will remain on until the system is restored to normal.
   4. All notification signals shall be automatically locked in at the control panel until the operating device is returned to its normal condition, and the panel is manually reset. A switch shall be provided on the control panel for silencing the notification devices. The manual reset switch and the alarm-silencing switch shall be of the self-restoring type, which cannot be left in the abnormal position.
   5. The control panel shall provide relay contacts, of quantity as shown on the drawings, for control of heating, ventilation and air conditioning equipment. Such contacts shall be connected to air conditioning equipment, as indicated on drawings, for shutdown of individual units. Unit shutdown shall be initiated by duct-mounted smoke detectors unless otherwise indicated. Operation of any initiating device shall open all control contacts and release all mechanically held doors.
   6. The control panel shall be equipped with a front mounted Drill switch.
   7. Metal oxide varistors (MOV's) shall be provided on the system power supply and the municipal connection circuit to provide transient suppression protection to the control panel.

8. Power Supply: The power supply shall be 24 Volt DC, filtered and regulated, and shall provide sufficient power for all system functions. The fire alarm system main power supply shall operate at 120 Volt AC obtained from the building service. The 120-volt AC main power shall be converted to low voltage direct current for system operation. The system shall operate on 24 volts DC with trickle charged batteries provided as an emergency source of supply for operating the system in the event of interruption of main power. A changeover relay in the control panel shall transfer to standby power automatically upon main power failure and automatically reconnect to main power upon restoration.

D. Manual Stations: Manual Fire alarm stations shall be an addressable double acting, semi-flush mounted type. Stations with two sets of contacts will not be acceptable.

E. Smoke Detectors: Smoke detectors shall be addressable photoelectric type with base.

F. Heat Detectors: Addressable 135 degree/rate of rise type with base.

G. Duct Mounted Smoke Detectors: Duct detectors shall be addressable photoelectric type with sampling tube.

H. Contractor shall be responsible for coordinating prior to bid with mechanical drawings to confirm all duct mounted smoke detector locations and quantities. Contractor shall include in their base bid price the cost of all additional duct mounted smoke detectors and circuitry needed for locations.

I. Duct Detector Remote Test Station: Test stations shall be keyed with indicator light.

J. Audible/Visual Notification Devices: Audible/visual notification devices shall be four wire, horn/strobe units capable of 90 dB audible output, 100 candela-second output, shall be ADA compliant. Devices using incandescent lamps will not be acceptable.

K. Visual Notification Devices: Visual notification devices shall be strobe units capable of 100 candela-second visual output, shall be ADA compliant. Devices using incandescent lamps will not be acceptable.

L. Voice Control Panel: The Voice Control Panel shall play a digitally recorded message or microphone input for evacuation instructions.. The unit shall be installed next to the FACP, shall be equipped with emergency battery power, and shall provide a minimum of 75 watts of amplification.

M. Remote Microphone Panel: Remote Microphone Panels shall have a keyswitch control and shall be supervised.

N. Remote Amplifier: Remote amplifiers shall be 120 watt with battery backup.

O. Speaker/Visual Notification Devices: Speaker/Visual Notification devices shall be semi-flush, wall mounted, combination strobe/speaker assemblies with a minimum strobe output of 100 candella-second and equal to Simplex #4903-9144 Notifier #E70-24110W-FR for wall installation or Notifier #E70-W for speaker only ceiling installations.

P. Interface Relay:
   1. Provide addressable control modules equal to Notifier #CMX-2 or interface relays equal to Notifier #MR-101/CR as required for interface of the Fire Alarm System with HVAC shut down, door holders, kitchen hood fire suppression system, and fan shut down, and any other locations required for proper interface and operation of systems.
   2. A control module or interface relay shall be provided for each duct mounted smoke detector and shall be the point of interface between the Fire Alarm System and the HVAC Control System.
   3. Contacts shall be rated for 10 A at 120 V.

Q. Flow and Tamper switch Monitoring: Individual Addressable Module.

R. Door Holders: Door Holders: Door holders shall be magnetic semi-recessed wall-mounted type, or where indicated to be floor mounted.

S. **UL Fire Listed Cellular Communicator: Terminals and other necessary facilities shall be provided in the control panel to permit automatic transmission of trouble and alarm signals over a UL listed cellular communicator to the fire, police, or other continuously manned facility, so designated for response to fire emergency. Provide 2-years of**

cellular and monitoring for the fire alarm system in the base bid from the date of substantial completion.

T. Annunciator Panel: Provide and install an annunciator that provides an audible and visual indication of an alarm or trouble condition for each zone, an alarm silence switch, and a key operated test and reset switch..

U. Auxiliary Remote Power Supplies/Notification Appliance Circuit Extenders (NAC Panels):
   1. Provide auxiliary power supplies and/or NAC Panels where required for notification devices, door holders, annunciators, or for other devices requiring supplemental power.
   2. Remote power supplies shall include a filtered and regulated 24 VDC output, provisions for automatic transfer to battery back-up in case of primary power failure, and batteries sized for 60 hours of operation.

V. Wire Guards: Wire guards shall be made of 3/16" minimum steel wire with a corrosion resistant coating equipped with integral mounting rings. Provide wire guards for all devices located in gymnasium.

W. All devices installed on the exterior shall be weatherproof.

X. All A/V devices in gymnasium at bleachers or any other facility with bleachers shall mount the fire alarm devices 80" above top of bleachers.

Y. Monitoring - Provide 2-years of monitoring for the fire alarm system in the base bid from the date of substantial completion.

2.49. CONCRETE:

A. Concrete for electrical requirements shall be:
   1. Composed of fine aggregate (sand), coarse aggregate (graded from three-sixteenth (3/16) inch to one (1) inch), Portland cement, and water proportioned and mixed so as to produce a plastic, workable mixture.
   2. Aggregates shall be free from detrimental amounts of dirt, vegetable matter, soft fragments, or other foreign substances.
   3. Water shall be fresh, clean, and free from salts, alkali, organic matter, and other impurities.
   4. Concrete shall have a minimum 3000 psi ultimate twenty-eight day compressive strength and a maximum three (3) inch slump.

PART 3 - EXECUTION

3.01. GENERAL:

A. This section includes the installation of the complete electrical system.

3.02. ELECTRICAL SERVICE:

A. General: Arrange with local electric Utility Company for service to be brought to the building, and for installation of meter. Provide all material and labor not supplied by Utility Company so as to produce a complete installation meeting the Utility regulations.

B. Service requirements: It is the responsibility of this Section, prior to bid, to reaffirm with the Utility Companies involved, that locations, arrangement, Power Company voltage, phase, metering required, and connections to utility service are in accordance with their regulations and requirements. If their requirements are at variance with these drawings and specifications, contract price shall include an additional cost necessary to meet those regulations without extra cost to Owner after bids are accepted.

C. Notify Architect of any changes required before proceeding with work.

D. Fees and deposits:
   1. The Electrical Contractor shall be responsible for verification and payment of all utility fees associated with installation of the electrical service.

2. The Owner shall pay the cost of establishing an electrical service account and permanent meter deposit.

E. Metering: Obtain metering equipment from Utility Company and install in compliance with the Utility Company's requirements. The Electrical Contractor shall provide and install all necessary metering raceways, fittings, supports, connectors and ground conductor necessary for a complete installation. Provide 100# pull wire in all metering conduits.

F. Main Service Equipment: Provide UL approved service entrance components as indicated on drawings or specified herein.

G. Provide a full size copy of the AS-BUILT Power Riser Diagram framed behind plexiglass screwed to the wall near service entrance in main electrical room.

H. Service lateral or feeder: Extend lateral or feeder of the size shown on drawings from service equipment to the point of service as indicated (verify exact location with Utility Company).
   1. For Underground Service, provide and install underground conduit to utility riser, as directed by Utility Company. Conduit shall be of size and quantity as indicated on drawings. Provide 480# polypropylene pull line in each empty conduit.
   2. For Underground Service, provide and install transformer pad, primary underground conduit to utility riser as directed by Utility Company, underground secondary conduit, and secondary conductors. Conduit shall be of size and quantity as indicated on drawings. Provide spare 4" conduit in transformer pad extending 2' beyond edge of pad with PVC cap. Provide 480# polypropylene pull line in each empty conduit.
   3. On service transformers with multiple taps, it shall be the responsibility of this section to coordinate tap selection with the electric utility to insure the proper nominal voltage.

3.03. COMMUNICATIONS SERVICE:

A. General: Arrange with local Communications Utility Company for service to be brought to the building. Provide all material and labor not supplied by Utility Company so as to produce a complete installation meeting the Utility regulations.

B. Service requirements: It is the responsibility of this Section, prior to bid, to reaffirm with the Utility Companies involved, that locations, arrangement, and connections to utility service are in accordance with their regulations and requirements. If their requirements are at variance with these drawings and specifications, contract price shall include an additional cost necessary to meet those regulations without extra cost to Owner after bids are accepted.

C. Fees and deposits:
   1. The owner shall pay all utility fees and deposits associated with service installation.
   2. The Contractor shall pay all costs associated with the installation of the service.

D. Telephone Backboards: Provide backboards as indicated on drawings. Backboards shall consist of a 4' x 8' x 3/4" sheet of plywood mounted to the wall and painted with two coats of ANSI 61 gray enamel on both sides and all edges. Each telephone backboard shall be provided with a #6 copper ground wire connecting it to the ground electrode system.

E. Telephone Termination Cabinet (for outdoor service point): Install a 30”x 36”x 5”(minimum) NEMA 3R Telephone Termination Cabinet with hinged cover, integral covered splice compartment, and ¾” plywood back board equal to a Benner-Nawman #BN-30365 where indicated on the plans. Terminate the service conduit in the covered splice compartment and conduit from each tenant space in the telephone equipment compartment.

F. Phone Service Raceway: Extend conduit of the size shown on drawings or as directed by the telephone company from the telephone backboard to the point of service as indicated or as directed by the telephone company (verify exact location with Utility Company).
   3. For underground telephone service, provide and install a minimum 2” underground conduit from the TBB to the utility pedestal or riser, as directed by Utility Company. Provide 480# polypropylene pull line in each empty conduit.

3.04. GROUNDING:

A. Bond the neutral conductor and various conductive materials in the building per NEC Article 250.

B. Grounding Electrode System: A bare copper grounding conductor shall be bonded to grounding electrodes as specified below. This conductor shall serve as ground for system neutral and for building equipment bonding. Where conductor is #6, or smaller, or is subject to injury, it shall be run in conduit, Schedule 80 PVC or Rigid Galvanized to which the conductor shall be bonded at both ends.
   1. Grounding electrodes shall be as follows:
      a. Cold water piping, if metal and in direct contact with the earth for 10 feet or more, at the point of entry into the building. Grounding electrode shall be attached with UL approved bronze clamp.
      b. Building structural steel, if present and accessible.
      c. Grounding electrode shall be attached with exothermic weld connector.
      d. Foundation reinforcing bar system. Coordinate with General Contractor to provide turned up re-bar (sleeved) near service point for attachment of grounding electrode above grade. Grounding electrode shall be attached with UL approved bronze clamp or exothermic weld connector.
      e. Driven ground rod(s).
         1) Three 3/4" x 10' copper weld rods shall be driven into the ground at the lowest point adjacent to the building, spaced a minimum of 10' apart.
         2) Ground rods shall be driven to 12” below grade.
         3) The grounding electrode conductor shall be attached to the rod(s) with UL approved bronze clamp or exothermic weld connector.
      f. Existing grounding electrode system. If an existing electrical service is in place, it must be bonded to the new grounding electrode system.

C. Connections to grounding rods, building structure, counterpoise, and conductor junctions shall be made by exothermic weld unless specifically noted otherwise.

D. Electric system (neutral) ground: The current carrying neutral leg of the wiring system shall be of insulated conductor, and shall be connected to the grounding electrode conductor only via the neutral connection at the service equipment. Each branch circuit or multi-outlet branch circuit shall be provided with a dedicated neutral conductor.

E. Equipment grounding conductors:
   1. An equipment grounding conductor (copper with green insulation except where bare copper is used) shall be provided in all wiring raceways.
   2. Sizes shall be in accordance with NEC 250.
   3. The equipment grounding conductor shall originate in the same panelboard, panelboard section, as the circuit conductors.
   4. The equipment grounding conductor bonding the sections of multi-section panelboards shall be sized per NEC 250.
   5. The equipment grounding conductor is not included in number of branch circuit conductors indicated on the drawings.

F. Gas piping: Bond interior above grade gas piping to the grounding electrode.

G. Telephone service ground: provide a minimum #6 bare, solid copper grounding conductor from the electrical service grounding connection to the TBB. Leave six (6) feet minimum of free conductor. Install the conductor in PVC conduit where inside the building.

H. Computer backboard ground: provide a minimum #6 bare, solid copper grounding conductor from the electrical service grounding connection to the CBB. Leave six (6) feet minimum of free conductor. Install the conductor in PVC conduit where inside the building.

I. Metal Lighting poles: Provide a grounding electrode at poles supporting outdoor lighting fixtures in addition to installing a separate equipment grounding conductor with supply branch-circuit conductors.

J. Grounding electrode resistance shall be less than 15 ohms. The resistance of the grounding electrode shall be tested by the Fall of Potential Method.

K. Lighting Standards (Poles): Install 10’ driven ground rod at each pole. On non-metallic poles, ground metallic components of lighting unit and foundations. Connect fixtures to grounding system with No. 6 AWG conductor.

L. Each grounding conductors at the service entrance ground bus bar shall be provided with a brass round identifying tag. Tag shall indicate where ground wire is terminated.

3.05. EXCAVATION, CUTTING AND BACKFILLING:

A. Provide cutting and patching, under the supervision of the General Contractor, as required for the work in Section 16.

B. Locate all existing below grade and/or below floor utilities prior to beginning any site excavation or cutting of existing floor slabs. The Contractor shall repair any damage to existing utilities or systems.

C. Saw cut existing concrete slabs and asphalt paving.

D. Trenching:
   1. Dig trenches true to line, with a flat, even bottom.
   2. Width of the trench shall provide not less than 3 inches clearance from the conduit to each side of the trench.
   3. Insure that foundation walls and footings and adjacent load bearing soils are not disturbed in any way.
   4. Conduits shall be installed below footings where possible. Where a line passes under a footing, make crossing with the smallest possible trench to accommodate the conduits/sleeves.
   5. Where a line must pass adjacent to and below the bottom of a column footing, or the corner of a continuous footing, backfill the trench with concrete up to the level of the footing bottom, for a distance away from the footing equal to the depth of the fill.
   6. Keep excavation free from water, by pumping if necessary.
   7. Where rock, soft spots, or sharp-edged materials are encountered, excavate the bottom for an additional 3 inches, fill and tamp level to proper elevation with sand or earth free from particles that would be retained on a 1/4 inch sieve.
   8. Remove and relocate existing obstructions as directed.
   9. The Contractor shall be responsible for the repair and/or replacement of any damage to existing utilities, structure, or finishes.
   10. Coordinate work with other trades as work progresses so cutting and patching will be minimal.
   11. Refer to Section “Earthwork” for shoring, sub-soil assumptions and data, work around trees, surplus earth, etc.

E. See Section 16100, “Conduit Installation, Below grade and below slab conduit installation”, for installation of conduits in trenches.

F. Backfilling:
   1. Immediately after inspection, cover conduits with 3” of compacted sand or earth free from particles that would be retained on a 1/4 inch sieve. Do not to disturb the alignment or joints of the conduits.
   2. Carefully backfill with 4” of earth free from clods, brick, etc., firmly puddling and tamping.
   3. Thereafter, puddle and tamp every vertical 4” for hand tamping or 8” for heavy duty mechanical tamping.
   4. Backfill shall meet the compaction requirements set forth in Division 2.
   5. Backfilling Beneath Slabs and Pavement: Trenches beneath future slabs or pavement, including but not limited to buildings, drives, parking areas, sidewalks, playground surfaces, and equipment pads, shall be backfilled, from 3” above top of conduits to final grade, with crushed aggregate, AHD 825, type B, compacted in 4” layers to 100% ASTM 698.
   6. Install marking tape above conduits at 12 inches below grade.

3.06. SLEEVES, INSERTS, AND SUPPORTS:

A. Provide and install No. 16 gauge galvanized steel or iron sleeves in all walls, floors, ceilings, and partitions. Sleeves shall have no more than 1/2" clearance around pipes and insulation.

B. The contractor shall furnish to other responsible trades all sleeves, inserts, anchors and other required items which are to be built in by other trades for securing of all hangers or other supports by the Contractor.

C. The contractor shall assume all responsibility for the placing and sizing of all sleeves, inserts, etc., and shall either directly supervise or give explicit instructions to other trades for their installation.

D. The contractor shall seal all conduits through floors, smoke partitions, and floor partitions, with a sealant approved for the application.

E. All sleeves through sound barrier walls and partitions shall be sealed with mineral wool.

F. Through the floor conduit penetrations shall be sealed watertight.

G. Furnish and install steel angles and channels as required for mounting and bracing heavy equipment and conduits. Steel shall be securely bolted or welded to structure and equipment bolted to the steel framework. Obtain the approval of the Architect prior to welding.

3.07. BELOW GRADE THRU WALL WATER SEALS:

A. Each conduit penetrating exterior, below grade, cast cncrete walls shall have the annular space aroung the conduit sealed with an approved Thru Wall Water Seal System.

B. Where the system includes water seal thru wall sleeves, the Electrical shall provide properly sized sleeves to the contractor responsible for constructing the walls and shall be responsible for the proper location of each sleeve.

C. Where openings are to be core drilled, the Electrical Contractor shall be responsible for the core drilling and for coordinating proper sizing and location of each opening.

3.08. FIRE STOPPING:

A. The Electrical Contractor shall be responsible for firestopping of all penetrations of fire rated partitions made by any and all lighting, power, and auxiliary circuiting, sleeves and/or equipment.

B. The Electrical Contractor shall submit manufacturers' UL System drawings for the systems to be utilized. The systems shall be compatible with the partition ratings as indicated on the Architectural drawings and in accordance with details on the Electrical drawings.

C. Penetrations of fire rated partitions shall be sealed with an approved fire sealant resulting in the completed penetration having the same fire rating as the partition.

D. The installation shall be in accordance with the manufacturer's UL system detail and installation instructions to attain the required fire partition rating.

E. Empty sleeves through 1 and 2 hour rated partitions shall be plugged with mineral wool.

F. Sleeves through 4 hour rated partitions shall be plugged with mineral wool and fire stopping material.

3.09. ROOF PENETRATIONS:

A. Furnish roof flashing for all equipment, installed under Section 16, which penetrates through the roof. Flashing shall be approved by the Architect prior to installation.

3.10. CONDUIT INSTALLATION:

A. Conduits shall be as follows:
   1. Overhead Service Entrance - Rigid Galvanized Steel (RGS) Conduit or IMC.
   2. Underground Service Laterals: Schedule 40 rigid PVC in horizontal runs with rigid galvanized steel elbows turning up to vertical RGS.
   3. Where subject to moisture or mechanical injury - RGS conduit.
   4. ALL conduits exposed to moisture or subject to mechanical damage shall be RGS. Where conduit exits building, the changeover from EMT to rigid shall be inside exterior wall.
   5. In open shop and industrial installations RGS shall be run to 10' A.F.F.
   6. All conduit exposed on the outside of the building envelope shall be Rigid Galvanized Steel (RGS) conduit. This includes all conduits on and/or under canopies or awnings.
   7. In concrete or solid masonry – RGS conduit

8. Above furred spaces or in cells of hollow masonry - EMT
9. Concealed inside drywall construction walls and above lay-in ceilings – EMT.
10. Exposed conduits:
    a. Conduits installed exposed in shop, warehouse, and manufacturing areas shall be RGS up to 12' A.F.F. Conduits in such spaces above 12' A.F.F. may be EMT unless indicated otherwise on the drawings.
    b. Exposed indoors in non-hazardous unfinished areas not subject to physical damage - EMT
    c. Exposed in kitchen and dishwashing areas: Rigid aluminum.
11. Branch circuits in slab (3/4") - PVC. Turn up through slab with RGS ells - no exceptions. Extend rigid turn-ups 2" minimum above finish floor level.
12. Circuits beneath building vapor barrier - PVC. Turn up through slab with RGS ells - no exceptions. All elbows 45º and greater shall be RGS. Extend RGS turn-ups 2" minimum above finish floor level.
13. Below Grade – PVC with RGS, or rigid aluminum where applicable, elbows turning up to vertical. All below grade elbows 45º and greater shall be RGS.
14. Motor, HVAC equipment, and vibrating equipment connections - flexible metal conduit, liquid tight flexible metal conduit outdoors, in kitchen and dishwashing area, or in other wet areas. Liquidtight flexible nonmetallic conduit shall be used only where specifically indicated.
15. IMC may be used where RGS is indicated.

B. Conduit sizes:
    1. Unless specifically indicated otherwise herein or on the drawings, the minimum conduit size shall be 3/4".
        a. All conduits installed below grade or below slab shall be ¾" minimum.
        b. The minimum size for flexible lighting fixture "whips" shall be 3/8" and the maximum length shall be 6 feet. Lighting fixture "whips" shall be defined as flexible conduits with conductors feeding one or more recessed lighting fixtures installed in suspended, lay-in, acoustical ceiling systems from a single junction box.
        c. ½" conduit may be for final connections to equipment or fixtures where conduit is less than three (3) feet in length and is extended from a junction box or from a ¾" conduit stub up.
    2. Conduits shall be sized in accordance with the National Electrical Code as adopted by the local authority having jurisdiction or as amended to date, except where a larger size is indicated on the drawings or specified herein.

C. Layout:
    1. Generally follow the conduit layout shown on the drawings. However, the layout is diagrammatic only and must be adjusted for structural conditions, built-in equipment and other factors. Offsets are not indicated and must be furnished as required.
    2. Install all conduits concealed except in equipment rooms and where exposed runs are specifically indicated.
    3. Install conduit runs to avoid proximity to steam or hot water pipes. In no place shall a conduit be run within 6" of such pipes except where crossings are unavoidable, then conduit shall be kept at least 1" from the covering of the pipe crossed.
    4. Eliminate trapped runs insofar as possible.
    5. Do not chase new work, but instead build in conduit as work progresses.
    6. Do not run conduit in cavity of exterior walls.
    7. Run concealed conduits in direct line with long sweep bends and offsets where practicable.
    8. Install exposed conduit with runs parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings, with right-angle turns consisting of cast-metal fittings or symmetrical bends.
    9. Where conduits are indicated exposed overhead, runs down to wall outlets shall be concealed in wall.

D. Conduit Installation:

1. Securely fasten conduits to all sheet metal outlets, cabinets, junction and pull boxes with locknuts and bushings, taking care to see that stout mechanical and solid electrical connections are obtained.
2. All conduits shall have bushings with smooth beveled throats installed at both ends prior to installing conductors. Split bushings around conductors shall be taken to indicate that the conductors were pulled into conduit without the proper bushings installed and a basis for requiring the replacing of the conductors.
3. Conduits entering service enclosures (panelboards, disconnect switches, switchboards, motor control centers, etc. used as service entrance equipment) shall be provided with specification grade, insulating, grounding type bushings. Grounding bushing shall be bonded together and bonded to the service grounding buss.
4. Support:
   a. Raceways shall be securely and rigidly supported to the building structure in a neat and workmanlike manner, and wherever possible, parallel runs or horizontal conduit shall be grouped together on adjustable trapeze hangers.
   b. Support shall be provided at appropriate intervals not exceeding eight(8) feet with straps, hangers, and brackets specifically designed for the application.
   c. Channels shall be 1 inch for 18-inch wide trapeze, 1-3/8 inch for 24 to 30 inch, and 1-5/8 inch for over 30 inch wide trapeze.
   d. Perforated steel straphangers, “butterfly clips”, or tie-wire supports are not acceptable.
   e. Conduits shall not be supported from ceiling support wires.
   f. Conduits installed along wall surfaces shall be supported with galvanized steel brackets specifically designed for conduits and sized for the conduit used.
   g. PVC conduits shall be supported per the NEC with PVC or stainless clamps and stainless steel hardware.
   h. Attach to supporting devices with screws, bolts, expansion sleeves or other workmanlike means appropriate to the surface.
   i. In stud walls, anchors shall be completely rattle proof.
   j. For conduits in damp and wet locations, use stainless steel clamps and stand-offs, or galvanized malleable or cast iron clamps and spacers.
   k. All mounting hardware for aluminum conduit shall be stainless steel.
   l. Surface mounted conduits installed in kitchen and dishwashing areas shall be supported off walls approximately 3/16”.
5. Thread rigid conduits so that the ends meet in couplings; cut ends square, ream smooth and draw up tight.
6. All field cut threads shall be cleaned with a solvent such as mineral spirits and painted with two coats of galvanize primer.
7. Cap conduit ends to keep out water and trash during construction.
8. Field made bends:
   a. Avoid field-made bends where possible, but where necessary, use a proper hickey or conduit-bending machine.
   b. Field made bends in PVC conduit shall be made with a heated PVC conduit bender.
   c. Make no bends with radius less than six times the conduit diameter, nor more than 90 degrees.
9. Make changes in direction with pull boxes, symmetrical bends and/or cast-metal fittings.
10. Total bends in any conduit run shall not exceed the equivalent of four, quarter (90^{o}) bends for a total of 360^{o}, per NEC, between pull boxes.
11. Replace any crushed or deformed conduits.
12. Conduits passing through roofs shall be in place before roof is installed.
13. Conduits installed in concrete/grout filled CMU walls shall be Rigid steel or IMC conduits installed field wrapped with 0.010 inch thick pipe-wrapping plastic tape applied with a 50 percent overlay. Painted on coating shall not be acceptable.
14. Where conduits pass through or across building expansion joints, provide hot-dipped galvanized expansion fittings with bonding jumpers.
15. Insure that all penetrations of firewalls are sealed per NEC and IBCC.

16. Right and left couplings shall not be used; conduit couplings of the Erikson type shall be used at location requiring such joints.
17. Paint all conduits exposed in finished spaces. Paint shall consist of one coat of zinc rich primer plus two top coats of water-based latex paint, color to match adjacent finishes. Verify colors and paint system with Architect.
18. All conduit runs entering the building from outdoors shall be sealed against moisture migration and condensation by filling with insulating type foam.
19. All conduits passing through walls of coolers or freezers shall have seal fitting installed on the outside of the cooler/freezer wall and within 3" of the wall. Fitting shall be sealed per manufacturer's recommendations.
20. Install telephone, data, intercom, and signal system raceways, 2-inch trade size and smaller, in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements, in addition to requirements above.

E. Below grade and below slab conduit installation:
1. See Section 16100, "Excavation, Cutting, and Backfilling" for trenching and backfilling requirements.
2. Rigid steel or IMC conduits installed below slab-on-grade or in the earth shall be field wrapped with 0.010 inch thick pipe-wrapping plastic tape applied with a 50 percent overlay, or shall have a factory-applied polyvinyl chloride, plastic resin, or epoxy coating system. Painted on coatings shall not be acceptable. Wrap shall extend a minimum of 1" above slabs or 3" above finished grade where there is no slab. Alternate methods must approved by Engineer prior to bids.
3. Top of the conduit shall be not less than 30 inches below grade.
4. Run conduit in straight lines except where a change of direction is necessary.
5. Conduits stubbed up from below grade or slab into exterior walls shall be turned toward the interior of the building below slab fill perpendicular to the wall. Conduits shall not be turned out toward the exterior unless specifically indicated to do so.
6. Placing of conduits below slab on grade:
   a. Conduits 1-1/4" and larger shall be installed a minimum of 12" below the bottom of slab in the clay/sand fill below any gravel fill material.
   b. Conduits 1" and smaller may be installed in the porous/gravel fill below the vapor barrier.
7. Multiple Conduits:
   a. Separate multiple conduits by a minimum distance of 2-1/2 inches horizontally and 3 inches vertically, except that light and power conduits shall be separated from control, signal, and telephone conduits by a minimum distance of 3 inches horizontally and vertically.
   b. Where multiple layers of conduits are to be placed in a trench, each layer shall be placed in the trench, straight and parallel, clear fill material (see Excavation, Cutting, and Backfilling) placed and tamped in place to provide the specified spacing, and each subsequent layer placed in the same manner.
   c. Stagger the joints of the conduits by rows and layers to strengthen the conduit assembly.
   d. Conduits shall not be placed haphazardly in the trench.
8. Where conduits pass through footings or foundation walls:
   a. Conduits roughed in beneath slab shall exit the foundation perpendicular to the building spaced approximately 3" apart. Conduits shall be arranged in a single horizontal row where practical.
   b. Secure approval from the Architect and Structural Engineer prior to penetrating any footing or foundation wall.
   c. Schedule 40 PVC sleeves shall be cast in the footings or foundation wall for the conduits to pass through.
   d. Multiple sleeves shall have 3" clearance, vertically and horizontally, between the sleeves unless directed otherwise by the Architect and/or Structural Engineer.

9. Where PVC conduit is installed below grade a PVC to rigid metallic conduit coupling shall be installed in the horizontal run and a rigid galvanized steel conduit elbow installed to turn up to above grade. Where above grade conduits are indicated to be rigid aluminum the elbow turning up to vertical shall be rigid aluminum.
10. Rigid aluminum conduit shall be wrapped same as RGS through concrete from 2” each side of the concrete.
11. Rigid galvanized conduit shall extend a minimum of 6” above the finished floor level.
12. In hazardous areas the coupling shall be below grade and a single section of conduit installed up to 18” A.F.F. to accept the required seal fitting.
13. Wiring shall be extended in rigid threaded conduit to equipment, except that where required, flexible conduit may be used from 6 inches above the floor to the served equipment.
14. Conduits shall exit concrete slabs vertically.
    a. Where adequate support cannot be obtained by wiring to reinforcing steel, obtain support with solid iron stakes (which may be driven through membrane) cut off flush with slab after pouring.
    b. At turn-ups of adjacent runs of exposed conduit, obtain alignment by wiring members to a temporary horizontal member.
15. Empty or spare conduit stub-ups shall be capped with a threaded cap.
16. Encasement Under Roads, Structures, and at other locations indicated on the drawings:
    a. Under roads, paved areas, railroad tracks, and other locations indicated on the plans install conduits in concrete encasement of rectangular cross-section providing a minimum of 3 inch concrete cover around ducts.
    c. Provide plastic duct spacers that interlock vertically and horizontally. Spacer assemblies shall consist of base spacers, intermediate spacers, and top spacers to provide a completely enclosed and locked-in conduit assembly.
    d. Install #4 rebar at each corner of the encasement and at not more than 18” on center vertically and horizontally on the sides of the encasement. #4 rebar hoops shall be installed at not more than 18” on center along the length of the encasement.
    e. Concrete encasement shall extend at least 5 feet beyond the edges of paved areas and roads, and 12 feet beyond the rails on each side of railroad tracks.
17. Conduits to be installed under existing paved areas, which are not to be disturbed, and under roads and railroad tracks, shall be installed through a zinc coated, rigid steel, sleeve, jacked into place.
18. Conduits installed between handholes, manholes or other accessible areas shall have a minimum slope of 3 inches in each 100 feet away from buildings and toward manholes and other necessary drainage points.
19. The contractor shall provide properly rated and sized junction and pull boxes as required on all underground conduit runs 150 feet and greater so as to minimize pulling tensions on cables to be installed in conduits. In no case shall pull or junction boxes be further than 300 feet apart. Provide pulling tension calculations on all underground runs over 200 feet as required in Paragraph 1.09 Submittals.

F. Conduit Installation in concrete slabs:
1. Conduit installed in concrete slabs shall be rigid steel or IMC. Rigid steel or IMC conduits installed in slabs-on-grade shall be field wrapped with 0.010 inch thick pipe-wrapping plastic tape applied with a 50 percent overlay, or shall have a factory-applied polyvinyl chloride, plastic resin, or epoxy coating system. Painted on coatings shall not be acceptable.
2. At slabs on grade, conduit, 3/4" maximum, may be run in the slab; larger conduit shall be run below slab.
3. Where adequate support cannot be obtained by wiring to reinforcing steel, obtain support with solid iron stakes (which may be driven through membrane) cut off flush with slab after pouring.
4. At turn-ups of adjacent runs of exposed conduit, obtain alignment by wiring members to a temporary horizontal member.

G. Flexible conduit:
   1. At motor or equipment connections:
      a. The maximum length allowable for flexible conduit shall be 36 inches except at lighting fixtures.
      b. Flexible conduit installed outdoors shall be installed so as to provide an 8 inch minimum drip loop as measured from the lowest end of the conduit.
   2. At lighting fixture connections provide flexible steel conduit by one of the manufacturers named for rigid.
      a. Maximum length allowable shall be 72 inches.
      b. Support flexible conduit such that it does not contact the ceiling system, ductwork, or other equipment above the ceiling. The conduit shall not be attached to a ceiling or ceiling support system.
      c. All fixture whips shall be supported within 12” of outlet/junction boxes with single hole clamps.

H. Empty conduit:
   1. Install a #14 galvanized fish wire or polypropylene pull cord with 14-inch free ends in all empty power and/or auxiliary conduits.
   2. All conduits indicated to be terminated above the ceiling shall have an elbow turned out above the ceiling and shall be terminated with an insulating bushing.
   3. Empty conduits stubbed out of buildings below grade:
      a. Empty conduits stubbed out of buildings below grade shall extend 5 feet outside of the building foundation.
      b. Install a 12”x 12”x 6” concrete marker at grade, above the end of the conduits, with “ELEC” inscribed on top.
      f. Note on as-built drawings the exact location where empty conduit(s) are stubbed out below grade to the building exterior. Indicate conduit sizes and number of each size.
      g. The contractor shall provide properly rated and sized junction and pull boxes as required on all underground conduit runs 150 feet and greater. In no case shall pull or junction boxes be further than 200 feet apart.

I. Conduit entries into enclosures, panelboards, and wiring troughs:
   1. Layout conduit entries carefully to allow clearances for the number and sizes of conduits, electrical equipment, and future expansion.
   2. In sheet metal equipment use Greenlee Knock-Out punch, or equal, to cut holes for conduit installation. Do not drill holes, or cut holes out with snips or torch.
   3. In cast enclosures and boxes drill conduit openings with correct size drill for tight fit.

J. **All junction box covers above the ceiling shall be labeled to which circuits or systems they contain**.

3.11. CONDUIT BODIES:

A. Conduit bodies shall be sized in accordance with NEC 370, and 373.
   1. Conduit bodies for conductor sizes AWG #4 and larger shall be mogul type bodies sized in accordance with NEC 370-28.
   2. Conduit bodies for conductor sizes AWG #6 and smaller shall be sized in accordance with NEC 370-16(c).

3.12. JUNCTION AND PULL BOXES:

A. Junction and pull boxes shall be sized per NEC to accommodate the installed number and size of conductors and conduits.

B. Boxes shall be securely fastened in place.

C. Boxes serving lighting fixtures installed in accessible, suspended ceilings:
   1. Provide number of boxes as required to maintain fixture whips within the 6’ maximum length.
   2. Generally attach to underside of structure above, in accessible location, to accommodate a maximum 6' flexible conduit connection to each fixture or fixture run.

3. Where the structure above is more than 18” above the ceiling the boxes shall be supported within 18 inches of the ceiling with all thread rod and/or strut.

D. Install galvanized steel utility box plates, by box manufacturer, at exposed conduit fittings or boxes.

E. **All junction box covers above the ceiling shall be labeled to which circuits or systems they contain**.

3.13. WIRE AND CABLE INSTALLATION:

A. No conductor shall be smaller than #12 except where so designated on the drawings or specified elsewhere.

B. Multiwire lighting branch circuits shall be used where indicated.

C. Wiring devices shall be connected such that each device can be removed without interrupting the neutral or equipment grounding conductors serving other outlets on the same circuit(s).

D. Joints and splices in wire shall be made with solderless connectors, and covered so that insulation is equal to conductor insulation. Wire nuts shall not be used for conductor #8 and larger.

E. No splices shall be pulled into conduit.

F. Both conductors and conduit shall be continuous from outlet to outlet.

G. No conductor shall be pulled into the conduit until the conduit is cleaned of all foreign matter.

H. When installing parallel conductors, it is mandatory that all conductors making up the feeder be exactly the same length, the same size, and type of conductor with the same insulation. Each group of conductors making up a phase or neutral must be bonded together at both ends in an approved manner.

I. MC cable or Romex cable will note be accepted unless specifically called for on drawings.

J. Wiring thru light fixtures and receptacles will not be accepted.

3.14. AUXILIARY GUTTERS (WIRING TROUGHS):

A. Auxiliary Gutters shall be sized per NEC to accommodate the installed number, size, and orientation of conductors and conduits.

B. Conductors serving a gutter shall be extended without reduction in size, for the entire length of the gutter.

C. All taps and splices shall be made with insulated multi-tap connectors.

3.15. CIRCUITS AND BRANCH CIRCUITS:

A. Outlets shall be connected to branch circuits as indicated on the drawings by circuit number adjacent to outlet symbols, and no more outlets than are indicated shall be connected to a circuit.

3.16. WIRE JOINTS:

A. Except for motor circuits, wire joints for #8 and smaller wire shall be made with twist on connectors.

B. Wire joints and splices for motor circuits, for conductors #6 and larger, and for smaller conductors where other connectors are not rated for the number of conductors involved shall be made with split bolt connectors rated for the applicable conductor size, number of conductors, and conductor material.

1. Properly tape and insulate all joints to attain the same insulation rating as the cable insulation.
2. Splices for #6 through #1 shall have a minimum or two (2) layers of rubber tape covered by a minimum of three (3) layers of electrical tape.
3. Splices for #1/0 and larger conductors shall have a minimum of two (2) layers of electrical filler tape covered by a minimum of three (3) layers of electrical tape.

C. Splices in control conductors shall be avoided as much as possible. Stranded control conductor up to #12 may be connected or spliced with hand crimped type compression connectors. The connectors shall be of the proper size for the conductors being connected.

D. Splices and joints made with mechanical/hydraulic type compression connectors:
   1. Connections and splices shall be made with connectors rated for the applicable conductor size and conductor material.
   2. Dies used shall leave the die number embossed in the connector. The Contractor shall provide the Engineer with the Manufacturer's connector and die chart prior to final inspection.

E. Taps and splices in auxiliary gutters/troughs shall be made with insulated multi-tap connectors.

F. Wire joints and splices made below grade shall be made with UL listed waterproof connectors, wire nuts, or splice kits.

G. All joints and splices shall be made in junction boxes, wiring troughs, or conduit bodies sized per NEC.

H. All connections to switchboards, panelboards, transformers, generators, ATS, or any other type electrical distribution type equipment shall be compression type fittings. Mechanical fittings will not be accepted in these applications.

3.17. STRUT SYSTEM FOR SUPPORT OF ELECTRICAL EQUIPMENT:

A. Strut Systems: Strut shall be utilized to rack exposed piping vertically or horizontally on walls and across slabs (where applicable). Strut may be utilized to support piping above ceilings, for support of equipment, and elsewhere as deemed appropriate.
   1. Strut in conditioned spaces and above accessible ceilings shall be electro-galvanized.
   2. Strut installed outdoors, in mechanical rooms, and in other unconditioned spaces shall be hot-dipped galvanized.
   3. Strut installed in waste water treatment facilities, kitchens, dishwashing spaces, and labs shall be stainless steel.
   4. Strut fittings and hardware, including anchors, shall be same material as strut.
   5. Saw cut strut square, 6" minimum lengths. Strut on continuous runs of pipe shall be same length. File or grind burrs from saw cuts.
   6. After installation, electro-galvanized and hot-dipped galvanized strut shall be painted with two coats of zinc primer.

3.18. OUTLET BOX INSTALLATION:

A. General: The drawings indicate approximate locations only; determine the exact location at the building in view of all structural and architectural conditions. Obtain Architect's verification of final locations.

B. Outlet boxes shall be sized per NEC to accommodate the installed number and size of conductors, wiring devices, and conduits.

C. Ceiling and Wall Bracket Outlets: 4" octagonal boxes with plaster rings appropriate for finish surface.

D. Typical boxes (for switches, receptacles and auxiliary systems): 4" square boxes ganged as required. Furnish with 3/4" plaster rings where employed in plaster, 1" tile covers where used in ceramic tile, 1" plaster rings where set in exposed concrete, and otherwise appropriate for surface and construction.

E. Boxes in Exposed (or Thin-Coat Plastered) Masonry: Where conduit connections permit, employ solid flush-type, square-cornered, masonry boxes with turned-in device holders; otherwise employ typical box with 1-1/2" square-cut tile cover. .

F. Multiple Outlet Floor Boxes:
   1. Verify the exact location of the floor boxes with the Architect prior to rough-in.
   2. Set the boxes in accordance with the manufacturer's instructions.
   3. Boxes shall be set so that the box is flush with the finished floor; the boxes shall not cause a rise or fall in the floor.

4. The power outlets shall be connected to the circuits indicated by the numbers next to the symbol.
5. For Data outlets, install a 1” C. to above the nearest corridor ceiling..

G. Boxes used with Exposed Conduit: 4" square utility boxes.

H. Exterior Boxes: Cast-metal boxes, Crouse-Hinds Type FS or FD as appropriate. Make weatherproof with gasketed covers. Equal products by Appleton, Killark, O-Z/Gedney, or approved equal will be accepted.

I. Boxes used with Recessed Lighting Fixtures in suspended acoustical tile ceilings:
   1. Provide a 4" square box with blank cover adjacent to each fixture or fixture group.
   2. Install a flexible metal conduit fixture ”whip” from the box to the fixtures. The “whip” shall not be longer than 72”.
   3. Attach the box to the underside of the structure above, in an accessible location, not more than 18” above the lay-in ceiling.
   4. Where structure is more than 18” above the ceiling, the boxes shall be supported from all-thread rods, strut, or a combination of rod and strut.

J. Boxes in Dry Wall Construction:
   1. Outlet boxes shall be securely fastened in place.
   2. Outlet boxes installed in metal stud construction shall be supported by brackets screwed to studs. Clip on brackets shall not be accepted.
      a. Where a single outlet box is installed adjacent to a stud, brackets may attach to a single stud with a brace against the back of the opposite wall. Use a bracket equal to Caddy Fasteners “H” Series.
      b. Where outlets do not fall next to a stud or where more than one outlet is installed between studs use a metal bracket attached to both studs. Brackets shall be equal to Caddy Fasteners “SGB", “TSGB”, or “RBS” series brackets.
      c. Outlet boxes three gangs and wider shall be supported with support member screwed to the two adjacent studs. Brackets equal to Caddy Fasteners SGB or TSGB brackets may be used.

K. Sectional type switch boxes at least 2-1/2" deep may be used instead of typical box (but not where dry wall finish is applied over masonry back-up and not where multi- gang devices occur).

L. Outlets in unfinished masonry walls may be slightly adjusted upward or downward to suit masonry courses, provided outlets are mounted at uniform heights throughout the installation.

M. Coordinate installation of outlet boxes in masonry walls with the masonry contractor to insure that boxes are flush with face of wall and grouted smooth around boxes such that covers, fixtures or devices install flush on face of wall.

N. Where outlets at different levels are shown adjacent, install in one vertical line where possible. Avoid conflict with wainscot caps, splash backs and upper cabinets by adjusting height slightly up or down as directed.

O. Back to back boxes shall be staggered with at least 3 inches between boxes.

P. Back to back boxes in fire rated partitions shall have a minimum of 24” horizontal and/or vertical separation between them.

Q. Backs of boxes three gang and larger installed in fire rated partitions shall be wrapped with self adhesive fire stopping tape.

R. Locate switch outlets on the lock side of doors and so that the first switch in a single or gang installation is approximately 6" to 10" from the doorjamb. Verify door swings on Architectural Drawings.

S. Dimmers shall be ganged together in accordance with the manufacturer’s instructions where appropriate, but shall not be ganged with toggle switches.

T. Coordinate carefully with appropriate trades the size and orientation (vertical, horizontal) of outlet boxes for thermostats, data outlets, fire alarm equipment, security equipment, and other control and communications outlets.

U. Mounting Heights:

Confirm all mounting height with local codes and authorities prior to bid and adjust as required:

Switches, generally	48" A.F.F. to top of outlet
Safety switches	Center of Switch 48" A.F.F. or as required.
Receptacles, generally	16" A.F.F. to bottom of outlet
Receptacles over counters	Bottom of outlet 6” above countertops or 2” above backsplashes
Telephone Outlets	16" A.F.F. to bottom of outlet
Computer Outlets	16" A.F.F. to bottom of outlet
Television Outlets	16" A.F.F. to bottom of outlet or as indicated
Wall mounted exit and emergency lights	Bottom of fixture 7’- 6” A.F.F. or 12” below Ceiling whichever is lower
Electric Water Coolers	Coordinate location with plumbing contractor to locate the receptacle(s) concealed within the EWC enclosure per manufacturer’s installation instructions.

V. Install blank coverplates on all unused power and auxiliary outlet boxes. Blank coverplates shall match other cover plates installed in the facility.

W. Furnish blank plates, matching those on the other outlets in the same area, on TV outlets and other outlets installed for future use.

3.19. WIRING DEVICES:

A. Install wall devices vertically’ unless otherwise noted, so that all devices of any given height will align exactly.

B. Where boxes are not flush or square with the finished wall surface install wiring devices utilizing a leveler and retainer equal to Caddy #RLC or Steel City #SSF-SR.

C. Plates shall be plumb and true with all four edges contacting wall surface.

D. Mount receptacles with grounding terminals down.

E. Do not install devices until plastering or other type wall covering has been completed; install ahead of painting work, but protect from paint spatter.

F. Use screw terminal connections only.

G. Do not gang dimmer switches with toggle switches.

H. Each single or multi outlet receptacle, other than straight blade, 15 or 20 amp, 120 volts, NEMA 5-15R or NEMA 5-20R, shall be provided with matching cord plugs and a minimum of 8 feet of Type SOW cable matching the receptacle size and configuration.

I. Pin and sleeve plugs for food service equipment shall be provided with a Type SOW cable connected to the equipment and plug of sufficient length to reach from the equipment to the plug with a minimum of 18” slack cork. Minimum length shall be 6 feet from equipment to plug.

J. Provide “Kellums” type grips at the plug, cord connector, and for overhead support on all overhead cord connector drops.

3.20. TELE-POWER POLES:

A. Tele-Power poles shall be attached to the floor and rigidly supported from the structure above such that there is no lateral movement of the pole.

B. Where direct attachment to the structure is not possible, install cross bracing constructed of strut members.

3.21. OCCUPANCY SENSORS AND ASSOCIATED DEVICES FOR LIGHTING CONTROL:

A. Occupancy sensors and associated devices and circuiting shall be installed in strict accordance with the manufacturer’s instructions.

B. Wall, corner mounted sensors shall be mounted as close to the ceiling as possible on the manufacturer’’ corner mounting bracket.

C. Power packs shall be mounted above the ceiling. Power packs shall be installed utilizing two(2) 4" x 4" x 2-1/8" deep boxes joined together using the nipple on the powerpack in accordance with the manufacturer's instructions. One of the boxes shall contain the power pack and control wiring and the other shall contain the power wiring.

D. All control and power circuiting shall be in EMT conduit. Where the devices are not equipped with conduit connections the conduit shall be brought up as close as possible to the device and terminated with insulating bushings.

3.22. ELECTRICALLY POWERED EQUIPMENT AND CONTROLS:

A. Provide and install power circuits for all electrically powered equipment and controls.

B. Heating, Ventilating, and Air Conditioning Control Wiring and Conduit:
   1. The electrical contractor shall be responsible for installing outlet boxes for flush mounted HVAC system thermostats in dry wall or masonry wall construction and, where called for on the plans, for surface mounted metallic raceway in finished areas. Extend ¾" conduit from the outlet to above nearest accessible ceiling and terminate horizontally. Refer to the Mechanical/HVAC plans for thermostat locations and coordinate exact type outlet required and orientation with the Mechanical/HVAC contractor.
   2. The Mechanical Contractor shall be responsible for the installation of all outlets and conduit for surface mounted devices in unfinished areas such as shops, warehouses, industrial facilities, etc.
   3. The mechanical contractor shall furnish and install all low and line voltage control wiring required for the temperature control and/or ventilation systems.

C. Where Fire Alarm system duct mounted smoke detectors and HVAC shut down interface relays are provided, the Electrical contractor shall provide wiring from the smoke detectors to the HVAC shut down interface relay. All circuiting from the shut down relay to the HVAC controls and/or starters shall be provided and installed by the Mechanical/Controls contractor.

D. The mechanical contractor shall furnish all motor starters for the temperature control and/or ventilation equipment unless otherwise indicated on the electrical plans or elsewhere in these electrical specifications. The electrical contractor shall install all motor starters, except for equipment with factory installed starters, for the temperature control and/or ventilation equipment.

E. Where exhaust fans are supplied with field installed speed controllers, the Electrical Contractor shall provide all necessary circuiting to the fan/speed controller and between the fan and the speed controller.

3.23. DISCONNECTING MEANS:

A. Where required by the National Electrical Code and/or other applicable codes or authorities, or where indicated on the electrical plans, the electrical contractor shall furnish and install an approved disconnecting means for all electrically powered equipment and/or controllers for such equipment whether the disconnecting means is or is not shown on the electrical plans.
   1. The location, rating, and enclosure for the disconnecting means shall be as required by the National Electrical Code and/or other applicable codes or authorities.
   2. Manual motor starters with thermal overload protection may be used in lieu of safety switches for individual motors under 1 horsepower.
   3. Motor rated switches may be used for the disconnecting means when supplied of correct voltage, phase, amperage rating, and enclosure type.
   4. The disconnecting means shall be as manufactured by General Electric, Cutler Hammer, or Siemens. Square D will not be accepted.

B. Where the disconnecting means shown on the electrical plans has a rating greater than the required code rating, the greater rating device shall be installed.

C. An approved horsepower rated fusible safety switch shall be installed where the circuit overcurrent protection does not provide overload protection for the equipment served and where required to meet the equipment's listing requirements.

D. Motor rated switches may be used as service disconnect switches when supplied with a padlockable, handle locking guard.

E. Install an engraved phenolic nameplate on the front of each switch enclosure identifying the equipment served by the safety switch and source of power (i.e., panel name and circuit number). Plates shall be white with black lettering. The plates shall be permanently installed with stainless steel screws or stainless steel rivets.

F. All disconnects installed in public areas or in areas readily accessible to the public shall be lockable and shall be furnished with a brass lock. Provide 10 keys for each lock. All disconnect locks furnished on the project shall be keyed alike.

3.24. LIGHTING FIXTURES:

A. The installation and support of all lighting fixtures shall be the responsibility of the Electrical Contractor.

B. Lay out work as shown, and to provide attractive and efficient arrangement.

C. Install fixtures level, plumb, and true with ceiling and walls, and in alignment with adjacent lighting fixtures.

D. Provide adequate and substantial supports for fixtures in accordance with manufacturers' directions and as specified herein.

E. A Re-lock system will not be accepted for installing lights.

F. Wire grid mounted luminaries individually to junction boxes with flexible conduit not more than 6 feet in length. Individual flexible connections shall be 2 #14 and 1 #14 ground THHN in 3/8" flexible conduit. Ground wire shall be bonded at each end.

G. Light fixtures with center baskets shall have all fixtures in a room installed with the center baskets oriented in the same direction.

H. Fixtures mounted in inverted “T” grids:
   1. For round fixtures or fixtures smaller in size than the ceiling grid, provide a minimum of four wires per fixture located within 4 inches of each corner of the ceiling grid in which the fixture is located. Do not support fixtures by ceiling acoustical panels. Fixtures shall be supported independent of the ceiling system or shall be supported by at least two metal channels spanning the grid system, and secured to, the ceiling tees. One support wire shall be attached to the center of the fixture or to each of the metal channels.
   2. Surface mounted fixtures:
      a. Surface mounted fixtures installed on lay-in ceiling systems shall be supported independent of the ceiling system form the building structure with a minimum of two (2) 3/8”, minimum, all-thread rods.
      b. Install nuts and washers on inside and outside of the fixture housing to provide a rigid installation.
      c. Provide cross bracing as required such that fixtures have no lateral movement.

I. All stems on lighting fixtures shall be installed as follows: (except fixtures with slide grip hangers) first and last stem in row in first knockout from end of fixture. One stem shall be installed between each two fixtures, stem shall center joint, where fixtures join, and attach by use of "jointing plates". Nipples with lock nuts and bushings shall connect all fixtures in continuous rows other than recessed grid type.

J. All suspended lighting fixtures shall be provided with chain or cable sway bracing to keep fixtures from swinging.

K. Fixtures installed in fire rated assemblies shall be tented in accordance with the specified assembly.

L. Means shall be provided to keep insulation 4” minimum away from fixtures not rated for direct contact with insulation.

M. Prior to final inspection clean fixtures and lamps with a soft cloth or sponge and detergent (not soap) solution.

N. All lighting fixtures installed in gymnasiums, hangars, high bay or similar use areas shall be equipped with wire guards.

O. All emergency and exit lights designated on drawings shall be provided with an 1100-lumen battery ballast.

P. All light fixtures shall be supported to the structure independent of the ceiling system on two opposite sides. Support wires shall be different color from ceiling support wires. Engage all ceiling mounting clips. If light fixture is not provided with grid support clips, then the contractor will be responsible to support the fixture on all four sides with support wires. See “Typical Lay-In Luminaire Detail” on drawings for further requirements.

3.25. STEEL(ALUMINUM) POLE SETTING:

A. Bases for poles shall be constructed as detailed on the drawings

B. Anchor bolts shall be set plumb and centered in the base with adequate threads left exposed for base plate, backing nuts, washers, and locking nut.

C. Poles shall be set plumb. Adjust backing and locking nuts to plumb pole with pole base held as close to concrete bas as possible.

D. Grout space between pole base plate and concrete base with non shrinking grout to provide a smooth finish.

E. Smooth all nicks, scratches and scrapes and recoat with factory supplied or recommended primer coat and finish coat.

3.26. PANELBOARDS AND SWITCHBOARDS:

A. Panelboards and switchboards shall be installed where shown on the drawings.

B. Ratings and configurations shall be as scheduled and/or indicated on the drawings.

C. The Electrical Contractor shall coordinate installation of equipment in Electrical and Electrical/Mechanical spaces with other trades such that Code required clearances and working space around the electrical equipment is maintained.

D. Conduit termination:
   1. In general use panelboards with blank ends, without knockouts.
   2. Layout conduit entries carefully to allow clearances for drywall or CMU wall thickness, and to accommodate the number and sizes of home run conduits and specified spare conduits.
   3. Use Greenlee Knock-Out punch, or equal, to cut holes in panelboard ends and/or sides for conduit installation. Do not drill holes, or cut holes out with snips or torch.

E. Phase arrangement in panelboards shall be per the NEC, phase A, B, C from front to back, top to bottom, or left to right as viewed from the front.

F. In Delta connected systems the “high” leg shall be the B phase and shall be clearly marked with an orange outer finish.

G. Multi-Section Panelboards:
   1. Sub-feed conductors shall be the same size as the conductors feeding the main section.
   2. Circuiting originating in one section shall not pass through another section.
   3. Circuit conductors and grounding conductors shall originate in the same panelboard section.
   4. A separate isolated grounding conductor shall be installed from the main section to the sub-feed section(s).
   5. Where the panelboard is rated for service entrance equipment the each sub-feed section shall have a separate isolated ground buss fed from the main section ground buss.

H. Labeling:
   1. Each panelboard shall have an engraved phenolic plate permanently installed on the front of the panel with the panel name, current rating, and voltage rating.
   2. Where there is more than one nominal voltage system the panel shall also have an engraved phenolic plate describing the means of identification used to identify the phase and system of each ungrounded conductor of the system served by the panel.

3. Plates shall be white with black lettering.
4. Panelboard circuit numbers shall be as indicated on the panelboard schedules.

3.27. LIGHTING CONTROL SYSTEM:

A. The Lighting Control System shall be installed in strict accordance with the manufacturer's instructions and recommendations.

B. System Startup:
1. The Manufacturer shall provide a factory authorized technician to confirm proper installation and operation of all system components.

C. Training:
1. The Manufacturer shall provide factory authorized application engineer for a minimum of 8 hours on site to train owner personnel in the operation and programming of the lighting control system.

D. Documentation
1. Manufacturer shall provide system documentation including:
2. System 1-line diagram showing all panels, number and types of switches and sensors.
a. Lighting Control Panel Schedules
b. Lighting Channel Schedule
c. Typical wiring diagrams for each component.

E. Warranty
1. Manufacturer shall provide a 1-year warranty for all system components. In addition a three(3) year extended warranty shall also be included.

3.28. PHOTOELECTRIC CELLS, TIMERS, AND CONTACTORS FOR LIGHTING CONTROL:

A. Install time clocks where accessible.

B. Install photoelectric cells so that lighting fixtures do not affect the cell.

C. Adjust time clock(s) and photoelectric cells as required for proper operation.

3.29. DRY TYPE TRANSFORMERS:

A. Flexible metallic conduit equipped with bare stranded copper ground jumper shall be provided for all transformer primary and secondary connections

B. Transformer secondaries shall be grounded to the building steel and to the primary and secondary side conduit systems.

3.30. IDENTIFICATION AND LABELING:

A. Feeder Designation:
1. Non-ferrous identifying tags or pressure sensitive labels shall be securely fastened to all cables, feeders, and power circuits in vaults, pull boxes, manholes, switch gear and at termination of cables. Tags or labels shall be stamped or printed to correspond with markings on drawings so that feeder or cable number and phase can be readily identified.
2. Where there is more than one nominal voltage system, each ungrounded system conductor shall be identified by phase and system wherever accessible per NEC. The means of identification shall be permanently posted at each branch-circuit panelboard.

B. Color Coding of Conductors:
1. The ungrounded (phase) conductors and the grounded (neutral) conductors of each voltage system shall be identified by the following color coding method:
a. 120/240 Volts, Single Phase, 3 Wire:
1) Grounded (Neutral) Conductor --- White
2) Ungrounded (Phase) Conductors --- Red, Black
a. 120/240 Volts, Three Phase, 4 wire:
1) Grounded (Neutral) Conductor --- White
2) Ungrounded (Phase) Conductors --- Red, Orange, Black
b. 120/208 Volts, 3 Phase, 4 Wire:
1) Grounded (neutral) Conductor --- White
2) Ungrounded (phase) Conductors --- Black, Blue, Red
c. 277/480 Volts, 3 Phase, 4 Wire:

1) Grounded (neutral) Conductor --- Gray
2) Ungrounded (phase) Conductors --- Brown, Orange, Yellow

2. Green shall be used for equipment grounding conductors only.
3. The insulation color shall be visible for the entire length of wire.

C. Panelboard:
1. Each Lighting and Power Panelboard shall contain a typed circuit directory listing all circuit breakers and the load served by each.
2. Panelboard directories shall be typewritten, and shall include adequate descriptions for proper identification of individual circuits. Do not write in or on panelboards.
3. On Distribution panelboards, provide and install an engraved laminated label for each circuit, indicating circuit's number and load served.
4. Each panelboard shall have an engraved phenolic plate permanently installed on the front of the panel with the panel name, current rating, and voltage rating.
5. Where there is more than one nominal voltage system each panelboard shall have an engraved phenolic plate describing the means of identification used to identify each phase, neutral, and grounding conductors of the system served by the panelboard per NEC.
6. Plates shall be white with black lettering.

D. Wall Switches: Where three or more switches are ganged, and elsewhere as indicated, identify each switch with approved legend engraved on the wall plate.

E. Receptacles: Install a label on the face of the coverplate and tags or wire markers inside the outlet box identifying the panelboard and circuit number from which the outlet is served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on face of coverplate- black print on clear tape on light colored or stainless steel plates and white print on clear tape on dark colored plates. Embossed tape labels will not be accepted. Use durable wire markers or tags within outlet boxes.

G. Disconnect Switches:
1. Install an engraved phenolic nameplate on the front of each switch enclosure identifying the equipment served by the safety switch and source of power (i.e., panel name and circuit number).
2. Plates shall be white with black lettering.
3. The plates shall be permanently installed with stainless steel screws or stainless steel rivets. Plates installed with glue or other adhesives will not be accepted.
4. Where motor rated switches are used as service disconnect switches, labeling shall be as described for receptacles.

H. Junction boxes: Identify circuits enclosed in concealed junction boxes on the cover with permanent marking pen.
1. For power and lighting circuits indicate panelboard of origin and panelboard circuit number(s).
2. For auxiliary systems circuiting indicate the system and zone served.

I. Service disconnects:
1. An additional engraved sign shall be permanently attached next to panelboard circuit breakers, on enclosed circuit breaker enclosures, and/or on disconnect switches used as service disconnects to identify each main service disconnect.
2. The sign shall be red with white lettering a minimum of ½" high.
3. Where multiple main disconnects are utilized the labels shall identify each as one of a group, i.e., "Service Disconnect 1 of 3", etc. where there are three service disconnects.

3.31. FIRE ALARM SYSTEM:

A. The installation shall be by a Certified Fire Alarm Contractor who has qualified and received a permit from the State Fire Marshal, with an NICET Level III on staff.

B. All wiring shall be in accordance with the National Electric Code and the local code having jurisdiction.

C. Unless otherwise specified, minimum wire size shall be 14 gauge for AC and power supply connections, 14 gauge for audible alarm and auxiliary circuits, and 18 gauge for signal initiating circuits. Diagrams shall be provided for device and power wiring. Color coding and permanent numbering shall be used as recommended be the equipment supplier.

D. All system wiring shall be installed in metal raceway in accordance with Section "Raceways".

E. Junction boxes shall have covers painted red with the letters "FA" stenciled on the cover in 2" high white letters.

F. Auxiliary Remote Power Supplies/Notification Appliance Circuit Extender (NAC panel):
   1. Power supplies shall be sized at 133% of proposed load. Fire Alarm submittals shall include power supply capacity and loading data.
   2. Remote power supplies shall be supervised by the FACP.
   3. The power supplies shall be installed, accessible, below ceiling, in electrical rooms or where indicated on the drawings.

G. Provide circuiting as required for the interface with the kitchen hood fire suppression system and the fire alarm system.

H. Where air handler shut down is controlled from the fire alarm system, the fire alarm system installer shall provide circuiting as required between the Duct Mounted Smoke Detectors and the HVAC interface/shut down relays. Circuiting connecting the relay output contacts to the HVAC control system shall be provided and installed by the Mechanical/Controls contractor.

I. Each air handling unit shall be a separate fire alarm initiating zone.

J. Install wire guards on all smoke detectors and notification devices installed in gymnasiums or similar use areas.

K. Install UL fire listed cellular communicator for monitoring of the fire alarm system. Provide all material and labor as needed for complete functioning system at the completion of construction.

L. Install telephone cable(s) in conduit from the FACP to the Telephone Backboard as required for connection of the FACP to the telephone system.
   1. Terminate the conduit on the TBB with an insulating bushing.
   2. The FACP shall be connected to two telephone lines per Code.
   3. Coordinate the connection of the Fire Alarm System to the telephone system and verify proper communications.

M. Final connections to the Fire Alarm Control Panel and Voice Panel shall be made by a factory certified, NICET Level III, technician.

N. A factory-trained representative of the manufacturer shall supervise connections and final testing of this system and shall complete a Certificate of Completion per NFPA 72. The Certificate of Completion shall be completed and copies delivered to the Owner, Architect, and Engineer prior to the final inspection.

O. On completion of the acceptance tests, the Owner or his representative shall be instructed in the operation and testing of the system.

P. **At the acceptance tests, contractor shall provide engineer with smoke detector diagnostic reports for all smoke detectors. All smoke detectors more than 10% dirty shall be either cleaned or replaced until test show value less than 10%.**

Q. The fire alarm system shall be warranted free from defects in workmanship and materials, under normal use and service, for a period of one year from the date of acceptance or beneficial occupancy, whichever is earlier. Any equipment shown to be defective in workmanship or material shall be repaired, replaced, or adjusted free of charge.

R. Identification and labeling:
   1. Provide a framed building drawing identifying each zone and/or building area.
   2. Each building zone on the Fire Alarm Control panel shall relate to the building drawing in a manner that will direct the fire department to the area of a fire.
   3. On addressable systems each addressable device shall be given a name displayed on the control panel readout that will direct the fire department to the area of the fire, i.e. – South

End of Zone(Building) 5; AHU-1 – Mechanical Room 201 – Building 2. Any room number reference shall be to final room numbers assigned to rooms on completion of construction.

4. Building drawing, schedule of zones, and device identification schedule shall be submitted to the Engineer for approval prior to final inspection and acceptance.
5. On addressable systems the contactor shall label each device with an alpha-numeric identifier that is unique to that device. This identifier shall correspond to the identifier programmed in the fire alarm control panel such that maintenance personnel may quickly and readily identify the device.

3.32. SECONDARY SURGE ARRESTERS:

A. Secondary surge arresters shall be installed in strict accordance with the manufacturer's recommendations.

B. Arrester may be mounted to the side of a surface mounted panelboard or trough. If such a surface is not available, the arrester shall be mounted on a bracket in its own flush mount enclosure located immediately adjacent to the service panel. Insure that all leads are attached per manufacturer's recommendations. Excess lead length shall be cut off prior to making connections.

3.33. CONCRETE:

A. The Electrical Contractor shall be responsible for placing concrete for electrical equipment pads, lighting standard bases, electrical equipment supports, and at other locations as indicated on the electrical drawings and/or specified herein.

B. This Contractor shall be responsible for size, location, and orientation of the pads, bases, etc. Any required additions or modifications to concrete due to incorrect size, location, or orientation shall be the responsibility of this contractor.

C. Concrete shall be cured for a period of not less than seven (7) days prior to setting poles, transformers, switchgear, motor control centers, or other pad mounted equipment.

D. Forms shall be completely removed after concrete has cured and prior to setting equipment.

E. A smooth wood float finish shall be given to exposed, unformed concrete.

F. Honeycombed, or otherwise defective areas of concrete shall be repaired by patching with cement mortar.

3.34. FOOD SERVICE AND KITCHEN EQUIPMENT:

A. Provide and install all power and control circuiting required for complete connection and operation of all food service and kitchen equipment.

B. Install all control and power equipment shipped loose with food service and kitchen equipment.

C. Provide and install all interconnecting circuiting between equipment and controls.

D. Contractor must coordinate all voltage, phase, and overcurrent protection characteristics with the electrical drawings prior to releasing any power equipment. Adjust circuit breaker, disconnect, and feeder sizes as required to properly feed and protect equipment. Any wrong size feeder or overcurrent protection discovered at the completion of construction because the coordination was not completed up front will be the sole responsibility of the electrical contractor to fix and meet the National Electrical Code.

3.35. SPARE MATERIAL:

A. Provide four exit signs and 50 feet of circuiting in conduit for each device complete with all labor and material for installation in a location as directed by the engineer or architect.

B. Provide six type NEMA 5-20R receptacles complete with 75 feet of circuiting in conduit. For each device provide complete with all additional labor and materials for installation in a location as directed by the architect or engineer.

C. Provide 4 duplex communications outlets complete with all labor, material, cabling and conduit necessary to install outlet 300 feet from the nearest communications CBB closet and terminate

outlet cables on patch panels in rack. Outlets to be installed in a location as directed by architect or engineer.

D. Provide two of each type of fire alarm notification devices (speaker/strobe units, strobe only units) and 75 feet of circuiting in conduit for each device complete with all labor, programming, and material for installation in a location as directed by the engineer or architect.

E. Provide two of each type of fire alarm heat detector devices and 75 feet of circuiting in conduit for each device complete with all labor, programming, and material for installation in a location as directed by the engineer or architect.

F. Provide two of each type of initiating device (pull station, zone module, duct detector, smoke detector) and 75 feet of circuiting in conduit for each device complete with all labor and material for installation in a location as directed by the engineer or architect.

G. Provide one spare set of fuses for each size and type fuse used.

3.36. EQUIPMENT TOUCHUP AND PAINTING:

A. Clean damaged and disturbed areas on all painted surfaces of enclosures, cabinets, and equipment, sand smooth, and apply primer, intermediate, and finish coats of paint to suit the degree of damage at each location. Paint shall be the manufacturer’s supplied touch up paint or a matching paint. Prep all surfaces to be painted by removing all rust, dirt, oil, and any other material that might inhibit good paint adhesion by mechanical means and/or with solvents.

B. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.

C. Repair damage to galvanized finishes with two coats of zinc-rich paint recommended by manufacturer.
   1. Paint cut ends.
   2. Paint all drilled and punched holes.
   3. Paint all knicks and scratches.
   4. Paint all field cut conduit threads.

D. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 16231

PACKAGED ENGINE GENERATOR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes packaged engine-generator sets for **emergency standby** power supply with the following features:

1. Natural Gas Engine. (Diesel engines will not be accepted)
2. **Unit-mounted** cooling system.
3. **Unit-mounted** control and monitoring.
4. Performance requirements for sensitive loads.
5. Load banks.
6. Outdoor enclosure.

1.3 DEFINITIONS

A. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

B. LP: Liquid petroleum.

1.4 SUBMITTALS

A. Product Data: For each type of packaged engine generator indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. In addition, include the following:

1. Thermal damage curve for generator.
2. Time-current characteristic curves for generator protective device.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Dimensioned outline plan and elevation drawings of engine-generator set and other components specified.
2. Design Calculations: Signed and sealed by a qualified professional engineer. Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.

3. Vibration Isolation Base Details: Signed and sealed by a qualified professional engineer. Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include base weights.
4. Wiring Diagrams: Power, signal, and control wiring.

C. Manufacturer Seismic Qualification Certification: Submit certification that engine-generator set, batteries, battery racks, accessories, and components will withstand seismic forces defined in Division 26 Section "Electrical Supports and Seismic Restraints." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

    a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
    b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Qualification Data: For **manufacturer.**

E. Source quality-control test reports.

1. Certified summary of prototype-unit test report.
2. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
3. Certified Summary of Performance Tests: Certify compliance with specified requirement to meet performance criteria for sensitive loads.
4. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
5. Report of sound generation.
6. Report of exhaust emissions showing compliance with applicable regulations.
7. Certified Torsional Vibration Compatibility: Comply with NFPA 110.

F. Field quality-control test reports.

G. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:

1. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.

H. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1. Maintenance Proximity: Not more than **two** hours' normal travel time from Installer's place of business to Project site.
2. Engineering Responsibility: Preparation of data for vibration isolators and seismic restraints of engine skid mounts, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within **200 miles (321 km)** of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

C. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Comply with ASME B15.1.

F. Comply with NFPA 37.

G. Comply with NFPA 70.

H. Comply with NFPA 99.

I. Comply with NFPA 110 requirements for Level **1** emergency power supply system.

J. Comply with UL 2200.

K. Engine Exhaust Emissions: Comply with applicable state and local government requirements.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify **Architect** no fewer than **two** days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without **Architect's** written permission.

B. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: **5 to 40 deg C**.
2. Relative Humidity: 0 to 95 percent.
3. Altitude: Sea level to **1000 feet**.

C. Unusual Service Conditions: Engine-generator equipment and installation are required to operate under the following conditions:

1. **High salt-dust content in the air due to sea-spray evaporation**.

1.7 COORDINATION

A. Coordinate size and location of concrete bases for package engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 2 years from date of Substantial Completion.

1.9 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide **12** months' full maintenance by skilled employees of manufacturer's designated service organization. Include quarterly exercising to check for proper starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

1.10 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. +Filters: One set each of lubricating oil, fuel, and combustion-air filters.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Generator manufacturer must be Cummins-Onan or Kohler.

2.2 ENGINE-GENERATOR SET

A. Factory-assembled and -tested, engine-generator set.

B. Mounting Frame: Maintain alignment of mounted components without depending on concrete foundation; and have lifting attachments.

1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and generator-set center of gravity.

C. Capacities and Characteristics:

1. Power Output Ratings: Nominal ratings as indicated.
2. Output Connections: Three-phase, **four** wire.
3. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of components.

D. Generator-Set Performance:

1. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage from no load to full load.
2. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.
3. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.
4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
5. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
7. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
8. Start Time: Comply with NFPA 110, Type 10, system requirements.

E. Generator-Set Performance for Sensitive Loads:

1. Oversizing generator compared with the rated power output of the engine is permissible to meet specified performance.

    a. Nameplate Data for Oversized Generator: Show ratings required by the Contract Documents rather than ratings that would normally be applied to generator size installed.

2. Steady-State Voltage Operational Bandwidth: 1 percent of rated output voltage from no load to full load.
3. Transient Voltage Performance: Not more than 10 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 0.5 second.
4. Steady-State Frequency Operational Bandwidth: Plus or minus 0.25 percent of rated frequency from no load to full load.
5. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
6. Transient Frequency Performance: Less than 2-Hz variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within three seconds.
7. Output Waveform: At no load, harmonic content measured line to neutral shall not exceed 2 percent total with no slot ripple. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.

8. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to winding insulation or other generator system components.
9. Excitation System: Performance shall be unaffected by voltage distortion caused by nonlinear load.

    a. Provide permanent magnet excitation for power source to voltage regulator.

10. Start Time: Comply with NFPA 110, Type 10, system requirements.

2.3 ENGINE

A. Fuel: **Natural Gas**

B. Rated Engine Speed: 1800 rpm.

C. Maximum Piston Speed for Four-Cycle Engines: 2250 fpm (11.4 m/s).

D. Lubrication System: The following items are mounted on engine or skid:

1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

E. Engine Fuel System:

1. Main Fuel Pump: Mounted on engine. Pump ensures adequate primary fuel flow under starting and load conditions.
2. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.
3. Dual Natural Gas with LP-Gas Backup (Vapor-Withdrawal) System:

    a. Carburetor.
    b. Secondary Gas Regulators: One for each fuel type.
    c. Fuel-Shutoff Solenoid Valves: One for each fuel source.
    d. Flexible Fuel Connectors: One for each fuel source.

F. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity.

G. Governor: **Adjustable isochronous, with speed sensing**.

H. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine-generator-set mounting frame and integral engine-driven coolant pump.

1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.

3. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
4. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.

    a. Rating: 50-psig (345-kPa) maximum working pressure with coolant at 180 deg F (82 deg C), and noncollapsible under vacuum.
    b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

I. Cooling System: Closed loop, liquid cooled, with remote radiator and integral engine-driven coolant pump.

1. Configuration: **Vertical** air discharge.
2. Radiator Core Tubes: **Aluminum**.
3. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
4. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
5. Fan: Driven by **totally enclosed electric motor with sealed bearings**.
6. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
7. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.

J. Muffler/Silencer: Critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.

1. Minimum sound attenuation of 25 dB at 500 Hz.
2. Sound level measured at a distance of 10 feet (3 m) from exhaust discharge after installation is complete shall be [**85**] <**Insert number**> dBA or less.

K. Air-Intake Filter: **Heavy**-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

L. Starting System: **24**-V electric, with negative ground.

1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in Part 1 "Project Conditions" Article.
2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
3. Cranking Cycle: **As required by NFPA 110 for system level specified**.
4. Battery: Adequate capacity within ambient temperature range specified in Part 1 "Project Conditions" Article to provide specified cranking cycle at least **three times** without recharging.
5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above

10 deg C regardless of external ambient temperature within range specified in Part 1 "Project Conditions" Article. Include accessories required to support and fasten batteries in place.

7. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.
8. Battery Charger: Current-limiting, automatic-equalizing and float-charging type. Unit shall comply with UL 1236 and include the following features:

    a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
    b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg C to plus 60 deg C to prevent overcharging at high temperatures and undercharging at low temperatures.
    c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
    d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
    e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
    f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

2.4 CONTROL AND MONITORING

A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of a remote emergency-stop switch also shuts down generator set.

B. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts generator set. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of a remote emergency-stop switch also shuts down generator set.

C. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the generator set. Mounting method shall isolate the control panel from generator-set vibration.

D. Indicating and Protective Devices and Controls: As required by NFPA 110 for Level **1** system, and the following:

1. AC voltmeter.
2. AC ammeter.
3. AC frequency meter.
4. DC voltmeter (alternator battery charging).
5. Engine-coolant temperature gage.
6. Engine lubricating-oil pressure gage.

7. Running-time meter.
8. Ammeter-voltmeter, phase-selector switch(es).
9. Generator-voltage adjusting rheostat.
10. Fuel tank derangement alarm.
11. Fuel tank high-level shutdown of fuel supply alarm.
12. Generator overload.

E. Indicating and Protective Devices and Controls:

1. AC voltmeter.
2. AC ammeter.
3. AC frequency meter.
4. DC voltmeter (alternator battery charging).
5. Engine-coolant temperature gage.
6. Engine lubricating-oil pressure gage.
7. Running-time meter.
8. Ammeter-voltmeter, phase-selector switch(es).
9. Generator-voltage adjusting rheostat.
10. Start-stop switch.
11. Overspeed shutdown device.
12. Coolant high-temperature shutdown device.
13. Coolant low-level shutdown device.
14. Oil low-pressure shutdown device.
15. Fuel tank derangement alarm.
16. Fuel tank high-level shutdown of fuel supply alarm.
17. Generator overload.

F. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.

G. Connection to Data Link: A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication is reserved for connections for data-link transmission of indications to remote data terminals. Data system connections to terminals are covered in Division 26 Section "Electrical Power Monitoring and Control."

H. Common Remote Audible Alarm: Comply with NFPA 110 requirements for Level 1 systems. Include necessary contacts and terminals in control and monitoring panel.

1. Overcrank shutdown.
2. Coolant low-temperature alarm.
3. Control switch not in auto position.
4. Battery-charger malfunction alarm.
5. Battery low-voltage alarm.

I. Common Remote Audible Alarm: Signal the occurrence of any events listed below without differentiating between event types. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset.

1. Engine high-temperature shutdown.
2. Lube-oil, low-pressure shutdown.
3. Overspeed shutdown.
4. Remote emergency-stop shutdown.
5. Engine high-temperature prealarm.
6. Lube-oil, low-pressure prealarm.
7. Fuel tank, low-fuel level.

8. Low coolant level.

J. Remote Alarm Annunciator: Comply with NFPA 99. An LED labeled with proper alarm conditions shall identify each alarm event and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.

K. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

2.5 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Generator Circuit Breaker(s): Molded-case, electronic-trip type; 100 percent rated; complying with UL 489.

1. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
2. Trip Settings: Selected to coordinate with generator thermal damage curve.
3. Shunt Trip: Connected to trip breaker when generator set is shut down by other protective devices.
4. Mounting: Adjacent to or integrated with control and monitoring panel.

B. Generator Protector: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other generator-set protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits. Protector shall perform the following functions:

1. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms.
2. Under single or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.
3. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the generator set.
4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

C. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground-fault. Integrate ground-fault alarm indication with other generator-set alarm indications.

2.6 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Electrical Insulation: Class H or Class F.

D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required.

E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

F. Enclosure: Dripproof.

G. Instrument Transformers: Mounted within generator enclosure.

H. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified.

1. Adjusting rheostat on control and monitoring panel shall provide plus or minus 5 percent adjustment of output-voltage operating band.

I. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

J. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

K. Subtransient Reactance: **12** percent, maximum.

2.7 LOAD BANK

A. Description: Jail Generator. Permanent, outdoor, weatherproof, remote-controlled, forced-air-cooled, **resistive** unit capable of providing a balanced 3-phase, delta-connected load to generator set at 750kw, at **80** percent power factor, lagging. Unit may be composed of separate resistive and reactive load banks controlled by a common control panel. Unit shall be capable of selective control of load in 5 Kw.

B. Resistive Load Elements: Corrosion-resistant chromium alloy with ceramic and steel supports. Elements shall be double insulated and designed for repetitive on-off cycling. Elements shall be mounted in removable aluminized-steel heater cases.

C. Reactive Load Elements: Epoxy-encapsulated reactor coils.

D. Load-Bank Heat Dissipation: Integral fan with totally enclosed motor shall provide uniform cooling airflow through load elements. Airflow and coil operating current shall be such that, at maximum load, with ambient temperature at the upper end of specified range, load-bank elements operate at not more than 50 percent of maximum continuous temperature rating of resistance elements.

E. Load Element Switching: Load bank controller shall govern all switching and load operations of the load bank. Provide programmable automatic operation for KW sensing and regulation of loading on the generator. Using building loads as the base line the load bank shall switch in enough load from the load bank to load and regulate the load on the generator such that at least 60% loading is maintained on the generator at all times. Generator loading shall not exceed 90% at any given time using the load bank.

F. Contactor Enclosures: Heated by thermostatically controlled strip heaters to prevent condensation.

G. Load-Bank Enclosures: NEMA 250, Type 3R, complying with NEMA ICS 6. Louvers at cooling-air intake and discharge openings shall prevent entry of rain and snow. Openings for airflow shall be screened with 1/2-inch- (13-mm-) square, galvanized-steel mesh. Reactive load bank shall include automatic shutters at air intake and discharge.

H. Protective Devices: Power input circuits to load banks shall be fused, and fuses shall be selected to coordinate with generator circuit breaker. Fuse blocks shall be located in contactor enclosure. Cooling airflow and overtemperature sensors shall automatically shut down and lock out load bank until manually reset. Safety interlocks on access panels and doors shall disconnect load power, control, and heater circuits. Fan motor shall be separately protected by overload and short-circuit devices. Short-circuit devices shall be noninterchangeable fuses with 200,000-A interrupting capacity.

I. Remote-Control Panel: Separate from load bank in NEMA 250, Type 1 enclosure with a control power switch and pilot light, and switches controlling groups of load elements.

J. Control Sequence: Control panel may be preset for adjustable single-step loading of generator during automatic exercising.

K. Load Bank to be provided on the Jail Generator.

2.8 OUTDOOR GENERATOR-SET ENCLOSURE

A. Description: Vandal-resistant, weatherproof steel housing, wind resistant up to 100 mph (160 km/h). Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.

B. Description: Prefabricated or preengineered walk-in enclosure with the following features:

1. Construction: Aluminum or non-ferrous metallic, integral structural-aluminum-framed building erected on concrete foundation.
2. Structural Design and Anchorage: Comply with ASCE 7 for wind loads.
3. Space Heater: Thermostatically controlled and sized to prevent condensation.
4. Louvers: Equipped with bird screen and filter arranged to permit air circulation when engine is not running while excluding exterior dust, birds, and rodents.
5. Hinged Doors: With padlocking provisions.
6. Ventilation: Louvers equipped with bird screen and filter arranged to permit air circulation while excluding exterior dust, birds, and rodents.
7. Thermal Insulation: Manufacturer's standard materials and thickness selected in coordination with space heater to maintain winter interior temperature within operating limits required by engine-generator-set components.
8. Muffler Location e**xternal to** enclosure.

C. Engine Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for 2 hours with ambient temperature at top of range specified in system service conditions.

1. Louvers: Fixed-engine, cooling-air inlet and discharge. Storm-proof and drainable louvers prevent entry of rain and snow.
2. Automatic Dampers: At engine cooling-air inlet and discharge. Dampers shall be closed to reduce enclosure heat loss in cold weather when unit is not operating.

D. Interior Lights with Switch: Factory-wired, vaporproof-type fixtures within housing; arranged to illuminate controls and accessible interior. Arrange for external electrical connection.

1. AC lighting system and connection point for operation when remote source is available.
2. DC lighting system for operation when remote source and generator are both unavailable.

E. Convenience Outlets: Factory wired **GFCI**. Arrange for external electrical connection.

F. Jail Generator Enclosure: - Provide structural service platform complete with handrails that meets all OSHA and local codes and requirements for servicing of generator.

2.9 MOTORS

A. General requirements for motors are specified in Division 15 Section "Motors."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
2. Controllers, Electrical Devices, and Wiring: Electrical devices and connections are specified in Division 26 Sections.

2.10 VIBRATION ISOLATION DEVICES

A. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to 1/4-inch- (6-mm-) thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
2. Outside Spring Diameter: Not less than 80 percent of compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.11 FINISHES

A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

2.12 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.

1. Tests: Comply with NFPA 110, Level 1 Energy Converters and with IEEE 115.

B. Project-Specific Equipment Tests: Before shipment, factory test engine-generator set and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:

1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
2. Full load run.
3. Maximum power.
4. Voltage regulation.
5. Transient and steady-state governing.
6. Single-step load pickup.
7. Safety shutdown.
8. Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.
9. Report factory test results within 10 days of completion of test.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine-generator performance.

B. Examine roughing-in of piping systems and electrical connections. Verify actual locations of connections before packaged engine-generator installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions and with NFPA 110.

B. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.

C. Install packaged engine generator with **restrained spring isolators** having a minimum deflection of **1 inch (25 mm)** on 4-inch- (100-mm-) high concrete base. Secure sets to anchor bolts installed in concrete bases. Concrete base construction is specified in Division 26 Section "Electrical Supports and Seismic Restraints."

D. Install Schedule 40, black steel piping with welded joints and connect to engine muffler. Install thimble at wall. Piping shall be same diameter as muffler outlet. Flexible connectors and steel piping materials and installation requirements are specified in Division 15 Section "Hydronic Piping."

1. Install condensate drain piping to muffler drain outlet full size of drain connection with a shutoff valve, stainless-steel flexible connector, and Schedule 40, black steel pipe with welded joints. Flexible connectors and piping materials and installation requirements are specified in Division 15 Section "Hydronic Piping."

E. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.3 CONNECTIONS

A. Piping installation requirements are specified in Division 15 Sections. Drawings indicate general arrangement of piping and specialties.

B. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow service and maintenance.

C. Connect engine exhaust pipe to engine with flexible connector.

D. Connect fuel piping to engines with a gate valve and union and flexible connector.

1. Piping, valves, and specialties for fuel systems outside the building are specified in Division 2 Section "Fuel Oil Distribution."

E. Ground equipment according to Division 26 Section "Grounding and Bonding."

F. Connect wiring according to Division 26 Section "Conductors and Cables."

3.4 IDENTIFICATION

A. Identify system components according to Division 15 Section "Mechanical Identification" and Division 26 Section "Electrical Identification."

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Perform tests recommended by manufacturer and each electrical test and visual and mechanical for "AC Generators and for Emergency Systems" specified in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, single-step full-load pickup test.
3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.

    a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
    b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
    c. Verify acceptance of charge for each element of the battery after discharge.
    d. Verify that measurements are within manufacturer's specifications.

4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine-generator system before and during system operation. Check for air, exhaust, and fluid leaks.
6. Exhaust-System Back-Pressure Test: Use a manometer with a scale exceeding 40-inch wg (120 kPa). Connect to exhaust line close to engine exhaust manifold. Verify that back pressure at full-rated load is within manufacturer's written allowable limits for the engine.
7. Exhaust Emissions Test: Comply with applicable government test criteria.
8. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.

D. Coordinate tests with tests for transfer switches and run them concurrently.

E. Test instruments shall have been calibrated within the last 12 months, traceable to standards of NIST, and adequate for making positive observation of test results. Make calibration records available for examination on request.

F. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

G. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

H. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

I. Remove and replace malfunctioning units and **retest** as specified above.

J. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

K. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

L. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each power wiring termination and each bus connection. Remove all access panels so terminations and connections are accessible to portable scanner.

1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan 11 months after date of Substantial Completion.
2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
3. Record of Infrared Scanning: Prepare a certified report that identifies terminations and connections checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION 260231

SECTION 16600

TRANSFER SWITCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes transfer switches rated 600 V and less, including the following:

1. Service Entrance Rated Automatic transfer switches.
2. Remote annunciation systems.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.

1. Single-Line Diagram: Show connections between transfer switch, bypass/isolation switch, power sources, and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Features and operating sequences, both automatic and manual.
2. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintain a service center capable of providing training, parts, and emergency maintenance repairs within a response period of less than eight hours from time of notification.

B. Source Limitations: Obtain service entrance rated automatic transfer switches and remote annunciators through one source from a single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NEMA ICS 1.

E. Comply with NFPA 70.

F. Comply with NFPA 99.

G. Comply with NFPA 110.

H. Comply with UL 1008 unless requirements of these Specifications are stricter.

1.7 FIELD CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service:

1. Notify Architect no fewer than two days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Architect's written permission.

1.8 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 1 sections.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Contactor Transfer Switches with service entrance rated circuit breaker:

1. Automatic Switch Company (ASCO)

2. Zenith Electric

3. Eaton Electric

2.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.

C. Solid-State Controls: Repetitive accuracy of all settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

D. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

E. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.

F. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are not acceptable.
2. Switch Action: Double throw; mechanically held in both directions.
3. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 225 A and higher, shall have separate arcing contacts.

G. Neutral Switching. Where four-pole switches are indicated, provide neutral pole switched simultaneously with phase poles.

H. Neutral Terminal: Solid and fully rated, unless otherwise indicated.

I. Oversize Neutral: Ampacity and switch rating of neutral path through units indicated for oversize neutral shall be double the nominal rating of circuit in which switch is installed.

J. Heater: Equip switches exposed to outdoor temperatures and humidity, and other units indicated, with an internal heater. Provide thermostat within enclosure to control heater.

K. Battery Charger: For generator starting batteries.

1. Float type rated 2 A.
2. Ammeter to display charging current.
3. Fused ac inputs and dc outputs.

L. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels shall have communication capability matched with remote device.

M. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color-code or by numbered or lettered wire and cable tape markers at terminations. Color-coding and wire and cable tape markers are specified in Section 260553 "Identification for Electrical Systems."

1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.

N. Enclosures: General-purpose NEMA 250, Type 3R, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.3 AUTOMATIC TRANSFER SWITCHES

A. Comply with Level 1 equipment according to NFPA 110.

B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.

C. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.

D. Manual Switch Operation: Unloaded. Control circuit automatically disconnects from electrical operator during manual operation.

E. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.

F. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.

G. In-Phase Monitor: Factory-wired, internal relay controls transfer so it occurs only when the two sources are synchronized in phase. Relay compares phase relationship and frequency difference between normal and emergency sources and initiates transfer when both sources are within 15 electrical degrees, and only if transfer can be completed within 60 electrical degrees. Transfer is initiated only if both sources are within 2 Hz of nominal frequency and 70 percent or more of nominal voltage.

H. Motor Disconnect and Timing Relay: Controls designate starters so they disconnect motors before transfer and reconnect them selectively at an adjustable time interval after transfer. Control connection to motor starters is through wiring external to automatic transfer switch. Time delay for reconnecting individual motor loads is adjustable between 1 and 60 seconds, and settings are as indicated. Relay contacts handling motor-control circuit inrush and seal currents are rated for actual currents to be encountered.

I. Programmed Neutral Switch Position: Switch operator has a programmed neutral position arranged to provide a midpoint between the two working switch positions, with an intentional, time-controlled pause at midpoint during transfer. Pause is adjustable from 0.5 to 30 seconds minimum and factory set for 0.5 second, unless otherwise indicated. Time delay occurs for both transfer directions. Pause is disabled unless both sources are live.

J. Automatic Transfer-Switch Features:

1. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
2. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.
3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
4. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes to automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
5. Test Switch: Simulate normal-source failure.
6. Switch-Position Pilot Lights: Indicate source to which load is connected.
7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

    a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
    b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
9. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
11. Engine Shutdown Contacts: Instantaneous; shall initiate shutdown sequence at remote engine-generator controls after retransfer of load to normal source.
12. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
13. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

    a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
    b. Push-button programming control with digital display of settings.
    c. Integral battery operation of time switch when normal control power is not available.

14. Service Entrance Rating:
    a. Provide transfer switch with main circuit breaker with ratings as shown on drawings ahead of all switch components.
    b. Provide with neutral and ground busses in switch with U.L. required and sized bonding jumper between the two busses.

c. Electrical service entrance components shall be listed and labeled for use with switch components and shall have proper AIC ratings as indicated on the drawings (minimum 65k AIC unless noted otherwise on drawings).

2.4 REMOTE ANNUNCIATOR SYSTEM

A. Functional Description: Remote annunciator panel shall annunciate conditions for indicated transfer switches. Annunciation shall include the following:

1. Sources available, as defined by actual pickup and dropout settings of transfer-switch controls.
2. Switch position.
3. Switch in test mode.
4. Failure of communication link.

B. Annunciator Panel: LED-lamp type with audible signal and silencing switch.

1. Indicating Lights: Grouped for each transfer switch monitored.
2. Label each group, indicating transfer switch it monitors, location of switch, and identity of load it serves.
3. Mounting: Flush, modular, steel cabinet, unless otherwise indicated.
4. Lamp Test: Push-to-test or lamp-test switch on front panel.

2.5 SOURCE QUALITY CONTROL

A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Floor-Mounting Switch: Anchor to floor by bolting.

1. Concrete Bases: 4 inches (100 mm) high, reinforced, with chamfered edges. Extend base no more than 4 inches (100 mm) in all directions beyond the maximum dimensions of switch, unless otherwise.

B. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

3.2 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

C. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

    a. Check for electrical continuity of circuits and for short circuits.
    b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
    c. Verify that manual transfer warnings are properly placed.
    d. Perform manual transfer operation.

4. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

    a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
    b. Simulate loss of phase-to-ground voltage for each phase of normal source.
    c. Verify time-delay settings.
    d. Verify pickup and dropout voltages by data readout or inspection of control settings.
    e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
    f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for 1 pole deviating by more than 50 percent from other poles.
    g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

5. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

    a. Verify grounding connections and locations and ratings of sensors.

6. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

    a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.

b. Simulate loss of phase-to-ground voltage for each phase of normal source.
c. Verify time-delay settings.
d. Verify pickup and dropout voltages by data readout or inspection of control settings.
e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for 1 pole deviating by more than 50 percent from other poles.
g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

7. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

a. Verify grounding connections and locations and ratings of sensors.

C. Coordinate tests with tests of generator and run them concurrently.

D. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

E. Remove and replace malfunctioning units and retest as specified above.

F. Prepare test and inspection reports.

G. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switch. Remove all access panels so joints and connections are accessible to portable scanner.

1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.
2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
3. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment as specified below. Refer to Section 017900 "Demonstration and Training."

B. Coordinate this training with that for generator equipment.

END OF SECTION 260600

SECTION 16601

LIGHTNING PROTECTION SYSTEM

PART 1 – GENERAL

1.1 SCOPE

A. Furnish and install all materials and labor required to provide a complete functional lightning protection and common ground system for the building as shown and detailed on the plans, in strict accordance with this section of the specifications and the applicable contract drawings. This is a performance based specification. The lightning protection company will be strictly responsible for the design and complete installation of the system. The system shall meet all applicable codes and shall be given an UL Master Label prior to final acceptance.

1.2 STANDARDS AND QUALITY ASSURANCE

A. The following specifications and standards of the latest current issue form a part of this specification.

N.F.P.A. - Code No. 780.

B. All materials for this system shall be new and the standard product of a manufacturer regularly engaged in the production of lightning protection systems and shall be of the latest approved designs. Equipment shall be approved for UL listing. All materials shall be as manufactured by Thompson Lightning Protection, Inc. of St. Paul, Minnesota, or approved equal by Heary Brothers. For approval of manufacturer other than specified, complete proposed material data and installation drawings must be submitted to Engineer for review not less than 7 days prior to bid date.

C. In order to insure integrity of installation, the system shall be installed under the direct job site supervision of Certified Master Installer.

1.3 SHOP DRAWINGS

A. Complete shop drawings of the entire lightning protection system showing the type, size, mounting details, and location of all equipment, grounds and cable routings, etc., shall be submitted to the Engineer for approval prior to start of work. If any departures of consequence from the Approved Shop Drawings are deemed necessary by the Contractor, details thereof shall be submitted and approval obtained, before work is resumed and completed.

1.4 SYSTEM

A. System materials in general shall be aluminum, and shall comply in weight, size, and composition for the class of structure to be protected, as specified in above mentioned Codes. The system shall consist of all necessary cables, air terminal, mounting bases, fittings, couplings, connectors, fasteners, etc., as required to provide a complete and coordinated system. All cable and all air terminals shall bear proper UL labels.

B. System conductors shall be concealed wherever practical. All main down leads and roof risers shall be concealed within the building walls or columns on new work or additions to existing structures. Down leads and risers to be run in 1" PVC conduit in locations shown on

Shop Drawings. Down leads in steel frame buildings shall be bonded at the top and bottom. Install suitable junction boxes in conduit system for bonding taps which shall be made with full-size conductors. Rebar steel in these columns shall be lapped a minimum of 24 diameters and ties shall be installed per A.S.T.M. standards. All system fittings except cable holders, regardless of Structure classification shall be heavy-duty type made from bronze castings and secured with bolted-pressure clamps. Pressure plates made from stamped or pressed metal parts, or fittings utilizing crimp-type pressure devices will not be allowed. All bolts, screws and related type hardware shall be stainless steel.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. All materials shall be aluminum as described above, UL approved and labeled as required, and of the size, weight, and construction to suit the application where used in accordance with Code requirements for the Class of structure involved, and as per manufacturer recommendations.

B. Air terminals shall be solid, 1/2" diameter round aluminum bar, full nickel plated, and of sufficient length to project 10" minimum above the object to be protected, and UL labeled. Locate and space points in accordance with L.P.I. requirements.

C. Point bases shall be cast bronze with bolt-pressure cable connectors. Parapet type units shall provide for 1-1/2" coping overhand. Adhesive type bases for flat roofs shall have a minimum surface contact area of 18.5 square inches, and be secure with a proper adhesive.

D. Conductors shall be braided smooth twist or rope-lay stranding commercially pure aluminum cable, sized per Code and UL labeled.

E. Ground rods shall be 3/4" diameter and 10'-0" long cooper-clad steel, connected to system down lead cable with two-bolt bronze clamp with stainless steel cap screws. Driven depth to be minimum of 12 feet.

F. Cable fasteners shall be substantial in construction, compatible with the conductor and mounting surfaces, and spaced according to Code requirements.

G. Bonding devices, cable splicers, and miscellaneous connectors shall be cast bronze with bolt pressure cable connections with stainless steel hardware. Any connections between dissimilar metals shall be made with approved bi-metallic connectors or spacers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All equipment and materials shall be installed in a neat workmanlike manner by skilled installers, under the direct field supervision of a Certified Master Installer who has qualified under the LPI's Certification Program.

B. System installation shall be complete; including necessary cable networks on the roof for air terminals and devices, bonding networks and taps for grounding equipment and roof metals , and down lead conductors routed concealed in building structure to ground level. Where down leads and risers penetrate roofs and walls, suitable 1/2" copper rod type thru-roof connectors shall be used, equipped with necessary lead or neoprene washers and nuts for watertight seal. Copper pitch pockets shall be used at locations with built-up roofs. Adhesive-type point bases and cable holders shall be installed on build-up roof

areas before application of roof gravels. System installers shall thoroughly coordinate their work with other trades to insure a correct, neat, and unobtrusive complete installation.

3.2 BONDING AND SYSTEM GROUNDS

A. A common ground shall be provided between the lightning protection system and the building electric and telephone service grounds. In addition, all underground metallic piping systems shall be bonded with full size conductor; including water, gas, sewer, fuel oil, and any other piping system, at points where these pipings enter the building.

B. The building electrical service shall be provided with a set of lightning surge arresters, secondary as required. Only valve type arresters will be acceptable, either single or three-phase as required.

C. Bonding of all metallic objects and systems at roof levels and elsewhere on the structure shall be complete. Primary bonds for metal bodies of conductance shall be bonded with appropriate fittings and full-time conductor; and shall consist of but not limited to the following: Roof exhaust fans, HVAC units with related piping ductwork, exhaust vents and any other roof piping systems, cooling towers, elevator hoist machinery supports and rails systems, window washing tracks, antenna mast for TV, radio or microwave, flag poles, roof handrails and/or decorative screens, roof ladders, skylights, metal stacks, etc. Exterior architectural metal fascia and/or curtain walls or mullions, which extend the full height of the structure shall also be bonded, if not inherently bonded thru the building frame.

D. Metal bodies in inductance located within six feet of a conductor or object with primary bonds, shall be bonded with secondary cable and fittings. Typical of these are: plumbing vent stacks, roof flashings, parapet coping caps, gravel guards, isolated metal building panels or siding roof drains, down sprouts, roof ventilators, exterior balcony handrails, lower level sizeable miscellaneous metals, etc.

3.3 SUPERVISION AND CERTIFICATION

A. The manufacturer's local representative shall be a Certified Master Installer and shall provide direct job site technical supervision to Contractor's personnel during installation to insure compliance with all Code requirements.

B. Upon job completion, Contractors shall furnish Owners with written certification plus UL Master Label "C", that system is installed in compliance with above Codes.

END OF SECTION

SECTION 16715

STRUCTURED CABLING SYSTEM

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. General Requirements/Provisions shall be considered a part of this section and shall have the same force as if printed herein full. In addition, all information related to communications infrastructure that is documented in the architectural, structural, mechanical, and electrical drawings/documents shall be considered as part of the communications documents.

1.02 QUALITY ASSURANCE

A. Specifications, Standards and Codes: All work shall be in accordance with the following:

1. The current edition of the National Electrical Code (NFPA 70)
2. American National Standards Institute (ANSI)
3. National Electrical Manufacturers Association (NEMA)
4. Telecommunications Industries Association (TIA)
5. Electronic Industries Association (EIA)
6. Institute of Electrical & Electronics Engineers (IEEE)
7. Underwriters Laboratories (UL)
8. American Standards Association (ASA)
9. Federal Communications Commission (FCC)
10. Occupational Safety and Health Administration (OSHA)
11. American Society of Testing Material (ASTM)
12. Americans with Disabilities Act (ADA)
13. Local city and county ordinances governing electrical work
14. In the event of conflicts, the more stringent provisions shall apply.

1.03 SCOPE

A. The work under this section of the specifications shall include furnishing labor, material and equipment required to provide a complete installation of the work indicated on the drawings or as specified herein.

B. All material required to provide a fully operational system but not specifically mentioned or shown on the drawings, shall be furnished and installed without any additional charge.

C. The drawings and specifications are complementary to each other and what is called for by one shall be as binding as if called for by both. If a discrepancy exists between the drawings and specifications, the more stringent shall be included, and the engineer shall be notified of the discrepancy.

D. All structured cabling that is routed thru underground conduits shall be outside plant rated.

1.04 WORK INCLUDED

The Communications Infrastructure installed and work performed under this Division of the Specifications shall include but are not limited to the following:

A. Data Cabling Infrastructure
B. Audio Video Cabling Infrastructure System
C. Wireless Access System Cabling

D. Communications raceways, cable tray, ladder rack, racks and equipment mounting backboards
E. Grounding and Bonding

1.05 DEFINITIONS

A. Terms: The following definitions of terms supplement those of the General Requirements and are applicable to Division 27 - Communications:
B. Provide: As used herein shall mean “furnish, install and test (if applicable) complete.”
C. Infrastructure: As used herein shall mean cable, conduit, raceway, cable tray or j-hooks with all required boxes, fittings, connectors, and accessories; completely installed.
D. Work: As used herein shall be understood to mean the materials completely installed, including the labor involved.

1.06 DRAWINGS

A. Drawings are diagrammatic and show the arrangement and location of pathways, outlets, support structures and equipment. The contractor shall carefully investigate the structural and finish conditions affecting his work and arrange his work accordingly. Should conditions on the job make it necessary to make adjustments to pathways or materials, the contractor shall advise the engineer in writing for approval before proceeding with such work.
B. Materials, equipment or labor not specifically indicated but required to form a complete system shall be provided. Drawings and Specifications do not indicate every item of material, equipment, or labor required to produce a complete and properly operating installation.
C. The right is reserved to make reasonable changes in locations of equipment indicated on drawings prior to rough-in without increase in contract cost.
D. The contractor shall not reduce the size or number of conduit runs indicated on the drawings without the written approval of the Engineer.
E. Any work installed contrary to contract drawings shall be subject to change as directed by the Engineer, and no extra compensation will be allowed for making these changes.
F. The location of equipment, support structures, outlets, and similar devices shown on the drawings are approximate only. Do not scale drawings. Obtain layout dimensions for equipment from Architectural plans unless indicated on communications plans.
G. Verify the ceiling type, ceiling suspension systems, and clearance above ceilings prior to ordering cabling and associated hardware. Notify the engineer of any discrepancies.
H. Review all architectural drawings for modular furniture layouts.

1.07 SUBMITTALS

A. Submit for approval, manufacture specifications of all materials, equipment and systems to be furnished. Work shall not proceed without the Engineer’s approval of the submitted items. Three (3) copies of the following shall be submitted:

1. Submittal specification sheets for individual items for equipment assemblies that consist of more than one item or component shall be submitted. Each specification sheet shall be reviewed and sealed by contractors RCDD. Partial or incomplete submittals will not be considered, reviewed or stored, and such submittals will not be returned except at the request and expense of the contractor.
2. Contractor shall generate shop drawings. Modify reviewed and accepted shop drawings to include revisions based upon completion of work. Submit shop drawings with record drawings on hard copy. Additionally, provide one electronic copy of shop drawings in both AutoCad format (.dwg file) and Visio format(.vsdx

file). Failure to submit electronic file with drawings will be grounds for immediate rejection.

3. Shop drawings shall include equipment racks, patch panels, termination blocks, connection details, rack mounting details and any other details not included in the construction drawings. All Submittal drawings shall be prepared and sealed by the contractors RCDD for approval.

B. Any materials and equipment listed that are not in accordance with specification requirements may be rejected.

C. The approval of material, equipment, systems and shop drawings is a general approval subject to the drawings, specifications and verification of all measurements at the job. Approval does not relieve the Contractor from the responsibility of shop drawing errors. The contractor shall carefully check and correct all shop drawings prior to submission for approval.

1.08 QUALITY ASSURANCE

A. Equipment and materials required for installation under these Specifications shall be the current model and new (less than one [1] year from the date of manufacture), unused and without blemish or defect.

B. Equipment shall bear labels attesting to Underwriters Laboratories, where subject to label service. Manufacturers of equipment and materials pertinent to these items shall have been engaged in the manufacture of said equipment a minimum of three (3) years and be able to furnish proof of their ability by submitting affidavits and descriptive data about their product including size and magnitude comparable to requirements specified herein.

1.09 CONTRACTOR QUALIFICATIONS

A. The contractor shall have total responsibility for the coordination and installation of the work shown and described in the drawings and specifications. The contractor shall be a company specializing in the design, fabrication and installation of integrated communications systems.

B. Communication systems specified shall be installed under the direction of a qualified Contractor. Qualification requirements shall include submittal by the contractor to the engineer of the following:

1. List of five [5] previous projects of this scope, size and nature; including names and sizes of projects, description of work, time of completion and names of contact persons for reference.

2. Certification of contractor's manufacturer-authorization to provide material, perform installation and provide a minimum 25 year manufactures warranty for work to be performed under this contract. <u>This must be provided with submittals for approval.</u>

C. Contractor must have a Registered Communications Distribution Designer (RCDD) on staff. This individual must be a W-2 employee of data contractor. Various types RCDD contractors are not allowed for this project.

D. Submit copy of contractor's RCDD Certificate and resume for verification and approval at time of submittal.

E. All submittal documentation shall be prepared, sealed and signed by the contractors RCDD for approval.

F. Contractor shall have a certified BICSI Technician present at all times during the installation and/or testing of the entire Structured Cabling System.

G. Contractor must have an office regularly staffed on a daily basis with certified service and installation technicians within a 75 mile radius of the project site.

1.10 COORDINATION WITH OTHER TRADES

A. The Contractor shall coordinate communications work with that of other sections as required ensuring that the entire communications work will be carried out in an orderly, complete and coordinated fashion.

1.11 PERMITS

A. Obtain all permits and inspections for the installation of this work and pay all charges incident thereto. Deliver to the Owner all certificates of said inspection issued by authorities having jurisdiction.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

A. Where equipment is identified by manufacturer and catalog number, it shall be as the base of requirements for quality and performance. Where manufacturers for equipment are identified by name, the Contractor may submit for approval, similar equipment of other manufacturers as substitution. The Engineer's decision as to whether the submitted equipment is acceptable shall be final and binding.
B. All changes necessary to accommodate the substituted equipment shall be made at the contractor's expense, and shall be as approved by the Engineer. Detailed drawings indicating the required changes shall be submitted for approval at the time the substitution is requested.
C. If substitutions are made in lieu of devices specified; form, dimension, design and profile shall be submitted to the Engineer for approval.
D. Submit request for approval of substitute materials in writing to the Engineer at least ten (10) days prior to bid opening for review.

2.02 MATERIALS

A. All materials used in this work shall be new and shall bear the inspection label of Underwriters' Laboratories Inc. or certification by other recognized laboratory.
B. The published standards and requirements of the Telecommunications Industries Association (TIA), National Electrical Manufacturers Association (NEMA), the American National Standard Institute (ANSI), the Institute of Electrical and Electronic Engineers (IEEE), and the American Society of Testing Materials (ASTM), are made a part of these Specifications and shall apply wherever applicable.
C. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, for which replacement parts are available.
D. When more than one unit of the same class of equipment or material is required, such units shall be the products of a single manufacturer or partner manufacturers that offer a certified solution.
E. Components shall be compatible with each other and with the total assembly for the intended service.

PART 3 - EXECUTION

3.01 EXAMINATION OF CONDITIONS

A. Prior to the start of work, the Contractor shall carefully inspect the installed work of other trades and verify that such work is complete to the point where installation may properly commence. Start of work indicates acceptance of conditions.

B. Install equipment in accordance with applicable codes and regulations, the original design and the referenced standards.
C. In the event of a discrepancy, immediately notify the engineer in writing.
D. Do not proceed with installation until unsatisfactory conditions and discrepancies have been fully resolved.

3.02 PROTECTION OF SYSTEMS AND EQUIPMENT

A. Protect materials and equipment from damage during storage at the site and throughout the construction period. Equipment and materials shall be protected during shipment and storage against physical damage, dirt, theft, moisture, extreme temperature and rain.
B. During installation, equipment shall be protected against entry of foreign matter on the inside and be vacuum cleaned both inside and outside before testing, operating or painting.
C. As determined by the engineer, damaged equipment shall be fully repaired or shall be removed and replaced with new equipment to fully comply with requirements of the contract documents.
D. Damaged paint on any equipment or material shall be repainted to the same quality of paint, color, finish and workmanship as used by the manufacturer.

3.03 ACCESS TO EQUIPMENT

A. Equipment shall be installed in a location and manner that will allow convenient access for maintenance and inspection.
B. Working spaces shall be not less than specified in the National Electrical Code (NEC) for voltages specified.
C. Where the engineer determines that the contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled, one time only, as directed by the engineer, at no additional cost to the Owner. “Conveniently accessible” is defined as being capable of being reached without the use of ladders or without climbing or crawling under or over obstacles such as motors, pumps, belt guards, transformers, piping and duct work.

3.04 CLEANING

A. During construction, and prior to Owner acceptance of the building, remove from the premises and dispose of all packing material and debris caused by communications work.
B. Remove dust and debris from interiors and exteriors of all communications equipment.

3.05 COMPLETION

A. General: Upon completion of the work, remove excess debris, materials, equipment, apparatus, tools and similar items. Leave the premises clean, neat and orderly.
B. Results Expected: Systems shall be complete and operational and controls shall be set and calibrated. Testing, start-up and cleaning work shall be complete.
C. Maintenance Materials: Special tools for proper operation and maintenance of the equipment provided under this specification shall be delivered to the Owner.

PART 4 – HORIZONTAL CABLING

4.01 APPROVED PRODUCTS

A. Approved Horizontal Copper Cable Manufacturer(s)

1. Berk-Tek
2. Systimax (Uniprise Not Excepted)
3. Nexans

4.02 HORIZONTAL COPPER CABLE

A. 100 OHM Category 6 Balanced Twisted Pair Cable

1. The horizontal balanced twisted pair cable shall meet or exceed the Category 6 transmission characteristics per issue of ANSI/TIA-568-C.2.
2. Cable jacket shall be CMR or CMP rated (according to the space it occupies).
3. All Category 6 cabling shall be equal to Berk-Tek LANmark-1000 Category 6 cabling.
4. Provide Plenum cabling in all plenum areas.
5. Jacket color shall be:
   A. Blue Category 6 cabling for Data.
      1. Berk-Tek Part LANmark-1000
      2. Or Approved Equal

   B. Yellow Category 6 cabling for Security Camera.
      1. Berk-Tek Part LANmark-1000
      2. Or Approved Equal

   C. Green Category 6 cabling for Wireless Access Points.
      1. Berk-Tek Part LANmark-1000
      2. Or Approved Equal

4.03 HORIZONTAL CABLES

A. Cable shall be installed in accordance with manufacturer's recommendations and best industry practices.
B. A plastic or nylon pull cord with a minimum test rating of 90 Kg (200 lb.) shall be co-installed with all cable installed in any conduit.
C. Cable raceways shall not be filled greater than the ANSI/TIA-569-B maximum fill for the particular raceway type.
D. Cables shall be installed in continuous lengths from origin to destination (no splices) except for transition points, or consolidation points.
E. Riser rated cable shall be installed in metallic conduit when installed in a plenum space.
F. Where transition points or consolidation points are allowed, they shall be located in accessible locations and housed in an enclosure intended and suitable for the purpose.
G. The cable's minimum bend radius and maximum pulling tension shall not be exceeded. Refer to manufacturer's requirements.
H. If a J-hook or trapeze system is used to support cable bundles all horizontal cables shall be supported at a maximum of 48 to 60 inch (1.2 to 1.5 meter) intervals. At no point shall cable(s) rest on acoustic ceiling grids, conduit, pipes, duct work or panels.
I. Horizontal distribution cables shall be bundled in groups of no more than 50 cables. Cable bundle quantities in excess of 50 cables may cause deformation of the bottom cables within the bundle and degrade cable performance.
J. Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes or other control devices.
K. Cables shall not be attached to ceiling grid or lighting fixture wires. Where support for horizontal cable is required, the Contractor shall install appropriate carriers from the

building structure to support the cabling.

L. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the Contractor prior to final acceptance at no cost to the Owner.

M. Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA-568-C.2 document, manufacturer's recommendations and best industry practices.

N. Leave a minimum of 12" of slack for twisted pair cables at the outlet. Cables shall be coiled in the outlet box, surface-mount box or modular furniture raceway if adequate space is present to house the cable coil without exceeding the manufacturers bend radius. Excess slack shall be loosely coiled and stored in the ceiling above each drop location when there is not enough space present in the outlet box to store slack cable.

O. Cables shall be neatly bundled and dressed to their respective termination device. Each terminating device shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.

P. Each cable shall be clearly labeled on the cable jacket behind the termination device at a location that can be viewed without removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.

PART 5 – BACKBONE FIBER OPTIC CABLING

5.01 APPROVED PRODUCTS

A. Approved Optical Fiber Backbone Cable (Inside Plant) Manufacturer(s)

1. Berk-Tek
   a) 6, 12 or 24 Strand Single Mode OS2
2. Systimax (Uniprise Not Excepted)
3. Nexans

B. Approved Optical Fiber Backbone Cable (Outside Plant) Manufacturer(s)

1. Berk-Tek
   a) 12 Strand OS2 OSP Part #OPD012AB0403
   b) 24 Strand OS2 OSP Part #OPDD12B024AB0403
2. Systimax (Uniprise Not Excepted)
3. Nexans

C. Approved Optical Splice Cassettes Manufacturer(s)

1. Leviton
   a) Splice Cassette OM4 Part #SPLCS-12A
   b) Splice Cassette OS2 Part #SPLCS-12L
   c) Splice Cassette OS2/APC Part #SPLCS-12V
2. Systimax (Uniprise Not Excepted)
3. Nexans

5.02 OPTICAL FIBER BACKBONE CABLE

A. Outdoor 8.3/125-micron, Singlemode Optical Fiber Non Conductive (OFNR) Loose Tube cable (OS2)

1. Generic Characteristics
   A. The indoor/outdoor optical fiber cable with up to twelve 250-micron coated fibers placed in a color-coded sub-unit bundle with moisture-

blocking gel.

B. The indoor/outdoor optical fiber cable shall meet or exceed the performance criteria found in ANSI/TIA-568-C.3.

C. The indoor/outdoor optical fiber cable shall have sequential length markings printed on the cable jacket.

D. All singlemode fibers shall be pigtail spliced into a rack mounted optical fiber enclosure or wall-mounted enclosure.

E. The loss of fiber shall not exceed 0.5 dB per kilometer @ 1550 nm and 0.5 dB per kilometer @ 1310 nm.

5.04 OPTICAL FIBER PIGTAIL ASSEMBLIES

A. Singlemode Fiber Connectivity

1. The optical fiber pigtail assemblies shall be factory terminated LC for installation onto singlemode 8.3/125-micron fiber.
2. The optical fiber pigtail connectors shall meet or exceed the performance criteria found in ANSI/TIA-568-C.3.
3. The optical fiber pigtail connectors shall be compatible with 900-micron buffered fibers or 250-micron loose-tube fibers.
4. All singlemode fiber pigtail assemblies shall be installed by fusion splicing method only (No Exceptions).
5. Pigtails shall be factory terminated to a color-coded 900-micron buffer tube 3 meters in length. All fiber enclosure shall be equipped with slack storage splice trays that shall be used for housing all pigtail-splicing.
6. The fusion splice loss of each pigtail connector shall not exceed 0.05 dB.
7. The optical fiber adapter module that occupies the faceplate shall be equipped with zirconia ceramic sleeve.
8. Singlemode fiber connector boot color shall be Blue for OS2 and Green for OS2/APC.

5.05 FIBER OPTIC ENCLOSURE SPLICE TRAYS

A. Splice Tray

1. Splice trays shall be capable of housing a maximum of 24 strands of fiber. No more than 24 stands of fiber shall be installed in each splice tray.
2. All splice trays, seals and hardware shall be from the same manufacturer as the rack or wall mount fiber optic enclosure.
3. Splice trays shall utilize heat-shrink seals.

5.06 BACKBONE FIBER OPTIC CABLES (INSIDE PLANT)

A. Cables shall be dressed and terminated in accordance with the recommendations made in ANSI/TIA-568-C.0 and/or ANSI/TIA-568-C.1, manufacturer's recommendations and best industry practices.

B. Backbone cables shall be installed separately from horizontal distribution cables

C. A plastic or nylon pull cord with a minimum test rating of 90 Kg (200 lb.) shall be co-installed with all cable installed in any conduit.

D. Where cables are housed in conduits, the backbone and horizontal cables shall be installed in separate conduits

E. Exposed cables must be OFCP rated if installed in an air return plenum. Riser rated cables shall be installed in metallic conduit if installed in an air return plenum.

F. Where backbone cables and distribution cables are installed in a cable tray or wire way, backbone cables shall be installed first and bundled separately from the horizontal distribution cables.

G. Leave 10' of slack on each end of fiber backbone cable.
H. Backbone cables spanning more than three floors shall be securely attached at the top of the cable run with a wire mesh grip and on alternating floors or as required by local codes.
I. Vertical runs of cable shall be supported to messenger strand, cable ladder, or other method to provide proper support for the weight of the cable.
J. Large bundles of cables and/or heavy cables shall be attached using metal clamps and/or metal banding to support the cables.
K. The cable's minimum bend radius and maximum pulling tension shall not be exceeded. Refer to manufacturer's requirements.
L. Each optical fiber cable shall be individually attached to the respective enclosure by mechanical means. The cables strength member shall be securely attached the cable strain relief bracket in the enclosure.
M. Each optical fiber cable shall be clearly labeled at the entrance to the enclosure. Cables labeled within the bundle shall not be acceptable.
N. Each fiber bundle shall be stripped upon entering the splice tray and the individual fibers routed in the splice tray.
O. A maximum of 24 strands of fiber shall be spliced in each tray
P. Fiber slack shall be neatly coiled within the fiber splice tray or enclosure. No slack loops shall be allowed external to the fiber panel.

5.07 BACKBONE FIBER OPTIC CABLES (OUTSIDE PLANT)

A. All OSP cables brought to the Entrance Facilities shall have 15ft of slack coiled and secured to the wall in the proximity of the fiber enclosure.
B. All cables shall be tagged and identified within each hand-hole/maintenance hole.
C. Place initial cables in bottom conduits to facilitate easy subsequent cable placement.
D. Place leader guard in the duct before placing cable to prevent damaging the cable sheath on the sharp edge of the duct.
E. Ventilate maintenance where gas has been detected before entering the maintenance hole.
F. To ensure that the optical fiber cable's qualities and characteristics are not degraded during installation, excessive pulling tensions and short bending radii will not be allowed. The maximum pulling tension is 600 lbs. The minimum bending radius for cable under tension is 20 times the outside diameter of the cable and for cable at rest is 10 times the outside diameter of the cable.
G. A 600 lb. break-away swivel, along with a slip clutch capstan winch that shows the dynamometer (pulling tension) reading, shall be used at all times during pulling.
H. Reels shall be continuously manned during cable installation.
I. Cable coils shall have at least two points of support on the optical fiber racking system.
J. When mounting the optical fiber slack coils, the minimum bend radius shall not be exceeded; this radius is equal to 10 times the outside diameter of the cable in a static application and 20 times the outside diameter in a dynamic application. At any time during the entire handling process of the optical fiber cable, as much care as possible should be maintained and all the manufacturer's recommendations should be followed.

5.08 OPTICAL FIBER CONNECTIVITY / SPLICING

A. Optical fiber pigtails shall be installed as per the requirements specified by the manufacturer's installation guidelines.
B. All splicing shall be of the fusion type made under Light Injection and Detection Mode. The Contractor shall provide certified and experienced personnel for splicing.
C. Contractor's tools and equipment shall be in excellent working order. Any worn or improperly working tools shall be discarded and not used on this project. All fusion splicers shall be calibrated and labeled according to the manufacturer's specifications. Contractor shall submit certification of calibration for the fusion splicers to the Engineer.

PART 6 – FACEPLATES AND CONNECTORS

6.01 APPROVED PRODUCTS

A. Approved Copper Connectivity Manufacturer(s)

1. Leviton
   a) Cat 6 8P8C Connector Blue-Data Part #61UJK-RL6
   b) Cat 6 8P8C Connector Green-WAP Part #61UJK-RV6
2. Systimax (Uniprise Not Excepted)
3. Nexans

B. Approved Faceplate Manufacturer(s)

1. Leviton
   a) 6 Port Stainless Steel Faceplate Part #43080-1L6
2. Systimax (Uniprise Not Excepted)
3. Siemon

C. Approved Surface Mount Box Manufacturer(s)

1. Leviton
   a) 2 Port Surface Mount Housing Part #41089-2WP
2. Systimax (Uniprise Not Excepted)
3. Siemon

6.02 AUDIO VISUAL APPROVED PRODUCTS

A. Approved Faceplate Module Manufacture(s)

1. Quiktron Rapid Run
2. Extron
3. Or Approved Equal

B. Approved Faceplate Modules

1. HDMI Module: Quiktron Part #42419
2. USB Transmitter Module: Extron Part #60-1252-13
3. USB Receiver Module: Extron Part #60-1252-73

6.03 COPPER CONNECTIVITY

A. Voice/Data Jacks

1. Category 6, 8-Position, 8-Contact (8P8C) Modular Jack
   A. The connector module shall meet or exceed the Category 6E performance criteria per ANSI/TIA-568-C.2.
   B. The eight-position connector module shall accommodate six-position modular plug modular cords without damage to either the cord or the module.
   C. The connector module shall be designed for use at the work area (WA), communications room (TR) and/or equipment room (ER) without modification.
   D. The connector module shall be available in both the T568A and T568B wiring configurations within the same module.

E. The connector module shall have an insulation displacement connection featuring insulation slicing of 22 to 24 AWG plastic-insulated solid copper conductors forming a gas-tight connection.
F. Jack/Icon colors shall be:
    1. Blue for Data
    2. Green for Wireless Access Points

6.04 FACEPLATES

A. Faceplates

1. The faceplate housing the connector modules shall have no visible mounting screws.
2. The faceplate shall have a labeling capability using built-in labeling windows, to facilitate outlet identification and ease network management.
3. The faceplate shall provide flexibility in configuring multimedia workstation outlets that respond to present or future network application needs.
4. Each faceplate shall have a minimum of (4) ports per each outlet location. Each unpopulated port shall have a blank module installed that matches the color of the faceplate.
5. Faceplates shall be stainless steel unless noted otherwise. All faceplates shall match electrical outlet covers. Verify color and size of each faceplate prior to ordering.

6.05 SURFACE MOUNT BOXES

A. The surface mount box shall be sized to accommodate the quantity of outlets per each location as required.
B. A surface mount box shall be provided at each of the following locations: Projector, Wireless Access Point and/or any outlet location serving a ceiling mounted device.
C. Provide a minimum of 15ft of slack at each ceiling mounted outlet location. Slack loop shall be coiled up neatly and placed on a j-hook to support cable.
D. Verify location with owner prior to mounting.

6.06 COPPER CONNECTIVITY

A. 8-position, 8-contact (8P8C) modular jacks shall be installed in accordance with manufacturer's recommendations and installation guides, and best industry practices.
B. Pair untwist at the termination shall not exceed 13 mm (0.5 inch).
C. All outlet locations shall have color-coded 8P8C modular jacks installed. No cable shall be left unterminated.

6.07 FACEPLATES

A. Blank inserts shall be installed where ports are not used.
B. The same orientation and positioning of jacks and connectors shall be utilized throughout the installation.
C. Faceplates shall be installed straight and level.
D. Faceplates shall be installed at the same heights as electrical outlets.

6.08 SURFACE MOUNT BOXES

A. Blank inserts shall be installed where ports are not used.
B. The same orientation and positioning of jacks and connectors shall be utilized throughout the installation.
C. Surface mount boxes shall be installed straight and level.

D. Surface mount boxes shall be installed in an accessible area.

PART 7 – PATCH PANELS AND FIBER OPTIC ENCLOSURES

7.01 APPROVED PRODUCTS

A. Approved Patch Panel Manufacturer(s)

1. Leviton
   a) 24 Port Patch Panel Part #49255-L24
   b) 48 Port Patch Panel Part #49255-L48
2. Systimax (Uniprise Not Excepted)
3. Nexans

B. Approved Optical Fiber Enclosure Manufacturer(s)

1. Leviton
   a) 1RU Rack Mount Fiber Enclosure Part #5R1UH-S03
   b) 2RU Rack Mount Fiber Enclosure Part #5R1UH-S06
   c) 4RU Rack Mount Fiber Enclosure Part #5R1UH-S12
2. Systimax (Uniprise Not Excepted)
3. Nexans

C. Approved Termination Block Manufacturer(s)

1. Leviton
2. Systimax (Uniprise Not Excepted)
3. Nexans
4. Siemon

D. Category 6 Patch Panel

1. The Category 6 patch panel shall be compatible with 19" equipment racks, cabinets or wall mount brackets.
2. The Category 6 patch panels shall be 24 or 48 port unloaded patch panels.
3. The Category 6 patch panels shall be sized to accommodate one port for each cable installed plus 25% spare capacity for future growth. All ports shall be filled with a removable 8-position color coded modular jacks for each system. No port shall be left empty or blank.
4. The Category 6 patch panel shall be equipped with removable 8-position modular jacks color coded for each system and shall allow for termination of both T568A and T568B wiring schemes.
5. Data and WAP cabling shall not occupy the same patch panel. All cabling for each system shall be installed in separate patch panels with color coded modular jacks to match as specified.
6. The Category 6 patch panel shall be equipped with front labeling windows to facilitate port identification.
7. The connector module shall meet or exceed the Category 6 performance criteria per ANSI/TIA-568-C.2.

7.02 OPTICAL FIBER PANELS/ENCLOSURES

A. Rack Mount Optical Fiber Enclosure

1. The rack mount optical fiber enclosure shall be equipped with a sliding drawer to access fibers.

2. The rack mount optical fiber enclosure shall be capable of terminating tight-buffered or loose tube optical fiber cable.
3. The rack mount optical fiber enclosure shall provide for bend radius control throughout the panel as well as storage space for slack cabling.
4. The panel/enclosure shall meet or exceed the performance criteria per ANSI/TIA-568-C.3.
5. The rack mount optical fiber panel/enclosure shall be equipped with optical fiber cassettes.
    A. The optical fiber adapter panels shall accommodate either multimode or singlemode terminated optical fiber.
    B. The optical fiber adapter panels shall be compatible with LC 7 OS2, and OS2/APC connectors.
    C. Single-mode adaptors shall be blue or green in color and equipped with zirconia ceramic sleeves.

7.03 PATCH PANELS

A. Cables shall be dressed and terminated in accordance with the recommendations made in ANSI/TIA-568-C.0 and/or ANSI/TIA-568-C.1, manufacturer's recommendations and best industry practice.
B. Pair untwist at the termination shall not exceed 13 mm (0.5 inch).
C. Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.
D. Cables shall be neatly bundled and dressed to their respective patch panel. Each patch panel shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.
E. Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.

7.04 OPTICAL FIBER PANELS/ENCLOSURES

A. Cables shall be dressed and terminated in accordance with the recommendations made in ANSI/TIA-568-C.0 and/or ANSI/TIA-568-C.1, manufacturer's recommendations and best industry practices.
B. Each cable shall be individually attached to the respective splice enclosure by mechanical means. The cables strength member shall be securely attached the cable strain relief bracket in the enclosure.
C. Bend radius of the optic fiber cable in the enclosure shall not exceed 10 times the outside diameter of the cable.
D. Each fiber bundle shall be stripped upon entering the splice tray and the individual fibers routed in the splice tray.
E. Each cable shall be clearly labeled at the entrance to the splice enclosure. Cables labeled within the bundle shall not be acceptable.
F. A maximum of 24 strands of fiber shall be spliced in each tray
G. Fiber slack shall be neatly coiled within the fiber splice tray or enclosure. No slack loops shall be allowed external to the fiber panel.

PART 8 – PATCH CORDS

8.01 APPROVED PRODUCTS

A. Approved Copper Patch Cord Manufacturer(s)

1. Leviton
    a) See details on drawings for requirements.

2. Systimax (Uniprise Not Excepted)
3. Nexans

B. Approved Fiber Patch Cord Manufacturer(s)

1. Leviton
   a) LC to LC OS2 Fiber Patch Cord 1 Meter Part #UPDLC-S01
   b) LC to LC OS2 Fiber Patch Cord 3 Meter Part #UPDLC-S03
2. Systimax (Uniprise Not Excepted)
3. Nexans

8.02 COPPER PATCH CORDS

A. Category 6 Patch Cords

1. Copper patch cords shall be installed as per the requirements specified by the manufacturer's installation guidelines.
2. The Category 6 patch cord shall be 4-pair, with 24 AWG solid or stranded copper conductors and 8-position modular plug.
3. The Category 6 modular cord cable shall be UL Listed as Type CMR.
4. The Category 6 patch cord shall meet or exceed the requirements of ANSI/TIA-568-C.2.
5. Lengths shall be 3', 5', 7' and/or 10' as required by the Owner.
6. Provide one patch cord for every cable installed that will be utilized for patching between patch panel and switches. Verify length and color with Owner prior to ordering.
7. Provide one patch cord for every cable installed at each work area outlet. Verify length and color with Owner prior to ordering.
   A. The Category 6 patch cord color for Data shall be: Blue
   B. The Category 6 patch cord color for Wireless Access Points shall be: Green

8.03 FIBER PATCH CORDS

A. Singlemode Fiber Patch Cords

1. 8.3/125-micron singlemode fiber patch cord:
   A. Fiber patch cords shall be installed as per the requirements specified by the manufacturer's installation guidelines.
   B. The 8.3/125-micron fiber used in the singlemode fiber patch cord shall have a maximum attenuation of 1.0 dB/km @ 1310 nm and 1.0 dB/km @ 1550 nm.
   C. The optical fiber cord connector shall have a maximum insertion loss of 0.5 dB and a reflectance of -30 dB.
   D. The 8.3/125-micron singlemode fiber patch cord shall meet or exceed the requirements of ANSI/TIA-568-C.3.
   E. The optical fiber cord connector shall be LC to LC duplex.
   F. The singlemode fiber patch cord assembly shall be dual zip jacketed yellow in color.
   G. Lengths shall be 1m, 2m, and/or 3m as required by the application. Verify length with Owner prior to ordering.
   H. Provide a minimum of (3) OS2 LC to LC fiber optic patch cords per each IDF and a minimum of (12) OS2 LC to LC fiber optic patch cords in the MDF. Verify length with Owner prior to ordering.
   I. Provide a minimum of (2) OS2/APC LC to SC fiber optic patch cords per each IDF requiring fiber terminated with OS2/APC fiber connectors and a

minimum of (4) OS2/APC LC to SC fiber optic patch cords in the MDF. Verify length with Owner prior to ordering.

PART 9 – EQUIPMNET RACKS AND ENCLOSURES

9.01 APPROVED PRODUCTS

A. Approved Equipment Rack/Cabinet Manufacturer(s)

1. Chatsworth Products, Inc.
   a) 2-Post Floor Mounted Equipment Racks Part #48353-703
   b) 4-Post Adjustable Server Rack Part #15213-703
2. Hoffman
   a) Wall Mount Equipment Rack Part #E19SWM25U24
3. Middle Atlantic

9.02 EQUIPMENT RACKS/CABINETS

A. Equipment Racks

1. The equipment rack shall be constructed of high strength, lightweight aluminum.
2. The vertical rails of the equipment rack shall be equipped with the EIA hole pattern.
3. 2 Post rack shall be: 7'H x 19"W floor mounted. Vertical channels shall be drilled and taped.
4. 4 Post rack shall be: 7’H with adjustable depth of 26-inches to 38-inches. Vertical channels shall have square punched mounting holes. Provide additional equipment mounting hardware, per each rack installed, to owner upon completion of the installation.
5. Provide a minimum of (50) 12X24 cage nuts with (50) 12X24 rack screws per each 4-Post rack and a minimum of (50) 12X24 rack screws per each 2-Post or wall mount rack provided/installed.
6. Rack color shall be black.

9.03 EQUIPMENT RACKS/CABINETS

A. Equipment racks shall be securely attached to the concrete floor using minimum 3/8" hardware or as required by local codes.
B. Equipment racks shall be installed as per the requirements specified by the manufacturer's installation guidelines.
C. Equipment racks shall be placed with a minimum of 36-inch clearance from each of the corresponding walls: front, rear and one side of the rack or as indicated on Drawings.
D. All equipment racks shall be grounded to the telecommunications ground bus bar.
E. Mounting screws not used for installing patch panels and other hardware shall be bagged and left with the rack or turned over to the owner upon completion of the installation.

9.04 BACKBOARDS

A. Backboards shall be 3/4" void free plywood. Size of backboard shall be 4' x 8' mounted vertically 18” A.F.F. unless otherwise noted differently on Drawings. Backboards shall be painted with two (2) coats of gray fire-retardant paint.

PART 10 – CABLE MANAGEMENT AND LADDER RACK

10.01 APPROVED PRODUCTS

A. Approved Horizontal Cable Management Manufacturer(s)

1. Chatsworth Products, Inc.
   a) 2RU Horizontal Cable Manager Part #35441-702
2. Leviton
   a) 2RU Horizontal Cable Manager Part #492RU-HFR
3. Systimax (Uniprise Not Excepted)

B. Approved Vertical Cable Management Manufacturer(s)

1. Chatsworth Products, Inc.
   a) 6” Vertical Cable Manager Part #35521-703
   b) 8” Vertical Cable Manager Part #35522-703
2. Leviton
   a) 6” Vertical Cable Manager Part #4980L-VFR
   b) 8” Vertical Cable Manager Part #8980L-VFR
3. Systimax (Uniprise Not Excepted)

C. Approved Ladder Rack System Manufacturer(s)

1. Chatsworth Products, Inc.
   a) 12” Ladder Rack Part #11275-712
   b) 18” Ladder Rack Part #11275-718
2. Hoffman
3. Middle Atlantic

D. Approved Tie Wrap/Velcro Strap Manufacturer(s)

1. Leviton
2. Or Approved Equal

10.02 CABLE MANAGEMENT - HORIZONTAL

A. Horizontal Cable Management

1. The horizontal wire manager shall be compatible with 19-inch equipment racks, cabinets or wall mount brackets.
2. The horizontal cable manager shall be double-sided to provide support/management for patch cords at the front of the panel and support/management of cables at the rear of the panel.
3. The horizontal cable manager shall be equipped with removable front and covers
4. The horizontal cable manager shall be 2 rack-units in height, installed above and below each patch panel and each switch as indicated on drawings.
5. Horizontal cable managers shall be black.

10.03 CABLE MANAGEMENT - VERTICAL

A. Vertical Cable Management

1. The vertical cable manger shall be 80” high double-sided, installed on both sides of all racks.
2. The vertical cable manager shall provide support/management for patch cords at the front of the rack and support/management of cables at the rear of the rack.

3. Vertical cable managers shall be installed on both sides of a single equipment rack. Where two (2) or more racks are positioned in a row, vertical cable managers shall be installed between each rack and each end of the row.
4. The vertical cable manager shall be a minimum width of 6".
5. Vertical cable manager color shall be black.

10.04 LADDER RACK

A. Ladder Rack System

1. See Drawings for ladder rack system details.
2. The ladder rack system shall be securely mounted with hardware (triangle brackets, top mounting plates, junction splice kits, butt splice kits, end caps, radius drop kits, etc.) designed for use with ladder rack systems per manufactures recommendations.
3. Ladder rack shall be 12” or 18” wide as indicated on drawings.
4. End caps shall be installed on the exposed ends of the ladder racks and channel supports. Protective covers shall be installed on threaded rods that come in contact with cabling plant.
5. All sections of ladder rack shall be properly grounded to the corresponding telecommunications ground bus bar in each communications room.
6. Ladder Rack System color shall be black.

10.05 TIE WRAPS AND VELCRO STRAPS

A. Tie Wraps and Velcro Straps

1. Tie wraps/Velcro straps installed in air handling spaces must be plenum rated.
2. Backbone cables shall be fastened to support structures with tie wraps/Velcro straps.
3. Horizontal cables shall be fastened to support structures with Velcro straps.
   A. Tie Wraps shall be plenum rated red in color.
   B. Velcro Strap color shall be black.
4. Tie wraps/Velcro straps shall be installed around cables at intervals of 12" minimum.
5. Tie wraps shall secure cables to ladder racks using an “X” pattern.
6. Do not over-cinch cables.

10.06 D-RINGS

A. D-rings

1. D-Rings shall be used on backboards to support cables, patch cords and cross-connect wire.
2. D-Rings shall be made of high-strength, fire-retardant material with rounded edges to prevent damage to cable and wire insulation.
3. Provide D-Rings of appropriate size and quantity for proper cable management and support as required.
4. D-Rings shall be installed on 3/4" backboard, straight and level.

10.07 LADDER RACKS

A. Ladder rack system shall be installed straight, level and perpendicular to walls and ceiling slabs.
B. Ladder racks shall be supported at 4' intervals maximum.
C. Provide all hardware, accessories, fasteners, anchors, threaded rods and support

channels required to provide a complete ladder rack system.

D. Provide ladder rack system at minimum on (2) adjacent walls in each communications room or as indicated on drawings.

E. See Drawings for ladder rack system details.

PART 11 – PATHWAYS

11.01 APPROVED PRODUCTS

A. Innerduct Conduit Manufacturer(s)

1. MaxCell
   a) 3-Cell Part #MXC4003XX
2. Carlon
   a) Plenum-Gard Flexible Conduit Part #CG4X4C-XXX
3. Or Approved Equal

B. Approved Cable Tray System Manufacturer(s)
1. Hoffman Quick Tray Pro Part #QTP4X18
2. Wire Basket Tray Part #WBT4X18
3. Or Approved Equal

C. Approved Cable Hanger Manufacturer(s)

1. Erico Products – Caddy HP Series
2. Hoffman
3. Or Approved Equal

D. Innerduct/Inner-Conduit Channel

1. Innerduct shall be corrugated PVC equipped with mule tape.
2. Inner-conduit channel (MaxCell) shall be 3-cell with each cell equipped with mule tape. Provide a minimum of (2) (Max Cell) 3-cell fabric duct per each underground conduit as indicated on drawings.
3. See Drawings for innerduct/inner-conduit channel (MaxCell) details.

11.02 COMMUNICATIONS OUTLET BOXES

A. Outlet boxes and device covers shall be galvanized steel not less than 1/16" thick.

B. The dimensions of the outlet box shall be 4" x 4" square with a minimum depth of 2-1/8".

C. Outlet boxes shall be equipped with single gang device covers. Where installed in plaster, gypsum board, etc., covers shall be raised to compensate for the thickness of the wall finish.

D. Where outlet boxes are to be empty for future use, blank cover plates shall be used.

11.03 CABLE TRAY

A. Cable Tray System

1. Cable tray shall be aluminum construction.
2. Cable tray cross members shall be factory welded at 12" intervals maximum.
3. Cable tray shall be equipped with one (1) or two (2) support rails that run the length of each segment.
4. End caps shall be installed on the exposed ends of the cable tray, channel supports and bolts. Protective covers shall be installed on threaded rods that come in contact with cabling plant.

5. Wall mount cable tray used in limited clearance areas shall be hook style and constructed of aluminum.
6. Provide all cable tray hardware accessory assemblies required to properly install cable tray system per manufactures requirements.
7. See Drawings for cable tray dimensions.

11.04 CABLE HANGERS

A. J-Hooks

1. J-hooks shall provide sufficient width to comply with required bend radii of high-performance cables. J-hook shall be cULus Listed.
2. J-hooks shall have flared edges to prevent damage while installing cables.
3. J-hooks sized 1 5/16" and larger shall have a cable retainer strap to provide containment of cables within the hanger. The cable retainer strap shall be removable and reusable and be suitable for use in air handling spaces.

11.05 CABLE TRAY SYSTEM

A. Install trays in accordance with recognized industry practices, to ensure that the cable tray equipment complies with requirements of the NEC.
B. All open trays shall be installed a minimum of six (6) inches away from any light fixture.
C. Provide external grounding strap at expansion joints, sleeves, crossover and other locations where tray continuity is interrupted.
D. Support all pathways from building structure. Do not support pathways from ductwork, piping or equipment hangers.
E. Install cable tray level and straight.
F. Provide all hardware, accessories, fasteners, anchors, threaded rods and support channels required to provide a complete cable tray system.
G. Cable trays shall not be used to house both low voltage and power cables unless cables are separated by a grounded physical barrier.
H. Cable tray system shall be grounded in accordance with ANSI/TIA-607-B.

11.06 CABLE HANGERS

A. Installation and configuration shall conform to the requirements of ANSI/TIA-568-C.0, ANSI/TIA-568-C.1 & ANSI/TIA-569-B, NFPA 70 (National Electrical Code), applicable local codes, and to the manufacturer's installation instructions.
B. Install cables using techniques, practices, and methods that are consistent with Category 6 or higher requirements and that supports Category 6 or higher performance of completed and linked signal paths, end to end.
C. Install cables without damaging conductors, shield, or jacket.
D. Do not bend cables, in handling or in installing, to smaller radii than minimums recommended by manufacturer.
E. Pull cables without exceeding cable manufacturer's recommended pulling tensions. Use pulling means that will not damage media.
F. Do not exceed load ratings specified by manufacturer.
G. Adjustable non-continuous support sling shall have a static load limit of 100 lbs.
H. To avoid electromagnetic interference (EMI), pathways shall provide minimum clearances of four feet from motors or transformers, one foot from conduit and cables used for electrical power distribution, and five inches from fluorescent lighting. Pathways shall cross perpendicular to fluorescent lighting and electrical power cables or conduits.

PART 12 – GROUNDING AND BONDING

12.01 APPROVED PRODUCTS

A. Approved Grounding Lug Manufacturer(s)

1. Harger
   a) 2 Hole Compression Lugs Part #GECLB62A
2. Hoffman
   a) 2 Hole Compression Lugs Part #DGCL61
3. Or Approved Equal

B. Approved Grounding Busbar Manufactures(s)

1. Harger
   a) Wall Mount TMGB Ground Bar Part #GBI14412TMGB
   b) Wall Mount TGB Ground Bar Part #GBI14212TGB
   c) Rack Mount Ground Bar Part #RGBHKIT14119.25
2. Hoffman
3. Or Approved Equal

C. Approved OSP Cable Shield Bond Connector Manufacturer(s)

1. 3M
   a) Shield Bond Connector Part #4460-S
2. Or Approved Equal

12.02 GROUNDING CONDUCTORS

A. Grounding Conductor

1. Construction shall be Type THHN copper conductors, insulated with heat and moisture resistant PVC over which a UL listed jacket is applied.
2. Jacket color shall be green.

12.03 GROUNDING LUGS

A. Grounding Lugs and Hardware

1. Grounding lugs shall be 2-hole compression type irreversible. Stainless steel bolts and washers shall be used to install lugs to equipment and grounding bus bars.

12.04 GROUNDING BUSBARS

A. Grounding Busbar

1. The grounding busbar shall be made of 1/4" thick solid copper.
2. The grounding busbar shall be installed with minimum clearance, 1" offsets and 1-1/2" insulators.
3. The grounding busbar shall accommodate 2-hole compression lugs.
4. The grounding busbar shall meet or exceed ANSI/TIA-607-B requirements.

12.05 GROUNDING

A. The facility shall be equipped with a Telecommunications Bonding Backbone (TBB). This backbone shall be used to ground all communications cable shields, equipment, racks, cabinets, raceways, and other associated hardware that has the potential to act as a current carrying conductor. The TBB shall be installed independent of the building's

electrical and building ground and shall be designed in accordance with the recommendations contained in the ANSI/TIA-607-B Telecommunications Bonding and Ground Standard.

B. The main entrance facility/equipment room (EF/ER or MDF) in each building shall be equipped with a telecommunications main grounding busbar (TMGB). Each telecommunications room (TR or IDF) shall be provided with a telecommunications ground busbar (TGB). The TMGB shall be connected to the building electrical entrance grounding facility.

C. All racks, metallic backboards, cable sheaths, metallic strength members, splice cases, cable trays, etc. entering or residing in the EF, ER, or TR shall be grounded to the respective TGB or TMGB using a minimum #6 AWG stranded copper bonding conductor and compression lugs.

D. All wires used for communications grounding purposes shall be identified with a green insulation. Non-insulated wires shall be identified at each termination point with green tape. All cables and busbars shall be identified and labeled in accordance with the ANSI/TIA-606-A.

PART 13 - LABELING

13.01 LABELING REQUIREMENTS

A. Labeling shall be done in accordance with the recommendations made in the ANSI/TIA-606-A document, manufacturer's recommendations and best industry practices.

B. All spaces, pathways, outlets, cables, termination hardware, grounding system and equipment shall be labeled with machine-generated labels.

C. All labels shall be clear with black text.

D. All cables shall be labeled with machine generated, wrap around labels. Handwritten labels will not be accepted.

E. A total of three (3) labels per horizontal cable are required at the following intervals: 6" from outlet; 18" from outlet' 12" from termination block/patch panel.

F. Labeling scheme shall be alphanumeric. Verify labeling scheme requirements with Owner prior to installation.

PART 14 - TESTING

14.01 TESTING REQUIREMENTS

A. General

1. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA-568-C.0, ANSI/TIA-568-C.1 and/or ANSI/TIA-1152. All conductors/strands of each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors/strands in all cables installed.

B. Copper Testing

1. All twisted-pair copper cable links shall be tested for continuity, pair reversals, shorts, opens and performance as indicated below. Additional testing is required to verify Category 6 performance. Horizontal balanced twisted pair cabling shall be tested using a level IIe, III, or IV test unit for category 6 performance compliance.
2. Continuity - Each pair of each installed cable shall be tested using a test unit that

shows opens, shorts, polarity and pair-reversals, crossed pairs and split pairs. The test shall be recorded as pass/fail as indicated by the test unit and referenced to the appropriate cable identification number and circuit or pair number. Any faults in the wiring shall be corrected and the cable re-tested prior to final acceptance.

3. Length - Each installed cable link shall be tested for installed length using a TDR type device. The cables shall be tested from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length shall conform to the maximum distances set forth in the ANSI/TIA-568-C.2 Standard. Cable lengths shall be recorded, referencing the cable identification number and circuit or pair number. For multi-pair cables, the shortest pair length shall be recorded as the length for the cable.

C. Fiber Testing

1. All fiber testing shall be performed on all fibers in the completed end-to-end system. There shall be no splices unless clearly defined in the RFP and/or Drawings. These tests also include continuity checking of each fiber.

2. Singlemode

A. Test the optical fiber cable bi-directionally with an OTDR and uni-directionally with a power meter/light source. Fiber must be tested at both 1310nm and 1550nm. Maximum attenuation dB/Km @ 1310nm/1550nm shall be 0.5/0.5 for outside plant and 1.0/1.0 for inside plant. Maximum attenuation per connector pair shall be .75 dB. Attenuation testing shall be performed with a stable launch condition using one-meter or two-meter jumpers to attach the test equipment to the cable plant. The light source shall be left in place after calibration and the power meter moved to the far end to take measurements. Test set-up and performance shall be conducted in accordance with ANSI/TIA-568-C.3 and to the manufacturer's application guides.

B. All fiber optic stands shall be tested utilizing the “Method B” one jumper reference.

D. Test Results

1. Test documentation shall be provided on disk as part of the as-built package. The disk shall be clearly marked on the outside front cover with the words “Project Test Documentation,” the project name, and the date of completion (month and year). The results shall include a record of test frequencies, cable type, conductor pair (or strand) and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s). The test equipment name, manufacturer, model number, serial number, software version and last calibration date will also be provided at the end of the document. Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle will be required on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.
2. The field test equipment shall meet the requirements of ANSI/TIA-568-C.2, ANSI/TIA-568-C.3, and/or ANSI/TIA-1152.
3. Printouts generated for each cable by the wire (or fiber) test instrument shall be submitted as part of the documentation package. Alternately, the Contractor may furnish this information in electronic form (CD). These CDs shall contain the electronic equivalent of the test results as defined by the Specification and be of a format readable from Microsoft Word.

4. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.

PART 15 – DOCUMENTATION, AS-BUILTS, TRAINING AND RECORDS

15.01 DOCUMENTATION & AS-BUILTS

A. As-Built record documentation for communications work shall include:

1. Cable routing and identification
2. System function diagrams
3. Manufacturers' description literature for equipment
4. Connection and programming schedules as appropriate
5. Equipment material list including quantities
6. Spare parts list with quantities if required.
7. Details not on original Contract Documents
8. Test results
9. Warranties
10. Release of liens

B. The Contractor shall provide and maintain at the site a set of prints which shall accurately show the actual installation of all work under this section, indicating any variation from contract drawings, including changes in pathways, sizes, locations and dimensions. All changes shall be clearly and completely indicated as the work progresses.

C. Progress prints shall be available for inspection by the Owner or any of his representatives and may be used to determine the progress of communications infrastructure work.

D. At the completion of the work, prepare a new set of as-built drawings, of the work as actually noted on the marked-up prints, including the dimensioned location of all pathways.

E. Furnish as-built drawings and documentation to the Project Manager. As-built drawings shall be generated in AutoCad 2006 or later and Visio formats. Submit as-built drawings electronically on C.D. and hard copy.

15.02 OPERATIONS AND MAINTENANCE MANUAL

A. After completion of the work, the Contractor shall furnish and deliver to the Engineer three (3) copies of a complete Operations & Maintenance Manual. A system wiring diagram shall be furnished for each separate system.

B. The manual shall be subdivided into separate sections with tab dividers to identify subsystems of the integrated system. Reference appropriate Specification sections.

C. Provide the following additional information for each electronic system. Information shall be edited for this project where applicable.

1. Point-to-point diagrams, cabling diagrams, construction details and cabling labeling details

15.03 TRAINING

A. The Contractor shall be responsible for training of facility personnel. Training shall take place after occupancy and before acceptance and shall include programs for on-site operations and maintenance of technology and communications systems. Training shall be held at the Owner's site and shall be of sufficient duration and depth to ensure that the trained personnel can operate the installed systems and can perform usual and customary maintenance actions.

15.04 WARRANTY

A. General

1. All equipment is to be new and warranted free of faulty workmanship and damage.
2. Replacement of defective equipment and materials and repair of faulty workmanship within 24 hours of notification, except emergency conditions (system failures), which must be placed back in service within eight (8) hours of notification, all at no cost to the Owner.
3. The minimum warranty provisions specified shall not diminish the terms of individual equipment manufacturer's warranties.

B. Voice & Data Structured Cabling

1. Manufacturer(s) shall provide a minimum 25-year warranty for components used in the installed Structured Cabling System. Defective and/or improperly installed products shall be replaced and/or correctly installed at no cost to the Owner.
2. Contractor shall provide a 1 year material, labor and workmanship warranty on all products installed under this contract against any defects. Defective and/or improperly installed products shall be replaced and/or correctly installed at no cost to the Owner.

END OF SECTION

SECTION 32 1123

AGGREGATE BASE COURSES

PART 1 GENERAL

1.1 SUMMARY

A. This Section covers the material to be used where indicated on the drawings and by this Section.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Related work specified elsewhere includes:

1. Section 31 2000 – "Earthwork"
2. Section 32 1216 – "Hot Mixed Asphalt Paving"
3. Section 32 1613 – "Concrete Curb and Gutters"

1.3 REFERENCES

A. Alabama Department of Transportation (ALDOT) *Standard Specifications for Highway Construction*; 2018 Edition

1.4 SUBMITTALS

A. Submit certifications and gradations for all crushed stone to be used for this project.

B. Submit information on geotextile fabric and sample.

PART 2 PRODUCTS

2.1 CRUSHED STONE

A. The crushed stone shall consist of durable sandstone, limestone, or other hard durable stone approved by the Engineer, which is not excessively weathered. Rock necessary to provide the quantities needed in the construction of the crushed stone blanket shall be quarried at the location of the Contractor's choosing as approved by the Engineer, and hauled to the project site.

B. Unless otherwise specified, crushed stone shall be ALDOT SECT 825 crushed aggregate base materials as defined by the *Standard Specifications for Highway Construction* Manual.

C. Unless otherwise specified, bedding material for PVC pipe shall crushed 57 stone or washed sand, either natural or manufactured.

2.2 GEOTEXTILE FABRIC

A. Contractor shall provide a geotextile fabric that conforms to ALDOT Standards as stated in the *Standard Specifications for Highway Construction* Manual.

PART 3 EXECUTION

3.1 INSTALLATION OF CRUSHED STONE

A. Crushed stone shall be placed in areas shown on the drawings. Stone shall be consolidated by mechanical means.

B. Unless otherwise specified or shown, crushed stone shall have a minimum thickness of 6".

C. All crushed stone shall be underlain by an approved geotextile fabric to prevent erosion.

3.2 INSTALLATION OF GEOTEXTILE FABRIC

A. Contractor shall install geotextile fabric per the manufacture's recommendations.

END OF SECTION 32 1123

SECTION 32 1216

HOT-MIXED ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division Specifications Sections, apply to this Section.

1.2 DESCRIPTION OF WORK:

A. Work described in this section includes new bituminous paving, base, any indicated pavement repairs/resurfacing, and otherwise as indicated on Drawings; In the event of conflict between this Section and Drawings, the more stringent requirements shall be provided.

B. Work shall also include pavement patching for any utility trenches under existing paving and this Contract, with prepared subgrade, 8-inches of base material indicated, 6-inches thick 3,000 psi concrete, prime coat, and 2-inches bituminous concrete overlay, and as indicated on the Drawings.

1. Pavement patch shall extend 9" to 1'-0" beyond each side or edge of trench, and to abut flush with edge where existing paving was cut out as required, to a neat straight line.

1.3 QUALITY CONTROL:

A. Certifications: The Contractor shall submit to the Architect copies of certificates from suppliers of bituminous materials and other manufactured items, certifying that these products comply with specifications and standards listed hereinafter.

1. All asphalt used for pavement shall be produced by a plant certified by the Alabama Department of Transportation (ALDOT).

B. Standard Specifications: Unless otherwise noted, all specifications referred to shall be the "Alabama Highway Department Standard Specifications for Highway Construction", latest edition.

C. Testing: All laboratory and field testing required to ensure compliance with these specifications will be performed by an independent testing laboratory. Refer to Section "Special Conditions," for additional information.

I.4 JOB CONDITIONS:

A. Any base or sub-base areas damaged by weather or construction operations shall be scarified, remixed and recompacted in accordance with requirements before application of the prime coat.

B. Special care and attention shall be given to be certain that paving operations and/or equipment do not cause damage to any existing and/or new buildings, structures, or iinprovements which are to remain.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Provide the paving system(s) indicated on the Drawings, and where indicated, generally to match existing base and paving; Installed in accordance with Part 3 of this Section, and referenced standards.

PART 3 - EXECUTION

3.1 PRIME COAT:

A. Application rates and construction requirements shall be as specified in Alabama Highway Department Specification Section 401, Bituminous Surface Treatments, for a Bituminous Treatment Type "A" which is a prime coat.

3.2 TACK COAT:

A. Construction requirements, including preparation of the existing surface or substrate and maximum application rates, are specified in Article 405.03 of the Alabama Highway Department Specifications.

3.3 PLANT MIX BITUMINOUS CONCRETE BINDER LAYER AND BITUMINOUS CONCRETE WEARING SURFACE:

A. Construction details, including finished surface tolerance, density requirements, and maintenance and protection shall be as specified in Articles 410.03 through 410.07, and 424.04. Rate of application shall be not less than the number of pounds per square yard for a I-inch wearing surface or pavement patching layer, pro-rated for other thicknesses, as indicated, or if not indicated, as required by referenced Alabama Highway Department Specifications.

3.4 CRUSHED AGGREGATE BASE:

A. Construction requirements shall comply with the Alabama Highway Department Specifications for the materials indicated, including in part, applicable portions of Article 825 and Article 301.

1. Compaction: 100% Modified Proctor Density (M.P.D.).

3.5 MODIFIED ROADBED:

A. Construction requirements shall comply with the Alabama Highway Department Specifications for the materials indicated, including in part, applicable portions of Article 230.03.

1. Depth: 12" unless greater depth is indicated on the Drawings or in the "Report of Subsurface Exploration".
2. Compaction: 98% Standard Proctor Density (S.P.D.)

3.6 COMPACTION EQUIPMENT:

A. Compaction equipment shall be self-propelled, capable of compacting the mixture throughout the depth of the layer while it is still in a workable condition without damage to the material.

1. Self-propelled rollers shall have a minimum weight of 10 tons.

3.7 PAVEMENT PATCH:

A. Saw cut perimeter of existing paving to a neat straight line where removal is indicated and/or required.

1. Protect edges of paving and base exposed to prevent cracking, breaking-up, wash-out, erosion, and/or other damage; apply prime coat as specified and at all such vertical edges prior to placing new pavement.

B. Patch pavement with components stated in Paragraph 1.2-B above, in compliance with each component's specified requirements, and as per details and sections on Drawings, if any.

END OF HOT-MIXED ASPHALT PAVING

SECTION 32 1613

CONCRETE CURBS AND GUTTERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division I Specification Sections, apply to this section.

B. Related work specified elsewhere includes:

1. Section 31 2000 - "Earthwork"
2. Section 32 0000 - "Concrete"

1.2 DESCRIPTION OF WORK

A. Work described in this section includes the construction of new concrete curbs and gutters, and/or straight curbs where indicated, and patching between any existing paving and new curb and gutters, sidewalks, etc., flush with and to match existing pavement.

B. Refer to Drawings for additional information and base requirements; In the event of conflict between this Section and Drawings, the more stringent requirements shall be provided.

1.3 QUALITY CONTROL

A. Certifications: The Contractor shall submit to the Architect copies of certificates from suppliers of ready-mix concrete, reinforcing steel, curing material, joint fillers, and other manufactured items, certifying that these products comply with the specifications and standards listed hereinafter.

B. Standard Specifications: Unless otherwise noted, all specifications referred to shall be the "Alabama Department of Transportation", latest edition.

C. Testing: All laboratory and field testing as required to ensure compliance with these specifications shall be performed by a qualified independent testing laboratory. Refer to "Special Conditions Section", for additional information.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete shall be 3,000 psi. A modified mix shall be used if optional machine laid curb and gutter is constructed.

B. Curing material shall be either burlap cloth, waterproof paper, polyethylene sheeting, or impervious membrane.

C. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork in preformed strips.

D. Expansion Joint Materials: Comply with requirements of Section 07 92 00 - "Joint Sealers" for preformed and pourable expansion joint fillers and sealers.

E. Curing and Sealing Compound: Conform to TT-C-800, with 30% solids content minimum.

F. Joint filler and sealer for expansion and construction joints shall also comply with the appropriate requirements of ALDOT.

PART 3 - EXECUTION

3.1 CURBS AND GUTTERS

A. Comply with requirements of Section 03310 - "Concrete," and the following:

1. Construction requirements, including foundation, forms, sections, joints, placing and finishing concrete, curing and protection, and backfilling shall be as specified ALDOT Standard Specifications. Curbs and gutters shall match the profile of existing adjoining curb and gutter, if any, and otherwise as detailed.
2. Curb and gutter shall be constructed in sections having a maximum length of 10-feet. Transverse expansion joints with filler and joint sealer shall be installed at all curb returns and in curb and gutter at intervals not exceeding 40-feet. Similar joints shall be installed behind the curb where sidewalks adjoin the curb and gutter, and at all fixed objects which adjoin or extend through the curb and gutter.
3. Care shall be exercised that "tilt-out" curb and gutter is installed where pavement slopes away from the curb, and that 10-foot long transition sections are used where required to transition between "standard" and "tilt-out" curb and gutter.

3.2 REPAIRS AND PROTECTIONS

A. Repair or replace broken or defective concrete, as directed by Engineer.

B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14-days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

1. Sweep concrete pavement and wash free of stains, discolorations, dirt and other foreign material just prior to final inspection.

END OF CONCRETE CURBS AND GUTTERS

SECTION 32 1723

PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Work described in this section includes marking of graphic symbols, lane separations, parking stripes, and lettering on concrete and asphalt pavements, if any, at locations indicated and as shown on the Drawings.

B. Related work specified elsewhere includes:

1. Section 32 1216 - "Hot-Mixed Asphalt Paving"

1.2 QUALITY CONTROL

A. Certifications: The Contractor shall submit to the Architect copies of certificates from suppliers of materials, certifying that these products comply with specifications and standards listed hereinafter.

B. Standard Specifications: Unless otherwise noted, all specifications referred to shall be Alabama Highway Department "Standard Specifications for Highway Construction", latest edition.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Paint for pavement marking shall be, traffic marking paint complying with Section 856, of the Alabama Highway Department specifications, and as follows:

1. Class 1, Type A (reflective) in public Right-of-Ways, unless otherwise specified by authorities having jurisdiction.

2. Class 1, Type B (non-reflective) within property lines of this project's site.

3. Comply with requirements of Drawings and locality where project is located, if more stringent than above.

PART 3 - EXECUTION

3.1 PAVEMENT MARKING

A. Each individual painted parking stripe shall be 4-inches wide, and shall be laid out as indicated on drawings. Construction requirements shall conform to the applicable parts of Article 701.03 of the Alabama Highway Department Specifications for Class 1, Type as specified, traffic stripe.

1. Color shall be white for asphalt, yellow for concrete pavement, and international blue for striping and graphics for parking spaces for the disabled and handicapped.

2. Use same materials and construction methods for any arrows and symbols indicated on paved areas.

3. Mark paving at each space for the disabled and handicapped (H.C.) with acceptable international graphics symbol, unless otherwise indicated, approximately 4' x 4' in size. Locate centered in space width and approximately 2'-0" from end of space where vehicle enters.

END OF PAVEMENT MARKINGS

SECTION 32 8423

IRRIGATION WORK

PART 1.0 - GENERAL

1.1 RELATED DOCUMENTS:

A. The general provisions of the Contract, including General and Supplementary Conditions, and General Requirements apply to the work specified in this Section.

B. Section 329000 - "Landscape Work"

1.2 DESCRIPTION OF WORK:

A. Furnish all labor, materials, equipment and services necessary for the complete installation of the landscape irrigation system as drawn and specified. The work includes, but is not limited to:

1. Trench, backfill and compaction for irrigation lines.
2. Automatically controlled landscape irrigation system; backflow preventer; pressure reducing valve; isolation gate valves; piping and sleeves under paving; repair of paving, main and lateral lines; electrical valves and wiring; valve boxes and controllers; sprinklers; couplings; connectors; fittings; and if needed, tape and meter.
3. Test all systems and make operative.
4. Submit Record Drawings and Maintenance Manual.
5. One-year Guarantee Period.
6. Maintain and operate for 1-year beyond Date of completion of Substantial Completion punch list.

1.3 QUALITY CONTROL:

A. Installer Qualifications: Firm shall hold Alabama General Contractors License for Specialty Construction, Subclassification - Landscaping or Other Specialty Construction (specified as Irrigation). Firm experienced in the successful installation of a minimum of five (5) projects within the past five (5) years similar in scope, quality, and contract value to that indicated for this project. Firm shall have sufficient manpower, equipment and financial resources to complete the Work of this Section.

B. The Owner and the Landscape Architect reserve the right to reject any and all materials and workmanship, which they deem to be not in accordance with Drawings and Specifications. Rejected materials and work shall be removed from site immediately and replaced with that of the specified quality.

C. Applicable Standards:

1. ASTM:
   a. D1785: Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedule 40.
   b. D2464: Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Threaded, Schedule 40.
   c. D2466: Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Socket Type, Schedule 40.
   d. D2564: Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

D. Applicable Codes:

1. Most current edition of Uniform Plumbing Code.
2. Applicable Building Code.
3. All applicable local codes and ordinances.
4. National Electrical Code.
5. Should Specification's requirements differ from local requirements, consider Contract Document requirements to be the minimum acceptable and comply with any more stringent local requirements.

E. Permits and Fees:

1. Obtain all permits and pay required fees to any agency having jurisdiction over the work.
2. Arrange inspections required by local ordinances during the course of construction.
3. Upon completion of the work, furnish satisfactory evidence to show that all work has been installed in accordance with the ordinances and code requirements.

F. Testing:

1. Perform testing and inspections required by specifications and by regulating authorities.
2. Give 24-hours notice that such tests are to be conducted.

1.4 <u>SUBMITTALS</u>:

A. Qualification data for firms specified in "Quality Control" article to demonstrate their capabilities and experience. Include a list of a minimum of 5-similar projects completed within the last 5-years with project name, address, names of Architects and Owners, overall description of scope of work and contract value.

B. Shop Drawings:

1. Submit with Shop Drawings manufacturer's catalog sheet showing full specifications of each type sprinkler proposed including discharge of GPM, minimum allowable operating pressure at sprinkler, maximum allowable spacing and distance of throw (coverage).

C. Record Drawings:

1. Prepare and submit a reproducible Record Drawing showing deviations from the Contract Documents made during construction affecting the main line pipe, controller location, valve locations, and all sprinkler head locations. Record Drawings shall also indicate and show approved substitutions of size, material, and manufacturer's name and catalog number and name.
2. Deliver Record Drawings with request for inspection and acceptance.
3. Deliver one (1) set of record drawings, reduced in size and laminated. Drawings should be suitable for mounting adjacent to irrigation controller.

D. Maintenance Manual:

1. Prepare and submit irrigation system maintenance and operating instructions, with relevant manufacturer's literature. Include complete parts list covering all operating equipment.
2. Submit in a hardcover, 3-ring binder.
3. Include full name, address, and telephone number of Installer.

1.5 COORDINATION:

A. Coordinate and cooperate with the Architect and other contractors and trades to enable the work to proceed as rapidly and efficiently as possible, and to be completed on schedule.

B. Anticipate last minute delays, which may necessitate overtime work to complete the work on schedule. Sleeves under paving shall be placed by Site Contractor. Coordinate with other trades on site for sequencing of work.

1.6 SITE INSPECTION:

A. Become familiar with all site conditions.

B. Should utilities not shown on plans be found during excavations, promptly notify the Architect for instructions as to further action.

C. Make necessary adjustments in the layout as may be required:

1. To connect to existing stubouts (should such stubs not be located exactly as shown); or
2. To work around existing work. Such adjustments shall be made with no increase in cost to the Owner.
3. To avoid existing utilities.

1.7 PROTECTION OF EXISTING CONDITIONS:

A. Take necessary precautions to protect site conditions to remain.

B. Should damage be incurred, repair the work to its original condition at no additional cost to the Owner.

PART 2.0 - PRODUCTS

2.1 PVC PIPE - (Polyvinyl Chloride Pipe):

A. PVC pipe shall be manufactured in accordance with standards noted herein.

B. Marking and Identification: PVC pipe shall be continuously and permanently marked with the following information:

1. Manufacturer's name, pipe, size, type of pipe and material, SDR number, ASTM standard number and NSF (National Sanitation Foundation) seal.

C. Irrigation Water Piping:

1. Main Lines: ASTM D-1785, Schedule 40.
2. Lateral Lines: ASTM D-1785, Class 200.

D. This Contractor is responsible for determining if sleeves were installed prior to submitting a bid. If not installed, boring under paving, and/or hand excavation is required.

2.2 PIPE FITTINGS:

A. PVC: Meeting specified standards, Schedule 40, Standard Weight, at PVC pipe; joints solvent welded as recommended by manufacturer, except swing joints and riser to head, which shall be threaded with Teflon Tape. Swing joints shall be Schedule 80.

2.3 SOLVENT CEMENT:

A. Meeting ASTM D-2564 and of proper consistency.

2.4 RISERS:

A. Spray Heads in all areas use swing pipe. Submit sample of swing joint for approval.

B. Rotor heads use triple elbow swing joint, submit sample of swing joint for approval.

2.5 VALVES:

A. Electric Remote-Control valve sized as per manufacturer’s recommendations, mechanical joint.

2.6 BACKFILL UNDER PAVING:

A. Crushed stone of the following gradation, placed and compacted to 100%:

1. 100% passing ½-inch sieve.
2. 90-100% passing 3/8-inch sieve.
3. 60-85% passing #4 sieve.
4. 40-70% passing #8 sieve.
5. 10-25% passing #50 sieve.
6. 1-5% passing #200 sieve.

2.7 VALVE BOX AND COVER:

A. Ametek or equal with provision for locking.

2.8 AUTOMATIC CONTROLLER:

A. Provide controller with ample stations for system, 120 Volt power will be supplied by others.

2.9 CONNECTION TO WATER MAIN:

A. Install backflow preventer as per City recommendations.

B. If needed, install irrigation water meter and tap as per City recommendations.

C. Contractor to check pressure at water meter and install a pressure reducing valve if pressure is too excessive for irrigation system.

PART 3.0 - EXECUTION

3.1 GENERAL:

A. Verify existing and proposed locations of all site utilities (i.e. gas, water, electric, telephone) prior to any trenching and laying of pipe.

B. Coordinate all irrigation work with that of all other site work trades and contractors.

C. All piping to be installed directly behind curb where possible and in all cases to be routed around existing or proposed site elements, including root balls of proposed trees and shrubs. Refer to the landscape planting Drawings for approximate tree locations and closely coordinate work and schedule with grading and planting work.

D. Contractor is responsible for full and complete coverage of all areas designated on the Drawings to be irrigated and shall make any necessary adjustments at any time, at no additional cost to the Owner.

E. Exact location and configuration of islands and other features may vary from that shown on these Drawings. Verify location and configuration at the site prior to trenching for sleeves and piping under paving, and make any minor adjustments to irrigation systems layout. Notify Architect of substantial changes.

F. Maintain all warning signs, barricades, bracing, flares, and red lanterns as required by safety regulations and local ordinances.

3.2 INSTALLATION:

A. General:

1. Lay out according to site coordinates and actual field dimensional controls; verify piping and sleeve locations before trenching.

B. Excavating and Trenching:

1. Perform all excavation required for installation of the work included under this Section, including shoring and bracing of earth banks to prevent cave-in.
2. Restore all surfaces and existing underground installations damaged or cut as a result of the excavations, to their original condition and in a manner approved by the Owner.
3. All excavation shall be unclassified. Trenches shall be 4-inches wide and to the depth required as specified herein and shown in the Drawings.
4. Over-excavation shall be backfilled at the Contractor's expense with cushion sand. Remove all unsuitable or excess material from the site.
5. Dewater excavations as required for dry work including both surface and ground water.
6. Trenches shall have sides as nearly vertical as possible and bottoms shall be shaped to provide continuous bedding of each section of pipe along its entire length in undisturbed soil or thoroughly compacted fill.
7. Trenches for piping shall be of sufficient depths to provide 12-inches minimum cover for pipes from finished grade. In Public Right-Of-Way, provide 18-inches minimum cover over top of main and lateral lines, or greater depth if required by local authorities.

C. Pipe Installation:

1. Pipe installation includes all irrigation piping required for water and electrical wiring to complete the automatic irrigation system.
2. Provide firm, uniform bearing for entire length of each pipeline to prevent uneven settlement. Wedging or blocking of pipe will not be permitted. Remove foreign matter or dirt from inside of pipe before joining and keep piping clean by approved means during and after laying of pipe.
3. Assemble pipe and solvent weld. Clean joint thoroughly of dust, dirt, and moisture before applying solvent with non-synthetic bristle brush.
4. Install all pipe and wiring under paving in sleeves as specified, whether or not shown on Drawings. Pressure test all piping under paving prior to paving. All mains and piping under pavement to be pressure tested and activated immediately.

D. Pipe Fitting:

1. Solvent: Use only solvent recommended by manufacturer to make solvent welded joints. Thoroughly clean pipe and fittings of dirt, dust and moisture before applying solvent.

2. PVC to Metal Connection: Work metal connection first. Use a TEFLON pipe fitting tape on threaded PVC to metal joints. Use only light wrench pressure.
3. Threaded PVC Connections: Where required, use threaded PVC adapters into which pipe may be welded.

E. Irrigation Heads:

1. Prior to installation, verify configuration of planting areas and tree locations, and stake head layout accordingly. Obtain approval of staked head locations from Landscape Architect before proceeding.
2. Rotor and Pop-up Spray Heads: Attach sprinkler as specified. Adjust riser height after planting.

F. Wiring:

1. Supply #14 UL listed single strand U.F. direct burial wire from automatic controllers to the valves in accordance with the Specifications. Use PVC conduit for all locations of wire under paving; in landscaped areas, the Contractor may add conduit for wires at his option, in lieu of tucking wire under main lines and lateral lines.
2. Secure all wire-to-wire connections by approved means.
3. All wire from controllers to valves shall be tucked under piping.
4. Test wires prior to backfilling to insure continuity from valve location to controller location. Any wire not indicating continuity shall be repaired or replaced immediately.

G. Controller:

1. Coordinate controller location with Architect and Contractor.
2. Coordinate with Alabama Power Company to provide temporary power to controller location. This Contractor shall make power available for system.
3. Pull valve wires, program controller, and put controller in operations.

H. Electrical Valves: Supply and install in accordance with the materials list and the manufacturer's recommendations; set in a level position.

I. Valve Boxes: Set flush with finish grade (adjust as necessary); set over all valves.

J. Drainage: Place a minimum 12-inches depth of crushed stone under each box containing either water meter, pressure regulator, valve or backflow preventer.

3.3 <u>TESTING</u>:

A. Conduct test in presence of Architect. Notify Architect 48-hours in advance of testing date and time:

1. Thoroughly flush out all water lines before installing heads and valves.

2. Operational Test: After backfilling and adjusting heads to final positions, show that system meets coverage requirements and controls function properly. Adjust heads to be not more than ½-inches above finish grade.

3.4 BACKFILL AND COMPACTING:

A. Do not backfill until pipe systems have been hydrostatic tested and approved.

B. After system is operating and required tests and inspections have been made, backfill excavations and trenches as follows:

1. Backfill Under Paving:

a. Backfill for full depth of excavation with the specified crushed stone. Compact in lifts. Backfill shall be free of debris, large clods, roots or other deleterious material.
b. Place backfill material evenly in lifts not to exceed 6-inched and compact to 100-percent of maximum density.
c. Contractor is responsible for establishing compaction in trenches equal to or exceeding overall compaction of paving base. Leave top of trench ready for asphalt by others.

2. Backfill in Landscape Areas:

a. Backfill trenches with material removed during excavation and compacted to 85-percent except where rock is encountered. In this case lay pipe in a cushion sand bed surrounding the pipe, a minimum of 4-inches deep.
b. Compact all excavation to prevent settling. Hand rake excavation areas and adjoining areas to leave grade at the previous elevation and in a good or better condition than before installation. Water-floor compaction will not be permitted.
c. Repair settled areas throughout Guarantee Period, including repair of affected landscape work.

3.5 FINAL ADJUSTMENT:

A. After planting and irrigation installation has been completed, make final adjustment to irrigation system prior to the Architect's final inspection.

B. The system shall be completely flushed to remove any and all debris from the lines by removing nozzles from all heads on ends of lines and turning on the system.

C. Check all heads for correct operation, alignment, and direction of throw.

D. Check each section of spray heads for operating pressure, and balance in relation to all other sections by use of the flow adjustment on top of each valve.

E. Check nozzles for complete coverage. Prevailing wind or other conditions may indicate the arc or angle of spray should be other than as shown on plan. In this case, revise nozzle degree to provide correct coverage, at the Contractor's expense.

F. Adjust head and valve heights as necessary. Make any other adjustments determined necessary by the Landscape Architect to provide complete and uninterrupted coverage.

3.6 CLEAN-UP:

A. Keep site clean on a daily basis by removing trash and debris resulting from construction operation.

B. Keep all walks, roads, and circulation routes free from debris, materials, and equipment at all items.

C. Upon completion of the irrigation work, clean up all work and storage areas by removing trash piles, surplus material, or other material from site.

D. Restore pavement, curbs, ground, and any other disturbed surface to its original condition.

3.7 MAINTENANCE AND COMPLETION OF THE WORK:

A. Complete the irrigation system as specified and operate and maintain same from time of installation until Substantial Completion and for a period of 1-year beyond Substantial Completion.

B. Instruct Owner's personnel in complete operation and maintenance of irrigation system.

SECTION 4.0 - ACCEPTANCE AND GUARANTEE

4.1 SUBSTANTIAL COMPLETION:

A. Submit request for inspection for Substantial Completion to the Landscape Architect at least 24-hours prior to anticipated date of inspection and testing (refer to Paragraph 3.3 TESTING, herein).

B. Submit Record Drawings and Maintenance Manual to the Landscape Architect with request for inspection (refer to Paragraph 1.4 SUBMITTALS, C. and D., herein).

C. Review the work jointly with the Owner and Landscape Architect for Substantial

Completion.

D. Upon completion of repairs and replacements found necessary at time of review, the Owner and Architect will confirm the date of Substantial Completion of the work.

E. The date of completion of repairs and replacements found necessary at time of Substantial Completion, will constitute the beginning date of the 1-Year Guarantee.

4.2 GUARANTEE:

A. Guarantee all work, products, equipment, and materials for 1-year, beginning at date of completion of punch list from Substantial Completion.

B. During the period of the Guarantee, replace immediately, with no additional compensation, all work not functioning correctly; make adjustments as necessary to maintain complete coverage; make good any other damage, loss, destruction, or failure. Repairs and replacements shall be done promptly and at no additional cost to the Owner.

C. Repair damage to grade, plants, and other work or property as necessitated due to irrigation defects, repairs, replacement, or adjustment.

D. If the replacement is not acceptable during or at the end of the Guarantee Period, the Owner may elect either subsequent replacement or credit. Replacement products shall have a similar 1-year guarantee from time of replacement.

E. Guarantee applies to all losses with the exception of those due to Acts of God, Vandalism, or Owner neglect, as determined by the Landscape Architect.

4.3 FINAL INSPECTION AND ACCEPTANCE:

A. At end of Guarantee Period and upon request for inspection, jointly review all guaranteed work for Final Acceptance.

B. Submit written request for inspection for Final Acceptance to the Landscape Architect at least 2-weeks prior to anticipated date of inspection; include list of work provisionally accepted and list of work replaced during Guarantee Period.

C. Upon completion by the Contractor of all required repairs and replacements; the Owner and the Landscape Architect will confirm the date of Final Acceptance of the Work.

END OF IRRIGATION WORK

SECTION 32 9000

LANDSCAPE WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The general provisions of the Contract, including General and Supplementary and General Requirements apply to the work specified herein.

1.2 DESCRIPTION:

A. Provide all labor, equipment, materials and services necessary to complete the Work of this Section, including:

1. Providing, placing, grading topsoil and/or sand for landscape grading as indicated in the Drawings.
2. Providing and installing trees, shrubs, ground covers, and solid sod for landscape planting.
3. Maintenance for thirty days after Substantial Completion.

1.3 SUBMITTALS:

A. Qualification Data for firms specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include a list of a minimum of five (5) similar projects completed with the last five (5) years with project name, address, names of Architects and Owners, overall description of scope of work, and contract value.

B. Materials Lists:

1. Within ten (10) days of award of Contract, submit a complete list of materials and unit prices demonstrating source, availability, and complete conformance with requirements specified.
2. Substitutions not permitted unless proof is submitted to the Landscape Architect's satisfaction that the material is unavailable as specified.

C. Certificates: Deliver all certificates of inspection to the Engineer.

D. Product Data:

1. Submit manufacturer's product literature, instructions and guaranteed analysis for fertilizer.

1.4 DEFINITIONS:

A. Trees, shrubs, and groundcovers are plant materials listed in Plant Schedule on Drawings.

1.5 JOB CONDITIONS:

A. Coordinate the Work of this Section with that of other trades.

B. Examine conditions under which Work is to be performed and notify Landscape Architect and Landscape Architect in writing of unsatisfactory conditions.

C. Do not perform Work until conditions are satisfactory and acceptable.

D. Notify utility companies, prior to digging, for locations of underground utilities (electrical power, telephone, cable, water, sewer and gas) and perform Work in a manner which will avoid all possible damage. Hand excavate as required.

E. Maintain stakes or other location markers and controls set by others until removal is mutually agreed upon by all parties.

1.6 QUALITY ASSURANCE:

A. Codes and Standards:

1. Applicable Sections of Alabama Highway Department (ALDOT) Standard Specifications for Highway Construction, latest Edition as amended.
2. All plant materials to comply with State and Federal laws relating to inspection for disease and insect control.
3. Plant material quality to conform to *American Standard for Nursery Stock*, American Association of Nurserymen, Inc., 1986, ANSI Z-60.1.1
4. Plant Material nomenclature to conform to:

    a. *Hortus Third*, a Concise Dictionary of Plants Cultivated in the United States and Canada, MacMillan Publishing Company, Inc., New York, 1976 Edition.
    b. Names not listed in the above standard to comply with those most commonly used in the trade.
    c. In all cases, botanical names take precedence over common names.

B. Installer Qualifications: Firm shall hold Alabama General Contractor's License for Classification S - Specialty Construction, Subclassification 4 - Landscaping. Firm experienced in the successful installation of a minimum of five (5) projects within the past five (5) years similar in scope, quality, and contract value to that indicated for this project. Firm shall have sufficient manpower, equipment and financial resources to complete the Work of this Section.

C. Personnel: Use adequate numbers of skilled workmen trained and experienced in the Work and familiar with requirements and methods needed for performance of the Work. At all times during planting operations, have on the site a person knowledgeable in horticultural practices as a superintendent.

D. Inspection and Approval:

1. All plant material is subject to inspection and approval in the field or nursery before

digging, by the Landscape Architect.

2. All plant materials and other materials are subject to inspection and/or rejection at the site before planting or placing, or at any other time.
3. Attach secure, durable, legible waterproof labels, stating correct botanical and common names as specified, to a least one (1) plant, bundle or container of each plant variety.
4. Remove from site plant materials or other materials not complying with specified requirements within 5 days of rejection.
5. Approval is for visual qualities only and does not relieve the Contractor of his obligation to provide materials and workmanship in full compliance with the requirements of the Contract Documents.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Deliver packaged materials in manufacturer's original containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery, and while stored at the site.

B. Deliver all non-packaged or non-containerized materials to site in a manner that will prevent loss, damage, deterioration or contamination.

C. Store all materials in approved locations to prevent loss, damage, deterioration or contamination.

D. Deliver, storage and handling of all plant materials shall conform to ALDOT Specifications and the following:

1. Deliver freshly dug plants, which have not been in cold storage or heeled-in.
2. Do not prune prior to delivery.
3. Do not bend or bind trees or shrubs in such a manner as to damage bark, break branches or destroy natural shape.
4. Provide necessary protective covering during transport and delivery.
5. Deliver plants after preparations for planting have been completed and approved, and plant immediately.

1.8 SITE MAINTENANCE:

A. Keep roads, paving and structures adjacent to maintenance operations clean and free of obstructions, mud and debris at all times.

B. Do not permit flushing of roads or disposal of dirt or debris into sewers or drainage ditches.

C. Control dust from maintenance operations.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS:

A. Topsoil:
   1. This Contractor shall furnish topsoil in sufficient quantity, to complete grading and planting operations as specified.
   2. Characteristics of topsoil to be furnished:
      a. Fertile, friable, naturally occurring. Free of stones, clay, lumps, hardpan, roots, stumps, branches, sticks and other debris larger than two (2) inches in any dimension; free of noxious weeds, grasses, seeds, plants, extraneous matter and any substance harmful to plant growth. Topsoil from open fields will not be accepted.
      b. Ph: 5.0 to 7.0
      c. Organic Matter: 5% to 10%
      d. Sand: 50% to 70%
      e. Silt: less than 30%
      f. Clay: 10% to 25%
      g. Permeability Rate of 5 x 10 <-3> centimeters or greater at 85% compaction.

B. Notify Engineer of location of proposed topsoil for his inspection before testing or transporting to site.

C. Topsoil testing for furnished topsoil: Sample and test, minimum of three (3) samples, for compliance with specified characteristics. Tests to be performed by soil testing lab approved in advance by Engineer, by this Contractor at his expense. Submit Soil Test Reports to Landscape Architect for approval before transporting topsoil. Amend per recommendations of Soil Test Report and as approved to meet specified characteristics.

2.2 SOIL AMENDMENTS:

A. Fertilizer:
   1. Characteristics:
      a. Uniform in composition.
      b. Dry and free-flowing.
      c. Commercially available.
      d. Conforming to the State of Federal Fertilizer Laws.
   2. Of the formulation recommended in the Soil Test Report as specified.

B. Lime:
   1. Ground or crushed agricultural lime.
   2. Containing not less than 85% of total carbonates.
   3. 90% passing 20-mesh screen.
   4. Not less than 50% passing a 60-mesh screen.
   5. Dry and free-flowing.
   6. Apply at rate specified in Soil Test Report.

2.3 LANDSCAPE PLANTING MATERIALS:

A. Water:

1. Provide fresh water, free of impurities or any substance harmful to plant growth.
2. Provide all hose, attachments, and accessories necessary to complete the Work as specified.

B. Topsoil: Refer to Paragraph 2.1.A, this Section, for specified topsoil for use in all planting operations.

C. Topsoil Mix:

1. Prepare all topsoil mix used in tree and shrub pits and ground cover beds in the following proportions:

   a. 2 parts by volume topsoil as specified. 2.1.A.
   b. 1 parts by volume decomposed organic matter, 2.3.E.

2. Add three (3) pounds of 12-6-6 fertilizer to each cubic yard of topsoil mix during the mixing process, for all plants.

D. Decomposed Organic Matter:

1. Well rotted organic matter.
2. Containing no weeds, grasses or plants, their seeds, or any substance harmful to plant growth.
3. Of uniform composition.
4. Acceptable Materials:

   a. Mushroom Compost
   b. Ground pine bark
   c. Approved equal.

E. Chemical Weed Control

1. Pre-Emergent (in bed areas):
   a. Selective pre-emergent with no residual soil activity. Active ingredient: Trifluralin.
   b. Commercially available.
   c. Adhere to manufacturer's recommendations for strength, rate, and method of application.
   d. Acceptable Manufacturers:
      1) Elanco: Treflan
      2) Approved substitution.
   e. Herbicide:
   f. Non-selective post-emergent with no residual soil activity. Active ingredient: Isopropylamine salt of Glyphosate.

g. Commercially available.
h. Adhere to manufacturer's recommendations for strength, rate and method of application.
i. Acceptable Manufacturers:
   1) Monsanto Agricultural Products Company: Round Up.
   2) Approved substitution.

F. Mulch:

1. Pine straw on slopes: Free from leaves, twigs, insects, grasses, weeds, plants and their seeds, other foreign material and any substances harmful to plant growth.
2. Ground Pine bark: Free from leaves, twigs, insects, grasses, weeds, plants and their seeds, other foreign material and any substances harmful to plant growth.

G. Solid Sod:

1. Obtain solid sod from sources having growing conditions similar to the area to be planted.
2. Sod shall be true to name and type of the species named in the plant Schedule.
3. Sod shall be 100 percent of the type specified and shall contain no other grasses.
4. Sod shall be well cultivated and weed, disease and insect-free, of good texture, and free from extraneous roots, stones and other foreign material. The presence of nutgrass or other weeds shall be cause for rejection and replacement prior to Substantial completion, or during the Guarantee Period.
5. Contractor shall lay sod within 24 hours of harvesting. Contractor shall not lay sod if dormant or if ground is frozen or muddy.

H. Seed (If shown on plans):

1. Use Winter Rye Grass as a temporary grass during the cool months, defined as October to March. Seed is to meet purity standards as outlined in AHD Section 860.01a.
2. Use Cynodon Dactylon (Common Bermuda) for seeding during the warm months, defined as April through September. Seed is to meet purity standard as outlined in the AHD Section 860.01a. Seed at a rate of 50 lbs. per acre.
3. Do not broadcast or drop seed when wind velocity exceeds 10 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
4. Sow seed at a total rate of 1.5 lb/1000 sf (Common Bermuda).
5. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

I. Plant Material:

1. Definition: Trees and shrubs listed in the Plant Schedule in the Drawings.
2. General:

   a. Species, sizes, manner in which to be planted, and approximate quantities

to complete the planting as indicated are included in the Plant Schedule.

b. Scientific and common plant names conform to those given in *Hortus Third*, or are those generally accepted in the nursery trade.

3. Quality:

   a. Conform to the standards set forth in *American Standard for Nursery Stock.*
   b. Standard quality and first-class representatives of their species or variety and true to name and type.
   c. Nursery-grown, unless specified otherwise.
   d. In compliance with State and Federal laws relating to disease and insect infestation; file certificates with Landscape Architect.
   e. Having normal, well-developed branches and vigorous root systems, free from defects, decay, disfigurements, sun scaled, bark abrasions, plant diseases, insect pests or eggs, borers and any and all infestations.

4. Rejection of plants for:

   a. Lack of compactness or proper proportion;
   b. Week, thin growth in rows too close together;
   c. Cut back from larger stock to meet specified requirements;
   d. Undersized, dry, cracked or broken balls, or plants that are loose in their balls;
   e. Root bound within container or ball;
   f. Lacking proper proportion as to height and spread and specified characteristics or plant material;

5. Size:

   a. Sizes and proportions of all plant materials shall equal those recommended by the *American Standard for Nursery Stock* for specified grades.
   b. Measure plants before pruning, with branches in normal position.
   c. Equal or exceed measurements specified in Plant Schedule, which are the minimum acceptable; provide 50-percent of plant material maximum size specified.
   d. Height and spread dimensions: General body mass of plant, not from branch tip to tip.
   e. Well-proportioned as to height; reject plants which meet specified measurements but do not possess an overall balance.
   f. Take caliper measurement on trunk six-inches above natural ground level up to and including four-inch caliper size; twelve-inches above natural ground level for larger sizes.
   g. B&B plants shall have firm natural balls of a diameter and depth not less than that recommended in *American Standard For Nursery Stock.*
   h. Container-grown plants: Conform to standards set forth in *American Standard For Nursery Stock* for container-grown plants.

6. Quantity: Furnish plants in sufficient quantity to satisfy the intent of the Drawings

and Specifications. Locate in sufficient quantity to that time is not lost if some plants are rejected.

J. Guying and Staking Materials:

1. Wood Stakes:

a. Pressure-treated Southern Yellow Pine, or other approved wood, 2-inches x 4-inches x length specified in the Drawings, pointed at one end.
b. Free from insects and fungi.

2. Wire: Pliable #10 or #12 gauge galvanized steel wire, doubled and twisted.
3. Turnbuckles: As detailed and approved by Landscape Architect.
4. Protective Hose:

a. Reinforced fiber-bearing rubber hose.
b. Black.
c. May be second-hand.
d. Not less than 2-inches inside diameter.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Planting Season:

1. A period of acceptable weather conditions, during seasons in which satisfactory results can be expected as determined by acceptable practice in the locality and approved by the Landscape Architect.
2. Commence planting operations as soon as portions of the site are available, as approved by the Landscape Architect.

B. Site Inspection:

1. Examine areas and conditions under which Work is to take place.
2. Inform Landscape Architect in writing, prior to planting, of conditions existing which could be considered detrimental to the successful planting and growth of any plant material, including but not limited to, subsurface drainage conditions, utility locations, subgrade compaction, percolation rate and elevations.

C. Site Preparation:

1. Topsoil (4" in sod areas and 6" in shrub and groundcover beds) shall be spread by the Contractor and fine graded. Topsoil, regardless of the source, shall meet all requirements of the paragraph above.

Stockpile material that does not meet the requirements may, at the option of the contractor, be improved by screening and the addition of organic matter and chemical admixtures. Do not place or spread topsoil in an area until subgrade is approved by Landscape Architect and is acceptable to this Contractor.

2. Remove all vegetative growth from topsoil by approved means before commencing with planting operations.
3. Remove all unwanted vegetative growth from areas designated to receive new planting or sod with chemical herbicide or by other approved means, prior to scarifying and placing topsoil.
4. Remove extraneous matter measuring 1-2-inch or larger in any dimension from top 4-inches of placed topsoil.
5. Uniformly grade areas including adjacent transition areas to line and grade shown on Drawings.
6. Obtain approval of finished grades before proceeding with planting operations; eliminate irregularities and ponding.
7. Protect stockpiled or spread topsoil from erosion by force of wind, water, or other force; re-establish eroded, rutted or settled grades to proper finished grade.

D. Plant Location Staking and Excavating Compacted Subgrade Tree Pits:

1. Stake plant locations and areas for approval prior to planting.
2. Do not dig plant pits prior to obtaining Landscape Architect's approval of plant locations.
3. Make adjustments in plant locations as directed.
4. If underground obstructions are encountered in planting areas that would prevent the installation of the plant material, contact the Landscape Architect immediately. Alternate locations may be selected by the D & D at no additional cost to the Owner.
5. All locations where trees are to be installed shall have the topsoil broken up to an 18"depth and 10' radius (if space allows) with a mini excavator.

E. Topsoil Mix:

1. Prepare topsoil mix to specification 2.3.C off site, using approved topsoil.
2. Obtain approval of topsoil mix before delivery to site, and prior to commencing planting operations. Do not mix in place with placed topsoil.
3. Place topsoil mix as backfill for tree and shrub pits and beds as drawn. Place 2-inches of topsoil mix in all shrub beds unless otherwise indicated on the Drawings.
4. Protect stockpiled topsoil mix from erosion by force of wind of water, or damaged by traffic.

F. Planting:

1. Place plants comprising a planting composition in approved staked locates for approval by Landscape Architect.
2. Planting pits and beds:

    a. Drainage:

1) This Contractor is responsible for achieving and maintaining adequate drainage from all planting beds. Use specified drainage system, or other approved means, in all tree pits.
2) 48-hours prior to planting, test each plant pit for adequate drainage.
3) Owner reserves the right to test tree or plant pits at any time, before or after planting, for adequate drainage. Correct immediately any inadequate drainage encountered.

b. Pits are generally circular in outline with vertical sides.
c. Tree pits: 3-feet greater in diameter than ball or root spread.
d. Shrub pits: 1-foot greater in diameter than ball or root spread.
e. Excavate to specified dimensions and dispose of excavated material off site.
f. Prepare as specified in detail Drawings.

3. Setting plants:

a. Set plants uniformly 2-inches to 4-inches higher than surrounding grade or as necessary to provide adequate positive drainage away from roots. Slope soil gradually from saucer.
b. Cut rope, wire or string from top of ball after plant has been set; turn down and bury burlap.

4. Backfilling plants:

a. Backfill to 2/3 full with specified topsoil mix.
b. Water thoroughly to eliminate air pockets and settling before filling to grade.
c. Form shallow saucer at plant pit edge to hold water.
d. Water in thoroughly.

5. Pre-Emergent application:

a. Apply per manufactures instructions.

6. Staking:

a. Inspect tree trunks for injury, improper pruning and insect infestation; take corrective measure.
b. Immediately after planting, stake trees as detailed.

7. Pruning:

a. Do not prune plants without approval.
b. Prune after plants are in place and *ONLY* at the direction of Landscape Architect.
c. Main leaders of trees to remain intact.

d. Paint all cuts over 2-inch diameter with approved tree wound dressing.

8. Finished Grading: Handgrade and rake planting areas so that grades conform to surrounding areas and surface water drains freely.
9. Mulching:

a. Mulch all plant pits and beds with 4-inch deep specified mulch.
b. Spread mulch solid in planting beds.
c. Thickness is uniform throughout.
d. Mulch for trees shall be eight (8) feet in diameter from base of tree.

G. Solid Sod:

1. Procure and handle sod per ALDOT Section 860.05(b) 1-4.

2. Preparation of Sod Bed:

a. Spread and scarify amended topsoil as specified.
b. Rake and otherwise manipulate to form smooth-draining grades, remove all stones and clay lumps 1-inch in diameter or larger.
c. Leave the surface of the topsoil 1- 1/2-inches below finished grade.
d. Do not move heavy objects over areas to be sodded after the soil has been prepared. Planting in compacted areas will not be permitted.
e. The finished surface of the areas to be sodded shall be approved by the Landscape Architect prior to sod placement.

3. Solid Sod Placement:

a. Lay sod when sod bed is not excessively wet or frozen, but when soil is damp for a depth of 4-inches.
b. Immediately upon approval of bed preparation, lay sod smoothly, edge-to-edge, with staggered joints.
c. Press firmly into contact with sod bed by tamping or rolling by approved means to eliminate all air pockets, providing a true and even surface, and assuring knitting.

d. Fill cracks between sod blocks with strips of living sod, topsoil, or humus.
e. Water thoroughly by use of sprinkler or spray, without erosive force.

H. Seeding: (may not be applicable if Seeding specification is included)

1. Furnish, sow, establish and maintain an acceptable growth of specified grass over all disturbed areas not otherwise designated to receive planting, mulch or sod.
2. Ground Preparation: Spread and scarify amended topsoil as specified. Ground preparation shall consist of cultivation to loose depth approximately four (4) inches (minimum). The plowing, harrowing, cultivating, and all other operations shall be performed with proper equipment and in such a manner as to break up all clods, lumps or earth balls, and remove all boulders, stumps, large roots, or other

particles which will interfere with the Work. The resultant surface is to be smooth, uniform, loose, well broken, and fine grained soil providing a suitable bed for seed grass. The ground shall be plowed to the required depth, then cultivated with a rotary tiller and/or disc harrow, in both directions if feasible, until approved. In small or inaccessible areas use of hand tools will be permitted. After removal of all large particles which cannot be broken, the surface shall then be harrowed and tilled. Add sufficient water to wet the soil in order to prepare the ground.

3. Sowing:

   a. Sowing seed shall follow promptly after the addition of the fertilizer in a uniform manner at the rates specified by Soil Test Reports.
   b. Sowing shall be done by approved mechanical seeders. Without prejudice to power equipment or seeders of other types and makes, hand operated cyclone sowers, in sufficient number, will be considered mechanical seeders. No sowing shall be done during windy weather, or when the prepared surface is crusted, or when the ground is frozen, wet or otherwise in a non-tillable condition.
   c. Care shall be exercised during covering operations to preserve the line, grade and cross-section of the seeded areas and to see that areas adjacent to pavement, curbs, etc., are not left higher than the paved surface. Unless otherwise directed, after seed has been sown the seedbed shall be compacted immediately by means of a cultipacker, light roller or approved drag.

4. Mulching: Spread hay or straw mulch to seeded areas at specified rate within 24 hours after the area has been seeded.
5. Care During Construction:

   a. Water, fill washes, and otherwise protect and maintain the seeded areas including any mulch or cover used until the Work is accepted.
   b. Repair damage caused by pedestrian and/or vehicular traffic, or other causes.

6. Satisfactory Stand:

   a. The acceptance of areas designated to be seeded under this Section will be based on verification of a satisfactory stand of grass as determined by an on-site observation by the Landscape Architect.
   b. A satisfactory stand is defined as a cover of living grass of specified species, after true leaves are formed in which no gaps larger than five (5) inches square occur. Areas viewed by the Landscape Architect to be solid rock will be exempt from this requirement.
   c. If a satisfactory stand is not established in any area, the area shall be reseeded until a satisfactory stand is established, without additional compensation.

7. Should the site be ready for seeding during a season when, in the opinion of the Landscape Architect, the specified grass will not form a satisfactory cover, establish a cover of Winter Rye and reseed specified grass at earliest time when acceptable growth can be established at no additional cost to the Owner.

3.2 LANDSCAPE MAINTENANCE:

A. Provide labor, materials, equipment and means for proper maintenance of all materials and workmanship included in the Work of this Section until Substantial Completion and the beginning of the 30-day maintenance period.

B. Maintenance until Substantial Completion is included in the Work of this Section.

SUBSTANTIAL COMPLETION AND GUARANTEE:

A. Substantial Completion and Payment:

1. Submit written requests for inspection for Substantial Completion to Landscape Architect at least three calendar days prior to anticipated date of inspection and testing.
2. Substantial Completion cannot be granted and at the same time no further applications for payment shall be for more than 85 percent of Contract until there has been a walk - thru for planting at which time a "punch list" will be written consisting of items to be addressed and corrected by Landscape Contractor immediately. Depending on extent of work on "punch list", Landscape Architect will determine job to be "substantially complete" or pending the completion of punch list".
3. Submit Record Drawings and Maintenance manuals to Landscape Architect with written request for inspection.
4. Review "punch list" work jointly with Owner and Landcape Architect for Substantial Completion of total (contract) work.
5. Upon completion of repairs and replacements found necessary at time of review, Owner and Landscape Architect will confirm date of Substantial Completion and issue written notice of Substantial Completion if items on punch list have been completed. If necessary, another punch list will be written to itemize deficiencies still existing and will be attached to written notice of substantial completion. Landscape Contractor shall complete all "punch list" items if possible within 30 days while continuing maintenance.
6. Date of Substantial Completion will constitute beginning date of One - Year Guarantee. This date also constitutes beginning of warranty responsibilities and acceptance by Owner and Landscape Architect.

B. Guarantee:

1. Guarantee all materials and workmanship for a period of 1-year from the Date of Substantial Completion.
2. During the period of the Guarantee, replace with no additional compensation, and as soon as weather permits, all dead plant materials and all materials not in a

thriving condition; replace all other workmanship and materials which are unsatisfactory in the opinion of the Landscape Architect; make good any other damage, loss, destruction, or failure to flourish sufficiently as the result of inferior or defective materials or workmanship, including, but not limited to inadequate drainage.

3. All replacement material shall match the size attained by original materials at the time of the replacement.
4. Remove dead or dying material from the site within 5 days of notice, refer to section 1.6 paragraph D(4).
5. Repair grades and other Work necessitated due to planting replacements.
6. If the replacement is not acceptable during or at the end of the Guarantee Period, the Owner may elect either subsequent replacement or credit. Replacements shall have a similar 1-year Guarantee from date of replacement.
7. Guarantee applies to losses or damage other than those due to vandalism, Owner neglect, or Acts of Nature, as determined by the Landscape Architect. Acts of Nature, but may not be limited to, high winds of hurricane or tornado force, sleet, hail, freezing rain, and extreme cold (as determined by the Landscape Architect). Contractor agrees to replace losses due to Acts of Nature at fifteen percent (15%) less than original contract price for the damaged work.

3.4 FINAL INSPECTION AND ACCEPTANCE:

A. Contractor is responsible for contacting the Landscape Architect at the end of the Guarantee Period to schedule final inspection. Should the Contractor fail to contact the Landscape Architect at this time, the Guarantee Period is automatically extended until he does so.

B. At the end of the Guarantee Period, submit request for inspection for Final Acceptance to Landscape Architect at least 1-week prior to anticipated date of inspection; include list of Work substantially accepted and list of Work replaced during Guarantee Period.

C. Upon request for inspection, jointly review with Landscape Architect all guaranteed Work for Final Acceptance.

D. Remove tree staking apparatus and saucers from all trees, unless otherwise directed; replace mulch to specified thickness.

E. Upon completion by the Contractor of all required repairs and replacements, the Landscape Architect will confirm the date of Final Acceptance of the Work.

END OF LANDSCAPE WORK

SECTION 32 9219
SEEDING AND RESTORATION

PART 1 - GENERAL

1.1 SUMMARY:

A. Work described in this section includes site restoration material and general installation.

1.2 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Related work specified elsewhere includes:

1. Division 02 – 33 Sections

1.3 SUBMITTALS:

A. Submit the following items in accordance with Section 01 3300 – Submittal Procedures

1. Product Data for fertilizer and seeds.

PART 2 - PRODUCTS

2.1 TOPSOIL:

A. This Contractor shall furnish topsoil in sufficient quantity, to complete grading and planting operations as specified.

B. Characteristics of topsoil to be furnished:

1. Fertile, friable, naturally occurring. Free of stones, clay, lumps, hardpan, roots, stumps, branches, sticks and other debris larger than two (2) inches in any dimension; free of noxious weeds, grasses, seeds, plants, extraneous matter and any substance harmful to plant growth.
2. pH: 5.0 to 7.0
3. Organic Matter: 5% to 10%
4. Permeability Rate of 5 x 10 <-3> centimeters or greater at 85% compaction.
5. Topsoil from project site may stockpiled and used if it meets the above criteria. Stockpiled topsoil must be protected from weather and construction traffic until it is placed.

2.2 SEEDING MIXES:

A. All seed shall meet the requirements of these specifications and comply with applicable state law. The type of grass seed to be planted shall meet the approval of the Owner. Seed shall be delivered in sealed bags, properly labeled. Seeds of legumes shall be inoculated just before use with the appropriate culture. Seed mixtures shall be applied at the rate in pounds per acre and with the seasonal limitations shown in the Drawings.

2.3 FERTILIZER AND LIME:

A. After ground preparation is complete, the area to be seeded shall have commercial fertilizer (800 lbs./acre: 13-13-13) and lime (1.5 ton/acre: dolomitic or calcitic lime) applied at the applicable rate.

2.4 HYDRO SEEDING:

A. Hydro seeding may be used in areas deemed necessary by the Engineer. Under this method, spread the seed, fertilizer, and wood fiber mulch in the form of a slurry. Seeds of all sizes may be mixed together.

2.5 MULCHING:

A. Areas with permanent grass seed and covered with slope mats or blankets will not require mulch.

B. Mulching shall consist of covering areas that have been grassed or as otherwise specified with straw. Straw shall be threshed oats, pine, wheat, or rye, and shall be applied at the rate of 1-1/2 tons per acre. Mulch materials shall be free of seeds detrimental to the project.

C. Mulch shall be free from leaves, twigs, insects, grasses, weeds, plants and their seeds, other foreign material and any substances harmful to plant growth.

PART 3 - EXECUTION

3.1 SITE PREPARATION:

A. Bring the planting area to final grade and install the necessary erosion control measures.

B. Divert concentrated flows away from the seeded area.

C. Conduct soil test to determine pH and nutrient content. Roughen the soil by harrowing, tracking, grooving or furrowing.

D. Apply amendments as needed to adjust pH to 6.0-7.5. Incorporate these amendments into the soil.

E. Prepare a 3-5 inch (76-127 mm) deep seedbed, with the top 3-4 inches (76-102 mm) consisting of topsoil.

F. The seedbed should be firm but not compact. The top three inches of soil should be loose, moist and free of large clods and stones.

G. The topsoil surface should be in reasonably close conformity to the lines, grades and cross sections shown on the grading plans.

3.2 SEEDING:

A. Seed to soil contact is the key to good germination.

B. Furnish, sow, establish and maintain an acceptable growth of specified grass over all disturbed areas not otherwise designated to receive planting, mulch or sod.

C. Sowing seed shall, in general, follow promptly after incorporation of fertilizer in a uniform manner.

D. Sowing shall be done by approved mechanical seeders. Without prejudice to power equipment or seeders of other types and makes, hand operated cyclone sowers, in sufficient number, will be considered mechanical seeders. No sowing shall be done during windy weather, or when the prepared surface is crusted, or when the ground is frozen, wet or otherwise in a non-tillable condition.

E. Immediately after sowing, the seeded area shall be harrowed, dragged, raked, or otherwise worked so as to cover the seed with a layer of soil one and one fourth inches (1-¼") thick. After seed is properly covered, the seeded area shall be compacted immediately by means of a cultipacker, light roller, or approved drag.

F. Care shall be exercised during covering operations to preserve the line, grade and cross-section of the seeded areas and to see those areas adjacent to pavement, curbs, etc., are not left higher than the paved surface.

G. The Contractor shall water, fill washes, and otherwise protect and maintain the seeded areas until the contract is accepted. It shall be the responsibility of the Contractor to establish and maintain a satisfactory stand of grass, a satisfactory stand being defined as a complete cover of living grass (limited to species expected to germinate in the current season).

H. Should the site be ready for seeding during a season when, in the opinion of the Engineer, the specified grass will not form a satisfactory cover, establish a cover of Winter Rye and reseed specified grass at earliest time when acceptable growth can be established at no additional cost to the Owner.

3.3 HYDRO SEEDING:

A. Apply hydro seeding as follows:

1. Use wood fiber mulch as a metering agent and seed bed regardless of which mulching method is chosen. Apply wood fiber mulch with seed and fertilizer at a minimum coverage of 1,500 to 2,000 lbs/acre.
2. Prepare the ground for hydro seeding the same as for conventional seeding.
3. Use specially designed equipment to mix and apply the slurry uniformly over the entire seeding area.
4. Agitate the slurry mixture during application.
5. Discharge slurry within one hour after being combined in the hydro seeder. Do not hydro seed when winds prevent an even application.
6. Closely follow the equipment manufacturer's directions unless the Engineer modifies the application methods.

3.4 MULCHING:

A. Apply mulch to seeded areas at specified rate within 24 hours after the area has been seeded.

B. Evenly apply straw or hay mulch between ¾ inch and 1½ inch deep, according to the texture and moisture content of the mulch material.

C. Mulch shall allow sunlight to penetrate and air to circulate as well as shade the ground, reduce erosion, and conserve soil moisture. If the type of mulch is not specified on the Plans or in the Specifications, use any of the following as specified.

1. Mulch with Tackifier: Apply mulch with tackifier regardless of whether using ground or hydro seeding equipment for seeding.
   a. Mulch uniformly applied manually or with special blower equipment designed for the purpose.
   b. After distributing the mulch initially, redistribute it to bare or inadequately covered areas in clumps dense enough to prevent new grass from emerging (if required).
   c. Do not apply mulch on windy days.
   d. Apply enough tackifier to the mulch to hold it in place. Immediately replace mulch that blows away. If distributing the mulch by hand, immediately apply the tackifier uniformly over the mulched areas.
2. Walked-in-Mulch: Apply walked-in-mulch on slopes ranging in steepness from 5:1 to 2:1 and treat as follows:
   a. Immediately walk it into the soil with a cleated track dozer. Make dozer passes vertically up and down the slope.

3.5 INSPECTION AND MAINTENANCE:

A. Newly seeded areas need to be inspected frequently to ensure the grass is growing.

1. Repair damage caused by pedestrian and/or vehicular traffic, or other causes.
2. If the seeded area is damaged due to runoff, additional stormwater measures may be needed.

B. Satisfactory Stand

1. The acceptance of areas designated to be seeded under this Section will be based on verification of a satisfactory stand of grass as determined by an on-site observation by the Engineer.
2. A satisfactory stand is defined as a cover of living grass of specified species, after true leaves are formed in which no gaps larger than five (5) inches square occur. Areas viewed by the Engineer to be solid rock will be exempt from this requirement.
3. If a satisfactory stand is not established in any area, the area shall be reseeded until a satisfactory stand is established, without additional compensation.

C. Spot seeding can be done on small areas to fill in bare spots where grass did not grow properly.

END OF SEEDING AND RESTORATION

SECTION 33 3100

SANITARY SEWERAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes sanitary sewerage system piping and appurtenances from a point 5 feet outside the building to the point of disposal.

B. The extent of sanitary sewerage system is indicated on the Drawings, in this Section, and as otherwise required by authorities having jurisdiction.

C. All fees and charges for sanitary sewerage service, taps, connections, permits, impact fees, etc., shall be paid by the Contractor from their contract amount.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division Specification Sections.

1. Product data for drainage piping and specialties.
2. Shop drawings for precast concrete sanitary manholes, including frames and covers.

    a. Shop drawings for cast-in-place concrete sanitary manholes, if any, including frames and covers.

1.4 QUALITY ASSURANCE:

A. Environmental Compliance: Comply with applicable portions of local environmental agency regulations pertaining to sanitary sewerage systems.

B. Utility Compliance: Comply with local utility regulations and standards pertaining to sanitary sewerage systems.

C. Comply with requirements of authorities having jurisdiction, when more stringent than specified or otherwise indicated.

1.5 PROJECT CONDITIONS:

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations. Verify that sanitary sewerage system piping may be installed in compliance with original design and referenced standards.

1.6 SEQUENCING AND SCHEDULING:

A. Coordinate any connection to public sewer with utility company.

B. Coordinate with interior building sanitary drainage piping.

C. Coordinate with other utility work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cleanouts:

    a. Ancon, Inc.
    b. Josam Co.
    c. Smith (Jay R.) Mfg. Co.
    d. Wade Div.; Tyler Pipe.
    e. Zurn Industries, Inc.; Hydromechanics Div.

2. Underground Warning Tapes:

    a. Allen Systems, Inc.; Reef Industries, Inc.
    b. Brady (W.H.) Co.; Signmark Div.
    c. Calpico, Inc.
    d. Carlton Industries, Inc.
    e. EMED Co., Inc.
    f. Seton Name Plate Co.

2.2 PIPE AND FITTINGS:

A. General: Provide pipe and pipe fitting materials compatible with each other. Where more than one type of materials or products is indicated below, refer to drawings for locations of each one, or if not indicated, selection is Installer's option.

B. Pipe 8-inches and smaller, unless indicated otherwise:

1. PVC (Polyvinyl Chloride) Sewer Pipe and Fittings: ASTM D 3034, SDR 26, for solvent cement or elastomeric gasket joints.
2. Solvent Cement: ASTM D 2564, for pipe 4-inches and smaller.

3. Gaskets: ASTM F 477, elastomeric seal, for pipe larger than 4-inches.

C. Couplings: Rubber or elastomeric sleeve and stainless-steel band assembly fabricated to match outside diameters of pipes to be joined.

1. Sleeves: ASTM C 425, rubber for vitrified clay pipe; ASTM C 443, rubber for concrete pipe; ASTM C 564, rubber for cast-iron soil pipe; and ASTM F 477, elastomeric seal for plastic pipe. Sleeves for dissimilar or other pipe materials shall be compatible with pipe materials being joined.
2. Bands: Stainless steel, one at each pipe insert.

D. Couplings: Rubber or elastomeric compression gasket, made to match pipe inside diameter or hub, and adjoining pipe outside diameter.

E. Ductile-Iron, Gravity Sewer Pipe and Fittings:

1. Pipe: ASTM A 746, for push-on joints.
2. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.
3. Compact Fittings: AWWA C153, for push-on joints.
4. Gaskets: AWWA C111, rubber.

F. PE Encasement for Ductile-Iron Piping: ASTM A 674 or AWWA C105, PE film, 0.008-inch (0.20-mm) minimum thickness, tube or sheet.

G. Identification for Underground Plastic Pipe:

1. Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid yellow in color with continuously printed caption in red letters "CAUTION - SANITARY SEWER LINE BURIED BELOW."

2.3 MANHOLES (if any):

A. Precast Concrete Manholes: ASTM C 478, precast reinforced concrete, of depth indicated with provision for rubber gasket joints. All manhole covers shall be round.

1. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having a separate base slab or base section with integral floor.
2. Riser Sections: 4-inch minimum thickness; 48-inch diameter, and lengths to provide depth indicated.
3. Top Section: Eccentric cone type, unless concentric cone or flat-slab-top type is indicated. Top of cone to match grade rings.
4. Grade Rings: Provide 2 or 3 reinforced concrete rings, of 6 to 9 inches total thickness and match 24-inch diameter frame and cover.
5. Gaskets: ASTM C 443, rubber.
6. Steps: Cast into base, riser, and top sections sidewall at 12-to 16-inch equally spaced intervals.
7. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
8. Channel and Bench: Concrete.

B. Cast-in-Place Manholes (if any): Reinforced concrete of dimensions and with appurtenances indicated. All manhole covers shall be round.

1. Bottom, Walls, and Top: Reinforced concrete.
2. Channel and Bench: Concrete.
3. Steps: Cast into sidewall at 12- to 16-inch equally spaced intervals.

C. Concrete: Portland cement mix, 3000 psi.

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.
5. Refer to Section "Concrete" for additional information and requirements.

D. Reinforcement: Steel conforming to the following:

1. Fabric: ASTM A 185, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615, Grade 60, deformed.
3. Refer to Section "Concrete" for additional information and requirements.

2.4 MANHOLE STEPS:

A. General: Wide enough for a man to place both feet on one step and designed to prevent lateral slippage off the step.

1. Material: Ductile iron or cast aluminum.

2.5 CLEANOUTS:

A. General: Provide cast-iron ferrule and countersunk brass cleanout plug, with round cast-iron access frame and heavy-duty, secured, scoriated cast-iron cover.

2.6 IDENTIFICATION:

A. Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid green in color with continuously printed caption in black letters "CAUTION - SEWER LINE BURIED BELOW."

PART 3 - EXECUTION

3.1 PREPARATION OF FOUNDATION FOR BURIED SANITARY SEWERAGE SYSTEMS:

A. Grade trench bottom to provide a smooth, firm, stable, and rock-free foundation, throughout the length of the pipe.

B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid, and backfill with clean sand or pea gravel to indicated level.

C. Shape bottom of trench to fit bottom of pipe. Fill unevenness with tamped sand backfill. Dig bell holes at each pipe joint to relieve the bells of all loads and to ensure continuous bearing of the pipe barrel on the foundation.

3.2 PIPE APPLICATIONS FOR UNDERGROUND SANITARY SEWERS:

A. Refer to Paragraph 2.2 above.

3.3 INSTALLATION, GENERAL:

A. General Locations and Arrangements: Drawings (plans and details) indicate the general location and arrangement of the underground sanitary sewerage system piping. Location and arrangement of piping layout take into account many design considerations. Install the piping as indicated, to the extent practical.

B. Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's recommendations for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.

C. Use manholes for changes in direction, except where a fitting is indicated. Use fittings for branch connections, except where direct tap into existing sewer is indicated.

D. Use proper size increasers, reducers, and couplings, where different size or material of pipes and fittings are connected. Reduction of the size of piping in the direction of flow is prohibited.

E. Install piping pitched down in direction of flow, at minimum slope of 2 percent, except where indicated otherwise.

F. Extend sanitary sewerage system piping to connect to building sanitary drains, of sizes and in locations indicated.

G. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed, by tunneling, jacking, or a combination of both.

3.4 PIPE JOINT CONSTRUCTION AND INSTALLATION:

A. Join and install PVC pipe as indicated in Part 2 above, and the following:

1. Solvent cement joint pipe and fittings, joining with solvent cement in accordance with ASTM D 2855 and ASTM F 402.
2. Pipe and gasketed fittings, joining with elastomeric seals in accordance with ASTM D 3212, and for truss pipe ASTM D 2680, Appendix XI.
3. Installation in accordance with ASTM D 2321.

B. Join and install ductile iron pipe as indicated in Part 2 above.

3.5 MANHOLES:

A. General: Install manholes complete with accessories as indicated, of if not indicated, in compliance with project requirements and authorities having jurisdiction. Form continuous concrete or split pipe section channels and benches between inlets and outlet. Set tops of frames and covers flush with finish surface where manholes occur in pavements. Elsewhere, set tops 3 inches above finish surface, unless otherwise indicated.

1. Place precast concrete manhole sections as indicated, and install in accordance with ASTM C 891.
2. Construct cast-in-place manholes as indicated.
3. Provide rubber joint gasket complying with ASTM C 443 at joints of sections.
4. Install manhole steps as indicated.

3.6 CLEANOUTS:

A. Install cleanouts and extension from sewer pipe to cleanout at grade as indicated. Set cleanout frame and cover in concrete block 18 by 18 by 12 inches deep, except where location is in concrete paving. Set top of cleanout 1 inch above surrounding earth grade or flush with grade when installed in paving.

3.7 TAP CONNECTIONS:

A. Make connections to existing piping and underground structures so that finished work will conform as nearly as practicable to the requirements specified for new work.

B. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch overlap, with not less than 6 inches of 3000-psi 28-day compressive-strength concrete.

C. Make branch connections from side into existing 4- to 21-inch piping by removing section of existing pipe and installing wye fitting, into existing piping. Encase entire wye with not less than 6 inches of 3000-psi 28-day compressive-strength concrete.

1. Provide concrete that will attain minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.
2. Use epoxy bonding compound as interface between new and existing concrete and piping materials.

D. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris, concrete, or other extraneous material that may accumulate.

3.8 INSTALLATION OF IDENTIFICATION:

A. Install continuous plastic underground warning tape during back-filling of trench for underground water service piping. Locate 6 to 8 inches below finished grade, directly over piping.

3.9 FIELD QUALITY CONTROL:

A. Testing: Perform testing of completed piping in accordance with local authorities having jurisdiction.

B. Cleaning: Clear interior of piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.

1. In large, accessible piping, brushes and brooms may be used for cleaning.
2. Place plugs in ends of uncompleted pipe at end of day or whenever work stops.
3. Flush piping between manholes, if required by local authority, to remove collected debris.

C. Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred.

1. Make inspections after pipe between manholes and manhole locations has been installed and approximately 2 feet of backfill is in place, and again at completion of project.
2. If inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects correct such defects, and reinspect.

END OF SANITARY SEWERAGE

SECTION 334211

STORM DRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Related work specified elsewhere includes:

1. Section 312000 - "Earthwork"
2. Section 321216 - "Hot-Mixed Asphalt Paving"

1.2 SUMMARY

A. Work described in this Section includes the construction of new storm drainage systems, piping, structures, taps, and appurtenances, as indicated on the Drawings.

1. In the event of conflict between this Section and Drawings, the more stringent requirements shall be provided

B. Each bidder shall visit the site to determine the extent of work required for completion of this contract.

C. The extent of storm drainage system is indicated on the Drawings, in this Section 334211, and as otherwise required by authorities having jurisdiction.

D. All fees and charges for storm sewerage permits, connections, impact fees, inspections, etc., shall be paid by the Contractor from their contract amount.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Product data for drainage piping and specialties.
2. Shop drawings for precast concrete storm sewer manholes, including frames and covers.

a. Shop drawings for cast-in-place concrete or field-erected masonry storm sewer manholes, if any, including frames and covers.

1.4 QUALITY ASSURANCE

A. Certifications: The Contractor shall submit to the Engineer copies of certificates from suppliers of pipe, gaskets, reinforcing steel, cast iron frames, covers and grates, ready-mix concrete and

other manufactured items, certifying that these products comply with the Specifications and Standards listed hereinafter.

B. Standard Specifications: Unless otherwise noted, all specifications referred to shall be the Alabama Department of Transportation (ALDOT) "Standard Specifications for Highway Construction", Latest Edition.

C. Testing: All laboratory and field testing as required to ensure compliance with these Specifications will be performed by an independent testing laboratory. Refer to Section "Special Conditions Section", for additional information.

D. Environmental Compliance: Comply with applicable portions of local environmental agency regulations pertaining to storm sewerage systems.

E. Utility Compliance: Comply with local utility regulations and standards pertaining to storm sewerage systems.

F. Comply with requirements of authorities having jurisdiction, when more stringent than specified or otherwise indicated.

G. Refer to Division 01 Section "Special Conditions" for additional information and for minimum experience requirements.

1.5 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations. Verify that storm sewerage system piping is installed in compliance with original design and referenced standards.

1.6 SEQUENCING AND SCHEDULING

A. Coordinate any connection to public storm sewer with utility company.

B. Coordinate with interior building storm drainage piping, and exterior building storm drainage piping, to include in part, coordination of types of connections required adjacent to foundations and footings.

C. Coordinate with other utility work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Plastic Pipe: Provide one of the following, unless indicated otherwise on the Drawings:

1. Equivalent to ADS N-12 (unperforated) corrugated HDPE pipe with smooth interior, and all required or necessary system accessories, downspout adaptors, fittings, and components, specified in ALDOT Standard Specifications Article 853.04, unless otherwise indicated on the Drawings.

2. Equivalent to Contech A2000 PVC (unperforated), ASTM F949, specified in ALDOT Standard Specifications Article 852.07 and all required or necessary system accessories, downspout adaptors, fittings, and components, with watertight gasketed joints, unless otherwise indicated on the Drawings.

B. Reinforced Concrete Pipe (RCP), or Equivalent Area/Volume Arch Pipe (RCAP) Where Permitted: Class 4, reinforced concrete pipe as specified in ALDOT Standard Specifications Article 850.01, unless otherwise indicated on the Drawings.

C. Where indicated on the Drawings for "french drain", "underdrain", foundation drain, at planting or other areas, pipe shall be equivalent to ADS N-12 (perforated) corrugated HDPE pipe with smooth interior, complete with filter fabric "sock" and all required or necessary system accessories, fittings, and components, specified in ALDOT Standard Specification Article 853.13, or equivalent Contech A2000 PVC (perforated) with same filter sock, components and accessories.

1. Where underdrain is indicated, line trench with acceptable geotextile filtration fabric, backfill with clean washed "pea gravel", fold edges of fabric over top of gravel, and cover with acceptable and relatively impervious earth fill, up to subgrade level of grass or paving.
2. Synthetic Drainage Fabric: Equivalent to fabric supplied as a component of filter fabric "sock", but not less than 4.3 oz. per square yard per ASTM D 3776, and flow rate of 120 gpm and permitivity of 1.62 per ASTM D 4491.

D. Concrete and reinforcing steel for headwalls, inlets, manholes, and other storm drainage structures shall comply with Alabama Department of Transportation Standard Specification Articles 501 and 502. Concrete shall be Class "A", Type 2 (3,000 psi).

E. Masonry materials (if any shown) and precast concrete units shall conform to Article 621.02.

F. Castings for frames, covers and grates in drainage structures shall comply with Section 836, with particular attention directed to Article 836.04, 836.05, 836.06, and 836.07.

1. All manhole covers shall be round.

G. Identification for Underground Plastic Pipe:

1. Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid yellow in color with continuously printed caption in black letters "CAUTION - STORM SEWER LINE BURIED BELOW."
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allen Systems, Inc.; Reef Industries, Inc.
b. Brady (W.H.) Co.; Signmark Div.
c. Calpico, Inc.
d. Carlton Industries, Inc.
e. EMED Co., Inc.
f. Seton Name Plate Co.

PART 3 - EXECUTION

3.1 STORM DRAIN PIPE

A. Construction requirements, including excavation of trench, placing pipe, and backfilling around pipe shall conform to the applicable portions of Article 530.03 of the ALDOT Standard Specifications.

1. Additional Requirements for Plastic Pipe and Fittings: Comply with pipe manufacturer's current written instructions and recommendations, when more stringent than referenced ALDOT Standard Specifications.

B. A minimum of 4-inches of "select fill" bedding material shall be placed under all pipes. Backfill with "select fill" unless otherwise indicated on the Drawings.

C. Compaction requirements for backfill shall be the same as specified for type of surface constructed over the trench, paved or planted areas as described in Section 312000 - "Earthwork."

D. Properly coordinate with elevations of finished grades, footings, and below grade work.

3.2 INSTALLATION OF IDENTIFICATION

A. Install continuous plastic underground warning tape during back-filling of trench for underground plastic storm sewer piping. Locate 6 to 8 inches below finished grade, directly over piping.

3.3 STRUCTURES

A. Inlets, manholes, cleanouts and other storm drainage structures shall be installed or constructed in accordance with applicable portions of the following sections of the Alabama Department of Transportation Standard Specifications, Latest Edition:

1. Article 501 - Structural Portland Cement Concrete.
2. Article 502 - Steel Reinforcement.
3. Article 613 - Brick and Concrete Block Masonry.
4. Article 620 - Minor Structure Concrete.
5. Article 621 - Inlets, Junction Boxes, Manholes and Miscellaneous Drainage Structures.
6. Article 622 - Resetting Gratings and Covers and for Catch Basins, Inlets, and Manholes.

END OF STORM DRAINAGE