DESIGN-BUILD
FIRE STATIONS 90 & 70

REQUEST FOR PROPOSALS (RFP)

RFP No. NC22-030

Nassau County
Board of County Commissioners
Nassau County, Florida

PROPOSAL DOCUMENTS

CONTAINING

PROPOSAL REQUIREMENTS

DESIGN-BUILD AGREEMENT

GENERAL CONDITIONS

AND DESIGN-BUILD CRITERIA PACKAGE

AUGUST 2022

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FOR

FIRE STATION 90 & 70 DESIGN-BUILD
RFP No. NC22-030

Prepared for:

BOARD OF COUNTY COMMISSIONERS
Nassau County, Florida

AUGUST 2022

DESIGN-BUILD

FIRE STATION 90 & 70

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EXHIBIT 1 REFERENCE QUESTIONNAIRE

EXHIBIT 2 E-VERIFY AFFIDAVIT

EXHIBIT 3 STATEMENT OF 'NO RESPONSE'

ATTACHMENT(S):

ATTACHMENT 'A-0' FS 71 - DESIGN BUILD CRITERIA PACKAGE

ATTACHMENT 'A-1' FS 71 - APPENDIX A – PLAN SETS

ATTACHMENT 'A-2' FS 71 - ADDENDA

ATTACHMENT 'B' DESIGN-BUILD FORM OF AGREEMENT

ATTACHMENT 'C' FIRE STATION 90 AND 70 CONSTRUCTION LIST

ATTACHMENT 'D' CHILLER SPECIFICATION OPTION

ATTACHMENT 'E' FIRE STATION 90 CONCEPT PLAN

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SECTION I

REQUEST FOR PROPOSALS (RFP)

PROJECT: **Fire Station 90 & 70 Design-Build**
Solicitation No. NC22-030-RFP
Nassau County, Florida

COUNTY: **Board of County Commissioners**
Nassau County, Florida
96135 Nassau Place, Suite 1
Yulee, Florida 32097

PROJECT MANAGER: **Douglas Podiak, Public Works Director**
45195 Musselwhite Road
Callahan, FL 32011

ARCHITECT: **The R-A-M Professional Group Incorporated**
8298 Bayberry Road, Suite 1
Jacksonville, FL 32256

MANDATORY PRE-PROPOSAL MEETING: AUGUST 25, 2022 @ 2:00 PM

LOCATION OF MANDATORY PRE-PROPOSAL MEETING:
James S. Page Governmental Complex
Commissioners Chamber
96135 Nassau Place
Yulee, Florida 32097

PROPOSALS DUE/OPENING: SEPTEMBER 14, 2022, @ 10:00 AM

Robert M. Foster Justice Center
Office of Ex-Officio Clerk, Second Floor, Suite 456
76347 Veterans Way
Yulee, Florida 32097

1.0 PURPOSE

The Nassau County Board of County Commissioners is requesting proposals from Design-Build firms for the design and construction of two (2) new Fire Stations, approximately 9,000 square foot buildings, for the County's Fire & Rescue Department.

Project sites for the new stations:

Fire Station 90 – CR 2 - 3195 SR 2 Hilliard, FL 32046
Fire Station 70 – CR 107 - 942448 Old Nassauville Road, Yulee, FL 32097

The design for the new Fire Stations is to mirror the design and construction of Fire Station 71 with exceptions for each new location. The exceptions are included herein, (Fire Station 90 and 70 Construction List).The Design Criteria Package for Fire Station 71 is made a part of this solicitation as a reference attachment.

2.0 RECEIPT OF PROPOSALS

ALL PROPOSALS MUST BE RECEIVED NO LATER THAN THE DATE AND TIME STATED ABOVE.
All responses **must be** submitted electronically via the County's electronic bidding platform (PlanetBids), which is also accessible via the County's website.

It is the Proposer's responsibility to ensure that responses are received in the County's electronic bidding platform before the response due date and time. **The platform will not allow responses after the cut-off time EVEN IF YOU ARE IN THE PROCESS OF SUBMITTING YOUR RESPONSE WHEN THE CUT-OFF TIME ARRIVES.** Please plan your response timing accordingly. No mailed, facsimile, or emailed responses will be considered.

Responses will be opened at the Office of the Clerk on the date and time specified on the cover page of this solicitation at the Robert M. Foster Justice Center, 76347 Veterans Way, Suite 456 Yulee, Florida.

3.0 PROPOSAL DOCUMENTS

The PROPOSAL DOCUMENTS, consisting of the REQUEST FOR PROPOSAL, INFORMATION FOR PROPOSERS, PROPOSAL FORM, BID BOND, AGREEMENT, GENERAL CONDITIONS, SUPPLEMENTAL GENERAL CONDITIONS (IF APPLICABLE), PAYMENT BOND, PERFORMANCE BOND, NOTICE OF AWARD, NOTICE TO PROCEED, CHANGE ORDER, CONCEPTUAL DRAWINGS AND SPECIFICATIONS, SPECIAL CONDITIONS, ADDENDA and EXHIBITS, may be found on the County's vendor portal – Planet Bids - https://pbsystem.planetbids.com/portal/49083/portal-home

4.0 PROPOSAL WITHDRAWAL

No PROPOSALS may be withdrawn for a period of **sixty (60) days** after the date of Proposal opening. Proposals may be withdrawn or modified at any time before the proposal due date during which the Proposer may withdraw their proposal or make any needed modification(s) and resubmit without prejudice by utilizing the modification/withdrawal feature within the County's electronic bidding platform.

5.0 RIGHT TO REJECT

The County reserves the right to reject any or all proposals, with or without cause, without recourse, or to waive technicalities or to accept proposals which, in its sole judgment, best serve the interests of the County. The County also reserves the right to reject the response of a Proposer who has previously failed to perform properly, completely, on-time and/or on-cost, contracts of a similar nature, or that are not, in the County's sole discretion, in a position to perform the contract. Response to this solicitation is considered an operational cost of the Proposer and shall not be passed on to or borne by the County.

6.0 PUBLIC ENTITY CRIMES

A person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit a proposal/bid on a contract to provide any goods or services to a public entity, may not submit a proposal/bid on a contract with a public entity for the construction or repair of a public building or public work, may not submit a proposal/bid on leases or real property to a public entity, may not be awarded or perform work as a contractor, supplier, subcontractor or consultant under contract with any public entity, and may not transact business with any public entity in excess of the threshold amount provided in Section 287.017. Florida Statutes, for Category Two for a period of thirty six months from the date of being placed on the Convicted Vendor List. The enclosed sworn statement for Public Entity Crimes under Florida Statute 287.133(3)(a) must be submitted with the response.

7.0 AMENDMENTS TO PUBLIC MEETINGS AND PUBLIC RECORDS

Amendments to Public Meetings and Public Records Laws for Government Contracting: Pursuant to recent changes in Florida Statutes Chapter 119.071 (General Exemptions from inspection or copying of public records) the bid opening process is temporarily exempt from Public Records requirements, except bids received pursuant to a competitive solicitation for construction or repairs on a public building or public work. Information may be released to the

public once the Board provides a notice of intended decision or thirty (30) days after the bid opening, whichever is earlier.

Pursuant to recent changes in Florida Statutes Chapter 286.0113 (General exemptions from public meeting requirements) any portion of a meeting in which negotiations with a vendor is conducted as part of the "competitive negotiation" process at which a vendor makes an oral presentation or answers questions as part of the "competitive solicitation" process are exempt from public meeting requirements until the Board provides notice of an intended decision or until thirty (30) days after bid opening, whichever is earlier. Any portion of a committee meeting at which negotiation strategies are discussed is exempt.

A complete record shall be made of any portion of an exempt meeting; no portion may be held off the record. The recording of and any records presented at the exempt meeting are exempt from F.S. 119.071 until such time as the board provides notice of an intended decision or 30 days after opening the bids, proposals or final replies.

Please refer to Florida Statutes 119.071, 255.0518 and 286.0113 for further details.

8.0 PUBLIC RECORDS REQUIREMENT

The County is a public agency subject to Chapter 119, Florida Statutes. IF THE VENDOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO THE VENDOR'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS CONTRACT, CONTACT THE CUSTODIAN OF PUBLIC RECORDS AT (904) 530-6010, RECORDS@NASSAUCOUNTYFL.COM, 96135 NASSAU PLACE, SUITE 1, YULEE, FLORIDA 32097. To the extent that the selected vendor(s) provide(s) goods and/or services to the County, and pursuant to Florida Statute 119.0701, the Vendor(s) shall:

1. Keep and maintain public records required by the public agency to perform the service,

2. Upon request from the public agency's custodian of public records, provide the public agency with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided in this chapter or as otherwise provided by law,

3. Ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law for the duration of the contract term and following completion of the contract if the vendor does not transfer the records to the public agency, and

4. Upon completion of the contract, transfer, at no cost, to the public agency all public records in possession of the vendor or keep and maintain public records required by the public agency to perform the service. If the vendor transfers all

public records to the public agency upon completion of the contract, the vendor shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If the vendor keeps and maintains public records upon completion of the contract, the vendor shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to the public agency, upon request from the public agency's custodian of public records, in a format that is compatible with the information technology systems of the public agency.

If a vendor does not comply with a public records request, the County shall enforce the contract provisions in accordance with the contract.

9.0 PARTICIPATION IN E-VERIFY REQUIRED BY LAW

Pursuant to Florida Statute 448.095, all vendors doing business with Nassau County are required to register with, and participate in, the federal government's E-Verify program (www.e-verify.gov**). Responders will be required to provide proof of registration from E-Verify along with a completed affidavit certifying their compliance with F.S. 448.095**. By submitting a response to this solicitation, Responder acknowledges and agrees that:

(a) If the County has a good faith belief that a person or entity with which it is contracting has knowingly violated §448.09(1), Florida Statutes, the contract shall be terminated,

(b) If the County has a good faith belief that a subcontractor knowingly violated §448.095(2), but the Prime Contractor otherwise complied with §448.095(2), Florida Statutes, shall promptly notify the Prime Contractor and order the Prime Contractor to immediately terminate their contract with the subcontractor,

(c) A contract terminated under subparagraph a) or b) is not a breach of contract and may not be considered as such,

(d) Any challenge to termination under this provision must be filed in the Circuit Court no later than twenty (20) calendar days after the date of termination, and

(e) If a contract is terminated for a violation of F.S. 448 by the Contractor, the Contractor may not be awarded a public contract for a period of one (1) year after the date of termination.

10.0 INSURANCE REQUIREMENTS

Insurance: Proposer shall include in their proposal response a copy of their current, valid insurance coverage certification that meets or exceeds the requirements included with this solicitation (set forth in the Sample D/B Agreement).

11.0 Conflict of Interest

All Proposers must disclose with their offer the name of any corporate officer, director, or agent who is also an officer or employee of Nassau County. Further, all Proposers must disclose the name of any Nassau County officer or employee who owns, directly or indirectly an interest of ten percent (10%) or more of the Proposer's firm or any of its branches, subsidiaries or partnerships.

Conflict of Interest – Business Association:

All Proposers must disclose with their offer the name of any officer, director, or agent who is also an officer or employee of the County or related to an officer or employee of the County. Further, all Proposers must disclose the name of any Nassau County officer or employee who has, either directly or indirectly, any interest of the Proposer's firm or any of its branches, affiliates, or subsidiaries. Notwithstanding any other provision of law, failure to disclose will result in disqualification of the proposal and/or cancellation of work without the County being in breach of contract. The County will seek damages for recoupment of losses for having to re-solicit or re-assign and further reserves the right to debar any vendor who fails to disclose.

Conflict of Interest – Advisory Boards:

Sections 112.313(3) and 112.313(7), Florida Statutes, prohibit an advisory board member of the County from holding any employment or contractual relationship with any business entity doing business with the County. Section 112.313(12), Florida Statutes, provides that an advisory board member will not be in violation of the prohibition if certain conditions are met, including the filing of a disclosure form with the County, which is the sole responsibility of the Proposer and must be filed prior to or at the time of submission of the proposal. A copy of the filed disclosure form shall be included as part of the Proposer's response.

The advisory board member is required to, prior to or at the time of the submissions of the proposal, file a statement with the County, disclosing their interest and the nature of the intended business.

The advisory board member, or his or her spouse, child, or other relative, is required to have in no way used or attempted to use his or her influence to persuade a member of the County

or any of its personnel to enter into such a contract other than by the mere submission of the proposal.

The advisory board member, or his or her spouse, child, or other relative, is required to have in no way participated in the determination of the solicitation's specifications or the determination of the responsible and responsive Proposer.

12.0 DISABILITIES REQUIRING ACCOMMODATION

Persons with disabilities requiring accommodation in order to participate in this program or activity should contact the Office of the Ex-Officio Clerk to the Board of County Commissioners at (904) 548-4660 or Florida Relay Service at 1-800-955-8770 (v) or 1-800-955-8771 (TDD) at least seventy two hours in advance to request such accommodation.

NASSAU COUNTY BOARD OF COUNTY COMMISSIONERS
Jeff Gray, Chairman

ATTEST:

John A. Crawford
Its: Ex-Officio Clerk

End of Section

SECTION II

INSTRUCTIONS TO PROPOSERS

ARTICLE 1 DEFINED TERMS

1 .01 Terms used in this Request for Proposal, which are defined in the Agreement between the County and the Design-Build Firm, will have the meaning assigned to them there. Additional terms used in these Instructions to Proposers have the meanings indicated below which are applicable to both the singular and plural thereof:

A. Proposal Documents – The Request for Proposal, Instructions to Proposers, Proposal Form, proposed Contract Documents (including all Addenda issued prior to acceptance of Proposals), specifications, Design-Build Criteria Package, and any other documents included or incorporated by reference.

B. Proposer – One who submits a Proposal directly to County.

C. Successful Proposer – The Proposer to whom County (on the basis of County's evaluation as hereinafter provided) makes an award.

D. Technical Proposal – Documents prepared by Design/Builder which demonstrates the Proposer's plan for meeting the County's requirements is based on the design of Station 71 and for each of the new individual Fire Station's changes and additions stated in the Fire Stations 90 and 70 Construction List attached herein.

E. Lowest-Price Technically Acceptable (LPTA) – A process for award to the lowest-priced proposal that meets a set of minimum standards of technical acceptability specified in the Request for Proposal (RFP).

ARTICLE 2 COPIES OF PROPOSAL DOCUMENTS

2.01 Obtaining and Use of Proposal Documents

A. Complete sets of Proposal Documents will be provided by the County via the County's e-bidding platform, (PlanetBids)

B. Complete sets of Proposal Documents must be used in preparing Proposals. Neither County nor County's Consultant (if any) assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Proposal Documents.

C. Copies of Proposal Documents available on the above terms do so only for the purpose of obtaining Proposals for the Work and do not confer a license or grant to Proposers for any other use.

ARTICLE 3 QUALIFICATIONS OF PROPOSERS

3.01 The County may make investigations as necessary to determine the ability of the Proposer to perform the Work, and the Proposer shall furnish to the County all such information and data for this purpose as the County may request. The County reserves the right to reject any Proposal if the evidence submitted by, or investigation of, such Proposer fails to satisfy the County that such Proposer is properly qualified to carry out the obligations of the contract and to complete the work contemplated therein. Conditional proposals will not be accepted.

ARTICLE 4 SCHEDULE OF EVENTS

4.01 Below is the tentative remaining schedule of events that will take place in the selection process. The County reserves the right to make changes or alterations to the schedule as the County determines is in the best interests of the public. Unless otherwise notified in writing by the County, the dates indicated below for submission of items or for other actions on the part of a Proposer shall constitute absolute deadlines for those activities and failure to fully comply by the time stated shall cause a proposer to be disqualified. Events shown in italic are based on the County's desired design and construction timeline.

EVENT	DATE	TIME
Deadline for submission of written questions prior to Mandatory Pre-Proposal Meeting	Aug 22 2022	2:00 PM
MANDTORY PRE-PROPOSAL MEETING	**Aug 25 2022**	**2:00 PM**
Deadline for Final Questions from Proposers	Sep 02 2022	4:00 PM
Deadline for County's response to final questions from Proposers	Sep 08 2022	4:00 PM
PROPOSAL DUE DATE / PROPOSAL OPENING	**SEP 14 2022**	**10:00 AM**
Technical Committee Evaluation (Evaluate/Rank Firms)	Sep 26 2022	2:00 PM
Interview of Shortlisted Firms	*TBD*	
Posting of County's intended decision to Award	*TBD*	
Anticipated Award Date	*TBD*	
Receipt of fully executed contract / Performance & Payment Bonds	*TBD*	
Design Phase – Notice to Proceed	*TBD*	

ARTICLE 5 EXAMINATION OF PROPOSAL DOCUMENTS, OTHER RELATED DATA, AND SITE

5.01 Proposer's Responsibilities

A. It is the responsibility of each Proposer before submitting a Proposal to:

1) Attend a **mandatory** pre-proposal meeting to review and discuss the Request for Proposal (RFP) documents, which includes the model Design-Build Criteria Package for *Station 71* (see Article 6).

2) Examine and carefully study the Proposal Documents, including any Addenda and other related data identified in the Proposal Documents.

3) Visit the Site to become familiar with and satisfy Proposer as to the general, local and Site conditions that may affect cost, progress, performance or furnishing of the Work.

4) Become familiar with and satisfy Proposer as to all federal, state, and local Laws and regulations that may affect cost, progress, performance or furnishing of the Work.

5) Study and carefully correlate Proposer's knowledge and observations with the Proposal Documents and such other related data.

6) Obtain and carefully study (or assume responsibility for doing so) all reports of explorations and tests or subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities), which have been identified in the Proposal Documents, where available.

7) Obtain and carefully study (or assume responsibility for doing so) all supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Proposer,

including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Proposal Documents, and safety precautions and programs incident thereto;

8) Agree at the time of submitting its Proposal that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Proposal for performance of the Work at the price proposal and within the times and in accordance with the other terms and conditions of the Proposal Documents.

9) Become aware of the general nature of the Work to be performed by the County and others at the Site that relates to the Work as indicated in the Proposal Documents.

10) Promptly notify County of all conflicts, errors, ambiguities, or discrepancies which Proposer has discovered in the Proposal Documents.

11) Determine that the Proposal Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.

5.02 Reports of Subsurface Conditions

A. Reports of explorations and tests of subsurface conditions, existing surface and subsurface structures, or underground facilities at or contiguous to the Site are to be identified by the Proposer.

B. Proposer is responsible for any interpretation or conclusion Proposer draws from any technical data or any other data, interpretations, opinions, or information identified from such reports referenced in paragraph 5.02-A

5.03 Underground Facilities

Information and data shown or indicated in the Proposal Documents with respect to existing Underground Facilities at or contiguous to the Site is to be identified by the Proposer by the Utility County of such Underground Facilities, including County, or others.

5.04 Site Conditions

Before submitting a Proposal, each Proposer will be responsible to obtain such additional or supplementary examinations, investigations, explorations, test, studies and data concerning conditions (surface, subsurface and underground facilities) at or contiguous to the Site or otherwise, which may affect cost, progress, performance or furnishing of the Work or which relate to any aspect of the means, methods, techniques, sequences or procedures of construction to be employed by Proposer and safety precautions and programs incident thereto or which Proposer deems necessary to prepare its Proposal for performing and furnishing the Work in accordance with the time, price and other terms and conditions of the Contract Documents.

5.05 Each Proposer must inform himself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful Proposer of his obligation to furnish all material and labor necessary to carry out the provisions of this contract. Insofar as possible the Design-Build Firm, in carrying out the work, must employ such methods or means as will not cause any interruption of or interference with the work of any other contractor.

5.06 The submission of a Proposal will constitute an incontrovertible representation by Proposer that Proposer has complied with every requirement of this Article 5, that without exception the Proposal is premised upon performing and furnishing the Work required by the Proposal Documents and applying any specific means, methods, techniques, sequences and procedures of construction that may be shown or indicated or expressly required by the Proposal Documents, that Proposer has provided written notice of all conflicts, errors, ambiguities and discrepancies that Proposer has discovered in the Proposal Documents and written resolutions thereof are acceptable to Proposer, via addenda, and that the Proposal Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work

5.07 Proposer's Access to the Site

On request, County will provide each Proposer access to the Sites to conduct such examinations, investigations, explorations, tests and studies as each Proposer deems necessary for submission of a Proposal. Proposer must fill all holes and clean up and

restore the Site to its former conditions upon completion of such explorations, investigations, tests, and studies.

5.08 Work at the Site by Others

Reference is made in Section 11 of the General Terms and Conditions located in the Sample Design/Build Agreement (Attachment "B"), for the general nature of work that is to be performed at the Site by County or others (such as utilities) that relates to the Work for which a Proposal is to be submitted. On request, County will provide to each Proposer for examination access to or copies of Contract Documents (other than portions hereof related to price) for such work.

ARTICLE 6 MANDATORY PRE-PROPOSAL MEETING

6.01 A **mandatory** pre-proposal meeting will be held for this project. Attendance at the pre-proposal meeting is required. Any Proposer failing to attend will be deemed non-responsive and automatically disqualified from further consideration. The purpose of this meeting is to provide a forum for the County to discuss with all selected Design-Build firms the proposed Project, the design and construction criteria, CPM schedule, and method of compensation, instructions for submitting proposals, design exceptions/variances, and other relevant issues. In the event that any discussions at the pre-proposal meeting require, in the County's opinion, official additions, deletions, or clarifications of the Request for Proposal, the Design and Construction Criteria, or any other document, the County will issue a written addendum to this Request for Proposal as the County determines is appropriate. No oral representations or discussions, which take place at the pre-proposal meeting, will be binding on the County. Proposers shall direct all questions to the County as directed herein.

ARTICLE 7 SITE AND OTHER AREAS

7.01 The Sites are identified in the Proposal Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by the Design-Build Firm. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by the County unless otherwise provided in the Proposal Documents.

ARTICLE 8 INTERPRETATIONS AND ADDENDA

8.01 All questions about the meaning or intent of the Proposal Documents are to be directed to County in writing via PlanetBids, the County's vendor portal. Interpretations or clarifications considered necessary by County in response to such questions will be issued by Addenda (via PlanetBids). Questions received less than seven (7) days prior to the date for opening of Proposals may not be answered. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

8.02 Addenda may be issued to clarify, correct, or change the Proposal Documents as deemed advisable by County.

8.03 No interpretation of the meaning of the plans, specification or other pre-proposal documents will be made to any Proposer orally. Proposers are required to refrain from contacting any County Departments, Divisions, or external agents or consultants about this solicitation during the solicitation process. **ALL QUESTIONS MUST BE RECEIVED VIA THE COUNTY'S VENDOR PORTAL.** Failure to comply with this requirement may result in disqualification of your response and egregious and/or repeated violations may result in debarment from future solicitations, contracts, or other business with the County.

Questions received will be formatted and issued to all interested parties in the form of an addendum. Oral questions and/or answers are not authorized outside of the Mandatory Pre-Proposal Meeting , and **the County will not entertain any verbal communications regarding this or any other solicitation**. All questions regarding this solicitation must be received before **4:00 PM on September 2, 2022**. Questions received after this date will not be reviewed.

Inquiries or requests for clarification must include the questions along with the relevant Section(s), Subsection(s), Paragraph(s), and page number(s) of the solicitation being questioned by the Proposer.

The County will consider the Proposer's lack of inquiries or requests for clarification prior to the Deadline for Questions to constitute the Proposer's acceptance of all the terms, conditions, and requirements as stated in this solicitation and any addenda or amendments thereto.

8.04 Any and all such interpretations, answers to questions and any supplemental instructions will be in the form of written addenda not later than 72 hours prior to the date fixed for the due date of proposals.

8.05 All addenda issued shall become part of the proposal documents. It will be the responsibility of the Proposer to visit the County's Vendor Portal prior to submitting a response, to ascertain if any addenda have been issued and to review those addenda. Proposers must acknowledge the addenda pursuant to **SECTION III 1.03** if applicable. Failure to comply may result in disqualification of the response.

ARTICLE 9 PROPOSAL SECURITY

9.01 Each Proposal must be accompanied by Proposal security (bid bond) made payable to County in the amount of **five percent (5%)** of Proposer's maximum Proposal price or in the form of a certified or cashier's check or a Surety Bond, on the form attached. **The original bid bond must be mailed to Nassau County Clerk's Office, 76347 Veterans Way, Suite 456, Yulee, FL 32097, referencing the Proposal name and number. A copy of the bid bond is also to be included with the electronic proposal submission.**

9.02 The Proposal security of the Successful Proposer will be retained until such Proposer has executed the Agreement, furnished any required contract security, and met the other conditions of the Notice of Award, whereupon the Proposal security will be returned. If the Successful Proposer fails to execute and deliver the Agreement and furnish the required contract security within 15 days after the Notice of Award, County may annul the Notice of Award and the Proposal security of that Proposer will be forfeited. The Proposal security of other Proposers whom County believes to have a reasonable chance of receiving the award may be retained by County until the earlier of seven days after the Effective Date of the Agreement or sixty-one days after opening of Proposals, whereupon Proposal security furnished by such Proposers will be returned.

9.03 Proposal security of other Proposers whom County believes do not have a reasonable chance of receiving the award will be returned within seven days after the Proposal opening.

ARTICLE 10 CONTRACT TIMES

10.01 The times for Substantial Completion and readiness for final payment are to be set forth by Proposer on the Contract Times Proposal Form **(SECTION III - PROPOSAL FORM ARTICLE 3 CONTRACT TIMES – A separate Form is required for each Fire Station** and will be entered into the Agreement (or incorporated therein by reference to the specific language of the Proposal). **These times must be written or typed in to avoid possible disqualification**. The times will be taken into consideration by the County during the evaluation of Proposals, and it will be necessary for the apparent Successful Proposer to satisfy the County that it will be able to achieve Substantial Completion and be ready for final payment within the times designed in the Proposal.

ARTICLE 11 LIQUIDATED DAMAGES

11.01 Provisions for liquidated damages, if any, are set forth in the Sample D/B Agreement.

ARTICLE 12 SUBSTITUTE AND "OR-EQUAL" ITEMS

12.01 The Agreement, if awarded, will be on the basis of materials and equipment specified or described in the Proposal Documents without consideration of possible substitute "or-equal" items. Whenever it is specified or described in the Proposal Documents that a substitute or "or-equal" item of material or equipment may be furnished or used, if acceptable to the County designee and Engineer of Record, application for such acceptance will not be considered by County designee and Engineer of Record until after the Effective Date of the Agreement. The procedure for submission of any such application by and consideration by the County designee and Engineer of Record is set forth in Section 6 of the General Terms and Conditions located in the Sample Design/Build Agreement (Attachment “B”).

ARTICLE 13 SUBCONTRACTORS, SUPPLIERS AND OTHERS

13.01 If the Agreement requires the identity of certain Subcontractors, Suppliers, individuals, or entities to be submitted to the County in advance of a specified date prior to the Effective Date of the Agreement, the apparent Successful Proposer, and any other Proposer so requested, shall within five days after Proposal opening, submit to County a list of all such Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work for which such identification is required. Such list shall be

accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each Subcontractor, Supplier, individual, or entity if requested by the County. If the County or Engineer of Record, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual or entity, the County may, before the Notice of Award is given request apparent Successful Proposer to submit a substitute, without an increase in the Proposal Price.

13.02 If the apparent Successful Proposer declines to make any such substitution, the County may award the Contract to the next lowest Proposer that proposes to use acceptable Subcontractors, Suppliers, individuals, or entities. Declining to make requested substitutions will not constitute grounds for forfeiture of the Proposal security of any Proposer. Any Subcontractor, Supplier, individual, or entity so listed and against which County or Engineer of Record makes no written objection prior to giving of the Notice of Award will be deemed acceptable to the County and Engineer of Record .

13.03 Design-Build Firm shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom Design-Build Firm has reasonable objection.

ARTICLE 14 SUBMISSION OF PROPOSALS

14.01 Two (2) **separate** submittals are required:

A. Technical Proposal (see Article 15 for Technical Proposal requirements)

B. Price Proposal (see Article 16 for Price Proposal requirements)

14.02 Each Proposer shall submit one (1) electronic copy of the "Technical Proposal" sealed and clearly marked: "Technical Proposal – Design Build Construction Services for Fire Stations 90 and 70, RFP No. NC22-030". ***(Response File in PlanetBids)***

14.03 Each Proposer shall submit one (1) electronic copy of the "Price Proposal" sealed and clearly marked: "Price Proposal – Design Build Construction Services for Fire Stations 90 & 70, RFP No. NC22-030". ***(Cost File in PlanetBids)***

14.04 All proposal responses must be submitted electronically via the County's electronic bidding platform (PlanetBids), accessible via the County's website.

ARTICLE 15 TECHNICAL EXHIBITS REQUIRED WITH PROPOSAL

15.01 Each Design-Build Firm being considered for this project is required to submit a Technical Proposal. The proposal shall include sufficient information to enable the Technical Review Committee to evaluate the qualifications and capability of the Design-Build Firm to provide the desired services. The data shall be significant to the project and shall be innovative, when appropriate, and practical. Discussions of past performances on other projects shall be minimized except as they relate to the proposed work.

15.02 Proposers shall submit with their Proposals the following Technical Exhibits ***(as a Response File in PlanetBids)*:**

A. The Technical Proposal includes page limitation requirements as listed below. The total maximum number of pages for the entire Technical Proposal is fifty (50) pages. The Table of Contents, tabs & required forms (Section 7), are not included in the page number count. The minimum information to be included:

1) Introduction: Provide a cover letter **no longer than two (2) pages in length**, signed by an authorized representative of your firm. Provide a positive commitment to perform the required work. The letter should disclose the name of the contracting agent and primary contact person, his/her title, address, phone number, fax number and email address. The table of contents should follow the cover letter.
2) Table of Contents: Include a clear identification of the material included in the technical proposal by page number.
3) Tabs labeled Section 1 through 7

- **Section 1: Written Technical Proposal**
  - Standard paper size: 8-1/2"x11".
  - **Maximum allowed pages: Fifteen (15)**
  - Additional charts and graphs may be included electronically
  - The minimum information to be included:

i. Approach and Understanding of the Project: The Design-Build Firm shall present a comprehensive plan for completing the specified work. The plan should address all significant design and construction issues and constraints and should demonstrate efficient use of manpower, materials, equipment, construction schemes, and techniques for completing the project.

ii. Design-Build Firm shall describe how they intend to meet the technical requirements of the RFP.

iii. Staffing Plan: The Design-Build Firm shall submit a staffing plan, which clearly illustrates the key elements of the organizational structure proposed to accomplish the management, technical, construction and administrative services required. Project management and key personnel within each area of required services shall be identified and past experience of each, as it relates to this project, shall be discussed. (*The County must approve any changes to the Project Management and Key Personnel).*

iv. Responsible Office: Design-Build Firms being considered for this project may have more than one office location. The office assigned responsibility for the Work shall be identified in the Technical Proposal. If different elements of the work will be done at different locations, those locations shall be listed.

v. Other Appropriate Data: Other data demonstrating the ability of the Design-Build Firm to provide the desired services may be included in the Technical Proposal.

vi. Coordination: During the performance of the services, coordination must be maintained with the County and/or other agencies. A suggested method for assuring proper coordination shall be addressed in the Technical Proposal.

vii. A summary of the project schedule: The full schedule will be provided in Section 3 below.

viii. A summary of Quality Management: The actual plan will be provided in Section 5 below.

- **Section 2: Resumes of Key Project Personnel**
  - Standard paper size: 8-1/2x11”
  - Maximum allowed pages: Each resume is limited to **one (1) page per person.**

- The minimum information to be included: experience directly relevant to this project.

- **Section 3: Proposed Schedule**
  - Standard paper size: 8-1/2”x11” or larger within electronic submission
  - **Maximum allowed pages: <u>Three (3)</u>**
  - The minimum information to be included in the summary, CPM schedule of anticipated major milestones and their associated phasing as follows:
    a. Design Schedule
    b. Design Reviews by the County
    c. Geotechnical Investigations – *if applicable*
    d. Permitting
    e. Start of Construction
    f. Construction Milestones
    g. Construction Phasing
    h. Utility Relocations – *if applicable*
    i. Substantial Completion Date
    j. Final Completion Date for all Work
- **Section 4: Innovative Aspects**
  - Standard paper size: 8-1/2”x11”
  - **Maximum allowed pages: <u>Two (2)</u>**
  - The data shall be significant to the project including any proposed innovative concepts that may enhance value and quality. Any favorable cost containment approaches or additional or alternative ideas that may be successful if implemented by the County
- **Section 5: Quality Management Plan**
  - Standard paper size: 8-1/2”x11”
  - **Maximum allowed pages: <u>Five (5)</u>**
  - The minimum information to be included shall be in accordance with Section IV, Article 12. Project Requirements and Provisions for Work - Quality Management Plan (QMP).
- **Section 6: Related Experience and References**
- **Maximum allowed pages: Six <u>(6)</u>**

  For a minimum of three (3) relevant projects, include a one or two page project description that demonstrates capabilities in design-build services, experience with similar counties and/or local project experience within the last three (3)

years. *Projects completed for Nassau County should not be included in the list of relevant projects.*

For projects listed above Proposer shall submit three (3) references. The references should be submitted on the **Reference Questionnaire, EXHIBIT 1**.

THE COUNTY WILL ACCEPT THE REFERENCE FORM ONLY FROM THE INDIVIDUAL COMPLETING THE REFERENCE QUESTIONNAIRE. THE FORM SHOULD BE E-MAILED DIRECTLY TO eburton@nassaucountyfl.com WITH RFP NO. NC22-030 IN THE SUBJECT LINE.

As part of this solicitation, Proposer references are considered very important. As such, the County may contact and evaluate the responses it receives from each reference provided in response to this solicitation. To the extent the required reference questionnaires are not received, contact with proposed references cannot be made, or the proposed references indicate a lack of knowledge or awareness of Proposer, the same will be negatively reflected in the County's evaluation and award of points for this factor. Therefore, prior to proposing references, Proposers are encouraged to contact those individuals or entities being proposed as references in order to ensure that: (i) their contact information is current and correct; (ii) they are knowledgeable and aware of the issues for which they are being proposed as references; and (iii) they are ready, willing, able and permitted to provide the reference information being sought.

- **Section 7: Required Forms –** *(see Section V)*
  - Form 5-A Bid Bond
  - Form 5-B Florida Trench Safety Act Certification
  - Form 5-C Non-Collusion Affidavit
  - Form 5-D Drug-Free Workplace Certificate
  - Form 5-E Sworn Statement under Section 287-133(3)(a(), Florida Statutes, on Public Entity Crimes

ARTICLE 16 PRICE PROPOSAL

16.01 Price Proposals shall be submitted on the Proposal Form attached hereto and shall include one lump sum price for the design and construction of the Project (***separately for each Fire Station***) and the number of calendar days within which the Proposer will complete the project (Contract Times). The lump sum price(s) shall include all costs for all design, geotechnical surveys, engineering services, Design/Build Firm's quality plan, construction, and all other work necessary to fully and timely complete the Project in accordance with the Contract Documents, as well as all job sites and home office overhead, and profit. It being understood that payment of that amount will be full, complete, and final compensation for the work required to complete. **The Price**

Proposal shall be electronically submitted as a separate document from the Technical Proposal *(as a **Cost File** in Planet Bids).*

16.02 All blanks on the Proposal Form must be completed by printing in black ink or typed and the Proposal signed. A Proposal price shall be indicated for each lump sum price.

16.03 Proposal Signatures *(Form starting on page 39)*

A. A Proposal by a corporation shall be executed in the corporate name by the president or a vice-president or other corporate officer accompanied by evidence of authority to sign. The corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown on the form.

B. A Proposal by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown below the signature.

C. A Proposal by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm must be shown below the signature.

D. A Proposal by an individual shall show the Proposer's name and official address.

E. A Proposal by a joint venture shall be executed by each member of the joint venture in the manner indicated on the Proposal Form. The official address of the joint venture must be shown below the signature.

16.05 All names shall be typed or printed in ink below the signatures.

16.06 The Proposal shall contain an acknowledgement of receipt of all Addenda, the numbers of which shall be filled in on the Proposal Form.

16.07 The address and telephone number for communications regarding the Proposal shall be included.

16.08 The Proposal shall contain evidence of Proposer's authority and qualification to do business in the State of Florida or covenant to obtain such qualification prior to award of the Contract. The Proposer shall also be a state-certified Contractor in good standing and hold current registration with the Florida Construction Industry Licensing Board of the State Department of Professional Regulation. The type of license must be in a class that is related to the general nature of the construction to be performed on this project. The Proposer's State Contractor's license number for the State of the project shall be shown on the Proposal Form.

16.09 The total maximum cost to be paid by the County for Design-Build Firm's complete performance under the Design-Build Contract Documents, including, without limitations, final completion of all work, all services of Design-Build Firm under the Contract, and all fees, compensation and reimbursements to Design-Build Firm. The Guaranteed Maximum Price for **each** Fire Station shall be submitted by the Design-Build Firm to the County in a spreadsheet format separately showing cost of principal elements of: (1) Professional Architectural / Engineering & Permitting Services and (2) Construction Services for the new Fire Stations 90 & 70 individually**.** The cost of Professional Architectural / Engineering & Permitting Services shall be broken down to: (a) Site Design; (b) Building Design; (c) Permitting. The cost of Construction Services shall be broken down to each applicable Level Two Division of the CSI Classification System (CSI-MasterFormat latest Edition). The Design-Build Firm shall further separately identify for each principal element, the cost of performing the requested work as well as the amount of the Design-Build Firm's profit**.**

ARTICLE 17 WAIVER OF IRREGULARITIES

17.01 The County may waive minor informalities or irregularities in Proposals received where such is merely a matter of form and not substance, and the correction or waiver of which is not prejudicial to other Proposers. Minor irregularities are defined as those that will not have an adverse effect on the County's interest and will not affect the Price of the Proposals by giving a Proposer an advantage or benefit not enjoyed by other Proposers.

ARTICLE 18 MODIFICATION AND WITHDRAWAL OF PROPOSAL

18.01 Proposals may be withdrawn or modified at any time before the proposal due date during which the Proposer may withdraw their proposal or make any needed

modification(s) and resubmit without prejudice by utilizing the modification/withdrawal feature within the County's electronic bidding platform.

ARTICLE 19 OPENING OF TECHNICAL PROPOSALS

19.01 Evaluation of Technical Proposals / Selection of Short-List

The County reserves the right to accept or reject any or all Proposals in whole or in part. The County will be under no obligation or duty to award the resulting Contract to the Proposer with the lowest proposed price and the County reserves the right to award the resulting Contract to the lowest responsible Proposer submitting a responsive proposal which is most advantageous and in the best interests of the County.

A. The County shall open the Technical Proposals received at the public opening on the date/time referenced in the Request for Proposals. A Technical Review Committee will be responsible for evaluating and ranking each firm based upon the Technical Proposals submitted.

B. The County's Technical Review Committee will meet at the date/time referenced in the RFP to evaluate the Technical Proposals. The Technical Review Committee will evaluate the responses and rank the firms based on the evaluation criteria contained herein. Each firm should submit documents that provide evidence of capability to provide the services required for the committee's review for short-listing purposes.

C. By submission of its proposal, the Design-Build Firm accepts all solicitation requirements, including terms and conditions, representations and certifications, and technical requirements. Failure to meet a requirement may result in a proposal being determined technically unacceptable. Proposers must clearly identify any exception to the solicitation and conditions and provide complete accompanying rationale.

D. The Technical Review Committee shall present their recommendation of award to the Nassau County Board of County Commissioners, who has final approval authority.

ARTICLE 20 PROPOSALS TO REMAIN SUBJECT TO ACCEPTANCE

20.01 All Proposals will remain subject to acceptance for the period of time stated in the Proposal Form, but the County may, in its sole discretion, release any Proposal and return the Proposal security prior to the end of this period.

ARTICLE 21 EVALUATION CRITERIA

21.01 For the purpose of award, a 100-point formula scoring system will be utilized based upon the following criteria:

A. FACTOR 1 – Compliance with RFP Instructions – **5 points Max**:
Firm's proposal complied with instructions issued in the RFP. Non-compliance with significant instructions may be grounds for proposal disqualifications.

B. FACTOR 2 – Firm's Qualifications and Experience – **20 points Max:**
   a. The ability and capability of the firm to perform the project
   b. Firm's experience and expertise on similar projects
   c. Firm's ability to communicate, work effectively in a group and build consensus with staff, elected officials, the board, committees, and the public
   d. Firm's experience regarding project budgets and schedules, and their demonstrated ability to meet both.

C. FACTOR 3 – Project Team/Abilities and Expertise – **15 points Max**:
   a. The adequacy of the firm's professional key personnel and project team to be assigned to the project
   b. Project team's previous experience demonstrates success in completing projects
   c. Project team's previous experience with project scheduling, budget, and technical requirements that are directly relevant to the project description

D. FACTOR 4 – Project Approach – **30 points Max**:
   a. Firm's detailed project management plan, interpretation of scope and method of approach. Including any proposed innovative concepts that may enhance value and quality, any favorable cost containment approaches or additional or alternative ideas that may be successful if implemented by Nassau County
   b. Assess the Firm's proposed schedule for timely completion of the project
   c. Responsibilities and capabilities of the management and staff personnel, including sub-contractors, who will work on the project
   d. Firm's proposed schedule for services, timely initiation, and completion of all work

E. FACTOR 5 – Quality Control – **10 points Max**:
   a. The proposal will be evaluated on the quality control process to be implemented to ensure that quality work products and services can be delivered in a timely manner.

F. FACTOR 6 – Previous Projects/References – **10 points Max**:
   a. Firm's references with emphasis on projects of similar scope and size. Proposal will be evaluated on the basis of project experiences that include projects outlined in the scope of work and services required.

G. FACTOR 7 – Proposed Price (GMP) – **10 points Max**

21.02 County may conduct such investigations as County deems necessary to assist in the evaluation of any Proposal and to establish the responsibility, qualifications and financial ability of proposers and proposed engineers, Subcontractors, Suppliers, and other individuals and entities to perform and furnish the Work in accordance with the Contract Documents.

ARTICLE 22 SHORT-LIST / COMPETITIVE SELECTION

22.01 At the County's discretion, the Technical Review Committee may short-list up to three (3) firms based upon the average technical scores and make recommendation to the Board of County Commissioners who has final approval authority. During the evaluation process, the committee reserves the right, where it may serve the County's best interest, to request additional information or clarifications.

The County reserves the right to make selections based on the submittals only or to request oral presentations or question/answer sessions with the top ranked firms before determining the final ranking.

If the County requests oral presentations from the top ranked firms, a separate evaluation process will be conducted. Scores from the oral presentations will be added to the initial evaluation for short-list ranking scores. The evaluation criteria and scoring that will be used for ranking of the oral presentations will be provided prior to the presentation date.

ARTICLE 23 REJECTION OF ALL PROPOSALS AND DISCREPANCIES; AWARD OF CONTRACT

23.01 Rejection of All Proposals, Discrepancies

A. County reserves the right to reject any and all Proposals, including without limitation, nonconforming, non-responsive, unbalanced or conditional Proposals. County further reserves the right to reject the Proposal of any Proposer whom it finds, after reasonable inquiry and evaluation, to be non-responsible. County may also reject the Proposal of any Proposer if County believes that it would not be in the best interest of the Project to make an award to that Proposer. County also reserves the right to waive all informalities not involving price, time or changes in the Work and to negotiate contract terms with the Successful Proposer.

B. More than one Proposal for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Proposer has an interest in more than one Proposal for the Work may be cause for disqualification of that Proposer and the rejection of all Proposals in which that Proposer has an interest.

C. If the contract is awarded, County will award the Contract to Proposer whose Proposal is in the best interests of the Project.

23.02 Award of Contract/Design-Build Agreement

A. If the contract is to be awarded, County will give Successful Proposer a Notice of Award approximately 60 days after the day of the Proposal opening.

B. The County will enter into a Lump Sum agreement with the successful Design-Build Firm. In accordance with the agreement, the Design-Build Firm will provide a Schedule of Values to the County for their approval. The total of the Schedule of Values will be the lump sum contract amount.

C. The terms and conditions of this contract are fixed price and fixed time. The Design-Build Firm's submitted Proposal Price (time and cost) is to be a lump sum Proposal for completing the scope of work detailed in the Request for Proposal.

ARTICLE 24 CONTRACT SECURITY AND INSURANCE

24.01 Contract Security

A. Section 5 of the Sample Design/Build Agreement (Attachment "B") sets forth County's requirements as to performance and payment Bonds. When the Successful Proposer delivers the executed Agreement to County, such Bonds must accompany it.
B. Simultaneously, with delivery of the executed contract, the Design-Build Firm shall furnish a surety bond or bonds as security for faithful performance of this contract and for the payment of all persons performing labor on the project under this contract and furnishing materials in connection with this contract, as specified in the Design-Build Agreement. The surety on such bond and bonds shall be a duly authorized surety company satisfactory to County.
C. Attorneys-in-fact who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

24.02 Indemnification and Insurance

Section 12 of the General Terms and Conditions located in the Sample Design/Build Agreement (Attachment "B") sets forth County's requirements as to indemnification and insurance. The required Certificates of Insurance must be provided prior to the issuance of the Notice to Proceed.

ARTICLE 25 SIGNING OF AGREEMENT

25.01 When County gives Notice of Award to the Successful Proposer, it shall be accompanied by the required number of unsigned counterparts of the Agreement with the other Contract Documents which are identified in the Agreements as attached thereto. Within 15 days thereafter, Successful Proposer shall sign and deliver the required number of counterparts of the Agreement and attached documents to County. Within 15 days thereafter, County shall deliver one fully signed counterpart to Successful Proposer.

ARTICLE 26 COUNTY DIRECT PURCHASES SUPPLEMENTARY CONDITIONS

26.01 County reserves the **right to require** the Design-Builder to assign some or all of its subcontracts or other agreements with material suppliers directly to the County. This process will be referred to as Owner Direct Purchases (ODP) and is a method that **may** be utilized to create savings for County. County saves the amount of the sales tax when it purchases material/equipment required for a construction project directly from the manufacturer/supplier (material/equipment cost only), and simultaneously decreases

the amount of the contract for the cost of the materials/equipment plus the sales tax. The contract cost reduction is accomplished through the construction change order process. Additional savings may also be realized if County negotiates a cost reduction for the associated reduced premium cost for the project price guarantee, (e.g., performance and payment bond(s), irrevocable letter of credit, bank check, etc.)

End of Section

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SECTION III

PROPOSAL FORM

PROJECT IDENTIFICATION: **Fire Stations 90 & 70 Design-Build**
Proposal Number NC22-030-RFP
Nassau County, Florida

PROPOSAL DEADLINE: SEPTEMBER 14, 2022 @ 10:00 AM

THIS PROPOSAL IS SUBMITTED VIA THE COUNTY'S VENDOR PORTAL, PLANETBIDS TO:

Nassau County Board of County Commissioners
Robert M. Foster Justice Center
Office of the Ex-Officio Clerk
76347 Veterans Way, Suite 456
Yulee, Florida 32097

ARTICLE 1 PROPOSER'S OBLIGATIONS AND REPRESENTATIONS

1.01 The undersigned Proposer proposes and agrees if this Proposal is accepted, to enter into an agreement with County in the form included in the Proposal Documents, to perform all Work as specified or indicated in the Contract Documents for the contract price and within the contract times indicated in this Proposal and in accordance with the other terms and conditions of the Contract Documents.

Company Name (typed or printed): _____
Business address: _____
Phone No.: _____ Fax No.: _____
Contact Name: _____
Contact Title: _____
Contact email address: _____

1.02 Proposer accepts all of the terms and conditions of the Proposal Documents, including without limitation those dealing with the disposition of Proposal security. This Proposal will remain subject to acceptance for sixty (60) days after the day of Proposal opening, or for such longer period of time that Proposer may agree to in writing upon request of

the County. Proposer will sign and deliver the required number of counterparts of the Agreement with any Bonds and other documents required by the Request for Proposal and Proposal Form within fifteen (15) days after the date of County's Notice of Award.

1.03 In submitting this Proposal, Proposer represents and agrees as more fully set forth in the Agreement, that:

A. Proposer has examined and carefully studied the Proposal Documents and the following Addenda, receipt of all which is hereby acknowledged:

Addendum No.	Addendum Date
_____	_____
_____	_____
_____	_____
_____	_____

B. Proposer has visited the Site and become familiar with the general, local and Site conditions that may affect cost, progress, and performance and furnishing of the Work.

C. Proposer is familiar with all federal, state and local Laws and Regulations that may affect cost, progress, performance and furnishing of the Work.

D. Proposer has carefully studied all: (1) available reports of explorations and tests of subsurface conditions at or contiguous to the Site and all available drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified or made available by County, and (2) reports and drawings of a Hazardous Environmental Condition, if any.

E. Proposer has obtained and carefully studied (or assumes responsibility for having done so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the Site which may affect costs, progress, performance or furnishing of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be

employed by Proposer, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Proposal Documents to be employed by Proposer, and safety precautions and programs incident thereto.

F. Proposer is aware of the general nature of the work to be performed by the County and others at the Site that relates to Work for which this Proposal is submitted as indicated in the Contract Documents.

G. Proposer has correlated the information known to Proposer, information and observations obtained from visits to the Site, reports and drawings identified in the Proposal Documents and all additional examinations, investigations, explorations, tests, studies and data with the Proposal Documents.

H. Proposer does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Proposal for performance of the Work at the price Proposal and within the times and in accordance with the other terms and conditions of the Proposal Documents.

I. Proposer has given County written notice of all conflicts, errors, ambiguities, or discrepancies that Proposer has discovered in the Proposal Documents, and the written resolution thereof by the County designee and Engineer of Record is acceptable to Proposer, and the Proposal Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work for which this Proposal is submitted.

J. This Proposal is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; Proposer has not directly or indirectly induced or solicited any other Proposer to submit a false or fraudulent Proposal; Proposer has not solicited or induced any individual or entity to refrain from submitting a Proposal; and proposer has not sought by collusion to obtain for itself any advantage over any other Proposer or over County.

ARTICLE 2 CONTRACT PRICE - *(A SEPARATE CONTRACT PRICE FORM TO BE COMPLETED FOR EACH FIRE STATION AND UNDER SEPARATE COVER FROM THE TECHNICAL PROPOSAL)*

2.01 Proposer will complete the Work in accordance with the Contract Documents for the following price(s):

A. DESIGN-BUILD FIRM FEES

1. The Cost of all work shall be the amounts indicated below.

2. Design/Pre-Construction Phase Fee
   a. For the performance of the design/pre-construction services and for profit and overhead related to these services, a total lump sum fee of _____ _____($_____).

3. Construction Phase Fee
   a. The Design-Build Firm's compensation for services performed during the Construction Phase and for profit and overhead related to these services, a total lump sum fee of _____ _____($_____)

4. Total Guaranteed Maximum Price (Total of 2.01.A.2 and 2.01.A.3)

   a. The GUARANTEED MAXIMUM PRICE to County, consisting of the cost of the Work and Proposer's Fee, will not exceed _____ ($_____), subject to increases or decreases for changes in the Work.

2.02 All specific cash allowances are included in the price(s) set forth above.

ARTICLE 3 CONTRACT TIMES - *(A SEPARATE FORM TO BE COMPLETED FOR EACH FIRE STATION)*

3 .01 Proposer agrees that the Work shall be substantially completed within _____ (____) calendar days from the Commencement Date. The Work shall be fully completed and deemed ready by the County for final completion within _____ (_____) calendar days from the Substantial Completion Date. The Contract Time shall be the time period from the Commencement Date to the date of final completion totaling _____ (_____) calendar days (herein "Contract Time").

3.02 Contract must meet the following milestones:

A. _____ days from NTP: Phase 1 – Schematic Design Phase

B. _____ days from NTP: Phase 2 – Design Development

C. _____ days from NTP: Phase 3 – Working Drawings and Specifications

D. _____ days from NTP: Phase 4 – Construction/Final Completion

3.03 Proposer accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work within the times specified above, which is stated in Section 6 - Contract Time and Liquidated Damages, Attachment B Design/Build Sample Agreement.

ARTICLE 4 EXHIBITS/FORMS

4.01 The following documents are attached to and made a condition of this Proposal:

Form 5-A	Bid Bond
Form 5-B	Florida Trench Safety Act Certification
Form 5-C	Non-collusion Affidavit
Form 5-D	Drug-Free Workplace Certificate
Form 5-E	Sworn Statement under Section 287-133(3)(a), Florida Statutes, on Public Entity Crimes

ARTICE 5 TERMINOLOGY

5.01 The terms used in this Proposal which are defined in the General Conditions of the Design/Build Sample Agreement (Attachment "B") between County and Design/Builder ("General Conditions") included a part of the Contract Documents have the meaning assigned to them in the General Conditions. Terms defined in the Request for Proposal are used with the same meaning in this Proposal.

ARTICLE 6 SUBMISSION

6.01 SUBMITTED on _____, 20_____.

State Contractor License No. _____.
State Certificate of Authority for Corporate Engineering Practice (If Applicable):

[The remainder of this page intentionally left blank]

If Proposer is:

An Individual

Name (typed or printed): _____

By: _____

(*Individual's Signature*)

Doing business as: _____

Business address: _____

_____

Phone No.: _____ Fax No.: _____

A Partnership

Partnership Name: _____

By: _____

(*Signature of general partner - attach evidence of authority to sign*)

Name (typed or printed): _____

Business address: _____

_____

Phone No.: _____ Fax No.: _____

A Corporation

Corporation Name: _____

(SEAL)

State of Incorporation: _____

Type (General Business, Professional, Service, Limited Liability): _____

By: _____

(*Signature - attach evidence of authority to sign*)

Name (typed or printed): _____

Title: _____ (CORPORATE SEAL)

Attest _____

(*Signature of Corporate Secretary*)

Business address: _____

_____

Phone No.: _____ Fax No.: _____

Date of Qualification to do business is _____

A Joint Venture

Joint Venture Name: _____

By: _____

(*Signature of joint venture partner - attach evidence of authority to sign*)

Name (typed or printed): _____

Title: _____

Business address: _____

_____

Phone No.: _____ Fax No.: _____

Joint Venture Name: _____

By: _____

(*Signature - attach evidence of authority to sign*)

Name (typed or printed): _____

Title: _____

Business address: _____

_____

Phone No.: _____ Fax No.: _____

Phone and FAX Number, and Address for receipt of official communications:

_____

_____

(Each joint venture must sign. The manner of signing for each individual, partnership, and corporation that is a party to the joint venture should be in a manner indicated above.)

SECTION IV

PROJECT REQUIREMENTS AND PROVISIONS FOR WORK

ARTICLE 1 GOVERNING REGULATIONS

1.01 The services performed by the Design-Build Firm shall be in compliance with all applicable Manuals and Guidelines and additional requirements specified in this document. Except to the extent inconsistent with the specific provisions in this document, the current edition, including updates, of the following Manuals and Guidelines shall be used in the performance of this work. Current edition is defined as the edition in place and adopted by the issuing agency at the date of advertisement of this contract.

A. Florida Building Code
http://floridabuilding.org/bc/bc_default.aspx

B. Florida Department of Transportation Standard Specifications for Road and Bridge Construction
http://www.dot.state.fl.us/specificationsoffice/Specs.shtm

C. Nassau County Florida Construction Procedures (NCCP)
https://app.box.com/s/g4djy2y614txncfxryc2

D. Florida Statutes
http://www.leg.state.fl.us/STATUTES/

E. Florida Administrative Code
http://florida.eregulations.us/rule

F. United States Department of Labor, Occupational Safety & Health Administration (OSHA)
https://www.osha.gov/pls/oshaweb/owasrch.search_form?p_doc_type=standards&p_toc_level=0

G. Florida Department of Environmental Protection
http://www.dep.state.fl.us/

ARTICLE 2 INNOVATIVE ASPECTS

2.01 All innovative aspects shall be identified separately as such in the Technical Proposal.

2.02 An innovative aspect does not include revisions to specifications, standards or established policies. Innovation should be limited to Design-Build Firm's means and methods, approach to Project, etc.

ARTICLE 3 GEOTECHNICAL SERVICES

3.01 General Conditions

A. The Design-Build Firm shall be responsible for identifying and performing any geotechnical investigation, analysis and design of foundations, foundation construction, foundation load and integrity testing, and inspection dictated by the Project needs in accordance with guidelines, procedures and specifications. All geotechnical work necessary shall be performed in accordance with the Governing Regulations. The Design-Build Firm shall be solely responsible for all geotechnical aspects of the Project.

Article 4 ENVIRONMENTAL PERMITS

4.01 Storm Water and Surface Water

A. Plans shall be prepared in accordance with Chapters 373 and 403 (F.S.) and Chapters 40 and 62 (F.A.C.)

4.02 Permits

A. Contractor required to obtain all permits.

B. All applicable data shall be prepared in accordance with Chapter 373 and 403, Florida Statutes, Chapters 40 and 62, Florida Administrative Code

C. The Design-Build Firm will be required to obtain and pay for all permits and licenses required by authorities having jurisdiction, including but not limited to: land clearing permit, NPDES Notice of Intent and dewatering permit. Any fines levied by permitting agencies shall be the responsibility of the Design-Build Firm.

D. The Design-Build Firm shall be responsible to adhere to all provisions, requirements, and cost contained in all permits applicable to this project.

Article 5 Survey

5.01 The Design-Build Firm shall perform all surveying and mapping services necessary to complete the Project. Survey services must also comply with all pertinent Florida Statutes and applicable rules in the Florida Administrative Code. All field survey data will be furnished to the County in an approved digital format, readily available for input and use in CADD Design files. This work must comply with the Minimum Technical Standards for Professional Surveyors and Mappers, Chapter 5J-17, Florida Administrative Code (F.A.C.), pursuant to Section 472.027, Florida Statutes (F.S.) and any special instructions from the local County. This survey also must comply with the Department of Environmental Protection Rule, Chapter 18-5. F.A.C. pursuant to Chapter 177, F.S., and the Department of Environmental Protection.

5.02 The Design-Build Firm shall assure all surveying and mapping products and services comply with pertinent Florida Statutes and the Florida Administrative Code together with pertinent federal regulations and statutes.

5.03 Design-Build Firm shall employ a competent Engineer or Land Surveyor licensed in the State of Florida familiar with construction control procedures to lay out all other parts of the work, and to establish all points, grades and levels necessary to locate the work. The Design-Build Firm shall be held responsible for all mistakes that may be caused by his incorrect layout and grade spotting work or caused by the loss or disturbance of the Engineer's layout work.

5.04 No site or structure drawings are available for Fire Stations 90 or 70, only sample design/engineered drawings for Fire Station 71.

ARTICLE 6 VERIFICATION OF EXISTING CONDITIONS

6.01 The Design-Build Firm shall be responsible for verification of existing conditions, including research of all existing records and other information.

6.02 By execution of the contract, the Design-Build Firm specifically acknowledges and agrees that the Design-Build Firm is contracting and being compensated for performing adequate investigations of existing site conditions sufficient to support the design development by the Design-Build Firm and that any information is being provided merely to assist the Design-Build Firm in completing adequate site investigations.

6.03 Notwithstanding any other provision in the contract documents to the contrary, no additional compensation will be paid in the event of any inaccuracies in the preliminary information.

ARTICLE 7 SUBMITTALS

7.01 Plans:

A. The Design-Build Firm shall provide copies of required review documents as listed below:

30% Component Plans

Three (3) sets of 24”x36” construction plans
Independent Peer reviewer’s comments and comment responses

60% Component Plans

Three (3) sets of 24”x36” construction plans
Two (2) copies of the Geotechnical Report (if applicable)
One (1) copy of the preliminary Technical Specifications
Independent Peer reviewer’s comments and comment responses

90% Component Plans

Three (3) sets of 24”x36” construction plans
Three (3) copies of the Geotechnical Report (if applicable)
Three (3) sets of documentation – roadway/drainage
One (1) copy of the preliminary Technical Specifications
Independent Peer reviewer’s comments and comment responses

Final Component Plans

Three (3) sets of 24”x36” construction plans
Three (3) sets of final documentation
One (1) signed and sealed copy of Specifications Package
Two (2) sets of electronic copies of Technical Special Provisions on CD
Independent Peer Reviewer’s signed and sealed cover letter that all comments have been addressed and resolved.

Construction Set:

One (1) set of 24”x36” copies of the signed and sealed plans for the Local Agency to stamp “Released for Construction”.

7.02 Final signed and sealed plans will be delivered to the County's Project Manager a minimum of fifteen (15) calendar days (excluding Holidays) prior to construction of that component. The County's Project Manager will send a copy of a final signed and sealed plan to the appropriate office for review and comment. Once all comments have been satisfactorily resolved as determined by the County, the County's Project Manager or Representative will initial, date and stamp each submittal as "Released for Construction". Only signed and sealed plans which are stamped "Release for Construction" by the County Project Manager or Representative are valid and all work that the Design-Build Firm performs in advance of the County release of Plans will be at the Design-Build Firm's risk.

7.03 Record Set

A. The Design-Build Firm shall furnish to the County, upon Project completion, the following:

- One (1) set of 24"x36" Final As-Built
- Two (2) sets of 24"x36" copies of the signed and sealed plans
- One (1) set of final documentation (if different from final component submittal)
- Two (2) copies of the final documentation (if different from the final component submittal)
- Two (2) Final Project CD's

B. The Design-Build Firm's Professional Engineer in responsible charge of the Project's design shall professionally endorse (signed and sealed and certified) the record prints, the special provision and all reference and support documents.

C. The Design-Build Firm shall complete the record set as the Project is being constructed. The record set becomes the as-builts at the end of the Project. All changes shall be signed/sealed by the EOR. The record set shall reflect all changes initiated by the Design-Build Firm or the County in the form of revisions. The record set shall be submitted on a Final Project CD upon Project completion.

D. The CEI shall perform a review of the record set prior to final acceptance in order to complete the record set.

ARTICLE 8 CONTRACT DURATION

8.01 The Design-Build Firm shall establish the contract duration for the Project. The schedule supporting the proposed contract duration will be submitted with the Technical and Price Proposal and should identify if the work activity durations are based on calendar days or working days. The official proposed Contract Time will be the one submitted with the Technical and Price Proposal.

ARTICLE 9 PROJECT SCHEDULE

9.01 The Design-Build Firm shall submit a Project schedule which supports the established contract duration submitted as part of the Price Proposal. The Design-Build Firm's schedule should allow for fifteen (15) calendar days (excluding weekends and observed Holidays) review time for County review of all submittals.

9.02 The minimum number of activities shall be those listed in the payout schedule and those listed below:

- Design Submittals
- Design Survey
- Design Reviews by the Local Agency and Project Manager
- Design Review / Acceptance Milestones
- Geotechnical Investigation
- Start of Construction
- Clearing and Grubbing
- Construction Mobilization
- Environmental Permit Acquisition
- Construction milestones
- Permit Submittals
- Erosion Control
- Holidays and Special Events (shown as non-workdays)
- Additional Construction Milestones as determined by the Design-Build Firm
- Final Completion Date for All Work

ARTICLE 10 KEY PERSONNEL/STAFFING

10.01 The Design-Build Firm's work shall be performed and directed by key personnel identified in the Technical Proposal by the Design-Build Firm. Any changes in the indicated personnel shall be subject to review and approval by the County Project Manager or Representative. The Design-Build Firm shall have available a professional staff that meets the minimum training and experience set forth in Florida Statute Chapter 455.

ARTICLE 11 MEETINGS AND PROGRESS REPORTING

11.01 The Design-Build Firm shall anticipate periodic meetings with County personnel and other agencies as required for resolution of design and/or construction issues. These meetings may include:

- County Technical issue resolution
- Permit agency coordination

- Local government agency coordination
- Scoping Meetings

11.02 During design, the Design-Build Firm shall meet with the County Project Manager on a monthly basis and provide a month look ahead of the activities to be completed during the upcoming month.

11.03 During construction, the Design-Build Firm shall meet with the County Project Manager on a weekly basis and provide a one-week look ahead for activities to be performed during the coming week.

11.04 The Design-Build Firm shall, on a monthly basis, provide written progress reports that describe the items of concern and the work performed on each task.

ARTICLE 12 QUALITY MANAGEMENT PLAN (QMP)

12.01 Design

A. The Design-Build Firm shall be responsible for the professional quality, technical accuracy and coordination of all surveys, designs, drawings, specifications, geotechnical and other services furnished by the Design-Build Firm under this contract.

B. The Design-Build Firm shall provide a Design Quality Management Plan, which describes the Quality Control (QC) procedures to be utilized to verify, independently check, and review all design drawings, specifications, and other documentation prepared as a part of the contract. In addition, the QMP shall establish a Quality Assurance (QA) program to confirm that the Quality Control procedures are followed. The Design-Build Firm shall describe how the checking and review processes are to be documented to verify that the required procedures were followed. The QMP may be one utilized by the Design-Build Firm, as part of their normal operation or it may be specifically designed for this project. The Design-Build Firm shall submit a QMP within fifteen (15) working days of the written Notice to Proceed. A marked up set of prints from the Quality Control review will be sent in with the 90% review submittal. The responsible Professional Engineers or Professional Surveyor that performed the Quality Control review, as well as the QA manager will sign a statement certifying that the review was conducted.

C. The Design-Build Firm shall, without additional compensation, correct all errors or deficiencies in the surveys, designs, drawings, specifications and/or other services.

D. No fabrication, casting, or construction will occur until all related design review and shop drawing review comments are resolved.

12.02 Construction

A. The Design-Build Firm shall be responsible for developing and maintaining a Construction Quality Control Plan in accordance with Section 105 of FDOT Standard Specifications which describes their Quality Control procedures to verify, check, and maintain control of key construction processes and materials.

B. County shall maintain its rights to inspect construction activities and request any documentation from the Design-Build Firm to ensure quality products and services are being provided in accordance with the contract document.

ARTICLE 13 SCHEDULE OF VALUES

13.01 The Design-Build Firm will be responsible for invoicing the County based on current invoicing policy and procedure. Invoicing will be based on the completion or percentage of completion of major, well-defined tasks as defined in the schedule of values. Final payment will be made upon final acceptance by the County of the Design-Build Project. The Design-Build Firm must submit the schedule of values to the County for approval. No invoices shall be submitted prior to County approval of the schedule of values.

13.02 Upon receipt of the invoice, the County's Project Manager will make judgment on whether or not work of sufficient quality and quantity has been accomplished by comparing the reported percent complete against actual work accomplished.

ARTICLE 14 COMPUTER AUTOMATION

14.01 (Not Used)

ARTICLE 15 CONSTRUCTION ENGINEERING AND INSPECTION

15.01 The County is responsible for providing Construction Engineering and Inspection (CEI) and Quality Assurance Engineering.

15.02 The Design-Build Firm is subject to County's Independent Assurance (IA) Procedures.

ARTICLE 16 TESTING

16.01 The County or its representative will perform verification and resolution testing services in accordance with the latest Specifications.

16.02 County, its respective representatives, agents and employees, and any governmental agencies with jurisdiction over the Project shall have access at all times to the Work, whether the Work is being performed on or off of the Project site, for their observation, inspection and testing. Design-Build Firm shall provide proper, safe conditions for such access. Design-Build Firm shall provide County with timely notice of readiness of the Work for all required inspections, tests or approvals.

16.03 If the Contract Documents or any codes, laws, ordinances, rules or regulations of any public authority having jurisdiction over the Project requires any portion of the Work to be specifically inspected, tested or approved, Design-Build Firm shall assume full responsibility therefore, pay all costs in connection therewith and furnish County the required certificates of inspection, testing or approval. All inspections, tests or approvals shall be performed in a manner and by organizations acceptable to the County.

16.04 In any Work that is to be inspected, tested or approved is covered without written concurrence from the County, such work must, if requested by County, be uncovered for observation. Such uncovering shall be at Design-Builder's expense unless Design-Builder has given County timely notice of Design-Build Firm's intention to cover the same and County has not acted with reasonable promptness to respond to such notice. If any Work is covered contrary to written directions from County, such Work must, if requested by County, be uncovered for County's observation and be replaced at Design-Build Firm's sole expense.

16.05 Neither observations by the County nor inspections, tests or approvals by others shall relieve Design-Build Firm from Design-Build Firm's obligations to perform the Work in accordance with the Contract Documents.

16.06 Prior to payment for any Work for which testing is specified, Design-Build Firm shall provide the County a copy of reasonable acceptable test results relating to such work as required by the technical specifications of the solicitation.

ARTICLE 17 ADJOINING CONSTRUCTION PROJECTS

17.01 The Design-Build Firm shall be responsible for coordinating construction activities with other construction Projects that are impacted by or impact this Project. This includes Projects under the jurisdiction of local governments, County, or other regional and state agencies.

ARTICLE 18 USE OF COUNTY PROPERTY OR RIGHT OF WAY

18.01 Use of County owned property or Right of Way by the Design-Build Firm for the purpose of equipment or material storage, lay-down facilities, pre-cast material fabrication sites, batch plants for the production of asphalt, concrete or other construction related materials, etc. shall

require advance approval by the County. Use of County owned property or Right of Way by the Design-Build Firm for these purposes is expressly limited to the Project referenced in this RFP.

18.02 The Design-Build Firm shall provide on the jobsite an office of useful floor area for the exclusive use of the County's Construction Manager. Provide a weather-tight structure with adequate heating and cooling, toilet facilities, lighting, ventilation, a standard size office desk and chair, computer station, and working communications facilities.

ARTICLE 19 CONSTRUCTION CLARIFICATION, CONFLICT RESOLUTION, AND ISSUE ESCALATION

19.01 In the event that construction problems occur, the resolution of those problems will be processed in one or more of the following ways:

- If the resolution does not change the original intent of the technical proposal/RFP, then the Design-Build Firms' Architect/Engineer of Record (EOR) will be responsible for developing the design solution to the construction problem and the County will be responsible for review and response within ten (10) working days. The County will either concur with the proposed solution or, if the County has concerns, the issue will be escalated to the Review Committee, Engineering and the County's Legal department as needed or required.

- If the resolution does alter the original intent of the technical proposal/RFP then the Architect/EOR will develop the proposed solution, copy in the County, and send it to the County for review and response through the County Engineer. The Project Manager will respond to the proposed solution within ten (10) working days. The Project Manager will either concur with the proposed solution or, if the County has concern, the issue will be escalated to the Review Committee, Engineering and the County's Legal department as needed or required. Changes to the original intent of the technical proposal/RFP will require a contract change order.

- The County may utilize this section, at their discretion, as to disputes regarding Contract interpretation. The County may send a written communication to the Contractor by email, overnight mail, UPS, FedEx, or certified mail. The written notification shall set forth the County's interpretation of the Contract. A response shall be provided in the same manner prior to the initial meeting with the County Manager. This initial meeting shall take place no more than twenty (20) days from the written notification of the dispute addressed to the Contractor. The Contractor should have a representative, at the meeting that can render a decision on behalf of the Contractor.

If there is no satisfactory resolution as to the interpretation of the contract, the dispute may be submitted to mediation in accordance with mediation rules as established by the Florida Supreme Court. Mediators shall be chosen by the County and the cost of mediation shall be borne by the Contractor. The Contractor shall not stop work during the pendency of mediation or dispute resolution.

- Also reference Exhibit "A" Section 10 – General Terms and Conditions in the Sample Design-Build Agreement (Attachment "B") for remedies to claims and disputes.

End of Section

[The remainder of this page intentionally left blank]

SECTION V

Form 5-A

BID BOND (Proposal Security)

Any singular reference to Bidder, Surety, Owner, or other party shall be considered plural where applicable.

BIDDER (Name and Address):

SURETY (Name and Address of Principal Place of Business):

OWNER (Name and Address):

BID

Bid Due Date: **September 14, 2022**
Project: NC22-030-RFP Fire Stations 90 & 70 Design-Build (Nassau County FL)

BOND *(5% of Proposer's maximum proposal price)*
Bond Number:
Date (Not later than Bid due date):
Penal Sum: _____ _____
(Words) (Figures)

Surety and Bidder, intending to be legally bound hereby, subject to the terms hereof, do each cause this Bid Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

BIDDER

_____ (Seal)
Bidder's Name and Corporate Seal

By: _____
Signature and Title

Attest: _____
Signature and Title

SURETY

_____ (Seal)
Surety's Name and Corporate Seal

By: _____
Signature and Title
(Attach Power of Attorney)

Attest: _____
Signature and Title

Note: Above addresses are to be used for giving required notice.

DAMAGES FORM

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to the County upon default of Bidder any difference between the total amount of Bidder's Bid and the total amount of the Bid of the next lowest, responsible Bidder who submitted a responsive Bid as determined by the County for the work required by the Contract Documents, provided that:

1.1. If there is no such next Bidder, and the County does not abandon the Project, then Bidder and Surety shall pay to the County the penal sum set forth on the face of this Bond, and

1.2. In no event shall Bidder's and Surety's obligation hereunder exceed the penal sum set forth on the face of this Bond.

2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by the County) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.

3. This obligation shall be null and void if:

3.1. The County accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by the County) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or

3.2. All Bids are rejected by the County, or

3.3. The County fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph *5* hereof).

4. Payment under this Bond will be due and payable upon default by Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from the County, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount clue.

5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by the County and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from Bid due date without Surety's written consent.

6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety and in no case later than one year after Bid due date.

7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.

8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.

9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.

10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.

11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

Form 5-B

FLORIDA TRENCH SAFETY ACT CERTIFICATION

Bidder acknowledges that included in the various items of the proposal and in the Total Bid Price are costs for complying with the Florida Trench Safety Act (90-96, Laws of Florida) as modified October 1, 2008. The Bidder further identifies the costs to be summarized below:

	Cost
1. Trench Safety Act Compliance	$_____
2. Special Shoring	$_____

Identify method of compliance for Item #1: _____

_____

Identify or attach a copy of Special Shoring requirements for Item #2: _____

_____

The undersigned certifies that he/she is the Contractor who will perform the trench excavation for this project, and hereby gives written assurance that Contractor will comply with the applicable trench safety standards specifically set forth in Florida's Trench Safety Act, Laws of Florida, 90-96.

BIDDER: _____

By: _____

Name: _____

Title: _____

Sworn to (or affirmed) and subscribed before me by means of ___ physical presence or ___ online notarization, this _____ day of _____, 20__ by _____ who is___ personally known to me or ___ produced _____ as identification

_____
Notary Public

My Commission Expires: _____

Form 5-C

NONCOLLUSION AFFIDAVIT

TO: The _____, herein called the "County."

Pursuant to bidding requirements for the work titled "_____

_____,"

the enclosed contract documents shall be provided to the County.

State of _____

County of _____

_____, being first duly sworn, deposes, and says that:

A. He is _____(officer's title) of _____(company name), the Bidder that has submitted the attached bid;

B. He is fully informed respecting the preparation and contents of the attached bid and of all pertinent circumstances respecting such bid;

C. Such bid is genuine and is not a collusive or fraudulent bid;

D. Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees, or parties in interest, including this affiant, has in any way colluded, conspired, connived, or agreed, directly or indirectly with any other Bidder, firm, or person to submit a collusive or fraudulent bid in connection with the contract for which the attached bid has been submitted or to refrain from bidding in connection with such contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other Bidder, firm, or person to fix the price or prices in the attached bid or of any other Bidder, or to fix any overhead, profit, or cost element of the bid price or the bid price of any other Bidder, or to secure through any collusion, conspiracy, connivance, or unlawful agreement any advantage against the _____ or any person interested in the proposed contract; and

E. The price or prices quoted in the attached bid are fair and proper and are not tainted by any collusion, conspiracy, connivance, or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners: employees, or parties in interest, including this affiant.

(Signed) _____

_____

Sworn to (or affirmed) and subscribed before me by means of ___ physical presence or ___ online notarization, this _____ day of _____, 20__ by _____ who is___ personally known to me or ___ produced _____ as identification

_____
Notary Public

_____
My commission expires

Form 5-D

DRUG FREE WORKPLACE CERTIFICATE

I, the undersigned, in accordance with Florida Statute 287.087, hereby certify that _____

_____ (print or type name of firm)

- Publishes a written statement notifying that the unlawful manufacture, distribution, dispensing, possession or use of a controlled substance in the workplace named above and specifying actions that will be taken against violations of such prohibition.

- Informs employees about the dangers of drug abuse in the workplace, the firm's policy of maintaining a drug free working environment, and available drug counseling, rehabilitation, and employee assistance programs, and the penalties that may be imposed upon employees for drug use violations.

- Gives each employee engaged in providing commodities or contractual services that are under bid or proposal, a copy of the statement specified above.

- Notifies the employees that as a condition of working on the commodities or contractual services that are under bid or proposal, the employee will abide by the terms of the statement and will notify the employer of any conviction of, plea of guilty or nolo contendere to, any violation of Chapter 1893, or any controlled substance law of the State of Florida or the United States, for a violation occurring in the work place, no later than five (5) days after such conviction, and requires employees to sign copies of such written statement to acknowledge their receipt.

- Imposes a sanction on, or requires the satisfactory participation in, a drug abuse assistance or rehabilitation program, if such is available in the employee's community, by any employee who is so convicted.

- Makes a good faith effort to continue to maintain a drug free workplace through the implementation of a drug free workplace program.

“As a person authorized to sign a statement, I certify that the above named business, firm, or corporation complies fully with the requirements set forth herein.”

_____
Authorized Signature

_____
Date Signed

State of: _____

County of: _____

Sworn to (or affirmed) and subscribed before me by means of ___ physical presence or ___ online notarization, this _____ day of _____, 20__ by _____ who is___ personally known to me or ___ produced _____ as identification

_____
Notary Public

_____
My commission expires

Form 5-E

NASSAU COUNTY

SWORN STATEMENT UNDER SECTION 287.133(3)(a), FLORIDA STATUTES,

ON PUBLIC ENTITY CRIMES

[TO BE RETURNED WITH BID]

THIS MUST BE SIGNED IN THE PRESENCE OF A NOTARY PUBLIC OR OTHER OFFICER AUTHORIZED TO ADMINISTER OATHS

1. This sworn statement is submitted with Bid, Proposal or Contract for _____.
2. This sworn statement is submitted by _____ (entity submitting sworn statement), whose business address is _____ _____ and its Federal Employee Identification Number (FEIN) is _____. (if the entity has no FEIN, include the Social Security Number of the individual signing this sworn statement: _____).
3. My name is _____ (please print name of individual signing), and my relationship to the entity named above is _____.
4. I understand that a "public entity crime" as defined in Paragraph 287.133(1)(g), Florida Statutes, means a violation of any state or federal law by a person with respect to and directly related to the transaction of business with any public entity or with an agency or political subdivision of any other state or with the United States, including, but not limited to, any bid or contract for goods or services, any leases for real property, or any contract for the construction or repair of a public building or public work, to be provided to any public entity or an agency or political subdivision of any other state or of the United States and involving antitrust, fraud, theft, bribery, collusion, racketeering, conspiracy, or material misrepresentation.
5. I understand that "convicted" or "conviction" as defined in paragraph 287.133(1)(b), Florida Statutes, means a finding of guilt or a conviction or a public entity crime, with or without an adjudication of guilt, in any federal or state trial court of record relating to charges brought by indictment or information after July 1, 1989, as a result of a jury verdict, non-jury trial, or entry of a plea of guilty or nolo contendere.
6. I understand that an "affiliate" as defined in paragraph 287.133(1)(a), Florida Statutes, means:
    a) A predecessor or successor of a person convicted of a public entity crime; or
    b) An entity under the control of any natural person who is active in the management of the entity and who has been convicted of a public entity crime. The term "affiliate" includes those officers, directors, executives, partners, shareholders, employees, members, and agents who are active in the management of an affiliate.

The ownership by one person of shares constituting a controlling interest in another person, or a pooling of equipment or income among persons when not to fair market value under an arm's length agreement, shall be prima facie case that one person controls another person. A person who knowingly enters into a joint venture with a person who has been convicted of a public entity crime in Florida during the preceding thirty-six (36) months shall be considered an affiliate.

7. I understand that a "person" as defined in Paragraph 287.133(1)(e), Florida Statutes, means any natural person or entity organized under the laws of any state or of the United States with the legal power to enter into binding contract and which bids or applies to bid on contracts let by a public entity, or which otherwise transacts or applies to transact business with a public entity. The term "person" includes those officers, directors, executives, partners, shareholders, employees, members, and agents who are active in management of an entity.
8. Based on information and belief, the statement, which I have marked below, is true in relation to the entity submitting this sworn statement. (Please indicate which statement applies.)

_____ Neither the entity submitting this sworn statement, nor any of its officers, directors, executives, partners, shareholders, employees, members, or agents who are active in management of the entity, nor any affiliate of the entity have been charged with and convicted of a public entity crime subsequent to July 1, 1989.

_____ The entity submitting this sworn statement, or one of more of the officers, directors, executives, partners, shareholders, employees, members, or agents who are active in management of the entity, or an affiliate of the entity has been charged with and convicted of a public entity crime subsequent to July 1, 1989, and (Please indicate which additional statement applies.)

_____ There has been a proceeding concerning the conviction before a hearing officer of the State of Florida, Division of Administrative Hearings. The final order entered by the Hearing Officer did not place the person or affiliate on the convicted vendor list. (Please attach a copy of the final order.)

_____ The person or affiliate was placed on the convicted vendor list. There has been a subsequent proceeding before a hearing officer of the State of Florida, Division of Administrative

Hearings. The final order entered by the hearing officer determined that it was in the public interest to remove the person or affiliate from the convicted vendor list. (Please attach a copy of the final order.)

_____ The person or affiliate has not been placed on the convicted vendor list. (Please describe any action taken by or pending with the Department of General Services.)

_____

(Signature)

_____

(Date)

STATE OF FLORIDA

COUNTY OF _____

Sworn to (or affirmed) and subscribed before me by means of ___ physical presence or ___ online notarization, this _____ day of _____, 20__ by _____ who is___ personally known to me or ___ produced _____ as identification

_____

(Notary Public)

My Commission Expires: _____ (seal)

DESIGN-BUILD CRITERIA PACKAGE (DCP)

Prepared for:

Nassau County Board of County Commissioners

Prepared by:

THE R-A-M PROFESSIONAL GROUP, INC.

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DESIGN-BUILD CRITERIA PACKAGE

PART 1

PART 1

NASSAU COUNTY, FLORIDA
DESIGN – BUILD CONSTRUCTION DELIVERY METHOD
CONSTRUCTION OF NEW FIRE STATION # 71

RFP – NC19-006 DESIGN CRITERIA PACKAGE FOR FIRE STATION # 71 TO BE CONSTRUCTED ON CHESTER ROAD

RELEASE DATE – July 8, 2019

INTRODUCTION

A **"Design Criteria Package"** (DCP) means concise, performance-oriented drawings and / or specifications of public construction project. The purpose of the design criteria package is to furnish sufficient information to allow a Design Build Firm to prepare a bid or a response to an agency's request for proposal, or to permit an agency to enter into a design build contract.

Nassau County has selected the design build delivery method for this project. The following DCP specifies performance-based criteria for the construction of the New Fire Station # 71 including the legal description of the site and survey information concerning the site. Proposals shall include all exterior space requirements, material quality standards, proposed site layout and building design criteria of the project, cost estimates, design and construction schedules, site development requirements, provisions for utilities, storm water retention and disposal, parking requirements, and principal contract provisions applicable to this project.

SECTION 1

DEFINITIONS AND TERMS

1-1 GENERAL

The Nassau County Board of County Commissioners (“The County”) entered into an agreement with The R-A-M Professional Group, Inc., as the Design Criteria Professional, to develop the following Plans and Specifications called “The Design Criteria Package (The DCP)” for the purpose of allowing the selected Design Build Firm to prepare the Technical Proposal (Preliminary Design – 35%) and to propose to the County the Guaranteed Maximum Price (“The GMP”) and the Guaranteed Completion Date (“The GCD”).

Following the release of the DCP, the County will conduct a mandatory pre-proposal meeting pertaining to the scope and requirements of the DCP.

The provisions of the DCP represent the technical, material, and quality requirements for the foregoing project. The Design Build Firm is bound by these requirements during the design, permitting and construction of the New Fire Station # 71.

The Design Criteria Professional may amend the provisions of the Design Criteria Package after it has been released to the short-listed Design Build Firms but before the expiration of the period designated for submittal of the Technical Proposal, the GMP and the GCD to the County.

A DCP amendment may be issued at the County's initiative or at the request of the Design Build Firm, upon the approval by the Fire & Rescue Department, if the amendment is in the best interest of the County.

1-2 ABBREVIATIONS.

The following abbreviations, when used in the Design Criteria Package, represent the full text as shown:

ACI	American Concrete Institute
AISI	American Iron and Steel Institute
ANSI	American National Standard Institute, Inc.
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWG	American Wire Gauge
AWPA	American Wood Preservers Association
AWS	American Welding Society
CRSI	Concrete Reinforcing Steel Institute
EPA	Environmental Protection Agency of the United States Government
FBC	2007 Florida Building Code, including 2009 Supplement
FDEP	Florida Department of Environmental Protection
IEEE	Institute of Electrical & Electronic Engineers
IES	Illuminating Engineering Society
MSTCSD	Minimum Specifications for Traffic Control Signals and Devices
MUTCD	Manual on Uniform Traffic Control Devices
NEC	National Electrical Code (NFPA No. 70, 2008 Edition)
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NIST	National Institute for Standards and Technology
OSHA	Occupational Safety and Health Administration
SSPC	Steel Structures Painting Council

UL Underwriters' Laboratories

The Design Build Firm shall use standards, specifications, test methods, or other codes as specified in the current Florida Building Code including Supplements. If not specified in the FBC, the Design Build Firm shall use the current addition of standards, specifications, test methods or codes at the time of submitting the Technical Proposal.

1-3 DEFINITIONS.

The following terms, when used in the Design Criteria Package, have the meaning as described:

Architect: The Architect as defined in Section 481.203(3) Florida Statutes.

Architect of Record or Landscape Architect of Record: The Architect or Architectural Firm or the Landscape Architect or Landscape Architecture Firm registered in the State of Florida that performs services for the Design-Build Firm (Design Builder) in connection with the design and construction of buildings (fire stations).

Architecture or Landscape Architecture: The practice of architecture as defined in Section 481.203(6), Florida Statutes or to practice landscape architecture as defined in Section 481.303(6).

Bidder/Proposer: For the purpose of this DCP it is deemed to be a Design Build Firm or Team of Firms submitting the Technical Proposal, the Guaranteed Maximum Price and the Guaranteed Completion Date to Nassau County.

Calendar Day: Every day shown on the calendar, ending and beginning at midnight.

County: Nassau County Board of County Commissioners, Florida including its Departments and Divisions.

Change Order: A written order issued by the County and accepted by the Design Build Firm, covering changes in the plans, specifications, or quantities of work, within the Scope of the Contract, when prices for the items of work affected are negotiated between the County and the Design Build Firm.

Consultant: The Professional Engineer or Engineering Firm, or the Architect or Architectural Firm, registered in the State of Florida and under Contract with the County to perform professional services. The consultant may be the Engineer or Architect of Record or may provide services through and be subcontracted to the Engineer or Architect of Record.

Contract: "Contract" means the entire and integrated agreement between the County and the Design Build Firm and supersedes all prior negotiations, representations, or agreements, either written or oral. The Contract Documents form the Contract between the County and the Design Build Firm setting forth the obligations of parties, including, but not limited to, the performance of work and the basis of payment.

Contract Documents: The term "Contract Documents" includes: Advertisement, Request for Proposals (RFP), the Design Criteria Package (DCP), the Technical Proposal, the Guaranteed Maximum Price, the Guaranteed Completion Date, General Conditions, Instruction to Bidders, Non-collusion Affidavit, Executed Form of Contract, Performance Bond & Payment Bond, Builders Risk Insurance, Design Liability Insurance, Specifications, Nassau County Standard Details, Plans & Specifications prepared by the Design Build Firm and approved by the Engineer for the New Fire Station #71, Amendments to the Design Criteria Package, change orders, contract amendments, and supplemental agreements, all of which are to be treated as one instrument whether or not set forth at length in the form of a Contract.

Contract Bond: The security furnished by the Design Build Firm and the surety as a guaranty that the Design Build Firm shall fulfill the terms of the Contract and pay, all legal debts pertaining to the construction of the project.

Contract Time: The number of calendar days allowed for the completion of the Contract work, including authorized time extensions.

Contractor: The individual, firm, joint venture, or company contracting with the County to perform the work. The word "Contractor" is also deemed to include a Design Build Firm ("Design Builder") contracting with the County for performance of work, including all architectural, engineering and permitting services and furnishing of materials.

Delay: Any unanticipated event, action, force or factor, which extends the Design Build Firm's time of performance of any controlling work item under the Contract. The term "delay" is intended to cover all such events, actions, forces or factors, whether described as "delay", "disruption", "interference", "impedance", "hindrance", or otherwise, which are beyond the control of and not caused by the Design Build Firm, or the Design Build Firm's subcontractors, material-men, suppliers or other agents. This term does not include "extra work".

Design Build Contract (DBC): Means a single contract agreement between the County and a Design Build Firm in which the Design Build Firm agrees to both design and build the New Fire Station # 71 building site including but not limited to fire station building, site grading and paving, utilities, storm water management facilities, landscaping, emergency traffic lights, and other items as specified in the Design Criteria Package and in Contract Documents.

Design Criteria Package (DCP): See Page 1 - Introduction.

Design Build: Design Build means combining the project's design, permitting and construction phases into a single Contract.

Designer of Record: The Architect of Record, including Landscape Architect of Record or the Engineer of Record.

Engineer: Nassau County ("Engineer"), acting directly or through his duly authorized representatives; such representatives acting within the scope of the duties and authority assigned to them. In order to avoid cumbersome and confusing repetition of expressions in this Design Criteria Package, it is provided that whenever anything is, or is to be done, if, as, or, when, or where "acceptable, accepted, approval, approved, authorized, condemned, considered necessary, contemplated, deemed necessary, designated, directed, disapproved, established, given, indicated, insufficient, ordered, permitted, rejected, required, reserved, satisfactory, specified, sufficient, suitable, suspended, unacceptable, or unsatisfactory," it shall be understood as if the expression were followed by the words "by the Engineer", "to the Engineer", or "of the Engineer".

Engineer of Record: The Professional Engineer or Engineering Firm registered in the State of Florida that performs services for the Design Build Firm (Design Builder) in connection with the design, permitting and construction of the New Fire Station #71.

Equipment: The machinery and equipment, together with the necessary supplies for upkeep and maintenance thereof, and all other tools and apparatus necessary for the construction and acceptable completion of the work.

Extra Work: Any work which is required by the Engineer to be performed and which is not otherwise covered or included in the project by the existing Contract Documents, whether it is in the natural of additional work, altered work, deleted work, work due to different site conditions, or otherwise. This term does not include a "delay".

Guaranteed Completion Date: It means the date by which the Design Builder shall make Fire Station buildings and sites ready for occupancy by the Fire Rescue Department under the provisions of the Design Build Contract.

Guaranteed Maximum Price: The total maximum cost to be paid by the County for Design Build Firm's complete performance under the Design Build Contract Documents, including, without limitations, final completion of all work, all services of Design Build Firm under the Contract, and all fees compensation and reimbursements to Design Build Firm. The Guaranteed Maximum Price shall be submitted by the Design Build Firm to the County in the

spreadsheet format separately showing cost of principal elements of: (1) Professional Architectural / Engineering & Permitting Services and (2) Construction Services for the New Fire Station # 71. The cost of Professional Architectural / Engineering & Permitting Services shall be broken down to: (a) Site Design; (b) Building Design; (c) Permitting. The cost of Construction Services shall be broken down to each applicable Level Two Division of the CSI Classification System (CSI-MasterFormat latest Edition). The Design Build Firm shall further separately identify for each principal element the cost of performing the requested work as well as the amount of the Design Build Firm's profit.

Holidays: Days designated by the County as holidays, which include, but are not limited to New Year's Day, Martin Luther King's Birthday, President's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day and the following Friday, Christmas Eve and Christmas Day.

Inspector: An authorized representative of the Engineer, assigned to make official inspections of the materials furnished and of the work performed by the Design Build Firm.

Laboratory: The official testing laboratory used by the County.

Materials: Any substances to be incorporated in the work under the Contract.

Plans: The signed, sealed and dated plans, drawings and specifications prepared by the Designer of Record and accepted by the Engineer, including reproductions thereof, showing location, character, dimensions, technical requirements, and details of the work to be performed under the Contract. Upon review by the Engineer, the plans will be stamped "Release for Construction" dated and initialed by the Engineer.

Project: Means all activities and work necessary for the design, permitting and construction of the New Fire Station # 71 as described in the Request for Proposal (RFP) and the Design Criteria Package.

Project Site: Means a specific fire station to be designed, permitted, and constructed under the Contract at a specified location. For the purpose of this Design Criteria Package, the County has designated the New Fire Station # 71 to be located on Chester Road and further described in civil drawings.

Project Manager - County: Means a licensed design professional or an appointed County employee, who serves as the County's representative and who is responsible for the administration of the design build project.

Special Provisions: Specific clauses adopted by the County that add to or revise the Standard County Specifications and / or Details, setting forth conditions varying from or additional to the County Standard Specifications that are applicable for this project.

Specialty Engineer: A professional Engineer registered in the State of Florida, other than Engineer of Record or his subcontracted consultant, who undertakes the design and drawing preparation of components, systems, or installation methods and equipment for specific portions of the project work. The Specialty Engineer may be an employee or officer of the Design Build Firm or a fabricator, an employee or officer of an entity providing components to a fabricator, or an independent consultant. Any Corporation or Partnership offering engineering services must hold a Certificate of Authorization from the Florida Department of Business and Professional Regulation.

Superintendent: The Design Build Firm's authorized representative in responsible charge of the work at the New Fire Station # 71 site.

Supplemental Agreement: A written agreement between the County and the Design Build Firm, modifying the Contract within the limitations set forth in this Design Criteria Package.

Surety (Surety Company): The corporate body licensed to do business in the State of Florida that is bound by the Contract Bond with and for the Design Builder and responsible for the performance of the Contract and for payment of all legal debts pertaining thereto.

Working Day: Any calendar day on which the Design Build Firm works or is expected to work at the New Fire Station Site in accordance with the approved work progress schedule related to the Guaranteed Completion Date.

[end of Section 1]

SECTION 2
PROJECT SITE DEVELOPMENT CONDITIONS

2-1 GENERAL.

In anticipation of the Project, the County has procured or obtained the following design documents pertaining to the proposed site of the New Fire Station # 71:

a. Topographical & Tree Survey Map including existing utilities

The Topographical Survey has been completed by Geomatics Corp., which included the field work and prepared maps in the electronic format (AutoCAD) as well as hard copies signed, dated and sealed by Pablo Ferrari, Professional Land Surveyor; Florida Registration Number 5601. All inquiries pertaining to Boundary & Topographical Survey Maps shall be directed to Pablo Ferrari, PSM.

A CD as well as the signed, dated and sealed hard copy of the Topographical Survey Map for the New Fire Station # 71 is made an integral part of the Design Criteria Package ("the DCP") as Appendix C.

b. Phase I Environmental Site Assessment Report

There is no Environmental Site Assessment Report for this project.

c. Geotechnical Exploration Report

The County has obtained the Geotechnical Exploration Report No. 35-26109, dated 13 October 2017 for the proposed New Fire Station # 71 site. ECS Florida, LLC prepared this report in accordance with the site plan sketch developed by the Nassau County. The signed, sealed and dated paper copy of the Report is incorporated into the DCP as Appendix B.

d. Location of the Fire Station # 71 Site

Nassau County has acquired a +/- 2.00 acres parcel of land located at Chester Road approximately 300'+/- of Heron Isles Parkway. Parcel 44-3N-28-0000-0001-0530 located at 96262 Chester Road, Yulee, FL 32097.

e. Site Storm Water Management System

An Environmental Resource Permit (ERP) has been acquired for the site based on the concept plans. It is the bidder's option to modify the permit and obtain all necessary storm-water permit(s) etc. and to verify all permit(s).

f. Off-Site Utilities

Existing 8" water main and a three-way fire hydrant is located on the west side of Chester road. It will be the Design Build Firm's responsibility to confirm that the water pressure in the water main will be sufficient for the operation of the fire sprinkler system in the fire station without the need for a local fire pump. Also, a gravity sanitary sewer line will need

to be constructed from the northeast corner of Chester road and Heron Isles Parkway to serve the site, as indicated in the DCP. In addition, an electric power line with a transformer was to be located no more than two hundred (200) feet from the fire station property by the Heron Isles developer. Furthermore, telephone, cable television, and fiber optic services will be provided within the public right-of-way of Chester Road. The Design Build Firm shall obtain availability letters, make provisions and secure formal approvals for electrical, telephone, fiber optic and cable TV services as required for the New Fire Station # 71. A natural gas service will not be required.

Completion and Dedication of Improvements within New Fire Station # 71's property line

The Design Build Firm awarded the project will construct all improvements and dedicate them to the County and public utility companies before completion of construction of the New Fire Station # 71.

2-2 PROJECT SITE – NEW FIRE STATION # 71.

a. Land. An approximate 2.00-acre site is contained within the property for Fire Station # 71, located on Chester Road.

b. Topographical Map. The County has had prepared the Topographical Survey Map including limited existing utilities for the site. The Design Build Firms shall refer to Appendix C.

c. Zoning. All specific zoning, permits, and requirements to be the responsibility of The Design Built firm.

d. Utilities. The Design Build Firm shall be required to verify existing utilities, coordinate and secure approvals from the public utility companies and pay all required connection and permit / approval fees as required by the said public utility companies.

The new fire station requires LP (Propane) gas service.

The Design Build Firm shall be required to secure an 800-amp. electric power service. In addition, the Design Build Firm shall make provisions for accepting future fiber optic cables by installing an appropriate 3" PVC conduit from the right-of-way to the Telecommunication Room at the fire station building (see the design intent drawings Appendix A).

e. Floodplain Conditions. The Design Build Firm shall verify this designation.

f. Examination of Site. The Design Build Firm shall visit the project site and inform itself of all conditions under which the contract work is to be performed.

The County will make the project site available to the Design Build Firm for the purpose of conducting such site investigation and examination.

g. Provisions for LP Gas System. The Fire Rescue Department uses LP (Propane) Gas for water heaters, cooking stove, BBQ grill, and other apparatus, see the DCP for specific information.

h. Soil Conditions – Geotechnical Exploration Report. As indicated in Section 2-1c, the County has obtained the Geotechnical Exploration Report No. 35-26109, dated October 13, 2017. The field exploration consisted of five (5) SPT borings B-1 through B-4, and B-6 drilled to the depth of 25 feet each below the existing ground surface within the limits of the fire station #71 parcel.

The Design Build Firm shall thoroughly review the geotechnical exploration report obtained by the County and provide the County's Project Manager with a request for additional geotechnical testing and analysis if necessary before or at the Information Meeting.

i. Building Setbacks and Emergency and Non-Emergency Access to the Site Preferably, the fire station building and all site elements shall be located as shown in the Preliminary Site Plan (see Appendix A).

The Design Build Firm shall secure driveway permits and coordinate through the County's Project Manager the final design and location of proposed driveways.

[end of Section 2]

SECTION 3

EXECUTION OF CONTRACT

3-1 GENERAL.

The County Contract prepared and executed between the County and the Design Build Firm shall consists of two (2) integral parts: (1) Professional Architectural / Engineering and Permitting Services for the Design of the New Fire Stations #71 as specifically provided in the DCP; and (2) Construction Services for the construction of the New Fire Station # 71 as specifically provided in the plans and specifications prepared and permitted by the Design Build Firm and approved by the Engineer in accordance with all provisions of the DCP.

At the conclusion of the contract negotiations, the County and the Design Build Firm shall determine the following: (1) Approved Technical Proposal (Preliminary – 35% Design Phase) (TP); (2) The Guaranteed Maximum Price (GMP); and (3) The Guaranteed Completion Date (GCD).

The provisions and requirements of the Request for Proposal NC18-004 are hereby incorporated as the integral part of the Design Criteria Package.

The Design Criteria Package shall become an integral part of the County Contract for the design, permitting and construction of the New Fire Station # 71.

3-2 PROFESSIONAL ARCHITECTURAL / ENGINEERING DESIGN & PERMITTING SERVICES.

a. The Professional Architectural / Engineering & Permitting Services shall consist of all work necessary for the preparation of final design plans and specifications for all the Project Site as specifically listed and described in Section 4 – Scope of Work. This part shall also include permitting from and by all governmental agencies and utility companies such as St Johns River Water Management District, the Florida Department of Environmental Protection and the County Environmental Resource Management Department, JEA, Nassau County Building Inspection Division, the US Army Corps of Engineers, the Nassau County Soil and Water Conservation District, the US Coast Guard, the Florida Department of Transportation, AT&T, Comcast, etc as it may be applicable to this project.

b. The Design Build Firm shall also obtain the County's approval at each phase of project development indicating compliance with the requirements of the County Contract and the DCP. However, the approval of plans and specification by the County shall not constitute relaxation or modification of the requirements and provisions of the DCP. Any relaxation or modification of the requirements and provisions of the DCP contemplated by the Design Build Firm after the initial submittal of the TP, the GMP, and the GCD shall be presented during contract negotiations to the County in writing with the sufficient technical justification, and the GMP cost impact. When approved by the County, these relaxations and modifications of the DCP shall become an integral part of the County Contract with the Design Build Firm.

c. The Design Builder shall furnish the County Project Manager with four (4) sets of permitted final signed, sealed and dated plans and specifications for the New Fire Station # 71. In addition, the Design Build Firm shall provide the County with the electronic version of all plans and specifications in AutoCAD – Microsoft Word format on a thumb drive. Furthermore, the Design Build Firm shall provide the County with one complete set of permit and approvals required for the project.

d. As a part of the Construction Contract Documents, the Design Build Firm shall prepare and provide to the County in the paper and electronic format (Excel) the complete Submittal Schedule & Sequence Listing ("Shop Drawing Schedule") consisting of all shop drawings and submittals called for in the Project Plans & Specifications.

e. The AutoCAD files shall comply with the following requirements: (1) All drawings shall be 100% AutoCAD files, 2007 Version or newer; (2) Use standard AIA layer system; (3) All AutoCAD files shall be transferred to thumb drive by "E-transmit" command; (4) Use standard AutoCAD fonts/text files only, no third party application; (5) The "z" coordinate shall be set to zero in all cases.

f. Upon receiving of copies of final plans, specifications, and permits from the Design Build Firm, the County shall issue a Notice to Proceed for the construction of the New Fire Station # 71.

g. Insurance and indemnification in association with professional architectural / engineering services (design & permitting services) shall be as provided pursuant to the requirements in the Design-Build Agreement. Certificates of insurance shall be issued to the County as a Certificate Holder and Additional Insured.

3-3 CONSTRUCTION SERVICES.

The Design Build Firm shall provide all materials, equipment and labor necessary to construct the New Fire Stations # 71, as specifically described in the final construction contract

documents prepared based on and in compliance with the DCP. The work shall include but not be limited to the following: new construction and demolition; all trades associated with site work; utilities including water wells and sanitary sewer; stormwater management and drainage system; landscaping and irrigation; fences; grading and paving; concrete work; LP gas tank with the required piping; emergency generator; driveways; concrete block masonry; carpentry; architectural woodwork; insulation; roofing; doors & frames including automatic overhead doors; storefront entrances; windows; hardware; interior finishes; exhaust hoods and systems; pre-engineered wood trusses; HVAC, plumbing, electrical, fire protection systems; telecommunications infrastructure; and all other construction and installation work necessary for the proper operation of the New Fire Station # 71.

a. Licensing Requirements. The Design Build Firm and all his / her subcontractors shall be properly licensed as provided by applicable federal, state and local laws and regulations. The Design Builder shall verify that all his / her subcontractors are properly licensed.

b. Insurance Requirements. The Design Builder shall be properly insured as provided in the Design-Build Agreement" . Certificates of insurance shall be issued to the County as a Certificate Holder and Additional Insured.

c. Indemnification. The Design Builder shall comply with indemnification requirements as specifically provided in the Design-Build Agreement.

d. Bonding Requirements. The Design Builder shall provide the County with payment and performance bonds as provided in Section 5 of the Design-Build Agreement, as a condition of issuance of Notice to Proceed for the construction of the New Fire Station # 71.

e. Safety. The Design Build Firm shall be solely responsible for ensuring the safety of its crews, employees, and subcontractors, along with the safety of the public, when performing the work required under the contract. The Design Build Firm shall especially exercise caution while operating heavy equipment and conducting excavations.

f. Schedule and Progress Reports. The Design Builder shall develop an acceptable Schedule and Progress Report, which he shall submit to the County within 10 days after the issuance of the Notice to Proceed, a detailed bar chart or other graphic method displaying pertinent information shall be used. The Design Build Firm shall be required to submit updated progress reports, including photographic records (8"x10 photographs) with each payment request.

g. Shop Drawings.. Submit three (3) sets of paper copies of shop drawings / concrete mix design and other submittals and one electronic copy on a CD to the County.

h. National Pollutant Discharge Elimination System (NPDES). The Design Builder shall comply at all times at the construction site with the provisions of the NPDES Program as established by the US EPA and published under the 40CFR122.22.

i. Existing Utilities. It shall be the responsibility of the Design Build Firm to notify each of the parties at least five (5) working days prior to construction and request that the location of their respective utility or material be located and staked in the field. The Design Build Firm is reminded that the law of the State of Florida requires him to notify any utility company which may have underground lines in the work are at least 48-hours in advance of any digging operation. The Design Build Firm shall contact Sunshine State One-Call of Florida, Inc. (SSOCOF) (1-800-432-4770) to request that it locate all facilities owned by the utilities which participate in this locator program. Failure by the Contractor to call SSOCOF prior to digging shall obligate the Design Builder for any damages to participating utility company facilities and associated repair costs thereto. It is the Design Build Firm's responsibility to request line rubber protection (when needed) from Florida Power and Light at least ten (10) working days in advance.

j. Tree Protection. The Design Build Firm shall be responsible for protecting all trees within each Project Site during construction work.

3-4 FEDERAL REGULATIONS RELATED TO THIS PROJECT

No federal funds will be used for this project. However, the Design Build Firm shall be responsible for compliance with all federal and state laws applicable to this project, including laws and regulations pertaining to authorization to work in the United States of America.

[end of Section 3]

SECTION 4

SCOPE OF WORK – DESIGN & CONSTRUCTION REQUIREMENTS

4-1 GENERAL.

The County directs the Design Build Firm to utilize, for the design, permitting and construction of the New Fire Station # 71, the plans and specifications prepared for the New Fire Station # 71 by The R-A-M Professional Group, Inc. as incorporated herewith in Attachment A – the DCP.

The Design Build Firm shall review these plans and specifications and make necessary changes and modifications to comply with the soil and groundwater conditions at the proposed location of the New Fire station # 71. In addition, the Design Build Firm shall be responsible for all changes and modifications necessary to comply with the changes and modifications to the current Florida Building Code and Supplement.

The Design Build Firm shall then sign, seal, and date reviewed and modified as necessary plans in compliance with the provisions of the applicable laws and rules of the State of Florida governing Engineers, Architects, and Landscape Architects.

a. **Project Site – New Fire Station # 71.** The Design Build Firm shall utilize the preliminary site plan concept, depicted in Appendix A, with all functional elements of the project site consistent with the New Fire Station # 71 project. Specifically: visitor parking consisting of two regular and one HC parking space; an employee parking lot consisting of 27 regular parking spaces; a 30-foot flag pole with 5’ x 8’ American flag; a bicycle rack; an oil-water interceptor for the Apparatus Bay floor drains; a grease trap for the kitchen waste, a 250 Gal. LP gas tank; a 200 KW emergency generator; pavement marking; traffic signs; fire station illuminated wall sign and monument sign; apparatus bay approach slabs; a 15-foot buffer zone as required by the Zoning Code along the Easterly, Northerly, and Southerly property lines consisting of landscaping; and 8-foot galvanized, vinyl covered, black chain link fence with an automatic sliding 24-foot gate with the key pad controls for personal cars and fire trucks and a remote control for fire trucks as well as a push button in the Dispatch Room.

4-2 SCOPE OF SITE DESIGN AND CONSTRUCTION WORK.

The following site elements shall be designed, permitted and constructed in accordance with site development conditions described in Section 2 and in compliance with applicable design criteria, standards, codes and specifications promulgated by but not limited to the following:

the City, the State of Florida, ACI, ANSI, ASCE, ASTM, AWPA, EPA, FDEP, NFPA, OSHA, UL, NEC, NEMA (see Section 1).

a. Fire Station Building. The fire station building shall consist of two main parts: (1) an Apparatus Bay and (2) Living Quarters. The fire station building for the New Fire Station # 71 shall have three (3) bays in the Apparatus Bay with the finish floor at the minimum 31'-0" elevation. However, the Design Build Firm shall verify the minimum finish floor elevation based on the existing groundwater conditions as well as providing minimum 6" distance from the finish floor elevation to the finish grade at the exterior walls and the minimum 5% slope of ground immediately adjacent to the building foundation for a distance of minimum 10 feet away from the building.

b. Drainage and Stormwater Management System. The New Fire Station # 71 shall have an appropriate stormwater management system including a stormwater pond designed and constructed in compliance with the County Development Criteria and regulations promulgated by the St. Johns River Water Management District.

c. Pavement – Driveways - Parking. The Design Build Firm shall provide convenient exit and return access to the fire station building by fire and rescue apparatus. The fire station building shall have a minimum 60-foot long and 8" thick reinforced concrete approach slab spanning the entire width of the Apparatus Bay in the front and in the rear of the fire station building. There shall be an expansion joint between the concrete approach slab and the fire station building with ¾" x 18" dowels spaced at 18" O.C. and a silicon sealant seal constructed as required by ACI. The approach slab shall be reinforced with one layer of #5 @ 12" O.C. EW. All concrete pavements shall be f'_c =4,000 psi Portland cement concrete meeting the requirements of the Concrete Pavement Specification Section 02820. Other driveways and parking areas shall have asphalt pavement as specified for the New Fire Station # 71. It is the responsibility of the Design Build Firm to comply with Specification Section 02800 for Asphalt Paving, and to submit a proposed pavement design for approval by the Engineer.

All driveways and parking areas shall have curbing (curb and gutter). Turning radii for driveways are minimum 30' or 35' (emergency exit for fire trucks on right turns).

All driveway and parking concrete pavement shall be placed on 8" crush-crete base. No limerock shall be allowed.

Pavement shall be designed and constructed as subjected to AASHTO H20-44 and HS20-44 vehicular live loading.

d. Sidewalks. 5-foot or 6-foot wide and 5" thick plain concrete f'_c =3,000 psi sidewalks are required. It is required that the main public entrance to the fire station building has to be accessible via a sidewalk from the public right of way (public sidewalks). The Design

Build Firm shall coordinate this issue as necessary with the County. Expansion and control joints shall be provided as recommended by ACI. Sidewalks shall meet the ADA accessibility requirements.

e. Project Sign – Building Address Number. A signage wall with 10" high dimensional Letters sign reading, "Fire & Rescue Department Station # 71" with the 32" Fire & Rescue Department's Logo Plaque equal to A.R.K. Ramos shall be provided. Color of the sign to be selected by the Fire & Rescue Department. In addition, monument sign, as shown on drawings shall be provided as an additive alternate cost item. The County will provide an electronic file of the Fire & Rescue Department's logo.

Building Address Number (to be determined by the County) – 6" high vinyl white address numbers shall be attached to the exterior face of store front glazing of the fire station building public entrance at the top of glazing.

f. Trash Enclosure. A free standing on-site trash enclose meeting the requirements of the Zoning Code shall be provided in the vicinity of the employee parking lot. Construction shall be reinforced concrete, black vinyl coated chain-link fence with green privacy slats, and gate with two 8" Standard steel pipe bollards filled with concrete, painted "fire engine red".

g. Flagpole. A 30-foot flagpole with a 5'x8' U.S. flag shall be provided. The flagpole shall be design for 140 mph ultimate wind speed and importance factor I=1.15.

h. Bike Rack. A Dero bike rack in-ground mounted (2-bike rack) shall be provided in the proximity to the visitor's parking.

i. LP Gas Tank & Concrete Pad. See Section 2-2 h. for requirements pertaining to the LP Gas Service. An aboveground LP gas tank shall be protected with 2-guard posts. The LP gas tank shall have a 24V/AC Solenoid Valve supervised by the fire alarm system.

~~j.~~ Emergency Power Generator. A ~~100~~ 200KW emergency power generator shall be provided, supplied by Owner. Automatic transfer switch shall be supplied by Owner, installed by Contractor. Concrete pad, all conduit and normal power wiring shall be provided by the Contractor. The Owner shall provide all generator-side power and control wiring. The Design Build Firm shall be responsible for the coordination of the installation of the emergency generator system as indicated in the design criteria package drawings.

k. Traffic Signs and Pavement Marking. The Design Builder shall provide traffic signs and pavement marking as it may be required at the Project Site. In addition, "Do Not Enter" signs shall be installed at the emergency access driveway and the County right-of-way.

l. Water Service. The Design Build Firm shall provide domestic, fire, and landscape irrigation water service and pay all development and permit / approval fees as required by JEA. The landscape irrigation shall have a separate water meter and it shall have an additional 2" PVC piping for the 2.5" Fire Hose Bib w/ 3.5'x3.5'x0.5' concrete pad.

m. Sanitary Sewer Service. The Design Build Firm shall provide sanitary sewer service adequate for twelve (12) firefighters per shift and the number of fixtures required for the fire station.

n. Electric Power Service. The Design Build Firm shall coordinate with and obtain from FP&L an 800 A electric power service through the installation of a ground mounted transformer provided by FP&L. Contractor shall install FP&L supplied primary conduit.

o. Telephone and Comcast Services. The Design Build Firm shall obtain from Comcast a Comcast Fiber Optic Ethernet Connection. In addition, a cable TV service for the project site from Comcast is required.

The Design Builder shall provide three (3) – 3" Schedule 40 PVC conduits from the County right-of-way to the Telecommunication Room in the fire station building for telephone and TV services.

p. Fences. The Design Builder shall provide 8-foot wood fences at buffer strips required by Specifications, Nassau County. Refer to plans & specification for the New Fire Station # 71 for details and technical specifications. Include additional control requirements provided in the DCP.

q. Electrical Site Lighting. Provide site illumination similar to what has been shown and specified in the design criteria package drawings. The site illumination shall include flood lights for a wall sign. The site illumination shall be controlled by photocells and manual switches provided in the Dispatch Room of the fire Station building as applicable.

r. New Interior. Window design at exercise room with floor to ceiling store front glass. See floor plan, Appendix A.

4-3 SCOPE OF BUILDING DESIGN AND CONSTRUCTION WORK – THE FIRE STATION BUILDING.

The fire station building shall consist of two main parts: (1) an Apparatus Bay and (2) Living Quarters. The fire station building for the New Fire Station # 71 shall have three apparatus Bays. The fire station shall be designed and constructed as shown and specified for the New Fire Station # 71 provided in the DCP.

In general, the Design Build Firm shall utilize the functional layout of the New Fire Station # 71 building as provided in Appendix A. The County will not authorize any major changes to this design. However, the Design Build Firm may propose minor changes to the floor plan and any changes to materials and systems shown in Appendix A if the proposed materials and systems are equal to those specified and offer some tangible benefits to the County. The Design Build Firm shall submit to the County requests for approval of equal materials and systems at least 10-days before the deadline for submitting the Technical Proposal.

The New Fire Station # 71 shall be designed and constructed in compliance with the provisions of the current Florida Building Code.

a. Type of Building Construction & Structural Requirements. It is assumed that the foundations will be designed for an allowable bearing pressure of 2000 psf or more. It is assumed that the building will have continuous shallow footings at each wall location. The slab on grade shall be a minimum of 4" to 8" (min) thickness and shall slope to drains. The slab shall be reinforced as shown on the drawings. In addition, joints will be constructed in the slab in order to minimize the susceptibility of the slab to cracking. The vehicular live loads in the Apparatus Bay shall be AASHTO H20-44 and HS20-44. The structural system of the roof shall be composed of plywood over pre-engineered wood roof trusses spaced at 2 feet on center. All structural walls, for both sections of the building, will consist of reinforced concrete masonry. Lateral loads applied to the building, primarily generated from wind pressures, shall be resisted by masonry shear walls. Columns shall be incorporated for the support of covered porches. For durability and structural considerations, we anticipate that the porch columns shall consist of CMU.

b. Electrical, mechanical, fire protection, fire alarm, telecommunication, plumbing and other building systems. The New Fire Station # 71 shall be fully equipped in electrical, mechanical, fire protection, fire alarm, telecommunication, plumbing and other building systems as generally indicated in the design criteria package drawings.

c. Apparatus Bay. The Apparatus Bay shall have three 17'-4" bays with 14'x14' overhead door openings. The slab-on-grade shall be 10" thick (8" in the thinnest point) and #5 @ 12" reinforcement each way. A vapor barrier shall be 15" mil. Stego. For all architectural, structural and finish details as well as technical requirements pertaining to mechanical, electrical, telecommunication, plumbing and fire protection systems in the Apparatus Bay see the included design criteria package drawings.

d. Living Quarters. The Living Quarters part of the New Fire Station # 71 shall be designed and constructed as shown in plans and specifications.

4-4 SCOPE OF PERMITTING.

The Design Build Firm shall apply on behalf of the County, pay required application and permit fees and secure all approvals and permits from the County and the State regulatory agencies as required by law. Specifically, permits and approvals are required, but not limited to, from the St. Johns River Water Management District, , JEA, AT&T, Comcast, , the County, Engineering and the Building Departments as may be required for this project.

In addition, the Design Build Firm shall coordinate with JEA, FP&L, AT&T, Comcast and other utility companies as applicable all required utility services and pay all applicable fees.

Furthermore, the Design Build Firm shall provide the County for the review and approval all plans and specifications at 60%, 90% and 100% project development phases. The County may, at the request of the Design Build Firm waive the requirement for 90% Submittal Review if it is determined to be in the best interest of the County. For the purpose of the foregoing reviews and approvals, the Design Build Firm shall provide the County with 5 sets of drawings, specifications and engineering calculations.

The Design Build Firm shall provide the County with five (5) sets of final plans, specifications and engineering calculations prior to the Preconstruction Conference and the issuance of the Notice to Proceed. In addition, at the same time the Design Build Firm shall provide the County with two (2) copies of CD with the electronic version of all contract documents (drawings, specifications, engineering calculations, permits and approvals).

4-5 CONSTRUCTION SIGN

The Design Build Firm shall provide one on-site color construction sign for the project.
A construction sign shall be 4’x4’ and it shall have two 2”x4” brace posts. All wood and plywood shall be pressure treated for in ground or weather exposure as applicable.

[end of Section 4]

DESIGN-BUILD CRITERIA PACKAGE

PART 2

TECHNICAL SPECIFICATIONS

TECHNICAL SPECIFICATIONS

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SECTION 00 01 00

GENERAL REQUIREMENTS

I. DEFINITIONS FOR PURPOSES OF THIS CONTRACT DOCUMENT

A. OWNER: Nassau County Fire and Rescue
Station #71

1. The Owner is the person or organization identified above.

2. The term Owner or County referred to throughout the Contract Documents means the Owner or his authorized representative.

B. DESIGN ARCHITECT: Thomas Duke Architect, PA (TDA)

1. The term Architect is the person or organization identified above.

2. The term Architect referred to throughout the Contract Documents means TDA, or their authorized representative.

C. ENGINEER: Civil – The R-A-M Professional Group, Inc. (RAM)
Structural – McVeigh and Mangum Inc. (MME)
Mechanical – McVeigh and Mangum Inc. (MME)
Electrical – McVeigh and Mangum Inc. (MME)
Plumbing – McVeigh and Mangum Inc. (MME)

1. The Engineer is the organization identified above.

2. The term Engineer referred to throughout the Contract Documents means the group which signed and sealed the plans and specifications, or their authorized representative.

D. DESIGN-BUILD CONTRACTOR:

1. The term Design-Build Contractor or Contractor or General Contractor referred to throughout the Contract Documents means The Design-Build contractor, or their authorized representative or design professional.

E. SUBCONTRACTOR:

1. A Subcontractor is a person or organization who has a direct contract with the Design-Build Contractor to perform any of the Work at the site.

2. The term Subcontractor referred to throughout the Contract Documents means the Subcontractor or his authorized representative.

F. VENDOR:

1. A vendor is a person or organization who has a direct contract with the Contractor or Subcontractor to Supply materials or equipment but not labor.

2. The term Vendor referred to throughout the Contract Documents means the Vendor or his authorized representative.

G. SHOP DRAWINGS & SAMPLES:

1. Shop Drawings are drawings, diagrams, illustrations, schedules performance charts, brochures and other data which are prepared by the Contractor or any Subcontractor or Vendor and which illustrate some portion of the Work.

2. Samples are physical examples furnished by the Subcontractor or Vendor to illustrate material, equipment or workmanship, and to establish standards by which the Work will be judged.

H. CONTRACT DOCUMENTS: The Contract Documents forming the General Contract consist of the Purchase Order or Subcontract issued by the Contractor, the Drawings, the Specifications, all Addenda issued prior to execution of the General Contract, and all Modifications, Terms and Conditions listed on the Purchase Order or Subcontract.

I. THE WORK: The term Work includes all labor necessary and all materials and equipment incorporated or to be incorporated to produce the construction required by the Contract Documents.

J. THE PROJECT: The Project is the total construction designed by the Architect and Engineer of which the Work performed under the Contract Documents may be the whole or a part.

K. NIC: The term NIC used throughout the Contract Documents means "not included in this Contract".

II. GENERAL

A. These General Requirements shall be considered as being part of each technical section of this specification and shall be adhered to in every respect. In case of conflict between these General Requirements and individual technical sections, the technical sections will take precedence.

B. For the convenience of reference and to facilitate the letting of contracts, the organization of these specifications into divisions and sections shall not control the division of work among Subcontractors or in establishing the extent of work to be performed by each trade. Each Subcontractor shall be responsible for the settlement of labor disputes within his contract to avoid delay in the performance of his work.

III. PROTECTION

A. Each Subcontractor, according to his work, shall be responsible for the compliance with all building laws and safety regulations of all authorities having jurisdiction at the place of building.

B. Each Subcontractor shall exercise particular care of all finished work as the construction progresses and must protect it from damage or defacement. All work damaged must be made good to the County's satisfaction at the expense of the Subcontractor causing the damage.

C. The loss of any material or equipment on the job site to be installed in the Work, including items assigned to the Subcontractor for installation, or Subcontractor's equipment, occasioned by theft, is the sole responsibility of the Subcontractor installing the material or using or installing the equipment.

IV. SITE VISIT

A. Each Subcontractor shall personally have visited the site to satisfy himself as to the physical limitations of access and working space and to have included in his price all work and materials required to complete the project as specified.

V. AREA USE LIMITS

A. The Contractors shall confine their tools, equipment, materials and the operations of his workmen to the limits indicated by law, ordinances, permits or directions of the County and shall not unreasonably encumber the premises with said tools, equipment or materials.

B. The Contractor shall not load or permit any part of the structure to be loaded with a weight that will endanger its safety.

VI. REFERENCE POINTS

A. All Work shall be referenced from benchmarks and building corner points established by the Design-Build Contractor.

VII. CLEAN UP

A. The Contractor shall at all times keep the premises free from accumulations of waste material or rubbish caused by his employees or Work, or the employees or Work of any of his Subcontractors, and at the completion of the Work, he shall remove all rubbish from and about the project and all his and his Subcontractors' tools, scaffolding, and surplus materials and shall leave the Work "broom clean" unless more exactly specified. In case of dispute between Subcontractors employed on or about the project, upon which the Work is to be done, as herein provided, as to the responsibility for the removal of the rubbish, etc., or in case the same be not promptly removed as herein required, the Contractor may

remove the rubbish, etc., and charge the cost to the several Subcontractors, as the Contractor shall determine to be just.

VIII. TEMPORARY SERVICES

A. Protection: Unless otherwise specified, the Contractor shall provide and maintain all temporary enclosures, coverings and protection of the building.

B. Water: The Contractor will provide a temporary water line from the nearest available source and pay for any water charges imposed by the Water Authority. In cases where the nearest available source is through the Owner's existing system, the Owner will pay for any water charges.

C. Telephone: The Contractor will maintain telephone for his own use. Each Subcontractor will furnish any telephone service for their own use.

D. Offices, Sheds, Toilets: The Contractor will provide a field office for his own use. Each Subcontractor will furnish all such facilities required for their own use. The Contractor will also provide suitable and adequate toilet facilities for all trades.

E. Electricity and Lights:

1. Electric installations for temporary light and power will be provided by the Electrical Subcontractor in accordance with the electrical section of these specifications.

2. Each Subcontractor requiring temporary light or power in his temporary buildings or elsewhere on the site outside of the building proper, shall make his own connections to the temporary service panelboard.

3. All Subcontractors requiring service for portable hand tools or localized lighting in excess of the general lighting or power outlets provided by the Electrical Subcontractor shall obtain same at their own expense from the outlets provided.

4. When permanent lighting and power has been placed in operation, temporary lights and power may be removed; however, at no time may any Subcontractor make connection to the permanent outlets for use of power tools.

5. The cost of electrical energy consumed through the temporary electrical installation shall be borne by the Contractor. Where the on-site electrical system is a part of an existing facility owned by the Owner, then the Owner will pay for all electrical energy consumed.

6. The cost of electrical energy consumed through the permanent installation shall be borne by the Owner.

7. At times during construction, the total electrical power available may be insufficient for the wants of all Subcontractors. The Contractor, in such case, will allocate the power use among the various Subcontractors.

IX. DRAWINGS & SPECIFICATIONS

A. An adequate number of sets of architectural, structural mechanical, civil and electrical drawings and specifications shall be furnished or made available by the County at the Contractor's expense.

B. The Contractor shall examine all drawings listed in the drawing index before beginning the Work. Any doubt as to the meaning or scope of the drawings and specifications, or any other portion of the contract, may be clarified by submitting a request in writing for interpretation to the Engineer who will provide clarification. Absence of such request for clarification will imply a full understanding of the intent of the drawings and specifications.

C. The drawings and specifications are complementary and are intended to include all work necessary to the thorough and satisfactory completion of the project. Any work not indicated in the drawings, nor mentioned in the specifications, but obviously and reasonably necessary to the proper conclusion of the Work, shall be deemed a part of the Contract.

X. SHOP DRAWINGS & DATA REQUIREMENTS

A. With such promptness as to cause no delay in his work or in the work of any other Subcontractor, but in no case later than two (2) weeks, after award of Sub-contract or Purchase Order the Contractor, Subcontractor or Vendor shall submit for the County's approval, six (6) copies of all shop drawings (including erection, setting and equipment drawings), cuts, equipment data, performance data, test results and schedules required by the Contract Documents.

B. The Contractor shall examine each submission for compliance with the Contract Documents and shall indicate his approval thereupon that each submission does comply with the Contract Documents by stamp or in writing. Submissions shall be reviewed by the Design-Builder’s design professional prior to submission to the County. Any deviations from the Contract Documents requirements must be noted at the time of submission.

C. Submissions shall be specific so that compliance with the Contract Documents can be easily ascertained. Incorrect and/or incomplete submissions will be rejected and the Contractor or Vendor will be required to resubmit the required number of submissions prior to the start of the Work. Any Work begun or installed before approval of submission will be at the Contractor's own risk.

D. By approving and submitting shop drawings, data or samples, the Contractor thereby represents that he has determined and verified all field measurements, field construction criteria, materials, catalog numbers and similar data and that they have checked and coordinated the shop drawings, data or samples with the requirements of the Work and of the Contract Documents.

E. The County's approval of submissions shall not relieve the Contractor of the responsibility for any deviation from the Contract Document Requirements unless they have informed the County in writing of such deviation at the time of the submission and the County has given written approval to the specific deviation. The County's approval shall not relieve the Contractor, Subcontractor or Vendor from responsibility for errors or omissions in the submissions.

F. The Contractor, Subcontractors or Vendors shall make any corrections required by the County and

shall resubmit the required number of corrected submissions. The Subcontractor or Vendor shall direct specific attention in writing or on resubmitted shop drawings to revisions other than the corrections required by the County on previous submissions.

G. The Contractor, Subcontractors or Vendors shall indicate the following on all submissions:

1. Project name.

2. Identification of equipment, system or materials using the same symbols as used on the schedules, drawings or applicable paragraphs or sections of the specifications.

3. Manufacturer's name.

4. Contractor's or Subcontractor's name.

5. Identification of each sheet submitted by number.

H. The Contractor, Subcontractors or Vendors shall furnish for approval all samples requested by the specifications. The Work shall be in accordance with approved samples. If a sample is requested, it shall be the responsibility of the Subcontractor or Vendor to have the sample delivered to the County or to arrange for the County to examine it elsewhere. Failure to comply may be cause for rejection of the item.

XI. SUBSTITUTIONS

A. In these Specifications, one or more makes of materials, apparatus or appliances have been specified for use in this project. Should the Subcontractor or Contractor desire to substitute other makes of materials, apparatus or appliances than those mentioned herein, he shall make his request in the following way:

1. Prepare his bid based on the item or items specified herein and include the same in a separate alternate proposal, based on furnishing and installing the proposed substitute. This proposal shall contain the Contractor's installed price used in his bid for the item specified, and the price for which the Contractor will install the substitute, including the cost of modifying any other phase of the Work. This request shall be accompanied by complete plans and specifications of the substitution offered.

B. If requested by the County, the Contractor shall also submit samples of both the specified materials, apparatus or appliance and the substitute. Should the substitute fail to conform to the requirements of the Contract Documents as determined by the County, the Contractor shall install the specific make of material, apparatus or appliance specified herein.

C. Acceptance of substitution must be resolved prior to letting the Subcontract.

XII. INDEMNIFICATION

A. Each Subcontractor shall indemnify and hold harmless the Owner, Contractor, Engineer and their agents and employees from and against all claims, damages, losses and expenses including attorney's fees arising out of or resulting from the performance of the Work, provided that any such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property, other than the Work itself, including the loss of use resulting therefrom and is caused in whole or in part by any negligent act or omission of the Subcontractor or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

B. In any and all claims against the Owner, Contractor, Architect, Engineer, or any of their agents or employees by any employee of the Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this Section shall not be limited in the amount or type of damages, compensation, or benefit payable by or for the Subcontractor under Workmen's compensation acts, disability benefit acts or other employee benefit acts.

XIII. TESTS

A. If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any Work to be inspected, tested or approved, the Contractor shall give the County timely notice of its readiness and of the date arranged so the County may observe such inspection, testing or approval. The Contractor shall bear all cost of such inspections, tests and approvals. This paragraph does not apply to soils and concrete testing, which will be arranged and paid by the Contractor.

B. Contractor, sub-subcontractors, vendors, etc., shall provide that all material required to be provided by their subcontract or purchase order shall not be hazardous, or contain hazardous components, as defined by the environmental authorities having jurisdiction. If required by the County, appropriate documentation substantiating this requirement shall be submitted.

XIV. PROGRESS MEETINGS

A. The Contractor will hold progress meetings at the site. The time and occurrence will be established by the Contractor. Representatives of all Subcontractors working at the site, or scheduled to be working at the site will be required to attend. All representatives attending these meetings must have full authority to make decisions and commitments which will be binding upon his company in regard to scope of Work, schedules, manpower, or any other factors affecting the completion of his work.

XV. PERFORMANCE & PAYMENT BONDS

A. The Contractor shall have the right, prior to the signing of any Contract, to require any Subcontractor to

furnish bond for performance of Contract and payment of all obligations arising thereunder. If such bond is required prior to submission of bids, it shall be paid by the Subcontractor; if subsequent thereto, it shall be paid for by the Owner or the Contractor, whichever requires the bond, and shall be considered an additional cost of the Work.

XVI. LIENS

A. Neither the final payment nor any part of the retained percentage shall become due until the Contractor has delivered to the County a complete release of all liens which could arise out of the Contract and an affidavit that all labor, material and services committed for have been paid in full and that the release covers all labor and material for which a lien could be filed. If any lien remains unsatisfied after all payments are made, the Subcontractors shall refund to the Contractor all monies that the Contractor or Owner may be compelled to pay in discharging such lien, including all costs and attorney's fees.

XVII. CONTRACTOR'S CONTROL

A. The Contractor reserves the rights to prohibit the use of any men, tools, supplies, materials or pieces of equipment which, in his opinion, will not produce work meeting the requirements of the Contract Documents. The Subcontractors shall be entitled to no extra compensation because of any such prohibitions or changes resulting therefrom.

B. Each Subcontractor shall keep on the work during its progress a competent superintendent and any necessary assistants, all being satisfactory to the Contractor. The superintendent shall not be changed (except with the consent of the Contractor) unless the superintendent proves to be unsatisfactory to the Subcontractor and ceases to be in his employ. The superintendent shall represent the Subcontractor in his absence and all directions given to him shall be as binding as if given to the Subcontractor.

XVIII. CHANGE IN THE WORK

A. The Contractor, Architect, and Engineer reserve the right to require alterations in, additions to, or omissions from the work called for by this contract, and should any such alterations, additions or omissions be required, the same shall not make this contract void nor in any way affect the same, except that appropriate additions to or deductions from the contract price shall be made; provided, however, that unless otherwise provided in the contract documents, the Subcontractor shall not be entitled to any compensation for extra work unless orders therefore are given in writing duly executed by the Contractor and the amount of compensation for such extra work specified in such written orders.

B. No such change or alteration or modification of this Contract or of the Work called for hereunder shall release or exonerate any surety or sureties, if required, on any bond given to secure the performance of this contract or any party thereof and/or to insure to the benefit of any and all persons performing labor upon or furnishing materials used or to be used on said Work.

C. The value of the Work in additions or omissions shall be computed by one or more of the following

methods as established by the Contractor:

1. Lump sum.

2. Unit prices.

3. Estimated cost plus percentages for overhead and profit.

4. Actual cost as established by signed labor reports and material vouchers, plus overhead and profit percentages.

XIX. SUBCONTRACTOR'S PAYMENTS

A. The Subcontractor shall submit to the Contractor an application for each payment and, if requested, receipts or other vouchers showing his payments for materials and labor.

B. The making of progress payments shall not be considered as an acceptance by the Contractor of the whole or any part of the work done up to the payment thereof. The entire work is to be subject to inspection and approval by the Owner and the Contractor when it shall be claimed by the Subcontractor that this contract is complete.

C. Payments will be made on a basis of 90% monthly, based upon work completed and material on the site. Final payment will be due and payable within 60 days after acceptance of the work by the Contractor and receipt of lien waivers.

D. The Contractor may withhold or, on account of subsequently discovered evidence, nullify the whole or a part of any payment to such an extent as may be necessary to protect from loss on account of:

1. Defective work not remedied.

2. Claims filed or reasonable evidence indicating probable filing of claims.

3. Failure of the Subcontractor to make payments properly to other Subcontractors or for material or labor.

4. Damage to another Subcontractor.

5. Failure of the Subcontractor to perform in accordance with the terms and/or conditions of the contract.

E. Any Subcontractor, Vendor, Workman, or anyone else having claim against any Subcontractor for or on account of work done or material furnished for the performance of the work provided for hereunder may give notice of said claim and the amount thereof to the Contractor who may, but shall not be obligated to, thereupon withhold any and all payments due or to become due thereafter to the Subcontractor until said claims are resolved.

XX. MATERIALS, TOOLS & WORKMANSHIP

A. All materials shall be new and the best of their respective kinds and subject to the County's approval. The Subcontractor shall, if required, furnish satisfactory evidence as to the kind and quality of materials.

B. Except as otherwise specified or agreed, the Subcontractor shall furnish at his own risk and costs all tools, apparatus, hoists, derricks, scaffolding and all temporary work and materials necessary for the proper execution of the Contract. Temporary equipment shall be installed in such a manner that finished work will not be damaged and shall be subject to the Contractor's approval.

C. All work shall be performed in the best manner by skilled workmen.

XXI. ASSIGNMENT OF WORK

A. The Subcontractor shall not assign or sublet any portion of his contract without written approval by the Contractor.

XXII. OWNER'S RIGHT TO OCCUPY THE FACILITY

A. The Owner reserves the right to occupy any portion of the project before it has been entirely completed, with the distinct understanding that such occupancy shall not in any way constitute acceptance of the Work or any part thereof.

XXIII. TAXES

A. The Subcontractor or Vendor agrees and states that the amount of all taxes now required or which may be required, including sales taxes, incident to performance of the contract, will be paid by the Subcontractor or Vendor.

XXIV. SIGNS & ADVERTISING

A. The Subcontractor shall enforce the Contractor's instructions regarding signs, advertisements, fires and smoking. No advertising signs or name labels of any description shall be placed on or near the premises without the Contractor's written consent thereto.

XXV. CUTTING & PATCHING

A. The Subcontractor shall do all cutting, fitting or patching of his work that may be required to make its several parts come together properly and fit it to receive or be received by work of other Subcontractors

shown upon or reasonably implied by the drawings and specifications for the completed structure and shall do all that is necessary to accomplish the joining of said several parts in a neat and workmanlike manner to satisfaction of the Contractor. Openings shall be done in such a manner as not to impair the appearance or structural integrity of the structure, including the deck and all load bearing walls or foundations and only with the approval of the Engineer. Any reinforcement or other work shall be furnished and installed by the Subcontractor cutting the opening.

XXVI. INSPECTION

A. All materials and equipment are subject to periodic inspection by the County while the work is in progress, but approval of the work shall not release the warranty. The County's failure to inspect the fabrication or installation of material or equipment shall not constitute a waiver by the County of the right to reject the material or equipment for defective workmanship or material.

XXVII. SUBCONTRACTOR'S WARRANTY

A. Unless specified otherwise for a particular trade, all Subcontractors shall warrant that all work executed by him, or done under his supervision, will be free from defects of materials and workmanship for a period of one (1) year from the date of final acceptance. The Subcontractor shall further agree that he will, at his own expense, repair and replace all such defective work and any adjacent work that may be damaged by such repairs.

B. Unless specified otherwise for specific equipment, all Subcontractors shall pass through to the Contractor any warranty provided by the manufacturer on all equipment furnished under his contract starting from the date the equipment is accepted by the Contractor for normal operation.

XXVIII. CORRECTION OF DEFECTIVE WORK

A. Any work or material condemned by the County as failing to conform to the contract, whether incorporated in the work or not, shall be promptly removed from the premises by the Subcontractor and shall be promptly replaced or re-executed in accordance with the contract without expense to the Contractor or County. The Subcontractor shall bear the expense of making good all work of other Subcontractors destroyed or damaged by such removal or replacement.

B. If, after ten (10) days written notice, the Subcontractor shall fail to remove and replace condemned work, the Contractor may at his option cause such work to be done and may deduct all costs incurred in so doing from payments due the Subcontractor. If the payments then or thereafter due the Subcontractor are not sufficient to cover such amount, the Subcontractor shall pay the difference to the Contractor.

XXIX. CONTRACTOR'S LIABILITY INSURANCE

A. At its own expense and prior to commencing work, the Contractor shall procure all insurance coverages as required hereunder and furnish County with certificates of insurance, and copies of additional insured endorsements, executed by an authorized representative from an insurer duly licensed to transact business at the location of the jobsite. Evidence of such insurance shall be provided to the County through the warranty period of the Contractor's work. The insurance as set forth below shall be issued from companies satisfactory to the Contractor and with an AM Best rating of not less than A-VII. Securing and maintaining the insurance required hereunder is a condition precedent to payment to the Subcontractor. Failure of subcontractor to maintain the required insurance shall constitute a default under this Subcontract and, at Contractor's option, shall allow Contractor to terminate this subcontract for cause and/or purchase said insurance at subcontractor's expense.

1. Commercial General and Umbrella Liability Insurance: Contractor shall maintain commercial general liability (CGL) and, if necessary, umbrella insurance with a limit of not less than $2,000,000 each occurrence, subject to a general aggregate of not less than $2,000,000. The general aggregate limit shall apply separately to this contract or any subcontracts the Contractor enters into. The CGL insurance shall be written on ISO occurrence form CG 00 01 (or a substitute form providing equivalent coverage). The coverage shall include liability arising from premises, operations, independent contractors, products-completed operations. Personal injury and advertising injury, and liability assumed under an insured contract, including the tort liability of another assumed in a contract. The County or Contractor (if Subcontractor providing insurance) shall be included as an additional insured under the CGL policy for both ongoing and completed operations. ISO additional insured endorsement CG 20 10 (for ongoing operations) and CD 20 37 (for completed operations) (or substitute endorsements providing equivalent coverage) will be attached to subcontractors CGL, and to the commercial umbrella, if any. Subcontractor shall maintain ongoing CGL coverage for the products- completed operations hazard, including liability assumed under an insured contract, and the required additional insured coverage for the period of time the subcontractor may be held legally liable for its work following substantial completion of the work. The coverage shall have a limit of not less than $2,000,000 each occurrence, and a products-completed operations aggregate of not less than $2,000,000. This coverage shall be maintained on ISO occurrence form CG 00 01 (or a substitute form providing equivalent coverage). The subcontractor's CGL insurance shall apply as primary with respect to any other insurance or self-insurance programs afforded to contractor. There shall be no endorsement or modification of the CGL to make it excess over the other available insurance.

2. Automobile and Umbrella Insurance: Contractor shall maintain automobile liability insurance and, if necessary, umbrella liability insurance with a limit of not less than $1,000,000 each accident. Such insurance shall cover liability arising out of "any auto", including owned, hired, and non-owned autos. Coverage shall be written on ISO form CA 00 01 or a substitute form providing equivalent liability coverage.

3. Worker's Compensation Insurance: Contractor shall maintain worker's compensation and employer's liability insurance. The workers compensation coverage shall provide the statutory maximum limit of liability. The employers liability limits shall not be less than $1,000,000 each accident for bodily injury by accident or $1,000,000 each employee for bodily injury by disease.

4. Pollution Liability Insurance: If subcontractor's commercial general liability (CGL) policy contains an endorsement limiting or completely excluding coverage for fungus and/or mold, then subcontractor shall maintain a separate pollution liability policy to cover claims from fungus, including mold or mildew and any mycotoxins, spores, scents or byproducts produced or released by fungi, that may arise out of the subcontractor's ongoing operations or completed work. The limit of liability shall not be less than $1,000,000.

5. Professional Liability Insurance: If Contractor's scope of services includes design work or other professional services, then Contractor shall maintain insurance coverage for Contractor's errors, omissions and other wrongful acts arising out of the professional services performed by subcontractor. The limit of liability shall not be less than $1,000,000.

6. Waiver of Subrogation: Contractor waives all rights against contractor and its agents, officers, directors and employees for recovery of damages to the extent these damages are covered by any of the policies of insurance maintained pursuant to this subcontract.

7. Cross-Liability Coverage: If Contractor's liability policies do not contain the standard ISO separation of insureds provision, or a substantially similar clause, they shall be endorsed to provide cross-liability coverage.

8. Subcontractor's Insurance: Contractor shall cause each subcontractor employed by Contractor to purchase and maintain insurance of the type specified in this agreement. When requested by County, Contractor shall furnish to County copies of certificates of insurance evidencing coverage for each Subcontractor.

9. No Representation of Coverage Adequacy: By requiring the insurance as set out in this contract, County does not represent that coverage and limits will necessarily be adequate to protect Contractor, and such coverage and limits shall not be deemed as a limitation on Contractor's liability under the indemnities provided to County in this contract.

B. An Umbrella Liability policy may be used as part of the indicated total required limits at the Contractor's option.

C. In addition to the above, an Umbrella Liability policy in the amount of at least $1,000,000 will be required for the following types of Subcontractors:

Electrical
Heating, Ventilating and Air-Conditioning
Masonry
Plumbing
Roofing

D. The foregoing provisions shall not operate to relieve any Contractor from the responsibility of carrying his own insurance to cover loss to his respective materials, tools, and other equipment owned by him, or his employees, which will not become an integral part of or be consumed by the construction of the project.

(END OF SECTION 00 01 00)

SECTION 00 01 00

LIST OF DRAWING SHEETS

C-1	Cover Sheet
C-2	General Notes and Utility Contacts
C-3	Overall Site Plan
C-4	Geometry Site Plan
C-5	Grading and Drainage Plan
C-6	Water and Sewer Plan
C-7	Landscaping Plan
C-8	Landscaping Details
C-9	Details & Sections
C-10	Details & Sections
C-11	Pond Details & Sections
A-1.0	Architectural Site Plan
A-1.1	Floor Plan
A-1.2	Furniture and Equipment Layout Plan
A-1.3	Reflected Ceiling Plan
A-1.4	Roof Plan
A-2.0	Exterior Elevations
A-2.1	Exterior Elevations
A-3.0	Building Sections
A-3.1	Wall Sections
A-3.2	Wall Sections
A-3.3	Wall Sections
A-3.4	Wall Sections
A-4.0	Room Finish and Door Schedules
S1.1	Foundation Plan
S1.2	Roof Framing Plan
S2.1	Sections and Details
S3.2	Sections and Details
P0.1	Plumbing Legend, Schedule, and Notes
P1.1	Plumbing DWV Plan
P1.2	Plumbing Domestic Water Plan
P2.1	Plumbing Details
M0.1	Mechanical Legend, Schedule, and Notes
M1.1	Mechanical Floor Plan
M2.1	Kitchen Hood Detail
M2.2	Kitchen Hood Detail
M2.3	Kitchen Hood Detail
M2.4	Kitchen Hood Detail
M2.5	Kitchen Hood Detail
M3.1	Mechanical Details
M4.1	Mechanical Controls
E0.1	Electrical Legend Notes Schedule
E0.2	Riser Diagrams
E1.1	Electrical Site Plan
E2.1	Lighting Floor Plan
E3.1	Power Floor Plan
E4.1	Electrical Roof Plan
FP0.1	Fire Protection Criteria
FP1.1	Fire Protection Floor Plan
T1.1	Telecom Floor Plan

SECTION 02010

DEMOLITION

PART I – GENERAL

1.1 DESCRIPTION

A. The General Requirements, Section 00 01 00, are hereby made a part of this section as if fully repeated herein.

B. The Nassau County Standard Specifications are hereby made a part of this section and are fully repeated herein. If there are any discrepancies, the more stringent specification shall take precedence.

C. Work Includes:
   1. Permits.
   2. Install erosion and sediment control devices.
   3. Removal of existing pavement, fencing and utilities found on site.
   4. Removal of existing concrete slabs, sidewalks, foundations, footings, etc.
   5. Removal of underground structures, septic tanks, storage tanks, etc.
   6. Backfilling and compaction.

D. Related Work Specified Elsewhere:
   1. Site clearing: Site Clearing & Earthwork - 02210
   2. Removal of existing asphalt pavement: Site Clearing & Earthwork – 02210

E. Supervision: All work specified herein shall be under the supervision of the Contractor.

1.2 JOB CONDITIONS

A. Should any unusual conditions arise, the Engineer should be contacted for instructions prior to continuation of demolition operations.

1.3 PERMITS

A. Obtain and pay for all required permits and inspections.

1.4 HAZARDOUS MATERIALS

A. In the event hazardous material is discovered in the area of work, immediately notify the engineer for instruction.

PART II – EXECUTION

2.1 NOTIFICATION OF UTILITY COMPANIES

A. Notify all utility companies that may have lines or services on or around the site prior to starting any work. Have the utility company identify and locate their underground lines.

B. Take responsibility for the repair or replacement of any lines or services damaged during the course of this work.

C. Remove, plug or cap all abandoned lines, meters, boxes, obstructions or piping in accordance with the requirements and approval of the agencies affected or as directed by the Engineer. Use licensed electricians or plumbers for this work.

2.2 PROTECTION

A. Take responsibility for furnishing, placing and maintaining all support, shoring and sheet piling which may be required for the protection of site personnel and adjacent existing improvements.

B. Maintain all bench marks, monuments, and other reference points furnished by others and replace any that are disturbed or destroyed during the course of this work.
   1. Do not damage any trees not indicated for removal. Protect trees near this work so as to prevent damage to the branches, bark and soil around the root system.
   2. Protect all underground utilities in the area of this work.

2.3 PROCEDURE

A. Demolition: Perform work in an orderly and careful manner. Take responsibility for damages to public property resulting from this operation.

B. Materials: Promptly remove all materials, rubbish and debris from the premises. Subcontractors shall dispose of demolition and construction debris only at approved and legally operating waste and debris sites. Subcontractors shall obtain and retain for duration of the contract and two (2) years thereafter receipts from the disposal site operator for all debris. Accumulation of same will not be permitted. Refer to Nassau County Standard Contracts Documents.

C. Backfill: Fill excavations created by this work in accordance with the requirements of Section 02210 of these specifications.

END OF SECTION2010

SECTION 02200

EROSION AND SEDIMENTATION CONTROL

PART I – GENERAL

1.1 DESCRIPTION

A. The General Requirements, Section 00 01 00, are hereby made a part of this section as if fully repeated herein.

B. Work Included:
   1. Furnishing, installing and maintaining erosion controls and sedimentation controls.
   2. Temporary seeding and mulching.
   3. Clean up.

C. Related Work Specified Elsewhere:
   1. Paving: Section 02800 – Asphalt Paving
   2. Drainage Structures: Section 02700 – Storm Drainage
   3. Planted Areas: Section 02900 - Landscaping (Landscape Work)

D. References: EPA, "Storm Water Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices", 1992 Edition.

E. Supervision: All work specified herein shall be under the supervision of the Project Superintendent.

1.2 JOB CONDITIONS

A. The existing site is an undeveloped wooded site contractor is responsible to meet all local, state and federal criteria to protect adjacent land from erosion and sediment transport off the site.

1.3 QUALITY ASSURANCE

A. Provide erosion control methods in accordance with methods as indicated on the grading and erosion control plan and/or requirements of authorities having jurisdiction. The Contractor shall comply with all National Pollutant Discharge Elimination System (NPDES) rules and regulations in terms of both installation and maintenance during construction. Refer to per Nassau County requirements.

PART II – PRODUCTS

2.1 SILT BARRIER PRODUCTS

A. Hay bales shall be clean, seed-free cereal hay type, securely bound.

B. Netting shall be 1/2 in., galvanized steel chicken wire mesh.

C. Filter stone shall be crushed 1-in. stone without excessive fines or dust.

D. Silt barrier shall be nylon, polyester, propylene, or ethylene yarn with extra strength – 50 lb. / lin. in (minimum) and with a flow rate of at least 0.3 gal / SF / minute. Fabric shall have a minimum equivalent opening size (U.S. Standard Sieve) of 40 and a maximum equivalent opening size of 80. Fabric shall contain ultraviolet ray inhibitors and stabilizers.

E. Erosion control blankets shall be North American Green SC 150 Straw/Fiber Blanket.

2.2 TEMPORARY SEEDING

A. Provide seed mixture, mulch and fertilizer types and application rates in accordance with local agricultural recommendations.

PART III – EXECUTION

3.1 EROSION AND SEDIMENTATION CONTROL

A. Erosion controls shall include staked silt fencing, straw hay bales, grassing, mulching, watering, and reseeding on-site sloped surfaces, providing berms at the top of the slopes and providing interceptor ditches at the ends of berms and at those locations which will ensure that erosion during construction will be either eliminated or minimized.

B. Sedimentation controls shall include temporary sedimentation basins, rock check dams and turbidity fencing, silt fence barriers, and appurtenances at the toe of slopes.

C. The Contractor shall construct the sedimentation basins and sediment control devices prior to clearing and grubbing the site to ensure complete silt control. When the silt or the debris level is greater than 1 ft. above the bottom of sedimentation basin, the Contractor shall remove the silt or debris to restore the proper storage elevation from the bottom of the sedimentation basin.

D. Silt dams, traps, barriers, and appurtenances shall be installed and shall be maintained in place for duration of construction. This is done by periodically replacing silted structures, or removing the silt from the up-gradient side of it.

E. Hay bales shall be staked with (2) 2-in. by 2-in. wood stakes or 2 steel rebar per bale driven 18 to 24-in. into the ground and finishing flush with the top of the bale.

F. Hay bales, which have deteriorated, shall be replaced with new materials.

G. Erosion and sedimentation controls shall be maintained in a condition, which will retain unfiltered water.

H. The Site Contractor shall be solely responsible for ensuring that no silt or debris leaves the immediate construction site. Any silt or debris that does leave the immediate site shall be cleaned up, and the area disturbed shall be returned to its natural state as directed by the Project Superintendent at the

subcontractor's expense.

3.2 TEMPORARY SEEDING AND MULCHING

A. Mulch and seed all disturbed areas except building and pavement areas and areas designated as planting beds.

B. Seed mixture, mulch and fertilizer types, and application rates shall be in accordance with local agricultural recommendations.

C. Remove all rocks over 1-1/2-in. diameter or larger, large roots and other debris of objectionable matter from the top 3-in. of soil. Spread lime and fertilize as recommended and disk into soil. Rake area just before seeding so as not to affect proper drainage. Spread seed as recommended and cover to an average depth of 1/4-in. by means of a harrow or rake. Do not seed in windy weather or when the ground is too wet to be tilled. Apply mulch as recommended.

D. Maintain seeded areas until the work has been completed and accepted and for a minimum period of 90 days thereafter, including watering as necessary and at least 1 cutting. If the surface becomes eroded or otherwise damaged during this period, repair the affected areas and re-seed as specified above.

E. Hydro-seeding or sod may be used in place of seed and mulching on a properly prepared subgrade of fertilized topsoil. Use sod of the type noted on the landscape drawing. Use freshly cut and mature sod with a minimum root mat thickness of 2-in.. Peg all sod on slopes to prevent movement.

3.3 CLEAN UP

A. Minimize the transmission of dirt or debris by equipment or personnel to any property, public or private, outside the project site. Immediately remove any such debris or dirt transmitted.

END OF SECTION 02200

SECTION 02210

SITE CLEARING AND EARTHWORK

PART I – GENERAL

1.1 DESCRIPTION

A. The General Requirements, Section 00100, are hereby made a part of this section as if fully repeated herein.

B. The Nassau County Standard Specifications are hereby made a part of this section and are fully repeated herein. If there are any discrepancies, the more stringent specification shall take precedence.

C. Work Included:
1. Notification of utility companies.
2. Protection.
3. Site clearing.
4. Removal of vegetation and unsuitable material.
5. Stripping and stockpiling topsoil.
6. Layout and establishment of grades.
7. Proofrolling.
8. Grading and reshaping site.
9. Temporary drainage and erosion control.
10. Consolidation of existing soil.
11. Importing and compacting fill.
12. Construction of drainage ditches and swales.
13. Spreading and hauling of topsoil.
14. Mulching and seeding.
15. Clean up.

D. Related Work Specified Elsewhere:
1. Demolition of existing structures and slabs: Section 02010 - Demolition
2. Foundation excavation: Section 02220 - Excavation and Backfill
3. Drainage structures: Section 02700 – Storm Drainage
4. Paving: Section 02800 – Asphalt Paving
5. Planted areas: Section 02900 - Landscaping (Landscape Work)

1.2 JOB CONDITIONS

A. Should any unusual conditions arise, contact the Engineer for instructions prior to continuation of clearing and grading operations.

1.3 QUALITY ASSURANCE

A. Work specified herein will be subject to inspection and testing by an independent testing laboratory selected and compensated by the Contractor.

B. Soil tests will be made as follows:
   1. A moisture density relationship determination test will be obtained for each type of fill material used, and each type of existing soil to be compacted in accordance with ASTM D-1557 for granular or sandy soils and ASTM D-698 for fine or clay soils.
   2. One in-place density test is required for every 5,000 SF of stripped or cut subgrade, that is specified to be compacted.
   3. One in-place density test is required for each layer of fill for every 5,000 SF of area. Re- tests will be required in recompacted areas.

1.4 SUBMITTALS

A. Soil Tests: Two original, signed and sealed copies of each soil test must be submitted to the c ontractor.

1.5 HAZARDOUS MATERIALS

A. In the event hazardous material is discovered in the area of work, immediately notify the engineer for direction.

PART II – EXECUTION

2.1 NOTIFICATION OF UTILITY COMPANIES

A. Notify all utility companies that may have lines or services on or around the site prior to starting any work. Have the utility identify and locate their underground lines.

B. Take responsibility for the repair or replacement of any lines or services damaged during the course of this work.

C. Remove, plug or cap all abandoned lines, meters, boxes, obstructions or piping in accordance with the requirements and approval of the agencies affected or as directed by the Engineer. Use licensed electricians or plumbers for this work.

2.2 PROTECTION

A. Take responsibility for furnishing, placing and maintaining all support, shoring and sheet piling which may be required for the protection of site personnel and adjacent existing improvements.

B. Maintain all bench marks, monuments, and other reference points furnished by others and replace any that are disturbed or destroyed during the course of this work.

C. Do not damage any trees not indicated for removal. Protect trees near this work so as to prevent damage to the branches, bark and soil around the root system.

D. Protection devices shall be in accordance with local standards. Protect all underground utilities in the area of this work.

2.3 SITE CLEARING

A. Remove all trees, brush, vegetation, debris and any other existing material shown from all areas designated to be cleared. Remove all material to its full depth or extent unless otherwise indicated or directed by the Engineer.

B. Stage clearing and seeding so that no areas are left defoliated for more than 30 days, or as allowed by Local and State Codes, prior to beginning final construction or paving, unless otherwise authorized.

2.4 REMOVAL OF VEGETATION AND UNSUITABLE MATERIAL

A. Remove and dispose of all trees, vegetation, and all other cleared materials from the site. If permitted by local authorities, on-site burning will be allowed.

B. Undercut material may be stockpiled on site as directed by the General Contractor.

2.5 STRIPPING AND STOCKPILING OF TOPSOIL

A. Strip all topsoil from the building and pavement areas and stockpile it on the site as directed by the Contractor.

B. Do not include clay, stones larger than 3/4-in. diameter, weeds, roots, rubbish or any other foreign matter in the topsoil material.

C. Stripped topsoil meeting Section 02910 may be retained in proposed landscape areas only.

D. Stripped topsoil meeting Section 02220 may be retained on site and used for non-structural fill.

E. Excess strippings shall be hauled offsite, as directed by the contractor, at the subcontractor's expense.

2.6 LAYOUT AND ESTABLISHMENT OF GRADES

A. Provide all layout, including building corners, and establish grades as needed for the proper execution of the work.

B. Base all layout on bench mark provided by others.

2.7 PROOFROLLING

A. Proofroll stripped or cut subgrade in building and pavement areas prior to compaction of existing subgrade, or placement of fill.

B. Use loaded dump truck, or other heavy, large tired vehicle.

C. Determine zones of loose, wet, or soft organic material. If a pumping subgrade condition occurs, immediately stop proofrolling operations to avoid further subsurface disturbance.

D. Where soft materials, fine sands, or organic soils occur at subgrade elevations beneath the building or pavement, notify the Engineer with an estimate of the amount of unsuitable material, and the cost for undercutting and replacement fill. Engineer shall obtain Owner's authorization of undercutting and replacement fill costs prior to site work contractor proceeding with any undercutting of unsuitable material.

E. Following Owner authorization of undercutting, excavate down to suitable subgrade, as determined by the Engineer or Geotechnical Testing Agency, and backfill with structural fill conforming to Section 02210 2.11. Place replacement fill in 8-in. thick loose lifts when using lightweight compaction equipment and in 12-in. thick loose lifts when using a vibratory drum roller conforming to Section 02210 2.10A of these specifications, and compact each layer to 98% of the material's maximum dry density within the upper 12-in. beneath paving and building areas and to 95% of the material's maximum dry density elsewhere, as determined by ASTM D-1557.

2.8 GRADING AND RESHAPING SITE

A. Uniformly grade all areas as shown on the drawings including cut and filled areas and adjacent transition areas so that finished surfaces are at the elevation indicated on the drawings.

B. Grade areas to receive topsoil to allow for such material. Leave finished surfaces and surfaces to receive paving smooth, compacted and free from irregular surface drainage.

C. Surfaces shall not vary from the established grades more than the following:

Finished surfaces	0.1 ft.
Areas under paving	0.05 ft.
Areas under concrete slabs	0.05 ft.

D. Place fill in successive layers of not more than 8-in. in thickness when using lightweight compaction equipment and in 12 inch thick loose lifts when using a vibratory drum roller conforming to Section 02210 2.10A of these specifications, and compact each layer until the following percentage of the maximum dry density is obtained.

1.	Building areas	98%
2.	Paving areas	95%
3.	Upper 12" beneath paving areas	98%
4.	All other areas	95%

Recompact areas, which fail to meet the compaction requirements until passing results are achieved.

2.9 TEMPORARY DRAINAGE AND EROSION CONTROL

A. During all site clearing and grading operations, provide proper temporary drainage, complete with required trenching and pumping equipment, to adequately dispense surface and/or subsurface water and to insure that the site is kept in an accessible and workable condition at all times.

B. Perform temporary drainage work in conformance with all governing regulations including protective measures such as silt screens, hay bales, settling ponds and similar devices as required by such regulations.

C. At the conclusion of the project, prior to spreading the topsoil, restore all areas used for temporary drainage to the grades and elevations shown on the drawings.

2.10 CONSOLIDATION OF EXISTING SOIL

A. Upon completion of proofrolling operation, compact the building area, the paving area, and an area 5 ft. beyond the edge of all building and paving lines using a light to moderate weight vibratory roller .

B. A minimum of 8 complete passes is required and any additional passes necessary to obtain a density as specified in Section 02210 2.08D. Obtain this density in all material within 12-in. of the surface, unless otherwise directed by the Engineer.

C. Do not use heavy vibratory equipment within 25 ft. of existing buildings. Use small walk-behind equipment or non-vibratory rollers in this area.

2.11 PLACEMENT OF FILL

A. All fill material, whether from on-site, or imported material, must be approved by the Engineer prior to placing it on the site. Soil tests have been conducted on the site and the materials are suitable for use as fill material.

B. Import fill shall consist of a granular material free of clay, silt, or organic material. The material shall contain less than 10% material passing the No. 200 mesh sieve. The plasticity index of all import material shall not exceed 20. The liquid limit of all import material shall not exceed 30.

C. Place fill as specified in Section 02210 2.08D.

D. Import fill required by this specification shall be free of material that would deem the fill hazardous, as defined by the standards of the environmental authorities having jurisdiction. If required by the Engineer, appropriate documentation substantiating this requirement shall be submitted.

2.12 CONSTRUCTION OF DRAINAGE DITCHES AND SWALES

A. Construct drainage ditches and swales as shown on the drawings and finish to permit proper surface drainage.

2.13 SPREADING TOPSOIL

A. Transport topsoil from the stockpile on the site and spread uniformly on all disturbed areas that are to receive topsoil. Remove any clay, stones larger than 3/4-in. diameter, weeds, roots, rubbish and all other foreign matter from the topsoil. Excess topsoil shall be removed from the site.

2.14 MULCHING AND SEEDING

A. Mulch and seed all disturbed areas except building and pavement areas and areas designated as planting beds.

B. Seed mixture, mulch and fertilizer types, and application rates shall be in accordance with local agricultural recommendations.

C. Remove all rocks over 1-1/2-in. diameter or larger, large roots and other debris of objectionable matter from the top 3-in. of soil. Spread lime and fertilize as recommended and disk into soil. Rake area just before seeding so as not to affect proper drainage. Spread seed as recommended and cover to an average depth of 1/4-in. by means of a harrow or rake. Do not seed in windy weather or when the ground is too wet to be tilled. Apply mulch as recommended.

D. Maintain seeded areas until the work has been completed and accepted and for a minimum period of 90 days thereafter, including watering as necessary and at least 1 cutting. If the surface becomes eroded or otherwise damaged during this period, repair the affected areas and re-seed as specified above.

E. Sod may be used in place of seed and mulching on a properly prepared subgrade of fertilized topsoil. Use sod of the type recommended for the local conditions. Use freshly cut and mature sod with a minimum root mat thickness of 2-in.. Peg all sod on slopes to prevent movement.

2.15 CLEAN UP

A. Minimize the transmission of dirt or debris by equipment or personnel to any property, public or private, outside the project site. Immediately remove any such debris or dirt transmitted.

END OF SECTION 02210

SECTION 02220

EXCAVATION AND BACKFILL

PART I – GENERAL

1.1 DESCRIPTION

A. The General Requirements, Section 00 01 00, are hereby made a part of this section as if fully repeated herein.

B. The Nassau County Standard Specifications are hereby made a part of this section and are fully repeated herein. If there are any discrepancies, the more stringent specification shall take precedence.

C. Work Included:
1. Notification of utility companies.
2. Protection.
3. Excavation.
4. Unsuitable Materials.
5. Dewatering and erosion control.
6. Backfill and compaction.
7. Clean up.

D. Related Work Specified Elsewhere:
1. Site clearing and grading: Section 02210 - Site Clearing & Earthwork
2. Foundations and slabs: Section 033000 - Cast-In-Place Concrete

1.2 JOB CONDITIONS

A. Should any unusual conditions arise, contact the Engineer for instructions prior to continuation of excavation and/or backfilling operations.

B. Layout shall be by General Contractor unless otherwise directed.

1.3 QUALITY ASSURANCE

A. Work specified herein will be subject to inspection and testing by an independent testing laboratory selected and compensated by the Contractor.

B. Soil tests will be made as follows:
1. A moisture density relationship determination test will be obtained for each type of fill material used in accordance with the (ASTM D-1557 for granular or sandy soils) (ASTM D-698 for fine or clay soils).
2. One density test shall be performed for each 5,000 SF of area and for every layer of fill. One test is required in the bottom of 50% of the isolated footings and at 100-ft. intervals in the continuous footings when located in fill material.

1.4 SUBMITTALS

A. Submit two original, signed and sealed copies of each soil test to the contractor.

PART II – EXECUTION

2.1 NOTIFICATION OF UTILITY COMPANIES

A. Notify all utility companies that may have lines or services on or around the site prior to starting any work. Have the utility identify and locate their underground lines.

B. Take responsibility for the repair or replacement of any lines or services damaged during the course of this work.

C. Remove, plug or cap all abandoned lines, meters, boxes, obstructions or piping in accordance with the requirements and approval of the agencies affected or as directed by the Engineer. Use licensed electricians or plumbers for this work.

2.2 PROTECTION

A. Take responsibility for furnishing, placing and maintaining all support, shoring and sheet piling which may be required for the protection of site personnel and adjacent existing improvements.

B. Maintain all benchmarks, monuments, and other reference points furnished by others and replace any that are disturbed or destroyed during the course of this work.

C. Do not damage any trees not indicated for removal. Protect trees near this work so as to prevent damage to the branches, bark and soil around the root system.

D. Protect all underground utilities in the area of this work.

2.3 EXCAVATIONS

A. Make excavations to the dimension and elevation indicated on the drawings. Extra payment will not be made for excavations carried below indicated grades. Where unauthorized excavations are made below indicated elevations under slabs, restore to proper elevation as specified for compacted backfilling; if under footings, pay for the cost of the extra concrete required for the extra wall or footing depth.

B. Concrete may be cast against vertical excavated surfaces provided the material will stand without caving. Therefore, take care to maintain the cross section as shown on the drawings. Allow sufficient width when excavating for formed concrete to allow for construction and removal of forms. Allow sufficient width when excavating for below-grade walls to allow for application of waterproofing and drainage materials as specified and shown on the drawings.

C. Deposit excess excavated material and material determined unsuitable for use as fill or topsoil (off site).

2.4 UNSUITABLE MATERIALS

A. Where soft, organic, or wet materials are present in the bottom of footing or utility excavations, notify the Engineer in accordance with Section 02210, 2.07 D.

B. Following Owner authorization of undercutting footing or utility trench subgrade, remove 12-in. of unsuitable material, and replace with 12-in. of AASHTO #57 stone.

C. Compact replacement stone with a walk behind vibratory sled to 95% of the material's maximum dry density, according to ASTM D-1557.

2.5 DEWATERING AND EROSION CONTROL

A. Dispose of all surface or subsurface water encountered in a manner that will not interfere with the workable condition of the site.

B. Dewatering work to be performed in conformance with governing regulations including protective measures such as silt screens, hay bales, settling ponds and similar devices as required by such regulation.

2.6 BACKFILL AND COMPACTION

A. All fill, or backfill material shall be approved by the Engineer.

B. In the event that material must be brought onto the site or if the excavated material differs from those previously tested, tests will be made to establish its suitability for use and to develop moisture-density curves.

C. Place backfill material in successive layers of not more than 12-in. in thickness and compact each layer until 95% of the maximum dry density is obtained. Recompact areas, which fail to meet the compaction requirements until passing results are achieved.

D. Do not place backfill around, against or upon any concrete or masonry structure until structure has obtained sufficient strength to withstand the loads imposed as determined by the Engineer or when properly braced or shored.

2.7 CLEAN UP

A. Minimize the transmission of dirt or debris by equipment or personnel to any property, public or private, outside the project site. Immediately remove any such debris or dirt transmitted.

END OF SECTION 02220

SECTION 02222

BUILDING EARTHWORK

PART 1 – GENERAL

1.1 DESCRIPTION

A. Provide earthwork, including clearing and grubbing, excavation, fill, backfill and compaction for building areas and concrete walks and slabs, shown on the drawings and specified as required to complete work.

B. The Nassau County Standard Specifications are hereby made a part of this section and are fully repeated herein. If there are any discrepancies, the more stringent specification shall take precedence.

1.2 QUALITY ASSURANCE

A. Codes and Standards: Perform earthwork in compliance with applicable requirements of governing authorities having jurisdiction.

B. Testing and Inspection Service: Contractor shall employ and pay an independent soil testing and inspection service to perform a soil survey for satisfactory soil materials, sampling and testing for quality control during earthwork operations.

C. Test for Proposed Soil Materials:
   1. Test soil materials proposed for use in the work and promptly submit test result reports.
   2. Provide one optimum moisture-maximum density curve for each type of soil encountered in subgrade and fills under building foundations and slab areas. Determine maximum densities in accordance with ASTM D 1557, and ASTM D 4253, as applicable.
   3. For borrow materials, perform a mechanical analysis, AASHTO-T88 plasticity index, AASHTO T91; moisture-density curve, AASHTO-T180 or ASTM D 1557.

D. Project Geotechnical Report: Perform earthwork in accordance with the recommendations of the geotechnical report for the project.

1.3 SUBMITTALS

A. Test Reports: Submit two original, signed and sealed copies of the following reports to the architect-Engineer:
   1. Test report on borrow material.
   2. Field density test reports.
   3. Optimum moisture-maximum density curve for each type of soil encountered.

1.4 JOB CONDITIONS

A. Protection: Protect structures, utilities, sidewalks, pavements, and other facilities from damages caused by settlement, lateral movement, undermining, washout and other hazards created by excavation operations. Should any uncharted utilities be found, notify the utility company and Architect-Engineer immediately and await instructions before proceeding further with work in that location.

PART 2 – PRODUCTS

2.1 SOIL MATERIALS

A. Fill and Backfill Materials: Clean, free-draining sand (max. 10% passing the 200 mesh sieve) free from organic materials.

B. Excavated material conforming to requirements for fill and backfill material may be used for fill and backfill.

C. Provide additional fill material from off-site when required to complete the work.

2.2 VIBRATORY COMPACTION EQUIPMENT

A. Vibratory Roller: The vibratory drum roller shall be as recommended in the geotechnical report for the project. Vibratory roller shall not be used within 30 ft. of existing structures. Use mechanical hand tampers.

B. Mechanical Hand Tampers: Hand tampers shall be capable of meeting the compaction requirements specified herein.

PART 3 – EXECUTION

3.1 CLEARING AND GRUBBING BUILDING AREAS

A. Clear and grub the entire building area to at least 5 ft. beyond perimeter of building footings and foundation, walks and slabs to remove stumps, roots, trees, vegetation, organic material and other obstructions to the work. Grub out all roots larger than 1/4-in. diameter, matted roots and other organic material to at least 24-in. below existing surface.

B. Strip topsoil from areas within the building and slab areas and stockpile on the site for future use in site grading.

3.2 EXCAVATION

A. Excavate to depths and dimensions required for footings, slabs and structures. Remove and dispose of all obstructions to the work that are encountered above and below grade during excavation operations. Removal and disposal includes the following:
   1. Stumps, roots, trees and other organic materials.
   2. Pavement, foundations, concrete, and other inorganic materials.
   3. Abandoned utilities and utilities indicated to be removed.
   4. Organic and other unsuitable soil materials.

B. Stability of Excavations:
   1. Slope the sides of excavation to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible either because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.
   2. Shoring and Bracing: Provide shoring and bracing to comply with local codes and authorities having jurisdiction.

C. Dewatering:
   1. Prevent surface water and subsurface or groundwater from flowing into excavations and flooding the project site and surrounding area.
   2. Do not allow water to accumulate in excavations. Provide dewatering system components necessary to convey the water away from excavations.

D. Excavation for Structures:
   1. Conform to the elevations and dimensions shown on the drawings, with a tolerance of plus or minus 0.10 ft., and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.
   2. In excavating for footings and foundations, take care not to disturb bottom of the excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to the required lines and grades to leave a solid base to receive concrete.
   3. Where bottom of footing occurs in fill material, the fill and compaction operations shall continue until a minimum grade of 12-in. above bottom of footing is obtained. Footings may then be placed by excavating in accordance with methods herein specified.
   4. Foundations shall be constructed as soon as possible after the foundation excavation to minimize damage to the bearing surface. If the bearing surface is softened by surface water intrusion or exposure, the softened soils must be removed immediately prior to placement of concrete. The bearing surface may be protected from extended exposure or imminent rainfall by placing a 2-in. mat of lean concrete on the bearing surface. Increase the foundation depth accordingly.

E. Cold Weather Protection: Protect excavation bottoms against freezing when the atmospheric temperature is less than 35° F.

3.3 COMPACTION REQUIREMENTS

A. General: Compact and fill and backfill to the same density as adjacent in-place material.

B. Compaction Under Slabs and Structures:
   1. All building areas shall be compacted and densified using a vibratory drum roller as specified herein. Vibratory compaction shall extend at least 5 ft. beyond perimeter of building footings and foundations, slabs and walks. A minimum of twelve complete coverages, six in each direction, shall be made with the roller. Any soft yielding areas shall be excavated and replaced with acceptable fill material. Fill shall be placed in lifts not exceeding 12-in. in loose thickness (6-in. for mechanical hand tampers).Continue compaction until requirements specified herein are attained.

C. Percentage of Maximum Density Requirements: Compact soils to not less than the following percentages of the Modified Proctor maximum dry density, ASTM D 1557.
   1. Existing Subgrades Under Structures: Compact subgrade 12-in. below existing grade to 95 percent maximum density at optimum moisture.
   2. Fill and Backfill Under Footings and Foundations: Compact each layer of fill or backfill to 98 percent maximum density at optimum moisture.
   3. Walks and Slabs: Compact top 12-in. of subgrade and each layer of fill or backfill to 95 percent maximum density at optimum moisture.

D. Moisture Control:
   1. Where the subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to the surface or subgrade, or layer of soil material, to prevent free water appearing on the surface during subsequent to compaction operations.
   2. Remove and replace, dewater, or scarify and air dry soil material that is too wet to permit compaction to specified density.

E. Backfilling Under Slabs and Structures:
   1. Continue backfilling and compaction over entire building area to final elevation. Backfilling shall be in equal layers compatible with equipment used.

3.4 FIELD TESTING

A. Number of tests:
   1. Make one optimum moisture-maximum density curve test in accordance with ASTM D 1557 for each class of material.
   2. Make in-place density tests in accordance with ASTM D 1556, ASTM D 2937, or ASTM D 4253, as applicable, as fill and backfill work progresses. Test locations shall be as follows:
      a) approximately every 185 cubic yards of fill and backfill, or 5,000-SF of building area, shall be tested;
      b) at a minimum of 50% of isolated spread footings;
      c) at 100 linear ft. of continuous wall footings.

B. Work on Tested Area: Placing permanent construction over fill that has not been tested and approved may require the Contractor to remove permanent work, recompact the fill and replace the work.

END OF SECTION 02222

SECTION 02700

STORM DRAINAGE

PART I – GENERAL

1.1 DESCRIPTION

A. The General Requirements, Section 100, are hereby made a part of this section as if fully repeated herein.

B. The Nassau County Standard Specifications are hereby made a part of this section and are fully repeated herein. If there are any discrepancies, the more stringent specification shall take precedence.

C. Work Included:
1. Storm drainage piping.
2. Catch basins.
3. Manholes.
4. Curb inlets.
5. Outlet structures.
6. Erosion control devices.

D. Related Work Specified Elsewhere:
1. Site clearing: Section 02210 - Site Clearing & Earthwork
2. Excavation and grading: Section 02210 - Site Clearing & Earthwork
3. Curbs and gutters: Section 02830 – Pads, Sidewalks, Curbs & Bumpers
4. Seeding: Section 02210 - Site Clearing & Earthwork

1.2 SUBMITTALS

A. Pipe and fittings: Subcontractor shall submit manufacturer's data sheets for all pipe and fittings to be used on the project. Submittal must confirm compliance with ASTM Standards.

B. Structures: Subcontractor shall submit fabrication drawings, showing all invert elevations, grate and weir elevations, weir and orifice dimensions, and size of pipe openings. Structures shall not be ordered, until fabrication drawings have been approved by the Engineer. Submittal must confirm compliance with ASTM Standards.

C. Subcontractor shall submit manufacturer data sheets for the following ancillary product: grates, filter fabric, filter material, grout, joint sealer.

D. Cast-In-Place Structures: Shop drawings shall be submitted with approved concrete mix design suitable for site work meeting Section 033000.

PART II – PRODUCTS

2.1 MATERIAL

A. Concrete: Shall have a 28-day strength of 4,000 PSI and meet requirements specified in Division 3 of these specifications.

B. Corrugated Polyvinyl Chloride (PVC) pipe: Pipe and fittings shall have a smooth interior wall and shall conform with ASTM D 3034. All PVC pipe shall have Bell and Spigot ends, and be joined with a gasketed joint. All joints shall be water-tight.

C. Corrugated High Density Polyethylene (HDPE) pipe: shall have smooth interior wall and shall conform to ASTM D3350. HDPE pipe 12-in. to 36-in. diameter shall meet AASHTO M294, Type S standard specification for corrugated polyethylene. All HDPE pipe shall have bell and spigot ends meeting AASHTO M252 Type S, AASHTO M294 Type S, AASHTO MP6-95 Type S, or AASHTO MP97-97 specifications, and shall be joined with a gasketed joint meeting ASTM F477 specification for rubber gasket connection. All joints shall be watertight.

D. Gratings: Shall be US Foundry as detailed. Material shall be cast iron.

E. Concrete Block: Shall comply with the requirements of ASTM Designation C90-70, Grade "N", Type I or II.

F. Filter Fabric: Shall be a non-woven Typar material conforming to fabric style 3341, or approved equal.

G. Filter Material: Shall be ASTM #6 stone (3/4-in. clean stone with less than 5% passing the no. 4 sieve).

H. Precast concrete structures:
   1. Circular units shall be fabricated in accordance with ASTM C478. Square or rectangular units shall be fabricated in accordance with ASTM C913.
   2. Joints shall be made in accordance with ASTM C443. All joints shall be equipped with a pre-molded plastic joint sealer.
   3. Grout shall be 4000 PSI, and shall be non-metallic, non-shrink, premixed.
   4.
   5. Reinforcement shall be for H-20 traffic loading.

I. Mitered-end sections (MES): Shall be precast, and of the size as shown on the drawings. All concrete shall be 4000 PSI.

PART III – EXECUTION

3.1 PERFORMANCE

A. Excavation and Backfill: Excavate trenches to proper depth. Where soft material occurs at the bottom of the trench, immediately notify the Engineer with an estimate of the amount of unsuitable material, and the cost to remove and replace the unsuitable material. Engineer shall obtain Owner's approval of additional work prior to subcontractor proceeding with undercutting. Following excavation of unsuitable material, backfill to the bottom of the trench with granular material. Bottom of trench shall be shaped to fit pipe. Backfill shall be placed in 6-in. layers, and compacted to 95% of maximum dry density as determined by Proctor Test ASTM D-1557.

B. Installation of Pipe: Pipe shall be installed accurately to the grades and alignment shown on the drawings. Lay pipe with bell ends upstream and adjust spigots in bells to provide uniform space all around. Make all joints watertight.

C. Precast Concrete Structures:
   1. Set monolithic unit or precast sectional base in place on 2-in. (min.) leveling course of class "C" concrete as required by site soil conditions.
   2. Double seal joints in sectional structures with pre-molded plastic joint sealer.
   3. Provide smooth flowing channel of shape and size of connecting pipe.
   4. Grout all handling holes, and annular space between walls and pipes.
   5. Set frames and grates at grade in concrete paving areas and 0.05 ft. below adjacent pavement grade in asphalt pavement areas. In unpaved areas, set grates at grade and set frames at 0.05 ft. above adjacent grade. Frames shall be set concentric, in full bed of mortar.

D. Clean-up:
   1. Prior to demobilizing, subcontractor shall inspect all structures, and remove all accumulated sediment or trash from within structures.
   2. Subcontractor shall insure that all pipe outlets are clear and free-flowing. All pipe outlets shall be inspected for erosion, and properly stabilized, prior to final acceptance of the subcontractor's work by the contractor.

END OF SECTION 02700

SECTION 02800

ASPHALT PAVING

PART I – GENERAL

1.1 DESCRIPTION

A. The General Requirements, Section 00 01 00, are hereby made a part of this section as if fully repeated herein.

B. The Nassau County Standard Specifications are hereby made a part of this section and are fully repeated herein. If there are any discrepancies, the more stringent specification shall take precedence.

C. Work Included:
   1. Fine grading.
   2. Paving base.
   3. Asphalt wearing surface.
   4. Striping and traffic control marking.

D. Paving Thickness: Paving materials shall have the following minimum compacted thickness or equivalent structural numbers (SNs):
   1. Truck pavement area (Equivalent $SN_R = 2.32$):
      8-in. Lime rock base.
      2-in. Type SP-12.5 hot-mix asphalt surface
   2. Auto pavement area (Equivalent $SN_R = 1.74$):
      6-in. Lime rock base.
      1.5-in. Type SP-12.5 hot-mix asphalt surface

E. Related Work Specified Elsewhere:
   1. Rough grading and compaction of sub-base: Section 02210 - Site Clearing and Earthwork.
   2. Concrete paving: Section 02800 – Asphalt Paving
   3. Pads, sidewalks, curbs & bumpers: Section 02800 – Asphalt Paving.

1.2 QUALITY ASSURANCE

A. General: Perform all work included in this section in accordance with the appropriate standards of the Florida State Department of Transportation.

B. Qualifications of Asphaltic Concrete Producer: Use only materials which are furnished by a bulk asphaltic concrete producer regularly engaged in production of hot-mix, hot-laid, asphaltic concrete.

C. Submittals: Submit asphalt job-mix design with material certifications to the Engineer for approval prior to the commencement of any paving operations.

D. Testing: Testing as specified herein, will be performed by an approved testing laboratory, selected and compensated by the Contractor.

1.3 SUBMITTALS

A. Submit pavement design with structural numbers (SNs) to ensure minimum thicknesses or equivalents are achieved. For reference, see the Florida Department of Transportation, *Flexible Pavement Design Manual*, latest edition.
B. Submit manufacturer data sheets with proposed design mix and gradation for base, binder and asphalt layers. Sheets shall confirm compliance with the applicable ASTM sections.
C. Submit all test reports required.

PART II – PRODUCTS

2.1 MATERIAL

A. Base: Shall consist of graded aggregate of uniform quality throughout. The material retained on the No. 10 sieve shall be composed of aggregate meeting the requirements of Section 810 of the State of Florida Department of Transportation Standard Specifications. The graded aggregate may be produced from an approved source of deposit which will yield a satisfactory mixture conforming to applicable specifications of the State of Florida Department of Transportation Specifications, or a material may be furnished in 2 sizes of such gradation that when combined shall conform to the State of Florida Department of Transportation Specifications. All crushing, mixing or breaking which may be necessary to meet size requirements shall be done before mixing or placing. Compaction of stone will be 100% Modified Proctor (ASTM D-1557) and LBR 100.

B. Prime Coat: Shall conform to the requirements of ASTM standard test for grade RC-70 or grade RC-250.

C. Asphalt Surface: Shall meet the Florida State Department of Transportation Specifications for Type SP-12.5 hot-mix asphaltic concrete. Bitumen content, aggregate size and gradation of material shall meet the applicable section of those specifications. Stability of mix shall be at least 1,200 pounds as determined by Marshall Stability and Flow Test, ASTM D-1559.

D. Striping Paint: Shall be blue in those areas designated as handicap parking as shown on the handicap parking detail. All other striping paint shall conform to the Florida State Department of Transportation Specifications for traffic paint.

PART III – EXECUTION

3.1 PREPARATION

A. Establishment of Grades: Establish grades and make allowance for existing improvements, proper drainage, adjoining property rights, good appearance, and other pertinent considerations.

B. Preparation of Subgrade: Fine grade the area to be paved and remove any excess material from site. Construct the subgrade true to grade, hard, uniform, and smooth, using such methods and equipment as may be necessary. Final compaction shall meet the requirements specified for paving subgrade in Section 02210 of these specifications.

C. Subgrade Tolerance: The Earthwork Subcontractor shall leave the subgrade at plus or minus 0.05 foot. Take responsibility for checking the subgrade and notifying the Contractor if the grade is not to this tolerance.

3.2 INSTALLATION

A. Graded Crushed Aggregate or Slag Base: Spread base course evenly on top of the prepared subgrade to provide the finish depth called for in the specifications. Roll with a 10-ton roller. Continue rolling until the stone is locked and does not creep or wave ahead of the wheels. Apply screening to completely fill the voids, roll again, sprinkle surface with water, fill with additional screening as required, then roll to provide a smooth surface. Continue compaction until an average density of not less than 100% of maximum density, as determined by ASTM D-1557, and an LBR 100 is obtained.

B. Prime Coat: Apply the prime coat only when the base meets the specified density requirements and the moisture content in the top half of the base does not exceed 90% of the optimum moisture for the base material. At the time of priming, the base shall be firm and unyielding. Apply prime coat on all abutting vertical and horizontal surfaces.

C. Apply the prime coat from a pressure distributor at the rate of 0.20 gallon per square yard, only in clear weather at an ambient temperature of 60°F or greater. If sand is applied before curing is complete, sand must be removed and a tack coat of 0.025 gal. / sq. yd. of RC-70 or RC-250 must be applied just prior to placing the wearing surface.

D. Wearing Surface: Spread wearing surface with a self-propelled spreading machine equipped with a receiving and disbursing hopper and a mechanical screed or strike-off member. Roll material with a tandem steel roller, a self-propelled, rubber-tired roller, and then provide a final rolling with an 8-tn to 10-tn tandem steel roller, ensuring a density of at least 95% of the laboratory compacted density of the paving mixture.

E. Hold hand raking behind the paving machine to a minimum. Use the rake only to remove excess material and add additional material only to low areas. Where hand -spreading methods must be use, complete the work in a competent and careful manner and use a labor force of sufficient size and skill so that the operation will be rapid and smooth and mix will not become chilled before spreading is completed. Do not place mix at atmospheric temperature below 40°F. Use only hot tools.

F. Protect all adjacent finished surfaces from bituminous material. Repair any curbs or walls that are damaged by paving operations.

G. Striping: Paint automobile parking spaces with 6-in. wide stripes with clean, true edges without breaks in alignment. Use white, yellow, blue color where designated on the plan. Paint directional arrows where indicated on the plan. Apply a uniform coating of paint so the finish strip will not contain light spots or paint skips. Provide a minimum wet film thickness of 15 mils. Do not paint stripes until pavement has adequately cured to receive the type paint being used.

3.3 TESTING

A. Base material tests shall be made as follows:
   1. Determine moisture/density relationship of base material in accordance with ASTM D-1557.
   2. Perform in-place density tests in the compacted base material at the rate of at least one test for all areas up to 8,000 SF and one additional test for each additional 8,000 SF or fraction thereof. Recompact areas that fail to meet compaction requirements, then retest until passing results are

obtained. Reference test locations to easily identified points on the Site Plan.

B. Asphalt tests shall be made as follows:
   1. At the start of paving operations, obtain one sample each of binder and wearing surface asphalt delivered to the job. Conduct extraction and gradation analysis, Marshall Stability, and laboratory-compacted bulk specific gravity for each sample.
   2. Upon completion of paving, obtain at least one 4-in. diameter core through the asphalt paving for all areas up to 12,000 SY and one additional core for each 12,000 SY or fraction thereof. Obtain at least one core in both the truck pavement and the auto pavement areas. Grout core holes with non-shrink grout after core removal. Reference test locations to easily identified points on the Site Plan.
      a) Measure each asphalt core for thickness and test for bulk specific gravity. Compute the compaction percentages of each core, using the bulk specific gravity of the laboratory compacted specimen as the compaction standard.

END OF SECTION 02800

SECTION 02810

LANDSCAPE IRRIGATION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK: Provide all labor, materials and equipment and pay all associated fees to install a complete electrical automatic landscape irrigation system with accessories necessary for its proper function for all planted and grassed areas shown on the drawings and in accordance with these specifications.

1.2 WATER SOURCE: Public water supply. Verify flow rates. Provide irrigation meter. Include the cost of the meter and associated tap and capacity fees in the total price of the irrigation system.

1.3 POWER SOURCE: Provide all electrical connections between power source and the irrigation controller.

1.4 PERFORMANCE CRITERIA OF IRRIGATION SYSTEM: Provide 100% coverage at a maximum rate of 3 1/2-in. per week for all landscape areas. Maximum spacing of heads to conform to manufacturer's recommendations. Size pipe to provide maximum pipe velocity of 5 FPS and minimum recommended head pressure.

1.5 QUALIFICATION OF IRRIGATION CONTRACTOR:

A. The Irrigation Contractor must have been in business for at least 3 years and must have completed 3 installations of similar scope to this project.

B. The Irrigation Contractor shall be licensed by the Nassau County of Construction Trades Qualifying Board to do irrigation work.

1.6 CODES, INSPECTIONS AND FEES:

A. Comply with all applicable laws, ordinances and codes including the local building code and plumbing code.

B. Obtain required permits and inspections and pay all required fees unless otherwise noted.

C. Should the contract documents be at variance with the applicable laws, ordinances, and codes, notify Owner and wait for instructions before proceeding with the effected work.

1.7 WORKMANSHIP: Perform work in accordance with the best practices throughout the industry and as recommended by the manufacturers of all materials.

1.8 COORDINATION: Complete irrigation work before planting. Coordinate the irrigation work with the Engineer and with the work of other Contractors.

1.9 PROTECTION:

A. Protect vehicular and pedestrian traffic, landscape work, existing vegetation, structures, and above/ below ground utilities from damage by irrigation work.

B. Protect irrigation work from damage by trespassers, landscape operations, and operations by other contractors.

C. Post signs or barriers as required. Maintain protection until Final Acceptance. Repair or replace damage as required.

D. Maintain grade stakes set by others until all parties concerned agree to their removal.

1.10 SUBMITTALS:

A. Irrigation Contractor Qualifications: Submit contractor qualifications before award, if requested. Include date the irrigation business was established and a list of 3 completed installations of similar scope. Include project name, project location, date of completion, name of owner, and address of owner. Also include a copy of the irrigation contractor license issued by the Nassau County.

B. Manufacturer's Data: Submit manufacturer's or vendor's label and application/ installation instructions for the materials noted below that are specified for this project. Submit other data requested to substantiate that materials comply with specified requirements and applicable ASTM requirements. If requested, submit vendors invoice for the materials below. The invoice shall reference this project name and show the quantities used for this project.
   1. Backflow preventer
   2. PVC Shut-off Valve
   3. Automatic Control Valve
   4. PSR-D Regulators
   5. Valve Box (each type used)
   6. Sample Warranty's
   7. PVC piping and accessories (Joints, couplings, solvent, valves)
   8. Automatic Controller or Programmable Actuator
   9. Rain Shut-off Device
   10. Wire Splicing Material (splice kits)
   11. Control Wire
   12. Sprinklers (each type of body and nozzle)
   13. Quick Coupling Valve, valve key, & hose swivel (if shown on drawing)

C. OPERATIONS MANUAL: At Final Inspection, submit 1 copy of printed instructions for the most efficient operation and maintenance of the system, together with parts lists covering all operating equipment, bound into a 3 ring binder.

D. WARRANTY: All product warranties to be submitted at close-out.

E. AS-BUILT DRAWINGS:
   1. Prepare accurate as-built drawings as work proceeds and submit in accordance with the Nassau County requirements.
   2. Keep a daily record of all work installed during that day. Record in red on the print the location of check valves, gate valves, wire locations, head layout, automatic valves, quick couplers, and piping.

1.11 MATERIAL STORAGE AND CLEANUP: Clean the site daily of debris generated by the irrigation work. Arrange material storage so that it does not interfere with other construction. At the end of the irrigation work, remove all unused material and debris generated by that work.

1.12 WARRANTY AND GUARANTEE: A minimum of 1 year from the date of acceptance by Nassau County Fire and Rescue or the Nassau County requirements whichever is greater.

1.13 MEASURE AND PAYMENT: Measurement and payment of the irrigation system, completed and accepted, is established in the proposal as part of the total lump sum or on a unit price basis. The price includes all work specified in this section including associated fees, materials, labor, equipment and maintenance until the Final Acceptance.

PART 2 - PRODUCTS

2.1 MATERIALS: New and true to manufacturer's specifications and dimensions without flaws or defects.

2.2 WATER METER: In accordance with the water and sewer provider, JEA.

2.3 BACKFLOW PREVENTOR: In accordance with industry standards or JEA criteria whichever is the more stringent.

2.4 QUICK COUPLING VALVES (If shown): Provide 1-in. brass quick coupling valve, valve key, and hose swivel of the same manufacturer. The quick coupling valve shall be one piece with rubber cover. Provide units by Rainbird, Hunter, or approved equal.

2.5 SHUT OFF VALVE, PVC: Provide a PVC, schedule 80 equivalent, ball valve sized to match the pipe size to be installed on the upstream side of each automatic control valve.

2.6 AUTOMATIC CONTROL VALVES: Electrically operated 24 VAC solenoid valve of a normally closed design with PVC body and flow control. Use Rainbird 'PGA' series valves. For each zone with spray heads, provide a 'PRS-D' pressure-regulating module with the control valve.

2.7 VALVE BOXES: Provide rectangular injection-molded thermoplastic black valve box. Provide 12-in. Box and drop-in lid for each remote control valve. Provide 10-in. Round Box and drop-in lid for each separate shut off

valve, splice box and quick coupling valve. Provide green lid cast with the word "Control Valve" or “Irrigation Control Valve” on the surface. Provide vertical extensions from same manufacturer as the box.

2.8 GRAVEL: Washed gravel from 1/4-in. to 3/4-in. diameter.

2.9 FILTER FABRIC: Non-woven (4 oz./ sq. yd.) black polypropylene fabric having a water flow of 120 GPM / SF.

2.10 CONTROLLER (IF SHOWN): Provide controller specified on the drawing. Controller shall have: 115 VAC input/ 24 VAC output control transformer; full station clock with automatic or semi-automatic operation, with the time of each station independently variable from 0 to 60 minutes; fourteen day programming; ability to begin operation at any hour and to skip any day of the week.

A. Provide manufacturer’s standard built-in key lock cabinet. If exposed to weather, use standard painted metal or stainless steel weatherproof enclosure and internal transformer specified.

B. Provide primary surge protection if the controller has 12 stations or more.

2.11 RAIN SHUT-OFF DEVICE (IF SHOWN): Provide rain shut-off devise specified on the drawing and install as detailed and in strict accordance with the manufacturer’s printed instructions. Locate for maximum effectiveness. Coordinate location with Engineer. If the sensor is mounted on a PVC pipe use Schedule 40 pipe or post and paint all exposed parts with 2 coats of flat black waterproof paint.

2.12 RAIN FREEZE SHUT-OFF DEVICE (IF SHOWN): Provide the rain/ freeze shut-off device specified on the drawings. Install as detailed and in strict accordance with the manufacturer’s printed instructions. Locate for maximum effectiveness. Coordinate location with Engineer. If the device is mounted on a PVC pipe use Schedule 40 pipe. Paint all exposed parts of the sensor and post with 2 coats of flat black waterproof paint.

2.13 MINI-WEATHER STATION (IF SHOWN): Provide rain/ freeze shut-off devices and wind sensor that can be mounted as a single unit on a 2-in. vertical pipe. Install as detailed and in strict accordance with the manufacturer’s printed instructions. Coordinate location with Engineer for maximum effectiveness. Coordinate location with Engineer. If the device is mounted on a PVC pipe use Schedule 40 pipe. Paint all exposed parts of the sensors and pipe with 2 coats of flat black waterproof paint.

2.14 CONTROL WIRES: 24 volt direct burial, AWG #14, minimum single copper conductor wire with THWN insulation, NEC approved and UL listed. Provide different colors for each 24-volt control wire, and 115-volt service wire. Use white or gray for common wire.

2.15 SPLICING MATERIALS: Direct Bury (DBY) or (DBR) splice kits by 3M Corporation.

2.16 ELECTRICAL CONDUIT: Use Schedule 40 PVC pipe for electrical conduit. Paint all visible vertical portions of the pipe outside a building with 2 coats of flat black waterproof paint.

2.17 PIPE:

A. PVC virgin parent material that is homogenous throughout and free from visible cracks, holes, foreign

materials, blisters, deleterious wrinkles, and dents. Pipe shall be National Sanitation Foundation (NSF) approved.

B. Piping on pressure side of irrigation control valves.
   1. PVC 1120 with a minimum class rating of 200 PSI, sized to maintain a flow velocity of less than 5 ft. per second (FPS).
   2. Type I, Grade I, unthreaded, pressure rated pipe conforming to ASTM D 1784 60T, ASTM D 2241 and ASTM D 3139 with an outside diameter the same size as iron pipe.
   3. Pipe continuously marked at 5 foot intervals to show manufacturer's name or trade mark, nominal pipe size, schedule, PVC type and grade (i.e. PVC 1120), SDR rating class, working pressure at 73° F. and NSF approval.
   4. Handle Type I pipe with caution to prevent cracking or splitting.
   5. Where plastic is connected to metal, use a male adapter.

C. Piping on non-pressure side of irrigation control valve: PVC 1120 with a minimum class rating of 160 PSI, NFS approved, sized to maintain a flow velocity of less than 5 FPS.

2.18 SLEEVES:

A. PVC 2110 high impact pipe, minimum Schedule 40.

B. Water Line Sleeves: Provide sleeve diameter that is two pipe sizes larger that the pipe encased with 2-in. being the smallest diameter sleeve allowed.

C. Control Wire Sleeves: Provide sleeve diameter that is twice the diameter of the control wire bundle encased.

2.19 PVC FITTINGS:

A. Fittings for Solvent-weld PVC Pipe: PVC, Type I, Schedule 40 or 80, meeting the requirements of ASTM D2466 73 and D 2467 73, NSF approved.

B. Threaded PVC Nipples: Schedule 80.

C. Class 200 PVC Fittings (fittings for iron pipe sized PVC pipe): One piece injection molded PVC, Class 200, meeting ASTM D1784, and DR 21. Fittings shall be designed to withstand a minimum of 630 PSI quick burst pressure at 73° F., tested in accordance with ASTM D 1599. Bell shall be gasketed joint conforming to ASTM D 3139; gaskets conforming to ASTM F477. Push Joint or Mechanical Joint Ductile Iron fittings meeting AWWA C153 may be used when PVC sizes are not available.

2.20 SOLVENT for PVC Pipe: Provide #710, clear, NSF approved, manufactured by Weld-On or approved equal for PR 160 or CL 200 through 2 inch. Submit special glue grades for all other applications for approval before installation.

2.21 SPRINKLERS:

A. The type of Irrigation sprinklers and nozzles are specified on the drawings. Provide commercial grade sprinklers with matched precipitation rate nozzles and check valves. All nozzles shall be marked with the manufacturer's name and a letter or symbol designating the spray pattern.

B. Provide all pop-up sprinklers, unless shrub risers are shown. Sprinklers in lawn areas shall be 6 inch pop-up; 12 inch pop-up plus extensions in shrub and groundcover areas. If bubblers are shown, provide bubbler nozzle on a 6-in. pop-up body.

PART 3 - EXECUTION

3.1 UNSUITABLE CONDITIONS:

A. Inspect the site before beginning work to verify drawing dimensions and locations with actual field conditions; and to verify that the work of other contractors is sufficiently complete to permit the proper execution of the irrigation work.

B. Verify the correctness of all finish grades within the work areas to insure that the specified cover for pipes is maintained.

C. Notify Engineer of any discrepancies or unsatisfactory conditions that prevent proper execution of the work. Do not commence work until the unsatisfactory conditions are corrected.

3.2 SYSTEM LAYOUT:

A. The system layout is considered diagrammatic. Adjust the location of sprinkler heads to provide uniform coverage of all landscaped areas. However, do not install sprinklers at greater spacing than shown without the Engineer's approval. Also, adjust sprinklers and pipe alignment to avoid plants, structures and other obstructions. Install control wires, main lines, and laterals in common trenches wherever possible.

B. Where piping or sprinklers are shown near or adjacent to existing trees, adjust piping and sprinkler layout to minimize damage to existing roots. Hand excavate trenches where necessary to prevent tree root damage.

C. Where piping is shown under pavement but running parallel and adjacent to planted areas, the intent is to install pipe in the planted areas.

D. Install pipe diameters shown unless larger pipe diameters have been approved. The substitution of smaller pipe diameters than those shown will not be permitted. Remove all damaged or rejected piping.

E. Adjust location of automatic control valves so that the edge of the valve box is 2 ft. from the edge of vehicular or pedestrian pavement and is outside of plant beds of shrubs or groundcover with a mature height of 3-in. or greater.

3.3 BACKFLOW PREVENTION: Device: Coordinate with Engineer to determine the exact location of each backflow device before installation. Install and insulate in accordance with local code and the manufacturer's printed instructions. Connect the backflow device into the system with Sch. 40 galvanized pipe the same size as the irrigation main. Paint all exposed portions of pipe and backflow with 2 coats of waterproof flat black paint.

3.4 SLEEVING:

A. Place pavement sleeves where pipe or control wires cross vehicular pavement and walks or where control wires leave the main lines. Bury sleeves to the depth required for the particular pipe location and extend a minimum of 18-in. beyond the pavement edge. If the sleeves are within a public right-of-way, install sleeves in accordance with the requirements of the public agency having jurisdiction. Install sleeves before pavement is placed. Backfill and compact with the existing excavated material to the required density of the pavement base and sub-base.

B. In areas of existing pavement, bore under the pavement using the jack-and-bore or directional bore method. If boring occurs under pavement that is within a public right-of-way, bore in accordance with the requirements of the public agency having jurisdiction.

3.5 EXCAVATION AND TRENCHING:

A. Location of Underground Utilities: Prior to excavation, determine the location and depth of underground utilities and other work. Contact utility-locating services at least 72 hours before excavation. The utility location service for most utilities is the Florida Utility Locating Service at 1-800-432-4770.

B. Perform all excavation and shoring of earth banks that is necessary for installation of the irrigation system. Take proper precautions, including hand excavation, to protect existing pavements, structures, landscaping, and underground utilities from damage. If damaged, immediately notify Engineer. Repair or replace all damage to original condition as directed and at no cost to the Owner. If underground utilities are found during excavation that are not shown on the drawings nor marked by the utility locating services, immediately notify Engineer for instructions before proceeding.

C. Excavate vertical trenches wide enough to allow sufficient working space around the work installed and at least 2-in. of existing soil around any pipe. In trenches with two or more pipes, excavate the trench wide enough to install pipes in parallel alignment with at least 4-in. between each pipe. Never stack pipe directly above other pipe.

D. Excavate the trench to the minimum depths below finish grade as follows:
   1. 12-in. cover over lateral lines.
   2. 18-in. cover over irrigation mains and control wires.
   3. 24-in. cover over irrigation pipe sleeves underneath non-vehicular pavement.
   4. 36-in. cover over irrigation pipe sleeves underneath vehicular pavement.

E. In landscape areas, dispose of any excavated soil that is contaminated with lime rock, rocks, 1-in. diameter or greater, or other materials that may be harmful to plant growth. If additional backfill is needed, use topsoil or yellow yard sand. Do not mix construction debris or excavated contaminated soil

into the soil of the landscaped areas.

3.6 PIPE ASSEMBLY:

A. General:
   1. Install pipes and fittings in accordance with manufacturer's latest printed instructions. Clean all pipes and fittings of dirt, scale and moisture before assembly.
   2. Carefully place pipe, fittings, and valves in trenches, keeping the pipe interior free of dirt and debris. When pipe laying is stopped, close open end of pipe by approved means.
   3. Make all connections to the side of the main line pipe. Connections to the top of the main line are not allowed.

B. Solvent-weld Joints for PVC Pipes:
   1. Solvent weld plastic pipe and fittings except where screwed connections are required. Use solvents and methods recommended by the pipe and solvent manufacturers.
   2. Cure joints a minimum of one hour before applying any external stress on the pipe and at least 24 hours before placing the joint under water pressure, unless the manufacturer specifies otherwise.

C. Threaded Joints for PVC Pipes:
   1. Use Teflon tape on all threaded PVC fittings.
   2. Use a strap-type friction wrench; never a metal-jawed wrench.
   3. Use male adapters when connecting plastic to metal. Hand tighten male adapter; then make one turn with a strap wrench.

D. Pipe Laying:
   1. Lay irrigation pipe on a 2-in. bed of fine soil free of rocks and debris to provide uniform bearing. Under pavement, lay PVC sleeves on a 6-in. bed of fine soil. Lay pipe only when the trench is free of water. Snake irrigation pipe from side to side in the trench bottom to allow for expansion/ contraction.
   2. Cut PVC pipe with PVC pipe cutters or hacksaw. Cut a square butt. Remove burrs at cut ends to create a smooth surface.
   3. All plastic to plastic joints shall be either solvent welded or slip sealed.

E. Thrust Blocks for Irrigation Main (If Required)
   1. Provide thrust blocks when the main line pipe is 3-in. or greater.
   2. Provide concrete thrust blocks on the thrust side of the main line pipe wherever the pipe changes direction by 30° or more, dead ends, or at any other spot where thrust is expected. Form thrust blocks against solid, undisturbed, hand-excavated earth trench walls with 2000 PSI concrete. Size thrust blocks in accordance with ASAE Standard S-376.2. Fill thrust blocks to the height of the outside pipe diameter. See Irrigation Sheet(s) for thrust block details.

3.7 AUTOMATIC CONTROL VALVES:

A. Install each control valve at depth shown in valve box as detailed, grouping valves together where practical. Adjust the location of each control valve so that the edge of each valve box is located 24-in. away from vehicular or pedestrian pavement. Match valves to pipe size. Install a gate valve on the

upstream side of each control valve so that the control valve and gate are within the same valve box.

B. Excavate valve box pit to depth and width shown including the gravel layer. Excavate pit so that valve box is centered over valves. Install 4-in. gravel layer and filter fabric as shown.

C. Place valve box into pit. Using valve box extensions as necessary, set top of valve box level with top of root zone in lawn areas and 3-in. above mulch in plant beds.

D. Backfill and compact existing clean soil around valve box.

3.8 QUICK COUPLING VALVES (If shown): Install quick coupling valve in valve box approximately where shown, adjusting valve location so that the edge of the valve box is 18-in. away from pavement or a walk. Install valves with a 3-elbow PVC Schedule 80 swing joint assembly as detailed.

3.9 CLOSING AND FLUSHING OF SYSTEM:

A. Thoroughly flush out all water main and valves under a full head of water before installing heads, and other system components. Maintain flushing through the control valve located furthest from the water source for a minimum of 3 minutes.

B. After flushing, cap all openings until the remainder of the system is connected.

3.10 SPRINKLERS HEADS:

A. Provide matched precipitation rate nozzles on all heads. Do not mix sprinkler head types on the same zone. Provide 6-in. pop-up spray heads and minimum 4-in. pop-up rotor heads in all lawn areas. Provide 12-in. pop-up spray and 12-in. rotor heads in planting beds.

B. Flush out system with a full head of water before installing irrigation heads. Install as detailed. Set top of pop-up heads flush with top of sod root zone; in plant beds set head level with soil. Place pop-up sprinkler heads at least one foot from the edge of pavement, curbs, and any other structures. Set sprinkler heads and quick coupling valves perpendicular to the finished grade, unless otherwise shown.

C. Adjust sprinkler nozzle radii and direction of spray patterns to provide proper coverage of landscape areas after plant placement and to prevent over-spraying on pavement and major structures.

D. If shrub risers are shown, install as detailed. If risers are not detailed, strap riser to a 1/2-in. x 24-in. steel rebar with a minimum of 2 stainless steel straps. Provide Sch. 40 PVC risers. Paint riser strap and rebar with 2 coats of flat black waterproof paint.

E. Set tree bubblers adjacent to the tree root ball.

3.11 AUTOMATIC CONTROLLER (If Shown): Install where shown and according to manufacturer's written instructions. Match station numbers to zone numbers shown on drawings. Encase all above ground wiring in conduit in accordance with the local electric code. Attach conduit to vertical surface with metal clamps every two ft..

3.12 PROGRAMMABLE CONTROL MODULE (IF SHOWN): Install one programmable Control Module for 1 and up to 4 control valves at locations shown and accordance with the manufacturer's written instructions.

3.13 CONTROL WIRES:

A. Lay all control wires adjacent to and on the same side of the main line pipe. Bundle control wires together with waterproof tape every 20 ft., leaving slack for expansion. Provide a 10-in. expansion coil of wire at each valve. Waterproof splices with Rainbird 'Snap Tite,' 'Scotchlok,' or 'King' wire connectors.

B. Splice wires only if runs exceed 500 ft. Install each wire splice in valve box. Set valve box in turf areas only and install level with top of sod root mass.

C. When wires run under pavement or when wires leave the main line, run wires in PVC Sleeve.

3.14 LABELS:

A. Number each zone box on underside and topside of valve box cover with a waterproof marker. Also attach a 'Christy' tag, or approved equal, to each valve. Numbers shall match the zone numbers shown on the as-built drawing.

B. Place a tag around each zone valve control wire at the controller connection and print the zone number on the tag with a waterproof marker. Zone numbers shall match zones shown on the as-built drawing.

3.15 HYDROSTATIC TESTING:

A. Conduct hydrostatic testing after water meter, backflow preventer, mains, isolation valves and control valves are installed, but before pipes are covered; and then again during the initial inspection of the irrigation system.

B. Open all isolation valves, fill all lines with water, and then shut off the meter. If the water pressure in the main is less than 70 PSI, pressurize water main with air to 70 PSI. Monitor pressure loss for two hours with a pressure gauge. The maximum pressure loss allowed at the end of the two-hour period is 5 PSI.

C. Repair leaks and repeat test until system passes pressure test.

3.16 LATERAL TESTING AND SYSTEM ADJUSTMENT:

A. After the laterals, pop-ups heads, and risers are installed and the system is fully-operational, fill each zone with water and inspect for leaks before covering lines and fittings.

B. Repair leaks. Repeat inspection and repair until there are no more leaks and then cover.

C. After the system is complete, adjust the system components for efficient and proper operation. Adjust sprinkler head locations to achieve acceptable coverage after placement of grass and plants. Add vertical riser extensions as necessary to clear spray pattern over the top of new and existing vegetation. Adjust spray pattern to keep spray off structures and pavement. Adjust control valve pressure regulator for

optimum pressure for each zone. Adjust controller to provide proper cycling and watering time for all plants.

3.17 BACKFILL AND COMPACTION OF TRENCHES:

A. Backfill trenches under pavement, first, with a 3-in. layer of sandy A-3 soil above the sleeve. Then, backfill the remainder of the trench with the sub-base and base material of the type and depth specified for the pavement. A-3 soil shall be free of lime rock, rocks over 1-in. diameter, construction debris, wood and foreign material that may be harmful to plant growth.

B. Backfill all excavations and trenches with clean, rock-free A-3 sandy soil.

C. Compact soil to a 95% density under pavement and 85% density under planted areas. Continue with backfill and compaction until level with finish grade.

D. When backfilling is complete, remove from the site any surplus backfill material.

3.18 MAINTENANCE: Maintain the irrigation system until Initial Acceptance, during the specified landscape maintenance period, and until Final Acceptance. Maintenance shall include work, materials, and replacements necessary to insure a complete, properly operating system.

3.19 CLEAN UP Upon completion and prior to inspection of the work, clear the site of debris, superfluous materials and equipment.

3.20 INITIAL INSPECTION AND ACCEPTANCE:

A. The Engineer shall inspect the irrigation system to determine if the system meets the requirements of the contract documents within 7 days after the Contractor's written notification has been received, stating that the installation is complete and ready for both an inspection of the irrigation system and a pressure test.

B. Replace rejected work within 14 days after receipt of the Engineer's notification of deficiencies. Continue specified maintenance until re-inspected and found to be acceptable.

C. After Initial Acceptance, the Contractor will not be responsible for damage to the irrigation system resulting from: neglect by Owner; damage by others; abnormal weather conditions such as floods, excessive wind damage, severe freezing or abnormal rains; or other activities beyond the Contractor's control.

3.21 MAINTENANCE:

A. See Section 02935 - LANDSCAPE MAINTENANCE for specific maintenance requirements.

B. Begin maintenance of irrigation work immediately after each area is completed and continue through the Initial Acceptance, the maintenance period specified, and until Final Acceptance. Maintain irrigation system for a minimum period of 12 months after Initial Acceptance.

3.22 WARRANTY:

A. See Nassau County Standard requirements. The contractor shall guarantee the materials and workmanship of the irrigation system for one year after the date of the Initial Acceptance of the work.

B. If operational problems develop in the irrigation system during the one-year warranty period that, in Nassau County's opinion, are caused by inferior materials and/or workmanship, then the Contractor shall repair or replace the defects in the system at no cost to Nassau County.

C. If backfill settlement occurs during the warranty period, that, in the Nassau County's opinion, requires the adjustment or repair of pipes, valves, sprinkler heads, plant beds, lawns, pavement or other improvements to restore the original condition; then the contractor shall make the adjustments and repairs at no cost to Nassau County.

D. The Contractor shall submit the one-year warranty within 7 days of receipt of the notice of Initial Acceptance.

3.23 FINAL INSPECTION AND ACCEPTANCE:

A. The irrigation system will inspected at the end of the maintenance period. It will be acceptable if the system is fully operational and complies fully with the contract documents at the end of the maintenance period. The general irrigation warranty shall continue for a total of 1 year from the date of Initial Acceptance. The irrigation system is subject to a warranty inspection at the end of the 12 month warranty period.

B. Replace rejected work with 14 days of notification. Continue maintenance until work is re-inspected and found acceptable.

END OF SECTION 02810

SECTION 02820

CONCRETE PAVING

PART I – GENERAL

1.1 DESCRIPTION

A. The General Requirements, Section 00 01 00, are hereby made a part of this section as if fully repeated herein.

B. Work Included:
1. Concrete paving.
2. Reinforcing for paving.
3. Special joints.
4. Dowels for joints.
5. Fine grading.
6. Stripping.

C. Related Work Specified Elsewhere:
1. Earthwork and site preparation: Section 02210 - Site Clearing & Earthwork
2. Storm drainage structures: Section 02700 - Storm Drainage
3. Compaction of subgrade: Section 02210 - Site Clearing & Earthwork
4. Curbs: Section 02830 - Pads, Sidewalks, Curbs & Bumpers
5. Concrete: Section 033000 - Cast-In-Place Concrete

1.2 QUALITY ASSURANCE

A. All concrete work included in this section shall conform to the requirements of the latest edition of ACI 330.1, “Standard Specification for Plain Concrete Parking Lots”.

B. Submittals: Submit concrete job-mix design with material certifications to the Engineer for approval prior to the commencement of any paving operations.

C. Testing: Testing as specified herein, will be performed by an approved testing laboratory, selected and compensated by the contractor.

PART II – PRODUCTS

2.1 MATERIALS

A. Forms: Forms shall be made of steel, wood or other materials capable of supporting mechanical concrete

placing equipment without settling vertically, bowing inward or outward, or crushing. Forms shall be clean and free of dirt, rust, and hardened concrete.

B. Reinforcement and Wire Mesh: Shall conform to the requirements set forth in Section 033000 of these specifications.

C. Concrete: Concrete shall conform to the requirements set forth in Section 033000 of these specifications with the exception that the slump shall not exceed 4-in. for pavements placed by other than slip form equipment or 1 1/2-in. for concrete placed with slip form equipment. Concrete shall have a 28- day compressive strength of 4,000 PSI.

D. Aggregates: Aggregates shall conform to ASTM C-33. Maximum aggregate size shall not exceed one-third of the pavement thickness. Aggregates shall be tested for soundness in accordance with ASTM C-88 and for potential reactivity in accordance with ASTM C-289.

E. Isolation Joint Material: Shall be non-extruding, pre-molded joint filler board, 1/2-in. thick and shall comply with ASTM D1751 or ASTM D1752. Joint filler shall be full depth.

F. Membrane Forming Curing Compounds: Shall comply with ASTM C309.

G. Joint sealant shall be Dow Corning SL Parking Structure Sealant or approved equal.

PART III – EXECUTION

3.1 PREPARATIONE:

A. Establishment of Grades: Establish grades and make allowance for existing improvements, proper drainage, adjoining property rights, good appearance, and other pertinent considerations. Construct subgrade to insure that the required pavement thickness is obtained in all locations. Regrade and recompact any subgrade disturbed by concrete delivery vehicles or other construction equipment. Do not use sand or loose material to obtain final subgrade elevation.

B. Preparation of Subgrade: Fine grade the area to be paved to within ±0.10-ft. of the subgrade elevations, and remove all excess material from the site. Construct the subgrade true to grade, hard, uniform, and smooth, using such methods and equipment as required. Final compaction shall meet the requirements previously specified for paving subgrade in Section 02210 of these specifications. Properly moisturize dry subgrades with water prior to placing the concrete.

3.2 INSTALLATION

A. Setting Forms: Coat surfaces of forms with bond-breaking compound prior to placement of concrete. Provide commercial formulation form-coating compounds that will not bond with, stain or adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces requiring bond or adhesion. The edge of previously placed concrete may be used as a form. Do not apply form release

agent to previously placed concrete.

B. Placing Joint Reinforcement: Place reinforcement at locations shown on the drawings. Support joint reinforcement so that it will not be dislocated by concrete placing operations.

C. Placing and Finishing: Place the concrete on moist subgrade for the full depth called for on the plans. Do not place concrete on frozen subgrade. Bring to the required crown and cross section by means of screeds or templates and thoroughly vibrate. Do not move concrete horizontally with vibrator. Finish concrete by floating and troweling until the surface is dense and smooth, true to crown and grade, free from humps or depressions.

D. Provide the final finish by lightly brooming the surface immediately before the concrete takes its final set. Broom all areas of panel in the same direction.

E. Jointing: Joints shall be constructed at the locations, depths, and dimensions shown on the drawings. The maximum joint spacing in feet shall be no more than three times the pavement thickness in inches. The larger dimension of any panel shall not exceed 125% of the smaller dimension, and the minimum angle between any two intersecting joints shall be 80°, unless otherwise indicated on the drawings. Joints shall intersect pavement free edges at a 90° angle and shall extend straight for a minimum of 1 1/2-ft from the pavement edge. Joints of adjacent panels shall be aligned. Joints in attached curbs shall be aligned with joints in pavement. The minimum contraction joint depth shall be one-fourth of the pavement thickness. Isolation joints shall be provided only where pavement abuts buildings, foundations, manholes, and other fixed objects.

F. Contraction joints shall be constructed by one of the following methods:
   1. Construct contraction joints in fresh concrete after concrete has set sufficiently to maintain the formed joint to the specified depth and width.
   2. Saw-cut concrete after concrete has hardened sufficiently to prevent aggregate being dislodged and soon enough to control pavement cracking. If contraction joint sawing causes a crack, discontinue sawing that contraction joint and continue sawing other contraction joints.
   3. Extend isolation joints through the full depth of the pavement. Fill the entire isolation joint with isolation joint material unless otherwise required by project drawings.

G. Curing and Protection: As soon as finishing has been completed, cover the concrete with a curing compound as specified above. Do not allow traffic on the surface for a period of 72 hours.

H. Hot and Cold Weather Construction: In hot weather, protect finished concrete with windbreaks, shading, fog spraying, ponding, or wet covering of finished concrete. In cold weather, protect finished concrete in accordance with ACI 306.1.

END OF SECTION 02820

SECTION 02830

PADS, SIDEWALKS, CURBS, RAMPS, AND BUMPERS

PART I – GENERAL

1.01 DESCRIPTION

A. The General Requirements, section 00100, are hereby made a part of this section as if fully repeated herein.

B. The Nassau County Standard Specifications are hereby made a part of this section and are fully repeated herein. If there are any discrepancies, the more stringent specification shall take precedence.

C. Work Included:
1. Fine Grading
2. Reinforcing
3. Special Joint
4. Exterior Equipment Pads
5. Sidewalks
6. Concrete Curbs
7. Ramps
8. Concrete Bumpers

D. Related Work Specified Elsewhere
1. Earthwork and site preparation: Section 02210 Site Clearing & Earthwork
2. Storm Drainage Structures: Section 02700 - Storm Drainage
3. Asphalt Paving: Section 02800 - Asphalt Paving
4. Concrete: Section 033000 - Cast-In-Place Concrete

PART II – PRODUCTS

2.2 MATERIALS

A. Reinforcement and wire mesh: shall conform to the requirements set forth in Section 033000 of these specifications.

B. Concrete: Shall conform to the requirements set forth in Section 033000 of these specifications. Concrete shall have a 28-day compressive strength of 3,000 PSI, unless otherwise noted on the drawings.

C. Expansion joint material: Shall be non-extruding, pre-molded joint filler board, 1/2-in. thick. Expansion joint filler shall be full depth of joint.

D. Equipment Pads: Shall be cast-in-place concrete of the size, configuration, and location shown on the drawings.

E. Sidewalks, concrete curbs, and ramps: Shall be cast-in-place concrete of the size, configuration, and location shown on the drawings.

F. Concrete bumpers: Shall be precast concrete in the size and configuration shown on the drawings. Minimum 28-day compressive strength of concrete shall be 3,000 PSI. Furnish two 1/2-in. round steel dowels 18-in. long with each bumper.

PART III – EXECUTION

3.1 PREPARATION

A. Establishment of grades: Establish grades and make allowance for existing improvements, proper drainage, adjoining property rights, good appearance, and other pertinent considerations.

B. Fine grade the area to be improved to within ±0.10' of the designed sub-grade elevations, and remove all excess material from the site. Construct the sub-grade true to grade, hard, uniform, and smooth, using methods and equipment as required. Final compaction shall meet the requirements previously specified for paving sub-grade in section 02210 of these specifications. Properly moisturize dry sub-grades with water prior to placing the concrete.

3.2 INSTALLATION

A. Concrete
   1. Placing
      a) Place the concrete on moist sub-grade for the full depth called for on the plans.
      b) Use mechanical vibrating equipment for consolidation to eliminate air bubbles or stone pockets.
   2. Finishing
      a) Bring to required cross section by means of screeds, forms, or templates as appropriate.
      b) Finish concrete by floating and troweling until surface is dense and smooth, true to cross-section and grade, free from humps or depressions.
      c) Provide the final finish by lightly brooming the surface immediately before the concrete takes its final set as directed.
      d) Surface of all handicap accessible routes including walks, ramps and curb ramps shall be finished stable, firm, and slip resistant.
      e) Transitions from ramps and curb ramps, landings, walks, gutters, or streets shall be flush and free of abrupt grade changes.
   3. Joints: Cut the cast-in-place concrete into sections by expansion, construction or control joints. Construct the joints as shown on the drawings unless otherwise specified. Provide expansion joints in sidewalks no more than 50' apart and locate control or construction joints at 5' intervals between the expansion joints unless otherwise indicated. Provide expansion joints in curbs no more than 50'

apart and locate control or construction joints at 10' intervals unless otherwise indicated.

4. Curing and Protection: As soon as finishing has been completed, cover the concrete with a curing compound similar to that specified in Section 033000. Apply the curing compound uniformly at the rate recommended by the manufacturer. Do not allow traffic on the surface for a period of 72 hours.

B. Curb Ramps: Construct as specified on the drawings.

C. Ramps: Construct as specified on the drawings.

D. Parking Bumpers: Locate bumpers as shown on the drawings. Attach to paving with two (2) pins.

END OF SECTION 02830

SECTION 02831

CHAIN LINK FENCES AND GATES

PART I – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Nassau County requirements, apply to this Section.

B. The Nassau County Standard Specifications are hereby made a part of this section and are fully repeated herein. If there are any discrepancies, the more stringent specification shall take precedence.

1.2 SUMMARY

A. This Section includes the following:
   1. Chain-Link Fences: Industrial.
   2. Gates: Swing and Motor operated, horizontal slide.

B. Related Sections include the following:
   1. Earth Moving: Section 02210 – Site Clearing & Earthwork

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide chain-link fences and gates capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Minimum Post Size and Maximum Spacing for Wind Velocity Pressure: Determine based on mesh size and pattern specified, and on the following minimum design wind pressures and according to CLFMI WLG 2445:
      a) Wind Speed: 119 mph.
      b) Fence Height: 8 ft.
      c) Line Post Group: IA, ASTM F 1043, Schedule 40 steel pipe.
      d) Wind Exposure Category: C.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates.
   1. Fence and gate posts, rails, and fittings.
   2. Chain-link fabric, reinforcements, and attachments.
   3. Gates and hardware.
   4. Gate operators, including operating instructions.

5. Accessories: Barbed wire.
6. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.

B. Shop Drawings: Show locations of fences, gates, posts, rails, tension wires, details of extended posts, extension arms, gate swing, or other operation, hardware, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, gate elevations, sections, details of post anchorage, attachment, bracing, and other required installation and operational clearances.
   1. Gate Operator: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
   2. Wiring Diagrams: Power and control wiring and features.
   3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Product Certificates: For each type of chain-link fence, operator, and gate, signed by product manufacturer.
   1. Strength test results for framing according results for framing according to ASTM F1043.1043.

D. Qualification Data: For Installer.

E. Maintenance Data: For the following to include in maintenance manuals:
   1. Gate operator.
   2. Gate.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed chain-link fences and gates similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
   1. Engineering Responsibility: Preparation of data for chain-link fences and gates, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
   2. 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.
   3. UL Standard: Provide gate operators that comply with UL 325.
   4. Emergency Access Requirements: Comply with requirements of authorities having jurisdiction for automatic gate operators serving as a required means of access.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

PART II – 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:
   1. Gate Operator:
   2. DKS Doorking.

2.2 CHAIN-LINK FENCE FABRIC

A. General: Height indicated on Drawings. Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist. Comply with ASTM A 392, CLFMI CLF 2445, and requirements indicated below:
   1. Steel Wire Fabric: Metallic coated wire with a diameter of 0.148 in.
      a) Mesh Size: 2-in.
      b) Weight of Metallic (Zinc) Coating: ASTM A 392, Type II, Class 1, 1.2 oz./SF with zinc coating applied after weaving.
   2. Selvage: Knuckled at both selvages.

2.3 INDUSTRIAL FENCE FRAMING

A. Posts and Rails: Comply with ASTM F 1043 for framing, and the following:
   1. Group: IA, round steel pipe, Schedule 40.
   2. Fence Height: as indicated on drawings.
   3. Strength Requirement: Light industrial according to ASTM F 1043.
   4. Post Size and Thickness:
      a) Top Rail: 1.625-in.
      b) Line Post: 2.5-in.
      c) End, Corner and Pull Post: 3.0-in.
      d) Swing Gate Post: According to ASTM F 900.
      e) Horizontal-Slide Gate Post:
      f) Openings Wider Than 12 Ft.: Steel post, 4-inch diameter, and 9.11-lb/ft. weight.
   5. Coating for Steel Framing:
      a) Metallic Coating:
      1 Type A, consisting of not less than minimum 2.0-oz./SF average zinc coating per ASTM A 123/A 123M.

2.4 TENSION WIRE

A. General: Provide horizontal tension wire at the following locations:
   1. Location: Extended along bottom of fence fabric.

B. Metallic-Coated Steel Wire: 0.177-in. diameter, marcelled tension wire complying with ASTM A 817, ASTM A 824, and the following:

1. Metallic Coating: Type II, zinc coated (galvanized) by hot-dipped or electrolytic process, with the following minimum coating weight:
    a) Matching chain-link fabric coating weight.

2.5 INDUSTRIAL SWING GATES

A. General: Comply with ASTM F 900 for single swing gate types.
    1. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F 1043 and ASTM F 1083 for materials and protective coatings.

B. Frames and Bracing: Fabricate members from round, galvanized steel tubing with outside dimension and weight according to ASTM F 900 and the following:
    1. Gate Fabric Height: As indicated.
    2. Leaf Width: As indicated.
    3. Frame Members:
        a) Tubular Steel: 1.66-in. round.

C. Frame Corner Construction:
    1. Welded or assembled with corner fittings and 5/16-inch diameter, adjustable truss rods for panels 5 ft. wide or wider.

D. Hardware: Fork type or plunger-rod type latches permitting operation from both sides of gate, hinges, and keepers for each gate leaf more than 5 ft. wide. Fabricate latches with integral eye openings for pad locking. Pad lock accessible from both sides of gate.
    1. Hinge: Size and material to suit gate size, non-lifting type, offset to permit 180° opening. Provide 1-1/2 pair of hinges for each leaf over 6-foot nominal height.

2.6 INDUSTRIAL HORIZONTAL-SLIDE GATES

A. General: Comply with ASTM F 1184 for single slide gate types.
    1. Classification: Type II Cantilever Slide, Class 1 with external roller assemblies.
    2. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F 1184 for materials and protective coatings.

B. Frames and Bracing: Fabricate members from round, galvanized steel tubing with outside dimension and weight according to ASTM F 1184 and the following:
        a) Gate Fabric Height: As indicated.
    1. Gate Opening: 26 ft.
    2. Frame Members:
        a) Tubular Steel: 2.5-in.
    3. Bracing Members:
        a) Tubular Steel: 2.0-in. round.

C. Frame Corner Construction:
    1. Welded frame with panels assembled with bolted or riveted corner fittings.

D. Extended Gate Posts and Frame Members: Extend gate posts and frame end members above top of chain-link fabric at both ends of gate frame as required to attach barbed wire assemblies.
   1. Roller Guards: As required per ASTM F 1184 for Type II, Class 1 gates.
   2. Hardware: Latches permitting operation from both sides of gate, locking devices, hangers, roller assemblies and stops fabricated from galvanized steel. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.

2.7 FITTINGS

A. Post and Line Caps: Provide for each post.
   1. Line post caps with loop to receive tension wire or top rail.

B. Rail and Brace Ends: Attach rails securely to each gate, corner, pull, and end post.

C. Rail Fittings: Provide the following:
   1. Top Rail Sleeves: Pressed-steel or round-steel tubing Aluminum Alloy 6063 not less than 6-in. long.
   2. Rail Clamps: Line and corner boulevard clamps for connecting intermediate and bottom rails in the fence line-to-line posts.

D. Tension and Brace Bands: Pressed steel.
   1. Tension Bars: Steel, length not less than 2-in. shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.

E. Barbed Wire Arms: Pressed steel or cast iron, with clips, slots, or other means for attaching strands of barbed wire, integral with post cap; for each post, unless otherwise indicated, and as follows:
   1. Line posts with arms that accommodate top rail or tension wire.
   2. Corner arms at fence corner posts, unless extended posts are indicated.

F. Type I, single slanted arm.Tie Wires, Clips, and Fasteners: According to ASTM F 626.
   1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, complying with the following:
      a) Hot-Dip Galvanized Steel: 0.106-inch diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.

G. Finish:
   1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz. /SF zinc.

2.8 BARBED WIRE

A. Zinc-Coated Steel Barbed Wire: Comply with ASTM A 121, Standard grade for the following two- strand barbed wire:
   1. Standard Size and Construction: 0.099-inch diameter line wire with 0.080-inch diameter, 2- point round barbs spaced not more than 5-in. o.c.

2.9 GATE OPERATORS

A. General: Provide factory-assembled automatic operating system designed for gate size, type, weight, and operation frequency. Provide operation control system with characteristics suitable for Project conditions, with remote-control stations, safety devices, and weatherproof enclosures; coordinate electrical requirements with building electrical system.
   1. Provide operator designed so motor may be removed without disturbing limit-switch adjustment and without affecting auxiliary emergency operator.
   2. Provide operator with UL approved components.

B. Motor Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, within installed environment, with indicated operating sequence, and without exceeding nameplate rating or considering service factor. Comply with NEMA MG-1 and the following:
   1. Voltage: 230 VAC, 60 Hz.
   2. Horsepower: 1.0.
   3. Enclosure: Totally enclosed.
   4. Duty: Continuous duty.

C. Gate Operators: Concrete base/pad mounted and as follows:
   1. Mechanical Slide Gate Operators:
      a) Duty: Medium duty, residential/commercial/industrial.
      b) Gate Speed: Minimum 45 ft. per minute.
      c) Maximum Gate Weight: 1,500 lb.
      d) Frequency of Use: 60 cycles per hour.
   2. Remote Controls: Digital Keypad Entry Unit: Multiple, programmable, code capability, consisting of 4-digit codes.
      a) Face-lighted unit with metal-keyed or keyless-membrane keypad fully visible at night.
      b) Located remotely from gate for entering traffic only.
   3. Radio Control: Digital system consisting of code-compatible universal receiver, located where indicated, designed to operate gates. Provide 4 programmable transmitter(s) with multiple-code capability configured for the following functions:
      a) Transmitters: Single-button operated, with open function.
   4. Vehicle Loop Detector: System including automatic closing timer with adjustable time delay before closing and loop detector designed to hold gate open until traffic clears. Provide electronic detector with adjustable detection patterns, adjustable sensitivity and frequency settings, and panel indicator light designed to detect presence or transit of a vehicle over an embedded loop of wire and to emit a signal activating the gate operator. Provide number of loops consisting of multiple strands of wire, number of turns, loop size, and method of placement at location shown on Drawings, as recommended in writing by detection system manufacturer for function indicated.
      a) Loop: Factory preformed in size indicated; style for saw-cut with epoxy-grouted installation.
      b) Installed for detection of exiting traffic only.

2.10 CAST-IN-PLACE CONCRETE

A. Materials: Portland cement complying with ASTM C 150, Type I aggregates complying with ASTM

C 33, and potable water for ready-mixed concrete complying with ASTM C 94/C 94M.

1. Concrete Mixes: Normal-weight concrete with not less than 3000-PSI compressive strength (28 days), 3-inch slump, and 1-inch maximum size aggregate.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for a verified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance.
   1. Do not begin installation before final grading is completed, unless otherwise permitted by Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 ft. or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 INSTALLATION, GENERAL

A. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.
   1. Install fencing on established boundary lines inside property line.

3.4 CHAIN-LINK FENCE INSTALLATION

A. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.

B. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
   1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
   2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
   3. Exposed Concrete: Extend 2-in. above grade; shape and smooth to shed water.

C. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 30° or more.

D. Line Posts: Space line posts uniformly at 8 ft. to 10 ft. o.c. or as required for wind loading.

E. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end and gate posts and at both sides of corner and pull posts.
   1. Locate horizontal braces at mid height of fabric 6 ft. or higher, on fences with top rail and at 2/3 fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

F. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24-in. o.c. Install tension wire in locations indicated before stretching fabric.
   1. Bottom Tension Wire: Install tension wire within 6-in. of bottom of fabric and tie to each post with not less than same diameter and type of wire.

G. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.

H. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 2-in. between finish grade or surface and bottom selvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

I. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15-in. o.c.

J. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at 1 end to chain-link fabric, wrap wire around post a minimum of 180°, and attach other end to chain-link fabric per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.
   1. Maximum Spacing: Tie fabric to line posts at 12-in. o.c. and to braces at 24-in. o.c.

K. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

L. Barbed Wire: Install barbed wire uniformly spaced, angled toward security side of fence. Pull wire taut and install securely to extension arms and secure to end post or terminal arms.

3.5 GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.6 GATE OPERATOR INSTALLATION

A. General: Install gate operators according to manufacturer's written instructions, aligned and true to fence

line and grade.

B. Excavation for Concrete Bases/Pads: Hand-excavate holes for bases/pads, in firm, undisturbed soil to dimensions and depths and at locations as required by gate-operator component manufacturer's written instructions and as indicated.

C. Concrete Bases/Pads: Cast-in-place or precast concrete, , dimensioned and reinforced according to gate-operator component manufacturer's written instructions and as indicated on Drawings.

D. Vehicle Loop Detector System: Cut grooves in pavement and bury and seal wire loop according to manufacturer's written instructions. Connect to equipment operated by detector.

E. Comply with NFPA 70 and manufacturer's written instructions for grounding of electric-powered motors, controls, and other devices.

3.7 ADJUSTING

A. Gate: Adjust gate to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Automatic Gate Operator: Energize circuits to electrical equipment and devices. Adjust operators, controls, safety devices, and limit switches.
   1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Lubricate hardware, gate operator, and other moving parts.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's personnel to adjust, operate, and maintain gates.

END OF SECTION 02831

SECTION 02900

LANDSCAPING (LANDSCAPE WORK)

PART I – GENERAL

1.1 DESCRIPTION OF WORK

A. Provide all labor, materials, and equipment necessary for planting of trees, palms, shrubs, and ground covers and other supplementary landscape work described in this section.

B. Fine Grading: Provide fine grading necessary to establish finish grade in all landscape areas

1.2 DEFINITIONS

A. "Initial Acceptance": The point when all the plant installation requirements of contract documents, including any punch-list item, have been completed to the satisfaction of the Engineer.

B. "Final Acceptance": The point when the landscape maintenance work required after Initial Acceptance, including all punch list items from the Final Inspection, has been completed to the satisfaction of the Engineer.

C. "Nursery Grown": Plants grown in the nursery from liners or collected and then grown in a nursery not less than 2 years.

D. "Healthy, vigorous condition": Plants shall have live foliage out of the tips of all branches and stems, and a trunk caliper that is bigger at the end of the maintenance period than at the beginning of the maintenance period. Palms shall have new, green fronds developing with no necrosis or chlorosis.

E. "Hardened Off" or "Cured" tree or palm: Nursery field grown trees that have been dug, balled and burlapped, and then allowed to grow in a holding area for at least 4 weeks and until fibrous roots are seen growing through the burlap on the sides of the root ball.

1.3 REFERENCED DOCUMENTS:

A. The latest editions of the following publications, specifications, and standards, when referenced, form a part of this specification.

B. Grades and Standards for Nursery Plants, Florida Department of Agriculture and Consumer Services, Division of Plant Industry, current edition.

C. ANSI Z60.1-2004: American Standard for Nursery Stock.

1.4 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies requirements established for fertilizer and pesticide composition.

B. Application of Pesticides: Strictly comply with the manufacturer's specimen label and safety data sheet for each pesticide used, and the pest control regulation of the State of Florida and the EPA. The pesticide application shall not interfere with other construction activities or with the public.

1.5 QUALITY ASSURANCE

A. Plant Source Quality Control
   1. Ship landscape materials with certificates of inspection required by governmental authorities. All trees and palms shall be FLORIDA FANCY; all other plants shall be FLORIDA NO. 1, or better, as described in the "Florida Grades and Standards for Nursery Plants."
   2. Do not make plant substitutions without approval.

B. Landscape Contractor Qualifications: The Landscape Contractor must have been in business for at least 3 years and must have completed 3 installations of similar scope.

PART II – PRODUCTS

2.1 SUBMITTALS

A. Soil test report of soil mix with recommendations for fertilizer and pH adjustment of soil. One soil test shall be performed in sod area and one test performed in landscape bed area adjustment of soil.

B. Photographs of each tree type as specified, taken at the nursery or holding area.

C. Inspection Certificates, Manufacturer's Data: Submit copies of certificates of inspection required by governmental authorities. Submit manufacturer's or vendor's label, certified analysis, and application or installation instructions for the materials noted below. Submit other data requested to substantiate that materials comply with specified requirements. Submit vendors invoice for the materials below, if requested. The invoice shall reference this project name and show the plant quantities used for this project.
   1. Fertilizers.
   2. Ph Adjusters.
   3. Pesticides and Herbicides used.
   4. Topsoil and Soil Conditioner.

2.2 PLANT INSPECTION BEFORE INSTALLATION

A. At least 4 weeks before trees and palms are shipped from the grower, submit a photograph taken at the nursery that shows a typical example of each specified type of tree and palm and obtain initial approval. Include in the photograph an adult person holding a pole that is longer than the specified height of the tree and marked in 1-foot increments that can be clearly read in a photograph. Place pole on top of root ball.
B. Obtain preliminary approval of the plants either at the Contractor's nursery or at the work site before installing any plants. Remove and replace rejected plants.

2.3 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Packaged materials: Deliver packaged materials in original containers and protect from deterioration.

B. Plants:
1. Water root balls just before shipping.
2. During shipment, provide protective covering over plants. Do not allow plants to be left in closed trucks parked in the sun during hot weather unless air-conditioned. Tie down trees and palms to truck to prevent rolling during shipment. Do not bend or bind-tie plants in such a way that will damage bark, break branches, or destroy natural shape.
3. Do not lift trees by the trunk. Lift container trees with a forklift under the container or by hand holding the lip of the container. Lift B&B trees by the root ball, or if there is a wire basket, by the wire loops. Do not deform the root ball during handling.
4. Deliver plants after preparations for planting have been completed and plant immediately. If planting is delayed more than 6 hours after delivery, set plants in an erect position, shade root ball, and irrigate twice daily to keep roots moist until planting. Protect from weather and mechanical damage.
5. Keep container grown stock in containers until planting time. Pick up plants by ball or container, not by stems or trunks.
6. Do not lift trees by the trunk. Tall palms can be mechanically lifted with a sling around the palm trunk so long as the trunk is not damaged. Lift container plants with a forklift under the container or by holding the lip of the container by hand. Lift B&B trees by the root ball, or if there is a wire basket, by the wire loops. Do not deform the root ball during handling.
7. Label at least one plant of each specified variety with a securely attached waterproof tag bearing the botanical and common name, if requested.

2.4 JOB CONDITIONS:

A. Coordination: Coordinate all landscape work with the Engineer and other Contractors. Plant after final grades are established.

B. Location of Underground Utilities: Determine location of underground utilities before excavating; hand excavate where required to avoid damage to utilities. After the locations of transplanted trees, new trees and beds have been staked, contact utility-locating services at least 72 hours before any excavation. The utility location service for most utilities is the Florida Utility Locating Service at 800- 432-4770.

C. Notification of FDOT and Nassau County Traffic Engineering: If work is within a street right-of-way, coordinate work and maintenance of traffic with the appropriate agency. If work is within state highway right-of-way, notify the FDOT Inspector Coordinator at 360-5658. If work is located in the Nassau County right-of-way, contact the Nassau County Traffic Engineer at 387-8894. Notification shall occur at least 48 hours before starting work in the right-of-way.

D. Maintenance of Traffic: Comply with the FDOT Manual of Traffic Control when working in a FDOT right-of-way and with the maintenance of traffic requirements of the Nassau County Traffic Engineer when working in a Nassau County right-of-way.

E. Clean Up and Protection:
   1. During landscape work, store materials and equipment where directed. Keep pavements clean and work area in an orderly condition.
   2. Protect vehicular and pedestrian traffic, existing vegetation, above ground and underground utilities and structures during construction by using signs, barricades and/or fencing. In addition, post signs or barricades required by the Nassau County. Maintain protection until Initial Acceptance of the landscaping.
   3. Protect landscape work from damage by landscape operations, operations by other contractors and trespassers until Initial Acceptance.
   4. Maintain grade stakes set by others until all parties agree that the stakes can be removed.
   5. Repair or replace all construction damage to existing improvements on the project property, right-of-way or adjacent property as directed by the Nassau County, and at no cost to the Nassau County.

2.5 PLANTING SEASON**:**

A. Landscape work may proceed at any time or season agreed upon by the Contractor and the Engineer. However, schedule and perform landscape work only when weather and soil conditions are suitable in accordance with local practice. Do not install plant material when temperatures may drop below 35° or above 95° F, nor when wind velocity exceeds 10 miles per hour.

PART III – MATERIAL

3.1 PLANTS

A. General: Provide state inspected, nursery-grown plants, unless otherwise specified. Conform to the plant schedule, the FLORIDA FANCY and FLORIDA NO. 1 grades established by the "Grades and Standards for Nursery Plants", local landscape ordinance, and, where applicable, to ANSI Z60.1. Trees and Palms shall be graded FLORIDA FANCY; all other plants shall be graded a FLORIDA NO. 1 or better. Plants may be either container grown, balled and burlapped, or tree spaded unless otherwise specified. Provide healthy, vigorous plants, free from disease, insects and injury; well branched, free of included bark within major branch unions; and with a solid healthy root ball of vigorous, fibrous roots, but not excessively rootbound. All plants shall be true to variety, cultivar, species, quality, size, and flower color. Plants that do not conform to the referenced standards shall be rejected. Plants that have been cut back from larger sizes to meet certain specified requirements shall also be rejected. Plants shall have green, live foliage,

except deciduous plants planted in the dormant season. Plants that are planted during the growing season that are in “shock” (plants with dead or dying leaves) are subject to rejection. TREES THAT HAVE WOUNDS OR BARK INJURIES ON THE MAJOR TRUNKS SHALL BE REJECTED.

B. Balled and burlapped plants:
   1. Balled and burlapped plants shall be nursery-grown. Dig plants with a firm earth ball. Provide ball sizes complying with the "Grades and Standards for Nursery Plants," unless otherwise specified. Firmly wrap balls with burlap or other biodegradable cloth; trees with cracked or loose balls will be rejected. "HARDEN OFF" OR “CURE” TREES AND PALMS (EXCEPT CABBAGE PALMS) AT LEAST 4 WEEKS BEFORE SHIPMENT.

C. Container Plants: Provide healthy, vigorous, plants with a well-established root system reaching the sides of the container that will maintain a firm root ball after removal from the container, but shall not be root bound (excessive root growth encircling the inside of the container). Root-bound plants will be rejected.

D. Spaded Trees and Palms: Provide trees spaded from a commercial nursery field. Use tree spade equipment capable of appropriately moving trees up to caliper shown. Dig plants with firm balls of earth sufficient in diameter and depth to encompass the fibrous and feeding root system necessary for full recovery of the plant. Root ball diameter shall be at least 4-in. greater than the sizes recommended by the “Grades and Standards for Nursery Plants,” unless otherwise specified.

E. Single Trunk Trees and Palms: All trees and palms shall have a single straight trunk and a single dominant central leader, unless otherwise specified. Trees with multiple leaders and "V" crotches will be rejected. The specified trunk caliper is the minimum acceptable caliper size.

F. Multi-trunked Trees and Palms: The specified number of trunks of multi-trunked trees and palms shall originate from the root ball. The specified trunk caliper is the minimum acceptable caliper size of each trunk.

3.2 TOPSOIL:

A. Fine sand or loamy fine sand indigenous to the area suitable for plant growth that is free of weeds, roots, stumps, rocks larger than ½-in. diameter, organic muck, hard pan, toxic substances detrimental to plant growth, and construction debris such as limerock, concrete, and asphalt pieces. Deliver in a normally moist condition, neither muddy nor wet. Soil used for topsoil shall meet the following criteria measured in accordance with the appropriate AASHTO and ASTM standard:

1.	USDA Texture:	Fine Sand, Loamy fine
2.	AASHTO Classification:	A-3
3.	pH	5.0-7.5
4.	Deleterious Material (rocks, roots, sod)	0-2% maximum by mass
5.	Organic Matter Content	1-10% by mass

6.	Sand Content	80-96% by mass
7.	Silt & Clay Content	3-10% by mass

B. Submit a one-quart sample of the topsoil to the Engineer before beginning planting and obtain approval. If requested by the Engineer, submit a soil test report from a commercial soil testing laboratory to verify compliance with the above criteria.

3.3 EXISTING SOIL:

A. Use existing soil in plant pits if the soil complies with the standard for topsoil, unless the soil is contaminated with lime rock, clay, brush, weeds, roots, stumps, stones larger than 1 1/2-in. in any dimension, litter and other extraneous or toxic matter harmful to plant growth. Remove contaminated soil and replace with acceptable stockpiled existing soil, new topsoil or yard sand.

3.4 YARD SAND:

A. Coarse, clean yellow sand, commonly called “yard sand” that is free of lime rock, clay, silt, brush, weeds, roots, stumps, gravel, litter and other extraneous or toxic matter harmful to plant growth.

3.5 SOIL CONDITIONER:

A. Provide 100% organic soil conditioner, free of limerock, clay, brush, weeds, roots, stumps, gravel, litter and other extraneous or toxic matter harmful to plant growth. Soil conditioner shall be one of the following:
   1. Mechanically shredded pine bark with at least 90% of particle size ¼-in. or less.

B. Compost: Meet requirements of Florida Department of Environmental Protection Rule 62.709.550 Type Y (yard waste). Compost shall be 100% organic yard and tree trimmings with a 25/1 carbon/nitrogen ratio, mature and stable, free of pathogens, weed seeds, and debris, composted for a minimum of 15 days at 131° F., with at least 3 turnings, then shredded to pass through a 1/2 inch mesh screen. Available from Enviro-Comp Services, Inc.; 11771 Phillips Highway; Jacksonville, Fl 32256; 904-292-1828.

C. Potting mix equivalent to “Mulch Master’s Mix #3.”

3.6 FERTILIZER:

A. Palm Fertilizer: Commercial grade fertilizer of nitrogen (N), phosphorous, (phosphate) (P), potassium (potash)(K) and magnesium (Mg) in a ratio of 8-4-12-4 or 8-2-12-4. The fertilizer shall also contain 1-2% iron (Fe), 1- 2% manganese (Mn) and trace amounts of Zink (Zn), copper (Cu) and boron (B). Provide 50% of N, K and Mg in slow-release form.

3.7 SURFACE MULCH:

A. Provide the type of surface mulch specified on the drawings and in accordance with these specifications. Provide 100% natural, organic wood mulch, processed as a top dressing for trees and shrubs. Provide clean, bright mulch that is free of lime rock, clay, brush, weeds, leaves, sticks, color dyes and other extraneous or toxic matter harmful to plant growth. Color enhanced bark is not acceptable.

B. Pine Bark: Ground pine bark chunks from ¾-in. to 1 1/2-in.

C. Pine Straw: Mechanically baled pine needles.

3.8 ROOTBALL ANCHOR SYSTEM:

A. Anchor System 1:
   1. 2x2 pine posts, pointed on one end or steel u-channel fence posts in lengths as detailed.
   2. 2x2 pine post horizontal member and wood screws to connect.

B. Anchor System 2: "Terra Toggle" Rootball Anchor System by Accuplastics Inc., (352) 799-5232, or approved equal. System includes: two plastic or metal toggles rated at 500# maximum force; ¾-in. wide polyester strap rated at 2400# maximum force, one ¾-in. dichromate coated wire cinch buckle, and one 2x4 wood plank.

3.9 TREE TRUNK GUARD: (If shown):

A. Gray or black, flexible polyethylene, 9-in. ht., when uncoiled, with rows of openings and 2 tabs on one end or approved equal. A 9-in. long piece of flexible 6-in. or 8-in. diameter PVC corrugated drain field pipe cut open on one side may also be used.

3.10 PRE-EMERGENT AND POST EMERGENT HERBICIDE:

A. Broad-spectrum granular or liquid herbicide approved by the Engineer that will control annual grasses and many broadleaf weeds and that is labeled safe for use with the plants in the project.

3.11 ON-SELECTIVE HERBICIDE:

A. Non-selective liquid herbicide, such as 'Roundup, that will kill live vegetation and roots.

3.12 PORTABLE WATER BAG:

A. Provide a 12 mil, nylon-reinforced, UV treated polyethylene portable water bag or other alternative water bag system that can slowly deliver during each water application the volume of water shown on the table in Section 02900 3.16.

3.13 TEMPORARY IRRIGATION SYSTEM:

A. A run of PVC pipe and emitters with a water truck connection constructed to deliver water from the water truck to a cluster of trees. Remove the temporary water system at the end of the maintenance period.

3.14 WATER:

A. Provide water of suitable quality for healthy plant growth.

B. If a new automatic irrigation system is included with the construction of the landscaping, then the contractor shall pay for all irrigation water consumption during construction and until Initial Acceptance of the landscaping. The Nassau County shall pay for irrigation water consumption during the plant establishment period and until Final Acceptance of the landscaping.

C. If landscaping is not covered by an irrigation system, the contractor shall pay for all irrigation water consumption during construction, until Initial Acceptance of the landscaping, during the plant establishment period, and until Final Acceptance.

PART IV – EXECUTION

4.1 SOIL TESTING FOR DRAINAGE:

A. Before planting begins, test soil drainage by digging pits (1 foot wide by 2 ft. deep) in the locations of new plant beds and trees and then filling the pits with water twice in succession. If water remains for more than 24 hours, immediately notify Engineer before planting. The Engineer shall determine the corrective action required before planting is continued.

4.2 LAYOUT:

A. Before beginning planting work, identify the location of each individual tree and multiple plant beds with wood stakes, survey flags or paint and request a layout inspection by the Engineer when completed. Make minor adjustments to the layout requested by Engineer after his inspection.

4.3 COMMENCEMENT OF LANDSCAPE WORK:

A. Commencement of landscape work shall indicate that the Contractor has completed the site work necessary for the proper installation of landscaping in accordance with the contract documents and has completed work that may damage the installed landscaping. Perform all work in strict accordance with sound horticultural practice. Place plants where shown and as detailed.

4.4 CORRECTION OF CONDITIONS DETRIMENTAL TO PLANT GROWTH:

A. When conditions detrimental to plant growth, such as poor drainage, hardpan of clay or silt, rubble fill, obstructions, lime rock, petroleum products, and construction debris are encountered during the landscape work, cease landscape work in the affected area and immediately notify Engineer.

B. After the Engineer's review, excavate the area of contaminated soil to the depth approved by the Engineer. Remove and replace with topsoil or yard sand at no additional cost to the Nassau County. If contaminated soil is discovered that appears to be pre-existing before the beginning of construction operations, then the cost of removal of contaminated soil and replacement with new topsoil or yard sand will be in accordance with the contract documents.

4.5 REMOVAL OF EXISTING VEGETATION IN PLANT BEDS:

A. Remove bottles, boards, construction materials, lime rock, and other debris on the surface of plant beds.

B. If there is no vegetation in plant beds, proceed to bed preparation.

C. Multiple plant beds: Remove existing vegetation throughout the entire limits of the multiple plant beds.

D. Individual tree or palm planting beds: Remove exiting turf and other vegetation within an area of the following diameter centered on each tree or palm.

A. Table 1		
Single Trunk Tree Caliper	Small or Multi-trunked Tree Ht.	Mulch Bed Diameter
2-in. Cal	8'	8'
3-in. Cal.	10'	8'
4-in. Cal.	12'	8'
5-in. Cal.	14'	10'
6-in. Cal. +	-	12'
Palms	-	6'

E. Where living vegetation still remains in the new plant beds that are free of surface roots from existing trees, use a sod cutter or other equipment with blades of sufficient depth to remove the entire plant and root system in one operation. DO NOT REMOVE EXISTING VEGETATION WITH A ROTOTILLER OR OTHER MACHINE THAT WILL BREAK THE ROOTS IN SMALL PIECES DURING THE OPERATION.

F. Where living vegetation still remains in the new plant beds containing extensive surface roots of existing trees, spray the vegetation with a non-selective herbicide in strict accordance with the manufacturer's label. Apply herbicide only when the vegetation is actively growing. After vegetation is dead, remove all top growth and roots of the dead vegetation, being careful not to damage the surface roots of the existing trees.

4.6 PREPARATION OF PLANT BEDS:

A. Adjust the level of the existing soil by excavation or by the application of additional soil in plant beds so that after the application of the soil conditioner, and grading, the soil mix layer at the edge of the beds is 4-in. below adjacent turf, pavement, or curbs. Loosen soil of all new plant beds to a minimum depth of 4-in., excluding the areas containing surface roots of existing trees. Remove lime rock, stones over 1 ½-in., sticks, roots, rubbish, and soil contaminated with material detrimental to plant growth, and other extraneous matter exposed by the operation. Spread soil conditioner throughout all plant beds to a minimum depth of 2½-in. (7.7 cub. yds. per 1000 SF). Obtain approval Engineer's approval before proceeding further.

B. The application and incorporation of soil conditioner into individual tree and palm beds may be delayed until after the plant has been placed, so long as the finish soil level is 2-in. below the top of the root ball and 4-in. below adjacent turf, pavement or curbs.

C. After the Engineer has approved the application of soil conditioner, mix soil amendments into the top 7 ½-in. of existing soil to achieve a uniform mixture of 1/4 soil conditioner and 3/4 existing soil to a depth of 10-in. In areas free of tree surface roots, use a rototiller to mix soil amendments into existing soil. In areas with surface roots, mix soil amendments into existing soil by hand.

D. Add or remove soil mix necessary Grade, add or remove soil to remove ridges and fill depressions so that the soil mix layer at the edge of the plant beds is 4-in. below adjacent turf, pavement, or curbs. Rake to a smooth, even surface with a loose, uniformly fine texture.

4.7 PLANTING PREPARATION:

A. If the soil is very dry before planting, water soil sufficiently to moisten the prepared areas. Do not create a muddy soil condition.

B. DO NOT INSTALL LANDSCAPING UNTIL THE IRRIGATION SYSTEM IS OPERATIONAL IN THE AREA TO BE PLANTED OR UNTIL A TEMPORARY ALTERNATIVE MEANS OF WATERING THE LANDSCAPE AREAS HAS BEEN APPROVED AND PROVIDED.

4.8 EXCAVATION OF TREE OR PALM PLANTING PITS:

A. Excavate pit with a surface diameter equal to 1½ times the diameter of the root ball and with a depth that will leave top of the root ball 2-in. above the soil mix layer. If planting date palms, excavate the pit 12-in. deeper to allow for a layer of yellow sand below the root ball.

4.9 PLANTING:

A. Planting Trees
   1. If the tree is container grown, remove container before planting. Cut 8 vertical slices one inch deep, evenly spaced around the side of the root ball from top to bottom.
   2. If the tree is B&B, remove all plastic shrink-wrap, straps, and twine from the trunk and the root ball. Also, remove the burlap and wire cage from the top of the root ball and 18-in. down the sides of the root ball after the tree is properly placed in the pit. If the burlap is a synthetic non-biodegradable fabric, remove all of the fabric from the ball. Do not bury synthetic fabric in the planting pit.
   3. Set the tree plumb in the center of the pit and orient for best appearance.
   4. If the first root emerging from the trunk is not visible on the root ball surface, carefully remove soil from the top of the root ball next to the trunk until the first root can be seen. Pull away soil from the rest of the root ball surface down to the same point. Cut away exposed circling roots.
   5. Adjust the depth of the pit so that the top of the root ball is 2-in. above the soil mix layer.
   6. Backfill tree pit with existing uncontaminated soil in 12-in. layers until the soil 2-in. ;below the top of the root ball. Water in and compact each soil layer to eliminate voids. Apply at least 5 gallons of water per inch of trunk caliper during planting and backfilling.

B. After planting, remove excess soil and rake plant beds to a smooth even surface conforming to required soil grade, and so that the soil mix level at the edge of the plant beds is 4-in. below adjacent turf, pavement, or curbs.

C. Immediately apply at least 2-in. of water throughout each bed. If a temporary berm is desired around the edge of the root ball to help contain the water, then construct the berm with the mulch layer; do not use soil for the berm.

D. Planting Shrubs and Groundcovers
   1. Place shrubs and groundcovers where shown and as detailed, using the specified spacing.
   2. If the plant is in a container, remove container before planting. Excavate each pit to slightly larger than the root ball area and with slightly less depth than the root ball. If the container is 1 gallon or larger, and the root ball has encircling roots, cut 4 vertical slices one to two-in. deep, evenly spaced around the side of the root ball from top to bottom, and pull away from root ball. If the plant I s balled and burlapped, remove twine and burlap completely from the ball before planting. Set plant plumb in center of the pit. Set the top of the root ball level with or slightly above the level of the soil mix layer. Backfill remainder of pit with existing excavated soil and compact to eliminate voids. Keep top of the root-ball free of any soil.

4.10 PLANTING IN MARGINAL WET AREAS:

A. If during the excavation of the plan pits water saturated soil is encountered in the very bottom of the pit, stop work and notify the Nassau County. The Nassau County may approve the planting if the bottom of the root ball can be raised above the water table so that the top of the root ball is no higher than one foot above the existing surrounding grades. Otherwise the plant bid will be deleted or relocated on the site.

B. Fill the pit with existing soil until the entire root ball, when installed, will be above the water table.

C. After the plant is installed, place existing soil against the exposed sides of the root ball to create an earth mound around the root ball with a 4:1 maximum slope from the edge of the root ball to the edge of the bed.

D. Complete planting as specified for plants.

4.11 PLANTING ON SLPOES:

A. When planting on a slope, form a level platform by cutting into the slope on the back side of the tree and then using the cut soil as fill on the front side of the tree so that the volume of cut and fill are equal. The level platform for a shrub or groundcover shall be twice the diameter of the root ball; for a tree or palm, equal to the diameter of the root ball plus 2 ft.

4.12 FINISHING PLANT BEDS

A. After planting, remove excess soil and rake plant beds to a smooth even surface. Conform to the required soil mix grade and so that the soil mix grade at the edge of the plant beds is 4-in. below adjacent turf, pavement, or curbs to allow for a 3-in. layer of mulch, leaving 1-in. between the top of the mulch and the top of the adjacent turf pavement or curb. Keep top of each root ball free of any soil.

B. Immediately apply at least 2-in. of water throughout each bed. DO NOT USE SOIL BERMS around the

edge of the root ball. If a temporary berm is desired around the edge of the root ball to help contain the water, then form the berm with the thicker layer of surface mulch.

4.13 WATERING

A. General: Water plants sufficiently to keep roots moist, but not saturated and as needed for the healthy growth and to prevent wilting. (The Agriculture Extension Service recommends watering daily for at least one month after installation during the growing season when there is no rain). Following a rainfall, delay watering until all free moisture has drained from the soil.

B. After initial watering, where plants are not covered by an automatic irrigation system, provide temporary watering using water bags and/or temporary irrigation system that will provide to each plant during each watering the volume of water shown in Table 1 and 2 below.

C. If water bags are used to water trees and palms, place water bag around the trunk and fill with water in accordance with manufacturer's instructions to provide a slow water drip of at least 4 hours. Fill water bag with each subsequent watering.

D. If a temporary irrigation system is used, connect the system to a water truck or other water source and pump water until the specified volume of water in the tables below is delivered to each plant through emitters. Apply at a rate that will allow the water to soak into the root ball without runoff.

E. Maintain each water bag or temporary irrigation system in working condition throughout the installation and maintenance period and until final acceptance. Immediately repair or replace each water bag or temporary irrigation system that is damaged, stolen or malfunctioning.

F. Apply the volume of water shown in Table 2 each time trees and palms are watered (2 gallons/ caliper inch).

Table 2	WATER VOLUME FOR NEW TREES & PALMS	
Single Trunk Tree	Multi-trunked Tree	Min. Water Volume Per Application
2-in. Cal.	8-10'	4 Gal.
3-in. Cal.	10-12'	6 Gal.
4-in. Cal	12-14'	8 Gal.
5-in. Cal.	14-16'	10 Gal.
6-in. Cal.	-	12 Gal.
Each Palm	-	12 Gal.

G. Apply the volume of water shown in Table 3 each time shrubs and groundcovers are watered individually or provide 1/2-in. to ¾-in. of water throughout the bed.

TABLE 3	WATER VOLUME FOR NEW SHRUBS & GROUNDCOVERS
Plant Size	Min. Water Volume Per Application
1 Gallon	1 quart
3 Gallon	2 quarts

7 Gallon	1 gal.

4.14 INSTALLING TREE TRUNK GUARD

A. Install tree trunk guard around each single trunk tree in an individual bed.

B. Join flat sheets of guards together by pushing the two tabs of one guard into the holes of the other so that the guard diameter is 2-in. greater than the existing tree trunk diameter. Wrap joined guard around trunk at ground level to form a circle and attach the tabs to the holes in joined guards.

C. If using corrugated plastic pipe, cut a 9-in. long section of pipe and slice open on one side from top to bottom. Push around the tree trunk at ground level. Place a 6-in. diameter pipe around trees up to 4-in. caliper; place a 8-in. diameter pipe around trees with a trunk caliper greater than 4-in. and up to 6-in. caliper.

4.15 PRUNING

D. Prune plants in accordance with standard horticulture practice. Prune to remove suckers, dead, injured or diseased wood, and to achieve a uniform shape natural to each species. Required plant sizes are after pruning. Replace excessively pruned or misformed plants. Do not cut tree leaders.

E. Prune crape myrtles, ligustrums, and other multi-trunked trees to remove suckers or water sprouts growing from the root ball and the lower portion of the main trunks. Also remove small, twiggy growth that has developed underneath and within the tree canopy.

F. Crape myrtles: Cut back the tips of all stems approximately one foot to promote branching and blooming. Maintain upright branching character by removing branches that are drooping below a 30° angle from vertical. Extend pruning to create a very upright branching tree with a full, gently rounded crown.

4.16 TREE STAKING

A. General: Stake trees and palms ONLY IF NECESSARY to maintain them in a vertical alignment unless specifically required for the project.

B. Trees: Anchor tree root balls as detailed using “Anchor System 1 or 2.”

C. Stake palms in accordance with method shown in the latest edition of Florida Grades and Standards or as detailed. Do not drive nails into palm trunk.

4.17 MULCHING:

A. Apply 3-in. of mulch to all beds. Rake to neat finished appearance. Top of mulch to be 1-in. below adjacent top of pavement, curb or lawn. Pull mulch 8-in. away from each tree and palm trunk and 3-in.

away from the main stem of smaller plants.

4.18 FERTILIZING

A. Trees: Immediately after planting, spread 1 cup of tree fertilizer evenly over the root ball and 1' beyond in accordance with manufacturer's instructions.

B. Multiple Plant Beds: Apply fertilizer at a rate to achieve 1 lb. of nitrogen per 1000 SF of bed area.

4.19 APPLICATION OF PRE-EMERGENT HERBICIDE:

A. Rake mulch smooth and apply pre-emergent herbicide throughout all beds. Apply herbicide at the recommended manufacturer's rates and in strict accordance with the label instructions.

4.20 INITIAL INSPECTION AND ACCEPTANCE:

A. Inspection shall be made by the Engineer within ten days of written notification from the Contractor that installation is complete.

B. Plants shall be acceptable if in "healthy, vigorous condition" and are in compliance with both the specific specifications for each named plant and the general specifications for all plants.

C. Replace rejected work within 14 days of notification and continue specified maintenance until re-inspected and found to be acceptable. Remove rejected plants and materials promptly from project site.

4.21 MAINTENANCE AND WARRANTY:

A. Maintenance
   1. See Specification Section 02935-LANDSCAPE MAINTENANCE for specific maintenance requirements.
   2. Begin maintenance of landscape work immediately after each area is planted and continue until Initial Acceptance, through the maintenance period specified, and until Final Acceptance. Maintain plants for a minimum period of 12 months after Initial Acceptance.

B. Warranty: Warranty plants for a minimum period of 12 months after Initial Acceptance and until Final Acceptance.

4.22 FINAL INSPECTION AND ACCEPTANCE:

A. When maintenance work is complete, submit written notification to the Engineer. The Engineer shall conduct a final inspection within 10 days after receipt of the Contractor's notification.

B. Plants: Plants shall be acceptable if they are in "healthy, vigorous condition" and are in compliance with both the specific specifications for each plant named and the general specifications for all plants.

C. Replace rejected work with 14 days of notification. Continue landscape maintenance until work is re-inspected and found acceptable.

4.23 WARRANTY:

A. Warranty that all plants will remain in “healthy, vigorous condition” and meet specifications for 12 months from the date of Initial Acceptance and until Final Acceptance.

B. If the Final Inspection occurs in the dormant season, then the warranty of deciduous plants shall be extended until the deciduous plants are in full green leaf after dormancy, and can be inspected and approved by the Engineer.

4.24 MEASUREMENT AND PAYMENT:

A. Measurement and payment of landscaping, completed and accepted, is established in the proposal either as a lump sum or on a unit price basis. The price includes all work specified in this section including materials, soil preparation, planting, watering, pruning, staking, mulching and landscape maintenance until the Initial Acceptance.

4.25 REPLACEMENTS AND CONDITIONS:

A. The specified plant warranty, including the maintenance, inspection and acceptance provisions, shall apply to replacement plants. The extended warranty period shall begin from the date the Engineer has accepted the installation of replacement plants and shall continue for the minimum specified maintenance period and until Final Acceptance, with each additional replacement in turn being maintained and warranted for the minimum specified maintenance period.

B. Replacements shall comply with specified requirements for new plants.

C. After Initial Acceptance, the Contractor will not be responsible for damage to work resulting from: neglect by Owner; damage by others; abnormal weather conditions such as floods, excessive wind damage, severe freezing or abnormal rains; or other activities beyond the Contractor's control.

END OF SECTION 02900

SECTION 02910

TOPSOIL LAYER

PART I – GENERAL

1.1 DESCRIPTION OF WORK:

A. Provide all labor, materials, and equipment and other supplemental work necessary to provide a 6-in. deep topsoil layer favorable to tree, palms, shrubs, groundcovers and grass by utilizing existing stockpiled topsoil or by adding soil amendments to existing soil.

B. Grading: Provide grading necessary to establish finish grade in all landscaped areas.

1.2 SUBMITTALS:

A. Inspection Certificates, Manufacturer's Data: Submit copies of certificates of inspection required by governmental authorities. Submit manufacturers or vendors label, certified analysis, and application or installation instructions for the materials noted below. Submit other data requested to substantiate that materials comply with specified requirements. Submit vendors' invoices for the materials number 1 through 5, with this project referenced by the vendor and quantities shown. Save all containers of products used and submit for inspections. Nassau County will count containers to verify that the quantities specified have been applied.
   1. Fertilizer
   2. pH Adjusters
   3. Organic Matter
   4. Soil Tests

B. Samples: Submit each in 1-quart container.
   1. Top Soil
   2. Organic Matter

1.3 JOB CONDITIONS:

A. Coordination: Coordinate topsoil work with the Engineer and other Contractors.

B. Protection:
   1. Protect vehicular and pedestrian traffic, existing vegetation, above ground and underground utilities and structures during construction by using signs, barricades and/or fencing. Maintain protection until initial acceptance. Repair or replace damage as directed.
   2. Protect earth work from damage by landscape operations, operations by other contractors and trespassers.
   3. Maintain grade stakes set by others until all parties agree that the stakes can be removed.

1.4 OWNERSHIP OF MATERIALS

A. The Nassau County shall retain ownership of materials excavated from the site that are suitable for the topsoil layer until the project has been completed. Remove and dispose of surplus materials at no cost to the Nassau County upon Final Acceptance unless otherwise specified.

B. Where the temporary stockpiling of materials is not practical within the property or right-of-way owned by the Nassau County, the materials may be stockpiled in areas provided by the Contractor until needed on the project or declared surplus by the Engineer. The Contractor may dispose of excess stockpiled material with the Engineer's approval. However if a portion of the surplus material removed by the Contractor is required to fulfill the job requirements, then the Contractor shall replace the removed material with equally suitable material at no additional cost to the Nassau County.

1.5 TOPSOIL LAYER:

A. Fine sand or loamy fine sand indigenous to the area suitable for plant growth that is free of weeds, roots, stumps, rocks larger than ½-in. diameter, organic muck, hard pan, toxic substances detrimental to plant growth, and construction debris such as limerock, concrete, and asphalt pieces. Deliver in a normally moist condition, neither muddy nor wet. Soil used for topsoil shall meet the following criteria measured in accordance with the appropriate AASHTO and ASTM standard:
   1. USDA Texture..... Fine Sand, Loamy fine sand
   2. AASHTO Classification..... A-3
   3. pH 5.0-7.5
   4. Deleterious Material..... 0-2% maximum by mass (rocks, roots, sod)
   5. Organic Matter Content ..... 2 1/2%-20% by mass 6.
   6. Sand Content..... 70-97.5% by mass
   7. Silt & Clay Content..... 0 -10% by mass

B. Organic matter, pH adjusters, and other soil amendments may be mixed into existing sandy soil so long as the mixture conforms to the criteria for the topsoil layer and the mixture is not contaminated with materials harmful to plant growth. The soil amendments may be premixed with the existing soil or may be applied as a top dressing and then mixed into the existing soil to form the topsoil layer.

C. Obtain topsoil and organic matter from the following sources: stockpile of excavated existing soil from within the project limits; designated borrow pits for the project; and from other sources provided by the Contractor.

1.6 ORGANIC MATTER:

A. Peat: Mucky Peat or Peat with an organic matter content of 30% or more if the mineral fraction of clay and silt is 50% or more. The organic content shall be 20% or more if the soil has no clay or silt content.

B. Compost: Meet requirements of Florida Department of Environmental Protection Rule 62.709.550 Type Y (yard WASTE). COMPOST SHALL BE 100% ORGANIC YARD AND TREE TRIMMINGS WITH A 25/1 CARBON/NITROGEN RATIO, MATURE AND stable, free of pathogens, weed seeds, and debris,

composted for a minimum of 15 days at 131° F., with at least 3 turnings, then shredded to pass through a 1/2 inch mesh screen. Available from Enviro-Comp Services, Inc.

1.7 YARD SAND:

A. Coarse, clean, yellow sand, commonly called “yard sand” free of lime rock, clay, brush, weeds, roots, stumps, gravel, litter, and other extraneous or toxic matter harmful to plant growth.

1.8 PH ADJUSTER:

A. To Raise pH: Commercial grade ground or hydrated limestone containing not less that 50% of total oxides.

B. To Lower pH: Commercial grade granular sulfur.

PART II – EXECUTION

2.1 SUB GRADE PREPARATION

A. In landscape areas, remove subsoil contaminated with lime rock, “crushcrete,” petroleum products, construction debris and other extraneous or toxic matter harmful to plant growth to a depth of 24-in. below the finish soil grade. Replace contaminated subsoil with clean A-3 sandy soil or yellow yard sand.

B. Rough grade the landscape areas so that the finish grade elevations will be achieved after the placement of the topsoil layer or soil amendments. Leave the surface in a loose and roughened condition.

2.2 APPLICATION OF TOPSOIL LAYER:

A. Spread a 6-in. layer of topsoil or sandy soil. Apply organic matter, pH adjusters and other soil amendments required to achieve the criteria established for the topsoil layer, and mix uniformly to a depth of 6-in.. Grade to establish finish elevations.

B. A topsoil layer is not required in landscape areas where the top 6-in. of existing soil conforming with the topsoil criteria of this specification remains undisturbed.

C. Protect the topsoil layer from contamination by other construction operations. Remove and replace all soil that fails to meet the required topsoil classification or that becomes contaminated after placement.

2.3 SOIL TESTING:

A. Soil Samples: Take random samples of the topsoil layer immediately after placement, at a minimum of one sample for every 2,500 SY (22,500 SF) of landscape area outside of medians. Coordinate sample locations with the Engineer. The Engineer shall require additional samples where the type of the soil amendment changes.

B. Testing: Submit soil test report of each sample from the University of Florida Extension (IFAS) Soil Testing Laboratory or from a commercial soil testing facility at least 4 weeks before planting operations. Collect soil samples in accordance with recommendations of the laboratory.

C. Soil Test Report: The soil test report shall show the soil pH , USDA texture, AASHTD classification, deleterious material, organic matter content, sand content and SiH and clay content along with recommendations for adjustments needed to meet the topsoil requirements.

D. The Engineer may require additional samples to delineate the areas that need additional soil amendments. Repeat sampling and testing procedure after the application of additional soil amendments until the top soil layer complies with the specification.

2.4 CLEAN-UP AND PROTECTION:

A. Keep pavements clean and work area in an orderly condition.

B. Protect other work from damage. Maintain protection during installation and until Initial Acceptance. Treat, repair or replace damaged work as directed.

2.5 MEASUREMENT & PAYMENT:

A. Measurement and payment for the topsoil layer, completed and accepted, is established in the proposal either as part of a lump sum price or by the unit price basis. The price includes all work specified in this section including materials, soil preparation, and application of the topsoil layer.

END OF SECTION 02910

SECTION 02935

LANDSCAPE MAINTENANCE

PART I – GENERAL

1.1 SCOPE OF WORK

A. Provide maintenance of new plants and turf immediately after each area is planted and continue for a minimum of 12 months after the date of Initial Acceptance and until Final Acceptance. Landscape maintenance includes: turf mowing, tree pruning, mulching, weeding, pest control, fertilization of trees, palms shrubs, ground covers and turf; scheduled inspections; and reports.

B. Provide maintenance of all existing plants and turf areas within the work limits. Begin lawn maintenance 10 days after the Notice to Proceed is issued and continue for a minimum of 12 months after the date of Initial Acceptance and until Final Acceptance of the landscape work. Lawn maintenance includes debris removal, mowing, edging, trimming and fertilization.

1.2 MEASUREMENT & PAYMENT FOR SERVICES

A. The cost of landscape maintenance from the time of planting until Initial Acceptance shall be included in each landscape bid item or in the total lump sum bid.
B. The cost of landscape maintenance between Initial Acceptance of the landscaping and Final Acceptance of the landscaping shall be established in the proposal either as part of the lump sum bid or on a unit price basis.
C. Payment for the approved total value of the landscape maintenance shall be in 12 equal installments; each installment paid after completion and approval of the maintenance required during the previous two months. For each month of maintenance that is not satisfactorily completed, the Nassau County shall deduct the value of the work not completed from the amount due the contractor for maintenance during that month.

1.3 QUALIFICATIONS OF CONTRACTOR'S PERSONNEL

A. Provide knowledgeable and competent personnel for all landscape maintenance.

B. Provide a supervisor who is knowledgeable of all aspects of landscape maintenance, including pruning, the application of pest control chemicals, the operation of landscape maintenance power equipment, and vehicular traffic control during maintenance operations. The supervisor shall be present during all landscape maintenance operations.

C. Any personnel who apply restricted pesticides shall have a Certified Pesticide Applicator's license or be under the direct supervision of a Certified Pesticide Applicator as defined by the Florida Pesticide Law.

D. Use skilled personnel to prune palms who have at least 3 years palm pruning experience.

2.1 SUBMITTALS

A. Manufacturer's Data: Submit manufacturer's or vendors certified analysis, and application instructions for materials noted below. Submit other data substantiating that materials comply with specified requirements. Obtain approval of products before their use.
   1. Fertilizer
   2. Each insecticide, fungicide or herbicide to be used.

B. Within 7 days after the Initial Acceptance of the landscape and irrigation work, submit evidence that the personnel assigned to pesticide application have the appropriate licenses.

C. Maintenance Schedule: Within 7 days after the date of Initial Acceptance of the landscape and irrigation work, submit the 12 month landscape maintenance schedule showing the work to be performed during each monthly maintenance period.

D. Nassau County Notification: The Nassau County's inspector shall be present when applying fertilizer and pesticides. Submit a written request for the inspector's presence, at least 48 hours before application.

E. Landscape Maintenance Report

3.1 JOB CONDITIONS

A. Coordination and Scheduling
   1. Coordinate all landscape work with the Engineer.
   2. Submit to the Engineer a schedule for all landscape maintenance work and obtain approval before beginning work.
   3. Adjust schedule of landscape maintenance work when weather and soil conditions are unsuitable for the work to be performed in accordance with standard horticultural practice.

B. Protection and Safety
   1. Take necessary protection measures to prevent damage to vehicular and pedestrian traffic, existing vegetation, above ground and underground utilities and structures during landscape maintenance work.
   2. Post appropriate traffic control signs, safety cones or barriers required by the FDOT and the Nassau County Traffic Engineering Division during all maintenance operations. Maintain protection until operations are complete.

C. Application of Pesticides: Strictly comply with the manufacturer's specimen label and safety data sheet for each pesticide used, and the pest control regulation of the State of Florida and the EPA.PRODUCTS.

PART II – PRODUCTS

4.1 FUNGICIDE:

A. Palms: Use broad spectrum systemic fungicide recommended by the palm supplier to control leaf spot, rot and wilt diseases.

B. Other Plants: As recommended by the County Agent for the disease identified.

4.2 INSECTICIDE:

A. Trees and Sod: Systemic broad-spectrum insecticide recommended by the County Agent for the plants specified.

B. Palms: Use insecticide recommended by palm supplier to control palm weevils, boring beetle and other insects.

4.3 HERBICIDE

A. Plant Beds and Turf: Broad-spectrum, granular or liquid, pre-emergent and post-emergent herbicides that will control annual grasses and many broadleaf weeds. Use herbicides that are recommended by the County Agent and that are labeled safe for use with the plants and type of turf installed.

B. Non-selective Herbicide: Use "Round Up or other equivalent herbicide.

4.4 All Other Products: See Specification Sections 02900 - LANDSCAPING (LANDSCAPE WORK), 02945 - TURF SEEDING AND SODDING, and 02810 - LANDSCAPE IRRIGATION.

PART III – EXECUTION

5.1 LANDSCAPE MAINTENANCE

A. General: Visit the site at least once a month after Initial Acceptance and complete the following maintenance items:
   1. Reset settled plants to proper grade and position; tighten or repair guys and stakes; and rake mulch to keep neat and uniform.
   2. Remove and replace any plants that the Engineer determines are in unhealthy condition.
   3. Remove debris from maintenance operations.
   4. Apply "Roundup" to weeds growing in curb joints and other paved areas within the project.

B. During the last maintenance visit, in addition to the normal maintenance operations, remove stakes and guys from trees, unless instructed otherwise. Watering: After initial watering, water plants as needed for the healthy growth and to prevent wilting. Water turf twice a week in accordance with the requirements of the St. Johns River Water Management District. Water other plants daily for one month after installation, if not a rain day. Water sufficiently to keep roots moist, but not saturated and, thereafter, as needed for healthy growth.

C. Pruning
   1. During each monthly maintenance visit, prune trees to remove suckers, dead, or damaged branches, or branches heavily infected with disease or insects.
   2. During the last scheduled maintenance visit, prune crape myrtles to remove suckers or water sprouts from the root or the lower portion of the main trunk and to remove small, twiggy growth that has developed underneath and within the tree canopy. Cut back the tips of all stems approximately one foot to promote blooming. Maintain upright branching character by removing branches that are drooping below a 30° angle from vertical. Extend pruning to create a very upright shape in the branching with a full, gently rounded crown.
   3. Use sharp, clean tools that are specifically designed for type of pruning performed. Make clean cuts with no bark tears or other damage. Provide a ladder, hydraulic lift, bucket truck or similar equipment for tree pruning. No equipment or climbing is allowed that may damage the trunk. After the pruning is completed at each tree, load all debris into a trash truck before proceeding to the next tree. At the end of the day, remove all debris from the area. If any vegetation falls into the street, remove it from the street immediately.

D. Mulching: Apply specified mulch to all beds during the sixth monthly maintenance visit and during the last maintenance visit. Apply sufficient mulch to achieve a thickness of 3-in. throughout each bed after settlement of the mulch.

E. Fertilization:
   1. Apply fertilizer to plant beds and all turf areas within the work limits during the last maintenance visit. Broadcast the fertilizer throughout all beds at a rate of 6-½ lbs. of fertilizer/ 1000 SF of bed area.

F. Plant Bed Weed Control: During each monthly maintenance visit, remove all weeds from plant beds. Remove the entire weed, including roots, and dispose of all debris. Apply additional pre/ post- emergent herbicide, as needed, to prevent weed infestation. Apply herbicide in strict accordance with the label instructions. Use a pre/post-emergent herbicide suitable for the installed plants. Delay selective herbicide application if plants have not rooted in.

G. Insect Control
   1. Tree: With each monthly maintenance visit, inspect trees for the presence of insects. If insects are present, control with the appropriate insecticide.

H. Disease Control: During each visit, inspect trees and palms for disease problems. If present, consult with the County Agent to identify the disease and the recommended treatment. Submit the recommendation and the price for treatment to the Engineer. Upon approval, treat the affected areas. A Change Order will be issued for this additional work.

5.2 TURF MAINTENANCE:

A. Mowing Limits: Maintain all turf areas within the project limits unless otherwise specified.

B. Debris Removal: Before and after each mowing, remove trash, paper, sticks, and other like debris from turf areas. After mowing and edging, remove from the adjacent pavement all grass clippings or other

debris generated by the operations. Grass clippings may remain in the lawn areas.

C. Mowing: Mow and edge turf areas when the grass blades are 30% taller than the desired mowing height recommended by the County Agent for the grass species and cultivar. Repeat mowing each time the grass height again exceeds 30% of the recommended mowing height. (Grass height does not include the height of seed stalks). Mowing frequency will vary from once every 1½ to 2 weeks during the growing season to once every 4 weeks during the dormant season; but in no case shall the mowing frequency be less than once every 4 weeks. Keep mower blades sharp.

D. Edging: Immediately after each mowing, edge all sidewalks, curbs, paved surfaces, and plant beds adjacent to lawn areas. Do not use a string trimmer for edging; use only a blade edger.

E. Trimming: Immediately after each mowing, trim around all vertical obstacles within the lawn areas, such as walls, fences and sign posts. Match mowing height. If string trimmers are used, protect vertical structures from damage, particularly tree trunks.

F. Fertilization: Apply fertilizer during the sixth and last maintenance visit. Adjust fertilizer schedule so that both fertilizations are applied between March 1 and September 30. Apply fertilizer at a rate that will apply 1 lb. of nitrogen/ 1000 SF of plant beds and turf area.

5.3 IRRIGATION MAINTENANCE: Maintenance shall include inspection, system adjustment, and routine maintenance and repair necessary to insure efficient system operations. Any replacement parts shall the same as the existing system components, unless approved by the Engineer. Provide irrigation maintenance during each monthly landscape maintenance visit and complete the following:

A. Controller: Inspect controller, clean housing and controls, and adjust for proper cycling and station timing. Adjust operation time (frequency and duration) of each zone to provide sufficient water for the healthy growth of plants and to prevent saturation of soil or run-off. Adjust watering time for seasonal variation of rainfall.

B. Control Valves, Backflow Preventer: Inspect and adjust valves and backflow preventer for proper function. Keep manual valves and solenoid housing free of dirt and debris. Adjust height of valve boxes to keep the top of the box level with the top of the sod root zone or 1-in. above the mulch level. Keep lid snapped in place.

C. Sprinklers: Operate each zone manually. Inspect sprinklers for clogged nozzles and screens, head assembly damage, leaks, pop-up action, and pattern of spray coverage and make routine repairs. Clean and adjust sprinklers for proper operation and uniform water coverage of the landscape areas. Adjust spray pattern to minimize water spray on the pavement.

D. Warranty Repairs
   1. Should settlement occur in backfill areas or under pavement where piping was installed under pavement, repair damaged areas to original condition.
   2. Repair or replace any defective materials or workmanship, any damage resulting from such defects, and any damage caused by the specified landscape maintenance operations at no

additional cost to the Owner.

E. Damage by Others: If any system components are damaged by others or by abnormal weather conditions, submit a price proposal for the repair and obtain approval before beginning work. A change order shall be issued for the approved work.

END OF SECTION 02935

SECTION 02945

TURF SEEDIND AND SODDING

PART I – GENERAL

1.1 The General Requirements, Section 00 01 00, are hereby made a part of this section as if fully repeated.

1.2 The Nassau County Standard Specifications are hereby made a part of this section and are fully repeated herein. If there are any discrepancies, the more stringent specification shall take precedence.

1.3 DESCRIPTION OF WORK:

A. Provide all labor, materials, and equipment and other supplemental work necessary to establish a permanent turf by sodding. Work also includes watering and other maintenance necessary for turf establishment.
B. Fine Grading: Provide fine grading necessary to establish finish grade in all sodded areas.

1.4 DEFINITIONS:

A. "Initial Acceptance": The point when all requirements of contract documents, including any punch-list item, have been completed to the satisfaction of the Engineer.

B. "Final Acceptance": The point when all requirements of the landscape maintenance, including any punch list items, have been completed to the satisfaction of the Engineer.

C. "Nursery Sod": Any sod that is planted and grown on cultivated agricultural land specifically as commercial turf grass sod. Nursery sod is carefully and regularly maintained and mowed from planting until harvest to develop a sod of acceptable quality and uniformity described in these specifications.

1.5 REGULATORY REQUIREMENTS:

A. Comply with regulatory agencies requirements established for fertilizer and pesticide composition.

B. Application of Pesticides: Strictly comply with the manufacturer's specimen label and safety data sheet for each pesticide used, and the pest control regulation of the State of Florida and the EPA. The pesticide application shall not interfere with other construction activities or with the public.

1.6 QUALITY ASSURANCE:

A. Ship materials with certificates of inspection as required by governmental authorities.

B. Do not make plant substitutions.

2.0 SUBMITTALS

A. Inspection Certificates, Manufacturer's Data: Submit copies of certificates of inspection required by governmental authorities. Submit manufacturers or vendors label, certified analysis, and application or Installation instructions for the materials listed below. Submit other data requested to substantiate that materials comply with specified requirements. Save all containers of products used and submit for inspections. Nassau County will count containers to verify that the quantities specified have been applied. Remove containers after inspection.
   1. Fertilizer
   2. Herbicide
   3. Sod Growers Certification: Submit with each sod shipment from a different field the grower's invoice showing the species of the shipped sod and the date cut. Sod species shall be as indicated on the Landscape Plan.

2.1 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Packaged materials: Deliver packaged materials in original containers and protect from deterioration.

B. Sod: Time delivery so that sod will be placed on the day of delivery and within 36 hours after stripping. Protect uninstalled sod against drying and breaking by placing stacks in shade, covering with moist burlap sacking, and/or sprinkling.

2.2 JOB CONDITIONS:

A. Coordination: Coordinate all grassing work with the Engineer and other Contractors. Plant after final grades are established.

B. Protection:
   1. Protect vehicular and pedestrian traffic, existing vegetation, above ground and underground utilities and structures during construction by using signs, barricades and/or fencing. Maintain protection until initial acceptance. Repair or replace damage as directed.
   2. Protect grassing work from damage by landscape operations, operations by other contractors and trespassers.
   3. Maintain grade stakes set by others until all parties agree that the stakes can be removed.

C. Poor Soil Conditions: When conditions detrimental to plant growth are encountered, such as rubble fill, lime rock, poor drainage, or obstructions, cease planting in the affected area and immediately notify Engineer. The Engineer shall determine the corrective action required before

planting is continued.

2.3 PLANTING SEASON:

Schedule and perform sod work only when weather and soil conditions are suitable in accordance with local practice. Do not place sod when temperatures may drop below 35° or above 90° F, or when wind velocity exceeds 15 miles per hour.

PART III – PRODUCTS

3.1 SOD:

A. Provide healthy, green, strongly rooted sod in 16-in. x 24-in. pads or large roll sod grown specifically for turf grass purposes (nursery sod) cut with a ¾-in. layer of roots and topsoil. The sod shall be mature enough, that when grasped at one end, it can be picked up and handled without damage. Sod shall be neatly mowed before delivery.

B. Sod shall be reasonably free of diseases, nematodes, and soil-born insects, with no more than 5 objectionable grassy and broad leaf weeds per 100 SF of sod. Sod shall be completely free of Category I Invasive Exotics Plants on the current List of Invasive Species prepared by the Florida Exotic Pest Plant Council. The list includes Cogon Grass and Tropical Soda Apple.

C. Pasture sod is not acceptable.

D. For replacement of damaged turf on adjacent properties, provide grass species and variety that is the same type as the damaged turf.

E. Provide sod from North Florida sod farms that are located above a horizontal East/West line drawn through the center of Ocala, Florida.

F. Turf sod shall be: “Argentine” Bahia (Paspalum notatum Flugge).

3.2 FERTILIZER: Granulated commercial grade fertilizer with a ratio of nitrogen (N), phosphorous (P), and potassium (K) recommended by the soil test. The fertilizer shall contain minor elements of iron (Fe), manganese (Mn), and sulfur (S), and trace amounts of zinc (Zn), copper (Cu) and boron (B). Provide 30-50% of N in slow- release form. If a soil test is waived by the Engineer, then the fertilizer shall contain a ratio of N/P/K close to 1/0/1.

3.3 YARD SAND: Coarse, clean yellow sand, commonly called “yard sand” free of limerock, clay, brush, weeds, roots, stumps, gravel, litter, and other extraneous or toxic matter harmful to plant growth.

3.4 SOIL: Use existing topsoil free of contaminates for filling between in sod pieces and for minor leveling of grass areas.

3.5 WATER:

A. Suitable quality for plant irrigation.

B. If the landscape areas are covered by an irrigation system, the contractor shall pay for all irrigation water consumption during construction and until Initial Acceptance of the landscaping. The Nassau County shall pay for irrigation water consumption during the plant establishment period.

C. If landscaping is not covered by an irrigation system, the contractor shall pay for all irrigation water consumption during construction, until Initial Acceptance of the landscaping, during the plant establishment period until Final Acceptance.

PART IV – EXECUTION

4.1 GENERAL:

A. Sod new turf areas described in the contract documents, and existing turf areas that are damaged by the contractor's operations, including turf damaged by the storage of materials or equipment and the movement of vehicles.

B. Begin grassing operation after the Top Soil Layer has been applied, graded and accepted. Delay work if the soil is excessively wet or muddy.

4.2 TURF MOWING UNTIL INITIAL ACCEPTANCE:

A. Maintain existing and new turf areas within the work limits of the project beginning 14 days after the date of the Notice-to-Proceed, unless the Engineer approves a later date.

B. Debris Removal: Before and after each mowing, remove trash, paper, sticks, and other like debris from turf areas. After mowing and edging, remove from the adjacent pavement all grass clippings or other debris generated by the operations. Grass clippings may remain in the lawn areas.

C. Mow and edge turf areas when the grass blades are 30% taller than the desired mowing height recommended by the County Agent for the grass species and cultivar. Repeat mowing each time the grass height again exceeds 30% of the recommended mowing height. (Grass height does not include the height of seed stalks). Mowing frequency will vary from once every 1½ to 2 weeks during the growing season to once every 4 weeks during the dormant season; but in no case shall the mowing frequency be less than once every 4 weeks. Keep mower blades sharp.

D. Edging: Immediately after each mowing, edge all sidewalks, curbs, paved surfaces, and plant beds adjacent to lawn areas. Do not use a string trimmer for edging; use only a blade edger.

E. Trimming: Immediately after each mowing, trim around all vertical obstacles within the lawn areas,

such as walls, fences and sign posts. Match mowing height. If string trimmers are used, protect vertical structures from damage, particularly tree trunks.

4.3 PREPARATION

A. Remove bottles, boards, construction materials and other debris prior to commencement of the landscape work. Commencement of work shall indicate acceptance of the site conditions.

B. Removal of Existing Vegetation:
   1. Apply non-selective herbicide to new or disturbed turf areas covered with weeds and other vegetation. Apply herbicide only when the vegetation is actively growing.
   2. After vegetation is dead, remove weeds and damaged turf, being careful not to damage the surface roots of the existing trees. Extend removal of damaged turf to form straight regular edges to allow a tight fit between the new sod and the existing undisturbed turf.

A. Loosen soil of all new turf areas to a minimum depth of 6-in., excluding the areas containing surface roots of existing trees. Remove lime rock, stones over 1 1/2-in., sticks, roots, rubbish, and soil contaminated with material detrimental to plant growth, and other extraneous matter exposed by this operation. Spread pH adjustment materials throughout new turf areas in quantities recommended by the soil test for the plants specified.

B. If soil is encountered in the turf areas that have been contaminated with lime rock or other debris from the construction operations, notify the Engineer. After the Engineer's review, excavate the area of contaminated soil to the depth approved by the Engineer. Remove and replace with topsoil or yard sand at no additional cost to the Nassau County. If contaminated soil is discovered that appears to be pre-existing before the beginning of construction operations, then the cost of the removal and replacement of contaminated soil shall be negotiated with the Contractor.

C. Limit preparation to those areas that can be sodded within 48 hours. Grade, rake and drag finish soil level to a smooth, even surface with a loose, uniformly fine texture. Grade soil to remove ridges and fill depressions with yard sand or topsoil as necessary to meet finish grades. Establish the soil finish grade in areas to be sodded to allow for sod thickness, providing a sod finish grade 1-in. below adjacent pavement or curbs. Remove excess fill.

D. Notify Engineer when soil preparation is completed and obtain approval of the prepared turf areas before beginning grassing operations.

4.4 SODDING:

A. Lay sod on the day of delivery and within 36 hours after stripping at the farm. If sodding is delayed, keep palette or rolls moist and shaded. Covering shall allow air circulation around sod to prevent heat buildup. Do not lay broken, torn or uneven sod pads or pads with dead, or dried out grass that has turned mostly brown, if in the growing season.

B. If the soil is very dry, lightly moisten the prepared areas immediately before applying sod.

C. Lay sod in straight (not curved) parallel rows to form a solid mass with tightly fitted joints, without overlap. Stagger strips to offset joints. Work yard sand or topsoil into minor cracks. Where seeded areas meet sod, transition level of soil to cover sod root zone.

D. Begin installing sod along the longest straight line, such as a driveway or walk. Lay sod in straight (not curved) parallel rows to form a solid mass. Butt and push edges and ends of the sod pieces tightly together, without stretching, gaps or overlap. Use a sharp knife or machete to trim sod edges to fit. Stagger strips to offset joints. REMOVE ALL EXPOSED SOD NETTING. Avoid leaving small strips of sod at the outer edges of the new turf areas. Also avoid repeated walking or kneeling on the sod during installation and after watering.

E. Work topsoil or yard sand into minor cracks. Where new sod meets existing turf, taper the soil grade of the new sod down so that the top of the new sod and existing turf are flush. Begin the taper 6 ft. away from the edge of the existing turf.

F. 4:1 slopes or greater and in swales, begin laying sod at the bottom of the slope. Lay sod pads with long dimension of pads perpendicular to the flow of water and stagger joints. If roll sod is used, run rolls in the direction of the slope. Secure sod with pegs, staples, or other approved fasteners as necessary to resist washout until the sod is well rooted into the soil. Drive fasteners flush with top of sod. Avoid a continuous seal along the bottom of the swale.

G. Roll entire sodded area with a 200-lb. roller to improve sod/soil contact and to remove air pockets.

H. Apply approximately 1 inch of water to sod within ½ hour after rolling or until the entire sod pad and the soil beneath the pad is thoroughly wet. Thereafter, water sod sufficiently (at least once a day, if no rain) to keep the turf and the soil beneath the turf moist to a depth of 4-in. until the turf is firmly rooted (about 2 to 4 weeks).

4.5 EXISTING TURF REPAIR

A. Restore by sodding all existing turf areas damaged by contractor's operations such as the installation of the irrigation system, storage of materials or equipment and the movement of vehicles. Repair to be performed by the Landscape Subcontractor.

B. Preparation
   1. Remove damaged turf. Rake and drag the disturbed areas. Remove ridges and fill depressions with topsoil as required to meet finish grades. Allow for sod thickness, providing a sod finish grade level with adjacent turf and 1 inch below adjacent pavement.
   2. Moisten prepared areas before planting if soil is dry. Water thoroughly and allow surface moisture to dry before planting. Do not create a muddy soil condition.

C. Sodding: Follow procedure described for new sod.

D. Where pipe trenching has required the temporary removal of a narrow strip of turf, the existing turf

may be replanted if the turf has been carefully cut out in solid strips in healthy condition with the roots and soil intact; laid adjacent to the trench, grass side up; and then replanted within 24 hours after stripping. Compact trench backfill before sodding.

4.6 FERTILIZATION:

A. Sodded Turf: Apply fertilizer to all sodded turf areas within the work area during the Initial Inspection at a rate of 1 lb. of nitrogen / 1000 SF.

4.7 CLEAN-UP AND PROTECTION:

A. During grassing work, store materials and equipment where directed. Keep pavements clean and work area in an orderly condition.

B. Protect grass areas from damage. Maintain protection during installation and until Initial Acceptance. Treat, repair or replace damaged turf areas as directed.

C. Initial Inspection and Acceptance: When sodding of turf areas are complete, submit written notification to the Engineer. The Engineer shall conduct an initial inspection within 10 days after receipt of the Contractor's notification.

D. Sodded areas shall be acceptable if the sod is healthy, even colored, free of open joints and bare areas, and without visible signs of disease or insect stress, obvious patches of foreign grasses and broadleaf weeds. In no case shall the total amount of weeds or foreign grasses exceed 5 plants per 100 SF or 2% of the grassed area. If during the initial inspection, noxious weeds are identified growing within the sod pads or rolls, then the sod work will not be approved until all noxious weeds are eradicated.

E. Replace rejected work within 14 days of notification and continue specified maintenance until re-inspected and found to be acceptable. Remove rejected sod from the project site.

4.8 WARRANTY:

A. Warranty that all new turf shall remain in "healthy, vigorous condition" and meet the requirements of the specifications from the date of Initial Acceptance throught the maintenance period, and until Final Acceptance.

B. If the Final Inspection occurs in the dormant season, when the sod is partially or totally brown, then the warranty of the sod shall be extended until the sod has returned to its natural green color in the spring and can be inspected by the Engineer to determine if the sod is still in a "healthy, vigorous condition" and conforms to the specifications.

4.9 MAINTENANCE:

A. Maintenance Period:

1. Begin maintenance of new turf immediately after each area is planted and continue through the Initial Acceptance, the maintenance period specified, and until Final Acceptance.
2. If the scope of the landscaping work is limited to grassing only, maintain the sodded areas until the sod is well rooted into the soil (usually 30 to 45 days) and a uniform stand of grass is established in the seeded areas.
3. If the scope of the landscape work includes other landscaping (trees, palms, shrubs, and groundcovers), the maintenance period for turf shall be for same time period established for the other landscaping.

B. Grass Maintenance:
1. Regrade settled or eroded turf areas to proper grade and reset sod. Fill open joints between sod strips with top soil. Keep turf free of insects and disease. Repeat seeding operation until a permanent, uniform stand of healthy grass is established.
2. Water turf sufficiently to maintain healthy growth until Final Acceptance. Keep seed beds uniformly moist with frequent light sprinklings. Decrease watering frequency and increase the amount of water applied each time once the seedlings take root and grow.
3. After the sod is firmly rooted, and the seeded areas have a uniform stand of grass, begin mowing and edging when the grass blades are 30% taller than the desired mowing height recommended by the County Agent for the grass species and cultivar.. Repeat mowing when the grass height again exceeds 30% the recommended mowing height. Mowing frequency should vary from once every 7-10 days during the growing season to once every 4 weeks during the dormant season, but in no case shall the mowing frequency be less than once every 4 weeks. Clean paved areas of mowing debris.

4.10 FINAL INSPECTION AND ACCEPTANCE:

A. When maintenance work is complete, submit written notification to the Engineer. The Engineer shall conduct a final inspection within 10 days after receipt of the Contractor's notification.

B. Grass areas shall be accepted if a permanent, uniform stand of healthy grass is established that is even colored, well-rooted, and with no bare or eroded areas and, free of open joints. There shall be no signs of disease or insect damage, noxious weeds, grassy and broadleaf weeds, and obvious patches of foreign grasses. In no case shall the total amount of weeds or foreign grasses exceed 2% of the sod area or 5 weeds per 100 SF.

C. Replace rejected work within 14 days of notification, unless a time extension is approved. Continue landscape maintenance until work is re-inspected and found acceptable.

4.11 REPLACEMENTS AND CONDITIONS:

A. The warranty, maintenance, inspection, and acceptance provisions shall be extended for replacement turf, except that the maintenance and warranty period shall be only until the replacement turf is well rooted into the soil (usually 30 to 45 days) and the Engineer has inspected and accepted the replacement turf. Each additional replacement, in turn, shall be maintained and

warranted for the same period.

B. Replacements shall comply with the material and installation requirements specified for new work.

C. After Initial Acceptance the Contractor will not be responsible for damage to work resulting from: neglect by Owner; damage by others; abnormal weather conditions such as floods, excessive wind damage, severe freezing or abnormal rains; or other activities beyond the Contractor's control.

4.12 MEASUREMENT AND PAYMENT

A. Measurement and payment of turf seeding and sodding, completed and accepted, is established in the proposal either as a lump sum or by the square yard basis. The price includes all work specified in this section including materials, soil preparation, laying, seeding, rolling and watering new turf, pairing existing turf and maintenance until turf establishment.

B. If the landscape maintenance period is for one year, then the price for landscape maintenance shall be established in the proposal as a separate price item or included in the lump sum bid.

END OF SECTION 02945

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART I - GENERAL

1.1 SUBMITTALS

A. Submit concrete mix designs and laboratory test reports.

B. Comply with ASTM C 94; ACI 301, “Specifications for Structural Concrete for Buildings”; ACI 318, “Building Code Requirements for Structural Concrete”; and CRSI’s “Manual of Standard Practice.”

C. Subcontractor to engage a qualified independent testing agency to review and provide historical data for each concrete mix design to be submitted with mix design submittal.

D. Submit product data complying with all ASTM numbers.

E. The city standard specifications, section 130 is hereby made a part of this section and is fully repeated herein. If there are any discrepancies, the more stringent specification shall take precedence.

F. Submit mix design for the following items:

1. Footings / Foundations.
2. Interior slab on Grade.
3. Exterior concrete.
4. Exterior approach slab.

PART II - PRODUCTS

2.1 MATERIALS

A. Deformed Reinforcing Bars:
ASTM A 615, Grade 60.

B. Welded Steel Wire Fabric: ASTM A 185, flat sheets, not rolls.

C. Portland Cement: ASTM C 150, Type 1.

D. Fly Ash: ASTM C 618, Type F.

E. Aggregates: ASTM C 33, Class 4S.

F. Fiber Reinforcement: ASTM C 1116, Type III, engineered polypropylene fibers.

G. Air-Entraining Admixture: ASTM C 260.

H. Chemical Admixtures: ASTM C 494, water reducing.

I. Water Stops: Flat dumbbell or center-bulb type, of either rubber (CRD C 513) or PVC (CRD C 572).

J. Vapor Retarder: Clear 15-mil-thick polyethylene.

K. Liquid Membrane-Forming Curing Compound: ASTM C 309, clear, Type I, Class A or B, solvent borne, wax free.

L. Curing & Sealing Agent: Ashford Formula or Curecrete Chemical Company.

M. Termite protection: Per Section 02282

2.2 MIXES

A. Proportion normal-weight concrete mixes to provide the following properties:

1. Footings / Foundations:
   a. Compressive Strength: 3000 psi at 28 days.
   b. Slump Limit: 4 ± 1 inch at point of placement.
   c. Water-Cement Ratio: 0.50 maximum at point of placement.
   d. Air Content: 2% to 4%.

2. Interior slab on grade:
   a. Total cementitious content not to exceed 520 pounds (Use Type II Cement. Fly Ash, Silica Fume and Ground Granulated Blast Furnace Slag (GGBFS) are not allowed)
   b. Aggregates
      1. Size Number: 467 (1-1/2 inch normal).
      2. Conform to ACI 302.1, Section 5.4.
      3. Minimum Combined Aggregate gradation larger than one inch: Eight percent.
      4. Blend different aggregate sizes as necessary to obtain required grading. Coarse aggregate must be crushed granite or limestone unless otherwise approved by Architect/Engineer. Rounded river gravel aggregate is not acceptable.
   c. Compressive Strength: 4,000 psi at 28 days, see plan.
   d. Slump Limit: 4 ± 1 inch at point of placement.
   e. Water-Cement Ratio: 0.44 maximum at point of placement.
   f. Air Content: Maximum 2% (No Entrained Air).

3. Exterior concrete:
   a. Compressive Strength: 3000 psi 28 days.
   b. Slump Limit: 4 ± 1 inch at point of placement.
   c. Water-Cement Ratio: 0.46 maximum at point of placement.
   d. Air Content: 4% to 7%.

4. Exterior approach slab:
    a. Compressive Strength: 4,000 psi at 28 days.
    b. Slump Limit: 4 ± 1 inch at point of placement.
    c. Water-Cement Ratio: 0.35 maximum at point of placement.
    d. Air Content: 4% to 7%.

For normal weight concrete mixes, requirements of Section 130 Portland Cement Concrete of the City of Jacksonville Standard Specifications shall govern if they conflict with the properties described above.

PART III - EXECUTION

3.1 CONCRETING

A. Construct formwork and maintain tolerances and surface irregularities within ACI 117 limits of Class A for concrete exposed to view and Class C for other concrete surfaces.

B. Set water stops where indicated to ensure joint watertightness.

C. Place vapor retarder on prepared subgrade, with joints lapped 6 inches and sealed.

D. Accurately position, support, and secure reinforcement.

E. Install construction, isolation, and control joints.

F. Place concrete in a continuous operation and consolidate using mechanical vibrating equipment.

G. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placing, and curing.

H. Formed Surface Finish: Smooth-formed finish for concrete exposed to view, coated, or covered by waterproofing or other direct-applied material; rough-formed finish elsewhere.

I. Interior Covered Slab Finishes: Scratch finish for surfaces to receive mortar setting beds; float finish surfaces for interior steps and ramps and surfaces to receive waterproofing, or other direct-applied material; troweled finish for floor surfaces and floors to receive floor coverings, paint, or other thin film-finish coatings; trowel and fine broom finish for surfaces to receive thin-set tile; non-slip broom finish to exterior concrete platforms, steps, and ramps.

J. Interior Exposed Slab Finishes (Other than the Apparatus Bay): After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and re-straighten 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. Ground Floor Slab: Finish surfaces to the following tolerances, measured within 24 hours according to ASTM E 1155 for a randomly trafficked floor surface:
        a. Specified overall values of flatness, F_F 45; and levelness, F_L 35; with minimum local values of flatness, F_F 30; and levelness, F_L 24.

K. In the Apparatus Bay, provide machine trowel non-slick concrete slab finish to be approved by the Owner. The Design Build Firm shall contact the Owner and notify him of the scheduled concrete pour 48 hours in advance of the work.

L. Cure formed surfaces by moist curing until forms are removed.

M. Begin curing unformed concrete after finishing. At Contractor's option keep concrete continuously moist for at least 7 days or apply membrane-forming curing compound to concrete.

N. Owner will engage a testing agency to perform tests and to submit test reports.

O. Protect concrete from damage. Repair surface defects in concrete.

(END OF SECTION 033000)

SECTION 03 35 00

CONCRETE FINISHING

PART 1 - GENERAL

1. 1 SUMMARY

A. This section includes the following.
   1. Applying Sealer and Hardener, and polishing concrete to specified finish level.

B. Related Work:
   1. Section 03 30 00 Cast-In-Place Concrete

1.2 REFERENCES

A. American Society for Testing and Materials:
   1. ASTM-C779, Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces
   2. ASTM G23-81, Ultraviolet Light & Water Spray
   3. ASTM C805, Impact Strength

B. American Concrete Institute
   1. ACI 302. 1R-89, Guide for Concrete Floor and Slab Construction

C. Other Test:
   1. Reflectivity

1.3 SYSTEM DESCRIPTION

A. Performance Requirements: Provide polished flooring that has been designed, manufactured and installed to achieve the following:
   1. Abrasion Resistance: ASTM C779, Method A, high resistance, no more than 0.008 inch (0.20 mm) wear in 30 minutes.
   2. Reflectivity: Increase of 35% as determined by standard gloss meter.
   3. Waterproof Properties: Rilem Test Method 11.4, 70% or greater reduction in absorption.
   4. High Traction Rating: NFSI 101-A, ANSI B-101.1 2009 non-slip properties.

B. Design Requirements:
   1. Hardened Concrete Properties:
      a. Minimum Concrete Compressive Strength: 3500 psi (24 MPa).
      b. Normal Weight Concrete: No lightweight aggregate.
      c. Non-air entrained.
   2. Placement Properties:
      a. Natural concrete slump of 4-1/2 inches to 5 inches (114 to 127 mm). Admixtures may be used.
      b. Flatness Requirements:
         1) Overall FF 50.
         2) Local FF 40.

3. Hard-Steel Troweled (3 passes) Concrete: No burnishing marks. Finish to ACI 302.1R, Class 5 floor.
    a. Class 6 floors, special colored mineral aggregate hardener with repeated hard steel trowel finish.
4. Curing Options:
    a. Membrane forming curing compounds (ASTM C309, Type 1, Class B, all resin, dissipating cure). 1) Acrylic curing and sealing compounds not recommended.
    b. Sheet membrane (ASTM C171); polyethylene film not recommended.
    c. Damp Curing: Seven day cure.

1.4 SUBMITTALS

A. Comply with pertinent provisions of Section 01600- Product Requirements.
1. Provide submittal information within 35 calendar days after the contractor has received the owner's notice to proceed.

B. Product data:
1. Submit special concrete finishes manufacturer's specifications and test data.
2. Submit special concrete finishes describing product to be provided, giving manufacturer's name and product name for the specified material proposed to be provided under this section.
3. Submit special concrete finishes manufacturer's recommended installation procedures; which when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the work.
4. Submit special concrete finishes technical data sheet giving descriptive data, curing time, and application requirements.
5. Submit special concrete finishes manufacturer's Material Safety Data Sheet (MSDS) and other safety requirements.
6. Follow all special concrete finishes published manufacturer's installation instructions.

C. Test Reports:
1. Provide certified test reports, prepared by an independent testing laboratory, confirming compliance with specified performance criteria.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:
1. Use an experienced installer with at least 5 year polished concrete experience and adequate number of skilled workmen who are thoroughly trained and experienced in the necessary craft.
2. The special concrete finish manufacturer shall certify applicator.
3. Applicator shall be familiar with the specified requirements and the methods needed for proper performance of work of this section.

B. Manufacturer's Certification:
1. Provide letter of certification from concrete finish manufacturer stating that installer is certified applicator of special concrete finishes, and is familiar with proper procedures and installation requirements required by the manufacturer.

C. Mock-ups:
1. Apply mock-ups of each type finish, to demonstrate typical joints, surface finish, color variation (if any), and standard of workmanship.
    a. Build mock-ups approximately 50 square feet in the location indicated or if not indicated, as directed by the Architect or Owner Representative.
    b. Notify Architect or Owner Representative seven days in advance of dates and times when mock-ups will be constructed.
    c. Obtain from the Architect or Owner Representative approval of mock-ups before starting construction.
    d. If the Architect or Owner Representative determines that mock-ups do not meet requirements, demolish and remove them from the site and cast others until mock-ups are approved.
    e. Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed work.
    f. Approved mock-ups may become part of the completed work if undisturbed at time of substantial completion.

D. Protection
1. No satisfactory chemical or cleaning procedure is available to remove petroleum stains from the concrete surface. Prevention is therefore essential.
    a. All hydraulic powered equipment must be diapered to avoid staining of the concrete.
    b. No trade will park vehicles on the inside slab. If necessary to complete their scope of work, drop cloths will be placed under vehicles at all times.
    c. No pipe cutting machine will be used on the inside floor slab.
    d. Steel will not be placed on interior slab to avoid rust staining.
    e. Acids and acidic detergents will not come into contact with slab.
    f. All trades informed that the slab must be protected at all times.

E. Pre-Installation Conference:
1. Conduct conference at project site with Owner and Architect prior to installation.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original containers, with seal's unbroken, bearing manufacturer labels indicating brand name and directions for storage.

B. Dispense special concrete finish material from factory numbered and sealed containers. Maintain record of container numbers.

1.7 PROJECT CONDITIONS

A. Environmental limitations:
1. Comply with manufacturers written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting topping performance.
    a. Concrete Floor Flatness rating recommended at least 40, where possible.
    b. Concrete Floor Levelness rating recommended at least 30, where possible.
    c. Concrete must be cured a minimum of 45 days or as directed by the manufacturer before application of Retro Plate can begin.

d. Application of Retro-Plate shall take place 10 days prior to installation of equipment and substantial completion, thus providing a complete, uninhibited concrete slab for application.

B. Close areas to traffic during floor application and after application, for time period recommended in writing by manufacturer.

PART 2 – PRODUCTS

2.1 MATERIALS AND MANUFACTURERS

A. HARDENING/SEALING AGENT
1. Retro-Plate 99, manufactured by Advanced Floor Products, Inc., P.O. Box 50533, Provo, Utah 84605, 801-812-3420.
   a. Performance Criteria:
      i. Abrasion Resistance: ASTM C779 – Up to 400% increase in abrasion resistance.
      ii. Impact Strength: ASTM C805 – Up to 21% increase impact strength.
      iii. Ultra Violet Light and Water Spray: ASTM G23-81 – No adverse effect to ultra violet and water spray.
      iv. Reflectivity: Up to 30% increase in reflectivity.
2. Certified Applicators
3. Manufacturer's Regional Representative

2.2 RELATED MATERIALS

A. Neutralizing Agent:
1. Tri-sodium Phosphate

B. Water:
1. Potable

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS:

A. Examine substrate, with installer present, for conditions affecting performance of finish. Correct conditions detrimental to timely and proper work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that base slab meet finish and surface profile requirements in Division III Section 03 30 00 "Cast-In-Place Concrete," and Project Conditions above.

C. Prior to application, verify that floor surfaces are free of construction latents.

3.2 APPLICATION

A. Start any of the floor finish applications in presence of manufacturer's technical representative.

B. Sealing, Hardening and Polishing of Concrete Surface
   1. Concrete must be in place a minimum of 45 days or as directed by the manufacturer before application can begin.
   2. Application is to take place at least 10 days prior to racking and other in-store accessory installation, thus providing a complete, uninhibited concrete slab for application
   3. Only a certified applicator shall apply Retro-Plate 99. Applicable procedures must be followed as recommended by the product manufacturer and as required to match approved test sample.
   4. Achieve waterproofing, hardening, dust-proofing, and abrasion resistance of the surface without changing the natural appearance of the concrete, except for the sheen.
   5. Polish to required sheen level.

3.3 WORKMANSHIP AND CLEANING:

A. The premises shall be kept clean and free of debris at all times.

B. Remove spatter from adjoining surfaces, as necessary.

C. Repair damages to surface caused by cleaning operations.

D. Remove debris from jobsite
   1. Dispose of materials in separate, closed containers in accordance with local regulations.

3.4 PROTECTION:

A. Protect finished work until fully cured in accordance with manufacturer's recommendations.

END OF SECTION 03 35 00

SECTION 04 22 23

ARCHITECTURAL CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including 00 01 00 General Requirements, apply to the Section.

1.2 SUMMARY

A. This Section includes the following:

1. Concrete masonry.
2. Reinforced unit masonry.
3. Thru wall flashing.
4. Unit drainage system.

B. Related Sections:

1. Division VII Section 07 60 00 “Flashing and Sheet Metal” for exposed sheet-metal flashing installed in masonry.
2. Division VII Section 07 60 00 “Flashing and Sheet Metal” for sill pans.
3. Division IX Section 09 91 00 “Painting” for water repellant applied to Masonry.

C. Products installed but not furnished under this Section include the following:

1. Manufactured reglets in masonry joints for metal flashing specified in VII Section 07 60 00 “Flashing and Sheet Metal”.
2. Hollow metal frames in unit masonry openings specified in Division VIII Section 08 11 13 “Steel Doors and Frames”.

1.3 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops the following installed compressive strengths (f m) at 28 days.

B. For concrete unit masonry: as follows based on net area:

1. fm = 1500 psi
2. As indicated on the structural drawings.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to County requirements.

B. Product Data for each different masonry unit, accessory and other manufactured product specified. This includes, but not limited to, CMU, reinforcement, through wall flashing, unit drainage system and mortar/grout.

C. Shop drawings for reinforcing detailing fabrication, bending and placement of unit masonry reinforcing bars. Comply with ACI 315 "Details and Detailing of Concrete Reinforcement" showing bar schedules, stirrup spacing, diagrams of bent bars and arrangement of masonry reinforcement.

D. Shop Drawings for Powers Lintels.

E. Material test reports for the following:

1. Mortar complying with property requirements of ASTM C 270.
2. Mortar complying with BIA M1.
3. Grout mixes. Include description of type and proportions of grout ingredients.
4. Masonry units.

F. Submit letter of certificate for the use of Dry-Block admixture in masonry units.

G. Submit control joint material and cut sheets.

1.5 QUALITY ASSURANCE

A. Single Source Responsibility for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one source and by a single manufacturer for each different product required.

B. Single Source Responsibility for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from once source or producer for each aggregate.

C. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 DELIVERY, STORAGE AND HANDLING

A. Store masonry units on elevated platforms, under cover and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion and other causes. If units become wet, do not install until they are in an air-dried condition.

B. Store 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 avoided.

1.7 PROJECT CONDITIONS

A. Protection of Masonry: During erection, 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.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

B. Do not apply uniform roof loads for at least 12 hours and concentrated loads for a least 3 days after building masonry walls or columns.

C. 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 come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.
2. Protect sills, ledges and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt on completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit masonry damaged by frost or freezing conditions. Comply with the following requirements:

1. Cold-Weather Construction: When the ambient temperature is within the limits indicated, use the following procedures:

   a. 40 to 32 deg F: Heat mixing water or sand to produce mortar temperatures between 40 and 120 deg F.
   b. 32 to 25 deg F: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F. Heat grout materials to produce grout temperatures between 40 and 120 deg F. Maintain mortar and grout above freezing until used in masonry.
   c. 25 to 20 deg F: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F. Heat grout materials to produce grout temperatures between 40 and 120 deg F. Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg F if grouting. Use heat on both sides of walls under construction.
   d. 20 deg F and Below: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F. Heat grout materials to produce grout temperatures between 40 and 120 deg F. Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg F. Provide enclosures and use heat on both sides of walls under construction to maintain temperatures above 32 deg F within the enclosures.

2. Cold-Weather Protection: When the mean daily temperature is within the limits indicated, provide the following protection:

   a. 40 to 25 deg F: Cover masonry with a weather-resistant membrane for 48 hours after construction.
   b. 25 to 20 deg F: Cover masonry with insulating blankets or provide enclosure and heat for 48 hours after construction to prevent freezing. Install wind breaks when wind velocity exceeds 15 mi./h.
   c. 20 deg F and Below: Provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for 48 hours after construction.

3. 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 out, but not less than 7 days after completion of cleaning.

E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of

100 deg F and above.

PART 2 - PRODUCTS

2.1 MANUFACTURERS (ALL COLORS BY OWNER)

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Portland Cement, Mortar Cement, Masonry Cement, and Lime:

a. Essroc Materials, Inc.
b. Glen-Gery Corporation.
c. Lafarge Corporation.
d. Lehigh Portland Cement Co.
e. Riverton Corporation (The).
f. National Cement Company, Inc.
g. Holcim (US) Inc.
h. Capital Materials Corporation; Flamingo Color Masonry Cement.

2. Mortar Pigments:

a. Bayer Corporation, Industrial Chemicals Div.; Bayferrox Iron Oxide Pigments
b. Davis Colors.
c. Lafarge Corporation.
d. Solomon Grind-Chem Services, Inc.

3. Joint Reinforcement, Ties, and Anchors:

a. Dur-O-Wal, Inc.
b. Heckman Building Products, Inc.
c. Hohmann & Barnard, Inc.
d. Masonry Reinforcing Corp. of America.
e. National Wire Products Industries.
f. Southern Construction Products.

4. Colors by Architect and Government.

2.2 CONCRETE MASONRY UNITS

A. General: Provide shapes indicated and as follows for each form of concrete masonry unit required.

1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
2. Provide square-edged units for outside corners.

B. Concrete Masonry Units: ASTM C 90 and as follows:

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength indicated below:

a. 1900 psi.
b. Not less than the unit compressive strengths required to produce concrete unit masonry construction of compressive strength indicated.

2. Weight Classification: Normal weight.
3. Provide Type I, moisture-controlled units.
4. Size: Manufactured to the actual dimensions listed below (within tolerances specified in the applicable referenced ASTM specification) for the corresponding nominal sizes indicated on Drawings:

a. 8 inch nominal: 7-5/8 inch actual.
b. 12 inch nominal: 11-5/8 inch actual.

C. Exposed Faces: Provide integral colored split,smooth and ground-faced concrete masonry units.

D. Design Basis: Oldcastle Coastal® split-face, smooth-face, and/or ground-face masonry units. Other acceptable suppliers include A1- block as supplied by W.R. Grace Construction Products, Anchor/Demaco Architectural Masonry Systems, Trenwyth Premium Architectural Masonry Units.

E. Color: by Architect/Government, with “dry block” additive for base of wall, columns and screenwall.

F. Dry Block Masonry and Mortar System by Grace Construction Products or RainBloc Admixtures.

1. Applicable Standards – ASTM International:
   a. ASTM C90 Standard Specification for Load Bearing Concrete Masonry Units.
   b. ASTM C780 Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
   c. ASTM C1314 Standard Test Method for Constructing and Testing Masonry Prisms used to Determine Compliance with Specified Compressive Strength of Masonry.
   d. ASTM C1357 Standard Test Method for Evaluating Masonry Bond Strength.
   e. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.
   f. ASTM E514 Standard Test Method for Water Penetration and Leakage Through Masonry.

2. Concrete Masonry Units Qualified Dry-Block Producers manufacturer water repellent CMUs incorporating Dry-Block admixture for block using qualified mix designs and dosage rates.
3. Mortr – DryBlock mortar admixture is added at the recommended dosage rate, which is dependent on the type of mortar being used.
4. Mortar mixing procedure – Agitate dry-block mortar admixture before using. DryBlock should be added to the mix water prior to charging the cement and sand. Reduce the initial water used in the mortar.

2.3 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch, use aggregate graded with 100 percent passing the No. 16 sieve.

D. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars.

E. Epoxy Pointing Mortar: ASTM C 395, epoxy-resin based material formulated for use as pointing mortar for, and approved by manufacture of, structural clay tile facing units; in color indicated or, of not otherwise indicated, as selected by Architect from manufacturer's standard colors.

F. Water: Potable.

G. Mortar color by Architect.

H. See DryBlock above.

2.4 REINFORCING STEEL

A. Steel Reinforcing Bars: Material and grade as follows:

1. Billet steel complying with ASTM A 615.

a. Grade 60 (Grade 400).

B. Deformed Reinforcing Wire: ASTM A 496, with ASTM A 153, Class B-2 zinc coating.

2.5 JOINT REINFORCEMENT

A. General: Provide joint reinforcement formed from the following:

1. Galvanized carbon-steel wire, coating class as follows: ASTM A 153, Class B-2, for both interior and exterior walls.

B. Description: Welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10 feet, with prefabricated corner and tee units, and complying with requirements indicated below:

1. Wire Diameter for Side Rods: 0.1483 inch.
2. Wire Diameter for Cross Rods: 0.1483 inch.

C. For single-wythe masonry, provide type as follows with single pair of side rods:

1. Truss design with continuous diagonal cross rods spaced not more than 16 inches o.c.

2.6 TIES AND ANCHORS, GENERAL

A. General: Provide ties and anchors specified in subsequent articles that comply with requirements for metal and size of this Article, unless otherwise indicated.

B. Wire: As follows:

1. Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.
2. Wire Diameter: 0.1875 inch.

2.7 BENT WIRE TIES

A. Individual units prefabricated from bent wire to comply with requirements indicated below:

1. Tie Shape for Hollow Masonry Units Laid with Cells Vertical: Rectangular with closed ends and not less than 4 inches wide.

2.8 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Type 2, Class A, Grade 1; compressible up to 35 percent; of width and thickness indicated; formulated from the following material:

1. Neoprene.

B. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

C. Concrete Masonry Unit Drainage System

1. #BN120 CMU Drainage System as manufactured by Mortar Net, Inc., Gary IN, 800-664-6638 or equivalent.

2.9 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: manufacturer's standard strength, general purpose cleaner designed for removing mortar/grout stains, efflorescence and other new construction stains form new masonry surfaces of type indicated below without discoloring or damaging masonry surfaces; expressly approved for intended use by manufacturer of masonry units being cleaned.

B. Available Products: Subject to compliance with requirements, products that may be used to clean unit masonry surfaces include, but are not limited to the following:

1. 202 New Masonry Detergent; Diedrich Technologies, Inc.
2. 200 Lime Solv; Diedrich Technologies, Inc.
3. 202V Vana-Stop; Diedrich Technologies, Inc.
4. Sure Klean No. 600 Detergent; ProSoCo, Inc.
5. Sure Klean No. 101 Lime Solvent; ProSoCo, Inc.
6. Sure Klean Vana Trol; ProSoCo, Inc.

2.10 INSULATION

A. Foamed-in-Place Masonry Insulation: Two component thermal insulation produced by combining 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.

B. Available Manufacturers:

1. Manufacturers subject to compliance with requirements, provide products from the flowing or equal:

a. Core-fill Tailored Chemical Products (500).
b. Air Krete, Inc.
c. Jesco, Inc. (Rabco Foam Insulation).

2.11 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including air-entraining agents, accelerators, retarders, anti-freeze compounds or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Provide "dry block" additive to mortar and grout mixes maintain water repellency for the exterior wall. Provide in quantity and mix as recommended by the manufacturers.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification, for job-mixed mortar; and ASTM C 1142for ready-mixed mortar, of types indicated below:

1. Limit cementitious materials in mortar to portland cement and lime.
2. For masonry below grade in contact with earth, and where indicated, use Type S.
3. For exterior, above-grade, load-bearing use Type N.

C. Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required.

1. Limit pigments to the following percentages of cement content by weight. For mineral oxide pigments and Portland cement-lime mortar, not more than 10 percent.

2. Design Basis: Holcim o r Mortamix Custom Color Masonry Cement; Color: As selected by architect.

D. Grout for Unit Masonry: Comply with ASTM C 476. Use grout of consistency indicated or, if not otherwise indicated, of consistency (fine or coarse) at time of placement that will completely fill spaces intended to receive grout.

1. Use fine grout in grout spaces less than 2 inches in horizontal dimension, unless otherwise indicated.
2. Use coarse grout in grout spaces 2 inches or more in least horizontal dimension, unless otherwise indicated.

C. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's directions.

2.12 SOURCE QUALITY CONTROL

A. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested for strength, absorption and moisture content per ASTM C 140.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of unit masonry. Do not proceed with installation until

unsatisfactory conditions have been corrected.

B. Examine rough-in and built-in construction to verify actual locations of piping connections prior to installation.

3.2 INSTALLATION, GENERAL

A. Thickness: Build single-wythe walls to the actual thickness of the masonry units, using units of thickness indicated.

B. Leave openings for equipment to be installed before completion of masonry. After installing equipment, complete masonry to match construction immediately adjacent to the opening.

C. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting, where possible. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

D. Mix units for exposed unit masonry from several pallets or cubes as they are placed to produce uniform blend of colors and textures.

3.3 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces of walls and arrises, do not exceed 1/4 inch in 10 feet, nor 3/8 inch in 20 feet, nor 1/2 inch in 40 feet or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet, nor 1/2 inch in 40 feet or more. For vertical alignment of head joints, do not exceed plus or minus 1/4 inch in 10 feet, nor 1/2 inch maximum.

B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet, nor 1/2 inch in 40 feet or more. For top surface of bearing walls, do not exceed 1/8 inch in 10 feet, nor 1/16 inch within width of a single unit.

C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls, and partitions, do not exceed 1/2 inch in 20 feet, nor 3/4 inch in 40 feet or more.

D. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4 inch nor plus 1/2 inch.

E. Variation in Mortar-Joint Thickness: Do not vary from bed-joint thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary bed-joint thickness from bed-joint thickness of adjacent course by more than 1/8 inch. Do not vary from head-joint thickness indicated by more than plus or minus 1/8 inch. Do not vary head-joint thickness from adjacent head-joint thickness by more than 1/8 inch. Do not vary from collar-joint thickness indicated by more than minus 1/4 inch or plus 3/8 inch.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets. Avoid the use of less-than-half-size units at corners, jambs, and where possible at other locations.

B. Install concrete masonry unit drainage system in accordance with manufacturers written instructions.

C. Lay walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

D. Bond Pattern for Exposed Masonry: Lay exposed masonry in One-half running bond with vertical joint in each course centered on units in courses above and below. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

E. Stopping and Resuming Work: In each course, rack back 1/2-unit length for one-half running bond or 1/3-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar prior to laying fresh masonry.

F. Built-in Work: As construction progresses, build-in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

G. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.

H. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.

I. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry units as follows:

1. With full mortar coverage on horizontal and vertical face shells.
2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.
4. Maintain joint widths indicated, except for minor variations required to maintain bond alignment. If not indicated, lay walls with 3/8-inch joints.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

3.6 MASONRY-CELL INSULATION

A. General: Install formed-in-place 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 though a series of 5/8" to 7/8" holes drilled into every vertical column of block cells (every 8 feet on center) beginning at an approximate height of four (4) feet from finished floor level. Repeat this procedure at an approximate height of 8 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.

3.7 HORIZONTAL-JOINT REINFORCEMENT

A. General: Provide continuous horizontal-joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcing a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Provide reinforcement in mortar joint 1 block course above and below wall openings and extending 12 inches beyond opening.

B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.8 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joints in unit masonry where indicated. Build-in related items as the masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.

B. Form control joints in concrete masonry as follows:

1. Fit bond-breaker strips into hollow contour in ends of block units on one side of control joint. Fill the resultant core with grout and rake joints in exposed faces.

3.9 LINTELS

A. Provide masonry / “Powers” lintels where shown and where openings of more than 12 inches for brick size units and 24 inches for block size units are shown without structural steel or other supporting lintels.

1. Provide lintels as specified on the structural drawings matching concrete masonry units compressive strength as required to support loads indicated. Exposed portions of installed lintels to be painted to match masonry units.

B. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.10 THRU WALL FLASHING

A. In masonry thru wall flashing details used Pre-Kleened EPDM thruwall flashing by Carlisle. Install as per manufacturer's instructions.

B. Install weep holes in the head joints in exterior wythes of masonry as indicated on drawings.

1. Space weep holes 16 inches o.c.

3.11 INSTALLATION OF REINFORCED UNIT MASONRY

A. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.

1. Construct formwork to conform to shape, line, and dimensions shown. Make sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

B. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.

1. Do not exceed the following pour heights for fine grout:

a. For minimum widths of grout spaces of 3/4 inch or for minimum grout space of hollow unit cells of 1-1/2 by 2 inches, pour height of 12 inches.
b. For minimum widths of grout spaces of 2 inches or for minimum grout space of hollow unit cells of 2 by 3 inches, pour height of 60 inches.
c. For minimum widths of grout spaces of 2-1/2 inches or for minimum grout space of hollow unit cells of 2-1/2 by 3 inches, pour height of 12 feet.
d. For minimum widths of grout spaces of 3 inches or for minimum grout space of hollow unit cells of 3 by 3 inches, pour height of 24 feet.

2. Do not exceed the following pour heights for coarse grout:

a. For minimum widths of grout spaces of 1-1/2 inches or for minimum grout space of hollow unit cells of 1-1/2 by 3 inches, pour height of 12 inches.
b. For minimum widths of grout spaces of 2 inches or for minimum grout space of hollow unit cells of 2-1/2 by 3 inches, pour height of 60 inches.
c. For minimum widths of grout spaces of 2-1/2 inches or for minimum grout space of hollow unit cells of 3 by 3 inches, pour height of 12 feet.
d. For minimum widths of grout spaces of 3 inches or for minimum grout space of hollow unit cells of 3 by 4 inches, pour height of 24 feet.

3. Provide cleanout holes at least 3 inches in least dimension for grout pours over 60 inches in height.

a. Provide cleanout holes at each vertical reinforcing bar.
b. At solid grouted masonry, provide cleanout holes at not more than 32 inches o.c.

3.12 FIELD QUALITY CONTROL

A. The Contractor will employ and pay a qualified independent testing agency to perform the following testing for field quality control. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.

B. Testing Frequency: Tests and Evaluations listed in this Article will be performed during construction for each 5000 sq. ft. (460 sq. m) of wall area or portion thereof.

C. Mortar composition and properties will be evaluated per ASTM C 780.

D. Grout will be sampled and tested for compressive strength per ASTM C 1019.

E. Prism-Test Method: For each type of wall construction indicated, masonry prisms will be tested per ASTM E 447, Method B, and as follows:

1. Prepare 1 set of prisms for testing at 7 days and 1 set for testing at 28 days.

F. Evaluation of Quality-Control Tests: In the absence of other indications of noncompliance with requirements, masonry will be considered satisfactory if results from construction quality-control tests comply with minimum requirements indicated.

3.13 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units; install in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point-up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for application of sealants.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears prior to tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain present on exposed surfaces.

E. Protection: Provide final protection and maintain conditions that ensure unit masonry is without damage and deterioration at time of Substantial Completion.

END OF SECTION 04 22 23

SECTION 05 12 00

MISCELLANEOUS STEEL

PART I – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Conditions Section 00100 apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Metal bollards.
2. Girder truss Hurricane ties.
3. LVL Beam bearing devices.

B. Related Sections include the following:

1. Division 5 Section "Structural Steel."
2. Division 6 Section "Rough Carpentry" for metal framing anchors.

1.3 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Paint products.

B. Shop Drawings: Show fabrication and installation details for metal fabrications. (Shops not required for girder truss hurricane ties or LVL beam bearing devices.

C. Include plans, elevations, sections, and details of metal fabrications and their connections.

D. Cut-sheets on hurricane ties.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
2. Provide allowance for trimming and fitting at site.

1.6 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings for field use, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART II - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.3 FASTENERS

A. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

B. Anchor Bolts: ASTM F 1554, Grade 36.

1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.

C. Eyebolts: ASTM A 489.

D. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).

E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

F. Wood Screws: Flat head, ASME B18.6.1.

G. Plain Washers: Round, ASME B18.22.1 (ASME B18.22M).

H. Lock Washers: Helical, spring type, ASME B18.21.1 (ASME B18.21.2M).

I. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; 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, hot-dip galvanized per ASTM A 153/A 153M.

J. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material for Anchors in Exterior Locations: Alloy Group 1 (A1) 2 (A4) stainless-steel bolts complying with ASTM F 593 (ASTM F 738M) and nuts complying with ASTM F 594 (ASTM F 836M).

2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Shop Primers: Provide primers that comply with Division 9 painting Sections.

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

1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Pre-assemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

E. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.

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

G. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

H. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

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 retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Furnish inserts if units are installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated or required when exposed to weather.

D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.7 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 40 steel pipe.

2.8 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.

C. ASTM A 123/A 123M, for galvanizing steel and iron products.

1. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

D. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on insulation, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART III - 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. 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. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

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

3.2 INSTALLING PIPE BOLLARDS

A. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches (75 mm) above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.

B. Fill bollards solidly with concrete, mounding top surface to shed water.

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.

1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

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

END OF SECTION 051200

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Wood furring, grounds, nailers, and blocking.
2. Sheathing.
3. Framing with engineered wood products.

1.2 DEFINITIONS

A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise specified.

1.3 SUBMITTALS

A. Product Data for the following products:

1. Product Data for engineered wood products, blocking, furring, nailers, sheathing, and metal framing anchors.

2. Material certificates for engineered wood products specified to comply with minimum allowable unit stresses.

B. Warranty of chemical treatment manufacturer for each type of treatment.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.

1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

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. Wood-Preservative-Treated Materials:

a. Baxter: J. H. Baxter Co.
b. Chemical Specialties, Inc.
c. Continental Wood Preservers, Inc.
d. Hickson Corp.
e. Hoover Treated Wood Products, Inc.
f. Osmose Wood Preserving, Inc.
g. Great Southern Wood Preserving.

2.2 LUMBER, GENERAL

A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.

B. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.

C. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.

1. Provide dressed lumber, S4S, unless otherwise indicated.
2. Provide seasoned lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

A. General: Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWPA C2 (lumber) and AWPA C9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.

1. Do not use chemicals containing chromium or arsenic.

B. Pressure treat aboveground items with waterborne preservatives to a minimum retention of 0.25 lb/cu. ft. (4.0 kg/cu. m). After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively. Treat indicated items and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

C. Complete fabrication of treated items before treatment, where possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

2.4 MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.

B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.

C. Moisture Content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.

D. Grade: For dimension lumber sizes, provide No. 3 or Standard grade lumber per ALSC's NGRs of any species. For board-size lumber, provide No. 3 Common grade per NELMA, NLGA, or WWPA; No. 2 grade per SPIB; or Standard grade per NLGA, WCLIB or WWPA of any species.

2.5 CONCEALED, PERFORMANCE-RATED STRUCTURAL-USE PANELS

A. General: Where structural-use panels are indicated for the following concealed types of applications, provide APA-performance-rated panels complying with requirements designated under each application for grade, span rating, exposure durability classification, and edge detail (where applicable).

1. Thickness: Provide panels meeting requirements specified but not less than thickness indicated.
2. Span Ratings: Provide panels with span ratings required to meet "Code Plus" provisions of APA Form No. E30, "APA Design/Construction Guide: Residential & Commercial."

B. Wall Sheathing: APA-rated Structural I sheathing.

1. Exposure Durability Classification: Exterior.
2. Exposure Durability Classification: Exposure 1.
3. Span Rating: 12/0, 16/0, 20/0, or Wall - 16 for stud spacing of 16 inches (406 mm) or less.

C. Roof Sheathing: APA-rated Structural I sheathing.

1. Exposure Durability Classification: Exterior.
2. Exposure Durability Classification: Exposure 1.
3. Span Rating: As required to suit rafter spacing indicated.
4. Span Rating: 32/16.
5. Span Rating: 16/0 or Roof - 16.

2.6 STRUCTURAL-USE PANELS FOR BACKING

A. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant-treated plywood panels with grade, C-D Plugged Exposure 1, in thickness indicated or, if not otherwise indicated, not less than 15/32 inch (11.9 mm) thick.

2.7 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of Type 304 stainless steel.

B. Nails, Wire, Brads, and Staples: FS FF-N-105.

C. Power-Driven Fasteners: CABO NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1. (ASME B18.2.3.8M)

F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

2.8 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch (25-mm) nominal thickness, compressible to 1/32 inch (0.8 mm); selected from manufacturer's standard widths to suit width of sill members indicated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Discard units of material with defects that impair quality of rough carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.

B. Set rough carpentry to required levels and lines, with members plumb, true to line, 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. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

E. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

F. Use common wire nails, unless otherwise indicated. Use finishing nails for finish work. 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 between members. Install fasteners without splitting wood; predrill as required.

3.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

A. Install wood grounds, nailers, blocking, and sleepers where shown and where required for screeding or attaching other work. Form to shapes shown and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

C. Install permanent grounds of dressed, preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 INSTALLATION OF STRUCTURAL-USE PANELS

A. General: Comply with applicable recommendations contained in APA Form No. E30, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.

1. Comply with "Code Plus" provisions of above-referenced guide.

B. Fastening Methods: Fasten panels as indicated below:

1. Sheathing: Screw to framing.
2. Plywood Backing Panels: Screw to supports.

3.4 AIR-INFILTRATION BARRIER

A. Cover sheathing with air-infiltration barrier as follows:

1. Apply air-infiltration barrier to comply with manufacturer's written instructions.

END OF SECTION 06 10 00

SECTION 06 17 53

PREFABRICATED WOOD TRUSSES

PART I - GENERAL

1.1 SCOPE

A. General Conditions Section 0100 apply to this section.

B. The work under this section shall include prefabricated wood trusses.

1.2 SUMMARY

A. This Section includes the following:

1. Wood roof trusses.
2. Wood girder trusses.
3. Wood truss bracing.
4. Metal truss accessories

1.3 SUBMITTALS

A. Product Data: Fabricator's technical data covering lumber, metal plates, metal-plate connectors, metal truss accessories, hardware, fabrication process, treatment and handling and erection

B. Certificates:

1. Submit certification, signed by an officer of the fabricating firm, indicating that trusses to be supplied for project comply with indicated requirements.

C. Shop Drawings and Calculations:

1. Show species, sizes and stress grades of lumber to be used; pitch, span, camber, configuration and spacing for each type of truss required; type, size, material, finish, design values, location of metal connector plates; and bearing and anchorage details.
2. Shop drawings and calculations shall be prepared by a structural engineer licensed to practice in the State of Florida. Provide drawings and calculations bearing the impressed seal and signature of the Engineer responsible for the design, in accordance with the Florida Board of Professional Engineers.

1.4 QUALITY ASSURANCE

A. TPI Standards: Comply with applicable requirements and recommendations of the following Truss Plate Institute (TPI) publications:

1. Design Specification for Metal Plate Connected Wood Trusses.
2. Design Specification for Metal Plate Connected Parallel Chord Wood Trusses.
3. Commentary and Recommendations for Handling and Erecting Wood Trusses.
4. Commentary and Recommendations for Bracing Wood Trusses.
5. Quality Standard for Metal Plate Connected Wood Trusses.

B. Wood Structural Design Standard: Comply with applicable requirements of N.F.P.A. National Design Specification for Wood Construction.

C. Design by Manufacturer: Trusses shall be designed by Connector plate manufacturer to support all superimposed dead and live loads indicated, with design approved and certified by a structural engineer licenses to practice in the State of Florida.

D. Connector Plate Manufacturer's Qualifications: Proved truss connector plates manufactured by a firm which is a member of TPI and which complies with TPI quality control procedures for manufacture of connector plates published in TPI, Quality Standard for Metal Plate Connected Wood Trusses.

E. Lumber Standard: Manufacture of lumber to comply with PS 20, American Softwood Lumber Standard and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.

F. Refer to structural drawings for additional information for wind loading.

1.5 DELIVERY, STORAGE AND HANDLING

A. Handle and store trusses with care, and in accordance with manufacturer's instructions and TPI recommendations to avoid damage from bending, overturning or other cause for which truss is not designed to resist or endure.

B. Time delivery and erection of trusses to avoid extended on site storage and to avoid delaying work of other trades whose work must follow erection of trusses.

PART II - PRODUCT

2.1 MATERIALS

A. Lumber: Factory mark each piece of lumber with type, grade, mill, and grading agency. Provide lumber manufactured to actual sized required by PS 20 to comply with requirements indicated below:
   1. Dressed, S4S, unless otherwise indicated.
   2. Moisture Content: Seasoned, with 19 percent maximum moisture content at time of dressing and shipment for sizes 2 in. or less in nominal thickness, unless otherwise indicated.
   3. Species: As required to meet design. Provide trusses all of the same species.
   4. Grade: All truss members shall be No. 2 or better.
   5. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Division 06 Section "Rough Carpentry"

B. Connector Plates: Hot dip galvanized steel sheet; Structural (physical) quality steel sheet complying with ASTM A 446 Grade A; zinc coated by hot dip process to comply with ASTM A 525, Designation G60; minimum coated metal thickness indicated but not less than 0.036 in.

C. Fasteners and Anchorages: Provide size, type, material and finish for nails, screws, bolts, nuts, washers and other anchoring devices as required by design.

2.2 FABRICATION

A. Cut truss members to accurate lengths, angles and sizes to produce close fitting joints with wood-to-wood bearing in assembled units.

B. Fabricate metal connector plates to size, configuration, thickness and anchorage details required for types of joint designs indicated.

C. Assemble truss members in design configuration indicated using jigs or other means to ensure uniformity and accuracy of assembly with close fitting joints. Position members to produce design camber indicated.

D. Connect truss members by means of metal connector plates accurately located and securely fastened to each side of wood members by means indicated or approved.

PART III - EXECUTION

3.1 INSTALLATION

A. Erect and brace trusses to comply with recommendations of manufacturer, the Truss Plate Institute, and as specified.

B. Erect trusses with plane of truss webs vertical (plumb) and parallel to each other, located accurately at design spacings as indicated.

C. Hoist units in place by means of lifting equipment suited to sizes and types of trusses required, applied at designated lift points as recommended by fabricator, exercising care not to damage truss members by joints by out of plane bending or other causes.

D. Provide temporary bracing as required to maintain trusses plumb, parallel and in location indicated, until permanent bracing is installed.

E. Anchor trusses securely at all bearing points to comply with methods and details indicated.

F. Install permanent bracing and related components to enable trusses to maintain design spacing, withstand live and dead loads including lateral loads, and to comply with other indicated requirements.

G. Do not cut or remove truss members.

END OF SECTION 061753

SECTION 06 20 23

INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Plastic-laminate cabinets and countertops.
   2. Casework hardware.

B. This Section does not include the following:
   1. Wood Veneer Lockers.

1.2 RELATED WORK

A. General millwork and/or special conditions specifically noted on plans.

B. Blocking within walls for anchoring casework.

C. Sinks, mechanical and electrical fixtures, service and waste lines, and all connections furnished and installed under Mechanical and Electrical Divisions.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall show evidence of a minimum of five (5) years experience in providing manufactured casework. Manufacturer shall also show evidence of adequate facilities and personnel required to perform on this project.

B. Single-Source Manufacturing and Installation Responsibility: Engage a qualified Manufacturer to assume undivided responsibility for woodwork specified in this section, including fabrication, finishing, and installation.

C. Installer Qualifications: Arrange for installation of architectural woodwork by a firm that can demonstrate successful experience in installing architectural woodwork items similar in type and quality to those required for this project.

D. AWI Quality Standard: Comply with applicable requirements of "Architectural Woodwork Quality Standards" published by the Architectural Woodwork Institute (AWI) except as otherwise indicated.

E. Design of architectural woodwork including layouts, door and drawer arrangements and countertop configurations shall conform to the drawings.

F. Construction methods, joiner, materials and material thickness are shown on the drawings and specified herein. Bids not complying to these requirements will be rejected.

1.4 SUBMITTALS

A. Product Data

In addition to general conditions relating to prior approvals, submittals of manufacturer's data and samples are required for items including but not limited to drawer slides, grommets, pulls, hooks and other hardware, edge band, laminate samples etc. Any changes in color by owner if required.

B. Shop Drawings

1. Submit shop drawings for casework and countertops showing plan view, elevations, details, casework joinery, sizes of casework, and method of anchoring.
2. Include layout of units with relation to other building components and coordination with other trades, including floor base trim height/clearance

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, spoilages, and deterioration.

B. Do not deliver woodwork until painting, wet work, grinding, and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions."

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet-work is completed, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Environmental Limitations: Obtain and comply with woodwork fabricator's and Installer's coordinated advice for optimum temperature and humidity conditions for woodwork during its storage and installation. Do not install woodwork until these conditions have been attained and stabilized so that woodwork will be within plus or minus 1.0 percent of optimum moisture content from date of installation through remainder of construction period.

C. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Verify locations of concealed framing, blocking, reinforcements, and furring that support woodwork by accurate field measurements before being enclosed. Record measurements on final shop drawings.

1.7 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

A. 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 not meeting these minimum standards will not be accepted.

B. Specific materials, finish options, construction details, modularity, hardware, and test data are specified herein.

2.2 DEFINITIONS

A. Listed are definitions and materials commonly used in defining laminate clad casework. Refer to FABRICATION section for those items selected for use on this project.

B. Definitions: Identification of casework parts by surface visibility.
   1. Open Interiors: Any open storage unit without solid doors or drawer fronts and units with glass doors. Material, GP28 high pressure decorative laminate, color per schedule. (Note: Thermofused melamine, CL20 cabinet liner or glued on top coated melamine papers are not acceptable).
   2. Closed Interiors: Any closed storage unit behind hinged solid door or drawer fronts and sliding solid doors. Material, GP28 high pressure decorative laminate, white, or light gray. (Note: Thermofused melamine, CL20 cabinet liner or glued on top coated melamine papers are not acceptable).
   3. Exposed Surfaces: Any unit door/drawer front when closed and exposed ends. Material GP28 high pressure decorative laminate. (Colored melamine is not acceptable).
   4. Semi-Exposed Surfaces: Tops of wall and tall cabinets and exterior bottoms of wall cabinets, unless otherwise designated, shall be GP28 high pressure decorative laminate, white, or light gray.
   5. Concealed Surfaces: Any surface not normally visible after installation such as cabinet backs to wall and cabinet sides to cabinet sides. Material shall be a balanced backer. These flat surfaces shall be laminated and not left raw or painted.
   6. Balanced construction of all laminated panels is mandatory.

2.3 CORE MATERIALS

A. Veneer-Faced Panel Products (Hardwood Plywood): HPVA-1 without particleboard, MDF or hardboard core and made with adhesive containing no urea formaldehyde.

2.4 DECORATIVE LAMINATES

A. Countertops: Solid or pattern high pressure decorative laminates GP50 (.050) or post forming horizontal grade. NEMA test LD-3-1985. Changes in color by owner if required.
   1. Finish – Watch Countertop: Wilsonart “Tuscan Walnut” 7921-38
   2. Finish – Kitchen: Countertops: Natural quartz surface, color to be selected.

B. Exposed Cabinet Surfaces: Solid or pattern color high pressure decorative laminates GP28 (.028). NEMA test LD-3-1985. Thermofused melamine is not acceptable. Changes in color by owner if required.
   1. Finish - Dispatch: “Dove Gray” D92-60.
   2. Finish – Bunker Room Gear Shelves: Wilsonart “Graphite Nebula” 4623-60.
   3. Finish - Boot Stowage: “Pewter Brush” 4779-60
   4. Finish- Laundry Rm, Dining, Kitchen: Wilsonart “Tuscan Walnut” 7921-38
   5. Finish-All Remaining Linen Cabinets (Private Rooms and Vestibule): Wilsonart “Tuscan Walnut” 7921-38

C. High pressure cabinet liner CL20 (.020) for balance to GP28. NEMA test LD-3-1985.

D. High pressure backer BK20 (.020).

E. Acceptable manufacturers: Wilsonart, Formica, Nevamar, and Pionite.

F. Coordinate color selection with owner prior to shop drawing submittal.

2.5 EDGING MATERIALS

A. 3mm PVC banding, machine applied with waterproof hot melt adhesive. Use 3mm for all doors, drawer fronts, end panels, exposed shelves, and intermediate vertical panels on exposed shelving.

B. Color: The Contractor shall submit samples of PVC edging that closely match color of countertops, doors, drawer fronts, end panels, exposed shelves, and intermediate vertical panels on exposed shelving for final approval by the Architect together with samples of laminates.

2.6 CABINET HARDWARE AND ACCESSORY MATERIALS

A. Hinges
   1. Concealed (European Type) hinges conforming to BHMA B01602.
   2. For doors to 24" wide:
      a. Two hinges for doors weighing up to 20 lbs.
      b. Three hinges for doors weighing 20 - 40 lbs.
      c. Four hinges for doors weighing 40 - 60 lbs.
   3. Two hinges for doors up to 35-1/2" high.
   4. Three hinges for doors up to 63" high.

B. Pulls
   1. Wire pulls - 4 inches (100 mm) long, 5/16 inches (8 mm) in diameter, satin chromium plated (BHMA 626) with 1" finger clearance.

C. Drawer Slides
   1. Standard Drawers: Bottom mount, self-closing design, epoxy powder coated to match drawer body color, with positive in-stop, out-stop, and out-keeper to maintain drawer in 80% open position. Captive nylon rollers, both front and rear. Minimum 100 lb. dynamic load rating. Provide adjuster cam to regulate body side sway. Approved: Knape & Vogt K-V 8400, 100 pound load.
   2. File Drawers: Full extension, 3-part progressive opening slide, minimum 100 lb., zinc plated or epoxy coated at manufacturer's option. Approved: Knape & Vogt K-V 8400, 100 pound load.
   3. File Drawer Accessory: Pendaflex rack.

D. Adjustable Shelf Supports
   1. To be twin pin design with anti tip-up shelf restraints for both 3/4 inch and 1 inch shelves. Design to include keel to retard shelf slide-off, and slot for ability to mechanically attach shelf to clip. Load rating to be minimum 300 lbs. each support. Approved: Knape & Vogt K-V 346 ANO.

E. Locks
   1. Where indicated on drawings, provide door locks complying with E07121 (BHMA).
   2. Where indicated on drawings, provide drawer locks complying with E07041 (BHMA).
   3. Keying:
      a. Supplier shall meet with the Owner's representative to finalize keying requirements. Submit to the owner's representative a separate detailed schedule indicating clearly how the owner's final

instructions on keying of the cylinders has been fulfilled.

b. Comply with the owner's requirements for masterkeying and, except as otherwise indicated, provide individual change key for each lock which is not designated to be keyed alike with a group of related locks.

c. Permanently inscribe each key with keyset and "Do not Duplicate". Provide keys of nickel silver only.

F. Grommets

1. Grommets for cable passage through countertops: 2-3/8" (60 mm) OD molded-plastic grommets with hole and plastic cap with slot for wire passage, color to be black.

G. Silencers

1. Provide vinyl silencers to all cabinet doors, two (2) per door.

H. Storage Room Heavy Duty Shelf Standards and Brackets

1. Heavy Duty Shelf Standards: 12 gauge steel standards 7/8" wide x 11/16" high with 2" slot adjustment Knape & Vogt KV 87 WH
2. Heavy Shelf Supports: Steel supports with single molded nylon cam lock lever. Knape & Vogt KV 187LL WH

I. Hat and Coat Hook

1. Tubular Specialties 895 Hat & Coat Hook. Satin Finish

2.7 FABRICATION

A. Fabricate casework to dimensions, profiles and details shown on drawings.

B. Cabinet Body Construction

1. Joinery shall be AWI's custom grade.
2. Unless specifically indicated, core shall be 3/4" thick plywood before lamination. Edging and surface finishes as indicated herein.
2. Unit backs on fixed cabinets shall be 1/2" thick plywood, laminated with GP28 high pressure decorative laminate and balanced backer on concealed side, captured four sides and glued. Exposed backs shall be 3/4" plywood with exterior surface GP28 laminate as selected.
3. All fixed base and tall units shall have a separate and continuous pressure treated pine or exterior grade plywood base.
4. All under counter units, except sink base units, shall be provided with a full subtop. All sink cabinet bodies shall be exterior grade plywood core laminated with CL20 cabinet liner.
5. All exposed and semi-exposed edges of the cabinet body shall be factory edged with 3mm PVC banding, machine applied with waterproof hot melt adhesive.
6. Adjustable shelf core shall be 3/4" thick plywood up to 30" wide.
7. All upper wall cabinets shall provide a clear inside depth of 12 inches.
8. Exposed ends of double sided shelving units shall be covered with one piece of GP28 high pressure decorative laminate finish material. No joints permitted.

C. Drawers

1. Back and sides shall be 1/2" thick plywood, laminated with GP28 high pressure decorative laminate. Subfront shall be 5/8" plywood. Sides, back, and sub-front shall be connected by glued lock shoulder or doweled.
2. Drawer bottoms shall be 3/8" thick plywood with the drawer box bottom sides, hardwood edged. All surfaces shall be laminated with laminated with GP28 high pressure decorative laminate. Drawer bottom shall be captured four sides with a continuous bead of glue. Drawers over 24" shall

have the bottoms reinforced.

D. Door/Drawer Fronts
   1. Core for all doors and applied drawer fronts shall be 3/4" thick plywood. All edges shall be finished with 3mm PVC. Color as selected by Architect.
   2. Double doors shall be used on all cabinets in excess of 24" wide.
   3. Exterior faces shall be laminated with high pressure decorative laminate GP28, color as selected, balanced with cabinet liner CL20 to match basic cabinet interior body color.

2.8 DECORATIVE LAMINATE COUNTERTOPS

A. All countertops (excluding vanity & kitchen countertops) shall be self edged with a 1-1/2" thick built-up front edge. Top face laminated with GP50 (.050) high pressure laminate and balanced with backer underside. Exposed corners shall have a 2" radius.

B. All vanity countertops shall be self edged (see drawings for dimensions). Top face laminated with GP50 (.050) high pressure laminate and balanced with backer underside. Back and side splashes shall be 3/4" butt type and fastened to the deck with a waterproof caulk and screwed. Core material shall be a marine grade plywood core.

C. Splices in core materials or laminate shall not be over knee spaces or vanity locations.

PART 3 – EXECUTION

3.1 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installing.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

3.2 INSTALLATION

A. Quality Standard: Install woodwork to comply with AWI Section 400 for the same grade specified in Part 2 of this Section for type of woodwork involved.

B. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm) in 8'-0" for plumb and level (including tops) and no variations in flushness of adjoining surfaces.

C. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for complete installation.

E. Cabinets: Install without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.

F. Tops: Anchor securely to base units and other support systems as indicated. Caulk space between backsplash and wall with specified sealant.
   1. Install countertops with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
   2. Secure backsplashes to tops with concealed metal brackets at 16 inches (400 mm) o.c.
   3. Complete the finishing work specified in this Section to the extent not completed at shop or before installation of woodwork. Fill nail holes with matching filler where exposed. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats were applied in the shop.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork where possible to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

3.4 PROTECTION

A. Provide final protection and maintain conditions in a manner acceptable to fabricator and Installer that ensures that woodwork is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 06 20 23

SECTION 07 21 00

BUILDING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Blanket (Batt) insulation at interior acoustical partitions.
   2. Board Insulation at the perimeter CMU exterior walls including walls adjacent to apparatus room. See wall types.
   3. Foam cavity insulation

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division IV Section 04 22 23 "Architectural Concrete Unit Masonry" for insulation installed in cavity walls and masonry cells
   2. Division VII Section 07 21 29 "Polyicynene Open Cell Spray Insulation" for Spray Foam Insulation.

1.2 SUBMITTALS

A. Product Data for each type of insulation product specified including fire and flame spread data and product data indicating compliance with applicable ASTM requirements.

B. Product test reports from and based on tests performed by a qualified independent testing agency evidencing compliance of insulation products with specified requirements including those for thermal resistance, fire-test-response characteristics, fire & flame-spread data, water-vapor transmission, water absorption, and other properties, based on comprehensive testing of current products.

C. Research or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence compliance of foam-plastic insulations with building code in effect for Project.

1.3 QUALITY ASSURANCE

A. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products complying with requirements indicated without delaying the Work.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated on Drawings or specified elsewhere in this Section 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.

1.4 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. Protect against ignition at all times. 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

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering insulation products that may be incorporated in the work include:

B. Manufacturers: Subject to compliance with requirements, provide insulation products by one of the following:
   1. Glass-Fiber Insulation: (R-11)
      a. CertainTeed Corporation.
      b. Knauf Fiber Glass GmbH.
      c. Owens-Corning Fiberglas Corporation.
      d. Manville Bldg. Materials Corp.
      e. United States Gypsum Co.
      f. Guardian Fiberglass, Inc.
   2. Polyisocyanurate Board Insulation: (R-7 fully adhered, min. 4'x8' nom square edges taped).
      a. Celotex Corporation (The).
      b. NRG Barriers, Inc.
      c. DOW Chemical Company
      d. Rmax, Inc.
      e. Atlas Roofing Corporation
   3. Foamed-in-place Masonry Insulation: Two component thermal insulation produced by combining 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. (R-4.91 per inch).
      a. Available Manufacturers
         1. Manufacturers subject to compliance with requirements, provide products from the following.
            i. Core-Fill 500 Tailored Chemical Products.
            ii. Air Krete, Inc.
            iii. Jesco, Inc. (Rabco Foam Insulation).
         2. Install as per manufacturer's instructions.

2.2 INSULATING MATERIALS

A. General: Provide insulating materials that comply with requirements and with referenced standards.
   1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.

B. Unfaced Mineral-Fiber Blanket Insulation: Thermal insulation combining mineral fibers of type described below

with thermosetting resins to comply with ASTM C 665, Type I (blankets without membrane facing).

1. Mineral-Fiber Type: Fibers manufactured from glass.
2. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 25 and 50, respectively.

C. Polyisocyanurate Board Insulation: Rigid, cellular polyisocyanurate thermal insulation with core formed by using hydrochlorofluorocarbons as blowing agent and faced on both sides with aluminum foil to comply with referenced standards and with other requirements indicated below:

1. Federal Standard: FS HH-I-1972/1, reinforced core.
2. ASTM Standard: ASTM C 1289, Type I, Class 1 or 2.
3. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 75 and 450, respectively, based on tests performed on unfaced core on thicknesses up to 4 inches (101 mm).
4. Thermal Resistivity: 7.2 deg F x h x sq. ft./Btu x in. at 75 deg F (50 K x m/W at 24 deg C).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or that interfere with insulation attachment.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, unsoiled, and has not been exposed at any time to ice 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. Apply single layer of insulation to produce thickness indicated.

E. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

F. Installation guidelines (for foamed-in-place masonry insulation): 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 four (4) feet from finished floor level. Repeat this procedure at an approximate height of ten (10) feet above the first horizontal row of holes (or as needed) until void is completely filled. Patch holes with mortar and score to resemble existing surface.

3.4 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 to provide permanent placement and support of units.

B. Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:
   1. Use blanket widths and lengths that fill cavities formed by framing members. Where more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
   2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
   3. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically.

C. Stuff glass-fiber loose-fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).

3.5 INSTALLATION OF RIGID INSULATION

A. For units of rigid insulation, install adhesive on inside face of exterior wall, as recommended by manufacturer. Press units firmly against inside wall to adhere to CMU. Fit courses of insulation with edges butted tightly both ways. Seal all joints with vapor retardant tape.
   1. Coat edges of insulation units with full bed of adhesive to seal joints between insulation and between insulation and adjoining construction.

3.6 PROTECTION

A. General: Protect installed insulation and vapor retarders 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 07 21 00

SECTION 07 21 29

POLYICYNENE OPEN CELL SPRAY INSULATION

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Polyicynene open cell spray insulation at underside of roof surfaces.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
1. ASTM C518, Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
2. ASTM D2863, Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-like Combustion of Plastics (Oxygen Index).
3. ASTM E84, Test Method for Surface Burning Characteristics of Building Materials.
4. ASTM E90, Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
5. ASTM E96, Test Methods for Water Vapor Transmission of Building Materials.
6. ASTM E283, Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Differences Across the Specimen.

1.3 SUBMITTALS

A. Product Data: Provide data on materials describing insulation properties, surface burning characteristics, precautions for installation in existing facilities. Indicate compliance with specific ASTM requirements.

B. Manufacturers Installation Instructions: Indicate special procedures, perimeter conditions requiring special treatment and closure of existing roof vents.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements

D. Installation Certificate of Compliance (ICC) Report

E. Installation Certificate of Compliance

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three (3) years documented experience.

B. Applicator: Company specializing in performing the work of this section with minimum three (3) years documented experience and certified by the manufacturer.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Toxicity/Hazardous Materials
   1. Outgassing/Reactivity:
      a. Formaldehyde: Products containing urea-formaldehyde will not be permitted.
      b. Chlorofluorocarbons (CFCs)/HCFCs: Products and equipment requiring or using CFCs or HCFCs during the manufacturing process will not be permitted.

B. Air-tightness: Meet specific standards of the Energy Star Program of 1.5 Air Changes/Hour at 50 Pa.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.

B. Store materials in an area protected from freezing and overheating damage and in accordance with manufacturer's instructions.

C. Protect materials during handling and application to prevent damage and contamination.

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. Icynene, Inc. 6747 Campobello Road, Mississauga, Ontario L5n 2L7 Canada. Telephone 800-758-7325; fax 905-363-0102; web-site www.icynene.com

2.2 MATERIALS

A. Polyicynene Spray Insulation: Icynene; hydrophobic, low-density, open-cell modified polyicynene; conforming to the following: (Total R Value -29.6)
   1. Thermal Resistance (R-Value/inch): ASTM C518; 3.6 hr/sq ft/degree F/BTU. In.
   2. Air Permeance (for 5.25 inches of material): ASTM E283; 0.0049 l/m²/second.
   3. Water Vapor Transmission (for 5 inches of material): ASTM E96; 10 perms.
   4. Sound Transmission Class (STC): ASTM E90; STC 37 in wood stud wall.
   5. Noise Reduction Coefficient (NRC): ASTM E90; NRC-0.7 in wood stud wall.
   6. Corrosion: No significant corrosion when in contact with steel under 85 percent relative humidity.

7. Bacterial or Fungal Growth: No growth; no material deterioration.
8. Flame Spread and Smoke Developed Rating: ASTM E84; <20/<400.
9. Fuel Contribution: ASTM E84; 0.
10. Oxygen Index: ASTM D2863; average value 23.1 percent.

B. Vapor Retarder: Vapor retarder paint or vapor diffusion retarder recommended by insulation manufacturer.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that substrate is flat, dry and free of honeycombs, fins, or foreign material that will impede application.

C. Verify access locations to attic area, protection required for the Owner's existing furniture and equipment, and sufficient space to install the spray insulation.

D. Notify Architect of conditions that would adversely affect the application.

E. Beginning of installation means applicator accepts existing conditions.

3.2 PREPARATION

A. Comply with manufacturer's written installation instructions for preparing substrates indicated to receive insulation.

B. Mask and protect adjacent surfaces from overspray or damage.

C. Remove foreign materials, dirt, grease, oil, paint, laitance, efflorescence, and other substances that will affect application.

3.3 APPLICATION

A. Apply insulation in accordance with manufacturers written application instructions.

B. Apply insulation to a reasonably uniform monolithic density without voids.

C. Apply to minimum cured thickness to provide an aged 'R' value of 22.

D. Apply insulation to fill voids around accessible service and equipment penetrations in the roof.

E. Apply insulation to seal voids at truss ends to prevent wind scouring of ceiling insulation.

F. Seal plumbing stacks, electrical wiring and other penetrations to control air leakage.

3.4 FIELD QUALITY CONTROL

A. Inspect application for insulation thickness and density.

3.5 PROTECTION OF FINISHED WORK

A. Do not permit subsequent work to disturb applied insulation.

3.6 SCHEDULES

A. Location:

1. All interior surface of roof sheathing in building including porches.

END OF SECTION 07 21 29

SECTION 07 26 16

UNDER-SLAB VAPOR BARRIER/RETARDER

PART 1 – GENERAL

1.1 SUMMARY

A. Products Supplied Under This Section
   1. Vapor Barrier, seam tape, mastic, pipe boots, detail strip for installation under concrete slabs.

B. Related Sections:

1.	Section 03 30 00	Cast-in-place Structural Concrete
2.	Divisions XXII and XXIII	General plumbing and mechanical sections
3.	Section 26 00 00	Electrical General Requirements

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM)
   1. ASTM E 1745-97 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil.
      or Granular Fill Under Concrete Slabs.
   2. ASTM E 154-88 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs.
   3. ASTM E 96-95 Standard Test Methods for Water Vapor Transmission of Materials.
   4. ASTM E 1643-98 Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

1.3 SUBMITTALS

A. Quality Control / Assurance
   1. Independent laboratory test results showing compliance with ASTM & ACI Standards.
   2. Manufacturer's samples, literature.
   3. Manufacturer's installation instructions for placement, seaming and pipe boot installation.
   4. Data on seam tape, mastic, boots.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Vapor Barrier
   1. Vapor Barrier must have the following qualities
      a. **Minimum 15-mil thick** Polyolefin Geo-membrane.
      b. Manufactured from Prime, Virgin Resins.
      c. Water Vapor Barrier – ASTM E 1745 meets or exceeds Class A.
      d. Water Vapor Transmission Rate – ASTM E 96 0.008 gr/ft² or lower.

e. Permeance Rating – ASTM E 96 0.01 Perms or lower
f. Puncture Resistance – ASTM D 1709 minimum 2400 grams.
g. Tensile Strength – ASTM D 882 minimum 45.0 lb f/in.

2. Vapor Barrier Products
   a. Design Basis: Stego Wrap **(15 mil) Vapor Barrier** by STEGO INDUSTRIES LLC, San Juan Capistrano, CA (877) 464-7834 www.stegoindustries.com
   b. W.R. Meadows Premoulded Membrane with Plasmatic Core.
   c. Zero-Perm by Alumiseal.

2.2 ACCESSORIES

A. Seam Tape
   1. Tape must have the following qualities:
      a. Water Vapor Transmission Rate - ASTM E 96 0.3 perms or lower.
   2. Seam Tape
      a. Stego Tape by STEGO INDUSTRIES LLC, San Juan Capistrano, CA (877) 464-7834 www.stegoindustries.com
      b. Manufacturer's recommended tape.

B. Vapor Proofing Mastic
   1. Mastic must have the following qualities:
      a. Water Vapor Transmission Rate - ASTM E 96 0.3 perms or lowe.
   2. Mastic
      a. Stego Mastic by STEGO INDUSTRIES LLC, San Juan Capistrano, CA (877) 464-7834 www.stegoindustries.com
      b. Manufacturer's recommended tape.

C. Pipe Boots
   1. Construct pipe boots from vapor barrier material, pressure sensitive tape and/or mastic per manufacturer's instructions.

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 of 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 07 26 16

SECTION 07 31 13

ASPHALT SHINGLES

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. Asphalt shingles.
   2. Self-adhering sheet underlayment.

B. Related Sections include the following:
   1. Division VI Section 06 10 00 "Rough Carpentry" for roof deck wood structural panels.
   2. Division VII Section 07 60 00 "Flashing and Sheet Metal" for metal gutters and downspouts and counterflashings not part of this Section.

C. Compliance with the 2017 Florida Building Code, Sixth Edition
   1. Asphalt shingles shall comply with all pertinent provisions of the 2017 Florida Building Code and specifically with the provisions of Chapter 15 Roof Assemblies and Rooftop Structures
   2. For roof slopes from two units vertical in 12 units horizontal (17-percent slope), up to four units vertical in two12 units horizontal (33-percent slope), underlayment shall be two layers applied in the following manner. Apply a minimum 19-inch-wide strip of underlayment parallel with and starting at the eaves, fastened sufficiently to hold in place. Starting at the eave, apply 36-inch-wide sheets of underlayment overlapping successive sheets 19 inches and fastened sufficiently to hold in place.

1.3 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated including lead boots, underlayment, primer, sealants, nails, roof vents, etc.

B. Samples for Initial Selection: For each type of asphalt shingle indicated.
   1. Include similar Samples of trim and accessories involving color selection.

C. Research/Evaluation Reports: For asphalt shingles. Data indicating compliance with applicable codes.

D. Sample Warranties: Special warranties specified in this Section.

E. Fire-Test-Response Characteristics data indicating compliance with applicable ASTM or UL requirements.

F. Product data to indicate compliance with applicable building codes.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual that is approved, authorized, or licensed by asphalt shingle roofing system manufacturer to install roofing system indicated.

B. Source Limitations: Obtain ridge and hip cap shingles and self-adhering sheet underlayment through one source from a single asphalt shingle manufacturer.

C. Fire-Test-Response Characteristics: Provide asphalt shingle and related roofing materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method 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. Exterior Fire-Test Exposure: Class A; ASTM E 108 or UL 790, for application and roof slopes indicated.

D. Preinstallation Conference: Conduct conference at Project site with owner and architect prior to installation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store roofing materials in a dry, well-ventilated, weathertight location according to asphalt shingle manufacturer's written instructions. Store underlayment rolls on end on pallets or other raised surfaces. Do not double-stack rolls.
   1. Handle, store, and place roofing materials in a manner to avoid significant or permanent damage to roof deck or structural supporting members.

B. Protect unused underlayment from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.

1.7 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit asphalt shingle roofing to be performed according to manufacturer's written instructions and warranty requirements.
   1. Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended by manufacturer.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace asphalt shingles that fail in materials within specified warranty period. Materials failures include manufacturing defects and failure of asphalt shingles to self-seal after a reasonable time.
   1. Material Warranty Period: 40 years from date of Substantial Completion, prorated, with first 5 years nonprorated.
   2. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds up to 140 mph ultimate wind speed or as noted by local authorities having authorities

whichever is most stringent for 5 years from date of Substantial Completion.

B. Special Project Warranty: Roofing Installer's warranty, on warranty form at end of this Section, signed by roofing Installer, covering Work of this Section, in which roofing Installer agrees to repair or replace components of asphalt shingle roofing that fail in materials or workmanship within the following warranty period:
   1. Warranty Period: 2 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. The design basis is GAF-ELK Corporation's Prestique Plus High Definition. Other acceptable manufacturers are listed below.

2.2 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

A. Laminated-Strip Asphalt Shingles: ASTM D 3462, laminated, multi-ply overlay construction, glass-fiber reinforced, mineral-granule surfaced, and self-sealing.
   1. Manufacturing Products:
      a. Atlas Roofing Corporation
      b. Celotex Corporation
      c. CertainTeed Corporation
      d. EMCO Limited, Building Products Division
      e. Georgia-Pacific Corporation
      f. Globe Building Materials, Inc.
      g. IKO
      h. Malarkey Roofing Company
      i. Owens Corning;
      j. TAMKO Roofing Products, Inc.
   2. Butt Edge: Straightened cut.
   3. Strip Size: Manufacturer's standard.
   4. Algae Resistance: Granules treated to resist algae discoloration.
   5. Color and Blends: As selected by Owner from manufacturer's full range standard and of premium colors.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering Sheet Underlayment, Polyethylene Faced: ASTM D 1970, minimum of 40-mil thick, slip-resisting, polyethylene-film-reinforced top surface laminated to SBS-modified asphalt adhesive, with release paper backing; cold applied. Provide primer for adjoining concrete or masonry surfaces to receive underlayment.
   1. Available Products:
      a. Carlisle Coatings & Waterproofing, Div of Carlisle Companies Inc.; Dri-Start "A"
      b. Grace, W.R. & Co.; Grace Ice and Water Shield.
      c. Henry Company, Perma-Seal PE
      d. Johns Manville International, Inc; Roof Defender.
      e. NEI Advanced Composite Technology; AC Poly Ice and StormSeal.
      f. Owens Corning; WeatherLock M.

g. Polyguard Products, Inc.; Polyguard Deck Guard.
h. Protecto Wrap Company; Rainproof TM.
i. Safseal Innovations; SafSeal 7740.

2.4 ACCESSORIES

A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.

B. Roofing Nails: ASTM F 1667; aluminum, stainless-steel, copper, or hot-dip galvanized steel wire shingle nails, minimum 0.120-inchdiameter, barbed shank, sharp-pointed, with a minimum 3/8-inch diameter flat head and of sufficient length to penetrate 3/4 inch into solid wood decking or extend at least 1/8 inch through OSB or plywood sheathing.
1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.

2.5 METAL FLASHING AND TRIM

A. Sheet Metal Flashing and Trim: Comply with requirements in Division VII Section 07 60 00 "Flashing and Sheet Metal."
1. Sheet Metal: Aluminum, mill finished.

B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item.
1. Drip Edges: Fabricate in lengths not exceeding 10 feet with 2-inch roof deck flange and 1-1/2-inch fascia flange with 3/8-inch drip at lower edge.

C. Vent Pipe Flashings: ASTM B 749, Type L51121, at least 1/16 inch thick. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof and extending at least 4 inches from pipe onto roof.

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 work.
1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provision has been made for flashings and penetrations through asphalt shingles.
3. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install on entire roof deck below, lapped in direction to shed water. Lap sides not less than 3-1/2 inches. Lap ends

not less than 6 inches staggered 24 inches between courses. Roll laps with roller. Cover underlayment within 7 days.

1. Prime concrete and masonry surfaces to receive self-adhering sheet underlayment.

3.3 METAL FLASHING INSTALLATION

A. General: Install metal flashings and other sheet metal to comply with requirements in Division 7 Section "Sheet Metal Flashing and Trim."
   1. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

B. Rake Drip Edges: Install rake drip edge flashings over underlayment and fasten to roof deck.

C. Eave Drip Edges: Install eave drip edge flashings below underlayment and fasten to roof sheathing.

D. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

3.4 ASPHALT SHINGLE INSTALLATION

A. Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

B. Install starter strip along lowest roof edge, consisting of an asphalt shingle strip with self-sealing strip face up at roof edge.
   1. Extend asphalt shingles 3/4 inch over fascia at eaves and rakes.
   2. Install starter strip along rake edge.

C. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.

D. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.

E. Install asphalt shingles by single-strip column or racking method, maintaining uniform exposure. Install full length first course followed by cut second course, repeating alternating pattern in succeeding courses.

F. Fasten asphalt shingle strips with a minimum of 5 or as required by local authorities having jurisdiction, whichever is more stringent, roofing nails located according to manufacturer's written instructions.
   1. Where roof slope exceeds 20:12, seal asphalt shingles with asphalt roofing cement spots after fastening with additional roofing nails.
   2. Where roof slope is less than 4:12, seal asphalt shingles with asphalt roofing cement spots.
   3. When ambient temperature during installation is below 0 deg F, seal asphalt shingles with asphalt roofing cement spots.

G. Closed-Cut Valleys: Extend asphalt shingle strips from one side of valley 12 inches beyond center of valley. Use one-piece shingle strips without joints in the valley. Fasten with extra nail in upper end of shingle. Install asphalt shingle courses from other side of valley and cut back to a straight line 2 inches short of

valley centerline. Trim upper concealed corners of cut-back shingle strips.

1. Do not nail asphalt shingles within 6 inches of valley center.
2. Set trimmed, concealed-corner asphalt shingles in a 3-inch- wide bed of asphalt roofing cement.

H. Ridge and Hip Cap Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.

END OF SECTION 07 31 13

SECTION 07 60 00

FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes sheet metal flashing and trim in the following categories:
   1. Metal counter flashing and base flashing.
   2. Metal wall flashing.
   3. Exposed metal trim, drip edges, and fascia.
   4. Copings.
   5. Reglets.
   6. Downspouts/ seamless gutters.
   8. Sill pans.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division IV Sections for through-wall flashing and other integral masonry flashings specified as part of masonry work.
   2. Division VII Section 07 92 00 "Joint Sealants" for elastomeric sealants.
   3. Division VII Roofing Sections for flashing and roofing accessories installed integral with roofing membrane as part of roofing-system work.

1.2 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing.

1.3 SUBMITTALS

A. Samples, cut sheets and product data for each type of flashing or sheet metal product including flashing, masonry thru-wall flashing, reglets, gutters, downspouts and gutter screens. Include product information that indicates installation method and compliance with any applicable ASTM requirements. Product data for copper sheet metal to indicate bending method.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed sheet metal flashing and trim work similar in material, design, and extent to that indicated for this Project and with a record of successful in- service performance.

1.5 PROJECT CONDITIONS

A. Coordinate Work of this Section with interfacing and adjoining Work for proper sequencing of each installation. Ensure best possible weather resistance, durability of Work, and protection of materials and finishes.

PART 2 - PRODUCTS

2.1 SHEET METAL FLASHING AND TRIM MATERIALS

A. Sill pans: ASTM B 370, sheet copper flashing consisting of full single copper sheet weighing 5 oz. per square foot coated each side with asphalt compound weighing 6 ounces per square foot minimum. “Cop- R-Cote” as manufactured by Advanced Building Product, Inc. or approved equal.

B. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated and with not less than the strength and durability of alloy and temper designated below:
1. Factory-Painted Aluminum Sheet: ASTM B 209 (ASTM B 209M), 3003-H14, with a minimum thickness of 0.040 inch (1.0 mm), unless otherwise indicated. Approved manufacturer: Pac-Clad.

C. Lead Sheet: ASTM B 749, Type L51121, copper-bearing lead sheet, with a minimum thickness of 0.0625 inch (1.6 mm) except not less than 0.0937 inch (2.4 mm) thick for applications where burning (welding) is involved.

E. Masonry thru wall flashing and other integral masonry flashings indicated in Division IV Section 04 22 23 "Architectural Concrete Unit Masonry" are specified as part of masonry work.

2.2 REGLETS

A. General: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces and compatible with flashing indicated.

B. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.

C. Flexible Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.

D. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of the counterflashing lower edge.
1. Material: Stainless steel, 0.0187 inch (0.5 mm) thick.

E. Manufacturers: Subject to compliance with requirements manufacturers offering products that may be incorporated into the Work include the following:
1. Fry Reglet Corporation.
2. Hickman: W.P. Hickman Co.
3. Keystone Flashing Company.

2.3 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Burning Rod for Lead: Same composition as lead sheet.

B. Solder: ASTM B 32, Grade Sn50, used with rosin flux.

C. Fasteners: Same metal as sheet metal flashing or other noncorrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.

D. Asphalt Mastic: SSPC-Paint 12, solvent-type asphalt mastic, nominally free of sulfur and containing

no asbestos fibers, compounded for 15-mil (0.4-mm) dry film thickness per coat.

E. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

F. Elastomeric Sealant: Generic type recommended by sheet metal manufacturer and fabricator of components being sealed and complying with requirements for joint sealants as specified in Division VII Section 07 92 00 "Joint Sealants."

G. Epoxy Seam Sealer: 2-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior and interior nonmoving joints, including riveted joints.

H. Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather-resistant seaming and adhesive application of flashing sheet metal.

I. Paper Slip Sheet: 5-lb/square (0.244 kg/sq. m) red rosin, sized building paper conforming to FS UU-B-790, Type I, Style 1b.

J. Polyethylene Underlayment: ASTM D 4397, minimum 6-mil- (0.15-mm-) thick black polyethylene film, resistant to decay when tested according to ASTM E 154.

K. 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; noncorrosive; size and thickness required for performance.

L. Roofing Cement: ASTM D 4586, Type I, asbestos free, asphalt based.

2.4 FABRICATION, GENERAL

A. Sheet Metal Fabrication Standard: Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the item indicated.

B. Comply with details shown to fabricate sheet metal flashing and trim that fit substrates and result in waterproof and weather-resistant performance once installed. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Form exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.

D. Seams: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

E. Expansion Provisions: Space movement joints at maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

F. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.

G. Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces at

locations of contact with asphalt mastic or other permanent separation as recommended by manufacturer.

H. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.

I. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.
   1. Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.

2.5 SHEET METAL FABRICATIONS

A. General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements but not less than that listed below for each application and metal.

B. Downspouts: Fabricate from the following material:
   1. Aluminum: 0.024 inch (0.6 mm) thick.

C. Conductor Heads: Fabricate from the following material:
   1. Aluminum: 0.0320 inch (0.8 mm) thick.

D. Splash Pans: Fabricate from the following material:
   1. Aluminum: 0.040 inch (1.0 mm) thick.

E. Exposed Trim and Fascia: Fabricate from the following material:
   1. Aluminum: 0.050 inch (1.2 mm) thick.

F. Copings: Fabricate from the following material:
   1. Aluminum: 0.050 inch (1.2 mm) thick.

G. Base Flashing: Fabricate from the following material:
   1. Aluminum: 0.040 inch (1.0 mm) thick.

H. Counterflashing: Fabricate from the following material:
   1. Aluminum: 0.0320 inch (0.8 mm) thick.

I. Flashing Receivers: Fabricate from the following material:
   1. Aluminum: 0.0320 inch (0.8 mm) thick.

J. Drip Edges: Fabricate from the following material:
   1. Aluminum: 0.0320 inch (0.8 mm) thick.

K. Eave Flashing: Fabricate from the following material:
   1. Aluminum: 0.0320 inch (0.8 mm) thick.

L. Equipment Support Flashing: Fabricate from the following material:
   1. Aluminum-Zinc Alloy-Coated Steel: 0.0276 inch (0.7 mm) thick.

M. Roof-Penetration Flashing: Fabricate from the following material:
   1. Lead-Coated Copper: 16 oz./sq. ft. (0.55 mm thick).

O. Roof Drainage System Installation:
   1. General: Install aluminum sheet metal roof drainage items to product complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.
   2. Hanging Gutters: Provide seamless continuous gutters. Attach gutters at eave or fascia to firmly anchor gutter brackets spaced not more than 36 inches (900 mm) apart. Provide end closures and seal watertight with sealant. Slope to downspouts.
      a. Install gutter with expansion joints at locations indicated, but not exceeding, 25 feet apart. Install expansion-joint caps.
      b. Install continuous gutter screens on gutters with non-corrosive fasteners, hinged to swing open for cleaning gutters.
   3. Downspouts: Join sections with 1-1/2-inch (38 mm) telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches (1500 mm) o.c. in between.
   4. Hanging Gutters: Fabricate 0.040" thick aluminum to "K" cross section indicated, complete with end pieces, outlet tubes and other accessories as required. Fabricate in continuous 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, gutter bead reinforcing bars, and gutter accessories from same metal as gutters.
   5. Accessories: Continuous removable leaf screen with sheet metal frame and hardware cloth screen wire ball downspout strainer valley baffles.
   6. Downspouts: Fabricate square 0.032" thick aluminum downspouts complete with mitered elbows. Furnish with metal hangars, from same material as downspouts, and anchors.
   7. Finish on gutters, downspouts, hangers and accessories to be:
      a. General: Comply with Aluminum Associations (AA) "Designation system for aluminum Finishes" for finish designations and application recommendations.

2.6 ALUMINUM FINISHES

A. General: Comply with Aluminum Association's (AA) "Designation System for Aluminum Finishes" for finish designations and application recommendations.

B. High-Performance Organic Coating Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's instructions.
   1. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 605.2.
      a. Color and Gloss: Match Architect's sample.
         i. Clear anodize for concealed flashing.
         ii. White fluoropolymer for all fascias, soffits, gutters, downspouts and drip edges. Color to match Pac-Clad "Gloss White"

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions under which sheet metal flashing and trim are to be installed and verify that Work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Unless otherwise indicated, install sheet metal flashing and trim to comply with performance requirements, manufacturer's installation instructions, and SMACNA's "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 that will be permanently watertight and weatherproof.

B. Install exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Roof-Edge Flashings: Secure metal flashings at roof edges according to FM Loss Prevention Data Sheet 1-49 for specified wind zone meeting the requirements of basic wind speed of 120-mph (3-second gust) and importance factor I_w=1.15.

D. Expansion Provisions: Provide for thermal expansion of exposed sheet metal Work. Space movement joints at maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

E. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2 inches (38 mm), except where pretinned surface would show in finished Work.
   1. Do not solder the following metals:
      a. Aluminum.
   2. Pretinning is not required for the following metals:
      a. Lead.
   3. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

F. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards. Fill joint with sealant and form metal to completely conceal sealant.
   1. Use joint adhesive for nonmoving joints specified not to be soldered.

G. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.

H. Seams: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

I. Separations: Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.

1. Underlayment: Where installing stainless steel or aluminum directly on cementitious or wood substrates, install a slip sheet of red-rosin paper and a course of polyethylene underlayment.
2. Bed flanges of Work in a thick coat of roofing cement where required for waterproof performance.

J. Install reglets to receive counterflashing according to the following requirements:

1. Where reglets are shown in masonry, furnish reglets for installation under Division 4 Section "Unit Masonry."

K. Counterflashings: Coordinate installation of counterflashings with installation of assemblies to be protected by counterflashing. Install counterflashings in reglets or receivers. Secure in a waterproof manner by means of snap-in installation and sealant, lead wedges and sealant, interlocking folded seam, or blind rivets and sealant. Lap counterflashing joints a minimum of 2 inches (50 mm) and bed with sealant.

L. Roof-Drainage System: Install drainage items fabricated from sheet metal, with straps, adhesives, and anchors recommended by SMACNA's Manual or the item manufacturer, to drain roof in the most efficient manner. Coordinate flashing and sheet metal items with roofing installation.

M. Equipment Support Flashing: Coordinate equipment support flashing installation with roofing and equipment installation. Weld or seal flashing to equipment support member.

N. Roof-Penetration Flashing: Coordinate roof-penetration flashing installation with roofing and installation of items penetrating roof. Install flashing as follows:

1. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.
2. Seal and clamp flashing to pipes penetrating roof, other than lead flashing on vent piping.

O. Splash Pans: Install where downspouts discharge on low-sloped roofs, unless otherwise shown. Set in roof cement or sealant compatible with roofing membrane.

3.3 CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

B. Provide final protection and maintain conditions that ensure sheet metal flashing and trim Work during construction is without damage or deterioration other than natural weathering at the time of Substantial Completion.

END OF SECTION 07 60 00

SECTION 07 42 93

VINYL SOFFITS AND TRIM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Vinyl soffits.

B. Accessories and trim.

1.2 RELATED SECTIONS

A. Section – 6100 Rough Carpentry.

B. Section – 7901 Joint Sealants.

1.3 REFERENCES

A. ASTM D 1435 - Standard Practice Method for Outdoor Weathering of Plastics.

B. ASTM D 3679 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Siding and trim.

1.4 PERFORMANCE REQUIREMENTS

A. Provide vented vinyl soffits and accessories that comply with requirements of ASTM D 3679, Class 2 as follows:
   1. Cell classification: 1334.
   2. Tensile strength: 7,344 psi.
   3. Modulus of elasticity: 455,750-psi average.
   4. Izod impact, standard 1/8-inch bar: 1.5 ft.lbs/in average.
   5. Deflection temperature: 168 degrees F.
   6. Flash ignition temperature: 752 degrees F.
   7. Self-ignition temperature: 842 degrees F.
   8. Maximum smoke density: 86 percent.
   9. Smoke density rating: 52.4 percent average.
   10. Flammability, horizontal:
      a. Burn distance: Less than 10 mm.
      b. Burn time: Less than 5 seconds.
   11. Flammability, vertical: Non-burning.
   12. Wind load resistance: 58.2 ft-lbs./sq. ft.

1.5 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Construction details , material descriptions, descriptions of individual components and profiles and finishes for vinyl soffit panels.

2. Compliance with applicable performance requirements including ASTM requirements.
3. Preparation instructions and recommendations.
4. Storage and handling requirements and recommendations.
5. Installation methods.

B. Verification Samples: For each type of finish product specified, two samples of size indicated below
1. Vinyl Soffit Panels: Minimum size 12 inches (305 mm) long by actual panel width, representing actual product, color, and patterns. Include fasteners, clips closures, other accessories and sealants.
2. Trim and Closures: 12 inches long. Include fasteners and other exposed accessories.
3. Accessories: 12-inch long samples for each type of accessory.

C. Qualification Data: For installer.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Provide installer with not less than three years of experience with products specified or has obtained Master Craftsman credentials from Wolverine Siding Systems.

B. Mock-Up: Provide a mock-up for evaluation of installation techniques and workmanship.
1. Finish areas designated by Architect.
2. Do not proceed with remaining work until workmanship and color is approved by the Government Agency responsible.
3. Reinstall mock-up area as required to produce acceptable work.
4. Mock-up if approved can remain part of work.

1.7 DELIVERY, STORAGE, AND HANDLING

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

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 WARRANTY

A. Provide soffit standard lifetime warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Wolverine Vented Vinyl Soffits, 750 E. Swedesford Rd., Valley Forge, Pennsylvania 19482. ASD. Tel: (888) 838-8100. Fax: (610) 341-7940; Email: ctsiding@certainteed.com; Web: www.certainteed.com.

2.2 MATERIALS

A. Wolverine: Beaded triple 2" – wainscot style, .039 thickness.
B. Polyvinyl Chloride: Soffit materials made of PVC that meet or exceed the following properties:
   1. Shrinkage: 3 percent.
   2. Coefficient of linear expansion: 0.000031 in/in./degree F.
   3. Gardner impact: 1.74 in./lb. ft/mil.
   4. Surface distortion at 120 degrees F: None.
   5. Gloss (75 degree T Gloss Meter): Uniform.
   6. Weathering per ASTM D 1435: Free of any visual surface defects, such as peeling, chipping, cracking, flaking or crazing due to manufacturing conditions.
   7. Chalking: Number 6 Rating caused by manufacturing defects within 5 years in vertical exposure.
   8. Color: Uniform on surface and throughout the panels.

2.3 FASTENERS

A. Provide galvanized or other corrosion-resistant nails as recommended by manufacturer of siding products.

B. Joint Sealants: As specified in Section 079200.

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. Examine, clean, and repair as necessary any substrate conditions that would be detrimental to proper installation.

B. Do not begin installation until unacceptable conditions have been corrected.

3.3 INSTALLATION

A. Sub-contractor to provide and install blocking to complete turn-key soffit scope.

B. Install products in accordance with the latest printed instructions of the manufacturer. Installer should have current Master Craftsman credentials.

C. Install products with all components true and plumb.

D. Allow space between both ends of siding panels and trim for thermal movement. Overlap horizontal panel ends one-half the width of factory pre-cut notches.

E. Stagger lap joints in soffit in uniform pattern as successive courses of soffit are installed.

F. Joint Sealants: install gaskets, joint fillers and sealants where system meets walls and where required for performance of vinyl soffit panel assemblies. Provide types of gaskets, fillers and sealants indicated, or if not indicated, types recommended by vinyl soffit panel manufacturer.

3.4 PROTECTION

A. Protect installed products until completion of project.

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

3.5 CLEANING

A. At completion of work, remove debris caused by siding installation from project site.

END OF SECTION 07 42 93

SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes joint sealants for the following locations:
   1. Exterior joints in vertical surfaces and nontraffic horizontal surfaces as indicated below:
      a. Control and expansion joints in cast-in-place concrete.
      b. Control and expansion joints in unit masonry.
      c. Joints between different materials.
      d. Perimeter joints between materials listed above and frames of doors and windows.
      e. Other joints as indicated.
   2. Exterior joints in horizontal traffic surfaces as indicated below:
      a. Control, expansion, and isolation joints in cast-in-place concrete slabs.
      b. Isolation joint between Apparatus Bay and exterior approach slab.
      c. Other joints as indicated.
   3. Interior joints in vertical surfaces and horizontal nontraffic surfaces as indicated below:
      a. Perimeter joints of exterior openings where indicated.
      b. Joints between tops of non-load-bearing unit masonry walls and underside of cast-in-place concrete slabs and beams.
      c. Tile control and expansion joints.
      d. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
      e. Perimeter joints of toilet fixtures.
      f. Millwork joints at interior wall surfaces.
      g. Other joints as indicated.
   4. Interior joints in horizontal traffic surfaces as indicated below:
      a. Control and expansion joints in cast-in-place concrete slabs.
      b. Control and expansion joints in tile flooring.
      c. Other joints as indicated.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 7 Section "Flashing and Sheet Metal" for sealing joints related to flashing and sheet metal for roofing.
   2. Division 8 "Glass and Glazing" for sealants used in glazing.
   3. Division 9 Section "Gypsum Board Assembleis" for sealing concealed perimeter joints of gypsum board partitions to reduce sound transmission.
   4. Division 9 Section "Tile" for sealing tile joints.

1.2 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.

B. Provide joint sealants for interior applications that have been produced and installed to establish and

maintain airtight continuous seals that are water resistant and cause no staining or deterioration of joint substrates.

1.3 SUBMITTALS

A. Product data and samples from manufacturers for each exterior vertical non-traffic joint sealant product required. Product data and samples from manufacturers for each exterior horizontal traffic joint sealant product required. Product data and samples from manufacturers for each interior vertical and horizontal non-traffic joint sealant product required. Product data and samples from manufacturers for each interior horizontal traffic joint sealant product required.

B. Samples for initial selection purposes in form of manufacturer's standard bead samples, consisting of strips of actual products showing full range of colors available, for each product exposed to view.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.

B. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer.
   2. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer or below 40 deg F (4 deg C).
   3. When joint substrates are wet.

B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.7 SEQUENCING AND SCHEDULING

A. Sequence installation of joint sealants to occur not less than 21 nor more than 30 days after completion of waterproofing, unless otherwise indicated.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with 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 made by Architect from manufacturer's full range of standard colors for products of type indicated.

2.2 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Provide manufacturer's standard elastomeric sealants that comply with ASTM C 920 and other requirements indicated on each Elastomeric Joint Sealant Data Sheet at end of this Section, including those requirements referencing ASTM C 920 classifications for Type, Grade, Class, and Uses.

B. For use at pre-cast or poured concrete, masonry, window and door perimeters, and other manufacturer recommended applications.

C. Available Products: Subject to compliance with requirements, elastomeric sealants that may be incorporated in the Work include, but are not limited to, the products specified in each Elastomeric Sealant Data Sheet.

2.3 SOLVENT-RELEASE-CURING JOINT SEALANTS

A. Acrylic Sealant: For use in glazing and framing and other manufacturer recommended applications. Manufacturer's standard one-part, nonsag, solvent-release-curing acrylic terpolymer sealant complying with AAMA 808.3 or FS TT-S-00230 or both, with capability when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the following percentage change in joint width existing at time of application and remain adhered to joint substrates indicated for Project without failing cohesively:
   1. 12-1/2 percent movement in both extension and compression for a total of 25 percent.

B. Butyl Sealant: For use at storefronts, bedding thresholds, against neoprene or EDPM gaskets and other manufacturer recommended applications. Manufacturer's standard one-part, nonsag, solvent-release-curing, polymerized butyl sealant complying with ASTM C 1085 and formulated with minimum of 75 percent solids to be nonstaining, paintable, and have a tack-free time of 24 hours or less.

C. Available Products: Subject to compliance with requirements, solvent-release-curing joint sealants that may be incorporated in the work include the following:
   1. Acrylic Sealant:
      a. "60+Unicrylic," Pecora Corp.
      b. "Mono," Tremco, Inc.
   2. Butyl Sealant:
      a. "Tremco Butyl Sealant," Tremco, Inc.
      b. Press-Seal Gasket Corporation
      c. Polylok, Inc.

2.4 LATEX JOINT SEALANTS

A. General: For use at vinyl soffits, kitchen and bathroom fixtures general interior and other manufacturer recommended applications. Provide manufacturer's standard one-part, nonsag, 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.

B. 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.

C. Available Products: Subject to compliance with requirements, latex joint sealants that may be incorporated in the Work include the following:
   1. Acrylic-Emulsion Sealant:
      a. "AC-20," Pecora Corp.
      b. "Sonolac," Sonneborn Building Products Div., ChemRex, Inc.
      c. "Tremco Acrylic Latex 834," Tremco, Inc.

2.5 PREFORMED FOAM SEALANTS

A. Preformed Foam Sealants: Manufacturer's standard preformed, precompressed, impregnated open-cell foam sealant manufactured from high-density urethane foam impregnated with a nondrying, water repellent agent; factory-produced in precompressed sizes and in roll or stick form to fit joint widths indicated and to develop a watertight and airtight seal when compressed to the degree specified by manufacturer; and complying with the following requirements:
   1. Properties: Permanently elastic, mildew-resistant, nonmigratory, nonstaining, and compatible with joint substrates and other joint sealants.
   2. Impregnating Agent: Chemically stabilized acrylic.
   3. Density: Manufacturer's standard.
   4. Backing: Pressure-sensitive adhesive factory applied to one side with protective wrapping.
   5. Available Products: Subject to compliance with requirements, preformed foam sealants that may be incorporated in the Work include the following:
      a. "Emseal," Emseal Corp.
      b. "Emseal Greyflex," Emseal Corp.
      c. "Wil-Seal 150," Wil-Seal Construction Foams Div., Illbruck.
      d. "Wil-Seal 250," Wil-Seal Construction Foams Div., Illbruck.

2.6 JOINT SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; 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, nonstaining, nonwaxing, nonextruding 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. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, nonoutgassing in unruptured state.
   2. Proprietary, reticulated, closed-cell polymeric foam, nonoutgassing, with a density of 2.5 pcf (40 kg/cu. m) and tensile strength of 35 psi (240 kPa) per ASTM D 1623, and with water absorption

less than 0.02 g/cc per ASTM C 1083.

C. Elastomeric Tubing Joint Fillers: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, capable of remaining resilient at temperatures down to -26 deg F (-32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.

D. 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.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer and the following requirements:
   1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
   2. Clean concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil- free compressed air.
   3. Remove laitance and form release agents from concrete.
   4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous 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 where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. 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 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.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
   1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
      a. Do not leave gaps between ends of joint fillers.
      b. Do not stretch, twist, puncture, or tear joint fillers.
      c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.
   2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.

D. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.

E. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
   1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
   2. Provide flush joint configuration, per Figure 5B in ASTM C 1193, where indicated.
      a. Use masking tape to protect adjacent surfaces of recessed tooled joints.
   3. Provide recessed joint configuration, per Figure 5C in ASTM C 1193, of recess depth and at locations indicated.

F. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, and to comply with sealant manufacturer's directions for installation methods, materials, and tools that produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in conformance with sealant manufacturer's recommendations.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that and installations with repaired areas are indistinguishable from original work.

END OF SECTION 07 92 00

SECTION 08 11 13

STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes steel doors and frames.

B. Related Sections: The following Sections contain requirements that relate to this Section:
1. Division VIII Section 08 14 16 "Flush Wood Doors" for solid-core wood doors installed in steel frames.
2. Division VIII Section 08 71 00 "Finish Hardware" for door hardware and weatherstripping.
3. Division VIII Section 08 81 00 "Glazing" for glass in steel doors and sidelights.
4. Division IX Section 09 91 00 "Painting" for field painting primed doors and frames.

1.2 SUBMITTALS

A. Product Data for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles, and finishes.

B. Shop Drawings showing fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.

C. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Contract Drawings.
1. Indicate coordination of glazing frames and stops with glass and glazing requirements.
2. Indicate frame data and compliance with applicable ASTM requirements.
3. Indicate applicable Florida NOA number or Florida product approval number where required.

1.3 QUALITY ASSURANCE

A. Provide doors and frames complying with ANSI/SDI 100 "Recommended Specifications for Standard Steel Doors and Frames" and as specified.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.

B. Inspect doors and frames on delivery for damage. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect; otherwise, remove and replace damaged items as directed.

C. Store doors and frames at building site under cover. Place units on minimum 4-inch- (100-mm-) high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If cardboard wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch (6-mm) spaces between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include the following:
   1. Steel Doors and Frames:
      a. Amweld Building Products, Inc. (Florida Product Approval # FL5753 where required).
      b. Ceco Door Products.
      c. Curries Co. (NOA No. 03-0812.07 where required).
      d. Habersham Metal Products Co.
      e. Kewanee Corp.
      f. Republic Builders Products.
      g. Steelcraft.

2.2 MATERIALS

A. Hot-Rolled Steel Sheets and Strip: Commercial-quality carbon steel, pickled and oiled, complying with ASTM A 569 (ASTM A 569M).
B. Cold-Rolled Steel Sheets: Carbon steel complying with ASTM A 366 (ASTM A 366M), commercial quality, or ASTM A 620 (ASTM A 620M), drawing quality, special killed.
C. Galvanized Steel Sheets: Zinc-coated carbon steel complying with ASTM A 526 (ASTM A 526M), commercial quality, or ASTM A 642 (ASTM A 642M), drawing quality, hot-dip galvanized according to ASTM A 525, with A 60 or G 60 (ASTM A 525M, with Z 180 or ZF 180) coating designation, mill phosphatized.
D. Impact-Resistant Galvanized Steel Sheets (Insulated): Units shall comply with the Miami-Dade County product approval system or the Florida Building Code approval system. Panels shall be manufacturered from hot-dipped galvannealed steel having an A90 or G90 zinc-iron alloy coating conforming to ASTM designations A 653 and A 924.
E. Supports and Anchors: Fabricated from not less than 0.0478-inch- (1.2-mm-) thick steel sheet; 0.0516-inch- (1.3-mm-) thick galvanized steel where used with galvanized steel frames.
F. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built into exterior walls, hot-dip galvanize complying with ASTM A 153, Class C or D as applicable.

2.3 DOORS

A. Steel Doors: Provide 1-3/4-inch- (44-mm-) thick doors of materials and ANSI/SDI 100 grades and models specified below, or as indicated on Drawings or schedules:
   1. Interior Doors: Grade II, heavy-duty, Model 1, full flush design, minimum 0.0478-inch- (1.2-mm-) thick cold-rolled steel sheet faces.
   2. Impact-Resistive Exterior Doors: Face sheets shall be 14 gage (maximum), hot-dipped galvannealed with continuous vertical mechanical interlocking joints at lock and hinge edges with edge seams welded filed and ground smooth. Panels to be reinforced and sound deadened by 20 gage vertical stiffners manufactured from galvannealed steel conforming to ASTM designations A 653 and A 924 and welded to each face sheet and rigid polystyrene core laminated to the inside faces of both panels.

B. Door Louvers: Provide sightproof stationary louvers constructed of welded inverted V-shaped or Y-shaped blades formed of 0.067-inch (1.7 mm, 14 ga.) cold-rolled steel welded or tennoned to frame.
   1. Screens: Louvers for exterior doors to have steel framed wire screens secured to back of louvers. Wire screen to be fabricated of 1/4" galvanized hardware cloth.

2.4 FRAMES

A. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, according to ANSI/SDI 100, and of types and styles as shown on Drawings and schedules. Conceal fastenings, unless otherwise indicated. Fabricate frames of minimum 0.0478-inch- (1.2-mm-) thick cold-rolled steel sheet.
   1. Fabricate frames with mitered or coped and continuously welded corners.
   2. Fabricate frames for interior openings over 48 inches (1220 mm) wide from 0.0598-inch- (1.5-mm-) thick steel sheet.
   3. Form exterior frames from 0.0635-inch- (1.6-mm-) thick galvanized steel sheet.
   4. Impact-Resistant Frames: Provide units of 16 gage hot-dipped galvannealed steel having an A90 or G90 zinc-iron alloy coating conforming to ASTM designations A 653 and A 924, with mitered or coped and continuously welded corners, formed from 0.0635-inch- (1.6-mm-) thick galvanized steel sheet.

B. Door Silencers: Except on weatherstripped frames, drill stops to receive 3 silencers on strike jambs of single-door frames and 2 silencers on heads of double-door frames.

2.5 FABRICATION

A. Fabricate steel door and frame units to be rigid, neat in appearance, and free from defects, warp, or buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site. Comply with ANSI/SDI 100 requirements.
   1. Internal Construction: One of the following manufacturer's standard core materials according to SDI standards:
      a. Resin-impregnated paper honeycomb.
      b. Rigid polyurethane conforming to ASTM C 591.
      c. Rigid polystyrene conforming to ASTM C 578.
   2. Clearances: Not more than 1/8 inch (3.2 mm) at jambs and heads, except not more than 1/4 inch (6.4 mm) between non-fire-rated pairs of doors. Not more than 3/4 inch (19 mm) at bottom.
      a. Fire Doors: Provide clearances according to NFPA 80.

B. Fabricate exposed faces of doors and panels, including stiles and rails of nonflush units, from only cold-rolled steel sheet.

C. Tolerances: Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.

E. Galvanized Steel Doors, Panels, and Frames: For the following locations, fabricate doors, panels, and frames from galvanized steel sheet according to SDI 112. Close top and bottom edges of doors flush as an integral part of door construction or by addition of minimum 0.0635-inch- (1.6-mm-) thick galvanized steel channels, with channel webs placed even with top and bottom edges. Seal joints in top edges of doors against water penetration.
   1. At exterior locations.

F. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.

G. Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as shown or scheduled, provide doors fabricated as thermal-insulating door and frame assemblies and tested according to ASTM C 236 or ASTM C 976 on fully operable door assemblies.
   1. Unless otherwise indicated, provide thermal-rated assemblies with U-value rating of 0.41 Btu/sq. ft. x h x deg F (2.33 W/sq. m x K) or better.

H. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements of SDI 107 and ANSI A115 Series specifications for door and frame preparation for hardware.

I. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.

J. Locate hardware as indicated on Shop Drawings or, if not indicated, according to the Door and Hardware Institute's (DHI) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."

K. Glazing Stops: Minimum 0.0359-inch- (0.9-mm-) thick steel or 0.040-inch- (1-mm-) thick aluminum.
   1. Provide nonremovable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
   2. Provide screw-applied, removable, glazing beads on inside of glass, louvers, and other panels in doors.

2.6 FINISHES, GENERAL

A. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for steel sheet finishes.

B. Apply primers and organic finishes to doors and frames after fabrication.

2.7 GALVANIZED STEEL SHEET FINISHES

A. Surface Preparation: Clean surfaces with nonpetroleum solvent so that surfaces are free of oil or other contaminants. After cleaning, apply a conversion coating of the type suited to the organic coating applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
   1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.

B. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply air-dried primer specified below immediately after cleaning and pretreatment.
   1. Shop Primer: Zinc-dust, zinc-oxide primer paint complying with performance requirements of FS TT-P-641, Type II.

2.8 STEEL SHEET FINISHES

A. Surface Preparation: Solvent-clean surfaces to comply with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel to comply with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC-SP 8 (Pickling).

B. Pretreatment: Immediately after surface preparation, apply a conversion coating of type suited to organic coating applied over it.

C. Factory Priming for Field-Painted Finish: Apply shop primer that complies with ANSI A224.1 acceptance criteria, is compatible with finish paint systems indicated, and has capability to provide a sound foundation for field-applied topcoats. Apply primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.

B. Placing Frames: Comply with provisions of SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
   1. Except for frames located in existing concrete, masonry, or gypsum board assembly construction, place frames before constructing enclosing walls and ceilings.
   2. In metal-stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In steel-stud partitions, attach wall anchors to studs with screws.
   3. Install fire-rated frames according to NFPA 80.

C. Door Installation: Fit hollow-metal doors accurately in frames, within clearances specified in ANSI/SDI 100.
   1. Fire-Rated Doors: Install with clearances specified in NFPA 80.

3.2 ADJUSTING AND CLEANING

A. Prime Coat Touchup: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION 08 11 13

SECTION 08 14 16

FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Solid core doors with wood veneer faces.

1.2 SUBMITTALS

A. Product data for each type of door, including details of core and edge construction, trim for openings and louvers, and factory-finishing specifications.

B. Shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for veneer matching and factory finishing and other pertinent data.
   1. For factory-machined doors, indicate dimensions and locations of cutouts for locksets and other cutouts adjacent to light and louver openings.

1.3 QUALITY ASSURANCE

A. Quality Standard: Comply with the following standard:
   1. AWI Quality Standard: "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute for grade of door, core, construction, finish, and other requirements.

B. Fire-Rated Wood Doors: Provide wood doors that comply with NFPA 80; are identical in materials and construction to units tested in door and frame assemblies per ASTM E 152; and are labeled and listed by UL, Warnock Hersey, or another testing and inspection agency acceptable to authorities having jurisdiction.

C. Single-Source Responsibility: Obtain doors from one source and by a single manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Comply with requirements of referenced standard and manufacturer's instructions.

B. Identify each door with individual opening numbers as designated on shop drawings, using temporary, removable, or concealed markings.

1.5 PROJECT CONDITIONS

A. Conditioning: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.6 WARRANTY

A. General Warranty: Door manufacturer's warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Door Manufacturer's Warranty: Submit written agreement on door manufacturer's standard form signed by manufacturer, Installer, and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup, or twist) more than 1/4 inch (6.35 mm) in a 42-by-84-inch (1067-by-2134-mm) section or that show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 75-mm) span, or do not conform to tolerance limitations of referenced quality standards.
   1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors where defect was not apparent prior to hanging.
   2. Warranty shall be in effect during the following period of time after date of Substantial Completion:
      a. Solid Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering doors that may be incorporated in the Work include the following:

B. Manufacturer: Subject to compliance with requirements, provide doors by one of the following:
   1. Solid Core Doors:
      a. Algoma Hardwoods Inc.
      b. Ampco Products, Inc.
      c. Graham Manufacturing Corp.
      d. Lambton Doors.
      e. Weyerhauser Co.

2.2 INTERIOR FLUSH WOOD DOORS

A. Solid Core Doors for Opaque Finish: Comply with the following requirements:
   1. Faces: White birch, plain sliced.
   2. Grade: Economy.
   3. Construction: 5 plies.
   4. Core: Particleboard core.
   5. Bonding: Stiles and rails bonded to core, then entire unit abrasive planed before veneering.

2.3 LOUVERS AND LIGHT FRAMES

A. Metal Frames for Light Openings in Fire Doors: Manufacturer's standard frame formed of 0.0478-inch- (1.2-mm-) thick cold-rolled steel sheet, factory primed, and approved for use in doors of fire-rating indicated.

2.4 FABRICATION

A. Fabricate flush wood doors to comply with following requirements:
   1. In sizes indicated for job-site fitting.

a. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements of NFPA 80 for fire-resistance-rated doors.

2. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame shop drawings, DHI A115-W series standards, and hardware templates.
   a. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with factory machining.

B. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
   1. Light Openings: Trim openings with moldings of material and profile indicated.

2.5 FINISHES

A. Doors to be prepared to receive stain and transparent finish applied on site.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine installed door frames prior to hanging door:
   1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
   2. Reject doors with defects.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation see Division 8 Section "Door Hardware."

B. Manufacturer's Instructions: Install wood doors to comply with manufacturer's instructions and referenced quality standard and as indicated.
   1. Install fire-rated doors in corresponding fire-rated frames according to requirements of NFPA 80.

C. Job-Fit Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.
   1. Fitting Clearances for Non-Fire-Rated Doors: Provide 1/8 inch (3.2 mm) at jambs and heads, 1/16 inch (1.6 mm) per leaf at meeting stiles for pairs of doors, and 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4-inch (6.4- mm) clearance from bottom of door to top of threshold.
   2. Fitting Clearances for Fire-Rated Doors: Comply with NFPA 80.
   3. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
   4. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) on lock edge; trim stiles and rails only to extent permitted by labeling agency.

D. Field-Finished Doors: Refer to the following for finishing requirements:

1. Division 9 Section "Painting."

3.3 ADJUSTING AND PROTECTION

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Refinish or replace doors damaged during installation.

C. Protect doors as recommended by door manufacturer to ensure that wood doors will be without damage or deterioration at the time of Substantial Completion.

END OF SECTION 08 14 16

SECTION 08 36 13

SECTIONAL OVERHEAD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes sectional overhead doors, as follows:
   1. Steel frame and insulated steel panels.
   2. Tracks and hardware.
   3. Electric motor-operated doors w/ chain-hoist back-up.

1.2 SCOPE OF WORK

A. Furnish all labor, materials, tools, and equipment necessary for installation of overhead sectional doors as shown on the drawings. General Conditions, Special Conditions, and Scope of Work.

1.3 SUBMITTALS

A. Product data, roughing-in diagrams, and installation instructions for each type and size of overhead door. Include both published data and any specific data prepared for this project.

B. Submit shop drawing for approval prior to fabrication. Include detailed plans, elevations, and details of framing members, required clearances, anchors, and accessories. Include relationship with adjacent materials. Provide product data signed and sealed (raised seal) by a Florida Engineer where available or provide data that indicates compliance with the Miami-Dade County product approval system or the Florida Building Code product approval system. Include Florida product approval number.

C. Submit manufacturer's operating instructions and maintenance data.

D. Submit product data for all door components including but not limited to operators, tracks, spring counterbalance, weather stripping, hardware, locks, finishes.

E. Submit finish samples.

F. Submit product data for warning light F bolts.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide each sectional overhead door as a complete unit produced by a single manufacturer, including frames, sections, brackets, guides, tracks, counterbalance mechanisms, hardware, operators, and installation accessories.

B. Inserts and Anchorages: Furnish inserts and anchoring devices that must be set in concrete or built into masonry for unit installation. Provide setting drawings, templates, and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay.

C. Wind Loading: Design and reinforce sectional overhead doors to withstand wind-load pressures for exposure, per the current edition of the Florida Building Code. **Design pressures shall be in accordance w/ the chart on structural drawings for tributary areas if the individual components**

resist the positive and negative wind load pressures and shall take into account the 1.15 importance factor.

D. Refer to structural drawings for additional information for components and cladding.

PART 2 – PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Overhead doors shall be heavy-duty industrial type, of size shown on the drawings necessary for a complete installation. Doors shall be sectional overhead with high lift as indicated and shall be motor operated.

B. Doors shall be installed by a company that is an approved installer of the manufacturer of the doors to be used and has been in the business of installing this type of doors for a minimum period of 5 years.

C. The General Contractor shall furnish to the Owner a warranty from the door manufacturer and installer for the proper operation of the doors for a period of one year from date Owner's operation begin. Damage to the doors by Owner's operation will not be covered by the warranty, unless damage occurs due to faulty operation of the doors.

D. Installation – Install door including sections, brackets, guides, tracks, etc. in accordance with final shop drawings and instructions.

2.2 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include the following:

B. Manufacturer: See sheet A-4.0 for specified overhead sectional door. Subject to compliance with requirements, alternate doors may be provided by one of the following manufacturers:
   1. Clopay. (Florida Product Approval # 5678.7)
   2. Overhead Door Corp.
   3. Raynor Garage Doors
   4. DAB Door Co.

C. Sectional Doors: Provide steel sectional doors from one of above manufacturers meeting Dade County requirements and testing with Florida product approval number.

2.3 MATERIALS AND CONSTRUCTION

A. Panels shall be 1 3/8" thick roll formed commercial quality 27 gauge exterior face and 28 gauge interior face hot-dipped galvanized per ASTM A-924, A-653. Minimum 18 gauge single-end stiles, 16 gauge double-end stiles. All stiles engineered for easy hardware attachment through pre-punched holes. Bottom section reinforced with full-length .050" aluminum astragal retainer. Astragal to be U-shaped flexible PVC vinyl. Meeting rails to form weather tight ship lap joint.

B. Insulation – CFC and HCFC-free polyurethane. Steel backers on door interior for durability. Insulation to have fire retardant additive meet UL R-8194A.

2.4 FINISH

A. Exterior of door to be pre-painted stucco embossed flush. Exterior to be selected from manufacturer standard colors, interior standard white. Finished guaranteed against rust through for a full five years.

2.5 HARDWARE

A. All hinges and brackets to be manufactured of hot-dipped galvanized steel, 14-gauge minimum. Ten ball steel rollers to be full floating in case-hardened steel races, mounted to fit the taper of the tracks.

2.6 TRACKS

A. 3" tracks as required. Galvanized steel tapered and mounted for wedge type closing. Reinforced with minimum 13 gauge galvanized angle as required. 3" tracks to be 12 gauge.

B. Track – Minimum of 12" of high lift. Track for use of the wall mount type operator.

2.7 SPRING COUNTERBALANCE

A. Door assembly to be operated by a torsion spring counterbalance mechanism, with a helically wound, oil tempered torsion spring mounted on a solid steel shaft.

B. High Cycle Spring – (minimum design) 25,000 cycles.

2.8 LOCKING

A. Inside spring loaded slide bolt lock on end stile shall engage slot in track.

2.9 WEATHERSTRIPPING

A. Provide complete perimeter seals for a fully weather tight installation.

2.10 ELECTRIC OPERATION

A. Trolley Operator: Center mount type with V-belt and roller chain and sprocket secondary drive connected to counterbalance shaft, adjustable friction safety clutch, and auxiliary steel chain hoist which can be engaged/disengaged from floor level for mechanical operation, provide an interlock device to prevent motor from operating when release mechanism is activated. Chain to remain motionless during electric operation. Reinforce door section for operator attachment.

B. Electric Motor: Provide high starting torque, reversible, constant duty, Class A insulated electric motors with overhead protection, sized to move door in either direction, from any condition, from any position, at not less than 8" – 12" per second.

1. Coordinate wiring requirements and current characteristics of motors with building electrical systems.
2. Provide open drip proof type motor, and controller with NEMA Type 1 Enclosure.

C. Radio Control Transmitters: 2 each single button transmitters per door. Transmitters should be capable of opening and closing (individually) both the ingoing and outgoing of the door of one bay of the Apparatus bay. Each door operator to be set to a different frequency. Each transmitter should have the capability of

being reset to operate any of the following operates provided. Range to be a minimum of 150'-0". Each receiver per door with coaxial antenna.

D. Automatic Reversing Control: Furnish each door with watertight (NEMA $) photoelectric eye which upon activation reverses downward travel of door.

E. Electrical Contractor to provide/ install wiring for operators and controlling systems. Door contractor to provide/install operators and controlling systems along with wiring schematics to Electrical Contractor.

F. Electrical Contractor to make all connections.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Doors shall be installed in strict accordance with the door manufacturer's instructions and approved shop drawings. The installation shall be complete and in perfect working condition. After door installation is complete, each door shall be inspected together by a representative of the General Contractor, Owner, or Owners representative and door installer prior to final acceptance.

3.2 MAINTENANCE

A. Maintenance instructions, parts list, including drawings showing all parts, etc., shall be furnished at the completion of the work.

END OF SECTION 08 36 13

SECTION 08 41 13

LARGE MISSILE IMPACT ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Exterior large missile impact aluminum-framed entrance systems with flush glazing.
   2. Exterior large missile impact aluminum-framed storefront systems with flush glazing.

B. Related sections include the following:
   1. Division VII Section 07 92 00 "Joint Sealants" for joint sealants installed as part of aluminum entrance and storefront systems.

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide aluminum-framed systems, including anchorage, capable of withstanding, without failure, the effects of the following:
   1. Structural loads.
   2. Thermal movements.
   3. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
   4. Dimensional tolerances of building frame and other adjacent construction.
   5. Failure includes the following:
      a. Deflection exceeding specified limits.
      b. Thermal stresses transferred to building structure.
      c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
      d. Glazing-to-glazing contact.
      e. Noise or vibration created by wind and thermal and structural movements.
      f. Loosening or weakening of fasteners, attachments, and other components.
      g. Sealant failure.
      h. Failure of operating units to function properly.

B. Structural Sealant: Provide only the sealants used during testing of approved impacted specimens.

C. Structural-Sealant Joints: Designed to produce tensile or shear stress in structural-sealant joints of less than 0 psi138 kPa.

D. Structural Loads:
   1. Wind Loads: Provide aluminum-framed entrance and storefront systems capable of withstanding wind pressures associated with ultimate wind speed of 140 mph inward and wind pressures acting normal to the plane of the wall.
      a. Importance Factor is Iw=1.15.
      b. Exposure Category “C”.

c. Building Category: Fully Enclosed

E. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:
1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.

F. Windborne-Debris-Impact-Resistance-Test Performance: Provide aluminum-framed systems that pass large missile-impact tests and cyclic-pressure tests according to SBCCI protocols.

G. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 180 deg F100 deg C, material surfaces.

H. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft.300 Pa.

I. Water Penetration Under Static Pressure: Provide aluminum-framed systems that have been tested according to ASTM E 331 and meet SBCCI large missile impact testing standards of 10 lb/sq. ft. minimum.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of the Contract.
1. Product data for each aluminum entrance and storefront system required, including:
a. Manufacturer's published data sheets including Florida NOA acceptance data, product data that indicates compliance with the Miami-Dade County product approval system or the Florida Building Code product approval system). Data sheets shall indicate size, materials, glazing system, type of anchors, spacing, and placement of anchors, details of head, jambs, and sill conditions for opening type (frame, masonry, etc.).
b. Conformance test report from an industry recognized independent testing laboratory, attesting that the unit tested meets or exceeds the allowable structural loads and other performance conditions for which the unit was tested.
c. Data on finishing, hardware and accessories.
2. Shop drawings for each aluminum entrance and storefront system required, including:
a. Layout and installation details, including relationship to adjacent work.
b. Elevations at 1/4-inch scale.
c. Detail sections of typical composite members.
d. Anchors and reinforcement.
e. Hardware mounting heights.
f. Provisions for expansion and contraction.
g. Glazing details.
3. Samples for Verification:
a. For each type of hardware and accessory to be used. Provide samples of structural sealant, gaskets, weatherstripping and glazing
b. For each type of exposed finish required, in manufacturer’s standard sizes. Provide color samples.
4. Maintenance Data: For aluminum-framed systems to include in maintenance manuals
5. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing entrance and storefront systems similar to those required for this Project and who is acceptable to manufacturer.
   1. Engineering Responsibility: Prepare data for entrance and storefront systems, 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's Qualifications: Provide aluminum entrances and storefront systems produced by a firm experienced in manufacturing systems that are similar to those indicated for this project and that have a record of successful in-service performance.

C. Source Limitations: Obtain each type of entrance and storefront system through one source from a single manufacturer.

D. Design Criteria: The drawings indicate the size, profile, and dimensional requirements of aluminum entrance and storefront work required and are based on the specific types and models indicated. Aluminum entrance and storefront by other approved manufacturers listed in Part 2 Products may be considered.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.6 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty executed by the manufacturer agreeing to repair or replace components of entrance and storefront systems that fail in materials or workmanship within the specified warranty period or periods listed below. Failures include, but are not limited to, the following:
   1. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   2. Failure of operating components to function normally.
   3. Entrance door corner construction: lifetime.

C. Warranty Period:
   1. 5 years from date of Substantial Completion.

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 the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. U.S. Aluminum Corporation
2. Kawneer Company, Inc.
3. EFCO Corporation.

C. Products:
1. Kawneer Company, Inc “Storm Guard” 2-1/2" x 5" large missile impact storefront system NOA No. 07-0817.04. Only flush glazed products will be accepted.
2. Kawneer Company, Inc., 3501R large missile Outswing Aluminum Storefront Doors NOA No. 06-0803.05.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
1. Sheet and Plate: ASTM B209.
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 211.
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308/B 308M.
5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: Provide steel when required and as determined by wind loads and the architectural aluminum manufacturer as per their tested/approved specimens and drawings.

2.3 FRAMING SYSTEMS

A. Framing Members: Manufacturer’s standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

B. Brackets and Reinforcements: Manufacturer’s standard high-strength aluminum with non-staining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer’s standard corrosion-resistant, non-staining, nonbleeding fasteners and accessories compatible with adjacent materials.
1. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking fasteners.
2. Reinforce members as required to receive fastener threads.
3. Do not use exposed fasteners, except for hardware application. For hardware application, use countersunk Phillips flat-head machine screws finished to match framing members or hardware being fastened, unless otherwise indicated.

D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.

E. Flashing: Manufacturer’s standard corrosion-resistant, non-staining, nonbleeding flashing, compatible with adjacent materials. Form exposed flashing from sheet aluminum finished to match framing and of sufficient thickness to maintain a flat appearance without visible deflection.

F. Framing System Gaskets and Sealants: Manufacturer’s standard recommended by manufacturer for joint type.

2.4 GLAZING SYSTEMS

A. Glazing: 9/16" .070 Polycarbonate large missile impact resistant glazing for storefronts and entrances as manufactured by Security Impact Glass. Product name is “Saf-Glass”.

B. Glazing Gaskets: Manufacturer’s standard compression types, replaceable, molded or extruded, that maintain uniform pressure and watertight seal.

C. Spacers and Setting Blocks: Manufacturer’s standard elastomeric types.

D. Bond Breaker Tape: Manufacturer’s standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

E. Glazing Sealants: For structural-sealant-glazed systems, as recommended by manufacturer for joint type and as follows:
   1. Structural Sealant: ASTM C 1184, neutral-curing silicone formulation compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant, and approved by structural-sealant manufacturer for use in aluminum-framed systems as indicated.
      a. Color: Black.
   2. Weatherseal Sealant: ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; neutral-curing silicone formulation compatible with structural sealant and other system components with which it comes in contact; recommended by structural- and weatherseal-sealant and aluminum-framed system manufacturers for this use.
      a. Color: Matching structural sealant.

2.5 DOORS

A. Doors: Provide manufacturer’s standard glazed medium stile large missile impact door for manual swing operation.
   1. Door Construction: Doors shall have extruded tubular rail and stile members designed to meet specified performance requirements.
   2. Door Design: Medium stile large missile impact.
   3. Glazing Stops and Gaskets: Manufacturer’s standard stops and gaskets for assemblies designed to meet specified performance requirements. Exposed fasteners shall not be permitted on glass stops.
   4. Exposed fasteners shall not be permitted on glass stops.

2.6 HARDWARE

A. General: Provide heavy-duty hardware units in sizes and types recommended by entrance system and hardware manufacturers for entrances assemblies that are designed to meet specified performance requirements. Finish exposed parts to match door finish, unless otherwise indicated
   1. Opening Force Requirements:
      a. Egress Doors: Not more than 30 lbf required to set door in motion and not more than 15 lbf required to open door to minimum required width.

B. Ball Bearing Butts: Provide manufacturer’s standard ball bearing butt hinges for assemblies that meet specified performance requirements and as indicated below:
   1. Provide non-removable pins at hinges exposed to outside of door.
   2. Provide non-ferrous hinges where hinges are exposed to weather.
   3. Finish: Clear anodized aluminum.

C. Surface-Mounted Closers: With accessories required for complete installation, sized as required for door size, exposure to weather, and anticipated frequency of use, and adjustable to meet field conditions and requirements of opening force to meet barrier-free requirements
   1. Finish to match door.

D. Cylinder Guard: Manufacturer's standard hardened-steel security ring with retainer plate for inside stile wall that protects lock cylinder from removal by wrenches, prying, or sawing.

E. Exit Devices: Manufacturer's standard concealed exit device for entrance assemblies that meet specified performance requirements. Exit device shall have dogging feature and lock cylinder.
   1. Finish: Clear anodized.

F. Thresholds: At exterior doors, provide manufacturer's standard threshold for entrance assemblies that meet specified performance requirements and the following: cutouts coordinated for operating hardware, with anchors and jamb clips, and not more than 1/2-inch- high, with beveled edges providing a floor level change with a slope of not more than 1:2, and in the following material:
   1. Material: Aluminum, mill finish.

G. Door Bottom Rail: Manufacturer's door bottom rail with an E.P.D.M. blade gasket sweep strip applied with concealed fasteners.

H. Weatherstripping: Butt hung doors shall have weather-stripped door stops at frame jambs and header.

I. Pull Handle: Contemporary styled 1" diameter cast aluminum bent bar, 90-degree offset pull equal to U.S. Aluminum “Radius Pull”.
   1. Finish: Clear anodized.

J. Door Stops: BHMA A156.16, Grade 1, floor mounted, as appropriate for door location indicated, with integral rubber bumper.

2.7 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 7 Section “Joint Sealants”.

B. Bituminous Paint: Cold-applied asphaltic-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.8 FABRICATION

A. Glazing contractor must install all components of the project’s storefront and entrances per the manufacturer’s installation instructions.

B. Form aluminum shapes before finishing.

C. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

D. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Provisions for field replacement of glazing from exterior.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

E. Mechanically Glazed Framing Members: Fabricate for flush glazing (without projecting stops).

F. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device (dutchman) to retain glazing in place while structural sealant cures.

G. Storefront Framing: Fabricate components for assembly per manufacturer's requirements to meet specified performance requirements.

H. Door Frames: Reinforce as required to support loads imposed by door operation and for installing hardware.
1. At exterior doors, provide compression weather stripping at fixed stops.

I. Doors: Reinforce doors as required for installing hardware.
1. At exterior doors, provide weather sweeps applied to door bottoms.

I. Hardware Installation: Factory install hardware to the greatest extent possible. Cut, drill, and tap for factory-installed hardware before applying finishes. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

J. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

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

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

D. High-Performance clear anodized finish AA-M10C21A41 / AA-M45C22A41, Architectural Class I (.7 mils minimum).
1. Color: Clear

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of entrance and storefront systems. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:
   1. Install all components of large missile impact storefront and entrance systems per manufacturer's installation instructions.
   2. Do not install damaged components.
   3. Fit joints to produce hairline joints free of burrs and distortion.
   4. Rigidly secure nonmovement joints.
   5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
   6. Seal joints watertight, unless otherwise indicated.

B. 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 or installing nonconductive spacers as recommended by manufacturer for this purpose.
   2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Division 7 Section "Joint Sealants" and to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, without warp or rack.

F. Install glazing per manufacturer's requirements to meet the specified performance requirements.
   1. Structural-Sealant Glazing:
      a. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
      b. Install weatherseal sealant according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

G. Entrances: Install to produce smooth operation and tight fit at contact points.
   1. Exterior Entrances: Install to produce tight fit at weather stripping and weathertight closure.
   2. Field-Installed Hardware: Install surface-mounted hardware according to hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

H. Install insulation materials as specified in Division 7 Section "Building Insulation."

I. Install perimeter joint sealants as specified in Division 7 Section "Joint Sealants" and to produce weathertight

installation.

J. Erection Tolerances: Install aluminum-framed systems to comply with the following maximum tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet (3 mm in 3.7 m); 1/4 inch (6 mm) over total length.
2. Alignment:
   a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch (1.5 mm).
   b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch (0.8 mm).
3. Diagonal Measurements: Limit difference between diagonal measurement to 1/8 inch (3 mm).

3.3 ADJUSTING

A. Entrances: Adjust operating hardware for smooth operation according to hardware manufacturers' written instructions.
   1. For doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch measured to the leading door edge.

3.4 CLEANING

A. Clean the completed system, inside and out, promptly after installation, exercising care to avoid damage to coatings.

Clean glass surfaces after installation, complying with requirements contained in the "Glass and Glazing" Section for cleaning and maintenance. Remove excess glazing and sealant compounds, dirt and other substances from aluminum surfaces.

3.5 PROTECTION

A. Institute protective measures required throughout the remainder of the construction period to ensure that aluminum entrances and storefronts will be without damage or deterioration, other than normal weathering, at time of acceptance.

END OF SECTION 08 41 13

SECTION 08 51 13

LARGE MISSILE IMPACT ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes Architectural Grade aluminum windows of the performance class indicated. Window types required include the following:
   1. Heavy duty large missile impact aluminum single hung windows.

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide large missile impact aluminum windows engineered, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading without failure, as demonstrated by testing manufacturer's standard window assemblies representing types, grades, classes, and sizes required for Project according to test methods indicated.

B. Impact Resistant Glass: Provide materials that comply with the Miami-Dade County product approval system or the Florida Building Code product approval system.
   1. Ultimate Wind Speed Criteria: 140mph Exposure: C
   2. Importance Factor: 1.5
   3. Building Category: Fully Enclosed

C. Performance Requirements:
   1. When tested according to ANSI/AAMA 101 requirements, conforms to or exceeds an H-R60 rating using 3/16" annealed glass, and an H-R65 rating using 5/16" laminated glass.
   2. Air Infiltration: 0.3 (ft^3)/min (ft^2) maximum when tested per ASTM E 283 at a 1.57 psf staticair pressure difference.
   3. Water Resistance: no leakage when tested per ASTM E 547 at a static air pressure difference of 15% of the positive design pressure.
   4. Uniform Load Structural: after testing per ASTM E 330 with a load equal to 150% of the positive design pressure, the unit must be operable, with a maximum permanent deformation in any member of 0.4% of the member's length.
   5. See Structural Drawing Sheets of the Construction Documents for additional loading requirements.

1.3 SUBMITTALS

A. Provide cut sheets, manufacturer’s standard details, specifications and catalog information, recommendations, and installation instructions.

B. Shop Drawings showing fabrication and installation of each type of window required including information not fully detailed in manufacturer's standard Product Data and the following:
   1. Layout and installation details, including anchors.
   2. Elevations at 1/4 inch = 1 foot (1:50) scale and typical window unit elevations at 3/4 inch = 1 foot (1:20) scale.
   3. Full-size section details of typical composite members, including reinforcement and stiffeners.
   4. Location of weep holes.

5. Panning details.
6. Hardware, including operators.
7. Window cleaning provisions.
8. Glazing details.
9. Accessories.
10. Window finish.

C. Samples for initial color selection on 12-inch- (300-mm-) long sections of window members. Where finishes involve normal color variations, include Sample sets showing the full range of variations expected.

D. Provide product data that indicates compliance with the Miami-Dade County product approval system or the Florida Building Code product approval system including Notice of Acceptance (NOA).

E. Sample warranty.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: minimum five (5) years documented experience in the manufacture of aluminum windows as required for this project.

B. Installer Qualifications: Engage an experienced installer who has completed installation of aluminum windows similar in material, design, and extent to those required for this Project and with a record of successful in-service performance.

C. Single-Source Responsibility: Obtain missile impact aluminum windows from one source and by a single manufacturer.

1.5 PROJECT CONDITIONS

A. Field Measurements: Check window openings by field measurements before fabrication and show recorded measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Where field measurements cannot be made without delaying the Work, guarantee opening dimensions and proceed with fabricating aluminum windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to guaranteed dimensions.

1.6 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty signed by aluminum window manufacturer agreeing to repair or replace window components that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:
1. Structural failures including excessive deflection, water leakage, air infiltration, or condensation.
2. Faulty operation of sash and hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

C. Warranty Period: 3 years after date of Substantial Completion.

D. Warranty Period for Metal Finishes and Glass: 5 years after date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include the following:
   1. Single-Hung (Impact-resistant) Windows:
      a. PGT Industries Series SH-701 Heavy Duty Single Hung Aluminum Window, NOA No. 07-0322.06.

2.2 MATERIALS

A. Main Frame Members: extruded from 6063-T5 alloy, nominal 0.062" wall thickness.

B. Sash Members: extruded from 6063-T5 aluminum alloy, nominal 0.062" wall thickness.

C. Hardware: two spiral torsion spring balances. Two steel and tin-lead-zinc alloy cam lever sash locks on each vent locking beneath a groove in the fixed meeting rail (one sash lock if window width is less than 43").

D. Weatherstripping: sides and top of vent weatherstripped with .1270 x .270 fin seal, bottom of vent weatherstripped with compressed finned vinyl bulb.

E. Glazing attachment with silicone adhesive.

F. Screens: tubular aluminum frame with fiberglass screen cloth, vinyl spline, two plastic screen pull tabs and two compression retention springs per screen.

2.3 FABRICATION

A. Main frame and sash joints constructed with butt joint fit, assembled with phillips pan head screws, and factory sealed with Parabond sealer.

B. All hardware factory installed.

C. Bug screens constructed and installed in unit prior to shipping.

2.4 FINISHES

A. Finish: High-Performance clear anodized finish AA-M10C21A41 / AA-M45C22A41, Architectural Class I (.7 mils minimum) Color: Clear

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify that openings provide an acceptable anchoring surface, being clean, level, plumb, and dimensionally within the manufacturer's tolerance of clearance

B. Verify that rough or masonry opening is correct and sill plate is level.
   1. Masonry surfaces shall be visibly dry and free of excess mortar, sand, and other construction debris.
   2. Metal surfaces shall be dry; clean; free of grease, oil, dirt, rust and corrosion, and welding slag; without sharp edges or offsets at joints.

3.2 INSTALLATION

A. Comply with manufacturer's specifications and recommendations for installing window units, hardware, operators, and other components of the Work.

B. Set window units plumb, level, and true to line, without warp or rack of frames or sash. Provide proper support and anchor securely in place.
   1. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified under "Dissimilar Materials" Paragraph in appendix to AAMA 101.

C. Set sill members and other members in a bed of sealant or with joint fillers or gaskets, as shown on Shop Drawings, to provide weathertight construction. Refer to Division VIII Section 07 92 00 "Joint Sealants" for compounds, fillers, and gaskets to be installed concurrently with window units. Coordinate installation with wall flashings and other components of the Work.
   1. Sealants, joint fillers, and gaskets to be installed after installation of window units are specified in another Division VII Section.

D. Place insulation materials around shim spaces as required to ensure continuity of the thermal barrier of the structure.

E. Apply caulk all around between the aluminum frame and the structure, ensuring that a continuous air tight and watertight perimeter seal results. Leave exposed surfaces clean and free of caulk.

3.3 ADJUSTING

A. Ensure that units freely operate in a normal fashion, and that vents make proper contact with weatherstripping perimeter seal. Adjust frame, vent, or hardware as needed.

3.4 CLEANING

A. Clean aluminum surfaces promptly after installing windows. Exercise care to avoid damage to protective coatings and finishes. Remove excess glazing and sealant compounds, dirt, and other substances. Lubricate hardware and other moving parts.

B. Leave units thoroughly clean and free of dirt or other construction residue.

3.5 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to aluminum window manufacturer, that ensure window units are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 08 51 13

SECTION 08 71 00

FINISH HARDWARE

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Finish Hardware

B. Electro-mechanical Hardware

C. Aluminum Door Hardware Thresholds

D. Weather-stripping

1.2 RELATED WORK

A. Section: 06 20 23: Interior Architectural Millwork

B. Section: 08 11 13: Steel Doors and Frames

C. Section: 08 14 16: Flush Wood Doors

1.3 QUALITY ASSURANCE

A. STANDARDS: Manufacturers and model numbers listed are to establish a standard of quality. Similar items by approved manufacturers, unless otherwise noted, that are equal in design, finish and quality will be considered upon prior approval of the architect and provided required data and physical samples are submitted at least ten (10) days prior to date of bid**.** Products listed as "No Substitute" are specified as such by the Owner's request.

B. SUPPLIER QUALIFICATIONS: Hardware supplier must be engaged regularly in contracting work and be staffed to expedite work, the firm shall have been furnishing hardware on similar projects in the geographic area for not less than five years. The supplier must have in his employ a certified Architectural Hardware Consultant (AHC) to periodically inspect and direct detailing, setting, applying of all hardware items.

C. INSTALLER QUALIFICATIONS: Hardware for the project shall be installed by factory authorized personnel who have successfully completed factory training courses and shall be certified for the installation of locksets, door closers and exit devices. Prior to installation the installer shall inspect all door frames for proper plum and square condition. General Contractor shall be notified of frames found out of square, plum or unsuitable for door installation at the installation meeting.

D. PRE-INSTALLATION CONFERENCE FOR MECHANICAL HARDWARE: Conduct conference at Project site to include owner and architect related to mechanical door hardware, including but not limited to the following:

1. Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment and facilities needed to make progress an avoid delays.
2. Present General Contractor with a written report of the condition of door frames in terms of squareness and any other condition that may impede the installation and operation of the doors and hardware.
3. Review installer's responsibilities for testing, inspecting and adjusting doors and hardware in accordance with 08 71 00, Part 3 EXECUTION.

E. PRE-INSTALLATION CONFERENCE FOR ELECTRIFIED HARDWARE: Conduct conference prior to electrical rough-in for electro-mechanical hardware components. Review methods and procedures related to electrified door hardware including, but not limited to the following:
1. Discuss electrical rough-in requirements and other preparatory work to be performed by other trades.
2. Review sequence of operation for each type of electrical door hardware.
3. Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment and facilities needed to make progress an avoid delays.
4. Review installer's responsibilities for testing, inspecting and adjusting doors and hardware in accordance with 08 71 00, Part 3 EXECUTION.

F. FLORIDA WIND AND IMPACT REQUIREMENTS: All hardware shall meet or exceed requirements for Wind Pressure and Impact ratings. Furnish copies of Notice of Acceptance as required by the Architect.

1.4 REFERENCES

A. ANSI/BHMA designations where used in schedules to describe hardware items or to define quality or function are derived from the following standards and requirements specified elsewhere in this section.

1.	Butts and Hinges:	ANSI A156.1 (Formerly BHMA 101)
2.	Locks and Lock Trim:	ANSI A156.2 (BHMA 601)
3.	Exit Devices:	ANSI A156.3 (BHMA 701)
4.	Door Controls: Closers:	ANSI A156.4 (BHMA 301)
5.	Auxiliary Locks:	ANSI A156.5 (BHMA 501)
6.	Architectural Door Trim:	ANSI A156.6 (BHMA 1001)
7.	Template Hinge Dimensions:	ANSI A156.7
8.	Door Controls: Overhead Holders:	ANSI A156.8 (BHMA 311)
9.	Interconnected Locks & Latches:	ANSI A156.12 (BHMA 311)
10.	Mortise Locks & Latches:	ANSI A156.14 (BHMA 401)
11.	Sliding & Folding Door Hardware:	ANSI A156.14 (BHMA 401)
12.	Closer Holder Release Devices:	ANSI A156.16 (BHMA 1201)
13.	Self-Closing Hinges & Pivots:	ANSI A156.17 (BHMA 1101)
14.	Materials and Finishes:	ANSI A156.18 (BHMA 1301)

B. Door and Hardware Institute Standards used:
1. Keying Terminology / Systems and Nomenclature – 1989
2. Installation Guide for Doors and Hardware – 1984
3. Wood Door Hardware Standards – 1996
4. Abbreviations and Symbols – 1983
5. Sequence and Format for the Hardware Schedule - 1996

1.5 SUBMITTALS

A. GENERAL REQUIREMENTS: Submit manufacturer's product data for each item of hardware.

Include whatever information may be necessary to show compliance with requirements, and instructions for installation and maintenance of operating parts and exposed finishes.

B. SCHEDULES: Submit six (6) copies of the finish hardware schedule in vertical format complying with DHI publication: "Sequence and Format for the Hardware Schedule". Include a description of each electrified door hardware function, including product's location, narrative of sequence of operation and integration with other building control systems.

C. SAMPLES: At the request of the architect, submit samples of products for approval of design, finish, etc.

D. TEMPLATES: Whenever required, furnish templates to the necessary fabricators of other related work, which is to receive finish hardware, such as door and steel door frames.

E. CATALOG CUTS: Submit six (6) copies of catalog cuts of all products listed in the finish hardware schedule.

F. KEYING SCHEDULE: The specific keying requirements are noted elsewhere in this schedule. If these requirements are not noted then, it is the supplier's responsibility to submit a keying schedule based on the format listed in the DHI manual: Keying Procedures, Systems and Nomenclature for the approval of the Architect.

1.6 DELIVERY STORAGE AND HANDLING

A. MARKING & PACKAGING: Hardware shall be delivered to the project site, or as otherwise required, in manufacturer's original packages, numbered and labeled to identify each opening for which it is intended and to correspond to item numbers on the approved hardware schedule.

B. Storage and protection of the materials is the responsibility of the General Contractor.

C. The General Contractor shall provide clean, dry, locked storage room with shelves for sorting and protection of items.

1.7 WARRANTIES

A. All door closers shall have a ten (10) year warranty against defects in material and workmanship from the date of occupancy of the project.

B. All other products shall have a one (1) year warranty against defects in the material and workmanship from the date of occupancy of the project.

C. Exit hardware shall be warranted for a period of three (3) years against defects material and workmanship.

PART 2 - PRODUCTS

2.1 ACCEPTABLE PRODUCTS

Products:	Specified Manufacturers:	Acceptable Manufacturers:
HINGES	HAGER	LAWERENCE, McKINNEY
PIVOTS	RIXON	LCN
FLUSH BOLTS	HAGER	ROCKWOOD, TRIMCO
EXIT DEVICES	YALE	CORBIN RUSSWIN,
CYLINDERS	YALE	CORBIN RUSSWIN,
LOCKS	YALE	CORBIN RUSSWIN,
CYPHER LOCKS	KABA / ILCO	NO SUBSTITUTIONS
EXIT DEVICES	YALE	SARGENT
PUSH-PULLS	HAGER	ROCKWOOD, TRIMCO
DOOR CLOSERS	YALE	CORBIN RUSSWIN,
DOOR HOLDERS	RIXON	LCN
KICK PLATES	HAGER	ROCKWOOD, TRIMCO
DOOR STOPS	HAGER	ROCKWOOD, TRIMCO
THRESHOLDS	PEMKO	NATIONAL GUARD, HAGER
WEATHER	PEMKO	NATIONAL GUARD, HAGER
DOOR BOTTOMS	PEMKO	NATIONAL GUARD,
SMOKE SEALS	PEMKO	NATIONAL GUARD, HAGER

To the greatest extent possible, obtain materials from one manufacturer. Manufacturers listed above are intended to insure quality and design of the project.

2.2 MATERIALS

A. SCREWS & FASTENERS: All screws and fasteners required for the hardware items are listed in the individual hardware sets. Any omission of these items should be reflected in the schedule submitted for approval.

B. HINGES: Where hinges are specified unless otherwise noted they shall be of types and sizes as required by ANSI A156.1. **SIZE HINGES ACCORDING TO APPROVED MANUFACTURERS' RECOMMENDATIONS**. Provide stainless steel continuous hinges as listed in the hardware sets. Provide 4 heavy weight hinges for all doors 3-6 or wider. Provide UL fastener studs for continuous hinges on rated doors. Provide full length jamb reinforcements for all continuous hinges.

C. PIVOTS: All pivots and/or pivot sets shall be the product of one (1) manufacturer. Sets as noted in the hardware groups shall be matching in design and finish for aluminum storefront doors. The doors as noted in the hardware sets are to have intermediate pivots as well as top pivots. All pivot sets are required to meet ANSI Grade One standards as standard listed in ANSI A156.4, 1980.

D. FLUSH BOLTS: Provide Manual and automatic flush bolts as noted in the hardware sets. All flush bolts are required to meet ANSI A156.3.

E. COORDINATOR & CARRY BARS: Provide coordinator and carry bars as noted in the hardware sets. Coordinators and carry bars are required to meet ANSI A156.2 TYPE 21.

F. LOCKSETS & CYLINDERS: Provide locksets and cylinders as noted in hardware sets. Locksets shall meet ANSI A156.13 Series 1000 Grade 1 and ANSI 117.1. All lock functions shall be UL Listed for up to 3 hours. All keys and key blanks shall be restricted for use in the geographic area.

G. LOCK TRIM: The design criteria selected for the lockset is as noted in the hardware sets. This is the acceptable design selected by the owner and intended for this project.

H. EXIT DEVICES: Provide the series and type of exit devices as noted in the hardware sets. Exit devices are required to meet ANSI A156.3 Grade One. All exit devices and electrically controlled exit devices shall be of one manufacturer.

I. DOOR CLOSERS: Provide the series and type of door closers as noted in the hardware sets. These door closers are required to meet ANSI A156.4 Grade One. All closers and power actuated closers shall be of one manufacturer. Provide all door closers from the same manufacturer. Supply drop plates and fillers as required for all door and frame conditions. All door closers shall be fully adjustable and comply with the Americans with Disabilities Act (ADA).

NOTES:
1. ALL DOOR CLOSERS SHALL BE THROUGH-BOLTED.
2. SUPPLY DROP PLATES AND TRANSOM BRACKETS AS REQUIRED FOR EXISTING CONDITIONS AND FULL GLASS DOORS.

J. PUSH, PULL & KICK PLATE: Provide the type and size of these plates as noted in the hardware sets. These items are intended for the use and accessibility as protection of the openings indicated in the hardware schedule.

K. DOOR STOPS & HOLDERS: Provide the types as noted in the hardware sets. Any variation in the jobsite conditions could change the type as specified.

L. THRESHOLD & WEATHER-STRIPPING: Provide the types as noted in the hardware sets. All exterior openings and interior fire rated openings shall have the necessary items to meet the local building code standards. Provide stainless steel screws at all locations. All thresholds and door bottoms shall comply with the Americans with Disabilities Act (ADA).

M. SILENCERS: Provide the type required to accommodate the hollow metal frames and wood frames fabricated for the project. Stick on / adhesive silencers are not permitted.

2.3 FINISHES

A. Provide the finishes as specified in the hardware schedule. Otherwise, provide matching finishes for the hardware items at each door opening to the greatest extent possible. Refer to the ANSI A156.18 for the identification of these finishes.

2.4 KEYING

A. Establish a new Yale Master Key System for the Nassau County Fire Department. Key all cylinders in accordance with direction from the designated representative of the Nassau County Fire Department and the Architect. Submit keying schedule in the DHI written format for approval prior to factory order of permanently keyed cylinders.

B. All cylinders shall be Inter-changeable Core, a minimum of 6 pins from the same manufacturer and meet ANSI/BHMA Grade 1.

C. Provide 2 factory cut change keys per lock, 6 master keys per group, 4 grand master keys and 100 key blanks. All factory cut and blank keys shall be restricted for use in the North Florida / South Georgia geographic area and be of nickel silver. Ship all permanent factory cut keys direct via registered US Mail to: The designated representative of the Nassau County Fire Department.

D. Each key shall be marked and identified as directed by the owner' using the mechanical impact method of transferring the numerical impression to the key bow. Characters shall be consistent and uniform in their placement, alignment and depth of impression. Factory stamp all factory cut keys utilizing manufacturers Visual Key Control (VKC) system. Factory stamp cylinder core utilizing manufacturers Concealed Key Control (CKC) system.

E. Provide manufacturers temporary construction cores (12 each) for use during construction phase of project. Replace with factory keyed permanent cores during project completion phase or as directed by the Owner and General Contractor.

2.5 KEY CONTROL

A. Provide a key control system including envelopes, labels tags, with self-locking key clips, receipt forms, three-way visible card index, temporary markers and standard metal cabinet. Provide all of this material from one manufacturer and per that manufacturer's system standard. Provide a system with the capacity for 150% of the number of cylinders and locksets required for the project.

PART 3 - EXECUTION

3.1 INSPECTION

A. After installation has been completed, the hardware supplier shall have a qualified Architectural Hardware Consultant (AHC); check the job to determine the proper application of hardware according to the approved hardware schedule and keying schedule. Also, check the operation and adjustment of all hardware items.

3.2 INSTALLATION

A. Refer to the DHI manual publication for Recommended Locations for Builders Hardware, and ADA REQUIREMENTS for instruction. Install all hardware in compliance with manufacturer's instruction and recommendations. Drill and countersink all items which are not factory prepared for fasteners. Cut and fit all thresholds and weather-stripping to profile of door frames. Set thresholds in accordance with the application condition.

B. Use only fasteners supplied with hardware and approved by the manufacturer. Drill and tap doors and frames as required prior to installation of hardware. Self-drilling screws are not acceptable.

3.3 ADJUSTING & CLEANING

A. At final completion all hardware shall be left clean and free from disfigurement. The Contractor shall make a final adjustment to all door closers and other items of hardware. Where hardware is found defective, repair or replace or otherwise correct as directed.

B. At the completion of the project and / or during the close phase of the project the supplier will review with the designated owner's representative the proper service and adjustment of all hardware items.

C. At the completion of the project and / or during the close out phase of the project the supplier will perform a final adjustment to all door closers furnished in this section to insure that all fire rated doors close and latch and that all door closer opening and closing pressure are in compliance with ADA.

3.4 OPERATIONS, MAINTENANCE AND TRAINING

A. At completion of the project, provide the owner with a manual containing the following information:
1. Final (as built) copy of hardware schedule.
2. Final copy of keying schedule.
3. Final copy of all system schematics and wiring diagrams.
4. Copy of product data sheets as submitted including all Warranty data.
5. Parts list for Locksets, Door Closers and Exit Devices.
6. Copy of installation instructions for each type of hardware used.
7. Name, address and phone number of each manufacturer and local representative.
8. Complete set of any specialized tools.

B. At the completion of the project the supplier shall engage a factory authorized service representative to train the Owner's maintenance personnel to adjust, operate and maintain door hardware and electronic cylinder / lock systems provided in this section

3.5 PROTECTION

A. The general contractor is responsible for the proper protection of all items of hardware until the owner accepts the job as complete.

3.6 HARDWARE SCHEDULE: See hardware schedule (A602). Note: Doors 104 and 104B provide "Occupied/Unoccupied" designation hardware.

END OF SECTION 08 71 00

SECTION 08 81 00

GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes glazing for the following products, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Window units.
   2. Vision lites.
   3. Storefront glazing.

B. Related Sections: The following sections contain requirements that relate to this Section.
   1. Division X Section 10 28 00 "Toilet and Bath Accessories" for mirrored glass requirements.

1.2 DEFINITIONS

A. Manufacturer is used in this Section to refer to a firm that produces primary glass or fabricated glass as defined in the referenced glazing standard.

B. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's directions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems that are produced, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading (where applicable), without failure including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; and other defects in construction.

B. Glass Design: Glass thicknesses indicated on Drawings are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for the various size openings in the thicknesses and strengths (annealed or heat-treated) to meet or exceed the following criteria:
   1. Minimum glass thickness, nominally, of lites in exterior walls is 6 mm.
   2. Tinted and heat-absorbing glass thicknesses for each tint indicated are the same throughout Project.
   3. Minimum glass thicknesses of lites, whether composed of annealed or heat-treated glass, are selected so the worst-case probability of failure does not exceed the following:
      a. 8 lites per 1000 for lites set vertically or not over 15 degrees off vertical and under wind action.

         Determine minimum thickness of monolithic annealed glass according to ASTM E 1300. For other than monolithic annealed glass, determine thickness per glass manufacturer's standard method of analysis including applying adjustment factors to ASTM E 1300 based on type of glass.

C. Normal thermal movement results from the following maximum change (range) in ambient and surface temperatures acting on glass-framing members and glazing components. Base engineering calculation on materials' actual surface temperatures due to both solar heat gain and nighttime sky heat loss.

1. Temperature Change (Range): 120 F deg (67 C deg), ambient; 180 F deg (100 C deg), material surfaces.

1.4 SUBMITTALS

A. Product data for each glass product and glazing material indicated.

B. Samples for verification purposes of 12-inch (300 mm) square samples of each type of glass indicated except for clear monolithic glass products, and 12-inch (300 mm) long samples of each color required (except black) for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative in color of the adjoining framing system.

C. Compatibility and adhesion test reports from sealant manufacturer indicating that glazing materials were tested for compatibility and adhesion with glazing sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed for adhesion.

D. Compatibility test report from manufacturer of insulating glass edge sealant indicating that glass edge sealants were tested for compatibility with other glazing materials including sealants, glazing tape, gaskets, setting blocks, and edge blocks.

E. Maintenance data for glass and other glazing materials to include in Operating and Maintenance Manual specified in Division 1.

F. Provide product data that indicates compliance with the Miami-Dade County product approval system or the Florida Building Code product approval system.

G. Provide product data that indicates compliance with the applicable ASTM requirements

H. Submit sample warranty.

1.5 QUALITY ASSURANCE

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
   1. FGMA Publications: "FGMA Glazing Manual."
   2. SIGMA Publications: TM-3000 "Vertical Glazing Guidelines" and TB-3001 "Sloped Glazing Guidelines".

B. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.
   1. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.

C. Fire-Resistive Glazing Products for Door Assemblies: Products identical to those tested per ASTM E 152, labeled and listed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

D. Fire-Resistive Glazing Products for Window Assemblies: Products identical to those tested per ASTM E 163, labeled and listed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

E. Glazier Qualifications: Engage an experienced glazier who has completed glazing similar in material, design, and extent to that indicated for Project with a record of successful in-service performance.

F. Single-Source Responsibility for Glass: Obtain glass from one source for each product indicated below:
   1. Primary glass of each (ASTM C 1036) type and class indicated.
   2. Heat-treated glass of each (ASTM C 1048) condition indicated.

G. Single-Source Responsibility for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials to comply with manufacturer's directions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing materials manufacturer or when glazing channel substrates are wet from rain, frost, condensation, or other causes.
   1. Install liquid sealants at ambient and substrate temperatures above 40 deg F (4 deg C).

1.8 WARRANTY

A. General: Warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

B. Manufacturer's Warranty on Coated Glass Products: Submit written warranty signed by coated glass manufacturer agreeing to furnish replacements for those coated glass units that deteriorate as defined in "Definitions" article, f.o.b. point of manufacture, freight allowed Project site, within specified warranty period indicated below. Warranty covers only deterioration due to normal conditions of use and not to handling, installing, and cleaning practices contrary to glass manufacturer's published instructions.
   1. Warranty Period: Manufacturer's standard but not less than 5 years after date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PRIMARY FLOAT GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I (transparent glass, flat), Class as indicated below, and Quality q3 (glazing select) Acceptable manufacturers are Pittsburgh Plate Glass Company, Libby-Owens Ford Glass Company, American Saint Gobain Corporation, Mississippi Glass Company, or Ford Glass Company, SAF-Glas, LLC.
   1. Class 2 (tinted, heat-absorbing, and light-reducing) where indicated.
   2. Tinted glass design basis: “Solorgray” by SAF.

B. Refer to coated glass product requirements for tint color and performance characteristics of coated tinted glass for monolithic glazing relative to visible light transmittance, U-values, shading coefficient, and visible reflectance.

C. Refer to requirements for sealed insulating glass units for performance characteristics of assembled units composed of tinted glass, coated or uncoated, relative to visible light transmittance, U-values, shading coefficient, and visible reflectance.

2.2 ELASTOMERIC GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:

1. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials they will contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
2. Suitability: Comply with sealant and glass manufacturer's recommendations for selecting glazing sealants and tapes that are suitable for applications indicated and conditions existing at time of installation.
3. Colors: Provide color of exposed joint sealants to comply with the following:
   a. Match colors indicated by reference to manufacturer's standard designations.

B. Elastomeric Glazing Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that comply with ASTM C 920 requirements indicated on each Elastomeric Glazing Sealant Product Data Sheet at the end of this Section, including those referencing ASTM classifications for Type, Grade, Class and Uses.

1. Additional Movement Capability: Where additional movement capability is specified in Elastomeric Glazing Sealant Product Data Sheet, provide products, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, with the capability to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements of ASTM C 920 for uses indicated.

C. Glazing Sealant for Fire-Resistant Glazing Products: Identical to product used in test assembly to obtain fire-resistive rating.

2.3 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent, non-staining and non-migrating in contact with nonporous surfaces, with or without spacer rod as recommended by tape and glass manufacturers for application indicated, packaged on rolls with a release paper backing, and complying with AAMA 800 for products indicated below:
   1. AAMA 804.1.

2.4 GLAZING GASKETS

A. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock strips, complying with ASTM C 542, black.

B. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:

1. Neoprene, ASTM C 864.
2. EPDM, ASTM C 864.
3. Silicone, ASTM C 1115.
4. Thermoplastic polyolefin rubber, ASTM C 1115.
5. Any material indicated above.

C. Soft Compression Gaskets: Extruded or molded closed-cell, integral-skinned gaskets of material indicated below, complying with ASTM C 509, Type II, black, and of profile and hardness required to maintain watertight seal:
1. Neoprene.
2. EPDM.
3. Silicone.
4. Thermoplastic polyolefin rubber.
5. Any material indicated above.

2.5 MISCELLANEOUS GLAZING MATERIALS

A. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85 plus or minus 5.

B. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

C. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side-walking).

D. Plastic Foam Joint Fillers: Preformed, compressible, resilient, non-staining, non-extruding, non-outgassing, strips of closed-cell plastic foam of density, size, and shape to control sealant depth and otherwise contribute to produce optimum sealant performance.

2.6 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

B. Clean cut or flat grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with indoor and outdoor faces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine glass framing, with glazier present, for compliance with the following:
1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
2. Presence and functioning of weep system.
3. Minimum required face or edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Do not proceed with glazing until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.3 GLAZING, GENERAL

A. Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials except where more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions as indicated on Drawings provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass from edge damage during handling and installation as follows:
   1. Use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass lites with flares or bevels on bottom horizontal edges so edges are located at top of opening, unless otherwise indicated by manufacturer's label.
   2. Remove damaged glass from Project site and legally dispose of offsite. Damaged glass is glass with edge damage or other imperfections that, when installed, weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install elastomeric setting blocks in sill rabbets, sized and located to comply with referenced glazing standard, 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 sizes larger than 50 united inches (1250 mm) (length plus height) as follows:
   1. Locate spacers inside, outside, and directly opposite each other. Install correct size and spacing to preserve required face clearances, except where gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and 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 to comply with requirements of referenced glazing publications, unless otherwise required by glass manufacturer.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. 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.

K. Square cut wedge-shaped gaskets at corners and install gaskets in 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 TAPE GLAZING

A. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.

B. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

C. Do not remove release paper from tape until just before each lite is installed.

D. Apply heel bead of elastomeric sealant.

E. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

F. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.

B. Secure compression gaskets in place with joints located at corners to compress gaskets producing a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

C. Install gaskets so they protrude past face of glazing stops.

3.6 LOCK-STRIP GASKET GLAZING

A. Comply with ASTM C 716 and gasket manufacturer's printed recommendations. Provide supplementary wet seal and weep system unless otherwise indicated.

3.7 PROTECTION AND CLEANING

A. Protect exterior glass from breakage 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 including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during construction period.

D. Wash glass on both faces in each area of Project not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION 08 81 00

SECTION 08 90 00

LOUVERS AND VENTS

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. Fixed, extruded-aluminum or formed-aluminum louvers.

B. Related Sections include the following:
   1. Division VII Section 07 92 00 "Joint Sealants" for sealants installed in perimeter joints between louver frames and adjoining construction.
   2. Division XXIII sections for louvers that are a part of mechanical equipment.

1.3 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide louvers capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act on vertical projection of louvers.
   1. Wind Loads: Determine loads based on a uniform pressure created by 120 mph wind with wind borne debris large missile resistant construction acting inward or outward.

1.5 SUBMITTALS

A. Product Data including cut sheets: For each type of product indicated.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other Work. Show blade profiles, angles, and spacing.
   1. For installed louvers and vents indicated to comply with design loads, include structural analysis data.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain louvers and vents through one source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.2, "Structural Welding Code--Aluminum."

C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify louver openings by field measurements before fabrication and indicate measurements on Shop Drawings.
1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating louvers without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to established dimensions.

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 the following:
1. Louvers:
a. Airline Products Co.
b. Airolite Company (The).
c. American Warming and Ventilating, Inc.
d. Arrow United Industries.
e. Carnes Company, Inc.
f. Cesco Products.
g. Construction Specialties, Inc.
h. Dowco Products Group; Safe-Air of Illinois, Inc.
i. Greenheck.
j. Industrial Louvers, Inc.
k. Louvers & Dampers, Inc.
l. Metal Form Manufacturing Company, Inc.
m. NCA Manufacturing, Inc.
n. Nystrom Building Products.
o. Reliable Products; Hart & Cooley, Inc.
p. Ruskin Company; Tomkins PLC.
q. Vent Products Company, Inc.

2.2 MATERIALS

A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy 6063-T5 or T-52.

B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Aluminum Castings: ASTM B 26/B 26M, alloy 319.

D. Fasteners: Of same basic metal and alloy as fastened metal or 300 Series stainless steel, unless otherwise indicated. Do not use metals that are incompatible with joined materials.

1. Use types and sizes to suit unit installation conditions.
2. Use Phillips flat-head screws for exposed fasteners, unless otherwise indicated.

E. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

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

2.3 FABRICATION, GENERAL

A. Assemble louvers in factory to minimize field splicing and assembly.

B. Maintain equal louver blade spacing to produce uniform appearance.

C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
1. Frame Type: Channel, unless otherwise indicated.

D. Include supports, anchorages, and accessories required for complete assembly.

E. Where indicated, provide subsills made of same material as louvers for recessed louvers.

F. Join frame members to each other and to fixed louver blades with fillet welds, threaded fasteners, or both, as standard with louver manufacturer, concealed from view, unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.4 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal, Nondrainable-Blade Louver:
1. Louver Depth: 4 inches.
2. Blade Profile: Plain blade without center baffle.
3. Frame and Blade Nominal Thickness: As required to comply with structural performance requirements, but not less than 0.080 inch for blades and 0.080 inch (2.0 mm) for frames].
4. Performance Requirements: Decorative louver with 2” insulated blank-off panel.

2.5 FINISHES, GENERAL

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

B. Finish louvers after assembly.

2.6 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.

B. Finish: High-Performance clear anodized finish AA-M10C21A41 / AA-M45C22A41, Architectural Class I (.7 mils minimum) Color: Clear

2.7 STAINLESS-STEEL SHEET FINISHES

A. Repair sheet finish by grinding and polishing irregularities, weld spatter, scratches, and forming marks to match surrounding finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, 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. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

F. Protect nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Division VII Section 07 92 00 "Joint Sealants" for sealants applied during louver installation.

3.4 CLEANING

A. Test operation of adjustable louvers and adjust as needed to produce fully functioning units that comply with requirements.

B. Clean exposed surfaces of louvers and vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.

C. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

D. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 08 90 00

SECTION 09 21 00

GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Non load-bearing steel framing members for gypsum board assemblies.
   2. Gypsum board assemblies attached to steel framing.

1.2 DEFINITIONS

A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA-505 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.3 ASSEMBLY PERFORMANCE REQUIREMENTS

A. Fire Resistance: Provide gypsum board assemblies with fire-resistance ratings indicated.

1.4 SUBMITTALS

A. Product Data for each type of product listed in Section 2 as specified including but not limited to insulation, joint compound, tape, screws, light gauge framing and furring members, etc.

B. Provide data indicating compliance with applicable ASTM testing requirements.

C. Submit one 12" x 12" sample for each type of gypsum board assembly required.

1.5 QUALITY ASSURANCE

A. Single-Source Responsibility for Steel Framing: Obtain steel framing members for gypsum board assemblies from a single manufacturer, unless otherwise indicated.

B. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.

C. Single-Source Responsibility for Finishing Materials: Obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board manufacturer.

D. Fire-Test-Response Characteristics: Where fire-resistance-rated gypsum board assemblies are indicated, provide gypsum board assemblies that comply with the following requirements:
   1. Fire-Resistance Ratings: As indicated by GA File Numbers in GA-600 "Fire Resistance Design Manual" or design designations in UL "Fire Resistance Directory" or in the listing of another testing and inspecting agency acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum panels flat to prevent sagging.

C. Handle gypsum board to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads and trim.

1.7 PROJECT CONDITIONS

A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C 840 requirements or gypsum board manufacturer's recommendations, whichever are more stringent.

B. Room Temperatures: For non-adhesive attachment of gypsum board to framing, maintain not less than 40 deg F (4 deg C). For adhesive attachment and finishing of gypsum board, maintain not less than 50 deg F (10 deg C) for 48 hours before application and continuously after until dry. Do not exceed 95 deg F (35 deg C) when using temporary heat sources.

C. Ventilation: Ventilate building spaces as required to dry joint treatment materials. Avoid drafts during hot, dry weather to prevent finishing materials from drying too rapidly.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, the following:
   1. Steel Framing and Furring:
      a. Consolidated Systems, Inc.
      b. Dale Industries, Inc.
      c. Dietrich Industries, Inc.
      d. National Gypsum Co.; Gold Bond Building Products Division.
      e. Abercrombie
      f. All Steel & Gypsum Products, Inc.
      g. Southeastern Stud & Components, Inc.
      h. Steel Construction Systems
      i. The Steel Network
      j. Clark Western Building Systems
   2. Gypsum Board and Related Products:
      a. Georgia-Pacific Corp.
      b. National Gypsum Co.; Gold Bond Building Products Division. United States Gypsum Co.
      c. American Gypsum Co.
      d. Lafarge North America, Inc.
      e. BPB America, Inc.

f. PABCO Gypsum
g. Temple

2.2 STEEL FRAMING FOR WALLS AND PARTITIONS

A. General: Provide steel framing members complying with the following requirements:
1. Protective Coating: G40 hot-dip galvanized coating per ASTM A 525.
2. Maximum Deflection: L/120 at 5 lbf. per square foot.

B. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch- (5-mm-) wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:
1. Thickness: 25 guage (min.).
2. Depth: 3-5/8 inches (92.1 mm), unless otherwise indicated.
3. Depth: 6 inches (152.4 mm) where indicated.
4. Depth: 2-1/2 inches (63.5 mm) where indicated.
5. Depth: 1-1/2 inch (41.3 mm) where indicated.

C. Deflection Track: Manufacturer's standard top runner designed to prevent cracking of gypsum board applied to interior partitions resulting from deflection of the structure above fabricated from steel sheet complying with ASTM A 653 (ASTM A 653M) or ASTM A 568 (ASTM A 568M). Thickness as indicated for studs, and width to accommodate depth of studs

2.3 GYPSUM BOARD PRODUCTS

A. General: Provide gypsum board of types indicated in maximum lengths available that will minimize end-to-end butt joints in each area indicated to receive gypsum board application.
1. Gypsum Wallboard: ASTM C 36 and as follows:
2. Type: Regular for vertical surfaces, unless otherwise indicated.
3. Type: Sag-resistant type for ceiling surfaces.
4. Edges: Tapered.
5. Thickness: 5/8 inch (12.7 mm), unless otherwise indicated.

2.4 CEMENTITIOUS BACKER UNITS

A. Provide cementitious backer units complying with ANSI A118.9, of thickness and width indicated below, and in maximum lengths available to minimize end-to-end butt joints.
1. Thickness: 5/8 inch, unless noted otherwise.

B. Available Products: Subject to compliance with requirements, cementitious backer units that may be incorporated in the Work include, the following:
1. DUROCK Cement Board; United States Gypsum Co.
2. Util-a-crete; FinPan, Inc.
3. Wonderboard; Custom Building Products, Inc.

2.5 TRIM ACCESSORIES

A. Accessories for Interior Installation: Corner bead, edge trim, and control joints complying with ASTM C 1047 and requirements indicated below:
1. Material: Formed metal or plastic, with metal complying with the following requirement:
a. Steel sheet zinc coated by hot-dip process.

2. Shapes indicated below by reference to Fig. 1 designations in ASTM C 1047:
   a. Corner bead on outside corners, unless otherwise indicated.
   b. LC-bead with both face and back flanges; face flange formed to receive joint compound. Use LC-beads for edge trim, unless otherwise indicated.
   c. One-piece control joint formed with V-shaped slot and removable strip covering slot opening.

2.6 JOINT TREATMENT MATERIALS

A. General: Provide joint treatment materials complying with ASTM C 475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.

B. Joint Tape for Gypsum Board: Paper reinforcing tape, unless otherwise indicated.

C. Joint Tape for Cementitious Backer Units: As recommended by cementitious backer unit manufacturer.

D. Drying-Type Joint Compounds for Gypsum Board: Factory-packaged vinyl-based products complying with the following requirements for formulation and intended use.
   1. Ready-Mixed Formulation: Factory-mixed product.
   2. All-purpose compound formulated for both taping and topping compounds.

E. Joint Compound for Cementitious Backer Units: Material recommended by cementitious backer unit manufacturer.

2.5 MISCELLANEOUS MATERIALS

A. General: Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.

B. Steel drill screws complying with ASTM C 954 for fastening gypsum board to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

C. Steel drill screws of size and type recommended by unit manufacturer for fastening cementitious backer units.

D. Sound-Attenuation Blankets: Unfaced fiber glass blanket insulation

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to which gypsum board assemblies attach or abut, installed hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLING STEEL FRAMING, GENERAL

A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.

B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with United States Gypsum Co.'s "Gypsum Construction Handbook."

C. Do not bridge building control and expansion joints with steel framing or furring members. Independently frame both sides of joints with framing or furring members as indicated.

3.3 GYPSUM PANEL INSTALLATION

A. Apply gypsum panels first to ceiling and then to walls. Position all edges of gypsum panels at framing members. Extend ceiling board to corners and make firm contact with wall angle, channel or top plate. To minimize end joints, use panels of maximum practical lengths. Fit ends and edges closely, but not forced together. Cut ends, edges, scribe or make cutouts within the field of panels in a workmanlike manner. Cut gypsum board to size using a knife and straight edge.

B. Attach Gypsum Panels to the suspension system main runners, cross tees and cross channels with conventional gypsum panel fasteners (No. 6 Type S HILO bugle head, self-drilling,self-taping steel screws) spaced 8" on center at periphery of gypsum panels and located 3/8" in from panel edges and spaced 12" o.c. in the field. Drive fasteners heads slightly below surface of gypsum panels in a uniform dimple without breaking face paper.

C. Install trim at all internal and external angles formed by the intersection of panel surfaces or other disimiliar materials. Apply corner bead to all vertical or horizontal external corners in accordance with manufacturer's directions.

D. Spacing of drywall grid is designed to support only the dead load. Heavy concentrated loads should be independently supported. Lighting fixtures or troffers, air vents and other equipment should be separately supported from the structure; Gypsum Panels will not support these items.

E. To prevent objectionable sag in new gypsum panel ceilings, the weight of overlaid unsupported insulation should not exceed 2.2 psf for 5/8" panels 24" on center.

F. Provide Control Joint No. 093 which has a 3/32" ground for drywall. Ceiling areas should not exceed 50 ft. (2500 sf) with a perimeter relief, 30 ft. (900 sf) without perimeter relief.

3.4 INSTALLING STEEL FRAMING FOR WALLS AND PARTITIONS

A. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction.
   1. Where studs are installed directly against exterior walls, install asphalt felt strips or foam gaskets between studs and wall.

B. Installation Tolerances: Install each steel framing and furring member so that fastening surfaces do not vary more than 1/8 inch (3 mm) from the plane formed by the faces of adjacent framing.

C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and

openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.

1. For STC-rated and fire-resistance-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid structural surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed, to support gypsum board closures needed to make partitions continuous from floor to underside of solid structure.

D. Install steel studs and furring in sizes and at spacings indicated but not less than that required by the referenced steel framing installation standard to comply with maximum deflection and minimum loading requirements specified:

1. Single-Layer Construction: Space studs 16 inches (610 mm) o.c., unless otherwise indicated.
2. Cementitious Backer Unit Construction: Space studs 16 inches (406 mm) o.c., unless otherwise indicated.

E. Install steel studs so flanges point in the same direction and leading edge or end of each gypsum board panel can be attached to open (unsupported) edges of stud flanges first.

F. Frame door openings to comply with details indicated, with GA-219, and with applicable published recommendations of gypsum board manufacturer. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

1. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.

G. Frame openings other than door openings to comply with details indicated or, if none indicated, as required for door openings. Install framing below sills of openings to match framing required above door heads.

3.5 APPLYING AND FINISHING GYPSUM BOARD, GENERAL

A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840 and GA-216.

B. Install sound-attenuation blankets, where indicated, prior to installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

C. Install gypsum wall panels with face side out. Do not install imperfect, damaged, or damp panels. 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 both edge or end joints over supports. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Avoid joints other than control joints at corners of framed openings where possible.

E. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

F. Attach gypsum panels to framing provided at openings and cutouts.

G. Form control and expansion joints at locations indicated and as detailed, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.

H. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases that are braced internally.
   1. Except where 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. (0.7 sq. m) in area.
   2. Fit gypsum panels around ducts, pipes, and conduits.
   3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

I. Isolate perimeter of nonload-bearing gypsum board partitions at structural abutments, except floors, as detailed. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

J. Where STC-rated gypsum board assemblies are indicated, seal construction at perimeters, behind control and expansion joints, openings, and penetrations with a continuous bead of acoustical sealant including a bead at both faces of the partitions. Comply with ASTM C 919 and manufacturer's recommendations for location of edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.

K. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.

L. Space fasteners in panels that are tile substrates a maximum of 8 inches (203.2 mm) o.c.

3.6 GYPSUM BOARD APPLICATION METHODS

A. Single-Layer Application: Install gypsum wallboard panels as follows:
   1. On ceilings apply gypsum panels horizontally (parallel to framing), unless otherwise indicated, and provide panel lengths that will minimize end joints.
   2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated, and provide panel lengths that will minimize end joints.
   3. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless parallel application is required for fire-resistance-rated assemblies. Use maximum-length panels to minimize end joints.
      a. Stagger abutting end joints not less than one framing member in alternate courses of board.
      b. At stairwells and other high walls, install panels horizontally.

B. Wall Tile Substrates: For substrates indicated to receive thin-set ceramic tile and similar rigid applied wall finishes, comply with the following:
   1. Install cementitious backer units to comply with ANSI A108.11 at showers, tubs, and where indicated.
   2. Install cementitious backer units to comply with ANSI A108.11 at locations indicated to receive wall tile.

C. Single-Layer Fastening Methods: Apply gypsum panels to supports as follows:
   1. Fasten with screws.

3.7 INSTALLING TRIM ACCESSORIES

A. General: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.

B. Install cornerbead at external corners.

C. Install edge trim where edge of gypsum panels would otherwise be exposed. Provide edge trim type with face flange formed to receive joint compound, except where other types are indicated.
   1. Install LC-bead where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate.

D. Install control joints according to ASTM C 840 and manufacturer's recommendations and in specific locations approved by Architect for visual effect.

3.8 FINISHING GYPSUM BOARD ASSEMBLIES

A. General: Treat gypsum board joints, interior angles, flanges of cornerbead, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.

B. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.

C. Apply joint tape over gypsum board joints, except those with trim accessories having flanges not requiring tape.

D. Apply joint tape over gypsum board joints and to flanges of trim accessories as recommended by trim accessory manufacturer.

E. Levels of Gypsum Board Finish: Provide the following levels of gypsum board finish per GA-214.
   1. Level 1 for ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
   2. Level 4 for gypsum board surfaces, unless otherwise indicated.

F. For Level 4 gypsum board finish, embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects and ready for decoration. Use the following joint compound combination:
   1. Embedding and First Coat: Ready-mixed, drying-type, all-purpose or taping compound.
   2. Fill (Second) Coat: Ready-mixed, drying-type, all-purpose or topping compound.
   3. Finish (Third) Coat: Ready-mixed, drying-type, all-purpose or topping compound.

G. Where Level 1 gypsum board finish is indicated, embed tape in joint compound.

H. Finish cementitious backer units to comply with unit manufacturer's directions.

3.9 CLEANING AND PROTECTION

A. Promptly remove any residual joint compound from adjacent surfaces.

B. Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure gypsum board assemblies are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 09 21 00

SECTION 09 30 13

PORCELAIN TILE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Unglazed floor tile (shower floors).
   2. Glazed wall tile.
   3. Waterproof membrane for thin-set tile installations.
   4. Anti-fracture membrane for thin-set tile installations.

B. Related Sections include the following:
   1. Division 3 Section "Cast-in-Place Concrete" for monolithic slab finishes specified for tile substrates.
   2. Division 7 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
   3. Division 9 Section "Gypsum Board Assemblies" for cementitious backer units installed in gypsum wallboard assemblies.

1.2 SUBMITTALS

A. Product Data: For each type of tile, mortar, grout, water proofing, anti-fracture, marble sills/ thresholds, and other products specified.

B. Tile and marble sills/ thresholds samples for Initial Selection: Manufacturer's color charts consisting of actual tiles or sections of tiles showing the full range of colors, textures, and patterns available for each type and composition of tile indicated. Include Samples of accessories involving color selection.

C. Grout Samples for Initial Selection: Manufacturer's color charts consisting of actual sections of grout showing the full range of colors available for each type of grout indicated.

D. 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 of architects and owners, and other information specified.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed tile installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Source Limitations for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties without delaying the Work.

C. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

D. Source Limitations for Other Products: Obtain each of the following products specified in this Section from one source and by a single manufacturer for each product:
   1. Joint sealants.
   2. Waterproofing membrane.
   3. Anti-fracture membrane.

1.4 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 requirement of ANSI A137.1 for labeling sealed tile packages.

B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

1.5 PROJECT CONDITIONS

A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.

B. Maintain temperatures at 50 deg F (10 deg C) or more in tiled areas during installation and for 7 days after completion, unless higher temperatures are required by referenced installation standard or manufacturer's instructions.

1.6 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Floor & wall tile:
   1. Garden State Tile
   2. Crossville Ceramics Company
   3. Dal-Tile Corp
   4. As selected by Architect/Designer.

B. Tile-Setting and -Grouting Materials:
   1. Mapei Corp.
   2. Bonsal: W.R. Bonsal Company.
   3. Bostik Construction Products Div.
   4. Laticrete International, Inc.

2.2 PRODUCTS, GENERAL

A. ANSI Standard for Ceramic Tile: Comply with ANSI A137.1 "American National Standard Specifications for Ceramic Tile" for types, compositions, and grades of tile indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting Materials" and "Grouting Materials" articles.

C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
   1. Provide Architect's selections from manufacturer's full range of colors, textures, and patterns for products of type indicated.
   2. Provide tile trim and accessories that match color and finish of adjoining flat tile.

2.3 WATERPROOFING FOR THIN-SET TILE INSTALLATIONS

A. General: Provide products that comply with ANSI A118.10 and the descriptions in this Article.

B. Liquid Applied Waterproofing Membrane: Manufacturer’s standard proprietary product consisting of a thin, load bearing waterproofing and crack prevention system that is a cold-applied, self-curing liquid rubber polymer and an integral reinforcing fabric which, together bond directly to the substrate and form a flexible seamless Waterproofing and Anti-Fracture Membrane.

C. Available Products: Subject to compliance with requirements, products which may be incorporated into the Work include the following:

D. Products: Subject to compliance with requirements, provide one of the following:
   1. Liquid Applied Waterproofing Membrane:

A. Anti-Fracture Membrane: Provide manufacturer’s standard proprietary product consisting of a two-part system of a liquid rubber and reinforcing fabric.

B. Available Products: Subject to compliance with requirements, provide one of the following:
   1. Anti-Fracture Membrane:
      a. Laticrete Blue 92; Laticrete International, Inc.

2.6 SETTING MATERIALS

A. Water-Cleanable, Tile-Setting Epoxy Adhesive: ANSI A136.1.

B. Available Products: Subject to compliance with requirements, provide one of the following:
   1. Water-Cleanable, Tile-Setting Epoxy Adhesive:
      a. Type 1 (KER 903); Mapei Corporation.

2.7 GROUTING MATERIALS

A. Polymer-Modified Hydraulic Tile Grout: ANSI A118.6.

B. Available Products: Subject to compliance with requirements, provide one of the following:

1. Polymer-modified hydraulic tile grout (color consistent & efflorescence-free):
    a. Ultra/Color; Mapei Corporation.
    b. As selected by Architect/Designer.

2.8 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.

2.9 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.

2.10 STONE THRESHOLDS & SILLS

A. General: Provide stone thresholds & sills that are uniform in color and finish, fabricated to sizes and profiles indicated to provide transition between tile surfaces and adjoining finished floor surfaces.
    1. Fabricate thresholds to heights indicated, but not more than 1/2 inch (12.7 mm) above adjoining finished floor surfaces, with transition edges beveled on a slope of no greater than 1:2.
    2. Fabricate window sills and shower ledges to heights indicated. If no height indicated us ½" thick material, with eased edges.

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 from oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 series of tile installation standards for installations indicated.
    2. 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 before installing tile.
    3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust latter in consultation with Architect.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove coatings, including curing compounds, and other substances that contain soap, wax, oil, or silicone and are incompatible with tile-setting materials by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.

B. Provide concrete substrates for tile floors installed with dry-set or latex-portland cement mortars that

comply with flatness tolerances specified in referenced ANSI A108 series of tile installation standards for installations indicated.

1. Use trowelable leveling and patching compounds per tile-setting material manufacturer's written instructions to fill cracks, holes, and depressions.
2. Remove protrusions, bumps, and ridges by sanding or grinding.

C. Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, verify that tile has been blended in the factory and packaged so tile units taken from one package show the same range in 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.

3.3 INSTALLATION, GENERAL

A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 series of tile installation standards in "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.

B. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. 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.

D. Jointing Pattern: Lay tile in pattern indicated by architect. Align joints when adjoining tiles on floor, base, walls, and trim are the same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.

E. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where required during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Locate joints in tile surfaces directly above joints in concrete substrates.
2. Prepare joints and apply sealants to comply with requirements of Division 7 Section "Joint Sealants."

F. Grout tile to comply with the requirements of the following tile installation standards:

1. For porcelain tile grouts (sand-portland cement, dry-set, commercial portland cement, and latex-portland cement grouts), comply with ANSI A108.10.

G. At showers, and where indicated, install cementitious backer units and treat joints to comply with ANSI A108.11 and manufacturer's written instructions for type of application indicated.

3.4 WATERPROOFING INSTALLATION

A. Install waterproofing to comply with waterproofing manufacturer's written instructions to produce a waterproof membrane of uniform thickness bonded securely to substrate.

B. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

C. Install waterproofing continuous over floor and turn-up at walls a minimum distance of 4-inches.

D. At shower walls, extend waterproofing up walls full height.

3.5 ANTI-FRACTURE MEMBRANE INSTALLATION

A. Install anti-fracture membrane to comply with manufacturer's written instructions to produce an anti-fracture membrane of uniform thickness bonded securely to substrate.

B. Do not install tile over anti-fracture membrane until membrane has cured.

3.6 FLOOR TILE INSTALLATION METHODS

A. Porcelain Floor Tile: Install tile to comply with manufacturer's requirements for setting bed methods, TCA installation methods related to type of subfloor construction, and grout types.
   1. Shower floor and recess only:

      a. Substrate: Waterproofing Membrane over concrete subfloor.
      b. Setting Bed: Water-Cleanable, Tile-Setting Epoxy Adhesive: ANSI A136.1.
      c. Grout: Polymer-Modified Hydraulic Grout: ANSI A118.6.

   2. All rooms scheduled to receive Porcelain floor tile:

      a. Substrate: Anti-fracture membrane over concrete subfloor.
      b. Setting Bed: Water-Cleanable, Tile-Setting Epoxy Adhesive: ANSI A136.1.
      c. Grout :Polymer-Modified Hydraulic Grout: ANSI A118.6.

3.7 WALL TILE INSTALLATION

A. Porcelain Wall Tile: Install tile to comply with manufacturer's requirements for setting bed methods, TCA's installation methods related to the subsurface wall conditions, and grout types listed below.
   1. Wall Tile (showers walls)

      a. Substrate: Waterproofing membrane over Cementitious Backer Units, Interior.
      b. Setting Bed: Water-Cleanable, Tile-Setting Epoxy Adhesive: ANSI A136.1.
      c. Grout: Polymer-Modified Hydraulic Grout: ANSI A118.6.

   2. Counter Backsplash

      a. Substrate: Waterproofing membrane over Cementitious Backer Units, Interior.
      b. Setting Bed: Water-Cleanable, Tile-Setting Epoxy Adhesive: ANSI A136.1.
      c. Grout: Polymer-Modified Hydraulic Grout: ANSI A118.6.

3.8 STONE THRESHOLD & LEDGE INSTALLATION

A. Stone Thresholds & ledges: Install stone thresholds & ledges at locations indicated or where required; set in same type of setting bed as abutting field tile, unless otherwise indicated.

1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent non-tile floor finish.

3.9 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all porcelain tile surfaces so they are free of foreign matter.
   1. Remove latex-portland cement grout residue from tile as soon as possible.
   2. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.

B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, that ensure tile is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 09 30 13

SECTION 09 51 00

ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Suspended metal grid ceiling system.
   2. Acoustical panels.
   3. Perimeter trim.

B. Related Documents: Additional requirements and information necessary to complete the Work of this Section may be found in other documents.

C. Related Sections:
   1. Section 23 31 13 - Metal Ducts
   2. Section 23 33 00 - Duct Accessories
   3. Section 23 37 13 - Diffussers, Registers and Grilles.
   4. Section 26 51 13 - Light Fixtures: Light fixtures attached to ceiling system.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM C 635 - Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
   2. ASTM C 636 - Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
   3. ASTM E 84 Test Method for Surface Burning Characteristics of Building Materials.
   4. ASTM E 580 - Specification for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Requiring Seismic Restraint.

1.3 SYSTEM DESCRIPTION

A. Design Requirements: Rigidly secure acoustical ceiling system including integral mechanical and electrical components with maximum deflection of 1/360.

1.4 SUBMITTALS

A. Submittal Procedures:
   1. Product Data: Metal grid suspension system components, hold down clips and acoustical panel units. Provide data that indicates compliance with applicable ASTM testing requirements. Include flame-spread and smoke density data.
   2. Samples: Two samples 6 inches x 6 inches illustrating each panel type, pattern and color and two 8" long samples of the metal grid. Provide 2 samples of hold down clips.
   3. Assurance/Control Submittals:
      a. Qualification Documentation: Acoustical ceiling installer documentation of experience indicating compliance with specified qualification requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of this Section with minimum 5 years documented experience.

B. Regulatory Requirements: Surface Burning Characteristics in Accordance with ASTM E 84 for Class III or C finish:
   1. Flame Spread: Less than 200.
   2. Smoke Density: Less than 450.

1.6 DELIVERY, STORAGE AND HANDLING

A. Product Requirements: Transport, handle, store, and protect products.

B. Deliver acoustical units in manufacturer's original unopened containers with brand name and type clearly marked.

C. Store under cover in dry, watertight conditions.

D. Prior to installation, store acoustical units for 24 hours minimum at same temperature and relative humidity as space where Work will be installed.

1.7 PROJECT CONDITIONS

A. Jobsite Requirements: Maintain uniform temperature range of 60-85 degrees F, and humidity of no more than 70 percent relative humidity prior to, during, and after installation.

1.8 MAINTENANCE

A. Extra Materials: Provide 1 box of extra acoustical panels for each panel type, pattern, and color to the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Suspension System: Subject to compliance with project requirements, manufacturers offering specified items which may be incorporated in the Work include the following:
   1. Armstrong World Industries Incorporated, Lancaster, PA (800) 448-1405.
   2. Celotex Building Products Division, Tampa, FL (800) 523-4684.
   3. USG Interiors, Chicago, IL (800) 950-3839.

B. Acoustical Panels: Subject to compliance with project requirements, manufacturers offering specified items which may be incorporated in the Work include the following:
   1. Armstrong World Industries Incorporated, Lancaster, PA (800) 448-1405.
   2. Celotex Building Products Division, Tampa, FL (800) 523-4684.
   3. USG Interiors, Chicago, IL (800) 950-3839

C. Product Requirements: Product options and substitutions. Substitutions: Permitted.

2.2 CEILING SYSTEMS

A. Acoustical Panels:

1. USG Interiors, Inc: ClimaPlus, Orion 210 Lay-in, Square Edge Size: 24" x 24" x 1/2"
Color: White
Gypsum substrate with washable vinyl surface.
Provide Armstrong Retention Clips where hold down clips are indicated.

B. Suspension System:

1. USG Interiors, Inc: DONN ZXLA W/VACT
Grid: ASTM C635, intermediate duty galvanized grid system with aluminum cap.
Nominal Width: 15/16" width, provide hold down clips where indicated.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
1. Verify that layout of hangers will not interfere with other Work.

B. Report in writing the Architect prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

C. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.2 INSTALLATION - SUSPENSION SYSTEM

A. Install system in accordance with ASTM C 636 [ASTM E 580] and manufacturer's published instructions.

B. Hang system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
Where ducts or other equipment prevent regular spacing of hangers, reinforce nearest affected hangers and related carrying channels to span extra distance.

C. Locate system on room axis according to Reflected Ceiling Plan, where indicated on Drawings, or locate system to a balanced grid design with edge units no less than 50 percent of acoustical panel size where Reflected Ceiling Plan not shown on Drawings

D. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Do not eccentrically load system, or produce rotation of runners.

E. Install edge molding at intersection of ceiling and vertical surfaces using longest practical lengths. Miter corners. Provide edge moldings at junctions with other interruptions. Secure at 16 inches (41 cm) on center.

F. Install four (4) hold-down clips per tile within five feet of exterior doors and throughout the Apparatus Bay.

G. Rivet cross tees at 4 feet on center to edge mould.

H. Install compression struts and secure system with tie wires as indicated on Drawings.
   1. Provide hanger wires, splayed 45 degrees, within 3 inches of intersection between main runner and cross runner.
   2. Provide compression strut and splayed hanger wires as follows:
      a. One assembly for each light fixture.
      b. Located within 6 feet of wall.
      c. Located at maximum 12 feet on center or as indicated on Drawings.

3.3 INSTALLATION - ACOUSTICAL PANELS

A. Fit acoustic units in place free from damaged edges or other defects. Install acoustic units level, in uniform plane, and free from twist, warp, and dents.

3.4 CONSTRUCTION

A. Interface with Other Work:
   1. Do not install acoustical ceiling tiles until building is enclosed, heating is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
   2. Schedule installation of acoustic units after interior wet work is completed.
   3. Install after major above ceiling work is complete.
   4. Coordinate location of hangers with other Work.

B. Site Tolerances:
   1. Variation from Flat and Level Surface: 1/8 inch in 12 feet.

3.5 FIELD QUALITY CONTROL

A. Inspect acoustical panel placement, ceiling grid suspension system installation and connection to structure.

3.6 SITE ENVIRONMENTAL PROCEDURES

A. Indoor Air Quality:
   1. Temporary ventilation: Ventilate products prior to installation. Remove from packaging and ventilate in a secure, dry, well-ventilated space free from strong contaminant sources and residues. Provide a temperature range of 60 degrees F minimum to 90 degree F maximum continuously for minimum 72 hours.

3.7 CLEANING

A. Clean exposed surfaces of acoustical ceilings including trim, edge mouldings, and suspension system members.

END OF SECTION 09 51 00

SECTION 09 65 13

RESILIENT WALL BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Wall base.
   2. Molding accessories.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated including resilient wall base, accessories and glue.

B. Samples for Initial Selection: For each type of product indicated.

C. Samples for Verification: 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.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.4 PROJECT CONDITIONS

A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg, in spaces to receive resilient wall base and accessories during the following time periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

1.5 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. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include products listed in other Part 2 articles.

2.2 COLORS AND PATTERNS

A. Colors and Patterns: As indicated by manufacturer's designations.

B. Design Basis: Johnsonite Wall Base, color as selected.

2.3 RESILIENT WALL BASE

A. Wall Base: ASTM F 1861.
1. Armstrong World Industries, Inc.
2. Azrock Commercial Flooring, DOMCO.
3. Burke Mercer Flooring Products.
4. Johnsonite.
5. Marley Flexco (USA), Inc.
6. Roppe Corporation.
7. VPI, LLC, Floor Products Division.

B. Type (Material Requirement): TV (vinyl).

C. Group (Manufacturing Method): I (solid, homogeneous) or II (layered).

D. Style: Cove (with top-set toe).

E. Minimum Thickness: 0.125 inch.

F. Height: 4 inches.

G. Lengths: Coils in manufacturer's standard length.

H. Outside Corners: Premolded.

I. Inside Corners: Jon formed.

J. Surface: Smooth.

2.4 RESILIENT MOLDING ACCESSORY

A. Description: Joiner for tile and carpet.
1. Burke Mercer Flooring Products.
2. Johnsonite.
3. Marley Flexco (USA), Inc.
4. Roppe Corporation.

B. Material: Vinyl.

C. Profile and Dimensions: As indicated.

2.5 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturers for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
   1. Coved Base Adhesives
   2. Rubber Floor Adhesives

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.
   1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
   2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.

B. 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.

C. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.

D. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

   1. Do not install resilient products until they are the same temperature as the space where they are to be installed.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 RESILIENT WALL BASE INSTALLATION

A. Apply wall base to walls, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

D. Do not stretch wall base during installation.

E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.

F. Premolded Corners: Install premolded corners before installing straight pieces.

G. Job-Formed Corners:
   1. Inside Corners: Use straight pieces of maximum lengths possible. Form by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor coverings that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing resilient product installation:
   1. Remove adhesive and other blemishes from exposed surfaces.
   2. Sweep and vacuum surfaces thoroughly.
   3. Damp-mop surfaces to remove marks and soil.
      a. Do not wash surfaces until after time period recommended by manufacturer.

B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

END OF SECTION 09 65 13

SECTION 09 65 18

LUXURY VINYL PLANK FLOORING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section includes: Solid vinyl plank flooring and accessories as shown on the drawings and schedules and as indicated by the requirements of this section.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete

1.3 REFERENCE STANDARDS

A. ASTM International (ASTM)
1. ASTM E 648 Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Head Energy Source.
2. ASTM E 662 Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
3. ASTM F 925 Test Method for Resistance to Chemicals of Resilient Flooring.
4. ASTM F 1700 Specification for Solid Vinyl Tile

1.4 QUALITY ASSURANCE AND REGULATORY REQUIREMENTS

A. Installer who is competent in the installation of solid vinyl tile plank flooring.

B. Provide resilient flooring and accessories supplied by one manufacturer including adhesives.

C. Provide flooring material to meet the following fire test performance criteria as tested by a recognized independent testing laboratory:
1. ASTM E 648 Critical Radiant Flux of 0.45 watts per sq. cm. or greater, Class I.
2. ASTM 3 662 (Smoke Generation) Maximum Specific Optical Density of 450 or less.

1.5 SUBMITTALS

A. Submit shop drawings, seaming plan, coving details, and manufacturer's technical data, installation and maintenance instructions for flooring and accessories.

B. Submit the manufacturer's standard samples showing the required colors for flooring and applicable accessories.

1.6 ENVIRONMENTAL CONDITIONS

A. Deliver materials in good condition to the jobsite in the manufacturer's original unopened containers that bear the name and brand of the manufacturer's, project identification, and

shipping and handling instructions.

B. Store materials in a clean, dry, enclosed space off the ground, and protected from the weather and from extremes of heat and cold. Protect adhesives from freezing. Store flooring, adhesives and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.

C. Maintain a minimum temperature in the spaces to receive the flooring and accessories of 65°F and a maximum temperature of 85°F for Epoxy Adhesive for at least 48 hours before, during, and for not less than 48 hours after installation. Thereafter, maintain a minimum temperature of 55°F in areas where work is completed. Protect all materials from the direct flow of heat from hot-air registers, or other heating fixtures and appliances.

D. Install flooring and accessories after the other finishing operations, including painting, have been completed. Close spaces to traffic during the installation of the flooring. Do not install flooring over concrete slabs until they are sufficiently dry to achieve a bond with the adhesive, in accordance with the manufacturer's recommended bond and moisture tests.

E. Do not install flooring over concrete slabs until they are sufficiently dry to achieve a bond with the adhesive, in accordance with the manufacturer's recommended bond, ASTM F-2170-11 (Relative Humidity Probe) moisture test and pH test. If any single test result shows excessive level of moisture content or vapor emission rate, apply manufacturer's recommended moisture vapor emission control material over the entire area based upon the highest test reading.

PART 2 – PRODUCTS

2.1 MANUFACTURER

Flexco Corporation, 1401 East 6th Street, Tuscumbia, AL, USA 35674, Phone: (800) 633-3151 Fax: (800) 346-9075, www.flexcofloors.com

A. Product: Flexco Natural Elements Wood, 28 mil, luxury vinyl plank flooring
   1. Warranty: 20 year commercial warranty
   2. Style: NEW-644 Driftwood
   3. Size: 6"x48"
   4. Thickness: 3mm

2.2 RESILIENT FLOORING MATERIALS

A. Classification: Class III solid vinyl tile Type B; ASTM F 1700.

B. Construction: Layered product consisting of wear layers, decorative film, and backing.

C. Composition: 100% recyclable printed film vinyl tile with a UV cured ceramic bead finish manufactured from 72% recycled materials designed to meet or exceed the above-mentioned standard specification for Solid Vinyl Tile.

D. Plank Size: Nominal overall total thickness: 3mm, Size: 6"x48"
   1. Wear Layer Thickness:
      a. 0.028 inch

2. Edge: straight.
3. Colors: NEW-644 DRIFTWOOD

E. Test Performance:
1. Critical Radiant Flux: CRF 70.45, Class I, ASTM E 648.
2. Smoke Density: <450, ASTM 652.
3. Static Coefficient of Friction: Meets ADA Guidelines.

2.4 ADHESIVES

A. Provide Schonox EMI Classic adhesive or XLBrands Stix 2230 Pressure Sensitive, Solvent Free Adhesive

2.5 STANDARDS

A. Flooring shall meet composition, size, thickness, squareness, flexibility, residual indentation, resistance to chemicals, resistance to heat and resistance to light requirements of ASTM F 1700, “Standard Specification for Solid Vinyl tile”, Class III.

2.6 ACCESSORIES

A. For patching, smoothing, and leveling of monolithic subfloors, follow instructions from Schonox ZM Cement Based Self-leveling Compound.

B. Provide slim-line transition/reducing strips tapered to meet abutting materials.

C. Provide threshold of thickness and width as shown on the drawings.

D. Provide resilient edge strips of width shown on the drawings, of equal gauge to the flooring homogenous vinyl or rubber composition, tapered or bullnose edge, with color to match or contrast with the flooring, or as selected by the Architect from standard colors available.

E. Provide metal edge strips of width shown on the drawings and of required thickness to protect exposed edges of the flooring. Provide units of maximum available length to minimize the number of joints. Use butt-type metal edge strips for concealed anchorage, or overlap-type metal edge strips for exposed anchorage. Unless otherwise shown, provide strips made of extruded aluminum with a mill finish.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine subfloors prior to installation to determine that surfaces are smooth and free from cracks, holes, ridges, and other defects that might prevent adhesive bond or impair durability or appearance of the flooring materials.

B. Inspect subfloors prior to installation to determine that surfaces are free from curing, sealing, parting, and hardening compounds; residual adhesives; adhesive removers; and other foreign materials that might prevent adhesive bond. Visually inspect for evidence of moisture, alkaline

salts, carbonation, dusting, mold, or mildew.

C. Report conditions contrary to contract requirements that would prevent a proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.

D. Failure to call attention to defects or imperfections will be construed as acceptance and approval of the subfloor. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.

3.2 PREPARATION

A. Underlayment and Patching Compounds: Use only Schonox SL cement based, rapid drying, smoothing compound. Use to provide a smooth finish on various substrates - filling cracks, holes, leveling. Schonox SL can be used to create a true featheredge.

B. For leveling of monolithic subfloors, use only Schonox ZM cement based self-leveling compound and follow manufacturer instructions. Schonox ZM can be installed up to 1".

C. If self-leveling is required, prime substrate with Schonox VD - universal acrylic primer. Schonox VD is for use prior to applying SCHÖNOX underlayments on porous and non-porous substrates.

D. Remove paint, varnish, oils, release agents, sealers, and waxes. Remove residual adhesives as recommended by the flooring manufacturer. Remove curing and hardening compounds not compatible with the adhesives used, as indicated by a bond test or by the compound manufacturer's recommendations for flooring. Avoid organic solvents.

E. Perform subfloor moisture testing in accordance with ASTM F 2170 "Standard Test Method for Determining Relative Humidity in Concrete Slabs Using *in-situ* Probes", ASTM F 1869 "Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride" and Bond Tests to determine if surfaces are dry; free of curing and hardening compounds, old adhesive, and other coatings; and ready to receive flooring.
   1. Relative humidity shall not exceed 80%. MVER shall not exceed 5 lbs./1000 sq. ft./24 hrs. On installations where both the Percent Relative Humidity and the Moisture Vapor Emission Rate tests are conducted, results for both tests shall comply with the allowable limits listed above.
   2. Do not proceed with flooring installation until results of moisture tests are acceptable. All test results shall be documented and retained.

F. Perform pH tests on concrete floors regardless of their age or grade level. All tests results shall be documented and retained.

G. Vacuum or broom-clean surfaces to be covered immediately before the application of flooring. Make subfloor free from dust, dirt, grease, and all foreign materials.

3.3 INSTALLATION OF FLOORING

A. Install flooring in strict accordance with the latest edition of Manufacturer's installation instructions.

B. Install flooring wall to wall before the installation of floor-set cabinets, casework, furniture, equipment, moveable partitions, etc. Extend flooring into toe spaces, door recesses, closets, and similar openings as shown on the drawings.

C. Scribe, cut, and fit to permanent fixtures, columns, walls, partitions, pipes, outlets, and built-in furniture and cabinets.

D. Install flooring with adhesives, tools, and procedures in strict accordance with the manufacturer's written instructions. Observe the recommended adhesive trowel notching, open times, and working times.

3.4 INSTALLATION OF ACCESSORIES

A. Place resilient edge strips tightly butted to flooring, and secure with adhesive recommended by the edge strip manufacturer. Install edge strips at edges of flooring that would otherwise be exposed.

B. Apply butt-type overlap metal edge strips where shown on the drawings, before flooring installation. Secure units to the substrate, complying with the edge strip manufacturer's recommendations.

3.5 CLEANING AND PROTECTION

A. Perform initial maintenance according to the latest edition of the Manufacturer's System Literature.

B. Protect installed flooring as recommended by the flooring manufacturer against damage from rolling loads, other trades, or the placement of fixtures and furnishings.

END OF SECTION 09 65 18

SECTION 09 65 19

RESILIENT TILE FLOORING

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes: Heavy duty quartz tile flooring.

B. Conform with requirements of all Sections of Division 1, General Requirements, as it applies to the work of this Section.

1.2 RELATED SECTIONS

A. Section(s) related to this Section include:
   1. Concrete: Division III.
   2. Wood & Plastics: Division VI.
   3. Thermal & Moisture Protection: Division VII.
   4. Mechanical: Division XXIII.

1.3 REFERENCES

A. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.

B. American Society for Testing & Materials (ASTM):
   1. ASTM D2047 Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine.
   2. ASTM E648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
   3. ASTM E662 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
   4. ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
   5. ASTM F970 Standard Test Method for Static Load Limit.
   6. ASTM F1482 Standard Guide to Wood Underlayment Products Available for Use under Resilient Flooring.
   7. ASTM F1066 Standard Specification for Vinyl Composition Floor Tile.
   8. ASTM F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
   9. ASTM F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

C. Resilient Floor Covering Institute (RFCI)

1. RFCI Standard Slab Moisture Test Method (Calcium Chloride Method).

1.4 SYSTEM DESCRIPTION

A. Performance Requirements: Provide heavy duty quartz tile flooring which has been manufactured and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.

1.5 SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.

B. Product Data: Submit product data, including manufacturer's information, for specified products.

C. Shop Drawings: Submit shop drawings showing layout, profiles and product components, including drain details, accessories, finish colors, patterns, and textures.

D. Samples: Submit selection and verification samples for finishes, colors and textures.

E. Quality Assurance Submittals: Submit the following:
1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
2. Manufacturer's Instructions: Current published manufacturer's installation and maintenance instructions.
3. Manufacturer's Field Reports: Manufacturer's field reports specified herein.

F. Closeout Submittals: Submit the following:
1. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.
2. Warranty: Warranty documents specified herein.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Experienced in performing work of this section and who is specialized in the installation of work similar to that required for this project. Installation of UPOFLOOR Quartz Tile should follow the instructions detailed in the UPOFLOOR Quartz Tile Installation Guide.
1. Training: Installer who has attended an UPOFLOOR installation training clinic.

B. Pre-installation Meeting: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

1.7 DELIVERY, STORAGE, & HANDLING

A. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Store materials protected from exposure to harmful weather conditions, at temperature and humidity conditions recommended by manufacturer.

1.8 PROJECT CONDITIONS

A. Temperature Requirements: If storage temperature is below 68F (20C), move the UPOFLOOR Quartz Tile to a warmer place and allow to reach this temperature before installation. Maintain temperature of installation area between 68F (20C) and 80F (26C) for a period of at least 72 hours prior to, during, and after completion of the installation for acrylic adhesives (12 hours after completion for polyurethane adhesives).

1.9 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.
   1. Warranty Period: Fifteen (15) years commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.1 QUARTZ TILE

A. Manufacturer: UPOFLOOR
   P.O. Box 8 37101 Nokia, Finland Tel. +358 207 409 600 Fax +358 207 409 736

B. Proprietary Product(s)/System(s): UPOFLOOR Quartz Tile:
   1. UPOFLOOR Quartz Tile is a homogeneous combination of high quality calcium carbonate, and fine and naturally weathered quartz. UPOFLOOR Quartz Tile meets the requirements of ASTM F1066, Class l, Type A.
   2. MOSAIC COLLECTION: 24" X 24" / 12" X 12"
      a. CD 9302: Thickness: 0.08" (2 mm); Width: 24" (61 cm) x 24" (61 cm) or 12" (30 cm) x 12" (30 cm)
      b. Weight: 0.82 lbs/Sq. ft. (4.0 kg/m2) Area per box 24" 24": 48 Sq. ft. (4.46 m2) Area per box 12" x 12": 58.13 Sq. ft. (5.4 m2)
      c. CD 9301: Thickness: 0.08" (2 mm); Width: 24" (61 cm) x 24" (61 cm) or 12" (30 cm) x 12" (30 cm)
      d. Weight: 0.82 lbs/Sq. ft. (4.0 kg/m2) Area per box 24" x 24": 48 Sq. ft. (4.46 m2) Area per box 12" x 12": 58.13 Sq. ft. (5.4 m2)

C. Proprietary Accessory Products: Provide UPOFLOOR accessories for use with UPOFLOOR Quartz Tile:
   1. Acrylic Adhesive: For dry areas with no spillage, use UPOFLOOR 5900, a one-part, water-

based, acrylic adhesive as recommended by manufacturer.

2. Approved alternate adhesive: Schonox EMI Classic or XLBrands XL Stix 2230

D. Proprietary Product(s) Standard and Testing:

1. Product Standard: Tested in accordance with ASTM F1066 for minimum product standards.
2. Fire Resistance: Flammability exceed minimum for Class 1 rating per ASTM E648.
3. Smoke Density: Less than 450 when tested in accordance with ASTM E662.
4. Chemical Resistance: UPOFLOOR Quartz Tile is virtually unaffected by surface water and most chemicals which do not have a solvent action on vinyl. Certain chemicals can cause staining, and acids and dyes can affect the color, which should be selected accordingly.
5. Flexibility: UPOFLOOR Quartz Tile meet flexibility requirements of ASTM F1066.
6. Indentation Resistance: UPOFLOOR Quartz Tile meets indentation resistance requirements of ASTM F1066.
7. Slip Resistance: UPOFLOOR Quartz Tile meets and exceeds current published slip resistance requirements of OSHA. Tests were performed in accordance with ASTM D2047 for dry conditions.
8. Static Load Limit: UPOFLOOR Quartz Tile has been tested to 3500 psi (12410 Kpa) in accordance with ASTM F970.
9. Light Resistance: UPOFLOOR Quartz Tile meets light resistance requirements of ASTM F1066.
10. Color Selection: Select color with expected traffic conditions and usage in mind.

2.2 PRODUCT SUBSTITUTIONS

A. Substitutions: No substitutions permitted.

2.3 SOURCE QUALITY

A. Source Quality: Obtain flooring products from a single manufacturer.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog, installation instructions and product label instructions for installation.

3.2 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

3.3 PREPARATION

A. Quartz Tile flooring shall be installed over subfloors conforming to ASTM F710 for concrete and other monolithic floors.

B. Moisture Testing: Moisture emissions from concrete subfloors must not exceed 5 lbs per 1000sf per 24 hours (2.25 kg H2O/24 hr/93 m2) via the Calcium Chloride Test Method (ASTM F1869) and not to exceed 85% internal concrete relative humidity as tested in accordance with ASTM F2170-02. If subfloor moisture exceeds the allowable maximum for installing UPOFLOOR Quartz Tile, please call your local UPOFLOOR distributor for advice.

C. Wood subfloors shall not exceed 10% moisture content when measured with a Delmhorst Wood Moisture Tester.

D. The pH level of the subfloor surface shall not be higher than 9.9. If higher, subfloor must be neutralized.

E. Underlayment and Patching Compounds: Use only Schonox SL cement based, rapid drying, smoothing compound. Use to provide a smooth finish on various substrates - filling cracks, holes, leveling. Schonox SL can be used to create a true featheredge.

F. For leveling of monolithic subfloors, use only Schonox ZM cement based, self-leveling compound and follow manufacturer instructions. Schonox ZM can be installed up to 1".

G. If self-leveling is required, prime substrate with Schonox VD - universal acrylic primer. Schonox VD is for use prior to applying SCHÖNOX underlayments on porous and non-porous substrates.

3.4 INSTALLATION

A. Quartz Tile Installation: Install UPOFLOOR Quartz Tile in accordance with the current published UPOFLOOR Installation Guide. Failure to install UPOFLOOR Quartz Tile in accordance with recommended procedures will void the UPOFLOOR Limited Product Warranty.

3.5 FIELD QUALITY REQUIREMENTS

A. Manufacturer's Field Services: Upon Owner's request, provide manufacturer's field service consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.6 CLEANING

A. Specifier Note: UPOFLOOR Quartz Tile is virtually unaffected by surface water and most chemicals which do not have a solvent action on vinyl. Certain organic solvents and chemicals can cause staining, and acids and dyes can affect the color, which should be selected accordingly. Contact manufacturer for a detailed list of the effect of chemicals on UPOFLOOR safety flooring.

B. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project site and legally dispose of debris.

3.7 PROTECTION

A. Protection:
   1. Protect the newly installed flooring from foot traffic for 24 hours and heavy rolling traffic for 72 hours.
   2. Protect installed product and finish surfaces from damage during construction.

B. Cover and protect finished installation from damage that may be caused by other trades using a plywood or non-staining temporary floor protection system, such as textured plastic sheeting.

END OF SECTION 09 65 19

SECTION 09 91 00

PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes surface preparation and field painting of the following:
   1. Exposed interior and exterior items and surfaces.
   2. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1.2 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
   1. Flat refers to a lusterless or matte finish with a gloss range between 0 and 5 when measured at a 60- degree meter.
   2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60- degree meter.
   3. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
   4. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
   5. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.3 SUBMITTALS

A. Product Data: For each paint system specified. Include block fillers and primers.
   1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross- reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
   2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
   3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated including stains, paints/colors and waterproofing materials.
   1. After color selection, the Architect will furnish color chips for surfaces to be coated.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.
   1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.6 PROJECT CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 deg F (10 and 32 deg C).

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 deg F (7.2 and 35 deg C).

C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
   1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.7 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to the Owner.
   1. Quantity: Furnish the Owner with an additional 5 percent, but not less than 1 gal. (3.785 L) or 1 case, as appropriate, of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include products listed in the paint schedules and those by approved manufacturers.

B. Products: Subject to compliance with requirements, provide one of the products in the paint schedules.

C. Manufacturers Names: The following are approved manufacturers referred to in the paint schedules by use of shortened versions of their names, which are shown in parentheses:
1. ICI Dulux (Dulux).
2. Benjamin Moore & Co. (Moore).
3. Sherwin-Williams Co. (S-W).

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of other approved manufacturers.

C. Colors: See finish schedule.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible

because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.
   1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
   1. Provide barrier coats over incompatible primers or remove and reprime.
   2. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber- reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
      a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
      b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's written instructions.
      c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.
   3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
      a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
      b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
      c. When transparent finish is required, backprime with spar varnish.
      d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on backside.
      e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
   4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.
      a. Blast steel surfaces clean as recommended by paint system manufacturer and according to requirements of SSPC-SP 10.
      b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
      c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.

5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

D. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
   1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
   2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
   3. Use only thinners approved by paint manufacturer and only within recommended limits.

E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

F. Masonry Sealing: Provide spray applied water repellant to alleviate block and exposed Apparatus Bay block by Grace Construction Products, Intinseal DB or approved substitute. Install per manufacturers instructions. Ensure that all cleaners, dirt, dust and loose particles of block and mortar are removed.

3.3 APPLICATION

A General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
   1. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
   2. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
   3. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
   4. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
   5. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
   6. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
   7. Sand lightly between each succeeding enamel or varnish coat.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
   1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
   2. Omit primer on metal surfaces that have been shop primed and touchup painted.
   3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats

until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
   1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
   2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
   3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and in occupied spaces.

F. Mechanical items to be painted include, but are not limited to, the following:
   1. Mechanical ductwork supports.

G. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

H. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.

I. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

J. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
   1. Provide satin finish for final coats.

K. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint

work not complying with requirements.

3.4 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
   1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.5 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
   1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.6 EXTERIOR PAINT SCHEDULE

A. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Prime any damage on shop-primed items.
   1. Semigloss, Acrylic-Enamel Finish: One Waterborne Acrylic Low VOC Primer & Two Finish Coats.
      a. Primer:
         1) Dulux: 4020 Devflex Waterborne Acrylic Direct to Metal Primer.
      b. First and Second Coat:
         1) Dulux: 4206 Deflex Waterborne Acrylic Semi-Gloss Enamel

B. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated (galvanized) metal surfaces:
   1. Semigloss, Acrylic-Enamel Finish: One Waterborne Acrylic Low VOC Primer Coat & Two Waterborne Acrylic Finish Coats.
      a. Primer:
         1) Dulux: 4020 Devflex Waterborne Acrylic Direct to Metal Primer
      b. First and Second Coats:
         1) Dulux: 4206 Deflex Waterborne Acrylic Semi-Gloss Enamel

C. Concrete Masonry Units (CMU): Provide the following finish systems over exterior CMU surfaces and interior exposed block not scheduled for paint:
   1. Product Name:
      a. Infiniseal DB Water Repellant sealer for Dry-Block Admixture Wall systems.
      b. Sure Klean® Weather Seal Siloxane PD (predilute)
   2. Manufacturers:
      a. Grace Construction Products, 62 Whittemore Ave. Cambridge, MA 02140, (877) 423-6491, Fax (877) 423-6492. www.graceconstruction.com. or approved substitute.
      b. PROSOCO, Inc., 3741 Greenway Circle, Lawrence, KS 66046. Phone: (800) 255-4255; Fax: (785) 830-9797. E-mail: CustomerCare@prosoco.com

3. Infiniseal DB Sealer is then either sprayed, oiled or brush applied to the outside surface of the walls, further enhancing the water repellency of the overall system.
4. Technical Data:
    a. Applicable Standards – ASTM International
        1) ASTM D3278 Standard Test Methods for Flash Point of Liquids by Small Scale Closed-Cup Apparatus.
        2) ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.
        3) ASTM E514 Standard Test Method for Water Penetration and Leakage Through Masonry.
5. Installation:
    a. Surface Preparation: The surface to be treated must be clean and dry, free of chemical cleaners, efflorescence, dirts, oils, mortar smears and other surface contaminants. Any loose, cracked or disintegrated mortar must be re-pointed at least 7 days prior to the application of sealer. Joint sealant and caulking work should be completed at least 6 hours or longer (depending on surface cure timing) prior to application of block sealer.

3.7 PAINT SCHEDULE

A. Concrete Masonry Units (CMU): Provide the following finish systems over interior CMU surfaces scheduled to be painted:
    1. Semi-gloss Finish: One coat of interior block filler, two coats of acrylic enamel.
        a. Filler:
            1) Dulux: 3010 Ultra-Hide Interior Vinyl/Acrylic Block Filler
        b. First and Second Coat:
            1) Dulux: 216 HP DEVFLEX High Performance Waterbourne Acrylic Semi-gloss Enamel.

3.8 QUALITY ASSURANCE

A. Include on label of container, manufacturer's name, type of material, catalog number, color and instructions for reducing where applicable.

B. Volatile Organic Compounds (VOC). The paints specified herein have a VOC not exceeding 3.5 pounds of volatile organic compounds for each gallon of paint product, according to the manufacturer's published literature.
    1. The VOC emission level permitted in different localities is dependent on the federal, state and local regulations legislated for that particular locality.
    2. The painting contractor shall notify the architect if lower VOC limits, than those of the paints specified, are required in the locality where the painting work will be done.
    3. If lower VOC levels are required the painting contractor shall submit, with this proposal a list of alternate materials which he proposes to use, and which do comply with the VOC emission limits.
    4. Alternate materials proposed shall be of the same generic types as specified materials and shall be, as much as possible, the products of one manufacturer.
    5. Alternate materials proposed for any single paint system must be the products of one manufacturer. Complete manufacturer's data, including VOC, shall be submitted for each alternate material proposed.

END OF SECTION 09 91 00

SECTION 10 14 00

SIGNS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following types of signs:
   1. Cast Metal Plaque.
   2. Dimensional Letters & Numbers.
   3. Panel signs.

1.2 SUBMITTALS

A. Product data for each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, anchoring and finishes.

B. Dimensional Letters: Provide full-size representative samples of each dimensional letter type required, showing letter style, color, and material finish and method of attachment.

1.3 QUALITY ASSURANCE

A. Sign Fabricator Qualifications: Firm experienced in producing signs similar to those indicated for this Project, with a record of successful in-service performance, and sufficient production capacity to produce sign units required without causing delay in the Work.

1.4 PROJECT CONDITIONS

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include the following:
   1. Manufacturers of Cast Metal Plaques and Dimensional Letters:
      a. A.R.K. Ramos

   2. Manufacturers of Panel Signs:
      a. Mohawk Sign Systems, Inc.
      b. Nelson-Harkins.

2.2 DIMENSIONAL LETTERS

A. Cast Letters and Numbers: Form individual letters and numbers by casting. Produce characters with smooth, flat faces, sharp corners, and precisely formed lines and profiles, free from pits, scale, sand holes, or other defects. Cast lugs into the back of characters and tap to receive threaded mounting studs. Comply with requirements indicated for finish, style, and size.
   1. Metal: Aluminum.
   2. Font: Equal to “Helvetica Medium” as manufactured by A.R.K. Ramos; size 8" tall.
   3. Finish: Painted, color equal to A.R.K. Ramos

B. Use concealed fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.

C. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance.

2.3 PANEL SIGNS

A. Panel Signs: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes and details of construction.

B. Material: Provide cast (not extruded or continuous cast) methyl methacrylate monomer plastic sheet in sizes and thicknesses indicated, with a minimum flexural strength of 16,000 p.s.i when tested according to ASTM D790, with a minimum allowable continuous service temperature of 176 deg F, and of the following general types.
   1. Opaque Sheet: Where sheet material is indicated as “opaque”, provide colored opaque acrylic sheet in colors and finishes as selected from the manufacturer’s standards.

C. Unframed Panel Signs: Fabricate signs with edges mechanically and smoothly finished to conform with the following requirements:
   1. Edge Condition: Square cut, edge color same as face.
   2. Corner Condition: Corners rounded to a 3/4" radius.
   3. Material: Acrylic plastic.
   4. Graphic Content and Style: Provide sign copy that complies with the requirements indicated for size, style, spacing, content, position, material, finishes and colors of letters, numbers, and other graphic devices. Provide signage in accordance with the American with Disabilities Act and the sign schedule at the end of this section.
   5. Applied Copy: Die-cut characters from vinyl film with pressure-sensitive adhesive backing. Apply copy to the exposed face of the sign panel.
   6. Panel Material: Matte finished opaque acrylic sheet.

2.4 CAST METAL PLAQUES

A. Plaques: Castings shall be free from pits, scale, sand holes, or other defects. Comply with requirements specified for metal, border style, background texture, and finish and with requirements shown for thickness, size, shape, and copy. Hand-tool and buff borders and raised copy to produce the manufacturer's standard satin polished finish.
   1. Material: Aluminum.
   2. Border Style: Equal to A.R.K. Ramos #504 custom round.
   3. Background Texture: Manufacturer's standard matte finish.
   4. Background Finish: Provide the manufacturer's standard acrylic baked-enamel finish. Color to be

equal to A.R.K. Ramos “Gun Metal Grey”.

5. Finish: Raised areas to be satin.
6. Design: Nassau County Fire and Rescue Department Seal. County shall provide artwork.
7. Size: 31 ½” diameters.

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 signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.

B. Dimensional Letters and Numbers: Mount letters and numbers using standard fastening methods recommended by the manufacturer for letter form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish letter spacing and to locate holes for fasteners.

1. Projected distance from wall to be 1-1/2".

D. Cast Metal Plaques: Mount plaques using the standard method recommended by the manufacturer for the type of wall surface indicated.

1. Concealed Mounting: Mount the plaques by inserting threaded studs into tapped lugs on the back of the plaque. Set in predrilled holes filled with quick-setting cement.

3.2 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

END OF SECTION 10 14 00

SECTION 10 28 00

TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes toilet and bath accessory items as scheduled.

B. Porcelain tile accessories are specified in Division 9, Section 09310.

C. Toilet compartments and related accessories are specified in Division 10, Section 10155.

1.2 SUBMITTALS

A. Product data for each toilet accessory item specified, including construction details relative to materials, dimensions, gages, profiles, mounting/ anchorage method, specified options, and finishes.

B. Schedule indicating types, quantities, sizes, and installation locations (by room) for each toilet accessory item to be provided for project.

C. Maintenance instructions including replaceable parts and service recommendations.

D. Provide product data that indicates compliance with applicable ASTM testing requirements.

1.3 QUALITY ASSURANCE

A. Inserts and Anchorages: Furnish accessory manufacturers' standard inserts and anchoring devices that must be set in concrete or built into masonry. Coordinate delivery with other work to avoid delay.

B. Single-Source Responsibility: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise acceptable to Architect.

1.4 PROJECT CONDITIONS

A. Coordination: Coordinate accessory locations, installation, and sequencing with other work to avoid interference with and ensure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

1.5 WARRANTY

A. Warranty: Submit a written warranty executed by mirror manufacturer, agreeing to replace any mirrors that develop visible silver spoilage defects within warranty period.

B. Warranty Period: 15 years from date of Substantial Completion.

C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide toilet accessories by one of the following:
1. Bobrick Washroom Equipment, Inc.
2. A & J Washroom Accessories.
3. Baylor American
4. Bradley Corporation.
5. General Accessory Manufacturing Co. (GAMCO).
6. American Specialties, Inc

2.2 MATERIALS, GENERAL

A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 0.034-inch (22-gage) minimum thickness.

B. Brass: Leaded and unleaded, flat products, ASTM B 19; rods, shapes, forgings, and flat products with finished edges, ASTM B 16; Castings, ASTM B 30.

C. Sheet Steel: Cold-rolled, commercial quality ASTM A 366, 0.04-inch (20-gage) minimum. Surface preparation and metal pretreatment as required for applied finish.

D. Galvanized Steel Sheet: ASTM A 527, G60.

E. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.

F. Mirror Glass: Nominal 6.0-mm (0.23-inch) thick, conforming to ASTM C 1036, Type I, Class 1, Quality q2, and with silvering, electro-plated copper coating, and protective organic coating.

G. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.

H. Fasteners: Screws, bolts, and other devices of same material as accessory unit, or of galvanized steel where concealed.

2.3 TOILET TISSUE DISPENSERS

A. Double Roll Toilet Tissue Dispenser:
1. Description: Non-controlled delivery double roll dispenser.
2. Mounting: Surface.
3. Capacity: 2 standard core toilet tissue rolls through 5 ½" in diameter.
4. Posts, Escutcheons and Mounting Brackets Finish: Type 304 stainless steel, satin finish.
5. Spindle Finish: Chrome plated plastic finish.

2.4 GRAB BARS

A. Stainless Steel Type (equal to Bradley Model 812) for handicapped accessible toilet and showers: Provide grab bars with wall thickness not less than 0.05 inch (18 gage) and as follows:
   1. Mounting: Concealed, manufacturer's standard flanges and anchorages.
   2. Clearance: 1-1/2-inch clearance between wall surface and inside face of bar.
   3. Gripping Surfaces: Smooth, satin finish.
   4. Heavy-Duty Size: Outside diameter of 1-1/2 inches.
   5. Provide information to locate blocking at handicapped shower.

2.5 MIRROR UNITS

A. Standard Stainless Steel Framed Mirror Units (equal to Bradley Model 780-2:
   1. Size:18" x36"
   2. Finish: Satin.
   3. Mirror: 1/4" tempered glass.
   4. Mounting: Theft-resistant, concealed.

2.6 PAPER TOWEL DISPENSERS

A. Towel (Folded) Dispenser:
   1. Description: Unit for dispensing C-fold or multifold towels.
   2. Mounting: Surface.
   3. Minimum Towel-Dispenser Capacity: 400 C-fold or 525 multifold paper towels.
   4. Material and Finish: 22 Ga. Stainless steel, No. 4 finish (satin).
   5. Lockset: Tumbler type for hinged front panel.

2.7 SOAP DISPENSERS

A. Liquid Soap Dispenser

2.8 MISCELLANEOUS ACCESSORIES

A. Towel Bar (Equal to Bradley Model No. 9054): 24 inch (610 mm) long, satin-finished, Type 304 stainless steel tubular (3/4 inch (19 mm) square) bar and rectangular end brackets. Provide galvanized backplates for concealed mounted at 52".

B. Robe Hook: (Equal to Bradley Model No. 9114): Heavy duty satin finished stainless steel single-prong robe hook, rectangular wall bracket with backplate for concealed mounting.

C. Towel Hook: (Equal to Bradley Model No. 9314) Satin-finished, surface-mounted towel hook with concealed mounting plate with set screw, projects 4-71/16" from wall.

D. Shower Curtain (Equal to Bradley Model No. 9537): Microban anti-bacterial shower curtain fabricated of 10 oz. nylon-reinforced anti-bacterial 8 gauge vinyl material. Flame-resistant and self-deodorizing with rust-proof grommets on 6" centers. All sides hemmed. Color: white. Size: full width x 72-inches high. At each shower.

E. Shower Curtain Hook (Equal to Bradley Model No. 9536). Shower curtain hook fabricated of stainless steel spring.

F. Shower Rod (Equal to Bradley Model No. 9539): Heavy-duty shower curtain rod with concealed mounting. Fabricated of type 304 satin finish stainless steel; 1-1/4" O.D., flanges 3-1/8" O.D.. Escutcheons snap over flanges to provide vandal-resistant mounting.

G. Shower Seat (Equal to Bradley Model No. 956): Shower seat fabricated of blow-molded polyethylene with Microban antimicrobial agent. Shower seat folds to vertical position when not in use.

2.9 FABRICATION

A. General: No names or labels are permitted on exposed faces of toilet and bath accessory units. On either interior surface not exposed to view or on back surface, provide identification of each accessory item either by a printed, waterproof label or a stamped nameplate indicating manufacturer's name and product model number.
   1. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.
   2. Framed Mirror Units, General: Fabricate frames for glass mirror units to accommodate wood, felt, plastic, or other glass edge protection material. Provide mirror backing and support system that will permit rigid, tamperproof glass installation and prevent moisture accumulation, as follows:
      a. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
      b. Provide galvanized-steel backing sheet, not less than 0.034 inch (22 gage) and full mirror size, with non-absorptive filler material. Corrugated cardboard is not an acceptable filler material.
   3. Mirror Unit Hangers: Provide system for mounting mirror units that will permit rigid, tamperproof, and theft-proof installation, as follows:
   4. Keys: Provide universal keys for access to toilet accessory units requiring internal access for servicing, resupply, etc. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install toilet accessory units according to manufacturers' instructions, using fasteners appropriate to substrate as recommended by unit manufacturer. Install units plumb and level, firmly anchored in locations and at heights indicated.

B. Secure mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, according to manufacturer's instructions for type of substrate involved.

C. Install grab bars to withstand a downward load of at least 250 lbf, complying with ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Clean and polish all exposed surfaces strictly according to manufacturer's recommendations after removing temporary labels and protective coatings.

TOILET AND BATH ACCESSORIES SCHEDULE

As supplied and installed by contractor provide support blocking for all accessories.

RESTROOM 104

1. Grab bar 36" -1
2. Grab bar 42" - 1
3. Toilet paper dispenser - 1
4. Mirror - 1
5. Surface soap dispenser - 1
6. Paper towel dispenser – 1

BATH 115, BATH 128, BATH 132

1. Toilet paper dispenser - 1
2. Mirror - 1
3. Surface soap dispenser - 1
4. Paper towel dispenser – 1
5. Ceramic Soap Dish - 1
6. Towel bar - 1
7. Robe hook - 1
8. Shower rod /curtain/hook – 1

BATH 116

1. Grab bar 36" -1
2. Grab bar 42" - 1
3. Toilet paper dispenser - 1
4. Mirror - 1
5. Surface soap dispenser - 1
6. Paper towel dispenser – 1
7. Ceramic Soap Dish - 1
8. Towel bar - 1
9. Robe hook - 1
10. Shower rod /curtain/hook – 1
11. ADA shower grab bar - 1
12. Folding ADA shower seat - 1

END OF SECTION 10 28 00

SECTION 10 44 1 6

FIRE EXTINGUISHER AND CABINET

PART 1 - GENERAL

8.1 SUMMARY

A. This Section includes the following:
   1. Fire extinguisher.
   2. Fire extinguisher cabinet.

8.2 SUBMITTALS

A. Product data for cabinets include rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.

8.3 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain extinguisher and cabinet from one source from a single manufacturer.

B. Coordination: Verify that cabinet is sized to accommodate type and capacity of extinguishers indicated.

C. UL-Listed Products: Fire extinguisher shall be UL listed with UL listing mark for type, rating, and classification of extinguisher.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Larsen's Manufacturing Co.

2.2 FIRE EXTINGUISHERS

A. General: Provide fire extinguisher for each cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard,that comply with authorities having jurisdiction.

B. Wet Chemical Type For Kitchen: Larsen’s WC-6L, K Class, UL-rated ZAik 6 liters in stainless steel container.

2.3 CABINETS

A. Cabinet: Larsen’s Architectural Series Fire Extinguisher Cabinet AL-2712RL for Wet Chemical Extinguisher

B. Cabinet Mounting: Suitable for the following mounting conditions:

1. Semi-recessed: Cabinet box (tub) partially recessed in walls of shallow depth.

C. Trim Style: Fabricate trim in one piece with corners mitered, welded, and ground smooth.
   1. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
      a. Rolled-edge trim with 2-1/2-inch backbend depth.
      b. Trim Metal: Aluminum with clear satin anodized finish.

D. Door Material and Construction: Manufacturer's standard door construction, of material indicated, coordinated with cabinet types and trim styles selected.
   1. Aluminum with clear satin anodized finish.

E. Door Style: Manufacturer's standard design.
   1. Full-Glass Panel: DSA (Float) Glass

2.4 STEEL CABINET FINISHES

A. Baked-Enamel Finish: Immediately after cleaning and pretreatment, apply manufacturer's standard two- coat baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's instructions for applying and baking to achieve a minimum dry film thickness of 2.0 mils.
   1. Color and Gloss: Manufacturer's standard color and gloss designations. Paint the following:
      a. Interior of cabinet.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for thickness and framing for cabinets to verify cabinet depth and mounting prior to cabinet installation

B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Follow manufacturer's printed instructions for installation.

B. Install in locations and at mounting heights indicated or, if not indicated, at heights to comply with applicable regulations of governing authorities.

   1. Prepare recesses in walls for cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
   2. Fasten mounting brackets and cabinets to structure, square and plumb.

END OF SECTION 10 44 16

SECTION 10 57 00

WARDROBE AND CLOSET SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Wood veneer wardrobes, including the following:
   a. Bunks 1 through 8 (114, 117 – 123), Chief's Quarters (129), and Officer's Quarters (130 & 133) See arch drawings for dimensions, , Maple/Clear Finish Veneer
2. Wood veneer gear storage, including the following:
   a. Bunker Gear (126) – see arch drawings for dimensions, Maple/Clear Finish Veneer.

1.2 SUBMITTALS

A. Product Data: Manufacturer's printed data including materials, accessories, construction, finishes, assembly, and installation instructions for units.

B. Shop Drawings: Layout and dimensions of wood veneer units. Indicate relationship to adjoining surfaces. Show unit elevations and details, fillers, trim, base, sloping tops, and accessories. Include unit numbering sequence.

C. Indicate installation and anchorage requirements.

D. Samples for Color Verification: Samples showing actual colors prepared on same material to be used for the Work.

E. Maintenance Instructions: Instructions for cleaning units and for adjusting, repairing, and replacing unit doors and latching mechanisms.

1.3 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain units and accessories from one manufacturer.

1.5 WARRANTY

A. All materials shall be structurally sound and free from defects in material and workmanship under normal use and service fora period of three (3) years after the date of delivery of the product. All lock parts are warranted by the manufacturer for a period of three (3) years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include the following.
   1. Hollman, Inc.
   2 Idealockers (www.idealockers.com)
   3 To be constructed by millwork subcontractor per the specifications of Division 6 Interior Architectural Millwork section.

2.2 CONSTRUCTION

A. Interior: Interior construction of 5/8" high density, high impact, stain and abrasion resistant thermally fused melamine.

B. Tops, bottoms, sides, backs and shelves to be precision machined.

B. Hinges: Four (4) nickel finished, concealed, heavy duty European steel hinges allowing a 130 degree door opening on all doors.

C. Doors: Wood veneer, 3/4" solid wood stiles and rails with a veneer raised panel insert on MDF. Panel is made of A-1 plain sliced veneer and pressed over an MDF panel. Finish equal to Hollman Maple/Clear finish.

D. Hooks: One (1) coat rod and one (1) coat hook with nickel finish.

E. Shelves: One (1) shelf finished to match interior.

F. Pulls: Wire pulls, 4-inches long, 5/16 inches (8 mm) in diameter, satin chromium plated with 1-inch finger clearance.

2.3 FABRICATION

A. Unit shall be fabricated using doweled and glued assembly process, with back tongue and grooved and glued and mechanically fastened into position.

B. Fabricate parts square, rigid and without warp, with the finished faces flat and free of scratches and chips.

C. Machine attachment holes accurate and free of chips. Attach fasteners as standard with manufacturer.

D. Fabricate corners and fillers as required for installation.

E. Provide finished side on all exposed sides.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units at the locations shown in accordance with the manufacturer's instructions for a plumb, level, rigid and flush installation.

B. Install units on a pressure-treated base sized to accommodate 6" wall base.

C. All hardware (screws and decor caps) and manufacturer's recommended installation instructions to be included with each shipment of units.

D. Anchor units to wall studs through the back panel and to the base through the unit floor using #8 1- 1/2" coated steel bugle head wood screws.

B. Clean interior and exposed exterior surfaces and polish stainless-steel and nonferrous metal surfaces.

C. Protect units from damage, abuse, dust, dirt, stain, or paint. Do not permit unit use during construction.

D. Touch up marred finishes, or replace units that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by unit manufacturer.

E. Provide finished end panels where end panel is exposed. Install filer strip for closing off space between the wall and the back of the unit.

3.2 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust doors and latches to operate easily without binding. Verify that integral locking devices are operating properly.

END OF SECTION 10 57 00

SECTION 10 75 00

FLAG POLES

PART 1- GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Aluminum ground mounted flagpole.
   2. Truck, halyards, and accessories.
   3. Concrete flagpole foundation base.

B. Related Documents: The Contract Documents, as defined in the Nassau County front end, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other documents.

C. Related Sections:
   1. Section 03 30 00 - Cast-In-Place Concrete: Concrete base.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM B 241 - Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless ExtrudedTube.

1.3 SYSTEM DESCRIPTION

A. Performance Requirements:
   1. Pole with Flag Flying: Resistant without permanent deformation, 120 miles per hour wind velocity, non-resonant, safety design factor of 1.0. Importance Factor I_W = 1.15.
   2. Flag Dimension: 5 foot x 8 foot.

1.4 SUBMITTALS

A. Section 00100 - Submittal Procedures: Procedures for submittals.
   1. Product Data: Data and cutsheets on pole, accessories, and configurations
   2. Shop Drawings: Detailed dimensions, anchor requirements, imposed loads, and foundation system.
   3. Shop Drawings and engineering calculations - six (6) copies - prepared, signed, sealed and dated by a professional engineer licensed in the State of Florida.
   4. Product data for flag

1.5 QUALITY ASSURANCE

A. Design flagpole and flagpole foundation under direct supervision of a Professional Structural Engineer licensed in the State of Florida, experienced in the design of flagpole and their foundations.

1.6 DELIVERY, STORAGE AND HANDLING

A. Spiral wrap flagpole with protective covering and pack in protective shipping tubes or containers.

B. Protect flagpole and accessories on site from damage or moisture.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with project requirements, manufacturers offering specified items which may be incorporated in the Work include the following:
   1. American Flagpole, Division of Kearney-National Incorporated, Abingdon, VA (800) 368-7171.
   2. Eder Flag Manufacturing Company, Incorporated, Oak Creek, WI (800) 558-6044.
   3. Concord Industries, Incorporated, Addison, TX (800) 527-3902.

2.2 MATERIALS

A. Pole Type: Provide 1 (one) 30 ft. cone-tapered aluminum flag pole fabricated from seamless extruded tubing complying with ASTM B241, alloy 6063-T6, having a minimum wall thickness of 3/16 inch (4.6 mm), tensile strength not less than 30,000 psi (207 MPa), and a yield point of 25,000 psi (172 MPa). Heat-treat and age-harden after fabrication.

B. Truck Assembly: Provide revolving cast aluminum truck with two (2) min. 2-3/8" dia. aluminum sheaves that rotate on a min. ½" dia. stainless steel pin. Truck shall revolve on stainless steel ball bearings mounted on an aluminum spindle.

C. Halyard: Provide two (2) #10 - 5/16" dia. white polypropylene halyards.

D. Cleats: Provide two (2) 9" cast aluminum cleats mounted with 2 - 5/16" stainless steel flathead machine screws.

E. Collar: Spun aluminum to match pole.

F. Foundation Sleeve: 16 gauge steel, galvanized corrugated tube with 3/16 inch thick steel base plate and support plate, 3/4 inch diameter x 18 inch long ground spike, and steel centering wedges.

G. Concrete: Specified in Section 03 30 00.

H. Flag: Furnished and installed by the specialty subcontractor.

I. Snaphooks: Provide four (4) 3-1/2" bronze chrome plated swivel type snaphooks with neoprene covers.

2.3 FINISHES

A. Metal Surfaces in Contact with Concrete: Asphaltic paint.

B. Aluminum: Polished to a Deep Luster Finish (with a soft sheen) followed by hard-coat clear anodized finish

conforming to AA M32-C12-A41.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.

C. Report in writing to the Architect prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.2 PREPARATION

A. Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with asphaltic paint.

3.3 INSTALLATION

A. Install flagpole base assembly, and accessories in accordance with manufacturer's published instructions.

B. Electrically ground flagpole installation.

C. Install foundation plate and centering wedges for flagpole base set in concrete base and fasten. Fill foundation tube sleeve with sand and compact.

3.4 CONSTRUCTION

A. Site Tolerances:
   1. Maximum Variation From Plumb: One inch.

3.6 ADJUSTING AND CLEANING

A. Clean flagpole surfaces immediately prior to installation.

B. Adjust operating devices for smooth halyard and flag function.

END OF SECTION 10 75 00

SECTION 11 30 00

APPLIANCES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following types of appliances:
   1. Gas Range (Owner furnish. Plumber install.)
   2. Exhaust Hood.
   3. Icemaker.
   4. Refrigerator.
   5. Washer.
   6. Dryer.

B. Related Sections: The following sections contain requirements that relate to this Section:
   1. Plumbing connections for appliances are specified in Division XXII.
   2. Electrical services and connections for appliances are specified in Division XXVI.

1.2 SUBMITTALS

A. Product data for each appliance type required indicating compliance with requirements, including installation instructions. Provide complete operating and maintenance instructions for each appliance.

B. Owner will provide product data for appliances supplied by the County.

C. Provide data to indicate energy ratings and efficiency information.

D. Provide product data that indicates compliance with applicable UL and NEMA standards.

E. Provide product data that indicates compliance with applicable AGA and ANSI standards.

1.3 DELIVERY AND STORAGE

A. Deliver appliances to the Project site in the manufacturer's undamaged protective packaging.

B. Delay delivery of appliances until utility rough-in is complete and construction in the spaces to receive appliances is substantially complete and ready for installation.

C. Contractor to advise the County within 30 days of Notice To Proceed, when appliances will need to be delivered at the site.

1.4 WARRANTY

A. Warranty: Submit written warranties executed by the manufacturer of each appliance specified agreeing to repair or replace units or components that fail in materials or workmanship within the specified warranty period.

1.5 QUALITY ASSURANCE

A. Energy Ratings: Provide residential appliances that carry labels indicating energy cost analysis (estimated annual operating costs) and efficiency information as required by Federal Trade Commission.

B. UL and NEMA Compliance: Provide electrical components required as part of residential appliances that are listed and labeled by UL and comply with applicable NEMA standards.

C. AGA and ANSI Standards: Provide gas-burning appliances that carry the design certification seal of the American Gas Association (AGA) and comply with ANSI Z21-Series standards.

PART 2 - PRODUCTS

2.1 GAS RANGES (SUPPLIED BY COUNTY/INSTALLED BY PLUMBER)

A. Freestanding Gas Range:
1. Wolf 48" Gas Range –GR486G - 6 Burners and Infrared Griddle

2.2 EXHAUST HOODS (FURNISHED/INSTALLED BY MECHANICAL SUBCONTRACTOR)

A. Ventilating Exhaust Hoods:
1. See sheet M-2.1 for model numbers and details.

2.3 ICEMAKER (SUPPLIED BY COUNTY/INSTALLED BY PLUMBER)

A. Automatic Icemaker:
1. Hoshizaki – C-101BAH-(AD)DS

2.4 REFRIGERATOR (SUPPLIED BY COUNTY /INSTALLED BY CONTRACTOR)

A. Frostless freezer and refrigerator section, two door, to freezer, total refrigerated volume minimum 20.7 cu.ft., freezer minimum 8.7 cu.ft. Equal to True Refrigeration TR-48SBS-B H=84", W=48", D= 24".

2.5 WASHER (WASHING MACHINE) (SUPPLIED BY COUNTY /INSTALLED BY PLUMBER)

A. Institutional and industrial, top-loading, capacity 14 lbs. Dry load (3.0 cu.ft. Minimum), without coin meter, four positions wash cycle selector (regular, permanent press, delicate, soak/prewash), four water temperature settings (hot/cold, warm/cold, cold/cold, warm/warm) wash/spin speed - two minimum, bleach dispense, stainless steel tub. Equal to Speed Queen Model LWS45A: 14 cu.ft. H=42 3/4", W=25 5/8", D=28". Star Laundry Equipment.

2.6 DRYER (SUPPLIED BY COUNTY /INSTALLED BY CONTRACTOR)

A. Automatic, electric, capacity 5.0 cu.ft. Minimum, two time cycle (two-position fabric selector) minimum three temperature selections (regular heat, low heat, no heat) Equal to Roper REX4634KQ: 5.9 cu.ft., H=42 3/8", W=29", D=261/4". Whirlpool Corporation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's instructions and recommendations.

B. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

C. Utilities: Refer to Divisions 15 and 16 for plumbing and electrical requirements.

D. Contractor shall be responsible for unpackaging appliances provided by the County and scheduling for installation.

3.2 ADJUST AND CLEAN

A. Testing: Test each item of residential equipment to verify proper operation. Make necessary adjustments.

B. Accessories: Verify that accessory items required have been furnished and installed.

C. Cleaning: Remove packing material from residential equipment items and leave units in clean condition, ready

END OF SECTION 11 30 00

SECTION 12 21 13

HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes horizontal blinds.

1.2 SUBMITTALS

A. Maintenance data for horizontal louver blinds to include the following:
   1. Methods for maintaining horizontal louver blinds and finishes.
   2. Precautions for cleaning materials and methods that could be detrimental to finishes and performance.

1.3 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain each type of horizontal louver blind from one source and by a single manufacturer.

1.4 PROJECT CONDITIONS

A. Field Measurements: Check actual horizontal louver blind dimensions by accurate field measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Space Enclosure and Environmental Limitations: Do not install horizontal louver blinds until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient temperature and humidity conditions are and will be continuously maintained at values near those indicated for final occupancy.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following

   1. Horizontal Louver Blinds (Rooms 100, 101, 106, 107, 117, 118, 119, 120, 121, 129, 130, 133):

      a. Hunter Douglas, Inc. Decor 1" Mini Blind

2.2 HORIZONTAL LOUVER BLINDS

A. Louvers: Manufacturer's standard as follows:

   1. Commercial Grade Aluminum.

2. Nominal Louver Width: 1 inch (miniblinds).
3. Thickness: .008”

B. Tilt Operation: Manual with cord.
1. Position of Tilt Control: Left side
2. Tilt: Full.

C. Cord-Lock Operation: Cord lock; locks pull cord to stop blind at any position in ascending or descending travel.
1. Position of Cord Lock: Right side

D. Cord Equalizers: Self-aligning to maintain horizontal louver blind position.

E. Mounting: Flush with wall.

F. Colors and Patterns: Brushed Aluminum.

2.3 FABRICATION

A. Product Standard and Description: Comply with AWCMA Document 1029 for each horizontal louver blind unit consisting of louvers, rails, cord locks, tilting mechanisms, tapes, and installation hardware.

B. Lifting and Tilting Mechanisms: Noncorrosive, self-lubricating materials.

C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F:
1. Blind Units Installed Between (Inside) Jambs: Width equal to 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch, less than jamb to jamb dimension of opening in which each blind is installed. Length equal to 1/4 inch, plus or minus 1/8 inch, less than head to sill dimension of opening in which each blind is installed.

D. Installation Fasteners: Not less than 2 fasteners per bracket, fabricated from metal noncorrosive to blind hardware and adjoining construction; support blind units under conditions of normal use.

3.1 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of horizontal louver blinds. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install blinds level, plumb, and located so exterior louver edges in any position are not closer than 1 inch to interior face of glass lites.
1. Flush Mounted: Install blinds with louver edges flush with finish face of wall.

3.3 ADJUSTING

A. Adjust components and accessories for proper operation.

3.4 CLEANING

A. Clean blind surfaces, according to manufacturer's instructions, after installation.

B. Remove surplus materials, packaging, rubbish, and debris resulting from installation. Leave installation areas neat, clean, and ready for use.

3.5 PROTECTION

A. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer that ensure that horizontal louver blinds are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 12 21 13

SECTION 21 13 00

FIRE-SUPPRESSION SYSTEMS

PART I - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following fire-suppression piping inside the building:

1. Wet-pipe sprinkler systems.
2. Dry-pipe sprinkler systems.

B. Related Sections include the following:

1. Water Distribution for piping outside the building.
2. Fire Alarm for alarm devices not specified in this Section.

1.3 DEFINITIONS

A. CR: Chlorosulfonated polyethylene synthetic rubber.

B. PE: Polyethylene plastic.

C. Underground Service-Entrance Piping: Underground service piping below the building.

1.4 SYSTEM DESCRIPTIONS

A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.

B. Dry-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing compressed air. Opening of sprinklers releases compressed air and permits water pressure to open dry-pipe valve. Water then flows into piping and discharges from opened sprinklers.

1.5 PERFORMANCE REQUIREMENTS

A. Standard Piping System Component Working Pressure: Listed for at least 175 psig (1200 kPa).

B. Fire-suppression sprinkler system design shall be approved by authorities having jurisdiction.

1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.
2. Sprinkler Occupancy Hazard Classifications:

    a. Building Service Areas: Ordinary Hazard, Group 1.
    b. Electrical Equipment Rooms: Ordinary Hazard, Group 1.
    c. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
    d. Bathrooms: Light Hazard.
    e. Sleeping and Living quarters: Light Hazard.
    f. Apparatus Bay: Ordinary Hazard, Group 1.
    g. General Storage Areas: Ordinary Hazard, Group 1.
    h. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
    i. Office and Public Areas: Light Hazard.
    j. Attic with combustible construction: Light Hazard.

3. Minimum Density for Automatic-Sprinkler Piping Design:

    a. Light-Hazard Occupancy (wet pipe): 0.10 gpm over 1500-sq. ft.

    b. Light Hazard Occupancy (dry pipe): 0.10 gpm over 1950-sq. ft.
    c. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft.

4. Maximum Protection Area per Sprinkler: Per UL listing.
5. Maximum Protection Area per Sprinkler:
    a. Office Spaces: 225 sq. ft. (20.9 sq. m).
    b. Storage Areas: 130 sq. ft. (12.1 sq. m).
    c. Mechanical Equipment Rooms: 130 sq. ft. (12.1 sq. m).
    d. Electrical Equipment Rooms: 130 sq. ft. (12.1 sq. m).
    e. Other Areas: According to NFPA 13.
6. Total Combined Hose-Stream Demand Requirement: According to NFPA 13unless otherwise indicated:
    a. Light-Hazard Occupancies: 100 gpm (6.3 L/s) for 30 minutes.
    b. Ordinary-Hazard Occupancies: 250 gpm (15.75 L/s) for 60 to 90 minutes.

1.6 SUBMITTALS

A. Product Data: For the following:

1. Piping materials, including dielectric fittings, flexible connections, and sprinkler specialty fittings.
2. Pipe hangers and supports.
3. Valves, including listed fire-protection valves, unlisted general-duty valves, and specialty valves and trim.
4. Air compressors, including electrical data.

5. Sprinklers, escutcheons, and guards. Include sprinkler flow characteristics, mounting, finish, and other pertinent data.
6. Monitors.
7. Fire department connections, including type; number, size, and arrangement of inlets; caps and chains; size and direction of outlet; escutcheon and marking; and finish.
8. Alarm devices, including electrical data.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Fire-hydrant flow test report.

D. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations, if applicable.

E. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."

F. Welding certificates.

G. Field quality-control test reports.

H. Operation and Maintenance Data: For standpipe and sprinkler specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing fire-suppression systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.
   a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

B. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

C. NFPA Standards: Fire-suppression-system equipment, specialties, accessories, installation, and testing shall comply with the applicable edition of the following standards as directed by the local authority having jurisdiction:

1. NFPA 13.
2. NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances."

1.8 COORDINATION

A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

1.9 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. Sprinkler Cabinets: Finished, wall-mounting, steel cabinet with hinged cover, with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler on Project.

PART II - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell end and plain end.

1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern; AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern; AWWA C153, ductile-iron compact pattern.
2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron gland, rubber gasket, and steel bolts and nuts.

B. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell end and plain end.

1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern; AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern; AWWA C153, ductile-iron compact pattern.
2. Gaskets: AWWA C111, rubber.

C. Grooved-End, Ductile-Iron Pipe: AWWA C151, with factory- or field-formed, radius-cut-grooved ends according to AWWA C606.

1. Grooved-Joint Piping Systems:
   a. Manufacturers:
      1) Victaulic Co. of America.
   b. Grooved-End Fittings: ASTM A 536, ductile-iron casting with OD matching ductile-iron-pipe OD and cement lining.
   c. Grooved-End-Pipe Couplings: AWWA C606, gasketed fitting matching ductile-iron-pipe OD. Include ductile-iron housing with keys matching ductile-iron-pipe and fitting grooves, prelubricated rubber gasket with center leg, and steel bolts and nuts.
   d. Grooved-End-Pipe Transition Coupling: UL 213 and AWWA C606, gasketed fitting with end matching ductile-iron-pipe OD and end matching steel-pipe OD. Include ductile-iron housing with key matching ductile-iron-pipe groove and key matching steel-pipe groove, prelubricated rubber gasket listed for use with housing, and steel bolts and nuts.
   e. Retain subparagraph above or below, or delete both if not required.
   f. Grooved-End Transition Flange: UL 213, gasketed fitting with key for ductile-iron-pipe dimensions. Include flange-type, ductile-iron housing with rubber gasket listed for use with housing and steel bolts and nuts.

2.3 STEEL PIPE AND FITTINGS

A. Threaded-End, Standard-Weight Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795, hot-dip galvanized where indicated and with factory- or field-formed threaded ends.

1. Cast-Iron Threaded Flanges: ASME B16.1.
2. Malleable-Iron Threaded Fittings: ASME B16.3.
3. Gray-Iron Threaded Fittings: ASME B16.4.
4. Steel Threaded Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, seamless steel pipe hot-dip galvanized where indicated. Include ends matching joining method.
5. Steel Threaded Couplings: ASTM A 865 hot-dip galvanized-steel pipe where indicated.

B. Plain-End, Standard-Weight Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795 hot-dip galvanized-steel pipe where indicated.

1. Locking-Lug Fittings: UL 213, ductile-iron body with retainer lugs that require one-quarter turn to secure pipe in fitting.
   a. Manufacturers:
      1) Anvil International, Inc.
      2) Victaulic Co. of America.
      3) Ward Manufacturing.

C. Plain-End, Standard-Weight Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795 hot-dip galvanized-steel pipe where indicated.

1. Steel Welding Fittings: ASTM A 234/A 234M, and ASME B16.9 or ASME B16.11.
2. Steel Flanges and Flanged Fittings: ASME B16.5.

D. Grooved-End, Standard-Weight Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795, hot-dip galvanized where indicated and with factory- or field-formed, roll-grooved ends.

1. Grooved-Joint Piping Systems:
   a. Manufacturers:
      1) Anvil International, Inc.
      2) Central Sprinkler Corp.
      3) Ductilic, Inc.
      4) JDH Pacific, Inc.
      5) National Fittings, Inc.
      6) Shurjoint Piping Products, Inc.
      7) Southwestern Pipe, Inc.
      8) Star Pipe Products; Star Fittings Div.
      9) Victaulic Co. of America.
      10) Ward Manufacturing.

   b. Grooved-End Fittings: UL-listed, ASTM A 536, ductile-iron casting with OD matching steel-pipe OD.
   c. Grooved-End-Pipe Couplings: UL 213 and AWWA C606, rigid pattern, unless otherwise indicated; gasketed fitting matching steel-pipe OD. Include ductile-iron housing with keys matching steel-pipe and fitting grooves, prelubricated rubber gasket listed for use with housing, and steel bolts and nuts.

E. Threaded-End, Schedule 40 Steel Pipe: ASTM A 135 or ASTM A 795, with wall thickness equal to Schedule 40; or ASTM A 795 and ASME B36.10M, Schedule 40 wrought-steel pipe; hot-dip galvanized where indicated and with factory- or field-threaded ends.

1. Cast-Iron Threaded Flanges: ASME B16.1.
2. Malleable-Iron Threaded Fittings: ASME B16.3.
3. Gray-Iron Threaded Fittings: ASME B16.4.
4. Steel Threaded Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, seamless steel pipe hot-dip galvanized where indicated]. Include ends matching joining method.
5. Steel Threaded Couplings: ASTM A 865 hot-dip galvanized-steel pipe where indicated.

F. Grooved-End, Schedule 40 Steel Pipe: ASTM A 135 or ASTM A 795, with wall thickness equal to Schedule 40; or ASTM A 795 and ASME B36.10M, Schedule 40 wrought-steel pipe hot-dip galvanized where indicated; with factory- or field-formed, roll-grooved ends.

1. Grooved-Joint Piping Systems:
   a. Manufacturers:
      1) Anvil International, Inc.

2) Central Sprinkler Corp.
3) Ductilic, Inc.
4) JDH Pacific, Inc.
5) National Fittings, Inc.
6) Shurjoint Piping Products, Inc.
7) Southwestern Pipe, Inc.
8) Star Pipe Products; Star Fittings Div.
9) Victaulic Co. of America.
10) Ward Manufacturing.

b. Grooved-End Fittings: UL-listed, ASTM A 536, ductile-iron casting with OD matching steel-pipe OD.

c. Grooved-End-Pipe Couplings: UL 213 and AWWA C606, rigid pattern, unless otherwise indicated; gasketed fitting matching steel-pipe OD. Include ductile-iron housing with keys matching steel-pipe and fitting grooves, prelubricated rubber gasket listed for use with housing, and steel bolts and nuts.

G. Plain-End, Schedule 10 Steel Pipe: ASTM A 135 or ASTM A 795, Schedule 10 in NPS 5 (DN 125) and smaller; and NFPA 13-specified wall thickness in NPS 6 to NPS 10 (DN 150 to DN 250).

1. Locking-Lug Fittings: UL 213, ductile-iron body with retainer lugs that require one-quarter turn to secure pipe in fitting.
   a. Manufacturers:
      1) Anvil International, Inc.
      2) Victaulic Co. of America.
      3) Ward Manufacturing.

H. Plain-End, Schedule 10 Steel Pipe: ASTM A 135 or ASTM A 795, Schedule 10 in NPS 5 (DN 125) and smaller; and NFPA 13 specified wall thickness in NPS 6 to NPS 10 (DN 150 to DN 250).

1. Steel Welding Fittings: ASTM A 234/A 234M, and ASME B16.9 or ASME B16.11.
2. Steel Flanges and Flanged Fittings: ASME B16.5.

I. Grooved-End, Schedule 10 Steel Pipe: ASTM A 135 or ASTM A 795, Schedule 10 in NPS 5 (DN 125) and smaller; and NFPA 13-specified wall thickness in NPS 6 to NPS 10 (DN 150 to DN 250); with factory- or field-formed, roll-grooved ends.

1. Grooved-Joint Piping Systems:
   a. Manufacturers:
      1) Anvil International, Inc.
      2) Central Sprinkler Corp.
      3) Ductilic, Inc.
      4) JDH Pacific, Inc.
      5) National Fittings, Inc.
      6) Shurjoint Piping Products, Inc.
      7) Southwestern Pipe, Inc.
      8) Star Pipe Products; Star Fittings Div.
      9) Victaulic Co. of America.
      10) Ward Manufacturing.

b. Grooved-End Fittings: UL-listed, ASTM A 536, ductile-iron casting with OD matching steel-pipe OD.
c. Grooved-End-Pipe Couplings: UL 213 and AWWA C606, rigid pattern, unless otherwise indicated; gasketed fitting matching steel-pipe OD. Include ductile-iron housing with keys matching steel-pipe and fitting grooves, prelubricated rubber gasket listed for use with housing, and steel bolts and nuts.

2.4 COPPER TUBE AND FITTINGS

A. Soft Copper Tube: ASTM B 88, Type K (ASTM B 88M, Type A); ASTM B 88, Type K (ASTM B 88M, Type A); or ASTM B 88, Type L (ASTM B 88M, Type B)] [ASTM B 88, Type L (ASTM B 88M, Type B), water tube, annealed temper; with plain ends.

1. Copper fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
2. Brazing Filler Metals: AWS A5.8, BCuP-3 or BCuP-4.

B. Plain-End, Hard Copper Tube: ASTM B 88, Type K (ASTM B 88M, Type A); ASTM B 88, Type K (ASTM B 88M, Type A) or ASTM B 88, Type L (ASTM B 88M, Type B); ASTM B 88, Type L (ASTM B 88M, Type B)], water tube, drawn temper.

1. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match tubing system.
3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body with ball-and-socket metal-to-metal seating surfaces, and solder-joint or threaded ends.
4. Copper, Mechanically Formed Tee Option: For forming T-branch on copper water tube.
   a. Manufacturers:
      1) T-Drill Industries, Inc.
5. Brazing Filler Metals: AWS A5.8, BCuP-3 or BCuP-4.

C. Grooved-End, Hard Copper Tube: ASTM B 88, Type K (ASTM B 88M, Type A); ASTM B 88, Type K (ASTM B 88M, Type A) or ASTM B 88, Type L (ASTM B 88M, Type B); ASTM B 88, Type L (ASTM B 88M, Type B)], water tube, drawn temper; with factory- or field-formed, roll-grooved ends.

1. Copper, Mechanically Formed Tee Option: For forming T-branch on copper water tube.
   a. Manufacturers:
      1) T-Drill Industries, Inc.
2. Grooved-Joint Systems:
   a. Manufacturers:
      1) Anvil International, Inc.
      2) Victaulic Co. of America.
   b. Grooved-End Copper Fittings: ASTM B 75 (ASTM B 75M), copper tube or ASTM B 584, bronze casting. Fittings may have ends factory or field expanded to steel-pipe OD if required for copper tube systems using grooved-end-pipe couplings.
   c. Grooved-End-Tube Couplings: UL 213, rigid pattern, unless otherwise indicated; gasketed fitting equivalent to AWWA C606, but made to match copper-tube OD. Include ductile-iron housing with keys matching steel-pipe and fitting grooves, prelubricated rubber gasket listed

for use with housing, and steel bolts and nuts. Use grooved-end-pipe couplings for tube and fitting that have expanded ends.

2.5 DIELECTRIC FITTINGS

A. Assembly shall be copper alloy, ferrous, and insulating materials with ends matching piping system.

B. Dielectric Unions: Factory-fabricated assembly, designed for 250-psig (1725-kPa) minimum working pressure at 180 deg F (82 deg C). Include insulating material that isolates dissimilar materials and ends with inside threads according to ASME B1.20.1.

1. Manufacturers:
   a. Capitol Manufacturing Co.
   b. Central Plastics Company.
   c. Epco Sales, Inc.
   d. Hart Industries International, Inc.
   e. Watts Industries, Inc.; Water Products Div.
   f. Zurn Industries, Inc.; Wilkins Div.

C. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 175-psig (1200-kPa) minimum working-pressure rating as required for piping system.

1. Manufacturers:
   a. Capitol Manufacturing Co.
   b. Central Plastics Company.
   c. Epco Sales, Inc.
   d. Watts Industries, Inc.; Water Products Div.

D. Dielectric Flange Insulation Kits: Components for field assembly shall include CR or phenolic gasket, PE or phenolic bolt sleeves, phenolic washers, and steel backing washers.

1. Manufacturers:
   a. Advance Products and Systems, Inc.
   b. Calpico, Inc.
   c. Central Plastics Company.
   d. Pipeline Seal and Insulator, Inc.

E. Dielectric Couplings: Galvanized steel with inert and noncorrosive thermoplastic lining and threaded ends and 300-psig (2070-kPa) working-pressure rating at 225 deg F (107 deg C).

1. Manufacturers:
   a. Calpico, Inc.
   b. Lochinvar Corp.

F. Dielectric Nipples: Electroplated steel with inert and noncorrosive thermoplastic lining, with combination of plain, threaded, or grooved ends and 300-psig (2070-kPa) working-pressure rating at 225 deg F (107 deg C).

1. Manufacturers:
   a. Perfection Corporation.
   b. Precision Plumbing Products, Inc.
   c. Victaulic Co. of America.

2.6 FLEXIBLE CONNECTORS

A. Flexible connectors shall have materials suitable for system fluid. Include 175-psig (1200-kPa) minimum; 250-psig (1725-kPa) minimum; 300-psig (2070-kPa) minimum working-pressure rating and ends according to the following:

1. NPS 2 (DN 50) and Smaller: Threaded.
2. NPS 2-1/2 (DN 65) and Larger: Flanged.
3. Option for NPS 2-1/2 (DN 65) and Larger: Grooved for use with grooved-end-pipe couplings.

B. Manufacturers:

1. Anamet Inc.
2. Flex-Hose Co., Inc.
3. Flexicraft Industries.
4. Flex-Pression, Ltd.
5. Flex-Weld, Inc.
6. Hyspan Precision Products, Inc.
7. Mercer Rubber Co.
8. Metraflex, Inc.
9. Proco Products, Inc.
10. Unaflex Inc.

C. Bronze-Hose, Flexible Connectors: Corrugated, bronze, inner tubing covered with bronze wire braid. Include copper-tube ends or bronze flanged ends, braze welded to hose.

D. Stainless-Steel-Hose/Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Include steel nipples or flanges, welded to hose.

E. Stainless-Steel-Hose/Stainless-Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Include stainless-steel nipples or flanges, welded to hose.

2.7 CORROSION-PROTECTIVE ENCASEMENT FOR PIPING

A. Encasement for Underground Metal Piping: ASTM A 674 or AWWA C105, PE film, 0.008-inch (0.20-mm) minimum thickness, tube or sheet.

2.8 SPRINKLER SPECIALTY FITTINGS

A. Sprinkler specialty fittings shall be UL listed or FMG approved, with 175-psig (1200-kPa) minimum working-pressure rating, and made of materials compatible with piping. Sprinkler specialty fittings shall have 250-psig (1725-kPa) minimum; 300-psig (2070-kPa) working-pressure rating if fittings are components of high-pressure piping system.

B. Outlet Specialty Fittings:

1. Manufacturers:

a. Anvil International, Inc.
b. Central Sprinkler Corp.
c. Ductilic, Inc.
d. JDH Pacific, Inc.
e. National Fittings, Inc.
f. Shurjoint Piping Products, Inc.
g. Southwestern Pipe, Inc.
h. Star Pipe Products; Star Fittings Div.
i. Victaulic Co. of America.
j. Ward Manufacturing.

2. Mechanical-T and -Cross Fittings: UL 213, ductile-iron housing with gaskets, bolts and nuts, and threaded, locking-lug, or grooved outlets.
3. Snap-On and Strapless Outlet Fittings: UL 213, ductile-iron housing or casting with gasket and threaded outlet.

C. Sprinkler Drain and Alarm Test Fittings: Cast- or ductile-iron body; with threaded or locking-lug inlet and outlet, test valve, and orifice and sight glass.
1. Manufacturers:
a. Central Sprinkler Corp.
b. Fire-End and Croker Corp.
c. Viking Corp.
d. Victaulic Co. of America.

D. Sprinkler Branch-Line Test Fittings: Brass body with threaded inlet, capped drain outlet, and threaded outlet for sprinkler.
1. Manufacturers:
a. Elkhart Brass Mfg. Co., Inc.
b. Fire-End and Croker Corp.
c. Potter-Roemer; Fire-Protection Div.

E. Sprinkler Inspector's Test Fitting: Cast- or ductile-iron housing with threaded inlet and drain outlet and sight glass.
1. Manufacturers:
a. AGF Manufacturing Co.
b. Central Sprinkler Corp.
c. G/J Innovations, Inc.
d. Triple R Specialty of Ajax, Inc.

F. Drop-Nipple Fittings: UL 1474, adjustable with threaded inlet and outlet, and seals.
   1. Manufacturers:
      a. CECA, LLC.
      b. Merit.

G. Dry-Pipe-System Fittings: UL listed for dry-pipe service.

2.9 LISTED FIRE-PROTECTION VALVES

A. Valves shall be UL listed or FMG approved, with 175-psig (1200 kPa) minimum pressure rating. Valves shall have 250-psig (1725-kPa) minimum pressure rating if valves are components of high-pressure piping system.

B. Gate Valves with Wall Indicator Posts:
   1. Gate Valves: UL 262, cast-iron body, bronze mounted, with solid disc, nonrising stem, operating nut, and flanged ends.
   2. Indicator Posts: UL 789, horizontal-wall type, cast-iron body, with operating wrench or hand wheel, extension rod, locking device, and cast-iron barrel.
   3. Manufacturers:
      a. Grinnell Fire Protection.
      b. McWane, Inc.; Kennedy Valve Div.
      c. NIBCO.
      d. Stockham.

C. Ball Valves: Comply with UL 1091, except with ball instead of disc.
   1. NPS 1-1/2 (DN 40) and Smaller: Bronze body with threaded ends.
   2. NPS 2 and NPS 2-1/2 (DN 50 and DN 65): Bronze body with threaded ends or ductile-iron body with grooved ends.
   3. NPS 3 (DN 80): Ductile-iron body with grooved ends.
   4. Manufacturers:
      a. NIBCO.
      b. Victaulic Co. of America.

D. Butterfly Valves: UL 1091.
   1. NPS 2 (DN 50) and Smaller: Bronze body with threaded ends.
      a. Manufacturers:
         1) Global Safety Products, Inc.
         2) Milwaukee Valve Company.
   2. NPS 2-1/2 (DN 65) and Larger: Bronze, cast-iron, or ductile-iron body; wafer type or with flanged or grooved ends.
      a. Manufacturers:
         1) Central Sprinkler Corp.
         2) Global Safety Products, Inc.
         3) McWane, Inc.; Kennedy Valve Div.
         4) Mueller Company.
         5) NIBCO.
         6) Pratt, Henry Company.
         7) Victaulic Co. of America.

E. Check Valves NPS 2 (DN 50) and Larger: UL 312, swing type, cast-iron body with flanged or grooved ends.

1. Manufacturers:

a. AFAC Inc.
b. American Cast Iron Pipe Co.; Waterous Co.
c. Central Sprinkler Corp.
d. Clow Valve Co.
e. Crane Co.; Crane Valve Group; Crane Valves.
f. Crane Co.; Crane Valve Group; Jenkins Valves.
g. Firematic Sprinkler Devices, Inc.
h. Globe Fire Sprinkler Corporation.
i. Grinnell Fire Protection.
j. Hammond Valve.
k. Matco-Norca, Inc.
l. McWane, Inc.; Kennedy Valve Div.
m. Mueller Company.
n. NIBCO.
o. Potter-Roemer; Fire Protection Div.
p. Reliable Automatic Sprinkler Co., Inc.
q. Star Sprinkler Inc.
r. Stockham.
s. United Brass Works, Inc.
t. Venus Fire Protection, Ltd.
u. Victaulic Co. of America.
v. Watts Industries, Inc.; Water Products Div.

F. Gate Valves: UL 262, OS&Y type.

1. NPS 2 (DN 50) and Smaller: Bronze body with threaded ends.
   a. Manufacturers:
      1) Crane Co.; Crane Valve Group; Crane Valves.
      2) Hammond Valve.
      3) NIBCO.
      4) United Brass Works, Inc.
2. NPS 2-1/2 (DN 65) and Larger: Cast-iron body with flanged ends.
   a. Manufacturers:
      1) Clow Valve Co.
      2) Crane Co.; Crane Valve Group; Crane Valves.
      3) Crane Co.; Crane Valve Group; Jenkins Valves.
      4) Hammond Valve.
      5) Milwaukee Valve Company.
      6) Mueller Company.
      7) NIBCO.
      8) Red-White Valve Corp.
      9) United Brass Works, Inc.

G. Indicating Valves: UL 1091, with integral indicating device and ends matching connecting piping.
   1. Indicator: Electrical, 115-V ac, prewired, single-circuit, supervisory switch.
   2. NPS 2 (DN 50) and Smaller: Ball or butterfly valve with bronze body and threaded ends.
      a. Manufacturers:
         1) Milwaukee Valve Company.
         2) NIBCO.
         3) Victaulic Co. of America.
   3. NPS 2-1/2 (DN 65) and Larger: Butterfly valve with cast- or ductile-iron body; wafer type or with flanged or grooved ends.
      a. Manufacturers:
         1) Central Sprinkler Corp.
         2) Grinnell Fire Protection.
         3) McWane, Inc.; Kennedy Valve Div.
         4) Milwaukee Valve Company.
         5) NIBCO.
         6) Victaulic Co. of America.

2.10 UNLISTED GENERAL-DUTY VALVES

A. Ball Valves NPS 2 (DN 50) and Smaller: MSS SP-110, 2-piece copper-alloy body with chrome-plated brass ball, 600-psig (4140-kPa) minimum CWP rating, blowout-proof stem, and threaded ends.

B. Check Valves NPS 2 (DN 50) and Smaller: MSS SP-80, Type 4, Class 125 minimum, swing type with bronze body, nonmetallic disc, and threaded ends.

C. Gate Valves NPS 2 (DN 50) and Smaller: MSS SP-80, Type 2, Class 125 minimum, with bronze body, solid wedge, and threaded ends.

D. Globe Valves NPS 2 (DN 50) and Smaller: MSS SP-80, Type 2, Class 125 minimum, with bronze body, nonmetallic disc, and threaded ends.

2.11 SPECIALTY VALVES

A. Sprinkler System Control Valves: UL listed or FMG approved, cast- or ductile-iron body with flanged or grooved ends, and 175-psig (1200-kPa) minimum pressure rating. Control valves shall have 250-psig (1725-kPa) minimum pressure rating if valves are components of high-pressure piping system.

   1. Manufacturers:

      a. AFAC Inc.
      b. Central Sprinkler Corp.
      c. Firematic Sprinkler Devices, Inc.
      d. Globe Fire Sprinkler Corporation.
      e. Grinnell Fire Protection.
      f. Reliable Automatic Sprinkler Co., Inc.
      g. Star Sprinkler Inc.
      h. Venus Fire Protection, Ltd.
      i. Victaulic Co. of America.
      j. Viking Corp.

2. Alarm Check Valves: UL 193, designed for horizontal or vertical installation, with bronze grooved seat with O-ring seals, single-hinge pin, and latch design. Include trim sets for bypass, drain, electrical sprinkler alarm switch, pressure gages, retarding chamber, and fill-line attachment with strainer.
    a. Drip Cup Assembly: Pipe drain without valves and separate from main drain piping.
    b. Drip Cup Assembly: Pipe drain with check valve to main drain piping.

3. Dry-Pipe Valves: UL 260, differential type; with bronze seat with O-ring seals, single-hinge pin, and latch design. Include UL 1486, quick-opening devices, trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
    a. Air-Pressure Maintenance Device: UL 260, automatic device to maintain correct air pressure in piping. Include shutoff valves to permit servicing without shutting down sprinkler piping, bypass valve for quick filling, pressure regulator or switch to maintain pressure, strainer, pressure ratings with 14- to 60-psig (95- to 410-kPa) adjustable range, and 175-psig (1200-kPa) maximum inlet pressure.
        1) Manufacturers:
            a) AFAC Inc.
            b) Central Sprinkler Corp.
            c) General Air Products, Inc.
            d) Globe Fire Sprinkler Corporation.
            e) Grinnell Fire Protection.
            f) Reliable Automatic Sprinkler Co., Inc.
            g) Star Sprinkler Inc.
            h) Viking Corp.
    b. Air Compressor: UL 753, fractional horsepower, 120-V ac, 60 Hz, single phase.
        1) Manufacturers:
            a) AFAC Inc.
            b) Gast Manufacturing, Inc.
            c) Grinnell Fire Protection.
            d) Reliable Automatic Sprinkler Co., Inc.
            e) Viking Corp.

B. Pressure-Regulating Valves: UL 1468, brass or bronze, [NPS 1-1/2 (DN 40)] [NPS 1-1/2 and NPS 2-1/2 (DN 40 and DN 65)] [NPS 2-1/2 (DN 65)], 400-psig (2760-kPa) minimum rating. Include female NPS inlet and outlet, adjustable setting feature, and straight or 90-degree-angle pattern design as indicated.
    1. Finish: chrome-plated.
    2. Manufacturers:
        a. AFAC Inc.
        b. Elkhart Brass Mfg. Co., Inc.
        c. Fire-End and Croker Corp.
        d. GMR International Equipment Corporation.
        e. Grinnell Fire Protection.
        f. Potter-Roemer; Fire Protection Div.
        g. Zurn Industries, Inc.; Wilkins Div.

C. Automatic Drain Valves: UL 1726, NPS 3/4 (DN 20), ball-check device with threaded ends.
    1. Manufacturers:
        a. AFAC Inc.
        b. Grinnell Fire Protection.

2.13 SPRINKLERS

A. Sprinklers shall be UL listed or FMG approved, with 175-psig (1200-kPa) minimum pressure rating. Sprinklers shall have 250-psig (1725-kPa) minimum pressure rating if sprinklers are components of high-pressure piping system.

B. Manufacturers:

1. Central Sprinkler Corp.
2. Globe Fire Sprinkler Corporation.
3. Grinnell Fire Protection.
4. Reliable Automatic Sprinkler Co., Inc.
5. Star Sprinkler Inc.
6. Viking Corp.

C. Automatic Sprinklers: With heat-responsive element complying with the following:

1. UL 199, for nonresidential applications.
2. UL 1626, for residential applications.
3. UL 1767, for early-suppression, fast-response applications.

D. Sprinkler Types and Categories: Nominal 1/2-inch (12.7-mm) orifice for "Ordinary" temperature classification rating, unless otherwise indicated or required by application.

1. Open Sprinklers: UL 199, without heat-responsive element.

a. Orifice: 1/2 inch (12.7 mm), with discharge coefficient K between 5.3 and 5.8.
b. Orifice: 17/32 inch (13.5 mm), with discharge coefficient K between 7.4 and 8.2.

E. Sprinkler types, features, and options as follows:

1. Pendent sprinklers.
2. Quick-response sprinklers.
3. Semi-recessed sprinklers, including escutcheon.
4. Sidewall sprinklers.
5. Sidewall, dry-type sprinklers.
6. Upright sprinklers.

F. Sprinkler Finishes: white.

G. Special Coatings: Corrosion-resistant coating where required.

H. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: Plastic, white finish, one piece, flat.
2. Sidewall Mounting: Plastic, white finish, one piece, flat.

I. Sprinkler Guards: Wire-cage type, including fastening device for attaching to sprinkler.

2.14 FIRE DEPARTMENT CONNECTIONS

A. Manufacturers:

1. AFAC Inc.
2. Central Sprinkler Corp.
3. Elkhart Brass Mfg. Co., Inc.
4. Fire-End and Croker Corp.
5. Fire Protection Products, Inc.
6. GMR International Equipment Corporation.
7. Guardian Fire Equipment Incorporated.
8. Potter-Roemer; Fire-Protection Div.
9. Reliable Automatic Sprinkler Co., Inc.
10. United Brass Works, Inc.

B. Wall-Type, Fire Department Connection: UL 405, 175-psig (1200-kPa) minimum pressure rating; with corrosion-resistant-metal body with brass inlets, brass wall escutcheon plate, brass lugged caps with gaskets and brass chains, and brass lugged swivel connections. Include inlets with threads according to NFPA 1963 and matching local fire department sizes and threads, outlet with pipe threads, extension pipe nipples, check devices or clappers for inlets, and escutcheon plate with marking similar to "AUTO SPKR & STANDPIPE."

1. Type: Flush, with two inlets and square or rectangular escutcheon plate.
2. Type: Exposed, projecting, with two inlets and round escutcheon plate.
3. Finish: Polished chrome-plated.

C. Exposed, Freestanding-Type, Fire Department Connection: UL 405, 175-psig (1200-kPa) minimum pressure rating; with corrosion-resistant-metal body, brass inlets with threads according to NFPA 1963 and matching local fire department sizes and threads, and bottom outlet with pipe threads. Include brass lugged caps, gaskets, and brass chains; brass lugged swivel connection and drop clapper for each hose-connection inlet; 18-inch- (460-mm-) high, brass sleeve; and round, floor, brass escutcheon plate with marking "AUTO SPKR & STANDPIPE."

1. Finish Including Sleeve: Polished brass.

2.15 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Water-Motor-Operated Alarm: UL 753, mechanical-operation type with pelton-wheel operator with shaft length, bearings, and sleeve to suit wall construction and 10-inch- (250-mm-) diameter, cast-aluminum alarm gong with red-enamel factory finish. Include NPS 3/4 (DN 20) inlet and NPS 1 (DN 25) drain connections.

1. Manufacturers:

a. AFAC Inc.
b. Central Sprinkler Corp.
c. Firematic Sprinkler Devices, Inc.
d. Globe Fire Sprinkler Corporation.

e. Grinnell Fire Protection.
f. Reliable Automatic Sprinkler Co., Inc.
g. Star Sprinkler Inc.
h. Viking Corp.

C. Electrically Operated Alarm: UL 464, with 10-inch- (250-mm-) diameter, vibrating-type, metal alarm bell with red-enamel factory finish and suitable for outdoor use.

1. Manufacturers:

a. Potter Electric Signal Company.
b. System Sensor.

D. Water-Flow Indicator: UL 346, electrical-supervision, paddle-operated-type, water-flow detector with 250-psig (1725-kPa) pressure rating and designed for horizontal or vertical installation. Include two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.

1. Manufacturers:

a. ADT Security Services, Inc.
b. Grinnell Fire Protection.
c. ITT McDonnell & Miller.
d. Potter Electric Signal Company.
e. System Sensor.
f. Viking Corp.
g. Watts Industries, Inc.; Water Products Div.

E. Pressure Switch: UL 753, electrical-supervision-type, water-flow switch with retard feature. Include single-pole, double-throw, normally closed contacts and design that operates on rising pressure and signals water flow.

1. Manufacturers:

a. Grinnell Fire Protection.
b. Potter Electric Signal Company.
c. System Sensor.
d. Viking Corp.

F. Valve Supervisory Switch: UL 753, electrical, single-pole, double-throw switch with normally closed contacts. Include design that signals controlled valve is in other than fully open position.

1. Manufacturers:

a. McWane, Inc.; Kennedy Valve Div.
b. Potter Electric Signal Company.
c. System Sensor.

G. Indicator-Post Supervisory Switch: UL 753, electrical, single-pole, double-throw switch with normally closed contacts. Include design that signals controlled indicator-post valve is in other than fully open position.

1. Manufacturers:

a. Potter Electric Signal Company.
b. System Sensor.

2.16 PRESSURE GAGES

A. Manufacturers:

1. AGF Manufacturing Co.
2. AMETEK, Inc.; U.S. Gauge.
3. Brecco Corporation.
4. Dresser Equipment Group; Instrument Div.
5. Marsh Bellofram.
6. WIKA Instrument Corporation.

B. Description: UL 393, 3-1/2- to 4-1/2-inch- (90- to 115-mm-) diameter, dial pressure gage with range of [0 to 250 psig (0 to 1725 kPa) minimum.

1. Water System Piping: Include caption "WATER" or "AIR/WATER" on dial face.
2. Air System Piping: Include retard feature and caption "AIR" or "AIR/WATER" on dial face.

PART III - EXECUTION

3.1 PREPARATION

A. Perform fire-hydrant flow test according to NFPA 13, and NFPA 291. Use results for system design calculations required in Part 1 "Quality Assurance" Article.

B. Report test results promptly and in writing.

3.2 EXAMINATION

A. Examine roughing-in for hose connections and stations to verify actual locations of piping connections before installation.

B. Examine walls and partitions for suitable thicknesses, fire- and smoke-rated construction, framing for hose-station cabinets, and other conditions where hose connections and stations are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PIPING APPLICATIONS, GENERAL

A. Shop weld pipe joints where welded piping is indicated.

B. Do not use welded joints for galvanized-steel pipe.

C. Flanges, flanged fittings, unions, nipples, and transition and special fittings with finish and pressure ratings same as or higher than system's pressure rating may be used in aboveground applications, unless otherwise indicated.

D. Piping between Fire Department Connections and Check Valves: Galvanized, standard-weight steel pipe with [threaded ends; cast- or malleable-iron threaded fittings; and threaded] [grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved] joints.

E. Underground Service-Entrance Piping: Ductile-iron, push-on, mechanical-joint pipe and fittings and restrained joints. Include corrosion-protective encasement.

F. Underground Service-Entrance Piping: Ductile-iron, grooved-end pipe and fittings; grooved-end-pipe couplings; and grooved joints. Include corrosion-protective encasement.

3.4 SPRINKLER SYSTEM PIPING APPLICATIONS

A. Standard-Pressure, Wet-Pipe Sprinkler System, 175-psig (1200-kPa) Maximum Working Pressure:

1. Sprinkler-Piping Fitting Option: Specialty sprinkler fittings, NPS 2 (DN 50) and smaller, including mechanical-T and -cross fittings, may be used downstream from sprinkler zone valves.
2. NPS 1-1/2 (DN 40) and Smaller: Threaded-end, black, standard-weight steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.
3. NPS 2 (DN 50): Threaded-end, black, standard-weight steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.
4. NPS 2-1/2 to NPS 3-1/2 (DN 65 to DN 90): Grooved-end, black, standard-weight steel pipe; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.
5. NPS 2-1/2 to NPS 3-1/2 (DN 65 to DN 90): Grooved-end, Schedule 10 steel pipe; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.
6. NPS 4 to NPS 6 (DN 100 to DN 150): Grooved-end, black, standard-weight steel pipe; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.
7. NPS 4 to NPS 6 (DN 100 to DN 150): Grooved-end, Schedule 10 steel pipe; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

B. Standard-Pressure, Dry-Pipe Sprinkler System, 175-psig (1200-kPa) Maximum Working Pressure:

1. Sprinkler-Piping Fitting Option: Specialty sprinkler fittings, NPS 2 (DN 50) and smaller, including mechanical-T and -cross fittings, may be used downstream from sprinkler zone valves.
2. NPS 1-1/2 (DN 40) and Smaller: Threaded-end, galvanized, standard-weight steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.
3. NPS 2 (DN 50): Threaded-end, galvanized, standard-weight steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.
4. NPS 2-1/2 to NPS 3-1/2 (DN 65 to DN 90): Grooved-end, galvanized, standard-weight steel pipe; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

5. NPS 4 to NPS 6 (DN 100 to DN 150): Grooved-end, galvanized, standard-weight steel pipe; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

3.5 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Listed Fire-Protection Valves: UL listed and FMG approved for applications where required by NFPA 13.

   a. Shutoff Duty: Use ball, butterfly, or gate valves.

2. Unlisted General-Duty Valves: For applications where UL-listed and FMG-approved valves are not required by NFPA 13.

   a. Shutoff Duty: Use ball, butterfly, or gate valves.
   b. Throttling Duty: Use ball or globe valves.

3.6 JOINT CONSTRUCTION

A. Threaded Joints: Comply with NFPA 13 for pipe thickness and threads. Do not thread pipe smaller than NPS 8 (DN 200) with wall thickness less than Schedule 40 unless approved by authorities having jurisdiction and threads are checked by a ring gage and comply with ASME B1.20.1.

B. Twist-Locked Joints: Insert plain-end piping into locking-lug fitting and rotate retainer lug one-quarter turn.

C. Pressure-Sealed Joints: Use UL-listed tool and procedure. Include use of specific equipment, pressure-sealing tool, and accessories.

D. Grooved Joints: Assemble joints with listed coupling and gasket, lubricant, and bolts.

1. Ductile-Iron Pipe: Radius-cut-groove ends of piping. Use grooved-end fittings and grooved-end-pipe couplings.
2. Steel Pipe: Square-cut or roll-groove piping as indicated. Use grooved-end fittings and rigid, grooved-end-pipe couplings, unless otherwise indicated.
3. Dry-Pipe Systems: Use fittings and gaskets listed for dry-pipe service.

E. Dissimilar-Metal Piping Joints: Construct joints using dielectric fittings compatible with both piping materials.

1. NPS 2 (DN 50) and Smaller: Use dielectric unions, couplings, or nipples.
2. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric flanges.
3. NPS 5 (DN 125) and Larger: Use dielectric flange insulation kits.

3.7 SERVICE-ENTRANCE PIPING

A. Connect fire-suppression piping to water-service piping of size and in location indicated for service entrance to building. Refer to other sections of these specifications for Water distribution for exterior piping.

B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-service piping.

C. Install shutoff valve, check valve, pressure gage, and drain at connection to water service.

3.8 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

B. Install underground ductile-iron service-entrance piping according to NFPA 24 and with restrained joints.

C. Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

D. Install unions adjacent to each valve in pipes NPS 2 (DN 50) and smaller. Unions are not required on flanged devices or in piping installations using grooved joints.

E. Install flanges or flange adapters on valves, apparatus, and equipment having NPS 2-1/2 (DN 65) and larger connections.

F. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, sized and located according to NFPA 13.

G. Install sprinkler piping with drains for complete system drainage.

H. Install ball drip valves to drain piping between fire department connections and check valves. Drain to floor drain or outside building.

I. Install alarm devices in piping systems.

J. Hangers and Supports: Comply with NFPA 13 for hanger materials.
   1. Install sprinkler system piping according to NFPA 13.

K. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 (DN 8) and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.

L. Drain dry-pipe sprinkler piping.

M. Pressurize and check dry-pipe sprinkler system piping and air compressors.

N. Fill wet-pipe sprinkler system piping with water.

3.9 VALVE INSTALLATION

A. Install listed fire-protection valves, unlisted general-duty valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Valves for Wall-Type Fire Hydrants: Install nonrising-stem gate valve in water-supply pipe.

D. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water supply sources.

E. Specialty Valves:

1. Alarm Check Valves: Install in vertical position for proper direction of flow, including bypass check valve and retarding chamber drain-line connection.
2. Dry-Pipe Valves: Install trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.

    a. Install air compressor and compressed-air supply piping.

3.10 SPRINKLER INSTALLATION

A. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing. Use dry pipe system.

3.11 FIRE DEPARTMENT CONNECTION INSTALLATION

A. Install wall-type, fire department connections in vertical wall.

B. Install freestanding-type, fire department connections in level surface.

C. Install protective pipe bollards on three sides of each fire department connection

D. Install ball drip valve at each check valve for fire department connection.

3.12 CONNECTIONS

A. Install piping adjacent to equipment to allow service and maintenance.

B. Connect water-supply piping to fire-suppression piping. Include backflow preventer between potable-water piping and fire-suppression piping. Refer to other sections of these specifications for backflow preventers.

C. Install ball drip valves at each check valve for fire department connection. Drain to floor drain or outside building.

D. Connect piping to specialty valves, hose valves, specialties, fire department connections, and accessories.

E. Connect compressed-air supply to dry-pipe sprinkler piping.

F. Connect air compressor to the following piping and wiring:

1. Pressure gages and controls.
2. Electrical power system.
3. Fire alarm devices, including low-pressure alarm.

G. Electrical Connections: Power wiring is specified in other sections of these specifications.

H. Connect alarm devices to fire alarm.

I. Ground equipment according to Grounding and Bonding requirements of these specifications.

J. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.13 LABELING AND IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

3.14 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Energize circuits to electrical equipment and devices.
4. Start and run air compressors.
5. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
6. Coordinate with fire alarm tests. Operate as required.
7. Verify that equipment hose threads are same as local fire department equipment.

B. Report test results promptly and in writing to Architect and authorities having jurisdiction.

3.15 CLEANING AND PROTECTION

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers with paint other than factory finish.

C. Protect sprinklers from damage until Substantial Completion.

3.16 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain specialty valves. Refer to Closeout Procedures.

END OF SECTION 21 13 00

SECTION 22 05 19

METERS AND GAGES FOR PLUMBING PIPING

PART I - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Thermometers.
2. Gages.
3. Test plugs.

1.3 DEFINITIONS

A. CR: Chlorosulfonated polyethylene synthetic rubber.

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated; include performance curves.

B. Shop Drawings: Schedule for thermometers and gages indicating manufacturer's number, scale range, and location for each.

C. Product Certificates: For each type of thermometer and gage, signed by product manufacturer.

PART II - PRODUCTS

2.1 DIRECT-MOUNTING, VAPOR-ACTUATED DIAL THERMOMETERS

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. Ashcroft Commercial Instrument Operations; Dresser Industries; Instrument Div.
2. KOBOLD Instruments, Inc.
3. Marsh Bellofram.

4. Trerice, H. O. Co.
5. Weiss Instruments, Inc.
6. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

B. Case: Liquid-filled type, drawn steel or cast aluminum, 4-1/2-inch diameter.

C. Element: Bourdon tube or other type of pressure element.

D. Movement: Mechanical, connecting element and pointer.

E. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.

F. Pointer: Red or other dark-color metal.

G. Window: Glass.

H. Ring: Stainless steel.

I. Connector: Adjustable type, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device.

J. Thermal System: Liquid- or mercury-filled bulb in copper-plated steel, aluminum, or brass stem for thermowell installation and of length to suit installation.

K. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.

2.2 THERMOWELLS

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. AMETEK, Inc.; U.S. Gauge Div.
2. Ashcroft Commercial Instrument Operations; Dresser Industries; Instrument Div.
3. Ernst Gage Co.
4. Marsh Bellofram.
5. Miljoco Corp.
6. NANMAC Corporation.
7. Noshok, Inc.
8. Palmer - Wahl Instruments Inc.
9. REO TEMP Instrument Corporation.
10. Tel-Tru Manufacturing Company.
11. Trerice, H. O. Co.
12. Weiss Instruments, Inc.
13. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
14. WIKA Instrument Corporation.
15. Winters Instruments.

B. Manufacturers: Same as manufacturer of thermometer being used.

C. Description: Pressure-tight, socket-type metal fitting made for insertion into piping and of type, diameter, and length required to hold thermometer.

2.3 PRESSURE GAGES

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. AMETEK, Inc.; U.S. Gauge Div.
2. Ashcroft Commercial Instrument Operations; Dresser Industries; Instrument Div.
3. Ernst Gage Co.
4. Eugene Ernst Products Co.
5. KOBOLD Instruments, Inc.
6. Marsh Bellofram.
7. Miljoco Corp.
8. Noshok, Inc.
9. Palmer - Wahl Instruments Inc.
10. REO TEMP Instrument Corporation.
11. Trerice, H. O. Co.
12. Weiss Instruments, Inc.
13. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
14. WIKA Instrument Corporation.
15. Winters Instruments.

B. Direct-Mounting, Dial-Type Pressure Gages: Indicating-dial type complying with ASME B40.100.

1. Case: Liquid-filled type, drawn steel or cast aluminum, 4-1/2-inch diameter.
2. Pressure-Element Assembly: Bourdon tube, unless otherwise indicated.
3. Pressure Connection: Brass, NPS 1/4 , bottom-outlet type unless back-outlet type is indicated.
4. Movement: Mechanical, with link to pressure element and connection to pointer.
5. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.
6. Pointer: Red or other dark-color metal.
7. Window: Glass.
8. Ring: Stainless steel.
9. Accuracy: Grade A, plus or minus 1 percent of middle half scale.
10. Vacuum-Pressure Range: 30-in. Hg of vacuum to 15 psig of pressure .
11. Range for Fluids under Pressure: Two times operating pressure.

C. Pressure-Gage Fittings:

1. Valves: NPS 1/4 brass or stainless-steel needle type.
2. Snubbers: ASME B40.5, NPS 1/4 brass bushing with corrosion-resistant, porous-metal disc of material suitable for system fluid and working pressure.

2.4 TEST PLUGS

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. Flow Design, Inc.
2. MG Piping Products Co.
3. National Meter, Inc.
4. Peterson Equipment Co., Inc.
5. Sisco Manufacturing Co.
6. Trerice, H. O. Co.
7. Watts Industries, Inc.; Water Products Div.

B. Description: Corrosion-resistant brass or stainless-steel body with core inserts and gasketed and threaded cap, with extended stem for units to be installed in insulated piping.

C. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

D. Core Inserts: One or two self-sealing rubber valves.

1. Insert material for water service at 20 to 200 deg F shall be CR.

E. Test Kit: Furnish one test kit containing one pressure gage and adaptor, two thermometer(s), and carrying case. Pressure gage, adapter probes, and thermometer sensing elements shall be of diameter to fit test plugs and of length to project into piping.

1. Pressure Gage: Small bourdon-tube insertion type with 2- to 3-inch- diameter dial and probe. Dial range shall be 0 to 200 psig.
2. Low-Range Thermometer: Small bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial ranges shall be 25 to 125 deg F.
3. High-Range Thermometer: Small bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial ranges shall be 0 to 220 deg F.
4. Carrying case shall have formed instrument padding.

PART III - EXECUTION

3.1 THERMOMETER APPLICATIONS

A. Install direct-mounting, vapor-actuated dial thermometers in the inlet and outlet of each boiler, domestic hot-water storage tank, and hot water recirculating pump.

B. Provide the following temperature ranges for thermometers:

1. Domestic Hot Water: 30 to 180 deg F, with 2-degree scale divisions.
2. Domestic Cold Water: 0 to 100 deg F, with 2-degree scale divisions.

3.2 INSTALLATIONS

A. Install direct-mounting thermometers and adjust vertical and tilted positions.

B. Install thermowells with socket extending a minimum of 2 inches into fluid, or to center of pipe, and in vertical position in piping tees where thermometers are indicated.

C. Install direct-mounting pressure gages in piping tees with pressure gage located on pipe at most readable position.

D. Install needle-valve and snubber fitting in piping for each pressure gage.

E. Install test plugs in tees in piping.

F. Install thermometers and gages adjacent to machines and equipment to allow service and maintenance for thermometers, gages, machines, and equipment.

G. Adjust faces of thermometers and gages to proper angle for best visibility.

END OF SECTION 22 05 19

SECTION 22 05 23

VALVES

PART I - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following general-duty valves:

1. Bronze angle valves.
2. Copper-alloy ball valves.
3. Ferrous-alloy butterfly valves.
4. Bronze check valves.
5. Gray-iron swing check valves.
6. Ferrous-alloy wafer check valves.
7. Bronze gate valves.
8. Cast-iron gate valves.
9. Bronze globe valves.
10. Cast-iron globe valves.

1.3 DEFINITIONS

A. The following are standard abbreviations for valves:

1. CWP: Cold working pressure.
2. EPDM: Ethylene-propylene-diene terpolymer rubber.
3. SWP: Steam working pressure.

1.4 SUBMITTALS

A. Product Data: For each type of valve indicated. Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its application. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

1.5 QUALITY ASSURANCE

A. ASME Compliance: ASME B31.9 for building services piping valves.

1. Exceptions: Domestic hot- and cold-water piping valves unless referenced.

B. ASME Compliance for Ferrous Valves: ASME B16.10 and ASME B16.34 for dimension and design criteria.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set angle, gate, and globe valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART II - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 VALVES, GENERAL

A. Refer to Part 3 "Valve Applications" Article for applications of valves.

B. Bronze Valves: NPS 2 and smaller with threaded ends, unless otherwise indicated.

C. Ferrous Valves: NPS 2-1/2 and larger with flanged ends, unless otherwise indicated.

D. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

E. Valve Sizes: Same as upstream pipe, unless otherwise indicated.

F. Valve Actuators:

1. Handwheel: For valves other than quarter-turn types.
2. Lever Handle: For quarter-turn valves NPS 6 and smaller, except plug valves.

G. Extended Valve Stems: On insulated valves.

H. Valve Flanges: ASME B16.1 for cast-iron valves, ASME B16.5 for steel valves, and ASME B16.24 for bronze valves.

I. Valve Grooved Ends: AWWA C606.

1. Solder Joint: With sockets according to ASME B16.18.

a. Caution: Use solder with melting point below 840 deg F for angle, check, gate, and globe valves; below 421 deg F for ball valves.

2. Threaded: With threads according to ASME B1.20.1.

J. Valve Bypass and Drain Connections: MSS SP-45.

2.3 BRONZE ANGLE VALVES

A. Available Manufacturers:

1. Type 3, Bronze Angle Valves with Metal Disc and Renewable Seat:

a. Cincinnati Valve Co.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Div.
e. Grinnell Corporation.
f. Milwaukee Valve Company.
g. NIBCO INC.

B. Bronze Angle Valves, General: MSS SP-80, with ferrous-alloy handwheel.

C. Type 3, Class 200, Bronze Angle Valves: Bronze body with bronze disc and renewable seat. Include union-ring bonnet.

2.4 COPPER-ALLOY BALL VALVES

A. Available Manufacturers:

1. Three-Piece, Copper-Alloy Ball Valves:

a. Conbraco Industries, Inc.; Apollo Div.
b. DynaQuip Controls.
c. Grinnell Corporation.
d. Hammond Valve.
e. Jamesbury, Inc.
f. Kitz Corporation of America.
g. NIBCO INC.
h. PBM, Inc.
i. Red-White Valve Corp.
j. Worcester Controls.

B. Copper-Alloy Ball Valves, General: MSS SP-110.

2.5 FERROUS-ALLOY BUTTERFLY VALVES

A. Available Manufacturers:

1. Flanged, Ferrous-Alloy Butterfly Valves:

a. Bray International, Inc.
b. Cooper Cameron Corp.; Cooper Cameron Valves Div.
c. Grinnell Corporation.
d. Mueller Steam Specialty.
e. Tyco International, Ltd.; Tyco Valves & Controls.

2. Grooved-End, Ductile-Iron Butterfly Valves:

a. Central Sprinkler Co.; Central Grooved Piping Products.
b. Grinnell Corporation.
c. Hammond Valve.
d. McWane, Inc.; Kennedy Valve Div.
e. Milwaukee Valve Company.
f. Mueller Steam Specialty.
g. NIBCO INC.
h. Victaulic Co. of America.

B. Ferrous-Alloy Butterfly Valves, General: MSS SP-67, Type I, for tight shutoff, with disc and lining suitable for potable water, unless otherwise indicated.

C. Flanged, 300-psig CWP Rating, Ferrous-Alloy Butterfly Valves: Flanged-end type with one or two-piece stem.

D. Grooved-End, 300-psig CWP Rating, Ferrous-Alloy Butterfly Valves: Ductile-iron or steel body with grooved or shouldered ends.

2.6 BRONZE CHECK VALVES

A. Available Manufacturers:

1. Type 3, Bronze, Swing Check Valves with Metal Disc:

a. American Valve, Inc.
b. Cincinnati Valve Co.
c. Crane Co.; Crane Valve Group; Crane Valves.
d. Crane Co.; Crane Valve Group; Jenkins Valves.
e. Crane Co.; Crane Valve Group; Stockham Div.
f. Grinnell Corporation.
g. Hammond Valve.
h. Kitz Corporation of America.
i. Legend Valve & Fitting, Inc.
j. Milwaukee Valve Company.
k. NIBCO INC.
l. Powell, Wm. Co.
m. Red-White Valve Corp.
n. Walworth Co.
o. Watts Industries, Inc.; Water Products Div.

B. Bronze Check Valves, General: MSS SP-80.

C. Type 3, Class 200, Bronze, Swing Check Valves: Bronze body with bronze disc and seat.

2.7 GRAY-IRON SWING CHECK VALVES

A. Available Manufacturers:

1. Type I, Gray-Iron Swing Check Valves with Metal Seats:

a. Cincinnati Valve Co.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Div.
e. Flomatic Valves.
f. Grinnell Corporation.
g. Hammond Valve.
h. Kitz Corporation of America.
i. Legend Valve & Fitting, Inc.
j. Milwaukee Valve Company.
k. Mueller Co.
l. NIBCO INC.
m. Powell, Wm. Co.
n. Red-White Valve Corp.
o. Walworth Co.
p. Watts Industries, Inc.; Water Products Div.

2. Grooved-End, Ductile-Iron Swing Check Valves:

a. Grinnell Corporation.
b. Mueller Co.
c. Victaulic Co. of America.

B. Gray-Iron Swing Check Valves, General: MSS SP-71.

C. Type I, Class 250, gray-iron, swing check valves with metal seats.

D. 300-psig CWP Rating, Grooved-End, Swing Check Valves: Ductile-iron body with grooved or shouldered ends.

2.8 FERROUS-ALLOY WAFER CHECK VALVES

A. Available Manufacturers:

1. Dual-Plate, Ferrous-Alloy, Wafer-Lug Check Valves:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Gulf Valve Co.
c. Valve and Primer Corp.

2. Dual-Plate, Ferrous-Alloy, Double-Flanged-Type Check Valves:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Gulf Valve Co.
c. Techno Corp.

B. Ferrous-Alloy Wafer Check Valves, General: API 594, spring loaded.

C. Single-Plate, Class 250 or 300, Ferrous-Alloy, Wafer-Lug Check Valves: Single-flange body.

D. Single-Plate, Class 250 or 300, Ferrous-Alloy, Double-Flanged Check Valves: Flanged-end body.

E. Dual-Plate, Class 250 or 300, Ferrous-Alloy, Wafer-Lug Check Valves: Single-flange body.

F. Dual-Plate, Class 250 or 300, Ferrous-Alloy, Double-Flanged Check Valves: Flanged-end body.

2.9 BRONZE GATE VALVES

A. Available Manufacturers:

1. Type 1, Bronze, Nonrising-Stem Gate Valves:

a. American Valve, Inc.
b. Cincinnati Valve Co.
c. Crane Co.; Crane Valve Group; Crane Valves.

d. Crane Co.; Crane Valve Group; Jenkins Valves.
e. Crane Co.; Crane Valve Group; Stockham Div.
f. Grinnell Corporation.
g. Hammond Valve.
h. Kitz Corporation of America.
i. Legend Valve & Fitting, Inc.
j. Milwaukee Valve Company.
k. NIBCO INC.
l. Powell, Wm. Co.
m. Red-White Valve Corp.
n. Walworth Co.
o. Watts Industries, Inc.; Water Products Div.

B. Bronze Gate Valves, General: MSS SP-80, with ferrous-alloy handwheel.

C. Type 1, Class 200, Bronze Gate Valves: Bronze body with nonrising stem and bronze solid wedge.

2.10 CAST-IRON GATE VALVES

A. Available Manufacturers:

1. Type I, Cast-Iron, Nonrising-Stem Gate Valves:

a. Cincinnati Valve Co.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Div.
e. Grinnell Corporation.
f. Hammond Valve.
g. Kitz Corporation of America.
h. Legend Valve & Fitting, Inc.
i. Milwaukee Valve Company.
j. NIBCO INC.
k. Powell, Wm. Co.
l. Red-White Valve Corp.
m. Walworth Co.
n. Watts Industries, Inc.; Water Products Div.

B. Cast-Iron Gate Valves, General: MSS SP-70, Type I.

C. Class 250, NRS, Bronze-Mounted, Cast-Iron Gate Valves: Cast-iron body with bronze trim, nonrising stem, and solid-wedge disc.

D. Class 250, NRS, All-Iron, Cast-Iron Gate Valves: Cast-iron body with cast-iron trim, nonrising stem, and solid-wedge disc.

E. Class 250, OS&Y, All-Iron, Cast-Iron Gate Valves: Cast-iron body with cast-iron trim, rising stem, and solid-wedge disc.

2.11 BRONZE GLOBE VALVES

A. Available Manufacturers:

1. Type 3, Bronze Globe Valves with Renewable Seat and Metal Disc:

a. Cincinnati Valve Co.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Div.
e. Grinnell Corporation.
f. Hammond Valve.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Walworth Co.

B. Bronze Globe Valves, General: MSS SP-80, with ferrous-alloy handwheel.

C. Type 3, Class 200, Bronze Globe Valves: Bronze body with bronze disc and renewable seat.

2.12 CAST-IRON GLOBE VALVES

A. Available Manufacturers:

1. Type I, Cast-Iron Globe Valves with Metal Seats:

a. Cincinnati Valve Co.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Div.
e. Grinnell Corporation.
f. Hammond Valve.
g. Kitz Corporation of America.
h. Milwaukee Valve Company.
i. NIBCO INC.
j. Powell, Wm. Co.
k. Red-White Valve Corp.
l. Walworth Co.

B. Cast-Iron Globe Valves, General: MSS SP-85.

C. Type I, Class 125, Cast-Iron Globe Valves: Gray-iron body with bronze seats.

D. Type I, Class 250, Cast-Iron Globe Valves: Gray-iron body with bronze seats.

PART III - EXECUTION

3.1 EXAMINATION

A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

C. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

D. Examine threads on valve and mating pipe for form and cleanliness.

E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

F. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE APPLICATIONS

A. Refer to piping Sections for specific valve applications. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball, butterfly, gate, or plug valves.
2. Throttling Service: Angle, ball, butterfly, or globe valves.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.

C. Domestic Water Piping: Use the following types of valves:

1. Angle Valves: Type 2, Class 200, bronze.
2. Ball Valves: Three-piece, 600-psig CWP rating, copper alloy.
3. Lift Check Valves: Type 2, Class 200, horizontal or vertical, bronze.
4. Swing Check Valves: Type 4, Class 200, bronze.
5. Gate Valves: Type 1 or 2, Class 200, bronze.
6. Globe Valves: Type 2, Class 200, bronze.

D. Select valves, except wafer and flangeless types, with the following end connections:

7. For Copper Tubing, NPS 2 and Smaller: Solder-joint.
8. For Copper Tubing, NPS 2-1/2 to NPS 4 : Flanged ends.
9. For Steel Piping, NPS 2 and Smaller: Threaded ends.
10. For Steel Piping, NPS 2-1/2 to NPS 4 : Flanged or threaded ends.

11. For Grooved-End, Copper Tubing and Steel Piping: Valve ends may be grooved.

3.3 VALVE INSTALLATION

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

C. Locate valves for easy access and provide separate support where necessary.

D. Install valves in horizontal piping with stem at or above center of pipe.

E. Install valves in position to allow full stem movement.

F. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.
2. Dual-Plate Check Valves: In horizontal or vertical position, between flanges.
3. Lift Check Valves: With stem upright and plumb.

3.4 JOINT CONSTRUCTION

A. Refer to Division 23 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

B. Grooved Joints: Assemble joints with keyed coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.5 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

END OF SECTION 22 05 23

SECTION 22 05 29

HANGERS AND SUPPORTS

PART I - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following hangers and supports for mechanical system piping and equipment:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Equipment supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.
3. Powder-actuated fastener systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers. Include Product Data for components.
2. Metal framing systems. Include Product Data for components.
3. Equipment supports.

C. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel." AWS D1.3, "Structural Welding Code--Sheet Steel." AWS D1.4, "Structural Welding Code--Reinforcing Steel." ASME Boiler and Pressure Vessel Code: Section IX.

PART II - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Manufacturers:

1. AAA Technology & Specialties Co., Inc.
2. Bergen-Power Pipe Supports.
3. B-Line Systems, Inc.; a division of Cooper Industries.
4. Carpenter & Paterson, Inc.
5. Empire Industries, Inc.
6. ERICO/Michigan Hanger Co.
7. Globe Pipe Hanger Products, Inc.
8. Grinnell Corp.
9. GS Metals Corp.
10. National Pipe Hanger Corporation.
11. PHD Manufacturing, Inc.
12. PHS Industries, Inc.
13. Piping Technology & Products, Inc.
14. Tolco Inc.

C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. GS Metals Corp.
4. Power-Strut Div.; Tyco International, Ltd.
5. Thomas & Betts Corporation.
6. Tolco Inc.
7. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Manufacturers:

1. Carpenter & Paterson, Inc.
2. ERICO/Michigan Hanger Co.
3. PHS Industries, Inc.
4. Pipe Shields, Inc.
5. Rilco Manufacturing Company, Inc.
6. Value Engineered Products, Inc.

C. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass] with vapor barrier.

D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass.

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.6 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

a. Hilti, Inc.
b. ITW Ramset/Red Head.
c. Masterset Fastening Systems, Inc.
d. MKT Fastening, LLC.
e. Powers Fasteners.

B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2. Manufacturers:

a. B-Line Systems, Inc.; a division of Cooper Industries.
b. Empire Industries, Inc.
c. Hilti, Inc.
d. ITW Ramset/Red Head.
e. MKT Fastening, LLC.
f. Powers Fasteners.

2.7 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.8 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.

2. Design Mix: 5000-psi , 28-day compressive strength.

PART III - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30 .
2. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24 , if little or no insulation is required.
3. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 .
4. Adjustable Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2 .
5. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3 .
6. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30 .
7. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36 , with steel pipe base stanchion support and cast-iron floor flange.
8. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36 , with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
9. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 36 , if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.

G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20 .

H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.

I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.

J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
2. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches .
2. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from hanger.
3. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

    a. Horizontal (MSS Type 54): Mounted horizontally.
    b. Vertical (MSS Type 55): Mounted vertically.
    c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

N. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.

M. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2 : 12 inches long and 0.048 inch thick.
    b. NPS 4 : 12 inches long and 0.06 inch thick.
    c. NPS 5 and NPS 6 : 18 inches long and 0.06 inch thick.
    d. NPS 8 to NPS 14 : 24 inches long and 0.075 inch thick.
    e. NPS 16 to NPS 24 : 24 inches long and 0.105 inch thick.

4. Pipes NPS 8 and Larger: Include wood inserts.
5. Insert Material: Length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and 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. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.6 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils .

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

END OF SECTION 22 05 29

SECTION 22 07 00

PLUMBING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Insulation Materials:

    a. Flexible elastomeric.
    b. Mineral fiber.

2. Adhesives.
3. Mastics.
4. Lagging adhesives.
5. Sealants.
6. Factory-applied jackets.
7. Field-applied fabric-reinforcing mesh.
8. Field-applied jackets.
9. Corner angles.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).

B. Shop Drawings:

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at pipe expansion joints for each type of insulation.
3. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
4. Detail removable insulation at piping specialties, equipment connections, and access panels.
5. Detail application of field-applied jackets.
6. Detail field application for each equipment type.

C. Qualification Data: For qualified Installer.

D. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, and jackets, with requirements indicated. Include dates of tests and test methods employed.

E. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports."

B. Coordinate clearance requirements with piping Installer for piping insulation application and equipment Installer for equipment insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Aeroflex USA Inc.; Aerocel.
    b. Armacell LLC; AP Armaflex.
    c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

E. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Fibrex Insulations Inc.; Coreplus 1200.
    b. Johns Manville; Micro-Lok.
    c. Knauf Insulation; 1000(Pipe Insulation.
    d. Manson Insulation Inc.; Alley-K.
    e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F (454 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ, ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Aeroflex USA Inc.; Aeroseal.
    b. Armacell LCC; 520 Adhesive.
    c. Foster Products Corporation, H. B. Fuller Company; 85-75.
    d. RBX Corporation; Rubatex Contact Adhesive.

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Childers Products, Division of ITW; CP-82.
    b. Foster Products Corporation, H. B. Fuller Company; 85-20.
    c. ITW TACC, Division of Illinois Tool Works; S-90/80.
    d. Marathon Industries, Inc.; 225.
    e. Mon-Eco Industries, Inc.; 22-25.

D. FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Childers Products, Division of ITW; CP-82.
    b. Foster Products Corporation, H. B. Fuller Company; 85-20.
    c. ITW TACC, Division of Illinois Tool Works; S-90/80.
    d. Marathon Industries, Inc.; 225.
    e. Mon-Eco Industries, Inc.; 22-25.

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Childers Products, Division of ITW; CP-35.
    b. Foster Products Corporation, H. B. Fuller Company; 30-90.
    c. ITW TACC, Division of Illinois Tool Works; CB-50.
    d. Marathon Industries, Inc.; 590.
    e. Mon-Eco Industries, Inc.; 55-40.
    f. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
5. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Childers Products, Division of ITW; CP-30.
    b. Foster Products Corporation, H. B. Fuller Company; 30-35.
    c. ITW TACC, Division of Illinois Tool Works; CB-25.
    d. Marathon Industries, Inc.; 501.
    e. Mon-Eco Industries, Inc.; 55-10.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.03 metric perm) at 35-mil (0.9-mm) dry film thickness.
3. Service Temperature Range: 0 to 180 deg F (Minus 18 to plus 82 deg C).
4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
5. Color: White.

D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Childers Products, Division of ITW; Encacel.
    b. Foster Products Corporation, H. B. Fuller Company; 60-95/60-96.
    c. Marathon Industries, Inc.; 570.
    d. Mon-Eco Industries, Inc.; 55-70.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.033 metric perm) at 30-mil (0.8-mm) dry film thickness.
3. Service Temperature Range: Minus 50 to plus 220 deg F (Minus 46 to plus 104 deg C).
4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
5. Color: White.

E. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Childers Products, Division of ITW; CP-10.
    b. Foster Products Corporation, H. B. Fuller Company; 35-00.
    c. ITW TACC, Division of Illinois Tool Works; CB-05/15.
    d. Marathon Industries, Inc.; 550.
    e. Mon-Eco Industries, Inc.; 55-50.
    f. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 3 perms (2 metric perms) at 0.0625-inch (1.6-mm) dry film thickness.
3. Service Temperature Range: Minus 20 to plus 200 deg F (Minus 29 to plus 93 deg C).
4. Solids Content: 63 percent by volume and 73 percent by weight.
5. Color: White.

2.4 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-52.
b. Foster Products Corporation, H. B. Fuller Company; 81-42.
c. Marathon Industries, Inc.; 130.
d. Mon-Eco Industries, Inc.; 11-30.
e. Vimasco Corporation; 136.

2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over equipment and pipe insulation.
3. Service Temperature Range: Minus 50 to plus 180 deg F (Minus 46 to plus 82 deg C).
4. Color: White.

2.5 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-76-8.
b. Foster Products Corporation, H. B. Fuller Company; 95-44.
c. Marathon Industries, Inc.; 405.
d. Mon-Eco Industries, Inc.; 44-05.
e. Vimasco Corporation; 750.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: Aluminum.

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.7 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. Metal Jacket:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Childers Products, Division of ITW; Metal Jacketing Systems.
   b. PABCO Metals Corporation; Surefit.
   c. RPR Products, Inc.; Insul-Mate.

2. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105 or 5005, Temper H-14.

   a. Factory cut and rolled to size.
   b. Finish and thickness are indicated in field-applied jacket schedules.
   c. Moisture Barrier for Indoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.
   d. Moisture Barrier for Outdoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.
   e. Factory-Fabricated Fitting Covers:

      1) Same material, finish, and thickness as jacket.
      2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
      3) Tee covers.
      4) Flange and union covers.
      5) End caps.
      6) Beveled collars.
      7) Valve covers.
      8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.8 TAPES

A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
   b. Compac Corp.; 110 and 111.
   c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
   d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches (75 mm).
3. Thickness: 6.5 mils (0.16 mm).
4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
5. Elongation: 2 percent.

6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

B. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
   b. Compac Corp.; 120.
   c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
   d. Venture Tape; 3520 CW.

2. Width: 2 inches (50 mm).
3. Thickness: 3.7 mils (0.093 mm).
4. Adhesion: 100 ounces force/inch (1.1 N/mm) in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch (6.2 N/mm) in width.

2.9 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Childers Products; Bands.
   b. PABCO Metals Corporation; Bands.
   c. RPR Products, Inc.; Bands.

2. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick, 1/2 inch (13 mm) or 3/4 inch (19 mm) wide with wing or closed seal.

2.10 CORNER ANGLES

A. Aluminum Corner Angles: 0.040 inch (1.0 mm) thick, minimum 1 by 1 inch (25 by 25 mm), aluminum according to ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105 or 5005; Temper H-14.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F (0 and 149 deg C) with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches (50 mm) o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems" for firestopping and fire-resistive joint sealers.

D. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies.

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts.
5. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
6. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
7. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, and switches on insulated pipes and tanks. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches (50 mm) over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Finish exposed surfaces with a metal jacket.

3.6 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.8 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch (38-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.

5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where metal jackets are indicated, install with 2-inch (50-mm) overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches (300 mm) o.c. and at end joints.

3.9 FINISHES

A. Equipment and Pipe Insulation with Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 9 painting Sections.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect field-insulated equipment, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.
2. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.11 EQUIPMENT INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a type of equipment, selection from materials listed is Contractor's option.

B. Insulate equipment in paragraphs below that is not factory insulated.

3.12 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Underground piping.
2. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.13 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water subject to freezing:

1. NPS 1 (DN 25) and Smaller: Insulation shall be the following:

a. Flexible Elastomeric: 1/2 inch (13 mm) thick.

2. NPS 1-1/4 (DN 32) and Larger: Insulation shall be the following:

a. Flexible Elastomeric: 1 inch (25 mm) thick.

B. Domestic Hot Water and Hot Water Return:

1. NPS 1-1/4 and Smaller: Insulation shall be:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

2. NPS 1-1/2 and Larger: Insulation shall be:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1.5 inch thick.

C. Stormwater and Overflow:

1. All Pipe Sizes: Insulation shall be the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch (25 mm) thick.

D. Roof Drain and Overflow Drain Bodies:

1. All Pipe Sizes: Insulation shall be the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch (25 mm) thick.

E. Condensate and Equipment Drain Water below 60 Deg F (16 Deg C):

1. All Pipe Sizes: Insulation shall be the following:
a. Flexible Elastomeric: 3/4 inch thick.

F. Floor Drains, Traps, and Sanitary Drain Piping within 10 Feet (3 m) of Drain Receiving Condensate and Equipment Drain Water below 60 Deg F (16 Deg C):

1. All Pipe Sizes: Insulation shall be the following:
a. Flexible Elastomeric: 1 inch (25 mm) thick.

3.14 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

1. None.

D. Piping, Exposed:

1. Aluminum, Corrugated: 0.040 inch (1.0 mm) thick.
2. Painted Aluminum, Corrugated 0.032 inch (0.81 mm) thick.

END OF SECTION 22 07 00

SECTION 22 11 16

DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes domestic water piping inside the building.

1.3 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing domestic water piping systems with 125 psig, unless otherwise indicated.

1.4 SUBMITTALS

A. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for potable domestic water piping and components.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Refer to Part 3 "Pipe and Fitting Applications" Article for applications of pipe, tube, fitting, and joining materials.

B. Transition Couplings for Aboveground Pressure Piping: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Types L, water tube, drawn temper.

1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought- copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300 flanges if required to match piping.
3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
4. Copper, Grooved-End Fittings: ASTM B 75 copper tube or ASTM B 584 bronze castings.

a. Grooved-End-Tube Couplings: Copper-tube dimensions and design similar to AWWA C606. Include ferrous housing sections, gasket suitable for hot water, and bolts and nuts.

2.3 CPVC PIPING

A. CPVC Schedule 80 Pipe: ASTM F 441/F 441M.

1. CPVC Schedule 80 Fittings: ASTM F 439, socket type or ASTM F 437, threaded type.

B. CPVC Piping System: ASTM D 2846/D 2846M, SDR 11, pipe and socket fittings.

C. CPVC Tubing System: ASTM D 2846/D 2846M, SDR 11, tube and socket fittings.

2.4 VALVES

A. Bronze and cast-iron, general-duty valves are specified in Division 22 Section "Valves."

B. Balancing and drain valves are specified in Division 22 Section "Plumbing Specialties."

C. CPVC Union Ball Valves: MSS SP-122, with full-port ball, socket or threaded detachable end connectors, and pressure rating not less than 150 psig (1035 kPa) at 73 deg F (23 deg C).

D. CPVC Non-Union Ball Valves: MSS SP-122, with full- or reduced-port ball, socket or threaded ends, and pressure rating not less than 150 psig (1035 kPa) at 73 deg F (23 deg C).

E. CPVC Check Valves: Swing or ball-check design and pressure rating not less than 150 psig (1035 kPa) at 73 deg F (23 deg C).

PART 3 - EXECUTION

3.1 EXCAVATION

A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earthwork."

3.2 PIPE AND FITTING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.

B. Flanges may be used on aboveground piping, unless otherwise indicated.

C. Grooved joints may be used on aboveground grooved-end piping.

D. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

E. Under-Building-Slab, Domestic Water Piping NPS 4 (DN 100) and Smaller: Hard copper tube, Type L (Type B); copper pressure fittings; and soldered joints.

F. Aboveground Domestic Water Piping: Use any of the following piping materials for each size range:

1. NPS 1(DN 25) and Smaller: CPVC, Schedule 80 pipe; CPVC, Schedule 80 threaded fittings; and threaded joints.
2. NPS 1 (DN 25) and Smaller: CPVC, Schedule 80 pipe; CPVC, Schedule 80 socket fittings; and solvent-cemented joints.
3. NPS 1-1/4 and NPS 1-1/2 (DN 32 and DN 40): CPVC, Schedule 80 pipe; CPVC, Schedule 80 threaded fittings; and threaded joints.
4. NPS 1-1/4 and NPS 1-1/2 (DN 32 and DN 40): CPVC, Schedule 80 pipe; CPVC, Schedule 80 socket fittings; and solvent-cemented joints.
5. NPS 2 (DN 50): CPVC, Schedule 80 pipe; CPVC, Schedule 80 threaded fittings; and threaded joints.
6. NPS 2 (DN 50): CPVC, Schedule 80; CPVC, Schedule 80 socket fittings; and solvent-cemented joints.
7. NPS 2-1/2 to NPS 3-1/2 (DN 65 to DN 90): CPVC, Schedule 80 pipe; CPVC, Schedule 80 threaded fittings; and threaded joints.
8. NPS 2-1/2 to NPS 3-1/2 (DN 65 to DN 90): CPVC, Schedule 80 pipe; CPVC, Schedule 80 socket fittings; and solvent-cemented joints.
9. NPS 4 to NPS 6 (DN 100 to DN 150): CPVC, Schedule 80 pipe; CPVC, Schedule 80 threaded fittings; and threaded joints.
10. NPS 4 to NPS 6 (DN 100 to DN 150): CPVC, Schedule 80 pipe; CPVC, Schedule 80 socket fittings; and solvent-cemented joints.

3.3 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use bronze ball or gate valves for piping NPS 2 and smaller. Use gate valves with flanged ends for piping NPS 2-1/2 and larger.
2. Throttling Duty: Use bronze ball or globe valves for piping NPS 2 and smaller. Use cast-iron butterfly valves with flanged ends for piping NPS 2-1/2 and larger.
3. Hot-Water-Piping, Balancing Duty: Memory-stop balancing valves.
4. Drain Duty: Hose-end drain valves.

B. CPVC ball, and check valves may be used in matching piping materials.

C. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball or gate valves for piping NPS 2 and smaller. Use gate valves for piping NPS 2-1/2 and larger.

D. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping.

1. Install hose-end drain valves at low points in water mains, risers, and branches.
2. Install stop-and-waste drain valves where indicated.

E. Install calibrated balancing valves in each hot-water circulation return branch and discharge side of each pump and circulator. Set calibrated balancing valves partly open to restrict but not stop flow.

3.4 PIPING INSTALLATION

A. Basic piping installation requirements are specified in Division 23 Section "Basic Mechanical Materials and Methods."

B. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 23 Section "Basic Mechanical Materials and Methods."

C. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Wall penetration systems are specified in Division 23 Section "Basic Mechanical Materials and Methods."

D. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance.

E. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.

3.5 JOINT CONSTRUCTION

A. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.6 HANGER AND SUPPORT INSTALLATION

A. Pipe hanger and support devices are specified in Division 15 Section "Hangers and Supports." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Individual, Straight, Horizontal Piping Runs: According to the following:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet : MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet : MSS Type 49, spring cushion rolls, if indicated.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install supports according to Division 22 Section "Hangers and Supports."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8 inch .

E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4 : 72 inches with 3/8-inch rod.
3. NPS 6 : 10 feet with 5/8-inch rod.

F. Install supports for vertical copper tubing every 10 feet .

G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

H. Install hangers for CPVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1 (DN 25) and Smaller: 36 inches (900 mm) with 3/8-inch (10-mm) rod.
2. NPS 1-1/4 to NPS 2 (DN 32 to DN 50): 48 inches (1200 mm) with 3/8-inch (10-mm) rod.
3. NPS 2-1/2 to NPS 3-1/2 (DN 65 to DN 90): 48 inches (1200 mm) with 1/2-inch (13-mm) rod.
4. NPS 4 and NPS 5 (DN 100 and DN 125): 48 inches (1200 mm) with 5/8-inch (16-mm) rod.

I. Install supports for vertical CPVC piping every 60 inches (1500 mm) for NPS 1 (DN 25) and smaller, and every 72 inches (1800 mm) for NPS 1-1/4 (DN 32) and larger.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve, and extend and connect to the following:

1. Water Heaters: Cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
2. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code.
3. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.8 FIELD QUALITY CONTROL

A. Inspect domestic water piping as follows:

1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

    a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
    b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Test domestic water piping as follows:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.9 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.

4. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
5. Close drain valves and replace drain plugs.
6. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.10 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures described in either AWWA C651 or AWWA C652 or as described below:

    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Fill and isolate system according to either of the following:

        1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
        2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

    c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Prepare and submit reports of purging and disinfecting activities.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

END OF SECTION 22 11 16

SECTION 22 11 19

DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following domestic water piping specialties:

1. Vacuum breakers.
2. Backflow preventers.
3. Balancing valves.
4. Strainers.
5. Outlet boxes.
6. Wall hydrants.
7. Drain valves.
8. Water hammer arresters.
9. Trap-seal primer valves.
10. Trap-seal primer systems.

1.3 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For domestic water piping specialties to include in operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. 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.

B. NSF Compliance:

1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. 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:

a. Ames Co.
b. Cash Acme.
c. Conbraco Industries, Inc.
d. FEBCO; SPX Valves & Controls.
e. Rain Bird Corporation.
f. Toro Company (The); Irrigation Div.
g. Watts Industries, Inc.; Water Products Div.
h. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1001.
3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
4. Body: Bronze.
5. Inlet and Outlet Connections: Threaded.
6. Finish: Rough bronze or Chrome plated.

B. Hose-Connection Vacuum Breakers:

1. 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:

a. Arrowhead Brass Products, Inc.
b. Cash Acme.
c. Conbraco Industries, Inc.
d. Legend Valve.
e. MIFAB, Inc.
f. Prier Products, Inc.
g. Watts Industries, Inc.; Water Products Div.
h. Woodford Manufacturing Company.
i. Zurn Plumbing Products Group; Light Commercial Operation.

j. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1011.
3. Body: Bronze, nonremovable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Chrome, nickel plated, or Rough bronze.

2.2 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:

1. 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:

   a. Ames Co.
   b. Conbraco Industries, Inc.
   c. FEBCO; SPX Valves & Controls.
   d. Flomatic Corporation.
   e. Watts Industries, Inc.; Water Products Div.
   f. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1013.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 12 psig maximum, through middle 1/3 of flow range.
5. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550, or steel with interior lining complying with AWWA C550 for NPS 2-1/2 and larger.
6. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
7. Configuration: Designed for horizontal, straight through flow.
8. Accessories:

   a. Valves: Ball type with threaded ends on inlet and outlet ofNPS 2 and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of NPS 2-1/2 and larger.
   b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

B. Reduced-Pressure-Detector, Fire-Protection Backflow-Preventer Assemblies:

1. 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:

   a. Ames Co.
   b. Conbraco Industries, Inc.
   c. FEBCO; SPX Valves & Controls.
   d. Watts Industries, Inc.; Water Products Div.
   e. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1047 and FMG approved or UL listed.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 12 psig maximum, through middle 1/3 of flow range.
5. Body: Cast iron with interior lining complying with AWWA C550, or Steel with interior lining complying with AWWA C550.

6. End Connections: Flanged.
7. Configuration: Designed for horizontal, straight through flow.
8. Accessories:

    a. Valves: Outside screw and yoke gate-type with flanged ends on inlet and outlet.
    b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.
    c. Bypass: With displacement-type water meter, shutoff valves, and reduced-pressure backflow preventer.

2.3 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum, unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations, unless otherwise indicated.
   Drain: Factory-installed, hose-end drain valve.

2.4 WALL HYDRANTS

A. Non-Freeze Wall Hydrants:

1. 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:

    a. Josam Company.
    b. MIFAB, Inc.
    c. Prier Products, Inc.
    d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    e. Tyler Pipe; Wade Div.
    f. Watts Drainage Products Inc.
    g. Woodford Manufacturing Company.
    h. Zurn Plumbing Products Group; Light Commercial Operation.
    i. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig .
4. Operation: T-Handle key.
5. Inlet: NPS 3/4 or NPS 1 .
6. Outlet: Concealed, with integral vacuum breaker or nonremovable hose-connection vacuum breaker complying with ASSE 1011; and garden-hose thread complying with ASME B1.20.7.
7. Box: Deep, flush mounting with cover.
8. Box and Cover Finish: Polished nickel bronze.
9. Nozzle and Wall-Plate Finish: Polished nickel bronze.
10. Operating Keys(s): One with each wall hydrant.

B. Vacuum Breaker Wall Hydrants:

1. 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:

    a. Arrowhead Brass Products, Inc.
    b. Mansfield Plumbing Products LLC.
    c. McDonald, A. Y. Mfg. Co.
    d. Prier Products, Inc.
    e. Smith, Jay. R. Mfg. Co.; Division of Smith Industries, Inc.
    f. Watts Industries, Inc.; Water Products Div.
    g. Woodford Manufacturing Company.
    h. Zurn Plumbing Products Group; Light Commercial Operation.

2. Standard: ASSE 1019, Type A or Type B.
3. Type: Freeze-resistant, automatic draining with integral air-inlet valve.
4. Classification: Type A, for automatic draining with hose removed or Type B, for automatic draining with hose removed or with hose attached and nozzle closed.
5. Pressure Rating: 125 psig .
6. Operation: Loose key.
7. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
8. Inlet: NPS 1/2 or NPS 3/4 .
9. Outlet: Exposed with garden-hose thread complying with ASME B1.20.7.

2.5 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4 .
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

B. Gate-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-80 for gate valves.
2. Pressure Rating: Class 125.
3. Size: NPS 3/4 .
4. Body: ASTM B 62 bronze.
5. Inlet: NPS 3/4 threaded or solder joint.
6. Outlet: Garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.6 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:

1. 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:

    a. AMTROL, Inc.
    b. Josam Company.
    c. MIFAB, Inc.
    d. PPP Inc.
    e. Sioux Chief Manufacturing Company, Inc.
    f. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    g. Tyler Pipe; Wade Div.
    h. Watts Drainage Products Inc.
    i. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Metal bellows.
4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.7 TRAP-SEAL PRIMER VALVES

A. Supply-Type, Trap-Seal Primer Valves:

1. 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:

    a. MIFAB, Inc.
    b. PPP Inc.
    c. Sioux Chief Manufacturing Company, Inc.
    d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    e. Watts Industries, Inc.; Water Products Div.

2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

B. Drainage-Type, Trap-Seal Primer Valves:

1. 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:

    a. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.

2. Standard: ASSE 1044, lavatory P-trap with NPS 3/8 minimum, trap makeup connection.
3. Size: NPS 1-1/4 minimum.

4. Material: Chrome-plated, cast brass.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 23 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.

B. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
3. Do not install bypass piping around backflow preventers.

C. Install balancing valves in locations where they can easily be adjusted.

D. Install Y-pattern strainers for water on supply side of each pump.

E. Install water hammer arresters in water piping according to PDI-WH 201.

F. Install trap-seal primer systems with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust system for proper flow.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.

B. Ground equipment according to Division 26 Section "Grounding and Bonding."

Connect wiring according to Division 26 Section "Conductors."

3.3 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Pressure vacuum breakers.
2. Reduced-pressure-principle backflow preventers.
3. Reduced-pressure-detector, fire-protection backflow-preventer assemblies.
4. Supply-type, trap-seal primer valves.

5. Trap-seal primer systems.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 23 Section "Mechanical Identification."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and prepare test reports:

1. Test each reduced-pressure-principle backflow preventer according to authorities having jurisdiction and the device's reference standard.

B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

END OF SECTION 22 11 19

SECTION 22 13 16

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following for soil, waste, and vent piping inside the building:

1. Pipe, tube, and fittings.
2. Special pipe fittings.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. PVC: Polyvinyl chloride plastic.

1.4 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.

1.5 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

Field quality-control inspection and test reports.

1.6 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 COPPER TUBE AND FITTINGS

A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.

1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

B. Hard Copper Tube: ASTM B 88, Types L and M, water tube, drawn temper.

1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
2. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
3. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

2.4 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.

2.5 SPECIAL PIPE FITTINGS

A. Flexible, Nonpressure Pipe Couplings: Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition pattern. Include shear ring, ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

1. Manufacturers:

a. Dallas Specialty & Mfg. Co.

b. Fernco, Inc.
c. Logan Clay Products Company (The).
d. Mission Rubber Co.
e. NDS, Inc.
f. Plastic Oddities, Inc.

2. Sleeve Materials:

a. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

B. Above and underground, soil, waste, vent, and storm drainage piping shall be:

1. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

3.2 PIPING INSTALLATION

A. Sanitary sewer piping outside the building is specified in Division 33 Section "Sanitary Sewerage."

B. Basic piping installation requirements are specified in Division 23 Section "Basic Mechanical Materials and Methods."

C. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

D. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Installations involving back-to-back blow-out water closets must be made with sanitary waste fittings that prevent cross flow. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

E. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

F. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for NPS 2 piping; 1 percent downward in direction of flow for piping NPS 3 and larger.
2. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

G. Install underground PVC soil and waste drainage piping according to ASTM D 2321.

H. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.3 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 23 Section "Basic Mechanical Materials and Methods."

B. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

3.4 VALVE INSTALLATION

A. General valve installation requirements are specified in Division 22 Section "Valves."

B. Backwater Valves: Install backwater valves in piping subject to sewage backflow.

1. Horizontal Piping: Horizontal backwater valves. Use normally closed type, unless otherwise indicated.
2. Floor Drains: Drain outlet backwater valves, unless drain has integral backwater valve.
3. Install backwater valves in accessible locations.
4. Backwater valve are specified in Division 22 Section "Domestic Water Piping Specialties."

3.5 HANGER AND SUPPORT INSTALLATION

A. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.

2. Install individual, straight, horizontal piping runs according to the following:

    a. MSS Type 1, adjustable, steel clevis hangers.

B. Install supports according to Division 22 Section "Hangers and Supports."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

E. Install supports for vertical copper tubing every 10 feet.

F. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

G. Install hangars for PVC piping following manufacturer's guidelines and recommendations.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

3.7 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.

3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.8 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 22 13 16

SECTION 22 14 13

DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following drainage piping specialties:

1. Cleanouts.
2. Floor drains.
3. Roof drains.
4. Air-admittance valves.
5. Roof flashing assemblies.
6. Through-penetration firestop assemblies.
7. Miscellaneous drainage piping specialties.
8. Flashing materials.

1.3 SUBMITTALS

A. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Exposed Metal Cleanouts:

1. 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:

a. Josam Company; Josam Div.
b. MIFAB, Inc.
c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
d. Tyler Pipe; Wade Div.
e. Watts Drainage Products Inc.
f. Zurn Plumbing Products Group; Specification Drainage Operation.
g. Josam Company; Blucher-Josam Div.

2. Standard: ASME A112.36.2M for cast iron, ASME A112.3.1 for stainless steel for cleanout test tee.
3. Size: Same as connected drainage piping
4. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch, Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head, brass or cast-iron plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Closure: Stainless-steel plug with seal.

B. Metal Floor Cleanouts:

1. 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:

a. Josam Company; Josam Div.
b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
c. Tyler Pipe; Wade Div.
d. Watts Drainage Products Inc.
e. Zurn Plumbing Products Group; Light Commercial Operation.
f. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M for heavy-duty, adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Heavy-duty, adjustable housing.
5. Body or Ferrule: Cast iron.
6. Outlet Connection: Inside calk, Spigot, or Threaded.
7. Closure: Brass plug with straight threads and gasket, or Brass plug with tapered threads.
8. Adjustable Housing Material: Cast iron with threads, set-screws or other device.
9. Frame and Cover Material and Finish: Nickel-bronze, copper alloy; Polished bronze; Rough bronze.
10. Frame and Cover Shape: Round or Square.
11. Top Loading Classification: Heavy Duty.
12. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts :

1. 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:

a. Josam Company; Josam Div.
b. MIFAB, Inc.
c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.

d. Tyler Pipe; Wade Div.
e. Watts Drainage Products Inc.
f. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hub-and-spigot, cast-iron soil pipe T-branch, Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head, brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, stainless-steel cover plate with screw. Provide security screw where wall access is exposed.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:

1. 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:

a. Commercial Enameling Co.
b. Josam Company; Josam Div.
c. MIFAB, Inc.
d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
e. Tyler Pipe; Wade Div.
f. Watts Drainage Products Inc.
g. Zurn Plumbing Products Group; Light Commercial Operation.
h. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.6.3[with backwater valve].
3. Body Material: Gray iron.
4. Seepage Flange: As required.
5. Anchor Flange: As required.
6. Clamping Device: As required.
7. Outlet: Bottom or Side.
8. Coating on Interior and Exposed Exterior Surfaces: Acid-resistant enamel.
9. Top or Strainer Material: Bronze, Gray iron, Nickel bronze, or Stainless steel.
10. Top of Body and Strainer Finish: Nickel bronze, Polished bronze, Rough bronze, or Stainless steel.
11. Top Shape: Round or Square.
12. Inlet Fitting: Gray iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
13. Trap Material: Cast iron.
14. Trap Pattern: Deep-seal P-trap, or Standard P-trap.
15. Trap Features: Trap-seal primer valve drain connection.

2.3 MISCELLANEOUS DRAINAGE PIPING SPECIALTIES

A. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

B. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

C. Expansion Joints:

1. Standard: ASME A112.21.2M.
2. Body: Cast iron with bronze sleeve, packing, and gland.
3. End Connections: Matching connected piping.
4. Size: Same as connected soil, waste, or vent piping.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 23 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

    a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
    b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
    c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

F. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

G. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

H. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

I. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

J. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

K. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

L. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

M. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.3 LABELING AND IDENTIFYING

A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 22 Section "Mechanical Identification."

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 22 14 13

SECTION 22 34 00

FUEL-FIRED WATER HEATERS

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 fuel-fired water heaters:

1. Instantaneous, tankless, gas water heaters.
2. Compression tanks.
3. Water heater accessories.

1.3 SUBMITTALS

A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Product Certificates: For each type of instantaneous water heater, signed by product manufacturer.

D. Source quality-control test reports.

E. Field quality-control test reports.

F. Operation and Maintenance Data: For water heaters to include in emergency, operation, and maintenance manuals.

G. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain same type of water heaters through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of water heaters and are based on the specific system indicated.

C. 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.

D. ASME Compliance:

1. Where ASME-code construction is indicated, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
2. Where ASME-code construction is indicated, fabricate and label commercial, finned-tube water heaters to comply with ASME Boiler and Pressure Vessel Code: Section IV.

E. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9" for all components that will be in contact with potable water.

1.5 COORDINATION

A. Coordinate size and location of concrete bases with Architectural and Structural Drawings.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel-fired water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including storage tank and supports.
b. Faulty operation of controls.
c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Period(s): From date of Substantial Completion:

a. Instantaneous, Gas Water Heaters:

1) Heat Exchanger: Five years.
2) Controls and Other Components: Three years.

b. Compression Tanks: One year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 INSTANTANEOUS, GAS WATER HEATERS

A. Description: Comply with ANSI Z21.10.3/CSA 4.3, except storage is not required.

1. Available Manufacturers:

a. Controlled Energy Corporation.
b. NORITZ America Corporation.
c. Paloma Industries, Inc.
d. Takagi Industrial Co. USA, Inc.
e. Smith, A. O. Water Products Company.
f. Rinnai.

2. Construction: Copper piping or tubing complying with NSF 61 barrier materials for potable water, without storage capacity.

a. Tappings: ASME B1.20.1 pipe thread.
b. Pressure Rating: 150 psig (1035 kPa).
c. Heat Exchanger: Copper tubing.
d. Insulation: Comply with ASHRAE/IESNA 90.1 or ASHRAE 90.2.
e. Burner: For use with tankless water heaters and for natural-gas fuel.
f. Automatic Ignition: Manufacturer's proprietary system for automatic, gas ignition.
g. Temperature Control: Adjustable thermostat.
h. Jacket: Metal with enameled finish or plastic.

3. Support: Bracket for wall mounting.

2.3 COMPRESSION TANKS

A. Description: Steel, pressure-rated tank constructed with welded joints and factory-installed, butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.

1. Available Manufacturers:

a. AMTROL Inc.
b. Armstrong Pumps, Inc.
c. Flexcon Industries.

d. Honeywell Sparco.
e. Myers, F. E.; Pentair Pump Group (The).
f. Smith, A. O.; Aqua-Air Div.
g. State Industries, Inc.
h. Taco, Inc.
i. Watts Regulator Co.
j. Wessels Co.

2. Construction:

a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
c. Air-Charging Valve: Factory installed.

3. Capacity and Characteristics:

a. Working-Pressure Rating: 150 psig (1035 kPa).
b. Capacity Acceptable: To be determined by the water heater manufacturer.

2.4 WATER HEATER ACCESSORIES

A. Gas Shutoff Valves: ANSI Z21.15/CGA 9.1, manually operated. Furnish for installation in piping.

B. Gas Pressure Regulators: ANSI Z21.18, appliance type. Include pressure rating, capacity, and pressure differential required between gas supply and water heater.

C. Gas Automatic Valves: ANSI Z21.21, appliance, electrically operated, on-off automatic valve.

D. Combination Temperature and Pressure Relief Valves: Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select each relief valve with sensing element that extends into storage tank.

1. Gas Water Heaters: ANSI Z21.22/CSA 4.4.

E. Pressure Relief Valves: Include pressure setting less than working-pressure rating of water heater.

1. Gas Water Heaters: ANSI Z21.22/CSA 4.4.

F. Water Heater Mounting Brackets: Water heater manufacturer's factory-fabricated steel bracket for wall mounting and capable of supporting water heater and water.

G. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1 or ASHRAE 90.2.

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

A. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

B. Install gas water heaters according to NFPA 54.

C. Install gas shutoff valves on gas supplies to gas water heaters without shutoff valves.

D. Install gas pressure regulators on gas supplies to gas water heaters without gas pressure regulators if gas pressure regulators are required to reduce gas pressure at burner.

E. Install automatic gas valves on gas supplies to gas water heaters, if required for operation of safety control.

F. Install combination temperature and pressure relief valves in water piping for water heaters without storage.

G. Extend relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch.

H. Install thermometer on outlet piping of water heaters.

I. Install pressure gage(s) on inlet and outlet piping of commercial, fuel-fired water heater piping. Assemble and install inlet and outlet piping manifold kits for multiple water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each water heater. Include shutoff valve and thermometer in each water heater inlet and outlet, and throttling valve in each water heater outlet.

J. Fill water heaters with water.

K. Charge compression tanks with air.

3.2 CONNECTIONS

A. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.

B. Ground equipment according to Division 26 Section "Grounding and Bonding."

C. Connect wiring according to Division 26 Section "Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain instantaneous water heaters.

END OF SECTION 22 34 00

SECTION 22 40 00

PLUMBING FIXTURES

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 conventional plumbing fixtures and related components:

1. Faucets for lavatories and sinks.
2. Flushometers.
3. Toilet seats.
4. Protective shielding guards.
5. Fixture supports.
6. Water closets.
7. Lavatories.
8. Service sinks.

1.3 DEFINITIONS

A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

B. Cast Polymer: Cast-filled-polymer-plastic material. This material includes cultured-marble and solid-surface materials.

C. Cultured Marble: Cast-filled-polymer-plastic material with surface coating.

D. Fitting: Device that controls the flow of water into or out of the plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

1.4 SUBMITTALS

A. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.

B. Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation, and maintenance manuals.

C. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.

1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

C. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

D. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

E. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

F. Comply with the following applicable standards and other requirements specified for plumbing fixtures:

1. Vitreous-China Fixtures: ASME A112.19.2M.
2. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.

G. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:

1. Faucets: ASME A112.18.1.
2. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
3. NSF Potable-Water Materials: NSF 61.
4. Pipe Threads: ASME B1.20.1.
5. Supply Fittings: ASME A112.18.1.
6. Brass Waste Fittings: ASME A112.18.2.

H. Comply with the following applicable standards and other requirements specified for shower faucets:

1. Faucets: ASME A112.18.1.
2. Hose-Coupling Threads: ASME B1.20.7.
3. Pipe Threads: ASME B1.20.1.

I. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:

1. Atmospheric Vacuum Breakers: ASSE 1001.
2. Brass and Copper Supplies: ASME A112.18.1.

3. Brass Waste Fittings: ASME A112.18.2.

J. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Flexible Water Connectors: ASME A112.18.6.
2. Floor Drains: ASME A112.6.3.
3. Grab Bars: ASTM F 446.
4. Hose-Coupling Threads: ASME B1.20.7.
5. Off-Floor Fixture Supports: ASME A112.6.1M.
6. Pipe Threads: ASME B1.20.1.
7. Plastic Toilet Seats: ANSI Z124.5.
8. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.6 WARRANTY

A. Special Warranties: Manufacturer's standard form in which manufacturer agrees to repair or replace components of whirlpools that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures of unit shell.
b. Faulty operation of controls, blowers, pumps, heaters, and timers.
c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Period for Commercial Applications: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LAVATORY FAUCETS

A. Lavatory Faucets:

1. 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:

a. American Standard Companies, Inc.
b. Bradley Corporation.
c. Chicago Faucets.
d. Delta Faucet Company.
e. Eljer.
f. Elkay Manufacturing Co.
g. Kohler Co.
h. Moen, Inc.
i. Royal Brass Mfg. Co.
j. Speakman Company.
k. T & S Brass and Bronze Works, Inc.

l. Zurn Plumbing Products Group; Commercial Brass Operation.

2.2 SINK FAUCETS

A. Sink Faucets:

1. 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:

a. American Standard Companies, Inc.
b. Bradley Corporation.
c. Chicago Faucets.
d. Delta Faucet Company.
e. Eljer.
f. Elkay Manufacturing Co.
g. Kohler Co.
h. Moen, Inc.
i. Royal Brass Mfg. Co.
j. Speakman Company.
k. T & S Brass and Bronze Works, Inc.
l. Zurn Plumbing Products Group; Commercial Brass Operation.

2.3 FLUSHOMETERS

A. Flushometers,:

1. 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:

a. Delta Faucet Company.
b. Sloan Valve Company.
c. Zurn Plumbing Products Group; Commercial Brass Operation.

2.4 TOILET SEATS

A. Toilet Seats:

1. 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:

a. American Standard Companies, Inc.
b. Bemis Manufacturing Company.
c. Centoco Manufacturing Corp.
d. Eljer.
e. Kohler Co.
f. Olsonite Corp.

2.5 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. 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:

   a. Engineered Brass Co.
   b. Insul-Tect Products Co.; a Subsidiary of MVG Molded Products.
   c. McGuire Manufacturing Co., Inc.
   d. Plumberex Specialty Products Inc.
   e. TCI Products.
   f. TRUEBRO, Inc.
   g. Zurn Plumbing Products Group; Tubular Brass Plumbing Products Operation.

2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures:

1. 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:

   a. TRUEBRO, Inc.

2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

2.6 FIXTURE SUPPORTS

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. Josam Company.
2. MIFAB Manufacturing Inc.
3. Smith, Jay R. Mfg. Co.
4. Tyler Pipe; Wade Div.
5. Watts Drainage Products Inc.; a div. of Watts Industries, Inc.
6. Zurn Plumbing Products Group; Specification Drainage Operation.

C. Water-Closet Supports:

1. Description: Combination carrier designed for accessible mounting height of wall-mounting, water-closet-type fixture. Include single or double, vertical or horizontal, hub-and-spigot or hubless waste fitting as required for piping arrangement; faceplates; couplings with gaskets; feet; and fixture bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.

D. Lavatory Supports:

1. Description: Type I, lavatory carrier with exposed arms and tie rods. Type II, lavatory carrier with concealed arms and tie rod. Type III, lavatory carrier with hanger plate and tie rod for wall-mounting, lavatory-type fixture. Include steel uprights with feet.
2. Accessible-Fixture Support: Include rectangular steel uprights.

2.7 WATER CLOSETS

A. Water Closets:

1. 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:

    a. Crane Plumbing, L.L.C./Fiat Products.
    b. American Standard Companies, Inc.
    c. Eljer.
    d. Kohler Co.

2.8 LAVATORIES

A. Lavatories:

1. 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:

    a. American Standard Companies, Inc.
    b. Eljer.
    c. Kohler Co.
    d. Crane Plumbing, L.L.C./Fiat Products.

2.9 SERVICE SINKS

A. Service Sinks:

1. 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:

    a. Acorn Engineering Company.
    b. Crane Plumbing, L.L.C./Fiat Products.
    c. Florestone Products Co., Inc.
    d. Precast Terrazzo Enterprises, Inc.
    e. Stern-Williams Co., Inc.
    f. Mustee, E. L. & Sons, Inc.
    g. Swan Corporation (The).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.

B. Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.

1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.

D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

E. Install wall-mounting fixtures with tubular waste piping attached to supports.

F. Install floor-mounting, back-outlet water closets attached to building floor substrate and wall bracket and onto waste fitting seals.

G. Install counter-mounting fixtures in and attached to casework.

H. Install fixtures level and plumb according to roughing-in drawings.

I. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Exception: Use ball, gate, or globe valves if supply stops are not specified with fixture. Valves are specified in Division 22 Section "Valves."

J. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

K. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

L. Install flushometer valves for accessible water closets with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

M. Install toilet seats on water closets.

N. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

O. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.

P. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

Q. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

R. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 23 Section "Basic Mechanical Materials and Methods."

S. Set service sinks in leveling bed of cement grout. Grout is specified in Division 23 Section "Basic Mechanical Materials and Methods."

T. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

C. Ground equipment according to Division 26 Section "Grounding and Bonding."

D. Connect wiring according to Division 26 Section "Conductors."

3.4 FIELD QUALITY CONTROL

A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.

B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.5 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.

C. Replace washers and seals of leaking and dripping faucets and stops.

3.6 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 22 40 00

SECTION 23 05 00

BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Mechanical sleeve seals.
5. Sleeves.
6. Escutcheons.
7. Mechanical demolition.
8. Equipment installation requirements common to equipment sections.
9. Painting and finishing.
10. Supports and anchorages.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, and unexcavated spaces.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. CPVC: Chlorinated polyvinyl chloride plastic.
2. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Escutcheons.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current

C. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. All equipment and material stored outside must be kept elevated to prevent damage.

B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

C. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 22 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 TRANSITION FITTINGS

A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

1. Manufacturers:

    a. Cascade Waterworks Mfg. Co.
    b. Dresser Industries, Inc.; DMD Div.
    c. Ford Meter Box Company, Incorporated (The); Pipe Products Div.
    d. JCM Industries.
    e. Smith-Blair, Inc.
    f. Viking Johnson.

2. Underground Piping NPS 2 and Larger: AWWA C219, metal sleeve-type coupling.
3. Aboveground Pressure Piping: Pipe fitting.

B. Plastic-to-Metal Transition Fittings PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

1. Manufacturers:

    a. Eslon Thermoplastics.

C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

1. Manufacturers:

    a. Thompson Plastics, Inc.

D. Plastic-to-Metal Transition Unions: MSS SP-107, PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.

1. Manufacturers:

    a. NIBCO INC.
    b. NIBCO, Inc.; Chemtrol Div.

2.5 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F .

1. Manufacturers:

a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Eclipse, Inc.
d. Epco Sales, Inc.
e. Hart Industries, International, Inc.
f. Watts Industries, Inc.; Water Products Div.
g. Zurn Industries, Inc.; Wilkins Div.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

1. Manufacturers:

a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Epco Sales, Inc.
d. Watts Industries, Inc.; Water Products Div.

E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

1. Manufacturers:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company.
d. Pipeline Seal and Insulator, Inc.

2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F .

1. Manufacturers:

a. Calpico, Inc.
b. Lochinvar Corp.

G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F .

1. Manufacturers:

a. Perfection Corp.
b. Precision Plumbing Products, Inc.
c. Sioux Chief Manufacturing Co., Inc.
d. Victaulic Co. of America.

2.6 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM, NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Plastic, Carbon steel, Stainless steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating, Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.7 SLEEVES

A. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.8 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated, Polished chrome-plated and rough brass.

C. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: Polished chrome-plated, Polished chrome-plated and rough brass.

D. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.

E. Split-Plate, Stamped-Steel Type: With concealed hinge, set screw or spring clips, and chrome-plated finish.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:

    a. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
    b. Insulated Piping: One-piece, stamped-steel type with spring clips.
    c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
    d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
    e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece or Split-casting, cast-brass type with polished chrome-plated finish.
    f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge and set screw.

M. Sleeves are not required for core-drilled holes. Coordinate core drilling location with all other trades including the structure.

N. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

O. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
2. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

P. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

Q. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Verify final equipment locations for roughing-in.

R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install mechanical equipment to facilitate service, maintenance, repair or replacement of components and meet the NEC access clearances. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.5 PAINTING

A. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

B. Field Welding: Comply with AWS D1.1.

END OF SECTION 23 05 00

SECTION 23 05 13

MOTORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes basic requirements for factory-installed motors.

1.3 DEFINITIONS

A. Factory-Installed Motor: A motor installed by motorized-equipment manufacturer as a component of equipment.

1.4 QUALITY ASSURANCE

A. 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.

B. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices and features that comply with the following:

1. Compatible with the following:
    a. Magnetic controllers.
    b. Multispeed controllers.
    c. Reduced-voltage controllers.
2. Designed and labeled for use with variable frequency controllers, and suitable for use throughout speed range without overheating.
3. Matched to torque and horsepower requirements of the load.
4. Matched to ratings and characteristics of supply circuit and required control sequence.

PART 2 - PRODUCTS

2.1 MOTOR REQUIREMENTS

A. Motor requirements apply to factory-installed motors except as follows:

1. Different ratings, performance, or characteristics for motor are specified in another Section.
2. Motorized-equipment manufacturer requires ratings, performance, or characteristics, other than those specified in this Section, to meet performance specified.

2.2 MOTOR CHARACTERISTICS

A. Frequency Rating: 60 Hz.

B. Voltage Rating: NEMA standard voltage selected to operate on nominal circuit voltage to which motor is connected.

C. Service Factor: 1.15 for open dripproof motors; 1.0 for totally enclosed motors.

D. Duty: Continuous duty at ambient temperature of 105 deg F and at altitude of 3300 feet above sea level.

E. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

F. Enclosure: Open dripproof.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Premium, as defined in NEMA MG 1.

C. Stator: Copper windings, unless otherwise indicated.

1. Multispeed motors shall have separate winding for each speed.

D. Rotor: Squirrel cage, unless otherwise indicated.

E. Bearings: Double-shielded, prelubricated ball bearings suitable for radial and thrust loading.

F. Temperature Rise: Match insulation rating, unless otherwise indicated.

G. Insulation: Class F, unless otherwise indicated.

H. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller Than 15 HP: Manufacturer's standard starting characteristic.

I. Enclosure: Cast iron for motors 7.5 hp and larger; rolled steel for motors smaller than 7.5 hp.

1. Finish: Gray enamel.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Inrush Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Designed with critical vibration frequencies outside operating range of controller output.
2. Temperature Rise: Matched to rating for Class B insulation.
3. Insulation: Class H.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

C. Rugged-Duty Motors: Totally enclosed, with 1.25 minimum Service Factor, greased bearings, integral condensate drains, and capped relief vents. Windings insulated with non-hygroscopic material.

Finish: Chemical-resistant paint over corrosion-resistant primer.

2.5 SINGLE-PHASE MOTORS

A. Type: One of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split-phase start, capacitor run.
3. Capacitor start, capacitor run.

B. Shaded-Pole Motors: For motors 1/20 hp and smaller only.

C. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

D. Bearings: Ball type for belt-connected motors and other motors with high radial forces on motor shaft; sealed, pre-lubricated-sleeve type for other single-phase motors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive field-installed motors for compliance with requirements, installation tolerances, and other conditions affecting performance.

B. Examine roughing-in for conduit systems to verify actual locations of conduit connections before motor installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FIELD-INSTALLED MOTOR INSTALLATION

A. Anchor each motor assembly to base, adjustable rails, or other support, arranged and sized according to manufacturer's written instructions. Attach by bolting. Level and align with load transfer link.

B. Install motors on concrete bases.

C. Comply with mounting and anchoring requirements specified in other sections of these specifications.

3.3 FIELD QUALITY CONTROL FOR FIELD-INSTALLED MOTORS

A. Prepare for acceptance tests.

1. Align motors, bases, shafts, pulleys, and belts. Tension belts according to manufacturer's written instructions.
2. Verify bearing lubrication.
3. Run each motor with its controller. Demonstrate correct rotation, alignment, and speed at motor design load.
4. Test interlocks and control and safety features for proper operation.
5. Verify that current and voltage for each phase comply with nameplate rating and NEMA MG 1 tolerances.

B. Perform the following field tests and inspections and prepare test reports:

1. Perform electrical tests and visual and mechanical inspections except optional tests and inspections stated in NETA ATS on factory- and field-installed motors. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.4 FIELD-INSTALLED MOTOR DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain field-installed motors.

END OF SECTION 23 05 13

SECTION 23 05 48

VIBRATION CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Isolation pads.
2. Restrained elastomeric isolation mounts.
3. Freestanding and restrained spring isolators.
4. Housed spring mounts.
5. Elastomeric hangers.
6. Spring hangers.
7. Spring hangers with vertical-limit stops.
8. Restraining braces and cables.
9. Steel vibration isolation equipment bases.

1.3 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

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:

1. Ace Mountings Co., Inc.
2. Amber/Booth Company, Inc.
3. California Dynamics Corporation.

4. Isolation Technology, Inc.
5. Kinetics Noise Control.
6. Mason Industries.
7. Vibration Eliminator Co., Inc.
8. Vibration Isolation.
9. Vibration Mountings & Controls, Inc.

B. Pads: Arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.

1. Resilient Material: Oil- and water-resistant neoprene.

C. Spring Isolators: Freestanding, laterally stable, open-spring isolators.

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch- (6-mm-) thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig (3447 kPa).
6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

D. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with limit-stop restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled baseplate bonded to 1/4-inch- (6-mm-) thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
2. Restraint: Limit stop as required for equipment.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

E. Elastomeric Hangers: Single or double-deflection type, fitted with molded, oil-resistant elastomeric isolator elements bonded to steel housings with threaded connections for hanger rods. Color-code or otherwise identify to indicate capacity range.

F. Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.

2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the 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.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
7. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

G. Spring Hangers with Vertical-Limit Stop: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression and with a vertical-limit stop.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the 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.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
8. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

2.2 VIBRATION ISOLATION EQUIPMENT BASES

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:

1. Amber/Booth Company, Inc.
2. California Dynamics Corporation.
3. Isolation Technology, Inc.
4. Kinetics Noise Control.
5. Mason Industries.
6. Vibration Eliminator Co., Inc.
7. Vibration Isolation.
8. Vibration Mountings & Controls, Inc.

B. Steel Base: Factory-fabricated, welded, structural-steel bases and rails.

1. Design Requirements: Lowest possible mounting height with not less than 1-inch (25-mm) clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails.

    a. Include supports for suction and discharge elbows for pumps.

2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Bases shall have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.

2.3 FACTORY FINISHES

A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

1. Powder coating on springs and housings.
2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
3. Baked enamel or powder coat for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application.

3.3 VIBRATION-CONTROL DEVICE INSTALLATION

A. Equipment Restraints:

1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.2 mm).

B. Attachment to Structure: Anchor bracing to structure at concrete members.

C. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.

4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust restraints to permit free movement of equipment within normal mode of operation.

(END OF SECTION 230548)

SECTION 23 05 53

MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following mechanical identification materials and their installation:

1. Equipment nameplates.
2. Equipment markers.
3. Equipment signs.
4. Access panel and door markers.
5. Pipe markers.
6. Valve tags.
7. Valve schedules.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Valve numbering scheme.

C. Valve Schedules: For each piping system. Furnish extra copies (in addition to mounted copies) to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

1.5 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with location of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT IDENTIFICATION DEVICES

A. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.

1. Data:

    a. Manufacturer, product name, model number, and serial number.
    b. Capacity, operating and power characteristics, and essential data.
    c. Labels of tested compliances.

2. Location: Accessible and visible.
3. Fasteners: As required to mount on equipment.

B. Equipment Markers: Engraved, color-coded laminated plastic. Include contact-type, permanent adhesive.

1. Terminology: Match schedules as closely as possible.
2. Data:

    a. Name and plan number.
    b. Equipment service.
    c. Design capacity.
    d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.

3. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.

C. Equipment Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.

1. Data: Instructions for operation of equipment and for safety procedures.
2. Engraving: Manufacturer's standard letter style, of sizes and with terms to match equipment identification.
3. Thickness: 1/16 inch for units up to 20 sq. in. or 8 inches in length, and 1/8 inch for larger units.
4. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

D. Access Panel and Door Markers: 1/16-inch- thick, engraved laminated plastic, with abbreviated terms and numbers corresponding to identification. Provide 1/8-inch center hole for attachment.

1. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

2.2 PIPING IDENTIFICATION DEVICES

A. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.

1. Colors: Comply with ASME A13.1, unless otherwise indicated.
2. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.
3. Pipes with OD, Including Insulation, Less Than 6 Inches : Full-band pipe markers extending 360 degrees around pipe at each location.
4. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.
5. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.

B. Pretensioned Pipe Markers: Precoiled semirigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.

C. Shaped Pipe Markers: Preformed semirigid plastic formed to partially cover circumference of pipe and to attach to pipe with mechanical fasteners that do not penetrate insulation vapor barrier.

D. Self-Adhesive Pipe Markers: Plastic with pressure-sensitive, permanent-type, self-adhesive back.

E. Plastic Tape: Continuously printed, vinyl tape at least 3 mils thick with pressure-sensitive, permanent-type, self-adhesive back.

1. Width for Markers on Pipes with OD, Including Insulation, Less Than 6 Inches : 3/4 inch minimum.
2. Width for Markers on Pipes with OD, Including Insulation, 6 Inches or Larger: 1-1/2 inches minimum.

2.3 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers, with numbering scheme approved by Architect. Provide 5/32-inch hole for fastener.

1. Material: 0.032-inch- thick [brass].
2. Valve-Tag Fasteners: Brass wire-link or beaded chain; or S-hook.

2.4 VALVE SCHEDULES

A. Valve Schedules: For each piping system, on standard-size bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-Schedule Frames: Glazed display frame for removable mounting on masonry walls for each page of valve schedule. Include mounting screws.
2. Frame: Extruded aluminum.

3. Glazing: ASTM C 1036, Type I, Class 1, Glazing Quality B, 2.5-mm, single-thickness glass.

PART 3 - EXECUTION

3.1 APPLICATIONS, GENERAL

A. Products specified are for applications referenced in other Division 23 Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

3.2 EQUIPMENT IDENTIFICATION

A. Install and permanently fasten equipment nameplates on each major item of mechanical equipment that does not have nameplate or has nameplate that is damaged or located where not easily visible. Locate nameplates where accessible and visible. Include nameplates for the following general categories of equipment:

1. Compressors, condensers, and similar motor-driven units.
2. Fans, blowers, balancing and control dampers, and mixing boxes.
3. Packaged HVAC equipment.

B. Install equipment markers with permanent adhesive on or near each major item of mechanical equipment. Data required for markers may be included on signs, and markers may be omitted if both are indicated.

1. Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
2. Locate markers where accessible and visible. Include markers for the following general categories of equipment:

    a. Main control.
    b. Fire department hose valves.
    c. Meters, gages, thermometers, and similar units.
    d. Compressors, condensers, and similar motor-driven units.
    e. Heat exchangers, coils, evaporators, heat recovery units, and similar equipment.
    f. Fans, blowers, balancing and control dampers, and mixing boxes.
    g. Packaged HVAC equipment.
    h. Tanks and pressure vessels.
    i. Strainers, filters, and similar equipment.

C. Install equipment signs with screws or permanent adhesive on or near each major item of mechanical equipment. Locate signs where accessible and visible.

1. Identify mechanical equipment with equipment markers in the following color codes:

    a. Green: For cooling equipment and components.
    b. Yellow: For heating equipment and components.

c. Green and Yellow or Orange: For combination cooling and heating equipment and components.
d. Brown: For energy-reclamation equipment and components.

2. Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
3. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
4. Include signs for the following general categories of equipment:

a. Main control.
b. Compressors, chillers, condensers, and similar motor-driven units.
c. Heat exchangers, coils, evaporators, heat recovery units, and similar equipment.
d. Fans, blowers, balancing and control dampers, and mixing boxes.
e. Packaged HVAC equipment.
f. Tanks and pressure vessels.
g. Strainers, filters, and similar equipment.

D. Install access panel markers with screws on equipment access panels.

3.3 PIPING IDENTIFICATION

A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.

1. Pipes with OD, Including Insulation, Less Than 6 Inches: Pretensioned pipe markers. Use size to ensure a tight fit.
2. Pipes with OD, Including Insulation, Less Than 6 Inches : Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, at least 3/4 inch wide, lapped at least 1-1/2 inches at both ends of pipe marker, and covering full circumference of pipe.
3. Pipes with OD, Including Insulation, 6 Inches and Larger: Shaped pipe markers. Use size to match pipe and secure with fasteners.
4. Pipes with OD, Including Insulation, 6 Inches and Larger: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, at least 1-1/2 inches wide, lapped at least 3 inches at both ends of pipe marker, and covering full circumference of pipe.

B. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior nonconcealed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and nonaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.

7. On piping above removable acoustical ceilings. Omit intermediately spaced markers.

3.4 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; plumbing fixture supply stops; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following:

1. Valve-Tag Size and Shape:

   a. Cold Water: 1-1/2 inches or 2 inches, round.
   b. Hot Water: 1-1/2 inches or 2 inches, round.
   c. Fire Protection: 1-1/2 inches or 2 inches, round.

2. Valve-Tag Color:

   a. Cold Water: Natural.
   b. Hot Water: Natural.
   c. Fire Protection: Red.

3. Letter Color:

   a. Cold Water: Black or White.
   b. Hot Water: Black or White.
   c. Fire Protection: Black or White.

3.5 VALVE-SCHEDULE INSTALLATION

A. Mount valve schedule on wall in accessible location in each major equipment room.

3.6 ADJUSTING

A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

3.7 CLEANING

A. Clean faces of mechanical identification devices and glass frames of valve schedules.

(END OF SECTION 230553)

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes TAB to produce design objectives for the following:

1. Air Systems:

a. Variable-air-volume systems.

b. Constant-air volume systems.
2. HVAC equipment quantitative-performance settings.
3. Verifying that automatic control devices are functioning properly.
4. Reporting results of activities and procedures specified in this Section.

1.3 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to indicated quantities.

C. Barrier or Boundary: Construction, either vertical or horizontal, such as walls, floors, and ceilings that are designed and constructed to restrict the movement of airflow, smoke, odors, and other pollutants.

D. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

E. NC: Noise criteria.

F. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

G. RC: Room criteria.

H. Report Forms: Test data sheets for recording test data in logical order.

I. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

J. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

K. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

L. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

M. TAB: Testing, adjusting, and balancing.

N. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

O. Test: A procedure to determine quantitative performance of systems or equipment.

P. Testing, Adjusting, and Balancing (TAB) Firm: The entity responsible for performing and reporting TAB procedures.

1.4 SUBMITTALS

A. Qualification Data: Within 30 days from Contractor's Notice to Proceed, submit 6 copies of evidence that TAB firm and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Contract Documents Examination Report: Within 30 days from Contractor's Notice to Proceed, submit 6 copies of the Contract Documents review report as specified in Part 3.

C. Strategies and Procedures Plan: Within 30 days from Contractor's Notice to Proceed, submit 6 copies of TAB strategies and step-by-step procedures as specified in Part 3 "Preparation" Article. Include a complete set of report forms intended for use on this Project.

D. Certified TAB Reports: Submit two copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.

E. Sample Report Forms: Submit two sets of sample TAB report forms.

F. Warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. TAB Firm Qualifications: Engage a TAB firm certified by either AABC or NEBB.

B. TAB Conference: Meet with Owner's and Architect's representatives on approval of TAB strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of TAB team members, equipment manufacturers' authorized service representatives, HVAC controls installers, and other support personnel. Provide seven days' advance notice of scheduled meeting time and location.

1. Agenda Items: Include at least the following:

    a. Submittal distribution requirements.
    b. The Contract Documents examination report.
    c. TAB plan.
    d. Work schedule and Project-site access requirements.
    e. Coordination and cooperation of trades and subcontractors.
    f. Coordination of documentation and communication flow.

C. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.

D. TAB Report Forms: Use standard forms from AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems." NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

E. Instrumentation Type, Quantity, and Accuracy: As described in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."

F. Instrumentation Calibration: Calibrate instruments at least every six months or more frequently if required by instrument manufacturer.

1. Keep an updated record of instrument calibration that indicates date of calibration and the name of party performing instrument calibration.

1.6 PROJECT CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.7 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.

B. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.

C. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.8 WARRANTY

A. National Project Performance Guarantee: Provide a guarantee on AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" forms stating that AABC will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee includes the following provisions:

B. Special Guarantee: Provide a guarantee on NEBB forms stating that NEBB will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee shall include the following provisions:

1. The certified TAB firm has tested and balanced systems according to the Contract Documents.
2. Systems are balanced to optimum performance capabilities within design and installation limits.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

1. Contract Documents are defined in the General and Supplementary Conditions of Contract.
2. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine Project Record Documents described in Division 1 Section "Project Record Documents."

D. Examine design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data including fan and pump curves. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from those

presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

F. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.

G. Examine system and equipment test reports.

H. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

J. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

K. Examine terminal units, such as variable-air-volume boxes, to verify that they are accessible and their controls are connected and functioning.

L. Examine plenum ceilings used for supply air to verify that they are airtight. Verify that pipe penetrations and other holes are sealed.

M. Examine equipment for installation and for properly operating safety interlocks and controls.

N. Examine automatic temperature system components to verify the following:

1. Dampers and other controlled devices are operated by the intended controller.
2. Dampers are in the position indicated by the controller.
3. Integrity of dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in variable-air-volume terminals.
4. Thermostats are located to avoid adverse effects of sunlight, drafts, and cold walls.
5. Sensors are located to sense only the intended conditions.
6. Sequence of operation for control modes is according to the Contract Documents.
7. Controller set points are set at indicated values.
8. Interlocked systems are operating.
9. Changeover from heating to cooling mode occurs according to indicated values.

O. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete.
2. Automatic temperature-control systems are operational.
3. Equipment and duct access doors are securely closed.
4. Balance, and fire dampers are open.
5. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
6. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems", NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.

B. Cut insulation, ducts, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.

C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

E. Check airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling unit components.

L. Check for proper sealing of air duct system.

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure fan static pressures to determine actual static pressure as follows:

    a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
    b. Measure static pressure directly at the fan outlet or through the flexible connection.
    c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
    d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

2. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

    a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.

3. Measure static pressures entering and leaving other devices such as sound traps, and heat recovery equipment, under final balanced conditions.
4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
5. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full cooling, full heating, and any other operating modes to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.

a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure terminal outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer, model, and serial numbers.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

3.7 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

3.8 PROCEDURES FOR HEAT-TRANSFER COILS

A. Electric-Heating Coils: Measure the following data for each coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperature at full load.
4. Voltage and amperage input of each phase at full load and at each incremental stage.
5. Calculated kilowatt at full load.
6. Fuse or circuit-breaker rating for overload protection.

B. Refrigerant Coils: Measure the following data for each coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.
5. Refrigerant suction pressure and temperature.

3.9 PROCEDURES FOR TEMPERATURE MEASUREMENTS

A. During TAB, report the need for adjustment in temperature regulation within the automatic temperature-control system.

B. Measure indoor wet- and dry-bulb temperatures every other hour for a period of two successive eight-hour days, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied.

C. Measure outside-air, wet- and dry-bulb temperatures.

3.10 TEMPERATURE-CONTROL VERIFICATION

A. Verify that controllers are calibrated and commissioned.

B. Check transmitter and controller locations and note conditions that would adversely affect control functions.

C. Record controller settings and note variances between set points and actual measurements.

D. Check the operation of limiting controllers (i.e., high- and low-temperature controllers).

E. Check free travel and proper operation of control devices such as damper and valve operators.

F. Check the sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water flow measurements. Note the speed of response to input changes.

G. Check the interaction of electrically operated switch transducers.

H. Check the interaction of interlock and lockout systems.

I. Check main control supply-air pressure and observe compressor and dryer operations.

J. Record voltages of power supply and controller output. Determine whether the system operates on a grounded or non-grounded power supply.

K. Note operation of electric actuators using spring return for proper fail-safe operations.

3.11 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 5 to plus 10 percent.
2. Air Outlets and Inlets: 0 to minus 10 percent.

3.12 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.13 FINAL REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.

1. Include a list of instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to certified field report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance, but do not include Shop Drawings and Product Data.

D. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:

1. Title page.
2. Name and address of TAB firm.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB firm who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer, type size, and fittings.
14. Notes to explain why certain final data in the body of reports varies from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outside-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Fan drive settings including settings and percentage of maximum pitch diameter.
    e. Settings for supply-air, static-pressure controller.
    f. Other system operating conditions that affect performance.

E. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outside, supply, return, and exhaust airflows.
2. Duct, outlet, and inlet sizes.
3. Terminal units.
4. Balancing stations.
5. Position of balancing devices.

F. Air-Handling Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data: Include the following:

    a. Unit identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.
    e. Manufacturer's serial number.
    f. Unit arrangement and class.
    g. Discharge arrangement.

h. Sheave make, size in inches (mm), and bore.
i. Sheave dimensions, center-to-center, and amount of adjustments in inches (mm).
j. Number of belts, make, and size.
k. Number of filters, type, and size.

2. Motor Data:

a. Make and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches (mm), and bore.
f. Sheave dimensions, center-to-center, and amount of adjustments in inches (mm).

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm (L/s).
b. Total system static pressure in inches wg (Pa).
c. Fan rpm.
d. Discharge static pressure in inches wg (Pa).
e. Filter static-pressure differential in inches wg (Pa).
f. Preheat coil static-pressure differential in inches wg (Pa).
g. Cooling coil static-pressure differential in inches wg (Pa).
h. Heating coil static-pressure differential in inches wg (Pa).
i. Outside airflow in cfm (L/s).
j. Return airflow in cfm (L/s).
k. Outside-air damper position.
l. Return-air damper position.
m. Vortex damper position.

G. Apparatus-Coil Test Reports:

1. Coil Data:

a. System identification.
b. Location.
c. Coil type.
d. Number of rows.
e. Fin spacing in fins per inch (mm) o.c.
f. Make and model number.
g. Face area in sq. ft. (sq. m).
h. Tube size in NPS (DN).
i. Tube and fin materials.
j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm (L/s).
b. Average face velocity in fpm (m/s).

c. Air pressure drop in inches wg (Pa).
d. Outside-air, wet- and dry-bulb temperatures in deg F (deg C).
e. Return-air, wet- and dry-bulb temperatures in deg F (deg C).
f. Entering-air, wet- and dry-bulb temperatures in deg F (deg C).
g. Leaving-air, wet- and dry-bulb temperatures in deg F (deg C).
h. Refrigerant expansion valve and refrigerant types.
i. Refrigerant suction pressure in psig (kPa).
j. Refrigerant suction temperature in deg F (deg C).

H. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:

1. Unit Data:

a. System identification.
b. Location.
c. Coil identification.
d. Capacity in Btuh (kW).
e. Number of stages.
f. Connected volts, phase, and hertz.
g. Rated amperage.
h. Airflow rate in cfm (L/s).
i. Face area in sq. ft. (sq. m).
j. Minimum face velocity in fpm (m/s).

2. Test Data (Indicated and Actual Values):

a. Heat output in Btuh (kW).
b. Airflow rate in cfm (L/s).
c. Air velocity in fpm (m/s).
d. Entering-air temperature in deg F (deg C).
e. Leaving-air temperature in deg F (deg C).
f. Voltage at each connection.
g. Amperage for each phase.

I. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches (mm), and bore.
h. Sheave dimensions, center-to-center, and amount of adjustments in inches (mm).

2. Motor Data:

    a. Make and frame type and size.
    b. Horsepower and rpm.
    c. Volts, phase, and hertz.
    d. Full-load amperage and service factor.
    e. Sheave make, size in inches (mm), and bore.
    f. Sheave dimensions, center-to-center, and amount of adjustments in inches (mm).
    g. Number of belts, make, and size.

3. Test Data (Indicated and Actual Values):

    a. Total airflow rate in cfm (L/s).
    b. Total system static pressure in inches wg (Pa).
    c. Fan rpm.
    d. Discharge static pressure in inches wg (Pa).
    e. Suction static pressure in inches wg (Pa).

J. Round and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

    a. System and air-handling unit number.
    b. Location and zone.
    c. Traverse air temperature in deg F (deg C).
    d. Duct static pressure in inches wg (Pa).
    e. Duct size in inches (mm).
    f. Duct area in sq. ft. (sq. m).
    g. Indicated airflow rate in cfm (L/s).
    h. Indicated velocity in fpm (m/s).
    i. Actual airflow rate in cfm (L/s).
    j. Actual average velocity in fpm (m/s).
    k. Barometric pressure in psig (Pa).

K. Air-Terminal-Device Reports:

1. Unit Data:

    a. System and air-handling unit identification.
    b. Location and zone.
    c. Test apparatus used.
    d. Area served.
    e. Air-terminal-device make.
    f. Air-terminal-device number from system diagram.
    g. Air-terminal-device type and model number.
    h. Air-terminal-device size.
    i. Air-terminal-device effective area in sq. ft. (sq. m).

2. Test Data (Indicated and Actual Values):

    a. Airflow rate in cfm (L/s).
    b. Air velocity in fpm (m/s).
    c. Preliminary airflow rate as needed in cfm (L/s).
    d. Preliminary velocity as needed in fpm (m/s).
    e. Final airflow rate in cfm (L/s).
    f. Final velocity in fpm (m/s).
    g. Space temperature in deg F (deg C).

L. System-Coil Reports: For reheat coils of terminal units, include the following:

1. Unit Data:

    a. System and air-handling unit identification.
    b. Location and zone.
    c. Room or riser served.
    d. Coil make and size.
    e. Flowmeter type.

2. Test Data (Indicated and Actual Values):

    a. Airflow rate in cfm (L/s).
    b. Entering-air temperature in deg F (deg C).
    c. Leaving-air temperature in deg F (deg C).

M. Compressor and Condenser Reports: For refrigerant side of unitary systems, stand-alone refrigerant compressors, air-cooled condensing units, or water-cooled condensing units, include the following:

1. Unit Data:

    a. Unit identification.
    b. Location.
    c. Unit make and model number.
    d. Compressor make.
    e. Compressor model and serial numbers.
    f. Refrigerant weight in lb (kg).
    g. Low ambient temperature cutoff in deg F (deg C).

2. Test Data (Indicated and Actual Values):

    a. Inlet-duct static pressure in inches wg (Pa).
    b. Outlet-duct static pressure in inches wg (Pa).
    c. Entering-air, dry-bulb temperature in deg F (deg C).
    d. Leaving-air, dry-bulb temperature in deg F (deg C).
    e. Control settings.
    f. Unloader set points.
    g. Low-pressure-cutout set point in psig (kPa).
    h. High-pressure-cutout set point in psig (kPa).
    i. Suction pressure in psig (kPa).

j. Suction temperature in deg F (deg C).
k. Condenser refrigerant pressure in psig (kPa).
l. Condenser refrigerant temperature in deg F (deg C).
m. Oil pressure in psig (kPa).
n. Oil temperature in deg F (deg C).
o. Voltage at each connection.
p. Amperage for each phase.
q. Kilowatt input.
r. Crankcase heater kilowatt.
s. Number of fans.
t. Condenser fan rpm.
u. Condenser fan airflow rate in cfm (L/s).
v. Condenser fan motor make, frame size, rpm, and horsepower.
w. Condenser fan motor voltage at each connection.
x. Condenser fan motor amperage for each phase.

N. Heat-Exchanger/Converter Test Reports: For steam and hot-water heat exchangers, include the following:

1. Unit Data:

a. Unit identification.
b. Location.
c. Service.
d. Make and type.
e. Model and serial numbers.
f. Ratings.

O. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.14 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the Final Report.
2. Randomly check the following for each system:

a. Measure airflow of at least 10 percent of air outlets.
b. Measure water flow of at least 5 percent of terminals.

c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
d. Measure sound levels at two locations.
e. Measure space pressure of at least 10 percent of locations.
f. Verify that balancing devices are marked with final balance position.
g. Note deviations to the Contract Documents in the Final Report.

B. Final Inspection:

1. After initial inspection is complete and evidence by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by [Owner] [Architect].
2. TAB firm test and balance engineer shall conduct the inspection in the presence of Architect.
3. Architect shall randomly select measurements documented in the final report to be rechecked. The rechecking shall be limited to either 10 percent of the total measurements recorded, or the extent of measurements that can be accomplished in a normal 8-hour business day.
4. If the rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
6. TAB firm shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes and resubmit the final report.
7. Request a second final inspection. If the second final inspection also fails, Owner shall contract the services of another TAB firm to complete the testing and balancing in accordance with the Contract Documents and deduct the cost of the services from the final payment.

3.15 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional testing, inspecting, and adjusting during near-peak summer and winter conditions.

END OF SECTION 23 05 93

SECTION 23 07 00

HVAC INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Insulation Materials:

    a. Flexible elastomeric.
    b. Mineral fiber.

2. Insulating cements
3. Adhesives.
4. Mastics.
5. Lagging adhesives.
6. Sealants.
7. Factory-applied jackets.
8. Field-applied fabric-reinforcing mesh.
9. Field-applied cloths.
10. Field-applied jackets.
11. Tapes.
12. Securements.
13. Corner angles.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, vapor barrier, and jackets (both factory and field applied, if any).

B. Shop Drawings:

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at pipe expansion joints for each type of insulation.
3. Detail insulation application at elbows, fittings, and specialties for each type of insulation.
4. Detail removable insulation at piping specialties, equipment connections, and access panels.
5. Detail application of field-applied jackets.
6. Detail application at linkages of control devices.
7. Detail field application for each equipment type.

C. Qualification Data: For qualified Installer.

D. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

E. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports."

B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.8 SUPPLEMENTAL REQUIREMENTS

A. Refer to part 4 of this section for specific requirements on insulation of aboveground chilled water piping.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Aeroflex USA Inc.; Aerocel.
    b. Armacell LLC; AP Armaflex.
    c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK or FSP jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. CertainTeed Corp.; Duct Wrap.
    b. Johns Manville; Microlite.
    c. Knauf Insulation; Duct Wrap.
    d. Manson Insulation Inc.; Alley Wrap.
    e. Owens Corning; All-Service Duct Wrap.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following]:

    a. Insulco, Division of MFS, Inc.; Triple I.
    b. P. K. Insulation Mfg. Co., Inc.; Super-Stik.

B. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Insulco, Division of MFS, Inc.; SmoothKote.
    b. P. K. Insulation Mfg. Co., Inc.; PK No. 127, and Quik-Cote.
    c. Rock Wool Manufacturing Company; Delta One Shot.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Aeroflex USA Inc.; Aeroseal.
    b. Armacell LCC; 520 Adhesive.
    c. Foster Products Corporation, H. B. Fuller Company; 85-75.
    d. RBX Corporation; Rubatex Contact Adhesive.

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.

D. FSK Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-35.
b. Foster Products Corporation, H. B. Fuller Company; 30-90.
c. ITW TACC, Division of Illinois Tool Works; CB-50.
d. Marathon Industries, Inc.; 590.
e. Mon-Eco Industries, Inc.; 55-40.
f. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F .
4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
5. Color: White.

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Childers Products, Division of ITW; CP-52.
    b. Foster Products Corporation, H. B. Fuller Company; 81-42.
    c. Marathon Industries, Inc.; 130.
    d. Mon-Eco Industries, Inc.; 11-30.
    e. Vimasco Corporation; 136.

2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct, equipment, and pipe insulation.
3. Service Temperature Range: Minus 50 to plus 180 deg F .
4. Color: White.

2.6 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Childers Products, Division of ITW; CP-76-8.
    b. Foster Products Corporation, H. B. Fuller Company; 95-44.
    c. Marathon Industries, Inc.; 405.
    d. Mon-Eco Industries, Inc.; 44-05.
    e. Vimasco Corporation; 750.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F .
5. Color: Aluminum.

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
2. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.

2.8 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric for Pipe Insulation: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. inch for covering pipe and pipe fittings.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Vimasco Corporation; Elastafab 894.

B. Woven Glass-Fiber Fabric for Duct and Equipment Insulation: Approximately 6 oz./sq. yd. with a thread count of 5 strands by 5 strands/sq. inch for covering equipment.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; Chil-Glas No. 5.

C. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. inch , in a Leno weave, for duct, equipment, and pipe.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Foster Products Corporation, H. B. Fuller Company; Mast-A-Fab.
b. Vimasco Corporation; Elastafab 894.

2.9 FIELD-APPLIED CLOTHS

A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd. .

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Alpha Associates, Inc.; Alpha-Maritex 84215 and 84217/9485RW, Luben 59.

2.10 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. Metal Jacket:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; Metal Jacketing Systems.
b. PABCO Metals Corporation; Surefit.

c. RPR Products, Inc.; Insul-Mate.

2. Aluminum Jacket: Comply with ASTM B 209 , Alloy 3003, 3005, 3105 or 5005, Temper H-14.

a. Factory cut and rolled to size.
b. Finish and thickness are indicated in field-applied jacket schedules.
c. Moisture Barrier for Indoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
d. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
e. Factory-Fabricated Fitting Covers:

1) Same material, finish, and thickness as jacket.
2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
3) Tee covers.
4) Flange and union covers.
5) End caps.
6) Beveled collars.
7) Valve covers.
8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

C. Self-Adhesive Outdoor Jacket: 60-mil- thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a crosslaminated polyethylene film covered with white aluminum-foil facing.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Polyguard; Alumaguard 60.

2.11 TAPES

A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, ailable products that may be incorporated into the Work include, but are not limited to, the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
b. Compac Corp.; 110 and 111.
c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches .
3. Thickness: 6.5 mils .
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

B. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
   b. Compac Corp.; 120.
   c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
   d. Venture Tape; 3520 CW.

2. Width: 2 inches .
3. Thickness: 3.7 mils .
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.12 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Childers Products; Bands.
   b. PABCO Metals Corporation; Bands.
   c. RPR Products, Inc.; Bands.

2. Aluminum: ASTM B 209 , Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 or 3/4 inch wide with wing or closed seal.
3. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

   1) Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-

2. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

   a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

      1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series T.
      2) GEMCO; Perforated Base.
      3) Midwest Fasteners, Inc.; Spindle.

   b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
   c. Spindle: Copper- or zinc-coated, low carbon steel; Aluminum; or Stainless steel; fully annealed, 0.106-inch- diameter shank, length to suit depth of insulation indicated.

d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

3. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

   a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

      1) GEMCO; Nylon Hangers.
      2) Midwest Fasteners, Inc.; Nylon Insulation Hangers.

   b. Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1-1/2 inches in diameter.
   c. Spindle: Nylon, 0.106-inch- diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches .
   d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

4. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

   a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

      1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series TSA.
      2) GEMCO; Press and Peel.
      3) Midwest Fasteners, Inc.; Self Stick.

   b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
   c. Spindle: Copper- or zinc-coated, low carbon steel; Aluminum; or Stainless steel; fully annealed, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
   d. Adhesive-backed base with a peel-off protective cover.

C. Wire: 0.080-inch nickel-copper alloy; 0.062-inch soft-annealed, stainless steel; or 0.062-inch soft-annealed, galvanized steel.

   1. 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:

      a. C & F Wire.
      b. Childers Products.
      c. PABCO Metals Corporation.
      d. RPR Products, Inc.

2.13 CORNER ANGLES

A. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch , aluminum according to ASTM B 209 , Alloy 3003, 3005, 3105 or 5005; Temper H-14.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches .
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

F. Insulation Installation at Floor Penetrations:

1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Pipe: Install insulation continuously through floor penetrations.
3. Seal penetrations through fire-rated assemblies.

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings:

1. Install insulation over fittings and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
5. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
6. Label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Finish exposed surfaces with a metal jacket.

3.6 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Pipe Specialties:

1. Install insulation to flanges as specified for flange insulation application.
2. Secure insulation to specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 MINERAL-FIBER INSULATION INSTALLATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches , place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Impale insulation over pins and attach speed washers.
    f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and

surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches .

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.8 FIELD-APPLIED JACKET INSTALLATION

A. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.9 FINISHES

A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

C. Do not field paint aluminum or stainless-steel jackets.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
2. Inspect field-insulated equipment, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.
3. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers,

three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.11 DUCT INSULATION SCHEDULE, GENERAL

A. Ducts Requiring Insulation:

1. Supply, return, and transfer ducts.

B. Items Not Insulated:

1. Metal ducts with duct liner of sufficient thickness to comply with Florida energy code and ASHRAE/IESNA 90.1.
2. Factory-insulated plenums and casings.
3. Factory-insulated double wall duct and fittings, typical of exposed supply and return duct.
4. Flexible connectors.
5. Vibration-control devices.
6. Factory-insulated access panels and doors.
7. Exhaust duct.

3.12 DUCT INSULATION SCHEDULE

A. Round and rectangular, supply, return, and transfer duct insulation shall be:

1. Mineral-Fiber Blanket: 2 inches thick and 0.75-lb/cu. ft. nominal density.

3.13 EQUIPMENT INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a type of equipment, selection from materials listed is Contractor's option.

3.14 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range.

3.15 INDOOR PIPING INSULATION SCHEDULE

A. Condensate and Equipment Drain:

1. All Pipe Sizes: Insulation shall be the following:

a. Flexible Elastomeric: 1 inch thick.

3.16 FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Ducts:

1. None.

D. Piping, Concealed:

1. None.

E. Piping, Exposed:

1. Smooth or Corrugated (0.040 inch thick) Aluminum.

END OF SECTION 23 07 00

SECTION 23 11 23

FACILITY LIQUIFIED- PETROLIUM GAS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Valves.
5. Pressure regulators.
6. Service meters.
7. Mechanical sleeve seals.
8. Grout.
9. Concrete bases.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. LPG: Liquefied-petroleum gas.

1.4 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. For Piping Containing Liquid:

    a. Piping between Shutoff Valves: 350 psig (2413 kPa) unless otherwise indicated.
    b. Piping Other Than Above: 250 psig (1723 kPa) unless otherwise indicated.
    c. Valves and Fittings: 250 psig (1723 kPa) unless otherwise indicated.

B. LPG System Pressure within Buildings: One pressure range. 0.5 psig (3.45 kPa) or less.

1.5 SUBMITTALS

A. Product Data: For each type of the following:

1. Piping specialties.
2. Corrugated, stainless-steel tubing with associated components.
3. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
4. Pressure regulators. Indicate pressure ratings and capacities.
5. Service meters. Indicate pressure ratings and capacities. Include bypass fittings and meter bars supports.
6. Dielectric fittings.
7. Mechanical sleeve seals.
8. Escutcheons.

B. Coordination Drawings: Plans and details, drawn to scale, on which LPG piping is shown and coordinated with other installations, using input from installers of the items involved.

C. Site Survey: Plans, drawn to scale, on which LPG piping is shown and coordinated with other services and utilities.

D. Welding certificates.

E. Field quality-control reports.

F. Operation and Maintenance Data: For pressure regulators to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

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.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and dispose of liquids from existing LPG piping according to requirements of authorities having jurisdiction.

B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.

D. Protect stored PE pipes and valves from direct sunlight.

1.8 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

1.9 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

B. Coordinate requirements for access panels and doors for valves installed concealed behind finished surfaces.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

    a. Material Group: 1.1.
    b. End Connections: Threaded or butt welding to match pipe.
    c. Lapped Face: Not permitted underground.
    d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
    e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.

5. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.

    a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

6. Mechanical Couplings:

    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) Dresser Piping Specialties; Division of Dresser, Inc.
        2) Smith-Blair, Inc.

    b. Stainless-steel, Steel flanges and tube with epoxy finish.
    c. Buna-nitrile seals.
    d. Stainless-steel, Steel bolts, washers, and nuts.
    e. Coupling shall be capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
    f. Steel body couplings installed underground on plastic pipe shall be factory equipped with anode.

B. Corrugated, Stainless-Steel Tubing: Comply with ANSI/IAS LC 1.

1. 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:

    a. OmegaFlex, Inc.
    b. Parker Hannifin Corporation; Parflex Division.
    c. Titeflex.
    d. Tru-Flex Metal Hose Corp.

2. Tubing: ASTM A 240/A 240M, corrugated, Series 300 stainless steel.
3. Coating: PE with flame retardant.

    a. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

        1) Flame-Spread Index: 25 or less.
        2) Smoke-Developed Index: 50 or less.

4. Fittings: Copper-alloy mechanical fittings with ends made to fit and listed for use with corrugated stainless-steel tubing and capable of metal-to-metal seal without gaskets. Include brazing socket or threaded ends complying with ASME B1.20.1.
5. Striker Plates: Steel, designed to protect tubing from penetrations.
6. Manifolds: Malleable iron or steel with factory-applied protective coating. Threaded connections shall comply with ASME B1.20.1 for pipe inlet and corrugated tubing outlets.
7. Operating-Pressure Rating: 5 psig (34.5 kPa).

C. Aluminum Tubing: Comply with ASTM B 210 and ASTM B 241/B 241M.

1. Aluminum Alloy: Alloy 5456 is prohibited.
2. Protective Coating: Factory-applied coating capable of resisting corrosion on tubing in contact with masonry, plaster, insulation, water, detergents, and sewerage.

3. Flare Fittings: Comply with ASME B16.26 and SAE J513.

    a. Copper-alloy fittings.
    b. Metal-to-metal compression seal without gasket.
    c. Dryseal threads shall comply with ASME B1.20.3.

D. Drawn-Temper Copper Tube: Comply with ASTM B 88, Type K (ASTM B 88M, Type A), ASTM B 88, Type L (ASTM B 88M, Type B), ASTM B 837, Type G.

1. Copper Fittings: ASME B16.22, wrought copper, and streamlined pattern.
2. Bronze Flanges and Flanged Fittings: ASME B16.24, Class 150.

    a. Gasket Material: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
    b. Bolts and Nuts: ASME B18.2.1, carbon steel or stainless steel.

3. Protective Coating for Underground Tubing: Factory-applied, extruded PE a minimum of 0.022 inch (0.56 mm) thick.

E. Annealed-Temper Copper Tube: Comply with ASTM B 88, Type K (ASTM B 88M, Type A), ASTM B 88, Type L (ASTM B 88M, Type B), ASTM B 837, Type G.

1. Copper Fittings: ASME B16.22, wrought copper, and streamlined pattern.
2. Flare Fittings: Comply with ASME B16.26 and SAE J513.

    a. Copper fittings with long nuts.
    b. Metal-to-metal compression seal without gasket.
    c. Dryseal threads complying with ASME B1.20.3.

3. Protective Coating for Underground Tubing: Factory-applied, extruded PE a minimum of 0.022 inch (0.56 mm) thick.

F. Tin-Lined Copper Tube: ASTM B 280, seamless, annealed, with interior tin-plated lining.

1. Flare Fittings: Comply with ASME B16.26 and SAE J513.

    a. Copper fittings with long nuts.
    b. Metal-to-metal compression seal without gasket.
    c. Dryseal threads complying with ASME B1.20.3.

G. PE Pipe: ASTM D 2513, SDR 11.

1. PE Fittings: ASTM D 2683, socket-fusion type or ASTM D 3261, butt-fusion type with dimensions matching PE pipe.
2. PE Transition Fittings: Factory-fabricated fittings with PE pipe complying with ASTM D 2513, SDR 11; and steel pipe complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
3. Anodeless Service-Line Risers: Factory fabricated and leak tested.

    a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet.
    b. Casing: Steel pipe complying with ASTM A 53/A 53M, Schedule 40, black steel, Type E or S, Grade B, with corrosion-protective coating covering. Vent casing aboveground.
    c. Aboveground Portion: PE transition fitting.
    d. Outlet shall be threaded or flanged or suitable for welded connection.
    e. Tracer wire connection.
    f. Ultraviolet shield.
    g. Stake supports with factory finish to match steel pipe casing or carrier pipe.

4. Transition Service-Line Risers: Factory fabricated and leak tested.

    a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet connected to steel pipe complying with ASTM A 53/A 53M, Schedule 40, Type E or S, Grade B, with corrosion-protective coating for aboveground outlet.
    b. Outlet shall be threaded or flanged or suitable for welded connection.
    c. Bridging sleeve over mechanical coupling.
    d. Factory-connected anode.
    e. Tracer wire connection.
    f. Ultraviolet shield.
    g. Stake supports with factory finish to match steel pipe casing or carrier pipe.

5. Plastic Mechanical Couplings, NPS 1-1/2 (DN 40) and Smaller: Capable of joining PE pipe to PE pipe.

    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) Lyall, R. W. & Company, Inc.
        2) Mueller Co.; Gas Products Div.
        3) Perfection Corporation; a subsidiary of American Meter Company.

    b. PE body with molded-in, stainless-steel support ring.
    c. Buna-nitrile seals.
    d. Acetal collets.
    e. Electro-zinc-plated steel stiffener.

6. Plastic Mechanical Couplings, NPS 2 (DN 50) and Larger: Capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.

    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) Lyall, R. W. & Company, Inc.
2) Mueller Co.; Gas Products Div.
3) Perfection Corporation; a subsidiary of American Meter Company.

b. Fiber-reinforced plastic body.
c. PE body tube.
d. Buna-nitrile seals.
e. Acetal collets.
f. Stainless-steel bolts, nuts, and washers.

7. Steel Mechanical Couplings: Capable of joining plain-end PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.

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) Dresser Piping Specialties; Division of Dresser, Inc.
2) Smith-Blair, Inc.

b. Stainless-steel, Steel flanges and tube with epoxy finish.
c. Buna-nitrile seals.
d. Stainless-steel, Steel bolts, washers, and nuts.
e. Factory-installed anode for steel-body couplings installed underground.

2.2 PIPING SPECIALTIES

A. Appliance Flexible Connectors:

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
4. Corrugated stainless-steel tubing with polymer coating.
5. Operating-Pressure Rating: 0.5 psig (3.45 kPa).
6. End Fittings: Zinc-coated steel.
7. Threaded Ends: Comply with ASME B1.20.1.
8. Maximum Length: 72 inches (1830 mm).

B. Quick-Disconnect Devices: Comply with ANSI Z21.41.

1. Copper-alloy convenience outlet and matching plug connector.
2. Nitrile seals.
3. Hand operated with automatic shutoff when disconnected.
4. For indoor or outdoor applications.
5. Adjustable, retractable restraining cable.

C. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.

2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.
3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig (862 kPa).

D. Basket Strainers:

1. Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.
3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig (862 kPa).

E. T-Pattern Strainers:

1. Body: Ductile or malleable iron with removable access coupling and end cap for strainer maintenance.
2. End Connections: Grooved ends.
3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 57 percent free area.
4. CWP Rating: 750 psig (5170 kPa).

F. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for LPG.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F (540 deg C) complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.4 MANUAL GAS SHUTOFF VALVES

A. See "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.

B. General Requirements for Metallic Valves, NPS 2 (DN 50) and Smaller: Comply with ASME B16.33.

1. CWP Rating: 250 psig (1723 kPa).
2. Threaded Ends: Comply with ASME B1.20.1.
3. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.

4. Listing: Listed and labeled by CSA or agency acceptable to authorities having jurisdiction for valves 1 inch (25 mm) and smaller.
5. Valves 1-1/4 inches (32 mm) to NPS 2 (DN 50) shall have initials "WOG" permanently marked on valve body.

C. General Requirements for Metallic Valves, NPS 2-1/2 (DN 65) and Larger: Comply with ASME B16.38.

1. CWP Rating: 125 psig (862 kPa).
2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
3. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
4. Service Mark: Initials "WOG" shall be permanently marked on valve body.

D. One-Piece, Bronze Ball Valve with Bronze Trim: MSS SP-110.

1. 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:

    a. BrassCraft Manufacturing Company; a Masco company.
    b. Conbraco Industries, Inc.; Apollo Div.
    c. Lyall, R. W. & Company, Inc.
    d. McDonald, A. Y. Mfg. Co.
    e. Perfection Corporation; a subsidiary of American Meter Company.

2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated brass.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Separate packnut with adjustable-stem packing threaded ends.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig (4140 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for LPG service with "WOG" indicated on valve body.

E. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. 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:

    a. BrassCraft Manufacturing Company; a Masco company.
    b. Conbraco Industries, Inc.; Apollo Div.
    c. Lyall, R. W. & Company, Inc.
    d. McDonald, A. Y. Mfg. Co.
    e. Perfection Corporation; a subsidiary of American Meter Company.

2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated bronze.

4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig (4140 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for LPG service with "WOG" indicated on valve body.

F. Two-Piece, Regular-Port Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. 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:

    a. BrassCraft Manufacturing Company; a Masco company.
    b. Conbraco Industries, Inc.; Apollo Div.
    c. Lyall, R. W. & Company, Inc.
    d. McDonald, A. Y. Mfg. Co.
    e. Perfection Corporation; a subsidiary of American Meter Company.

2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig (4140 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for LPG service with "WOG" indicated on valve body.

G. Bronze Plug Valves: MSS SP-78.

1. 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:

    a. Lee Brass Company.
    b. McDonald, A. Y. Mfg. Co.

2. Body: Bronze, complying with ASTM B 584.
3. Plug: Bronze.
4. Ends: Threaded, socket, or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Operator: Square head or lug type with tamperproof feature where indicated.
6. Pressure Class: 125 psig (862 kPa).
7. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.

8. Service: Suitable for LPG service with "WOG" indicated on valve body.

H. Cast-Iron, Nonlubricated Plug Valves: MSS SP-78.

1. 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:

    a. McDonald, A. Y. Mfg. Co.
    b. Mueller Co.; Gas Products Div.
    c. Xomox Corporation; a Crane company.

2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with LPG.
6. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig (862 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for LPG service with "WOG" indicated on valve body.

I. Cast-Iron, Lubricated Plug Valves: MSS SP-78.

1. 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:

    a. Flowserve.
    b. Homestead Valve; a division of Olson Technologies, Inc.
    c. McDonald, A. Y. Mfg. Co.
    d. Milliken Valve Company.
    e. Mueller Co.; Gas Products Div.
    f. R&M Energy Systems, A Unit of Robbins & Myers, Inc.

2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with LPG.
6. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig (862 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for LPG service with "WOG" indicated on valve body.

J. PE Ball Valves: Comply with ASME B16.40.

1. 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:

   a. Kerotest Manufacturing Corp.
   b. Lyall, R. W. & Company, Inc.
   c. Perfection Corporation; a subsidiary of American Meter Company.

2. Body: PE.
3. Ball: PE.
4. Stem: Acetal.
5. Seats and Seals: Nitrile.
6. Ends: Plain or fusible to match piping.
7. CWP Rating: [80 psig (552 kPa)] <Insert pressure>.
8. Operating Temperature: [Minus 20 to plus 140 deg F (Minus 29 to plus 60 deg C)] <Insert temperature range>.
9. Operator: Nut or flat head for key operation.
10. Include plastic valve extension.
11. Include tamperproof locking feature for valves where indicated on Drawings.

K. Valve Boxes:

1. Cast-iron, two-section box.
2. Top section with cover with "GAS" lettering.
3. Bottom section with base to fit over valve and barrel a minimum of 5 inches (125 mm) in diameter.
4. Adjustable cast-iron extensions of length required for depth of bury.
5. Include tee-handle, steel operating wrench with socket end fitting valve nut or flat head, and with stem of length required to operate valve.

2.5 MOTORIZED GAS VALVES

A. Automatic Gas Valves: Comply with ANSI Z21.21.

1. 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:

   a. ASCO Power Technologies, LP; Division of Emerson.
   b. Dungs, Karl, Inc.
   c. Eaton Corporation; Controls Div.
   d. Eclipse Combustion, Inc.
   e. Honeywell International Inc.
   f. Johnson Controls.

2. Body: Brass or aluminum.
3. Seats and Disc: Nitrile rubber.
4. Springs and Valve Trim: Stainless steel.
5. Normally closed.
6. Visual position indicator.

7. Electrical or Mechanical operator for actuation by appliance automatic shutoff device.

B. Electrically Operated Valves: Comply with UL 429.

1. 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:

   a. ASCO Power Technologies, LP; Division of Emerson.
   b. Dungs, Karl, Inc.
   c. Eclipse Combustion, Inc.
   d. Goyen Valve Corp.; Tyco Environmental Systems.
   e. Magnatrol Valve Corporation.
   f. Parker Hannifin Corporation; Climate & Industrial Controls Group; Skinner Valve Div.
   g. Watts Regulator Co.; Division of Watts Water Technologies, Inc.

2. Pilot operated.
3. Body: Brass or aluminum.
4. Seats and Disc: Nitrile rubber.
5. Springs and Valve Trim: Stainless steel.
6. 120-V ac, 60 Hz, Class B, continuous-duty molded coil, and replaceable.
7. NEMA ICS 6, Type 4, coil enclosure.
8. Normally closed.
9. Visual position indicator.

2.6 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for LPG.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 (DN 50) and smaller; flanged for regulators NPS 2-1/2 (DN 65) and larger.

B. Service Pressure Regulators: Comply with ANSI Z21.80.

1. 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:

   a. Actaris.
   b. American Meter Company.
   c. Fisher Control Valves and Regulators; Division of Emerson Process Management.
   d. Invensys.
   e. Richards Industries; Jordan Valve Div.

2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.

6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: 100 psig (690 kPa).

C. Line Pressure Regulators: Comply with ANSI Z21.80.

1. 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:

    a. Actaris.
    b. American Meter Company.
    c. Eclipse Combustion, Inc.
    d. Fisher Control Valves and Regulators; Division of Emerson Process Management.
    e. Invensys.
    f. Maxitrol Company.
    g. Richards Industries; Jordan Valve Div.

2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.

D. Appliance Pressure Regulators: Comply with ANSI Z21.18.

1. 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:

    a. Canadian Meter Company Inc.
    b. Eaton Corporation; Controls Div.
    c. Harper Wyman Co.
    d. Maxitrol Company.
    e. SCP, Inc.

2. Body and Diaphragm Case: Die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber.
6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
7. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
8. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.

2.7 DIELECTRIC FITTINGS

A. Dielectric Unions:

1. 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:

    a. Capitol Manufacturing Company.
    b. Central Plastics Company.
    c. Hart Industries International, Inc.
    d. McDonald, A. Y. Mfg. Co.
    e. Watts Regulator Co.; Division of Watts Water Technologies, Inc.
    f. Wilkins; Zurn Plumbing Products Group.

2. Minimum Operating-Pressure Rating: 150 psig (1034 kPa).
3. Combination fitting of copper alloy and ferrous materials.
4. Insulating materials suitable for LPG gas.
5. Combination fitting of copper alloy and ferrous materials with threaded, brazed-joint, plain, or welded end connections that match piping system materials.

B. Dielectric Flanges:

1. 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:

    a. Capitol Manufacturing Company.
    b. Central Plastics Company.
    c. Watts Regulator Co.; Division of Watts Water Technologies, Inc.
    d. Wilkins; Zurn Plumbing Products Group.

2. Minimum Operating-Pressure Rating: 150 psig (1034 kPa).
3. Combination fitting of copper alloy and ferrous materials.
4. Insulating materials suitable for LPG.
5. Combination fitting of copper alloy and ferrous materials with threaded, brazed-joint, plain, or welded end connections that match piping system materials.

C. Dielectric-Flange Kits:

1. 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:

a. Advance Products & Systems, Inc.
b. Calpico Inc.
c. Central Plastics Company.
d. Pipeline Seal and Insulator, Inc.

2. Minimum Operating-Pressure Rating: 150 psig (1034 kPa).
3. Companion-flange assembly for field assembly.
4. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or PE bolt sleeves, phenolic washers, and steel backing washers.
5. Insulating materials suitable for LPG.
6. Combination fitting of copper alloy and ferrous materials with threaded, brazed-joint, plain, or welded end connections that match piping system materials.

2.8 SLEEVES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.9 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. 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:

a. Advance Products & Systems, Inc.
b. Calpico Inc.
c. Metraflex Company (The).
d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM, NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe and sleeve.
3. Pressure Plates: Plastic, Carbon steel, Stainless steel.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating, Stainless steel of length required to secure pressure plates to sealing elements. Include one nut and bolt for each sealing element.

2.10 ESCUTCHEONS

A. General Requirements for Escutcheons: Manufactured wall and ceiling escutcheons and floor plates, with ID to fit around pipe or tube, and OD that completely covers opening.

B. One-Piece, Deep-Pattern Escutcheons: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Escutcheons: With set screw.

1. Finish: Polished chrome-plated or rough brass.

D. Split-Casting, Cast-Brass Escutcheons: With concealed hinge and set screw.

1. Finish: Polished chrome-plated or rough brass.

E. One-Piece, Stamped-Steel Escutcheons: With set screw or spring clips and chrome-plated finish.

F. Split-Plate, Stamped-Steel Escutcheons: With concealed or exposed-rivet hinge, set screw or spring clips, and chrome-plated finish.

G. One-Piece, Floor-Plate Escutcheons: Cast-iron floor plate.

H. Split-Casting, Floor-Plate Escutcheons: Cast brass with concealed hinge and set screw.

2.11 LABELING AND IDENTIFYING

A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored yellow.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for LPG piping system to verify actual locations of piping connections before equipment installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Close equipment shutoff valves before turning off LPG to premises or piping section.

B. Inspect LPG piping according to NFPA 54 and the International Fuel Gas Code to determine that LPG utilization devices are turned off in piping section affected.

C. Comply with NFPA 54 and the International Fuel Gas Code requirements for prevention of accidental ignition.

3.3 OUTDOOR PIPING INSTALLATION

A. Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of LPG piping.

B. Install underground, LPG piping buried at least 36 inches (900 mm) below finished grade.

1. If LPG piping is installed less than 36 inches (900 mm) below finished grade, install it in containment conduit.

C. Install underground, PE, LPG piping according to ASTM D 2774.

D. Steel Piping with Protective Coating:

1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
3. Replace pipe having damaged PE coating with new pipe.

E. Copper Tubing with Protective Coating:

1. Apply joint cover kits over tubing to cover, seal, and protect joints.
2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.

F. Install fittings for changes in direction and branch connections.

G. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches (150 mm) in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches (150 mm) and larger in diameter.

H. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

I. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

J. Install pressure gage upstream and downstream from each service regulator.

3.4 INDOOR PIPING INSTALLATION

A. Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of LPG piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install LPG piping at uniform grade of 2 percent down toward drip and sediment traps.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Install escutcheons at penetrations of interior walls, ceilings, and floors.

1. New Piping:

    a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    b. Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
    c. Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
    d. Piping at Ceiling Penetrations in Finished Spaces: One-piece or split-casting, cast-brass type with polished chrome-plated finish.
    e. Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge and set screw.
    f. Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated or rough-brass finish.
    g. Piping in Unfinished Service Spaces: One-piece, stamped-steel type with concealed or exposed-rivet hinge and set screw or spring clips.
    h. Piping in Equipment Rooms: One-piece, cast-brass type.
    i. Piping in Equipment Rooms: One-piece, stamped-steel type with set screw or spring clips.
    j. Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Verify final equipment locations for roughing-in.

M. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

N. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches (75 mm) long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

O. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.

P. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

Q. Concealed Location Installations: Except as specified below, install concealed LPG piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.

1. Above Accessible Ceilings: LPG piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.
2. In Floors: Install LPG piping with welded or brazed joints and protective coating in cast-in-place concrete floors. Cover piping to be cast in concrete slabs with minimum of 1-1/2 inches (38 mm) of concrete. Piping may not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors. Do not embed piping in concrete slabs containing quick-set additives or cinder aggregate.
3. In Floor Channels: Install LPG piping in floor channels. Channels must have cover and be open to space above cover for ventilation.
4. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.

    a. Exception: Tubing passing through partitions or walls does not require striker barriers.

5. Prohibited Locations:

    a. Do not install LPG piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
    b. Do not install LPG piping in solid walls or partitions.

R. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

S. Connect branch piping from top or side of horizontal piping.

T. Install unions in pipes NPS 2 (DN 50) and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

U. Do not use LPG piping as grounding electrode.

V. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

W. Install pressure gage upstream and downstream from each line regulator.

3.5 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.

B. Install underground valves with valve boxes.

C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

D. Install earthquake valves aboveground outside buildings according to listing.

E. Install anode for metallic valves in underground PE piping.

3.6 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.
3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

F. Flanged Joints: Install gasket material, size, type, and thickness appropriate for LPG service. Install gasket concentrically positioned.

G. Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not overtighten.

H. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

3.7 HANGER AND SUPPORT INSTALLATION

A. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 (DN 25) and Smaller: Maximum span, 96 inches (2438 mm); minimum rod size, 3/8 inch (10 mm).
2. NPS 1-1/4 (DN 32): Maximum span, 108 inches (2743 mm); minimum rod size, 3/8 inch (10 mm).
3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): Maximum span, 108 inches (2743 mm); minimum rod size, 3/8 inch (10 mm).
4. NPS 2-1/2 to NPS 3-1/2 (DN 65 to DN 90): Maximum span, 10 feet (3 m); minimum rod size, 1/2 inch (13 mm).
5. NPS 4 (DN 100) and Larger: Maximum span, 10 feet (3 m); minimum rod size, 5/8 inch (15.8 mm).

B. Install hangers for horizontal drawn-temper copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 3/8 (DN 10): Maximum span, 48 inches (1220 mm); minimum rod size, 3/8 inch (10 mm).
2. NPS 1/2 and NPS 5/8 (DN 15 and DN 18): Maximum span, 72 inches (1830 mm); minimum rod size, 3/8 inch (10 mm).
3. NPS 3/4 and NPS 7/8 (DN 20 and DN 22): Maximum span, 84 inches (2134 mm); minimum rod size, 3/8 inch (10 mm).
4. NPS 1 (DN 25): Maximum span, 96 inches (2440 mm); minimum rod size, 3/8 inch (10 mm).

C. Install hangers for horizontal, corrugated stainless-steel tubing with the following maximum spacing and minimum rod sizes:

1. NPS 3/8 (DN 10): Maximum span, 48 inches (1220 mm); minimum rod size, 3/8 inch (10 mm).
2. NPS 1/2 (DN 15): Maximum span, 72 inches (1830 mm); minimum rod size, 3/8 inch (10 mm).
3. NPS 3/4 (DN 20) and Larger: Maximum span, 96 inches (2440 mm); minimum rod size, 3/8 inch (10 mm).

3.8 CONNECTIONS

A. Install LPG piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

B. Install piping adjacent to appliances to allow service and maintenance of appliances.

C. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches (1800 mm) of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

D. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.9 LABELING AND IDENTIFYING

A. Install detectable warning tape directly above gas piping, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.10 PAINTING

A. Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.

1. Alkyd System: MPI EXT 5.1D.

    a. Prime Coat: Alkyd anticorrosive metal primer.
    b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
    c. Topcoat: Exterior alkyd enamel (flat), (semigloss), (gloss).
    d. Color: [Gray] <Insert color>.

B. Paint exposed, interior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.

1. Latex Over Alkyd Primer System: MPI INT 5.1Q.

    a. Prime Coat: Alkyd anticorrosive, Quick-drying alkyd metal primer.
    b. Intermediate Coat: Interior latex matching topcoat.
    c. Topcoat: Interior latex (flat), (low sheen). (eggshell), (satin), (semigloss), (gloss).
    d. Color: Gray.

2. Alkyd System: MPI INT 5.1E.

    a. Prime Coat: Alkyd anticorrosive, Quick-drying alkyd metal primer.
    b. Intermediate Coat: Interior alkyd matching topcoat.
    c. Topcoat: Interior alkyd (flat), (eggshell), (semigloss), (gloss) .
    d. Color: Gray.

C. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.11 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Test, inspect, and purge LPG gas according to NFPA 54 and the International Fuel Gas Code and authorities having jurisdiction.

C. LPG piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.12 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain earthquake valves.

3.13 OUTDOOR PIPING SCHEDULE

A. Underground LPG piping shall be one of the following:

1. PE pipe and fittings joined by heat fusion, or mechanical couplings; service-line risers with tracer wire terminated in an accessible location.
2. Steel pipe with wrought-steel fittings and welded joints, or mechanical couplings. Coat pipe and fittings with protective coating for steel piping.
3. Annealed or Drawn-temper copper tube with wrought-copper fittings and brazed joints. Coat pipe and fittings with protective coating for copper tubing.

B. Aboveground LPG piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.
3. Annealed or Drawn-temper copper tube with wrought-copper fittings and brazed joints.

C. Branch Piping in Cast-in-Place Concrete to Single Appliance: Annealed-temper copper tube with wrought-copper fittings and brazed joints. Install piping embedded in concrete with no joints in concrete.

D. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

3.14 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG (3.45 kPa)

A. Aboveground, branch piping NPS 1 (DN 25) and smaller shall be one of the following:

1. Corrugated stainless-steel tubing with mechanical fittings having socket or threaded ends to match adjacent piping.
2. Annealed-temper, tin-lined copper tube with flared joints and fittings.
3. Annealed-temper, copper tube with wrought-copper fittings and brazed joints.
4. Aluminum tube with flared fittings and joints.
5. Steel pipe with malleable-iron fittings and threaded joints.

B. Aboveground, distribution piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.
3. Drawn-temper copper tube with wrought-copper fittings and brazed joints.

C. Underground, below building, piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

D. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

E. Containment Conduit Vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

3.15 UNDERGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Underground:

1. PE valves.
2. NPS 2 (DN 50) and Smaller: Bronze plug valves.
3. NPS 2-1/2 (DN 65) and Larger: Cast-iron, lubricated plug valves.

3.16 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Valves for pipe sizes NPS 2 (DN 50) and smaller at service meter shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

B. Valves for pipe sizes NPS 2-1/2 (DN 65) and larger at service meter shall be one of the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze plug valve.
3. Cast-iron, nonlubricated plug valve.

C. Distribution piping valves for pipe sizes NPS 2 (DN 50) and smaller shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

D. Distribution piping valves for pipe sizes NPS 2-1/2 (DN 65) and larger shall be one of the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze plug valve.
3. Cast-iron, Lubricated plug valve.

E. Valves in branch piping for single appliance shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

END OF SECTION 23 11 23

SECTION 23 23 00

REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

1.3 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig (2068 kPa).
2. Suction Lines for Heat-Pump Applications: 535 psig (3689 kPa).
3. Hot-Gas and Liquid Lines: 535 psig (3689 kPa).

1.4 SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for the following:

1. Thermostatic expansion valves.
2. Solenoid valves.
3. Hot-gas bypass valves.
4. Filter dryers.
5. Strainers.

B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.

1. Shop Drawing Scale: 1/4 inch equals 1 foot (1:50).
2. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.6 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

1.7 COORDINATION

A. Coordinate size and location of roof curbs, equipment supports, and roof penetrations.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 88, Type K or L (ASTM B 88M, Type A or B), ASTM B 280, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8.

F. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum 3/4-inch (20-mm) misalignment in minimum 7-inch-(180-mm-) long assembly.
4. Pressure Rating: Factory test at minimum 500 psig (3450 kPa).
5. Maximum Operating Temperature: 250 deg F (121 deg C).

2.2 VALVES AND SPECIALTIES

A. Service Valves:

1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig (3450 kPa).

B. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.

1. Body and Bonnet: Plated steel.
2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch (16-GRC) conduit adapter, and [24] [115] [208]-V ac coil.
6. Working Pressure Rating: 400 psig (2760 kPa).
7. Maximum Operating Temperature: 240 deg F (116 deg C).
8. Manual operator.

C. Thermostatic Expansion Valves: Comply with ARI 750.

1. Body, Bonnet, and Seal Cap: Forged brass or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
5. Suction Temperature: 40 deg F (4.4 deg C).
6. Superheat: [Adjustable] [Nonadjustable].
7. Reverse-flow option (for heat-pump applications).
8. End Connections: Socket, flare, or threaded union.
9. Working Pressure Rating: 450 psig (3100 kPa).

D. Straight-Type Strainers:

1. Body: Welded steel with corrosion-resistant coating.
2. Screen: 100-mesh stainless steel.
3. End Connections: Socket or flare.
4. Working Pressure Rating: 500 psig (3450 kPa).
5. Maximum Operating Temperature: 275 deg F (135 deg C).

E. Angle-Type Strainers:

1. Body: Forged brass or cast bronze.
2. Drain Plug: Brass hex plug.
3. Screen: 100-mesh monel.
4. End Connections: Socket or flare.
5. Working Pressure Rating: 500 psig (3450 kPa).
6. Maximum Operating Temperature: 275 deg F (135 deg C).

F. Moisture/Liquid Indicators:

1. Body: Forged brass.
2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
3. Indicator: Color coded to show moisture content in ppm.
4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig (3450 kPa).
7. Maximum Operating Temperature: 240 deg F (116 deg C).

G. Replaceable-Core Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated [alumina] [charcoal].
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 (DN 8) connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: [2 psig (14 kPa)] <Insert value>.
8. Rated Flow: <Insert tons (kW).>
9. Working Pressure Rating: 500 psig (3450 kPa).
10. Maximum Operating Temperature: 240 deg F (116 deg C).

H. Permanent Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated [alumina] [charcoal].
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 (DN 8) connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: [2 psig (14 kPa)] <Insert value>.
8. Rated Flow: <Insert tons (kW).>
9. Working Pressure Rating: 500 psig (3450 kPa).
10. Maximum Operating Temperature: 240 deg F (116 deg C).

2.3 REFRIGERANTS

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:

1. Atofina Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants.
4. INEOS Fluor Americas LLC.

B. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Suction Lines NPS 1-1/2 (DN 40) and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.

B. Suction Lines NPS 2 to NPS 3-1/2 (DN 50 to DN 90) for Conventional Air-Conditioning Applications: Copper, Type ACR or L (B], drawn-temper tubing and wrought-copper fittings with brazed joints.

C. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR or L (B), annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.

D. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications]: Copper, Type K (A), annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.

E. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, K (A), or L (B), drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony soldered joints.

F. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, K (A), or L (B), drawn-temper tubing and wrought-copper fittings with Alloy HB soldered joints.

G. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications:

1. NPS 5/8 (DN 18) and Smaller: Copper, Type ACR or L (B), annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.
2. NPS 3/4 to NPS 1 (DN 20 to DN 25) and Smaller: Copper, Type K (A), annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.
3. NPS 1-1/4 (DN 32) and Smaller: Copper, Type ACR, K (A), or L (B), drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony soldered joints.
4. NPS 1-1/2 to NPS 2 (DN 40 to DN 50): Copper, Type ACR, K (A), or L (B), drawn-temper tubing and wrought-copper fittings with Alloy HB soldered joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

B. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.

C. Install thermostatic expansion valves as close as possible to distributors on evaporators.

D. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

E. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:

1. Solenoid valves.
2. Thermostatic expansion valves.
3. Compressor.

F. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

K. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 8 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

L. Install refrigerant piping in protective conduit where installed belowground.

M. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

N. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.

3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

O. When brazing, remove solenoid-valve coils and sight glasses; also remove valve stems, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

P. Install pipe sleeves at penetrations in exterior walls and floor assemblies.

Q. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

R. Install sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.

3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.

3.5 HANGERS AND SUPPORTS

A. Install the following pipe attachments:

1. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

B. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 1/2 (DN 15): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
2. NPS 5/8 (DN 18): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
3. NPS 1 (DN 25): Maximum span, 72 inches (1800 mm); minimum rod size, 1/4 inch (6.4 mm).
4. NPS 1-1/4 (DN 32): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
5. NPS 1-1/2 (DN 40): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
6. NPS 2 (DN 50): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
7. NPS 2-1/2 (DN 65): Maximum span, 108 inches (2700 mm); minimum rod size, 3/8 inch (9.5 mm).

C. Support multi-floor vertical runs at least at each floor.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.

    a. Fill system with nitrogen to the required test pressure.
    b. System shall maintain test pressure at the manifold gage throughout duration of test.
    c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers (67 Pa). If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig (14 kPa).
4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 23 23 00

SECTION 23 31 13

METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes metal ducts for supply, return, outside, and exhaust air-distribution systems in pressure classes from minus 2- to plus 2 (minus 500 to plus 500 Pa). Metal ducts include the following:

1. Rectangular ducts and fittings.
2. Single-wall, round spiral-seam ducts and formed fittings.

1.3 SYSTEM DESCRIPTION

A. Duct system design, as indicated, has been used to select size and type of air-moving and -distribution equipment and other air system components. Changes to layout or configuration of duct system must be specifically approved in writing by Architect. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

1.4 SUBMITTALS

A. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. NFPA Compliance:

1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with NFPA 96 “Ventillation Control and Fire Protection of Commercial Cooking Operations,” Ch. 3 “Duct System,” for range hood ducts, unless otherwise indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 SHEET METAL MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G90 (Z275) coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.

C. Carbon-Steel Sheets: ASTM A 366/A 366M, cold-rolled sheets; commercial quality; with oiled, matte finish for exposed ducts.

D. Stainless Steel: ASTM A 480/A 480M, Type 304 , and having a finish for concealed ducts and for exposed ducts

E. Aluminum Sheets: ASTM B 209 (ASTM B 209M), alloy 3003, temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

F. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts.

G. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.3 SEALANT MATERIALS

A. Joint and Seam Sealants, General: The term "sealant" is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.

B. Joint and Seam Tape: 2 inches (50 mm) wide; glass-fiber-reinforced fabric.

C. Tape Sealing System: Woven-fiber tape impregnated with gypsum mineral compound and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.

D. Water-Based Joint and Seam Sealant: Flexible, adhesive sealant, resistant to UV light when cured, UL 723 listed, and complying with NFPA requirements for Class 1 ducts.

E. Solvent-Based Joint and Seam Sealant: One-part, non-sag, solvent-release-curing, polymerized butyl sealant formulated with a minimum of 75 percent solids.

F. Flanged Joint Mastic: One-part, acid-curing, silicone, elastomeric joint sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.

G. Flange Gaskets: Butyl rubber or EPDM polymer with polyisobutylene plasticizer.

2.4 HANGERS AND SUPPORTS

A. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
2. Exception: Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.

B. Hanger Materials: Galvanized sheet steel or threaded steel rod.

1. Hangers Installed in Corrosive Atmospheres: Electro-galvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
2. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for steel sheet width and thickness and for steel rod diameters.
3. Galvanized-steel straps attached to aluminum ducts shall have contact surfaces painted with zinc-chromate primer.

C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

D. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel support materials.
3. Supports for Aluminum Ducts: Aluminum support materials unless materials are electrolytically separated from ducts.

2.5 RECTANGULAR DUCT FABRICATION

A. Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" and complying with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.

1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure class.
2. Deflection: Duct systems shall not exceed deflection limits according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Transverse Joints: Prefabricated slide-on joints and components constructed using manufacturer's guidelines for material thickness, reinforcement size and spacing, and joint reinforcement.

1. Manufacturers:

a. Ductmate Industries, Inc.
b. Nexus Inc.
c. Ward Industries, Inc.

C. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches (480 mm) and larger and 0.0359 inch (0.9 mm) thick or less, with more than 10 sq. ft. (0.93 sq. m) of nonbraced panel area unless ducts are lined.

2.6 ROUND DUCT AND FITTING FABRICATION

A. Round, Longitudinal- and Spiral Lock-Seam Ducts: Fabricate supply ducts of galvanized steel according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Duct Joints:

1. Ducts up to 20 Inches (500 mm) in Diameter: Interior, center-beaded slip coupling, sealed before and after fastening, attached with sheet metal screws.
2. Round Ducts: Prefabricated connection system consisting of double-lipped, EPDM rubber gasket. Manufacture ducts according to connection system manufacturer's tolerances.

a. Manufacturers:

1) Ductmate Industries, Inc.
2) Lindab Inc.

C. 90-Degree Tees and Laterals and Conical Tees: Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," with metal thicknesses specified for longitudinal-seam straight ducts.

D. Diverging-Flow Fittings: Fabricate with reduced entrance to branch taps and with no excess material projecting from fitting onto branch tap entrance.

E. Fabricate elbows using die-formed, gored, pleated, or mitered construction. Bend radius of die-formed, gored, and pleated elbows shall be 1-1/2 times duct diameter. Unless elbow construction type is indicated, fabricate elbows as follows:

1. Mitered-Elbow Radius and Number of Pieces: Welded construction complying with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.
2. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from minus 2- to plus 2-inch wg (minus 500 to plus 500 Pa):

a. Ducts 3 to 36 Inches (75 to 915 mm) in Diameter: 0.034 inch (0.85 mm).

3. Round Elbows 8 Inches (200 mm) and Less in Diameter: Fabricate die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60, and 90 degrees only. Fabricate nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.
4. Round Elbows 9 through 14 Inches (225 through 355 mm) in Diameter: Fabricate gored or pleated elbows for 30, 45, 60, and 90 degrees unless space restrictions require mitered elbows. Fabricate nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.
5. Round Elbows Larger Than 14 Inches (355 mm) in Diameter and All Flat-Oval Elbows: Fabricate gored elbows unless space restrictions require mitered elbows.
6. Die-Formed Elbows for Sizes through 8 Inches (200 mm) in Diameter and All Pressures 0.040 inch (1.0 mm) thick with 2-piece welded construction.
7. Round Gored-Elbow Metal Thickness: Same as non-elbow fittings specified above.

PART 3 - EXECUTION

3.1 DUCT APPLICATIONS

A. Static-Pressure Classes: Unless otherwise indicated, construct ducts according to the following:

1. Supply Ducts: 2-inch wg (500 Pa).
2. Return Ducts (Negative Pressure): 2-inch wg (500 Pa).
3. Exhaust Ducts (Negative Pressure): 2-inch wg (500 Pa).

B. All ducts shall be galvanized steel except as follows:
1. Range Hood Exhaust Ducts: Comply with NFPA 96.
    a. Concealed: Carbon-steel sheet.
    b. Exposed: Type 304, stainless steel with finish to match kitchen equipment and range hood.
    c. Weld and flange seams and joints.
2. Dishwasher Hood Exhaust Ducts:
    a. Type 304, stainless steel with finish to match kitchen equipment and range hood.
    b. Weld flange seams and joints.
    c. Aluminum, with seams and laps arranged on top of duct.

3.2 DUCT INSTALLATION

A. Construct and install ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.

B. Install round ducts in lengths not less than 12 feet (3.7 m) unless interrupted by fittings.

C. Install ducts with fewest possible joints.

D. Install fabricated fittings for changes in directions, size, and shape and for connections.

E. Install couplings tight to duct wall surface with a minimum of projections into duct. Secure couplings with sheet metal screws. Install screws at intervals of 12 inches (300 mm), with a minimum of 3 screws in each coupling.

F. Install ducts, unless otherwise indicated, vertically and horizontally and parallel and perpendicular to building lines; avoid diagonal runs.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.

I. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions unless specifically indicated.

J. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.

K. Seal all joints and seams. Apply sealant to male end connectors before insertion, and afterward to cover entire joint and sheet metal screws.

L. Electrical Equipment Spaces: Route ducts to avoid passing through transformer vaults and electrical equipment spaces and enclosures.

M. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls and are exposed to view, conceal spaces between construction openings and ducts or duct insulation with sheet metal flanges of same metal thickness as ducts. Overlap openings on 4 sides by at least 1-1/2 inches (38 mm).

N. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire dampers, sleeves, and firestopping sealant.

O. Protect duct interiors from the elements and foreign materials until building is enclosed.

3.3 RANGE HOOD EXHAUST DUCTS, SPECIAL INSTALLATION REQUIREMENTS

A. Install ducts to allow for thermal expansion through 2000 deg F (1110 deg C) temperature range.

B. Install ducts without dips or traps that may collect resideues unless traps have continuous or automatic residue removal.

C. Install access openings at each change in direction and at intervals defined by NFPA 96; located on sides of duct a minimum of 1-1/2 inches (38 mm) from bottom; and fit with grease-tight covers of same material as duct.

D. Do not penetrate fire-rated assemblies except as permitted by applicable building codes.

3.4 SEAM AND JOINT SEALING

A. Seal duct seams and joints according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for duct pressure class indicated.

1. For pressure classes lower than 2-inch wg (500 Pa), seal transverse joints.

B. Seal ducts before external insulation is applied.

3.5 HANGING AND SUPPORTING

A. Support horizontal ducts within 24 inches (600 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.

B. Support vertical ducts at maximum intervals of 16 feet (5 m) and at each floor.

C. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.

D. Install concrete inserts before placing concrete.

E. Install powder-actuated concrete fasteners after concrete is placed and completely cured.

1. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.

3.6 CONNECTIONS

A. Make connections to equipment with flexible connectors.

B. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.7 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections according to SMACNA's "HVAC Air Duct Leakage Test Manual" and prepare test reports:

1. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
2. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If pressure classes are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.
3. Maximum Allowable Leakage: Comply with requirements for Leakage Class 3 for round and flat-oval ducts, Leakage Class 12 for rectangular ducts in pressure classes lower than and equal to 2-inch wg (500 Pa) (both positive and negative pressures).
4. Remake leaking joints and retest until leakage is equal to or less than maximum allowable.

3.8 CLEANING NEW SYSTEMS

A. Mark position of dampers and air-directional mechanical devices before cleaning, and perform cleaning before air balancing.

B. Use service openings, as required, for physical and mechanical entry and for inspection.

1. Create other openings to comply with duct standards.
2. Disconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling sections to gain access during the cleaning process.

C. Vent vacuuming system to the outside. Include filtration to contain debris removed from HVAC systems, and locate exhaust down wind and away from air intakes and other points of entry into building.

D. Clean the following metal duct systems by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including coil section, condensate drain pans, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, and actuators except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.

F. Cleanliness Verification:

1. Visually inspect metal ducts for contaminants.
2. Where contaminants are discovered, re-clean and re-inspect ducts.

END OF SECTION 23 31 13

SECTION 23 33 00

DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Volume dampers.
2. Motorized control dampers.
3. Fire dampers.
4. Turning vanes.
5. Duct-mounting access doors.
6. Flexible connectors.
7. Duct accessory hardware.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Volume dampers.
2. Motorized control dampers.
3. Fire dampers.
4. Turning vanes.
5. Duct-mounting access doors.
6. Flexible connectors.

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. Special fittings.
2. Manual-volume damper installations.
3. Motorized-control damper installations.
4. Fire-damper installations, including sleeves and duct-mounting access doors.
5. Wiring Diagrams: Power, signal, and control wiring.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale and coordinating penetrations and ceiling-mounting items. Show ceiling-mounting access panels and access doors required for access to duct accessories.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to the manufacturers specified.

2.2 SHEET METAL MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated.

B. Stainless Steel: ASTM A 480/A 480M.

C. Aluminum Sheets: ASTM B 209 , alloy 3003, temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

D. Extruded Aluminum: ASTM B 221 , alloy 6063, temper T6.

E. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches .

2.3 VOLUME DAMPERS

A. Manufacturers:

1. Air Balance, Inc.
2. American Warming and Ventilating.
3. Flexmaster U.S.A., Inc.
4. McGill AirFlow Corporation.
5. METALAIRE, Inc.
6. Nailor Industries Inc.
7. Penn Ventilation Company, Inc.
8. Ruskin Company.
9. Vent Products Company, Inc.
10. Lindab, Inc.
11. Eastern Sheet Metal

B. General Description: Factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

1. Pressure Classes of 3-Inch wg or Higher: End bearings or other seals for ducts with axles full length of damper blades and bearings at both ends of operating shaft.

C. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, and suitable for horizontal or vertical applications.

1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
2. Roll-Formed Steel Blades: 0.064-inch- thick, galvanized sheet steel.
3. Blade Axles: [Galvanized steel.
4. Bearings: Oil-impregnated bronze, Molded synthetic, or Stainless-steel sleeve.
5. Tie Bars and Brackets: Galvanized steel.

D. Low-Leakage Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, low-leakage rating, and suitable for horizontal or vertical applications.

1. Steel Frames: Hat, U, or Angle-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
2. Roll-Formed Steel Blades: 0.064-inch- thick, galvanized sheet steel.
3. Blade Axles: Galvanized steel.
4. Bearings: Oil-impregnated bronze, Molded synthetic, or Stainless-steel sleeve thrust or ball.
5. Blade Seals: Felt, Vinyl, or Neoprene.
6. Jamb Seals: Cambered stainless steel or aluminum.
7. Tie Bars and Brackets: Galvanized steel or Aluminum.

E. Jackshaft: 1-inch- diameter, galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.

1. Length and Number of Mountings: Appropriate to connect linkage of each damper in multiple-damper assembly.

F. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.4 MOTORIZED CONTROL DAMPERS

A. Manufacturers:

1. Air Balance, Inc.
2. American Warming and Ventilating.
3. CESCO Products.
4. Duro Dyne Corp.
5. Greenheck.

6. McGill AirFlow Corporation.
7. METALAIRE, Inc.
8. Nailor Industries Inc.
9. Penn Ventilation Company, Inc.
10. Ruskin Company.
11. Vent Products Company, Inc.

B. General Description: AMCA-rated, opposed-blade design; minimum of 0.1084-inch- thick, galvanized-steel frames with holes for duct mounting; minimum of 0.0635-inch- thick, galvanized-steel damper blades with maximum blade width of 8 inches .

1. Secure blades to 1/2-inch- diameter, zinc-plated axles using zinc-plated hardware, with nylon blade bearings, blade-linkage hardware of zinc-plated steel and brass, ends sealed against spring-stainless-steel blade bearings, and thrust bearings at each end of every blade.
2. Operating Temperature Range: From minus 40 to plus 200 deg F .
3. Provide parallel- or opposed-blade design with inflatable seal blade edging, or replaceable rubber seals, rated for leakage at less than 10 cfm per sq. ft. of damper area, at differential pressure of 4-inch wg when damper is being held by torque of 50 in. x lbf ; when tested according to AMCA 500D.

2.5 FIRE DAMPERS

A. Manufacturers:

1. Air Balance, Inc.
2. CESCO Products.
3. Greenheck.
4. McGill AirFlow Corporation.
5. METALAIRE, Inc.
6. Nailor Industries Inc.
7. Penn Ventilation Company, Inc.
8. Prefco Products, Inc.
9. Ruskin Company.
10. Vent Products Company, Inc.
11. Ward Industries, Inc.

B. Fire dampers shall be labeled according to UL 555.

C. Fire dampers shall be rated for dynamic HVAC systems.

D. Fire Rating: 1-1/2 hours.

E. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch- thick galvanized steel; with mitered and interlocking corners.

F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.

1. Minimum Thickness: 0.052 or 0.138 inch thick as indicated and of length to suit application.

2. Exceptions: Omit sleeve where damper frame width permits direct attachment of perimeter mounting angles on each side of wall or floor, and thickness of damper frame complies with sleeve requirements.

G. Mounting Orientation: Vertical or horizontal as indicated.

H. Blades: Roll-formed, interlocking, 0.034-inch- thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- thick, galvanized-steel blade connectors.

I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

J. Fusible Links: Replaceable, 212 deg F rated.

2.6 TURNING VANES

A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for vanes and vane runners. Vane runners shall automatically align vanes.

B. Manufactured Turning Vanes: Fabricate 1-1/2-inch- wide, double-vane, curved blades of galvanized sheet steel set 3/4 inch o.c.; support with bars perpendicular to blades set 2 inches o.c.; and set into vane runners suitable for duct mounting.

1. Manufacturers:

a. Ductmate Industries, Inc.
b. Duro Dyne Corp.
c. METALAIRE, Inc.
d. Ward Industries, Inc.

C. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

2.7 DUCT-MOUNTING ACCESS DOORS

A. General Description: Fabricate doors airtight and suitable for duct pressure class.

B. Door: Double wall, duct mounting, and rectangular; fabricated of galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class. Include 1-by-1-inch butt or piano hinge and cam latches.

1. Manufacturers:

a. American Warming and Ventilating.
b. CESCO Products.
c. Ductmate Industries, Inc.
d. Flexmaster U.S.A., Inc.
e. Greenheck.
f. McGill AirFlow Corporation.
g. Nailor Industries Inc.

h. Ventfabrics, Inc.
i. Ward Industries, Inc.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Provide number of hinges and locks as follows:

a. Less Than 12 Inches Square: Secure with two sash locks.
b. Up to 18 Inches Square: Two hinges and two sash locks.
c. Up to 24 by 48 Inches : Three hinges and two compression latches.
d. Sizes 24 by 48 Inches and Larger: One additional hinge.

C. Door: Double wall, duct mounting, and round; fabricated of galvanized sheet metal with insulation fill and 1-inch thickness. Include cam latches.

1. Manufacturers:

a. Ductmate Industries, Inc.
b. Flexmaster U.S.A., Inc.

2. Frame: Galvanized sheet steel, with spin-in notched frame.

D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.

E. Insulation: 1-inch- thick, fibrous-glass or polystyrene-foam board.

2.8 FLEXIBLE CONNECTORS

A. Manufacturers:

1. Ductmate Industries, Inc.
2. Duro Dyne Corp.
3. Ventfabrics, Inc.
4. Ward Industries, Inc.

B. General Description: Flame-retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

C. High-Temperature System, Flexible Connectors: Glass fabric coated with silicone rubber.

1. Minimum Weight: 16 oz./sq. yd. .
2. Tensile Strength: 285 lbf/inch in the warp and 185 lbf/inch in the filling.
3. Service Temperature: Minus 67 to plus 500 deg F .

2.9 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct insulation thickness.

PART 3 - EXECUTION

3.1 APPLICATION AND INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts.

B. Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel ducts.

C. Install volume dampers in ducts with liner; avoid damage to and erosion of duct liner.

D. Provide balancing dampers at points on supply, return, and exhaust systems where branches lead from larger ducts as required for air balancing. Install at a minimum of two duct widths from branch takeoff.

E. Provide test holes at fan inlets and outlets and elsewhere as indicated.

F. Install fire dampers, with fusible links, according to manufacturer's UL-approved written instructions.

G. Install duct access doors to allow for inspecting, adjusting, and maintaining accessories and terminal units as follows:

1. On both sides of duct coils.
2. Downstream from volume dampers, turning vanes, and equipment.
3. Adjacent to fire or smoke dampers, providing access to reset or reinstall fusible links.
4. To interior of ducts for cleaning; before and after each change in direction, at maximum 50-foot spacing.
5. On sides of ducts where adequate clearance is available.

H. Install the following sizes for duct-mounting, rectangular access doors:

1. Two-Hand Access: 12 by 6 inches .

I. Install the following sizes for duct-mounting, round access doors:

1. Two-Hand Access: 10 inches in diameter.

J. Label access doors according to Division 23 Section "Mechanical Identification."

K. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and motorized equipment supported by vibration isolators.

L. For fans developing static pressures of 5-inch wg and higher, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

M. Install duct test holes where indicated and required for testing and balancing purposes.

3.2 ADJUSTING

A. Adjust duct accessories for proper settings.

B. Adjust fire dampers for proper action.

C. Final positioning of manual-volume dampers is specified in Division 23 Section "Testing, Adjusting, and Balancing."

END OF SECTION 23 33 00

SECTION 23 34 23

POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Centrifugal roof ventilators.
2. Upblast roof exhaust fans.
3. Centrifugal wall ventilators.
4. Ceiling-mounting ventilators.

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on actual Project site elevations.

B. Operating Limits: Classify according to AMCA 99.

1.4 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material thickness and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.
6. Roof curbs.
7. Fan speed controllers.

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. Wiring Diagrams: Power, signal, and control wiring.
2. Design Calculations: Calculate requirements for selecting vibration isolators for designing vibration isolation bases.

3. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.

C. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Roof framing and support members relative to duct penetrations.
2. Ceiling suspension assembly members.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. 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.

B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

D. UL Standard: Power ventilators shall comply with UL 705.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

1.7 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

1.8 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. Belts: One set for each belt-driven unit.

PART 2 - PRODUCTS

2.1 CENTRIFUGAL ROOF VENTILATORS

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:

1. Greenheck.
2. Loren Cook Company.
3. Penn Ventilation.

B. Description: Direct- or belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.

C. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.

1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain drains.

D. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

E. Belt-Driven Drive Assembly: Resiliently mounted to housing, with the following features:

1. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
2. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
3. Pulleys: Cast-iron, adjustable-pitch motor pulley.
4. Fan and motor isolated from exhaust airstream.

F. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
3. Bird Screens: Removable, 1/2-inch (13-mm) mesh, aluminum or brass wire.
4. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
5. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.

G. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- (40-mm-) thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch (40-mm) wood nailer. Size as required to suit roof opening and fan base.

1. Configuration: Self-flashing without a cant strip, with mounting flang.
2. Overall Height: 12 inches (300 mm).
3. Pitch Mounting: Manufacture curb for roof slope.
4. Metal Liner: Galvanized steel.

2.2 UPBLAST ROOF EXHAUST FANS

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:

1. Greenheck.
2. Loren Cook Company.
3. Penn Ventilation.

B. Description: Direct- or belt-driven fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.

C. Wind Band, Fan Housing, and Base: Reinforced and braced galvanized steel, containing galvanized-steel butterfly dampers and rain trough, motor and drive assembly, and fan wheel.

1. Damper Rods: Steel with bronze or nylon bearings.

D. Fan Wheel: Replaceable, airfoil blades fastened to cast-aluminum hub; factory set pitch angle of blades.

E. Belt-Driven Drive Assembly: Resiliently mounted to housing; weatherproof housing of same material as fan housing with the following features:

1. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
2. Shaft Bearings: Prelubricated and sealed, self-aligning, pillow-block-type ball bearings.
3. Pulleys: Cast-iron, adjustable-pitch motor pulley.
4. Motor Mount: On outside of fan cabinet, adjustable base for belt tensioning.

F. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- (40-mm-) thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch (40-mm) wood nailer. Size as required to suit roof opening and fan base.

1. Configuration: Self-flashing without a cant strip, with mounting flange.
2. Overall Height: 12 inches (300 mm).
3. Pitch Mounting: Manufacture curb for roof slope.
4. Metal Liner: Galvanized steel.
5. Mounting Pedestal: Galvanized steel with removable access panel.

2.3 CENTRIFUGAL WALL VENTILATORS

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:

1. Greenheck.
2. Loren Cook Company.
3. Penn Ventilation.

B. Description: Direct- or belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, and accessories.

C. Housing: Heavy-gage, removable, spun-aluminum, dome top and outlet baffle; venturi inlet cone.

D. Fan Wheel: Aluminum hub and wheel with backward-inclined blades.

E. Belt-Driven Drive Assembly: Resiliently mounted to housing, with the following features:

1. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
2. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
3. Pulleys: Cast-iron, adjustable-pitch motor pulley.
4. Fan and motor isolated from exhaust airstream.

F. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through internal aluminum conduit.
3. Bird Screens: Removable, 1/2-inch (13-mm) mesh, aluminum or brass wire.
4. Wall Grille: Ring type for flush mounting.
5. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in wall sleeve; factory set to close when fan stops.

2.4 CEILING-MOUNTING VENTILATORS

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:

1. Carnes Company HVAC.
2. Greenheck.
3. Loren Cook Company.

B. Description: Centrifugal fans designed for installing in ceiling or wall or for concealed in-line applications.

C. Housing: Steel, lined with acoustical insulation.

D. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

E. Grille: Painted aluminum, louvered grille with flange on intake and thumbscrew attachment to fan housing.

F. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

G. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.
3. Manufacturer's standard transition fittings.

2.5 MOTORS

A. Enclosure Type: Totally enclosed, fan cooled.

2.6 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Support units using spring isolators having a static deflection of 1 inch (25 mm).

C. Secure roof-mounting fans to roof curbs with cadmium-plated hardware.

D. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

E. Support suspended units from structure using threaded steel rods and spring hangers having a static deflection of 1 inch (25 mm).

F. Install units with clearances for service and maintenance.

3.2 CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors.

B. Install ducts adjacent to power ventilators to allow service and maintenance.

3.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Replace fan and motor pulleys as required to achieve design airflow.

D. Lubricate bearings.

END OF SECTION 23 34 23

SECTION 23 34 24

VEHICLE EXHAUST SYSTEM

PART 1 - EXTRACTION SYSTEM OVERVIEW

1.1 The exhaust system shall be designed to vent 100 % of exhaust gases and particulate safely to the outside of the fire station. The exhaust system shall be designed and installed by factory-authorized personnel, which have been certified by the manufacturer of the exhaust system. Manufacturers shall be required to have a minimum of five years of proven experience in the manufacturing of emergency vehicle exhaust extraction equipment with a minimum of 250 installations. This experience must include a vehicle (or) vehicles that have made 1200 emergency response calls a year for a minimum of 5 years. The purpose of this section of the specification insures that the vendor has a proven system for durability in high run departments.

A. This specified requirement allows the fire department to use the exhaust system for checking the vehicle pump and engine when it is inconvenient to do so outside the station house and without creating unnecessary performance criteria.

B. System Description: The exhaust system shall be a source capture system designed to simultaneously handle 8 vehicles in 4 drive through bay areas. The 4 bays shall be provided for drive through capture of exhaust fumes from door to door operation. A fan must have capability to maintain a minimum of 600 cfm at 6" static pressure per drop.

1.2 AIRFLOW REQUIREMENTS

A. Exhaust system shall be designed to eliminate vehicle exhaust gases by creating a negative pressure vacuum from vehicle tailpipe to the inlet of the fan. Motor/ Blower curve information from the manufacturer must be provided with the bid document showing air handling capacity at various static pressure losses.

B. This exhaust system shall extract hot exhaust gases by creating a vacuum around entire exhaust tailpipe to draw the exhaust gases and particulate into the connection nozzle and induce cooler, ambient air at the universal nozzle and tailpipe adapter connection.

C. The system shall be designed to vent toxic exhaust gases when the exhaust fan is not powered up at engine start-up due to power failure by means of one-way ambient airflow tailpipe adapter that employs a high temperature silicone check valve at the nozzle connection to seal off the backwash of toxic exhaust gases when vehicle is connected to the exhaust extraction system.

D. Substantially airtight exhaust extraction systems must employ ambient air induction to cool hot gases down to save the life of the flexible hose and exhaust fan motor bearings.

E. Exhaust system hose drops shall be the same cross sectional diameter as the vehicle tailpipe or greater. Also, exhaust system shall maintain CFM that matches the cfm of the vehicle engine exhaust when running at 1500 RPM. Hose drops that do not match the size of the tailpipe and the cfm of the engine's exhaust shall not be accepted.

F. The purpose of this portion of the specification is to insure that the exhaust system is designed to cool down hot exhaust gases as they are conveyed to the outside of the fire station. This type of exhaust

extraction keeps exhaust temperatures within a safe limit to insure that flexible hoses are within their designed temperature tolerances. Exhaust systems that size exhaust drops without dilution ventilation and also down size the exhaust connection hose unnecessarily put our vehicle engine warranty at risk.

1.3 OVERALL SYSTEM PERFORMANCE

A. System must be designed solely for high temperature vehicle exhaust fire rescue applications. The system shall automatically activate, disconnect, shutdown, and reactivate during an emergency situation without human operation.

1.4 SYSTEM WARRANTY

A. Complete exhaust system warranty shall be for a minimum of 5 years.

B. Any vendor claim of proven long-term durability must be illustrated on the specific product mentioned in this specification.

C. Any system offered to the city, that adds new or nonstandard system components not normally a part of the standard design used in all other emergency vehicle response application to date, shall not be accepted.

1.5 TURNKEY INSTALLATION

A. Complete exhaust system including the exhaust fan, control box, ductwork, and magnetic extraction unit shall be proven and field tested for a minimum of 20 years in the United States of America.

B. All system components shall be labeled with manufacturer identification.

C. Installation of Exhaust System shall be accomplished by a factory authorized installation team that specializes in the business of installing emergency response exhaust systems. Installations must be performed by installers that have been trained and certified by manufacturer.

1.6 AIR TESTING

A. The overall design shall include individual systems for each apparatus that are specifically designed for the output CFM of the apparatus engine.

B. The design CFM for each vehicle shall be a minimum 600 CFM.

C. The designed CFM stated has been selected to insure that exhaust system will not restrict airflow of exhaust gases as they are ducted to the outside of the station.

D. Air balancing shall be performed to insure that the designed CFM requirements are met for each bay.

1.7 FINAL ACCEPTANCE

A. At conclusion of installation of exhaust system all vehicles in the facility will be operated for a period of 15 minutes to insure that extraction hose, ducting, and fan have been sufficiently sized for all the vehicles operating in the fire station by providing negative pressure from the connection nozzle to the exhaust fan.

PART 2

2.1 METHOD OF NOZZLE ATTACHMENT

A. The exhaust system shall be attached to the vehicle within 3 feet of the door threshold.

B. The system shall be designed so that attachment to exhaust hose is accomplished by the operator standing erect and with one simple motion connect system to vehicle.

2.2 METHOD OF NOZZLE RELEASE

A. The disconnection of the hose shall not be speed dependent and have a balancer that lifts the exhaust nozzle off the vehicle tailpipe. The nozzle must separate from the tailpipe at the same point each time regardless of the speed of the vehicle.

B. Any auto-release system that is speed sensitive requiring the driver to modify the exit speed to control the nozzle release, shall not be accepted. Any nozzle requiring support systems such as compressed air or electrical support to operate or release shall not be accepted.

C. The intent of this portion of the specification is to reduce the amount of exhaust gases that will backwash into the station house due to early release of vehicle tailpipe or reduce the risk of violent or non release if the driver outruns a trip mechanism.

D. The major benefit of this portion of the specification is to extend the life of the exhaust hose due to less stress at release of vehicle tailpipe.

PART 3

3.1 SUCTION RAIL

A. The suction rail system shall be comprised of Rail Sections which shall have aluminum top profile length of ten feet (10'). Material shall be 6063-T-5 with a standard mill finish.

B. The aluminum rail shall be constructed from a one-piece continuous extruded aluminum profile. Construction shall be 6" round in diameter, with guide rails on each side to accommodate the external trolley assembly, and a slotted profile in the top for leg and support bracing. Rail wall thickness shall be 0.150. An opening of 3" along the bottom of the rail shall incorporate slots on each side to accept a pair of molded neoprene rubber seals. Seals shall be installed into the bottom of the rail, to seal the tube and prevent the escape of exhaust gases while being extracted. A vacuumed form ABS molded end cap shall incorporate in its design, both an end cap feature and a hose connection.

B. The end cover will seal off the ends of the rail. The total weight of these rail sections shall be 6 lbs. per foot.

C. The system shall further have suspension attachments, which shall be placed a maximum of 10' apart, for the purpose of rail support, and will be mounted in pairs from roof beams or brackets.

D. Connection to a fan shall be by means of a direct connection, thru molded end cap or by fabricated sheet metal plenums. When plenums are used, connections are made on top or sides of the rail. The complete rail system shall provide means of exhaust extraction, for vehicles moving within a work area.

3.2 SUCTIONRAIL CRAB (TROLLEY) ASSEMBLY

A. The trolley assembly shall be of external guide rail design. The assembly shall be designed and constructed, using a tube frame assembly with removal outer side assemblies, and finished in a powder coated blue.

B. Four Deltron wheels, using oil less bearing design, shall insure long life and allow the trolley assembly to roll freely along the external guide rails. System crabs or trolleys that incorporate wheels that roll inside the suction rail will not comply and will be rejected.

C. The chasse shall include a fitted cone assembly, designed to part the memory sealing lips. The cone assembly shall be designed with a series of friction rollers. These rollers shall be designed to reduce the resistance between the memory lips and the cone assembly.

D. The trolley shall be fitted with a front and rear rubber bumper, designed to eliminate metal-to-metal contact, which otherwise might cause damage to the assemblies.

3.3 CRAB INLET PLENUM

A. Plenum shall be designed and manufactured from 16 gauge CRS with a powder coated silver finish. A balancer attachment ring shall be fabricated in the center of plenum, to insure complete balance and weight distribution.

B. The attachment ring shall connect the balancer to the crab assembly. This design and feature will insure that the downward force exerted on the wheels shall be evenly distributed, to insure long life to the trolley assembly and produce the most efficient overall operating results. The plenum shall incorporate an isolation damper, insuring a positive fan startup.

3.4 ADJUSTABLE SHOCK ABSORBER END STOP ASSEMBLY

A. Shock absorber assembly shall incorporate an adjustable pneumatic cylinder, capable of reducing the forward impact of the trolley assembly, without causing damage to either the suction rail or the trolley assembly.

B. The assembly must be designed to have adjustable movement throughout the entire length of the rail. The assembly shall be designed to allow for a full stop of trolley (trolleys) in less than 6”.

C. A rubber bumper shall be located on the trolley assembly and designed as a contact point. The pneumatic cylinder shall be equipped with a rubber bumper end stop. Both bumpers shall be assigned to align upon impact, and at no time shall metal to metal or plastic to metal contact be allowed.

3.5 THE SYSTEM BALANCER

A. System balancer shall be calibrated and certified to carry the hose weight and have the capability to pull nozzle off the vehicle tailpipe by using a 0.80 stainless steel aircraft cable no more than 40” in length.

B. The purpose of this portion of the specification is to have a rugged specially designed system balancer peel the nozzle from the vehicle tailpipe.

3.6 EXTRACTION SYSTEM EXHAUST HOSE

A. The flexible exhaust hose is manufactured for the sole purpose of venting high temperature exhaust gases which are produced by internal combustion engines.

B. Flexible Hose Shall be high temperature synthetic rubber impregnated into a high temperature laminated fabric with Helix wire spacing equaling 3/4" apart, continuing throughout the entire hose, with a minimum thickness of Helix wire equaling 0.080, and including a minimum overlapping thickness of 2 7/16".

C. This construction of hose must be capable of operating at a continuous temperature of 400°F and intermittent temperatures of 500°F.

D. The exhaust hose diameter shall be a minimum of 5 inches depending on the size of the vehicle engine and corresponding exhaust pipe diameter. Hoses that are 4 inch in diameter will not be accepted. Hose diameters of 5 inches and greater lessen internal air stream temperature and friction loss within the system which allows for greater air delivery by the fan.

E. Hoses shall be individually sized for each bay depending on the types of vehicles that are to be used in the bay that the Exhaust system is installed. The exhaust hose shall not have any pieced together connections so as to avoid exhaust leakage.

F. Any exhaust system that relies on static regain from the vehicle engine or uses the engine horsepower to push the hot exhaust gases into the exhaust system shall not be accepted. Any ventilation system design that allows for hose a diameter smaller then the vehicle tailpipe shall not be accepted.

G. The sole purpose of this requirement is to insure that the exhaust hose that is used for this application is rightly applied to the purpose of venting hot exhaust gases directly to the outside of the station house. This benefits the department by extending the life of the exhaust hose which is affected the most in source capture systems

3.7 UNIVERSAL NOZZLE

A. Engineered and specially designed exhaust system nozzle (female connection) that is specifically designed to fit tightly over the circumference of an engineered mating ring (male connection) that attaches to the tail pipe and attaches tightly around the ring to capture 100% of the carcinogenic exhaust fumes.

B. Incorporated in the rubber boot are 4 to 8 powerful rare earth magnets which are strategically located inside two sets of metal pole pieces that pivot in and out to allow for smooth release of vehicle tailpipe.

C. This allows smooth positioning of the nozzle over the mating ring to produce a required substantially air tight seal, eliminating backwash of exhaust fumes into the station.

D. The release of the nozzle shall be activated by a forward motion of an apparatus simultaneously causing a lifting and backward motion of the release nozzle. This action shall institute a simple mechanical release. The simple release shall be based solely on the upward pull of the system balancer, which causes the pole pieces to pivot on the tailpipe radius and release over the flared end of the tailpipe.

3.8 ALUMINUM TRANSITION ELBOW ASSEMBLY

A. The nozzle shall be fitted to Cast Aluminum Elbow Transition, manufactured from 319 aluminum and incorporating a 62° degree curved angle. A special rag screen channel cast into the elbow shall allow for easy installation of replaceable non-static preformed spring steel rag screen with black oxide finish. A large 7" inlet opening shall incorporate a 1" mounting flange with molded locating pin for easy and accurate installation of rubber boot assembly. Aluminum elbow assembly shall be offered in all hose sizes, 5 and 6 inch.

B. Removal spring wire rag screen must be preformed spring steel oxide treaded finish. Allows for easy removal.

3.9 TAILPIPE ADAPTER

A. Tailpipes that are connected to the system shall be retrofitted with a tailpipe adapter (male end). The tailpipe adapter allows the nozzle (female end) to fit tightly against the outer edge of the mating ring on tailpipe adapter.

B. The ring shall contain a series of machined 3/4" oval holes placed around the circumference of the ring which allows cool ambient air to enter into the exhaust hose reducing the temperature of the exhaust, and thereby extending the life of the exhaust hose.

C. The circumference of the mating ring shall have a one-way silicon check valve rated at a minimum 600 degrees that opens or closes depending on the exhaust system airflow condition, when air pressure is either positive or negative. When the exhaust system is in a positive mode, the one way check valve will press against the holes on the ring and close off the ambient air intake. This will prevent any backflow of exhaust into the firehouse. When air pressure in the nozzle is negative, which is the normal condition, a silicone check valve will remain open and will prevent any harmful carcinogenic materials from back washing into the apparatus bay and/or filtering into the living areas as well as cool the exhaust temperatures. Ambient air introduction at the nozzle/tailpipe adaptor will also protect the apparatus engine from backward spinning of its turbo charger when the fan is activated by another vehicle engine startup located in the adjacent bay and that apparatus is not operational. This will occur because the fan will pull air from around the tailpipe connection rather than the vehicle engine compartment.

3.10 EXHAUST FAN OVERVIEW

A. The exhaust fan shall be sized for a minimum of 600 CFM per extraction. The induction of ambient air at the tailpipe connection shall insure that the exhaust temperature at the fan will less be then 150 degrees at the fan motor. Blower curve information for the motor/ blower combination being supplied MUST be included in the submittal information.

B. Each exhaust fan shall be designed specifically for the fire station with these factors being addressed:

1 The size and total number of vehicles being attached to exhaust fan.
2. The overall design of fire & emergency vehicle bays.
3. The location of the living quarters.
4. The existing electrical phase
5. The physical location of the fire station in the community that is served by the fire department (The sound level of the fan motor while in operation).

C. The exhaust fan shall be sized for a minimum of 600 CFM per extraction unit unless larger or smaller vehicles are being attached to exhaust system. The induction of ambient air at the tailpipe connection shall insure that the exhaust temperature at the fan will less be then 150 degrees at the fan motor.

D. The sound decibels generated by the fan motor and impeller shall not exceed 81 Db at 5 feet. A silencer is recommended for applications greater than this to further lessen noise levels.

E. No motor that allows exhaust temperatures in excess of 200 degrees shall be accepted, this requirement insures long life the exhaust fan motor and bearings.

F. Pump Checks Option: System shall allow for pump checks to be conducted indoors. System shall allow for pump checks to be conducted for 15 minutes or more without damage to the system. Exhaust fan system shall provide negative pressure from system nozzle connection to exhaust fan inlet ductwork.

3.11 FAN AIRFLOW CRITERIA

A. Shall be designed as a pre-engineered exhaust fan designed for the sole purpose of exhausting Volatile Organic Compound (VOC) and carcinogenic compounds generated by internal combustion engines designed to propel any motor vehicle.

B. The exhaust fan should operate automatically only during the point of when electrical power is administered to the totally enclosed fan motor.

C. Blower wheel design shall be backward inclined with minimum horsepower motor to produce the desired results for optimum efficiency and long term viability. Operating static pressure to be 6" water column.

D. Fan shall be capable of delivering a minimum of 600 CFM at 6" negative static pressure for 5" diameter hose drops.

E. Fan will not be designed with static regain from vehicle engine to assist in meeting the performance criteria mentioned in next paragraph. At no point shall the diameter of the hose drop be less then diameter of vehicle tailpipe.

3.12 PHYSICAL FAN DATA

A. Fan housing shall be heavy gauge welded steel construction suitable for temperatures up to 250 degrees. Housings shall be provided with drilled inlet and discharge flanges. The discharge flange shall be "full flange" design.

B. The housing frame shall be constructed with four flat sides to allow for discharge change to vertical or horizontal positions with disassembly of unit.

C. Fan Impeller blower wheel shall be backward curved single thickness aluminum blade design.

D. Welds on fan housing shall be performed by a factory qualified personnel who have met the requirements of ASME Section IX.

E. The first resonant speed of each rotor shall be not less than 125 percent of normal operating.

F. Rotor shall be two plane dynamically balanced to a maximum final vibration level of 1.0 mil.

G. Fan Motor shall be UL listed and manufactured by a readily available nationally recognized motor manufacturer. Motor shall be a permanently sealed and lubricated motor. Motor shall be supplied as a totally enclosed fan cooled or non-ventilated type with a readily available NEMA frame from 56-145Tand designed for an application where standard use is intermittent starts on average of ten times per day.

H. Fan Motor base frame shall be constructed with four flat sides to allow for discharge to change from vertical or horizontal positions without disassembly of fan housing.

I. Motor bearings shall be heavy duty anti-friction, self aligning ball or roller bearings with positive shaft locking.

J. Fan Motor Vibration Isolation shall be manufactured as a complete assembly to assure the least possible vibration or movement. Fan wheel shall be both statically and dynamically balanced.

K. Fan Motor Power shall be 3 phase whenever readily available in station. Single phase shall only be used when the cost of providing 3-phase power becomes prohibitive or when adequate supply of usable breakers is not available or otherwise instructed by the city.

L. Fan Motor Labeling and Identification must bear the same manufacturers name as the primary exhaust ventilation equipment and electrical controller operating it. Also listed on labeling shall be model number, RPM, pressure, inlet size, outlet size, temperature limitations, Brake Horse Power (BHP), CFM, class, and any warning labels or instructions required by Underwriters laboratories (UL).

3.13 SYSTEM DUCTWORK

A. All galvanized ductwork shall be spiral G-90 galvanized pipe and shall be a minimum of 26-gage pipe sizes for 4” – 8” in diameter, 24-gage pipe for sizes 8.5” – 15” in diameter, and 22-gage pipe for sizes 16” – 22” in diameter.

B. Duct Seals on the connection shall be with 400-degree silicone. Brazing and welding at joints are not required because duct system is designed for 7” of negative pressure and at these pressures the silicone sealant is sufficient to seal the system. The lateral fittings shall be brazed or welded and must be designed with a minimum 45-degree branch taps for a smooth convergence of a two or more airstreams.

C. If duct system is designed for more than 7” static pressure than welding, brazing, and additional mechanical seals shall be required for the sole purpose that ductwork is used as an extension of the exhaust pipe and at times is placed under positive pressure.

3.14 AUTO-START CONTROL SYSTEM

A. Shall be designed to sense the output pressure which is normally generated by any internal combustion engine designed to operate any gas or diesel engine. The operating logic must be designed to complete this cycle. When the nozzle is connected to the vehicle's exhaust tailpipe and the vehicle is started by the operator an automatic controller, senses the increased output pressure and energizes the exhaust fan. A low voltage timer will keep the exhaust fan operating for a period of time designated by fire department procedures.

B. Electrical Controller must be UL listed/approved and manufactured in accordance with Underwriters Laboratories standard UL-508 for enclosed industrial control panels and incorporate a limited energy control circuit.

C. Control Panel enclosure must be NEMA 4X rated and UL standard 508A (CSA standard 22.2 No 14) Fiberglass material must meet the UL 746C standard.

D. System control unit mounted electrical enclosure to restrict access of internal components of controller by only authorized entry.

E. Electrical contactor shall be Allen Bradley industrial electrical contactor provided with the appropriate adjustable overload relays to meet the proper full load amperage of motor it is designed to control. Contactor must conform to the following standards: BS-5424, VDE0660, and approved by UL certification as an approved component.

F. Controller transformer to be UL listed industrial control circuit transformer with primary and secondary fuse blocks. Transformer must be provided with multi-tap primary 208V through 480V, AC, and 24V through 120V secondary.

G. Controller timer shall be solid state, 60.-min variable timer. Operating logic must complete this cycle. Input voltage is applied to the timer at all times. Upon closure of a normally open isolated start switch, the load energizes and remains energized as long as the switch is closed. When the start switch opens, the timing cycle starts. At the end of the present time delay, the load de-energizes and the timer is ready for a new timing cycle. Timer must be UL recognized component under file number E65038.

H. System pressure sensor must be engine pressure sensing type capable of recognizing the output pressure of any type of motor vehicle. Electrical contact must be dry type and not exceed 24V.

I. Stop/Start Switch located on exterior of Controller shall be a red illuminated contact button. This device must meet UL type 4X rating. Indicator light/start button must be mounted on the enclosure cover and be identified by engraved ledger plate.

J. Shall be provided and secured permanently to the exterior of electrical controller, indicating the manufacturer, their address and telephone number, user instructions and any warnings or cautions required by Underwriter Laboratories.

K. Controller Supplier will fully guarantee a minimum of two-year warranty on parts. Exceptions are obvious misuse and/or abuse to the system.

L. Shall be offered with optional Wireless low-voltage Sensor operation.

M. Shall be offered with optional Ignition Start wireless control from apparatus if required.

3.15 POINT OF ORIGIN:

A. Equipment shall be manufactured by a U.S. Company that is headquartered in the United States of America. All components shall be American Standard. All standards of quality must be meet and adhered to including but not limited to: UL, NFPA, AMCA, IMC, ASME, UMC, NEC and all local and state building codes.

B. Company providing the exhaust venting system must have a U.S.A. ISO 9001:2008 current certification. A copy of the document must be provided with the bid package.

END OF SECTION 23 34 24

SECTION 23 37 13

DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.

1.3 SUBMITTALS

A. Product Data: For each product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate Drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Ceiling suspension assembly members.
2. Method of attaching hangers to building structure.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
5. Duct access panels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the products specified.

2.2 GRILLES AND REGISTERS

A. Fixed Face Grille and Register:

1. Manufacturers:

a. Metalaire Industries
b. Nailor Industries of Texas Inc.
c. Price Industries.
d. Titus.

2. General: Material, finish, face arrangement, frame, mounting frame, mounting, and damper requirements are indicated on the plans.

2.3 CEILING DIFFUSER OUTLETS

A. Rectangular and Square Ceiling Diffusers:

1. Manufacturers:

a. METALAIRE, Inc.; Metal Industries Inc.
b. Nailor Industries of Texas Inc.
c. Price Industries.
d. Titus.

2. General: Material, finish, face size, face style, mounting, pattern, damper and accessories are indicated on the plans.

B. Louver Face Diffuser:

1. Manufacturers:

a. METALAIRE, Inc.; Metal Industries Inc.
b. Nailor Industries of Texas Inc.
c. Price Industries.
d. Titus.

2. General: Material, finish, face size, mounting, Pattern, dampers, and accessories are indicated on the plans.

2.4 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 23 37 13

SECTION 23 63 23

CONDENSING UNITS

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 GENERAL DESCRIPTION

B. This section includes the design, controls and installation requirements for air-cooled condensers / condensing units.

1.3 QUALITY ASSURANCE

A. Unit shall be certified in accordance with UL Standard 1995/CSA C22.2 No. 236, Safety Standard for Heating and Cooling Equipment.

B. Unit and refrigeration system shall comply with ASHRAE 15, Safety Standard for Mechanical Refrigeration.

C. System Seasonal Energy Efficiency Ratio/Energy Efficiency Ratio (SEER/EER) shall be equal to or greater than prescribed by ASHRAE 90.1, Energy Efficient Design of New Buildings except Low-Rise Residential Buildings.

D. Unit shall be safety certified by ETL and be ETL US and ETL Canada listed. Unit nameplate shall include the ETL/ETL Canada label.

1.4 SUBMITTALS

C. Product Data: Literature shall be provided that indicates dimensions, operating and shipping weights, capacities, ratings, factory supplied accessories, electrical characteristics, and connection requirements. Installation, Operation and Maintenance manual with startup requirements shall be provided.

D. Shop Drawings: Unit drawings shall be provided that indicate assembly, unit dimensions, construction details, clearances, and connection details. Wiring diagram shall be provided with details for both power and control systems and differentiate between factory installed and field installed wiring.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Unit shall be shipped with doors bolted shut to prevent damage during transport and thereafter while in storage awaiting installation.

B. Follow Installation, Operation and Maintenance manual instructions for rigging, moving, and unloading the unit at its final location.

C. Unit shall be stored in a clean, dry place protected from construction traffic in accordance with the Installation, Operation and Maintenance manual.

1.6 WARRANTY

D. Manufacturer shall provide a “parts only” warranty for a period of 12 months from the date of equipment startup or 18 months from the date of shipment, whichever is less. Warranty shall cover material and workmanship that prove defective, within the specified warranty period, provided manufacturer’s written instructions for installation, operation and maintenance have been followed. Warranty excludes parts associated with routine maintenance and refrigerant.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Products shall be provided by the following manufacturers:

1. AAON
2. Carrier
3. York,
4. Trane
5. Substitute equipment may be considered for approval that includes at a minimum:
    a. R-410A refrigerant
    b. Hinged access doors with lockable handles
    c. All other provisions of the specifications must be satisfactorily addressed

2.2 CONDENSING UNITS

A. General Description

1. Condensing unit shall include compressors, air-cooled condenser coils, condenser fans, suction and liquid connection valves, and unit controls.
2. Condenser shall include air-cooled condenser coils, condenser fans, discharge and liquid connection valves, and unit controls.
3. Unit shall be factory assembled and tested including leak testing of the coil and run testing of the completed unit. Run test report shall be supplied with the unit in the controls compartment’s literature pocket.
4. Unit shall have decals and tags to indicate lifting and rigging, service areas and caution areas for safety and to assist service personnel.
5. Unit components shall be labeled, including pipe stub outs, refrigeration system components and electrical and controls components.
6. Installation, Operation and Maintenance manual shall be supplied within the unit.
7. Laminated color-coded wiring diagram shall match factory installed wiring and shall be affixed to the interior of the control compartment’s access door.

8. Unit nameplate shall be provided in two locations on the unit, affixed to the exterior of the unit and affixed to the interior of the control compartment's access door.

B. Construction

1. Unit shall be completely factory assembled, piped, wired and shipped in one section.

2. Unit shall be specifically designed for outdoor application.

3. Condenser coils shall be mechanically protected from physical damage by painted galvanized steel louvers (wire grille) covering the full area of the coil.

4. Access to condenser coils, condenser fans, compressors, and electrical and controls components shall be through hinged access doors with quarter turn, zinc cast, lockable handles.

5. Exterior paint finish shall be capable of withstanding at least 1,000 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.

6. Unit shall include a forkliftable base.

C. Electrical

1. Control circuit transformer and wiring shall provide 24 VAC control voltage from the line voltage provided to the unit.

   a. Air-source heat pump shall include a defrost cycle to prevent frost accumulation on the outdoor coil during heat pump heating operation. Defrost cycle shall begin when outdoor coil temperature is below a fixed setpoint and have a fixed 10 minute run time, or end when the outdoor coil temperature is above a fixed setpoint. Defrost timer, with 30/60/90 minute selectable defrost cycle interval time, shall be factory installed in the controls compartment. During defrost cycle all compressors shall energize, reversing valve shall de-energize, and auxiliary heat shall energize.

   b. Unit shall be provided with phase and brown out protection which shuts down all motors in the unit if the electrical phases are more that 10% out of balance on voltage, the voltage is more that 10% under design voltage, or on phase reversal.

D. Refrigeration System

1. Compressors shall be scroll type with thermal overload protection, independently circuited, and carry a 5 year non-prorated warranty.

2. Each compressor shall include a crankcase heater.

3. Compressors shall be mounted in an isolated service compartment which can be accessed without affecting unit operation. Lockable hinged access doors shall provide access to the compressors.

4. Compressors shall be isolated from the base pan with the compressor manufacturer's recommended rubber vibration isolators, to reduce any transmission of noise from the compressors into the building area.

5. Each refrigeration circuit shall be equipped with automatic reset low pressure and manual reset high pressure refrigerant safety controls, Schrader type service fittings on both the high pressure

and low pressure sides, and service valves for liquid and suction connections. Liquid line filter driers shall be factory provided. Finished field installed refrigerant circuits shall include the low side cooling components, refrigerant, thermal expansion valve, liquid line (insulated hot gas bypass line) (insulated hot gas line) and insulated suction line.

6. Unit shall include a factory holding charge of R-410A refrigerant and oil.

7. Each compressor shall be equipped with a 5 minute off, delay timer to prevent compressor short cycling.

    a. Unit shall include a variable capacity scroll compressor on the lead refrigeration circuit which shall be capable of modulation from 10-100% of its capacity.

    b. Lead refrigeration circuit shall be provided with hot gas reheat coil in the matching air handler, modulating valves, electronic controller, supply air temperature sensor and a dehumidification control signal terminal which allow the unit to have a dehumidification mode of operation, which includes supply air temperature control to prevent supply air temperature swings and overcooling of the space.

    c. Unit shall be configured as an air-source heat pump. Each refrigeration circuit shall each be equipped with a liquid line filter drier with check valve, reversing valve, accumulator, and thermal expansion valves on both the indoor and outdoor coils. Reversing valve shall energize during the heat pump heating mode of operation.

    d. Condensing unit shall be provided with on/off condenser fan cycling head pressure control and adjustable compressor lockout to allow cooling operation down to 35°F.

E. Condensers

1. Air-Cooled Condenser

    a. Condenser fans shall be vertical discharge, axial flow, direct drive fans.

    b. Fan motor shall be weather protected, single phase, direct drive, and open drip proof with inherent overload protection.

    c. Coils shall be designed for use with R-410A refrigerant and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and aluminum end casings. Fin design shall be sine wave rippled.

    d. Coils shall be designed for a minimum of 10°F of refrigerant sub-cooling.

    e. Coils shall be helium leak tested.

F. Controls

1. Standard Terminal Block – Disconnect provided by electrical.

    a. Unit shall be provided with a terminal block for field installation of controls.

PART 3 - EXECUTION

3.1 INSTALLATION, OPERATION, AND MAINTENANCE

A. Installation, Operation and Maintenance manual shall be supplied with the unit.

B. Installing contractor shall install unit, including field installed components, in accordance with Installation, Operation and Maintenance manual instructions.

C. Start up and maintenance requirements shall be complied with to ensure safe and correct operation of the unit.

END OF SECTION 23 63 23

SECTION 23 73 23

AIR HANDLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Air handler and accessories complete with controls.
2. Air filters.
3. Electric heater.
4. Refrigeration components.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each of the following:

1. Air handler.
2. Thermostat.
3. Air filter.
4. Electric heater.
5. Refrigeration components.

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. Wiring Diagrams: Power, signal, and control wiring.

C. Operation and Maintenance Data: For each air handler to include in emergency, operation, and maintenance manuals for each of the following:

1. Air handler.
2. Air filter.
3. Electric heater.
4. Refrigeration components.

D. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. 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.

B. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of air handlers that fail in materials or workmanship within specified warranty period:

1. Warranty Period, Commencing on Date of Substantial Completion:

a. Five years.

PART 2 - PRODUCTS

2.1 ELECTRIC FURNACES

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:

1. AAon.

2. Carrier Corporation; Div. of United Technologies Corp.
3. Trane.
4. York International Corp.
5. Daikin.

B. General Requirements for Electric Furnaces: Factory assembled, piped, wired, and tested.

C. Cabinet: Steel, with duct liner.

1. Duct Liner: Fiberglass, minimum 3/4 inch (19 mm) thick, complying with ASTM C 1071 and having a coated surface exposed to airstream complying with NFPA 90A or NFPA 90B and with NAIMA's "Fibrous Glass Duct Liner Standard."
2. Factory paint external cabinets in manufacturer's standard color.

D. Fan: Centrifugal, factory balanced, resilient mounted, direct drive.

1. Special Motor Features: Multitapped, multispeed with internal thermal protection and permanent lubrication.

E. Electric-Resistant Heating Elements: Helix-wound, nickel-chromium wire-heating elements in ceramic insulators mounted on steel supports.

F. Heating-Element Control: Sequencer relay with relay for each element; switches elements on and off, with delay between each increment; initiates, stops, or changes fan speed.

2.2 THERMOSTATS

A. Solid-State Thermostat: Wall-mounting, programmable, microprocessor-based unit with automatic switching from heating to cooling, preferential rate control, seven-day programmability with minimum of four temperature presets per day, and battery backup protection against power failure for program settings.

B. Control Wiring: Unshielded twisted-pair cabling.

1. No. 24 AWG, 100 ohm, four pair.

2.3 AIR FILTERS

A. Disposable Filters: 1-inch- (25-mm-) thick, disposable, fiberglass type.

2.4 REFRIGERATION COMPONENTS

A. General Refrigeration Component Requirements:

1. Refrigeration compressor, coils, and specialties shall be designed to operate with HCFC-free refrigerants.
2. Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE/IESNA 90.1, "Energy Standard for Buildings except Low-Rise Residential Buildings."
3. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE/IESNA 90.1, "Energy Efficient Standard for Buildings except Low-Rise Residential Buildings."

B. Refrigerant Coil: Copper tubes mechanically expanded into aluminum fins. Comply with ARI 210/240, "Unitary Air-Conditioning and Air-Source Heat Pump Equipment." Match size with furnace. Include condensate drain pan with accessible drain outlet.

1. Refrigerant Coil Enclosure: Steel, matching furnace and evaporator coil, with access panel and flanges for integral mounting at or on furnace cabinet and galvanized sheet metal drain pan coated with black asphaltic base paint.

C. Refrigerant Line Kits: Annealed-copper suction and liquid lines factory cleaned, dried, pressurized with nitrogen, sealed, and with suction line insulated. Provide in standard lengths for installation without joints, except at equipment connections.

1. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I, 3/8 inch (9.5 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine factory-installed insulation before air handler installation. Reject units that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for refrigerant piping systems to verify actual locations of piping connections before equipment installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Suspended Units: Suspend from structure using threaded rods, spring hangers, and building attachments. Secure rods to unit hanger attachments. Adjust hangers so unit is level and plumb.

B. Base-Mounted Units: Secure units to substrate. Provide optional bottom closure base if required by installation conditions.

1. Anchor furnace to substrate to resist code-required seismic acceleration.

C. Controls: Install thermostats at mounting height of 48 inches (1500 mm) above floor.

D. Wiring Method: Install control wiring in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal control wiring except in unfinished spaces.

E. Install remote air-cooled condensing units on equipment supports specified. Anchor units to supports with removable, cadmium-plated fasteners.

3.3 CONNECTIONS

A. Install piping adjacent to equipment to allow service and maintenance.

B. Connect ducts to air handler.

C. Connect refrigerant tubing kits to refrigerant coil in air handler and to air-cooled, compressor-condenser unit.

1. Flared Joints: Use ASME B16.26 fitting and flared ends, following procedures in CDA's "Copper Tube Handbook."
2. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Perform electrical test and visual and mechanical inspection.
2. Leak Test: After installation, charge systems with refrigerant and oil and test for leaks. Repair leaks, replace lost refrigerant and oil, and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.
4. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.
5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 STARTUP SERVICE

A. Complete installation and startup checks according to manufacturer's written instructions and perform the following:

1. Inspect for physical damage to unit casings.
2. Verify that access doors move freely and are weathertight.
3. Clean units and inspect for construction debris.
4. Verify that all bolts and screws are tight.
5. Verify that controls are connected and operational.

B. Start unit according to manufacturer's written instructions and complete manufacturer's operational checklist.

C. Measure and record airflows.

D. Verify proper operation of capacity control device.

E. After startup and performance test, lubricate bearings.

3.6 ADJUSTING

A. Adjust initial temperature set points.

B. Set controls, and other adjustments for optimum heating performance.

3.7 CLEANING

A. After completing installation, clean air handlers internally according to manufacturer's written instructions.

B. Install new filters in each air handler within 14 days after Substantial Completion.

3.8 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 23 73 23

SECTION 23 81 13

PACKAGED TERMINAL HEAT PUPMS

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 terminal heat pumps and their accessories and controls, in the following configurations:

1. Through the wall.
2. Heating and cooling unit.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Show installation details for wall penetrations.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Field quality-control test reports.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for packaged terminal air conditioners.

E. Operation and Maintenance Data: For packaged terminal heat pumps to include in emergency, operation, and maintenance manuals.

F. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of packaged terminal air conditioners and are based on the specific system indicated.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

C. 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.

D. Energy-Efficiency Ratio: Equal to or greater than prescribed by International Energy Code, and ASHRAE/IESNA 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

E. Units shall be designed to operate with HCFC-free refrigerants.

1.5 COORDINATION

A. Coordinate layout and installation of packaged terminal air conditioners and wall construction with other construction that penetrates walls or is supported by them.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of packaged terminal air conditioners that fail in materials or workmanship within specified warranty period.

B. Warranty Period for Sealed Refrigeration System: Manufacturer's standard, but not less than five years from date of Substantial Completion, including components and labor.

C. Warranty Period for Nonsealed System Parts: Manufacturer's standard, but not less than five years from date of Substantial Completion, including only components and excluding labor.

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:

1. Friedrich Air Conditioning Co.
2. GE Co.; GE Appliances.
3. Trane Company (The); North American Commercial Group.
4. AMANA Corporation.

2.2 MANUFACTURED UNITS

A. Description: Factory-assembled and tested, self-contained, packaged terminal air conditioner with room cabinet, electric refrigeration system, heating, and temperature controls; fully charged with refrigerant and filled with oil.

1. Power Supply: Cord-connected chassis for 230/208-V units.

B. Cabinet: 0.052-inch- (1.32-mm-) thick, galvanized steel with removable front panel with concealed latches.

1. Mounting: Wall with wall sleeve.
2. Finish: Manufacturer's standard finish.
3. Discharge Grille and Access Door: Punched-louver discharge grille allowing four-way discharge-air pattern, with hinged door in top of cabinet for access to controls.
4. Subbase: Enameled steel with adjustable leveling feet and adjustable end plates.
5. Wall Sleeves: Manufacturer's standard wall sleeves with thermal and acoustical insulation.
6. Louvers: Architectural grille, Extruded aluminum, with choice of finish by the architect.
7. Outdoor-Air Intake: Unless indicated otherwise, Minimum 65 cfm (30 l/s) with operable damper and replaceable filter.

C. Refrigeration System: Direct-expansion indoor coil with capillary restrictor, hermetically sealed scroll compressor with internal spring isolation, external isolation, and overload protection. Include the following:

1. Motor: Comply with requirements in Division 15 Section "Motors."
2. Outdoor coil and fan.
3. Accumulator.
4. Constant-pressure expansion valve.
5. Refrigerant Charge: R-410A.

D. Indoor Fan: Forward curved, centrifugal, with two-speed motor having a quiet noise rating and positive-pressure ventilation damper with concealed manual operator.

E. Filters: Washable polyurethane in molded plastic frame.

F. Electric-Resistance Heating Coil: Nickel-chromium-wire, electric-resistance heating elements with contactor and high-temperature-limit switch.

G. Condensate Drain: Drain pan to direct condensate to outdoor coil for re-evaporation with slinger ring around outside of outdoor fan. Provide additional drain kit to direct excess condensate to building exterior.

H. Outdoor Fan: Propeller type with separate motor having a quiet noise rating.

1. Motor: Comply with requirements in Division 15 Section "Motors."

2.3 CONTROLS

A. Control Module: Unit-mounted adjustable thermostat with heat anticipator, off-heat-auto-cool switch, and high-low fan switch.

B. Low Ambient Lockout Control: Prevents cooling-cycle operation below 40 deg F (5 deg C), outdoor-air temperature.

C. Fan-Cycle Switch: Allows fan operating mode to be either continuous or cycled on and off by thermostat.

D. Temperature-Limit Control: Prevents occupant from exceeding preset setup temperature.

E. Compressor Override: Manual switch prevents compressor operation.

F. Outdoor Air: Manual intake damper.

2.4 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Factory test to comply with ARI 270, "Sound Rating of Outdoor Unitary Equipment."

B. Unit Performance Ratings: Factory test to comply with ARI 310/380, "Packaged Terminal Air-Conditioners and Heat Pumps."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb, maintaining manufacturer's recommended clearances and tolerances.

B. Install wall sleeves in finished wall assembly; seal and weatherproof.

3.2 CONNECTIONS

A. Electrical System Connections: Comply with applicable requirements in Electrical Sections for power wiring, switches, and motor controls.

B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Inspect for and remove shipping bolts, blocks, and tie-down straps.
2. After installing packaged terminal air conditioners and after electrical circuitry has been energized, test for compliance with requirements.

3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove malfunctioning units, replace with new units, and retest as specified above.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. After installation, verify the following:

1. Unit is level on base and is flashed in exterior wall.
2. Unit casing has no visible damage.
3. Compressor, air-cooled condenser coil, and fans have no visible damage.
4. Labels are clearly visible.
5. Controls are connected and operable.
6. Shipping bolts, blocks, and tie-down straps are removed.
7. Filters are installed and clean.
8. Drain pan and drain line are installed correctly.

C. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements in Division 16 Sections.

D. Complete installation and startup checks according to manufacturer's written instructions, including the following:

1. Lubricate bearings on fan.
2. Check fan-wheel rotation for correct direction without vibration and binding.

E. After startup service and performance test, change filters.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged terminal air conditioners.

END OF SECTION 23 81 13

SECTION 23 81 26

MINI-SPLIT AIR-CONDITIONING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes split-system air-conditioning and heat pump units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed or concealed mounting, and may be connected to ducts.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

F. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated.

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.

C. Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

D. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

E. Units shall be designed to operate with HCFC-free refrigerants.

1.5 COORDINATION

A. Coordinate size, location, and connection details with roof curbs, equipment supports, and roof penetrations.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

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:

1. Carrier Air Conditioning; Div. of Carrier Corporation.
2. Mitsubishi Electronics America, Inc.; HVAC Division.
3. Sanyo Fisher (U.S.A.) Corp..
4. Daikin
5. LG

2.2 WALL-MOUNTING, EVAPORATOR-FAN COMPONENTS

A. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.

B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

C. Fan: Direct drive, centrifugal fan.

D. Fan Motors: Comply with requirements in Division 15 Section "Motors."

1. Special Motor Features: Multitapped, multispeed with internal thermal protection and permanent lubrication.

E. Filters: Permanent, cleanable.

2.3 AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS

A. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.

B. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

1. Compressor Type: Reciprocating or Scroll.
2. Compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
3. Refrigerant Charge: R-410A.

C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid subcooler.

D. Heat Pump Components: Reversing valve and low-temperature air cut-off thermostat.

E. Fan: Aluminum-propeller type, directly connected to motor.

F. Motor: Permanently lubricated, with integral thermal-overload protection.

G. Low Ambient Kit: Permits operation down to 45 deg F (7 deg C).

H. Mounting Base: Polyethylene.

2.4 ACCESSORIES

A. Thermostat: Low voltage with subbase to control compressor and evaporator fan.

B. Thermostat: Wireless infrared functioning to remotely control compressor and evaporator fan, with the following features:

1. Compressor time delay.
2. 24-hour time control of system stop and start.
3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
4. Fan-speed selection, including auto setting.

C. Automatic-reset timer to prevent rapid cycling of compressor.

D. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install compressor-condenser components on equipment supports. Anchor units to supports with removable, cadmium-plated fasteners.

D. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

A. Install piping adjacent to unit to allow service and maintenance.

B. Ground equipment.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 23 81 26

SECTION 26 00 00

ELECTRIAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE

A. General Conditions of the Contract, Special Conditions and Instructions to Bidders contained herein are a part of these specifications.

B. This Contractor shall furnish all labor, materials and equipment and perform all operations necessary for installation of complete electrical work within the intent of, and as indicated on, the Drawings and as herein specified.

1.2 CONTRACT DOCUMENTS

A. The contract drawings are diagrammatic and are not intended to indicate every detail of construction, or every item of material or equipment required.

B. Contractor shall maintain on the job site one complete set of contract documents of all trades, and shall coordinate with other trades so as to avoid conflicts.

C. Indicated locations of outlets, equipment connections, etc. are approximate and shall be verified by reference to related documents (i.e., Architectural casework drawings, equipment shop drawings, etc.).

1.3 RECORD DRAWINGS

A. During construction of this project, contractor shall maintain one complete set of electrical contract drawings, on which shall be recorded all significant changes in equipment locations, circuit assignments, etc. This set of drawings shall be used to prepare as-built drawings to be submitted to Owner upon completion.

B. Upon completion of the project, contractor shall prepare operation and maintenance manuals for all electrical equipment, which shall include shop drawings, catalog data, equipment information, detailed maintenance instruction, wiring diagrams, warranty information, etc. for the electrical installation. Submit three copies to the Architect/Engineer for approval and presentation to the Owner.

1.4 REGULATIONS AND COMPLIANCE

A. Latest editions of National Electrical Code, state codes or ordinances govern this work. All their requirements shall be satisfied.

B. This Contractor shall secure and pay for all permits, fees, inspections and licenses required (see Article 10 of the General Conditions). Upon completion of job, he shall present to the Architect/Engineer a certificate of inspection and approval from inspection authorities.

1.5 UTILITY COORDINATION

A. This Contractor shall verify with the serving electric, telephone and cable TV utilities all respective utility requirements for the provision of service for this project. All fees, materials and labor required for service installations shall be included in the bid.

B. Should utility requirements vary greatly from those shown on the drawings, the contractor shall notify the Architect/Engineer of those requirements prior to bid. Additional costs associated with utility services shall not be grounds for change order without pre-bid notification or bid clarification.

1.6 TEST AND GUARANTEE

A. Upon completion of work, contractor shall demonstrate installation and make such test as may be required to satisfy the Architect/Engineer and Owner that work is installed in accordance with drawings, specifications and instructions.

B. Contractor shall guarantee the work done in accordance with drawings and specifications, and to be free of imperfect materials and defective workmanship. Anything unsatisfactory shall be corrected immediately and at contractor's expense.

C. For a period of one year after acceptance, contractor shall replace, without any expense to the Owner, any imperfect materials or defective workmanship.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials shall be new, with required Underwriter's Laboratories label, and manufacturer's label or nameplate giving complete electrical data.

B. Where a manufacturer's catalog number is used, all parts shall be furnished to make it complete and fit the construction intended.

2.2 SUBMITTALS, ETC.

A. Within twenty days after award of contract, contractor shall submit to Architect/Engineer a complete list in triplicate of ALL materials he proposes to use. List shall show a single manufacturer for each item. List shall include not only major materials and equipment, but also such items as conduit fittings, bushings, ground clamps, anchors, outlet boxes, gutters, terminal cabinets, splice connections, fuses, etc.

B. Materials shall be provided by manufacturer and catalog number given in these specifications or shown on drawings or approved equal. If contractor wishes to furnish another make or number, he shall furnish complete, detailed data and obtain approval of it in writing from the Architect/ Engineer.

C. Submit cuts of fixtures, shop drawings on panels, and any other descriptive materials requested, in six copies.

D. Completely adequate housing shall be provided on the site for orderly and careful storage of all materials and equipment.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Required excavation and backfill for installation of all electrical work shall be provided by the Electrical Contractor.

3.2 CUTTING, PATCHING, ETC.

A. Contractor shall place his own sleeves and advise other trades of required chases and openings so they can be properly built-in. Where any raceways, supports, etc. installed under this contract pierce the roof, suitable pitch pockets shall be provided and coordinated with the roofing contractor as necessary to maintain roof warranty and to be acceptable to the Architect. Provide suitable fittings where any raceways or equipment cross expansion joint. Expansion fittings shall be complete with grounding type bond fittings.

B. Permitted cutting or patching necessary to the electrical installation shall be done by this contractor. Structural members shall not be cut except by written permission of Architect/Engineer.

3.3 CLEANING, ETC.

A. Contractor shall properly protect his work against damage by weather or other trades. All work shall be left well cleaned, and damaged finishes shall be restored to original condition.

B. Contractor shall keep premises free of debris resulting from his work.

3.4 PAINTING, FINISHING

A. Suitable finishes shall be provided on all items of electrical equipment, conduit, etc. which are exposed. This shall consist of either an acceptable finish as manufactured and supplied to the job or application of suitable finishes after installation.

B. Where installed in finished areas, exposed equipment, raceways, etc. (eg. panel covers, wiremold, etc.) shall be supplied with prime coat, and shall be professionally painted or enameled as directed to match or blend with adjacent surfaces.

C. In unfinished areas, such as equipment rooms, etc., exposed equipment shall be furnished with suitable factory applied finishes. (i.e., standard gray enamel finish for panelboards, etc.).

D. Equipment furnished in finishes such as stainless steel, brushed aluminum, etc. shall not be painted.

E. All finishing shall be as directed by and shall be satisfactory to the Architect/Engineer.

3.5 EQUIPMENT LABELS

A. Suitable labels shall be provided for the identification of major items of electrical equipment including switchboards, panelboards, motor starters, safety switches, enclosed circuit breakers, etc.

B. Labels shall be of engraved plastic laminate, not less than 1/16" thick, with black letters on white field.

C. Engraving shall be of professional quality, with block style letters, minimum 1/4" high.

D. Nameplates shall be attached with 2 cadmium plated screws. Nameplates shall under no conditions be attached with epoxy glue or double stick tape.

E. All conduit penetrations of fire-rated assemblies shall be protected by a UL approved penetration system. This Contractor shall field verify all required locations.

END OF SECTION 26 00 00

SECTION 26 05 19

CONDUCTORS

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install a complete system of wiring and cable as shown, specified and required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Conductors shall be as manufactured by Phelps Dodge, Anaconda, Triangle, Southwire, or approved equivalent.

B. Normal trade standard "Building Wire", copper, types THHN for dry locations, THWN for wet locations. Feeders rated greater than 150 amperes may utilize compact aluminum conductors, XHHW or XHHW-Z insulation equivalent to Alcan Stabiloy 8000 series. All wire to be used shall be new manufactured within the last 6 months.

C. Conductors #10 AWG and smaller shall be solid. #8 AWG and larger shall be stranded.

D. Each conductor shall bear easily readable markings along entire length, indicating size and insulation type. Dates of manufacturer shall be submitted to Architect/Engineer upon request.

E. Insulation on conductors #8 AWG and smaller shall be suitably colored in manufacturing.

F. Insulation on service and feeder conductors shall be 600 volt type THW, or THWN, unless code requires a different type.

G. Branch circuit conductors shall be minimum #12 AWG, with 600 volt type THWN insulation, unless code requires a different type.

H. Conductors in any location subject to abnormal temperature shall be furnished with an insulation type suitable for temperature encountered.

I. Where no indication is made of wire size (including that noted in panel schedules), the conductor shall be of N.E.C. size to match its overcurrent protective device, but in no case smaller than #12 AWG unless specifically called for.

J. Control and signal conductors shall be type and size indicated in those sections of the specifications.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Joints in conductors #10 AWG and smaller shall be made with approved twist-on type connectors as manufactured by T & B, Ideal, or approved equivalent.

B. Joints in conductors #8 AWG and larger shall be made with mechanical pressure type connectors or lugs.

C. Circuit joints may not be made up on terminal screws of wiring devices. Make circuit joints as above, and connect single leads to device terminals.

D. Conductors shall be labeled within all junction boxes, etc. using plastic "punch" tape, identifying the conductors according to panel and circuit numbers.

E. Where connected under screw or bolt heads, stranded wire shall be fitted with a lug of proper size. Make solid conductor loops clockwise so as to be forced closed as screw is tightened. Only one solid wire loop may be held under a single screw.

F. Make all connections tight. Torque-tighten all connections to lugs per manufacturer's and UL requirements.

G. Wires within panelboards, terminal cabinets, and similar equipment shall be neatly squared and "bunched" together and held so with plastic ties at several places.

H. Where paralleling of conductors is shown for feeders or service entrance, it is absolutely required they be exactly the same length between points of bonding together.

I. Where aluminum feeders are used, conductors shall be terminated with crimp compression type connectors.

3.2 COLOR CODING

A. All wiring shall be color coded.

B. On 120/208V, 3 phase, 4 wire power systems, conductors shall be color coded black (Phase A), red (Phase B), blue (Phase C), and white (Neutral).

C. Ground conductors on all systems shall be green. Isolated grounds shall be color coded green with yellow stripe.

D. Conductors #8 AWG and larger may be identified with two or more bands of proper color plastic tape applied near each termination. Painting of wire will not be acceptable.

E. Unless noted otherwise, or another arrangement is approved by the Engineer, busses in panels and switch gear shall be considered "A", "B", and "C" from left to right, top to bottom or front to back when facing equipment.

F. Control and signal wiring shall not use the above named colors except green for grounding. Any other colors or striping may be used but the coding shall provide same color or striping between any two terminals being joined.

G. "Travelers" in switching circuits shall be of same color as phase conductors serving the circuits.

3.3 WIRING METHOD FOR BRANCH CIRCUITS

A. Unless shown differently, single-phase circuiting shall be limited to one neutral per raceway (a maximum of three different phase wires but with a single neutral in any case). Three-phase circuits shall be limited to one circuit per raceway (three different phase wires and a neutral if needed).

B. In "3 wire" and "4 wire" branch circuits, a neutral shall not serve more than one circuit tied to the same phase. The neutral carrying all or any part of the current of any specific load or run shall be contained in the same raceway or enclosure with the phase wire or wires also carrying that current. No split neutrals permitted.

C. Circuits shall be connected to panels as shown in the panel schedules.

D. Under the above requirements and with required color coding system, no feeder or branch circuit raceway will contain more than one wire of the same color, except for switch legs and control circuits.

END OF SECTION 26 05 19

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SCOPE

A. Grounding and bonding of the electrical system shall be provided in accordance with requirements of the National Electrical Code, and the requirements of these specifications and the drawings.

B. Contractor shall note that not all required grounding conductors are specifically noted on the drawings or in the schedules or specifications.

C. All feeders and branch circuits shall be provided with grounding conductors separate from the conduit system.

PART 2 - PRODUCTS

2.1 GROUNDING CLAMPS, BUSHINGS, ETC.

A. Materials shall be as manufactured by T & B or approved equivalent.

B. Clamps for attachment of grounding conductors to water pipes, etc. shall be of bronze or brass, with conduit hub with insulated bonding bushings and compression type lugs.

2.2 GROUNDING CONDUCTORS

A. Grounding conductors shall be sized in accordance with the requirements of the NEC, or as noted on the drawings or specified herein.

B. Grounding conductors shall be of copper. Insulation as required by NEC or as noted or specified.

2.3 MADE ELECTRODES

A. Provide "made" grounding electrodes in accordance with NEC Article 250 and as detailed on the drawings.

B. Driven grounding electrodes shall consist of copper clad steel rods not less than 10 feet in length and 3/4 inches in diameter.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

A. All systems and equipment shall be grounded in accordance with NEC Article 250.

B. All grounding conductors shall be contained within raceway, unless specifically noted otherwise.

3.2 SERVICE GROUNDING

A. Where available on the premises, bond together the following:
   1. Metal water pipe.
   2. Concrete encased electrode
   3. Driven ground rod(s).

B. Where required by NEC Article 250, and as shown on drawings, provide "made" grounding electrodes to supplement the above. Bond together all available and made electrodes.

C. Service ground clamp shall be attached to cold water main at an accessible point and before its size is reduced. Clamp shall be accessible after construction is complete. Grounding conductor shall be without splice into the service enclosure where it shall be connected to the main service ground buss, and interconnected with system neutral.

3.3 EQUIPMENT GROUNDING, ETC.

A. Ground all fixed and portable appliances and equipment connected under this contract with a green grounding conductor, or metal conduit. The ground wire shall be carried inside the raceway or flex from equipment to ground bus in the panel. Connect at both ends with suitable lugs.

B. Each grounding type receptacle shall have a green ground wire from its grounding terminal to the ground bus in the panel, or to the nearest grounding portion of the raceway system. Ground wire shall be sized by NEC with #12 AWG minimum.

C. Any feeder raceway anywhere in the system which enters a box or cabinet through part of a concentric knockout shall be fitted with a bonding bushing and jumper. The jumper shall be sized by NEC Table 250-122 and be lugged to the box.

END OF SECTION 26 05 26

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SCOPE

A. Full and proper support shall be provided for all items of electrical equipment, raceway, etc.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials used shall be good quality, made of steel or of other non-corroding material.

B. Inserts in masonry shall be lead, plastic, or fiber type, installed in drilled holes. Lead only shall be used for exterior locations or for interior locations subject to moisture.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All equipment and flat raceways attached to outside walls or interior walls subject to permanent moisture shall be shimmed out with non-corrodible material so as to provide 1/4" air space between wall and equipment or raceway.

B. All materials, whether exposed or concealed, shall be firmly and adequately held in place. Fastening and support shall afford safety factor of three or higher.

C. All fixtures, raceways, equipment shall be supported from the structure. Nothing may be supported on suspended ceilings or ceiling hangar wires unless definitely noted otherwise on the Drawings or specifically permitted by the Architect/ Engineer.

D. Fixtures shall be supported with (minimum) 10 gauge steel wire, (independent of ceiling support wires) or with threaded steel rods, adjusted as necessary to level fixture. For troffer fixtures, use minimum of two supports for each opposite corner. Use one support for downlights and exit signs. See architectural ceiling plans for rated ceiling system fixture support requirements.

E. Where installed recessed in grid type ceilings, attach each fixture to grid with minimum of two "earthquake clips" or other approved method. This requirement is in addition to dedicated support as described in "D" above.

END OF SECTION 26 05 29

SECTION 26 05 33

RACEWAYS AND FITTINGS

PART 1 - GENERAL

1.1 SCOPE

A. Provide a complete system of raceways for the installation of wiring as indicated by applicable codes.

B. All wiring shall be installed in raceways unless specifically noted otherwise.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Metal raceway system components shall be as manufactured by G.E., Kaiser, Republic, T & B, or other approved manufacturers.

B. Non-metallic raceway system components shall be as manufactured by Carlon, Queen City Plastics, or other approved manufacturers.

2.2 APPLICATIONS

A. Raceways shall be of metal except as specifically noted, or where non-metallic raceway is permitted by these specifications.

B. In general, non-metallic Schedule 40 PVC raceway will be permitted for use underground or in poured concrete (including panel feeders, branch circuits, etc.) provided all 90 degree E11s up out of floor are heavy wall rigid metal conduit or pvc shall be wrapped with expansion joint material through the slab penetration. Non-metallic raceways will not be permitted for any exposed work for raceways in ceiling spaces, etc.

C. Use electric metallic tubing (EMT) for most other general applications unless otherwise noted.

D. Flexible conduit for appropriate applications. Galvanized type for dry locations. Liquid-tight type for wet locations, or as noted. Flexible conduit shall be minimum 1/2" diameter. Liquid-tight flexible metal conduit shall be used for final connection to all motors, transformers, and other rotating or vibrating equipment. Flexible metal conduit shall be used for final connection to lighting fixtures mounted in or on suspended ceilings, and similar applications. Metal-clad cable systems (MC Cable) may be used for all branch circuits rated 30 amperes or less in concealed, dry locations or above bottom chord of roof joists.

E. No raceway may be exposed in any finished space unless specifically so approved, in written form, prior to rough-in.

F. Raceways exposed in finished spaces shall be of an appropriate type "wiremold" type surface raceway or approved equal.

G. Minimum metal conduit size shall be 1/2" (interior) and 3/4" (exterior) for premises wiring system.

2.3 COUPLINGS, CONNECTIONS, ETC.

A. EMT couplings and connectors shall be steel set screw type.

B. Flexible conduit connectors shall be T & B "Tite-Bite" type or approved equivalent, with insulated throats. "Anti-short" bushings shall be used at all motor connections.

C. "Split" or "Erickson" couplings shall be manufactured by O.Z. or approved equivalent.

D. Expansion couplings shall be manufactured by O.Z. or approved equivalent.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Heavy wall intermediate metal conduit to be made up with full threads, to which a conductive pipe compound (T & B Kopr-Shield or equal) has been applied, and butted in couplings.

B. Underground runs outside building footprint shall have minimum of 24" cover, filled and tamped in 6" layers. An 8" wide, yellow warning tape reading "Danger Electrical Conduits" shall be provided for each underground conduit run. Bury maximum 12" below finished grade entire length of conduit run.

C. Support conduit as required by code.

D. All raceways shall be concealed unless specifically shown or approved otherwise.

E. Make all cuts square. Remove any burrs by reaming.

F. EMT shall be attached to boxes or enclosures with approved couplings only.

G. EMT and IMC shall be attached to boxes or enclosures with flanged connector and locknuts with insulating bushing.

H. All hard raceways both exposed and concealed shall be run at right angles, either parallel or perpendicular to building lines. Flexible conduit may be run point-to-point only in concealed locations, but must be installed in a neat, workmanship-like manner, that is easily traced. Random, sagging runs shall not be allowed.

3.2 SLEEVES AND PENETRATIONS

A. Electrical Contractor shall provide sleeves and openings for raceways penetrating exterior walls, fire rated partitions, and roofs. Provisions for all such penetrations shall be as approved by the Architect/Engineer.

B. For any raceway passing through an exterior wall, above or below grade, provide appropriate sleeve and water proofing. Fill space between conduit and sleeve with appropriate compound (eg. lead and oakum) and then apply caulking compound - Thiocaulk or approved equivalent - flush finished surfaces.

C. For raceways penetrating floor slabs, smoke partitions, and other fire-rated walls, provide UL listed penetration protection system as approved by the Architect/Engineer. Sealing compound used shall provide same fire rating as barrier being penetrated.

D. Conduits penetrating roof surfaces for purpose of connecting to mechanical equipment (eg. rooftop HVAC units, exhaust fans, etc.) shall utilize openings, curbs, etc. provided for the equipment where possible.

E. For raceway penetrations through roof (except as described in item D above), contractor shall provide appropriate prefabricated roof curb assembly, pate pipe assembly with boots, or equal method as approved by Architect/Engineer and roofing subcontractor.

F. After service entrance conduits have been installed, wire pulled, "meggered" and accepted, seal using UL listed and approved duct seal.

END OF SECTION 26 05 33

SECTION 26 05 34

OUTLET AND JUNCTION BOXES

PART 1 - GENERAL

1.1 SCOPE

A. Provide and install outlet boxes, junction boxes, pedestal boxes, etc. as required for installation of electrical work, as shown, specified and required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Unless specifically noted or approved otherwise, boxes shall be of metal (steel or aluminum) as manufactured by Steel City, T & B, Raco, Appleton, or approved equivalent.

B. Size all boxes in accordance with applicable NEC articles (eg. 362, 370, 373, 375, etc.).

C. Device boxes shall be section type of 4" square, equipped with plaster rings as required to mount devices.

D. Where appropriate, use masonry boxes as manufactured by Raco.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set all boxes with edges flush with finished surface.

B. Immediately after installation, cover raceways and boxes to prevent entrance of foreign matter, mortar, paint, etc.

C. Contractor shall coordinate with other trades, and shall study the Architectural Plan Drawings, casework drawings, etc. to determine proper placement and mounting heights of all devices.

D. Where not shown or required otherwise, the following standard mounting heights and positions shall apply:

1. Boxes beside doors shall be mounted so edge of trim plate is 2" from edge of door trim on strike side.
2. Panelboard enclosures 6'-4" (plus or minus 4" in concrete block construction) from finished floor to top of can.
3. Fire alarm signal devices 6'-8" to bottom of strobe lens - or 6" below ceiling to top of device for areas with ceilings lower than 7'-2".
4. Receptacle boxes shall be mounted at unobstructed locations.
5. When multiple switch/fire alarm pull stations are mounted side-by-side on same wall, all devices shall be mounted at the same height (does not include receptacle/telephone).

END OF SECTION 26 05 34

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install power distribution panelboards as scheduled on the drawings and as herein specified.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Panelboards shall be manufactured by Square D or approved equivalents by Siemens, General Electric or Cutler-Hammer.

B. Panelboard types indicated on the drawings are those of Square D, and the standard construction features of those types shall be considered as minimum requirements, with additional requirements as specified herein.

2.2 CONSTRUCTION FEATURES

A. Types, sizes, capacities, and characteristics shall be as shown on riser diagrams or in schedules on the drawings.

B. Equipment shall be built on NEMA Standards where such standards exist.

C. Housing shall be constructed of galvanized sheet steel and shall be securely fabricated with screws, bolts, rivets, or by welding. Housings for panelboards shall be a minimum 20" wide and 5-3/4" deep, unless noted otherwise. Top or bottom gutter space shall be increased 6" where feeder loops through panel. Housing dimensions shall not exceed those of specified panelboards without written approval of Engineer.

D. Covers shall be constructed of high grade flat sheet steel with:
   1. Door flush with face and closed against a full inside trim stop. Hinges shall be inside type.
   2. A flush latch and tumbler type lock, so panel door may be held closed without being locked. All such locks on same job shall be keyed alike. Furnish two keys with each lock.
   3. Four or more cover fasteners of a type which will permit mounting plumb on box. Cover shall also have inside support studs to rest on lower edge of can while being fastened. For flush mounted panelboards, cover fastener hardware shall be concealed behind the hinged door.

E. A means of readily adjusting projection of panel interior assembly with all connections in place shall be provided. A method requiring stacking of washers is not acceptable.

F. Interior trim shall fit neatly between interior assembly and cover leaving no gaps between the two. Where (2) section panels are specified, both panel trims shall be the same height.

G. Busses shall be of 98% conductivity copper.

H. Minimum interrupting capacity rating of any panelboard assembly shall be 10,000A (120/208V systems). Furnish panelboards with higher rating as required for the available fault current.

I. Where drawing schedules indicate spaces for addition of future circuit breakers, furnish all necessary bussing, brackets, hardware, etc.

J. Breakers in distribution or branch circuit panelboards shall be physically arranged in locations shown in panel schedules on the drawings. They shall be connected to the phases as shown.

K. All panels shall be supplied with copper ground bars.

L. All circuit breakers shall be bolt-on type.

M. All 120V, 15 or 20 amp breakers serving receptacles located in bedrooms shall be arc fault interrupting type.

N. Service equipment shall be labeled "UL approved for Service Entrance Use."

PART 3 - EXECUTION

3.1 INSTALLATION

A. All equipment, either surface or flush mounted, shall be perfectly plumb and level.

B. All openings in boxes, cabinets, or gutters shall be cut or sawed with tools made for that purpose. Burning of openings is absolutely unacceptable.

C. All unused openings shall be closed.

D. Only one solid wire is allowable under a screw. Provide an approved lug for connecting stranded wire or more than one solid conductor.

E. Front edges of all flush mounted panel housings shall be exactly flush with finished wall.

3.2 LABELING

A. For branch circuit power panelboards, directory cards shall be neatly typed to indicate load served by each breaker or fuse. Directory cards shall indicate circuits in a manner analogous to the physical circuit breaker arrangement (eg. odd numbered circuits in one column, even numbered circuits in another). Mount cards behind heavy plastic shields in metal frames. Mark spares and spaces in pencil only.

B. Next to each breaker within main or distribution panel boards, attach a label indicating load served. Wording shall be as shown on its diagram or schedule on the drawings.

C. Attach a label indicating panel designation centered above the door in each panelboard. Add voltage, for example, "DPI - 120/ 208V." Use black letters on white background.

END OF SECTION 26 24 16

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 SCOPE

A. Contractor shall furnish and completely install lighting switches, convenience outlets, special purpose receptacles, etc. along with appropriate outlet boxes, trim plates, etc. as indicated on the drawings and schedules, and as herein specified.

B. Where connection to an item of equipment is required under this contract, and where such equipment requires a wiring device (special purpose receptacle) for connection, contractor shall furnish and install the appropriate device, whether or not the device is specifically shown or specified.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. All wiring devices of any one general type (eg. all duplex receptacles, all wall switches, etc.) shall be of the same manufacturer and shall match throughout.

B. All wiring devices (i.e., receptacles and switches) and associated trim plates shall be manufactured by General Electric, Hubbell, P & S, Arrow, or approved equivalent. Snap switches shall be rated 20 AMP 120-277 volts, 60 HZ, AC. All duplex receptacles shall be rated 15 AMP, NEMA 5-15R, unless otherwise noted.

2.2 WIRING DEVICES

A. Devices shall be specification grade.

B. Devices unless otherwise noted or approved shall be white in color.

C. Receptacles noted as “WP” (weatherproof) shall be UL listed for “in-use” operation in the weather.

D. 120V, 15 or 20 amp receptacles located in bedrooms shall be protected arc fault interrupting type circuit breaker.

2.3 TRIM PLATES

A. All trim plates shall be of same style, matching throughout project.

B. Unless noted otherwise, trim plates shall be smooth white nylon. All plates shall look identical except for required openings and sizes.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Devices shall be mounted tightly to boxes, and be adjusted plumb and level.

B. Where two or more devices are indicated for adjacent installation, they shall be trimmed with gang type plates.

C. Ground each receptacle by means of a separate code size ground wire (#12 minimum) connecting the receptacle ground terminal to the branch circuit panel ground bus. The conduit system shall not be the code required return ground path.

END OF SECTION 26 27 26

SECTION 26 28 16

DISCONNECTS (MOTOR & CIRCUIT)

PART 1 - GENERAL

1.1 SCOPE

A. This section includes low voltage disconnect switches.

PART 2 - PRODUCTS

2.1 LOW VOLTAGE FUSIBLE SWITCHES RATED 600 AMPERES AND LESS

A. Quick-make, quick-break type in accordance with UL98, NEMA KS 1 and NEC.

B. Shall be capable of accepting UL and NEMA standard fuses.

C. Shall be rated at 100,000 A.I.C. when provided with the proper rated fuses.

D. Shall have the following features:

1. Switch mechanism shall be the quick-make, quick-break type.
2. Copper blades, visible in the OFF position.
3. An arc chute for each pole.
4. External operating handle shall indicate ON and OFF position and shall have lock-open padlocking provisions.
5. Mechanical interlock shall permit opening of the door only when the switch is in the OFF position, defeatable by a special tool to permit inspection.
6. Fuse mounting for the size and type of fuses specified. Furnish switches completely fused. Furnish a complete set of spare fuses for each switch being installed. Provide additional sets of spare fuses to constitute not less than two complete sets for the type, size, and rating of each set installed. Deliver the fuses to the Owner prior to the final inspection.
7. Enclosures:
   a) Shall be the NEMA types shown on the drawings for the switches.
   b) Where the types of switch enclosures are not shown, they shall be the NEMA types which are most suitable for the environmental conditions where the switches are being installed.

E. Shall be heavy duty, Type HD, and horsepower rated as required.

2.2 LOW VOLTAGE UNFUSED SWITCHES RATED 600 AMPERES AND LESS

A. Shall be the same as Low Voltage Fusible Switches rated 600 amperes and less, except it shall not accept fuses.

2.3 FUSES

A. Provide dual element, time delay fuses equal to Fusetron RK-1 or RK-5 unless otherwise noted.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be in accordance with the NEC and as shown on the drawings.

B. Provide fusible switches and fuses as required by nameplates of equipment served.

END OF SECTION 26 28 16

SECTION 26 32 13

DIESEL STANDBY GENERATOR SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

A. The generator system shall be owner furnished and contractor installed. The Contractor shall coordinate with the Owner for the following:
   1. Contractor to provide concrete pad for the generator. Generator shall be set by the Owner.
   2. Contractor shall install Owner furnished automatic transfer switch.
   3. All required conduit shall be provided by the Contractor.
   4. All utility side power wiring shall be by the contractor.
   5. Power wiring for battery charger and generator block heater shall be provided by Contractor.
   6. All generator side control and power wiring shall be by the Owner.
   7. All miscellaneous equipment, supports, etc. necessary for a complete, operable system shall be provided as required by the contractor.

B. Responsibility: Contractor shall be ultimately responsible for coordinating the install, testing, start-up, and other scheduling of the generator system with the owner. The contractor shall coordinate with the owner to obtain complete shop drawings or other information required for all products noted in the drawings and specs in order to coordinate the installation. The contractor shall thoroughly review the information prior to installation rough-in to assure that all components and labor necessary for complete operation are included.

C. The standby system to include automatic transfer switch, engine/generator, controls, batteries, silencer, exhaust flexible connection, rain cap, weatherproof enclosure, accessories needed to meet the performance requirement of this section.

1.2 SUBMITTALS

A. Shop drawings
   1. Shop drawings to include detailed installation plan and elevation drawings to scale for the transfer switch, indicating coordination with the other electrical gear in the electrical room.
   2. Submit proposed generator concrete base requirements.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine all areas to receive engine generator set, transfer switch and coordinate work with other trades. In case of question consult Owner and engineer prior to proceeding with work.

3.2 TESTING

A. Engage an independent testing agency to perform tests on the completion of the installation. Use instruments bearing records of calibrations within the last 12 months, and for making positive observation of text results.

B. Include the following:
1. InterNational Electrical Testing Association Test: Perform visual and mechanical inspections and electrical and mechanical tests stated in InterNational Electrical Testing Association's NETA ATS for emergency engine generator sets. Certify compliance with test parameters.
2. Battery Test:
   a. Measure charging voltage and voltages between available battery terminals for full charging and float charging.
   b. Check electrolyte and specific gravity under both conditions.
   c. Test for contact integrity of all connectors.
   d. Perform an integrity load test and capacity load test for the battery.
   e. Verify acceptance of charge for each element of battery after discharge.
   f. Verify acceptance measurements are within manufacturer's written specifications.
3. Battery Charger Test: Verify specified rates of charge for both equalizing and float-charging conditions.
4. System Integrity Tests: Methodically verify proper installation, connection and integrity of each element of engine generator system before and during system operation. Check air, exhaust and fluid leaks.

C. Retests: Notify and coordinate with the Owner to have deficiencies identified by tests and observations corrected and retest to the satisfaction of the Owner. One retest shall be included in the bid.

3.3 INSTALLATION

A. Install all equipment in strict accordance with generator manufacturer's instruction. The Owner shall engage the manufacturer's authorized factory representative to supervise the installation of the system.

B. Testing and adjusting: See other parts of this section for specific requirements.

END OF SECTION 26 32 13

SECTION 26 41 00

FACILITY LIGHTING PROTECTION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The requirements of Section 16000 govern the work specified in this section.

1.2 DESCRIPTION OF WORK

A. The work includes the design and installation of a lightning protection system meeting all the criteria set forth in NFPA 78 and that required for UL Master Label for the protection of the facility.

B. Service entrance transient voltage surge suppression (TVSS) shall be included as specified.

1.3 QUALITY ASSURANCE

A. The lightning protection system shall conform to the following requirements:
1. National Electric Code.
2. Lightning Protection Institute Installation (LPI) Code LPI-175.
3. Underwriter's Laboratories Lightning protection Components Code 96 (UL).
4. Underwriter's Laboratories Master Label Code 96A (UL).
5. National Fire Protection Association Standard 780 (NFPA).
6. Underwriter's Laboratories Standard for Transient Voltage Surge Suppressors 1449, 4th Edition (UL).
7. National Electrical Manufacturer's Association Low Voltage Surge Protective Devices Standard LS1 (NEMA).

B. Underwriter's Laboratories Master label shall be furnished affixed as required.

C. The system shall be the standard product of a manufacturer regularly engaged in the production of lightning protection systems and shall be the manufacturer's latest approved design.

1.4 SUBMITTALS

A. Shop Drawings: Submit the type, size, and locations of all equipment, grounds, and cable routing on a set of dimensioned drawings prepared by the Contractor to the same scale as the contract drawings.

B. Manufacturer's product data.

C. UL Master Application Form and LPI Forms 175A and 175B.

PART 2 – PRODUCTS

2.1 GENERAL

A. All material and equipment shall be UL approved and labeled with each terminal bearing an "A" label and all main conductors bearing a "B" label at 10-0" intervals.

B. All equipment shall be the product of a single manufacturer and of a design and construction to suit the application for which it is to be used, in accordance with accepted industry standards, LPI, NFPA and UL Code requirements.

2.2 TRANSIENT VOLTAGE SURGE SUPPRESSOR

A. Refer to section 26 43 13.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Installation shall be accomplished by an experienced installer employed by the approved manufacturer.

B. All equipment shall be installed in the most inconspicuous manner possible. System shall be installed complete with cable network on the roof, air terminals, splices, and bonds with cable downleads routed in conduit to ground.

C. All conductors shall be copper with bronze connections. Equipment shall not be connected to or allowed prolonged contact with aluminum surfaces except by a UL approved bimetal transition fitting.
   1. Where aluminum or aluminum alloys are used in surfaces which shall support lightning system conductors and components (i.e., aluminum roofs or siding), those portions of conductors and components shall also be aluminum. Once those portions are no longer supported by aluminum surfaces, provide bimetal transition to copper for the remainder of the system.

D. Air terminals and cable fasteners shall be located and spaced in compliance with LPI and UL requirements.

E. See Architectural, Mechanical, Plumbing and Electrical Plans for locations of all equipment requiring bonding and air terminal protection.

3.2 COORDINATION

A. Coordinate lightning protection with all trades work to insure a correct, neat, and unobtrusive installation.

B. Provide a tight, mechanical sound bond to the main water service to assure inter-connecting with other building ground systems.

C. Verify that the TVSS equipment is installed at the service entrance in accordance with the manufacturer's written recommendations.

3.3 TESTING

A. Upon completion of installation of lightning protection system, test ground resistance with a Megger ground tester or equal. Ground resistance shall be a maximum of 5 ohms.

3.4 LABEL

A. Secure and deliver a UL Master label to the Owner.

END OFSECTION 26 41 00

SECTION 26 43 13

TRANSIENT VOLTAGE SUPPRESSION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The requirements of Section 26 00 00 govern the work specified in this section.

1.2 DESCRIPTION OF WORK

A. Service entrance surge protective devices (SPDs) shall be included as specified.

1.3 QUALITY ASSURANCE

A. The system shall conform to the following requirements:
   1. National Electric Code Article 285.
   2. Underwriter's Laboratories Standard for Surge Protective Devices, UL 1449 Fourth Edition (UL).

B. The system shall be the standard product of a manufacturer regularly engaged in the production of Surge Protective Devices and shall be the manufacturer's latest approved design.

1.4 SUBMITTALS

A. Manufacturer's product data shall include UL 1449 Listing documentation verifying Short Circuit Current Rating (SCCR), Voltage Protection Ratings (VPRs) for all modes, Maximum Continuous Operating Voltage rating (MCOV), I-nominal rating (I-n), Type 1 Device Listing. UL data and visual inspection takes precedence over manufacturer's published documentation.

B. Submittals shall include shop drawings including the manufacturer installation instruction manual and line drawings detailing dimensions and weight of enclosure, internal wiring diagram illustrating all modes of protection in each type of SPD required, wiring diagram showing all field connections and manufacturer's recommended wire and breaker sizes.

C. Upon request, an unencapsulated but complete SPD shall be presented for visual inspection; proprietary technology included. MOV type & quantity shall reflect kA ratings on cutsheets, verification of diagnostic monitoring, thermal & overcurrent protection, etc.

D. Minimum of five (5) year warranty.

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. Subject to compliance, the following manufacturers are acceptable:
1. Current Technology
2. Siemens
3. SquareD
4. Advanced Protection Technologies, Inc.
5. Innovative Technology, Inc.

2.2 RATINGS

A. Every suppression component of every mode noted elsewhere in this specification, including N-G, shall be protected by internal overcurrent and thermal overtemperature controls.

B. Minimum Single Impulse Surge Current Capacity per phase (phase = L-N + L-G) shall be as follows: Service Entrance or Transfer Switch: 200 kA

C. SPD shall provide surge current paths for all modes of protection, (7-mode) L-N, L-G, and N-G for Wye systems

D. UL 1449 Fourth Edition Listed Let-through Voltage Protection Ratings (VPRs) shall not exceed the following:

System Voltage	L-N	L-G	L-L	N-G
208Y/120	700 V	700 V	1000 V	800 V

E. The SPD shall have UL 1283 EMI/RFI filtering with minimum attenuation of -50 dB at 100 kHz.

F. UL 1449 Fourth Edition Listed Maximum Continuous Operating Voltage (MCOV) (verifiable at UL.com):

System Voltage	Allowable System Voltage Fluctuation (%)	MCOV
208Y/120	25%	150V

G. SPD shall be UL labeled with 20 kA Inominal (I-n), which is verifiable at UL.com, for compliance to UL 96A Lightning Protection Master Label and NFPA 780.

H. SPD shall be UL labeled with 200 kA Short Circuit Current Rating (SCCR). Fuse ratings shall not be considered in lieu of demonstrated withstand testing of SPD, per NEC 285.6.

I. Suppression components shall be heavy duty 'large block' MOVs, each exceeding 30 mm diameter.

2.3 FEATURES AND ACCESSORIES

A. Surge Protective Device Description: Provide the following features and accessories:
   1. The SPD shall have visual LED diagnostics including a minimum of one green LED indicator per phase and one red service LED, visible without opening the enclosure door.
   2. The SPD shall be provided with 1 set of NO/NC Form C dry contacts for remote monitoring.
   3. Utilizing thermally protected metal oxide varistors, which are continuously monitored.
   4. The SPD shall be provided with an integral disconnect switch when a 3-pole breaker is not available to connect the SPD.
   5. Nema 1 style enclosure suitable for indoor installation.
   6. SPD shall include an audible alarm with on/off silence function and diagnostic test function (excluding branch).

PART 3 – EXECUTION

3.1 INSTALLATION

A. At Service Entrance or Transfer Switch, a UL approved disconnect switch shall be provided as a means of servicing disconnect if a 60A breaker is not available.

B. The surge protective device shall be installed per manufacturer's instructions with lead lengths as short (less than 24") and straight as possible. Gently twist conductors together.

C. Installer may reasonably rearrange breaker locations to ensure short & straightest possible leads to SPDs.

D. SPD shall be installed on the load side of the main service disconnect.

E. Verify that the SPD is installed in accordance with the manufacturer's written recommendations.

F. Before energizing, installer shall verify service and separately derived system Neutral to Ground bonding jumpers per NEC.

END OF SECTION 26 43 13

SECTION 26 51 13

LIGHTING FIXTURES

PART 1 - GENERAL

1.1 SCOPE

A. Contractor shall furnish and install completely the lighting fixtures indicated on the Drawings and as herein specified.

B. All fixtures shall be equipped with lamps.

C. A lighting fixture shall be provided for every lighting outlet indicated. Any omission shall be brought to the attention of the Architect/Engineer before submitting proposal; otherwise, a unit selected by the Architect/Engineer shall be furnished and installed at no additional charge.

PART 2 - PRODUCTS

2.1 FIXTURES AND BALLASTS

A. Fixture types shall be as indicated on the Drawings.

B. Catalog numbers shown on the Drawings are for general identification of fixtures only. All related parts, such as plaster rings, junction boxes, louvers, shields, mounting stems, canopies, connectors, straps, nipples, etc., required to fit them properly to the construction, shall be furnished and installed.

C. Unless noted otherwise, all fixtures shall utilize LED lamping.

D. Fixtures/drivers shall be serviceable while the fixture is in its normally installed position; drivers shall not be mounted to removable reflectors or wireway covers.

E. Provide all lighting fixtures with a specific means for grounding their metallic wireways and housings to an equipment grounding conductor.

2.2 LENSES

A. Shall be 100 percent virgin acrylic prismatic or injection molded as noted in light fixture schedule on the drawings.

B. Flat lens panels shall have no less than 1/8-inch thickness.

2.3 LAMPS

A. LED fixtures shall be provided with certified performance data of total luminous flux, efficacy and color to LM-79 standards and of lumen maintenance to LM-80 standard.

B. Refer to Lighting Fixture Schedule in the Drawings for fixture LED lumen and color ratings.

PART 3 - EXECUTION

3.1 COORDINATION

A. Contractor shall verify ceiling or wall type in or on which each fixture is to be mounted, and shall furnish unit with appropriate trim type, mounting hardware, feed through junction boxes, etc., to fit the construction and maintain proper access to system wiring.

3.2 INSTALLATION

A. Installation shall be in accordance with the NEC, and as shown on the drawings.

B. Align, mount and level the lighting fixtures uniformly.

C. Avoid interference with and provide clearance for equipment. Where the indicated locations for the lighting fixtures conflict with the locations for equipment, change the locations for the lighting fixtures by the minimum distances necessary as approved by the Architect/Engineer.

D. Lighting Fixture Supports:
   1. Shall provide support for all fixtures. Supports may be anchored to channels of the ceiling construction, to the structural slab or to structural members within a partition, or above a suspended ceiling. See also Section 26 05 29 of this specification.
   2. Shall maintain the fixture positions after cleaning.
   3. Shall support the lighting fixtures without causing the ceiling or partition to deflect.

E. Where fixtures are connected to the rigid raceway system by flexible conduit, a green grounding conductor shall be run within the flexible conduit. This grounding jumper shall be connected to the fixture and to the raceway system using screws, bolts, or clips, equivalent to Steel City "G" clip.

END OF SECTION 26 51 13

SECTION 27 00 00

COMMUNICATION RACEWAYS

PART 1 - GENERAL

1.1 SCOPE

A. Contractor shall furnish and install a system of raceways and backboards as indicated on the drawings and as herein specified.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Raceways, boxes, etc. shall be in compliance with the relevant sections of these specifications.

B. Wall outlet shall consist of a standard 2" x 4" x 2-1/2" outlet box, with single device ring. Trim plate shall be standard "telephone" type, to match wiring device trim plates.

C. Telephone equipment boards shall be of size noted or shown on the drawings, and shall be constructed of 3/4" plywood, with finish grade front. Paint board with gray fire-retardant paint.

D. Provide 3/4" electrical metallic tubing from voice or data only outlet boxes or 1” electrical metallic tubing from combination voice/data outlet boxes to above accessible ceiling. Provide insulating nylon bushings on all ends of all conduit stubs.

E. Special outlets, floor outlets, etc. shall be noted on the drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install pull boxes as necessary in all conduits to limit runs to two (2) 90 degree bends (or equivalent) and to 100 feet in length.

B. Leave all spare raceways with 200 lb. test nylon pull cord.

C. Install raceways, boxes, etc. in accordance with relevant sections of these specifications.

D. Coordinate with the telephone utility to provide service conduits extended underground to property line.

END OF SECTION 27 00 00

SECTION 27 10 00

COMMUNICATION CABLING

PART 1 - GENERAL

1.1 SCOPE

A. The contractor shall furnish and install a system of cabling as indicated on the drawings and as herein specified for voice-data systems as required. The goal of the project is to provide a finished, complete, certified Category 6 Structured Cabling System with the functionality, capacity, and flexibility, to support the Owner equipment additions.

1.2 QUALIFICATIONS

A. The Contractor directly responsible for the cabling portion of the work shall be a licensed and registered Low Voltage Contractor with the State, who is, and who has been, regularly engaged in providing the installation of non-residential, communication and technology systems of similar size and complexity to the requirements of this project.

B. The cabling installation and terminations shall be performed under the direct supervision of a technician with BICSI level 2 certification

1.3 SHOP DRAWINGS

A. It is the Contractors responsibility to provide all material in accordance with the Contract Documents. Material not fully complying with the Contract Documents will be removed and replaced at the personal expense of the Contractor. Shop Drawings shall be submitted for the following:
   1. Specified products and materials.
   2. Ancillary products and materials.
   3. Pathway and support systems.
   4. Termination hardware.
   5. Unspecified or unidentified Cabling.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Products shall be identified by the descriptions or descriptive functions stated in the Contract Documents. Only NEW (virgin) products shall be used for this scope of work. Used, discounted, salvaged, refurbished, or reused products shall not be used.

B. Raceways, boxes, etc. shall be in compliance with the relevant sections of these specifications.

C. Open Supports: The Contractor shall install appropriately rated “J-hook” or trapeze type supports for cabling installed above the ceiling outside of a dedicated raceway system.

D. Special outlets, floor outlets, etc. shall be noted on the drawings.

E. Cabling shall be Cat 6 UTP, non-plenum rated.

F. Outlet terminations shall be modular Cat 6 RJ-45, RJ-11 or RJ-31X as noted on the plans. Terminating jacks shall be modular-to-110 (IDC) type utilizing a UNIVERSAL T568-A/B termination scheme (verify with Owner.)

G. Patch panel terminations shall be provided as required. All patch panels shall be mounted into a standard 19-inch wall mounted rack or cabinet. All patch panels shall be a regularly produced manufactured assembly, possessing a standard, total port count in multiples of twenty-four (24).

PART 3 - EXECUTION

3.1 INSTALLATION

A. Raceways:
   1. Install raceways, boxes, etc. in accordance with relevant sections of these specifications.
   2. 'J' hook supports shall be typically spaced at four (4) feet on center and not exceeding five (5) feet on center. Open supports shall be staggered between centerline measurements, so as to reduce the induction of reflective harmonics onto, and tension deformations of the supported cabling. Provide a minimum of two (2) hangers at all corners and 90-degree turns.

B. Cabling
   1. Cable Identification: All technology cabling shall be marked, on each terminating end, with machine generated, self-adhesive, wrap-type labels. All hardware and equipment termination and interconnection points shall be labeled. Where cable terminations occur within terminal cabinets or equipment enclosures, the inside portion of the cabinet or enclosure door shall display a protected drawing with all connections shown and described as to color code, number assigned or connection function of the associated conductors and their destination.
   2. Cable Dressing: Cables shall be guided and dressed using approved cable supports. All cables shall be neatly led to terminations.

C. Avoiding EMI: To avoid EMI, all pathways shall provide clearances of at least four (4) feet from motors or transformers; one (1) foot from conduit and cables used for electrical-power distribution; and six (6) inches from fluorescent lighting. Pathways shall cross perpendicular to fluorescent lighting and electrical power cables and conduits. The Contractor shall not place any distribution cabling parallel and/or alongside power lines, or share the same conduit, channel and/or sleeve with any electrical apparatus.

D. Cabinets and Racks: All equipment cabinets and racks shall be labeled with an engraved plastic laminate label permanently affixed to the door or frame. Cabinet designation shall be as shown on the Contract Drawings. All cabinet(s) and rack(s) shall be mounted to the floor or wall and grounded as per EIA/TIA standards.

E. Equipment Installation: All equipment and devices shall be mounted in accordance with the manufacturers' instruction and shall be level and plumb.

F. Final: The system, upon notification of completion, shall be complete in every respect, clean, operating and properly adjusted.

3.2 TESTING/CERTIFICATION

A. All circuits shall be tested and certified for compliance with Cat 6 requirements.

3.3 AS-BUILT DOCUMENTATION

A. General: As-Built Drawings shall be provided as part of this Contract. All addendum information or Project revisions resulting in drawing changes that occurred, during the construction period, shall be documented and included in the As-Built Drawings. All required As-Built documentation is mandatory and shall be required prior to project closeout.

B. The Contractor shall maintain two (2) sets of black or blue line on white paper drawings to submit as record, "As-Built" drawings (Record Drawings). One set shall reside on the Project site and at all times, be accurate, clear, and complete, showing the actual location of all equipment as installed. At the completion of the Project, the Contractor shall transfer onto the second, clean set of drawings all changes and submit them to the Contract Manager.

C. Project test results along with the documented testing procedures shall be included in a separate binder.

END OF SECION 27 10 00

SECTION 28 31 00

ADDRESSABLE FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A. Contractor shall furnish and install as directed on the plan drawings, and as herein specified, a complete system of fire alarm and detection equipment. The system shall be non-proprietary.

B. System shall include all devices, wiring, equipment, raceways, etc. required for a complete and satisfactorily operating system, whether or not every such item is specifically shown or mentioned.

C. System components, installation and operation shall be in strict accordance with the Fire Marshal's requirements for fire detection & alarm systems. System supplier shall be required to review the drawings carefully and shall include all devices required to attain Certificate of Occupancy and to notify the electrical contractor of any additional requirements not shown on the drawings so that all labor shall be included in the bid.

D. All fire and smoke detection and alarm systems shall comply with latest applicable editions of NFPA 72 and ADA. They must also comply with State and Local Building Code, including NFPA 1 Fire Safety Code, NFPA 70 National Electrical Code, NFPA 90A Installation of Air Conditioning and Ventilating Systems, Fire Safety Code and NFPA 101 Life Safety Code.

E. The system shall be multiplexed addressable, nominal 24 VDC, non-coded, and fully supervised (including control circuits). All equipment supplied must be listed for the purpose for which it is used, and installed in accordance with any instructions included in its listing. It must also be new, with a warranty (parts & labor) of at least one year from the date of final inspection and acceptable by the State.

F. The system shall be electrically supervised for open or (+/-) ground fault conditions in the detection circuits, the alarm circuits, and the system alarm and trouble relay coils. Removal of any detection device, alarm appliance, system module, or standby battery connection shall also result in a trouble signal. Fire alarm signal shall override trouble signals, but any pre-alarm trouble signal shall reappear when the panel is reset.

1.2 SYSTEM FUNCTION

A. Upon activation of any manual station, smoke detector, flow switch or other alarm initiating device, the following functions shall occur automatically:
   1. The alarm condition shall be annunciated visually and audibly at the fire alarm control panel. Alphanumeric display shall indicate device type and location of alarm.
   2. The alarm signaling system shall be activated. Upon activation, the alarm signaling shall sound an alarm signal throughout the building via the audible/visual system. This evacuation signal shall sound continuously until such time as the manual station or automatic detector is restored to normal and the fire command station reset.
   3. The alarm condition shall be transmitted to Owner selected, UL listed central monitoring station via dual line digital communicator.

B. Special functions shall be activated as required.
   1. At any time (except as defined above) it shall be possible for the operator to transmit an alarm signal.
   2. Sleeping rooms shall be provided with system type combination smoke and carbon monoxide detectors on 520 hz sounder base.
   3. Activation of duct mounted smoke detectors shall cause HVAC shutdown. Coordinate interlock with the mechanical contractor.
      a. Duct detectors shall transmit supervisory signal only and will not activate the evacuation signal system nor notify the fire response service.
   3. Coordinate with the sprinkler system subcontractor as required.
      a. Verify exact location and quantity of all system flow switches and valves to be monitored by the fire alarm system.
      b. Verify requirements for any dry system installation including power connections for air compressor(s) and monitoring of pressure switch(es).

1.3 SYSTEM SUPERVISION

A. All functions of system shall be fully electrically supervised. Upon any system fault or component failure, appropriate audible and visible signals shall be activated to indicate the nature of the trouble.

B. Individual trouble messages shall be provided for each alarm and indicating circuit.

C. Upon application of primary power failure, the system shall automatically be in a normal supervisory condition. Systems which require operator intervention to reset manual controls following a primary power restoration shall not be acceptable.

D. Upon power outage, the system shall signal "AC Failure" and sound an audible trouble signal. The entire system shall be provided with 24 hours of standby power in the supervisory mode and 5 minutes in the alarm mode. Note maximum number of devices system can accommodate in shop drawing submittal.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. System components shall be non-proprietary. Silent Knight, or approved equal allowed.

2.2 SYSTEM COMPONENTS

A. Fire Alarm Control Panel (FACP):
   1. The Fire Alarm Control (FACP) Panel shall be fully solid state and of modular design, for ease of future system extension and/or modification. The front of the panel must have steady Power On indication and each alarm initiation device must have separate Alarm and Trouble indications.
   2. The FACP power supply shall have a continuous rating adequate to power all devices and functions in full alarm continuously. Detection modules and alarm modules must be able to withstand prolonged short circuits in the field wiring, either line to line or line to ground, without damage.

3. The system must be equipped with the following protective devices to prevent damage or nuisance alarms by nearby lightning strikes, stray currents, or voltage transients:
    a. On AC Input: GE 9L15ECA001, Leviton 51010-WM, or Square D Q02175SB, or equivalent.
4. The FAC panel must have an Alarm Silence switch with subsequent Alarm (alarm resound) feature.
5. All common modules, power supplies, amplifiers, control modules, relay and components as necessary to effect the fire alarm, detection, communication and control functions as herein specified and as indicated on the drawings shall be provided as required.
6. Surface mounted enclosure, with locked door.
7. System shall be provided with a separate and independent source of emergency power. Switching to emergency power during alarm shall not cause signal drop-out. Any batteries must meet the appropriate NFPA capacity requirements, with a 25% safety factor.

B. Wiring:
1. Wiring shall be installed tight to structure (tie wrapped at intervals not to exceed 4'-0" on center).
2. Conductors shall be copper. Conductors shall be #14 AWG solid THWN or XHHW.
3. All junction boxes shall be accessible. All junction box covers shall be painted red.
4. Addressable communications fire alarm wiring shall be shielded type as required by the system manufacturer.

C. Manual Stations:
1. Manual pull stations shall be double action, push/pull type with integral address module, red in color, with "FIRE" or "FIRE ALARM" printed in white letters.
2. Stations shall be for semi-flush mounting.

D. Detectors:
1. Detector bases shall be for ceiling mounting and operate from 24 VDC power from control panel. Detectors shall have environmental compensating and adjustable sensitivity, condition indicator to be flashing LED for normal, continuous LED for alarm. Trouble condition shall not interfere with the operation of other detectors in the circuit. Smoke detectors shall be photoelectric type unless otherwise noted.
    a. Photoelectric Smoke Detectors: Detectors shall be provided with insect screens and means to minimize entry of dust and air turbulence.
    b. Ionization Smoke Detectors: Detectors shall be dual chamber ionization type designed to sense both visible and invisible products of combustion. Ionization detectors shall be used in Electrical Equipment Rooms.
    c. Heat Detectors: Detectors shall be combination rate of rise-fixed temperature type. Rate of rise shall be 15°F per minute with a fixed setting of 135°F.
    d. Sounder bases shall be provided for bunk (sleeping) rooms to provide 520 hz signal upon alarm.

E. Duct Detectors:
1. Duct Detectors shall be photoelectric type detectors in duct mount housing with 24 VDC power operated from control panel.
    a. The Electrical Contractor shall verify with the Mechanical Contractor the tube lengths required and supply the complete units to the Mechanical Contractor for installation in the ducts. All wiring shall be by the Electrical Contractor.
    b. HVAC shutdown shall be from the FACP in order to integrate shutdown override at the FACP. Coordinate with the mechanical contractor as required.

c. Provide remote test switch with reset and indicating light installed in an accessible location near its associated detector.
d. The connector head components shall be supervised so that their failure shall cause a trouble indication in the Fire Alarm Control Panel.

F. Signaling Devices:
1. Synchronization shall be provided for strobe lights in all areas where two or more devices are visible.
2. Mount combination horn/strobe or strobe only device 80" above finish floor to bottom of strobe lens or 6" below ceiling maximum when ceiling height is less than 7'-0".
3. Mount horn only device aligned with top of door frame.
4. Visual signals shall have side viewing lens, white in color with the words "FIRE" printed on each side.
5. Visual signal shall be 24 VDC Xenon flasher with built-in reflector and shall be in accordance with ADA requirements.
6. Coordinate signaling devices carefully with visual signal to provide a complete integral unit.
7. In bunk (sleeping) rooms, 520 hz annunciation shall be provided by way of sounder base. Actuation of a single bunk room smoke detector shall result in the activation of the respective sounder base and not activate building-wide alarm. Actuation of more than one bunk room smoke detector shall activate building-wide alarm. Actuation of carbon monoxide alarm shall activate unique local alarm.

G. Battery Module:
1. Standby emergency power shall be provided to automatically power the system upon loss of 120 VAC input power.
a. Battery shall be sealed, maintenance free, lead calcium type.
b. After restoration of normal power, battery shall be automatically recharged and shall be continually float charged to maintain full power.
c. Module shall be fused to protect against over-current and accidental reversal of polarity.
d. Module shall be monitored to indicate low battery, battery disconnected or charge failure.

H. Sprinkler, Flow and Tamper Switches:
1. Provide addressable module for each flow and tamper switch in the sprinkler system. Switches are to be provided by sprinkler contractor, modules and required wiring to be provided by this contractor.

I. Spare Parts:
1. Provide two (2) fuses of each size used in the system.
2. Provide 2 additional glass rods for the fire alarm pull stations.
3. Provide two photoelectric smoke detectors
4. Provide two combination horn/strobe units.
5. Provide two strobe only units.
6. Provide two 520 hz sounder bases.

2.3 VERIFICATION OF SYSTEM PERFORMANCE

A. Upon completion of the installation, and prior to final inspections, the CONTRACTOR AND THE MANUFACTURER'S AUTHORIZED REPRESENTATIVE together shall test every alarm initiating device for proper response and zone indication, every alarm signaling appliance for effectiveness, and all auxiliary functions such as capture of elevators and control of smoke doors/dampers and HVAC systems. This will often require a coordinated effort involving several trades and contractors, since some of the things to be tested may have been furnished and/or installed by someone other than the Electrical Contractor.

B. The Owner and the Engineer will be given the opportunity to witness these tests. An itemized Test Report will be submitted to the Consulting Engineer and the Owner, detailing and certifying all results, including the measured sensitivity of each smoke detector. The data for each smoke detector will include the Manufacturer's serial number, plus specific location information adequate to quickly pinpoint the device.

C. In the event of any system malfunctions or nuisance alarms, the Contractor will take appropriate corrective action. However, this may necessitate a repeat of the response test, if the Owner so desires. Continued improper performance during warranty shall be cause to require the Contractor to remove the system.

D. System Documentation, Training, and Maintenance
   1. The contractor shall provide the Engineer with three (3) copies of the following, to be forwarded to the owner:
      a. As-built wiring and conduit layout diagrams, incorporating wire color code and/or label numbers, and showing all inter-connections in the system.
      b. Schematic wiring diagrams of all control panels, modules, communications panels, etc.
      c. Technical literature on all major parts of the system, including detector heads, manual stations, signaling devices, alarm panels, and power supplies.
   2. The manufacturer's authorized representative must instruct the Owner's designated employees in proper operation of the system and all required periodic maintenance. This instruction will include two (2) copies of a written, bound summary, for future reference.
   3. Basic operating instructions shall be provided at the FACP. Programmed device descriptions shall note location per Owner designations. Contractor shall obtain from the architect a reduced scale drawing (11" x 17" or smaller) in order to note space designations.
   4. The contractor must have the manufacturer's authorized representative provide a quotation for regular preventative maintenance, in accordance with the recommendations of NFPA, 72H, "Guide for Testing Protective Signaling Systems." This will cover the first 12 months period after expiration of the standard warranty. This quotation will provide the owner with information on internal versus contract maintenance costs.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Under no circumstances shall any fire alarm detection/initiating circuit be combined in the same conduit run with other building circuits. Within FAC panel, AC control circuits shall be isolated/insulated away from other circuits and the enclosure shall have an appropriate warning label alerting service personnel of the presence of high voltage.

B. No splicing or "wire-nut" connection of fire alarm wiring is permitted. All required terminations shall be continuous from device terminal to device terminal. If an intermediate termination is required, utilize Square-'D' TC series terminal strips suitable for wiring being used. Only one wire per terminal.

C. No annunciation circuit shall be more than 70% loaded prior to final inspections to allow addition of audible and strobe devices as may be required per local Fire Marshal.

D. All wiring shall be checked for shorts, grounds, and opens prior to termination at cabinets or detector heads. The minimum resistance to ground or between any two conductors shall be ten megohms, verified in writing, with "megger" headings.

E. Electrical contractor shall coordinate with mechanical contractor as required to extend HVAC shut-down interlock wiring to unit controller as required. Final connection at HVAC controller shall be by mechanical contractor/controls contractor.

END OF SECTION 28 31 00

PLAN SETS

Prepared for:

Nassau County Board of County Commissioners

Civil Design Criteria Drawings Prepared by:

THE R-A-M PROFESSIONAL GROUP, INC.

8298 Bayberry Road, Suite 1

Jacksonville, FL 32256

(904) 731-5440

FAX)904-731-5465

www.ramprofessionalgroup.com

Architectural Design Criteria Drawings Prepared by:

Thomas Duke Architect, P.A.

2345 Harper Street

Jacksonville, FL 32204

(904) 356-3335

ATTACHMENT "B" – SAMPLE DESIGN/BUILD AGREEMENT

THE SUCCESSFUL PROPOSER/BIDDER WILL ENTER INTO A CONTRACT IN SUBSTANTIALLY THIS FORM. NASSAU COUNTY RESERVES THE RIGHT TO MAKE CHANGES, PRIOR TO EXECUTION, NOT INCONSISTENT WITH THE OTHER PROVISIONS AND THE INTENT OF THE BID DOCUMENTS AND SPECIFICATIONS.

THIS SAMPLE CONTRACT WILL BE SUBJECT TO REVIEW AND MODIFICATION BY THE COUNTY ATTORNEY'S OFFICE

DESIGN BUILD AGREEMENT BETWEEN THE BOARD OF COUNTY COMMISSIONERS OF NASSAU COUNTY, FLORIDA

AND

_____

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AGREEMENT

THE BOARD OF COUNTY COMMISSIONERS OF NASSAU COUNTY, FLORIDA, ("County") a subdivision of the State of Florida with administrative offices at 96135 Nassau Place, Suite 1, Yulee, Florida 32097, hereby contracts with _____ ("Design-Build Firm"), a_____ corporation for profit with an address of _____ , to perform all work ("Work") in connection with _____, ("Project"), as said Work is set forth in the Plans and Specifications furnished by the Design-Build Firm and other Contract Documents hereafter specified.

SECTION 1. CONTRACT DOCUMENTS.

A. The Contract Documents consist of this Agreement, the Amendments and Exhibits described in Section 7 hereof, Change Orders, Work Directive Changes, Field Orders, and the solicitation documents, including addenda relating thereto. All of the foregoing Contract Documents are incorporated by reference and made a part of this Agreement (all of said documents, including this Agreement, sometimes being referred to herein as the "Contract Documents" and sometimes as the "Agreement"). A copy of the Contract Documents shall be maintained by Design-Build Firm at the Project site at all times during the performance of the Work.

B. In case of any inconsistency or conflict among the provisions of the Agreement and any other terms and conditions of any documents comprising the Contract Documents, the provisions of the Agreement shall control. Concerning the Contract Documents, the order of precedence shall be as follows: 1) the Agreement, including Amendments and Exhibits; 2) Change Orders; 3) Work Directive Changes; 4) Field Orders; 5) the Solicitation Documents, including addenda. The Contract Documents listed above represent the entire and integrated agreement between the parties hereto, and supersede prior negotiations, representations, or agreements, either written or oral.

C. County shall furnish to the Design-Build Firm up to three (3) sets of the Contract Documents for execution of the Work. Additional copies of the Contract Documents shall be furnished, upon request, at the cost of reproduction.

SECTION 2. SCOPE OF WORK.

A. Generally, Design-Build Firm will provide all planning, design, and architectural/engineering services required for the proper design and for all other services necessary for the construction of the Project.

B. Design-Build Firm's Responsibility with respect to Design

1) In fulfilling its obligations under this Section, Design-Build Firm shall employ Architects and Engineers of the appropriate specialties for proper preparation of the Project drawings and specifications, including structural, mechanical, electrical, soils, civil and such other specialties as are reasonably required. All such professional services shall be performed by appropriately State of Florida licensed personnel. Design-Build Firm takes responsibility for the proper performance of such architectural and engineering services.

2) The Design-Build Firm shall prepare and the County shall approve a Design Phase schedule as follows:

(a) DESIGN DEVELOPMENT

The Design-Build Firm shall prepare Design Documents to fix the size and character of the Project as to structural, mechanical and electrical systems, materials, and other appropriate essential items in the Project. These Design Documents, as approved, shall be the basis for the construction of the Project.

(b) WORKING DRAWINGS AND SPECIFICATIONS

From approved Design Documents, the Design-Build Firm will prepare working Drawings and Specifications setting forth in detail the requirements for the construction of the Project, and based upon codes, laws, or regulations which have been enacted at the time of their preparation.

3) The Design-Build Firm and the County will work closely together to monitor the design in accordance with prior approvals so as to ensure that the Project can be constructed within the amount as defined in Section 3. As these working Drawings and Specifications are being completed, the Design-Build Firm will keep the County advised of the effects of any County requested changes on the Contract Time Schedule and/or the Guaranteed Maximum Price (“GMP”). Construction of the Project shall be in accordance with these Drawings and Specifications as approved by the County and incorporated in the exhibits. The Drawings and Specifications shall remain the property of the County and may be used and/or re-used, in whole or in part, with or without modifications, by the County on this or other projects without the written consent of the Design-Build Firm.

4) After the completion of the Design Phase as set forth above in Subsection 2, if the Project is no longer feasible for any reason from the standpoint of the County, the County may terminate this Agreement and pay the Design-Build Firm the portion of the price associated with the Design Phase, pursuant to Section 3 “Contract Amount”.

C. Responsibilities of Design-Build Firm With Respect to Construction.

1) The Design-Build Firm will provide all construction supervision, inspection, labor, materials, tools, construction equipment, and subcontracted items of every kind and type necessary for the timely execution and full completion of the Project in a good workmanlike manner required by the Contract.

2) The Design-Build Firm will pay all sales, use, gross receipts and similar taxes related to the Work provided by the Design-Build Firm, which have been legally enacted at the time of execution of this Agreement and for which the Design-Build Firm is liable.

3) The Design-Build Firm will prepare and submit for the County's approval an estimated progress schedule for the Project using critical path method (CPM) using a software to be agreed with the County. This schedule shall include (1) a list of all activities required to complete the Project; (2) the duration of each activity; (3) the dependencies (e.g. finish to start, etc.) and logical end points such as milestones or deliverable items. It shall be revised as required by the conditions of the Work and by those conditions and events, which are beyond the Design-Build Firm's control. (Exhibit O)(Project Schedule) During the Construction Phase, the Design-Build Firm shall provide updates to the County every thirty days, on the first of each calendar month.

4) The Design-Build Firm shall keep such full and detailed accounts as may be necessary for proper financial management under this Agreement. The system shall be satisfactory to the County, which shall be afforded access to all of the Design-Build Firm's records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to this Agreement. The Design-Build Firm shall preserve all such records for a period of three (3) years after the final payment or longer where required by law. All such records shall be subject to public disclosure under Chapter 119, Florida Statutes, the Florida Public Records Law. Failure to maintain or disclose such documents may result in the termination of this Agreement by the County. The Design-Build Firm shall require its subcontractors to comply with the records retention requirements of this paragraph.

D. Royalties and Patents.

1) The Design-Build Firm shall pay all royalties and license fees for materials, methods, and systems incorporated in the Work. It shall defend all suits or claims for infringement of any patent rights and shall save the County harmless from loss on account thereof except when a particular design process or product is specified by the County. In such case the Design-Build Firm shall be responsible for such loss only if it has reason to believe that the design, process, or product so specified is an infringement of a patent, and fails to give such information promptly to the County.

E. Warranties and Completion.

In addition to the warranty set forth in Section 20, General Conditions:

1) The Design-Build Firm will secure required certificates of inspection, testing, or approval and deliver them to the County.

2) The Design-Build Firm will collect all written warranties and equipment manuals and deliver them to the County.

3) The Design-Build Firm, in coordination with the County's maintenance personnel, will be responsible for the commissioning of utilities and the operations of the Project's systems and equipment, and will assist in their initial start-up and testing.

SECTION 3. CONTRACT AMOUNT.

In consideration of the faithful performance by Design-Build Firm of the covenants in this Agreement to the full satisfaction and acceptance of County, County agrees to pay, or cause to be paid, to Design-Build Firm in accordance with the terms of this Agreement the following Guaranteed Maximum Price (GMP) amount for the Project (herein "Contract Amount"): $ _____, of which __(amount)_____, % is identified as the portion of the price associated with the Design Phase. The Design Phase portion of the price shall not exceed _____ percent of the GMP.

SECTION 4. DESIGN-BUILD FIRM FEES

A. Design Phase Fee. For the performance of the design services set forth herein and for profit and overhead related to these services, a total fee of $_____ shall be paid to the Design-Build Firm.

B. Construction Phase Fee. Prior to commencement of the Construction Phase of the Project, the County will direct the Design-Build Firm in writing to proceed with the Construction Phase. The Construction Phase Fee shall be paid in monthly payments pursuant to the provisions set forth in Section 3 of the General Terms and Conditions.

Design-Build Firm's Exclusive Remedy: In the event the construction Substantial or Final Completion date is extended, regardless of whether delay is caused by any act or neglect of the County, or is attributable to the County, the Design-Build Firm's sole and exclusive remedy is an extension of the construction completion date.

C. Overhead And Profit For the Construction Phase. For overhead, profit, and general expenses of any kind for services provided during and related to the Construction Phase of the Project, the fee shall be $_____, and shall be paid proportionally to the ratio of the cost of the Work in place, and less retainage as it bears on the latest estimate of the total construction cost or to the GMP or to the County's Construction Budget,

whichever is less. The balance of the fee shall be paid when construction of the Project is finally completed and occupancy of the Project accepted by the County as provided in this Agreement. If construction is authorized only for a part of a phase of the Project, the fee paid shall be proportionate to the amount of Work authorized by the County. The Overhead and Profit for the Construction Phase shall be negotiated based on the design and set forth in Exhibit J (Schedule of Project Fees).

SECTION 5. BONDS

A. Design-Build Firm shall provide Performance and Payment Bonds, in the form prescribed in Exhibit B, in the amount of one hundred percent (100%) of the Contract Amount, the costs of which to be paid by Design-Build Firm. The Performance and Payment Bonds shall be underwritten by a surety authorized to do business in the State of Florida and otherwise acceptable to County; provided; however, the surety shall be rated as "A-" (excellent) or better and Class "V" or higher rating as to financial size category and the amount required shall not exceed two percent (2%) of the reported policy holders surplus, all as reported in the most current Best Key Rating Guide, published by A.M. Best Company, Inc. of 75 Fulton Street, New York, New York 10038.

B. If the surety for any bond furnished by Design-Build Firm is declared bankrupt, becomes insolvent, its right to do business is terminated in the State of Florida, or it ceases to meet the requirements imposed by the Contract Document, the Design-Build Firm shall, within five (5) calendar days thereafter, substitute another bond and surety, both of which shall be subject to the County's approval. Failure by the Design-Build Firm to maintain its bonds in full force and effect at all times, including the warranty period, shall be grounds for termination of this Contract.

C. Per §255.05, Florida Statutes, the Design-Build Firm shall be required to execute and record the Performance and Payment bonds. The bonds must state the name and principal business address of both the Principal and the Surety and a description of the Project sufficient to identify it.

SECTION 6. CONTRACT TIME AND LIQUIDATED DAMAGES

A. **Time is of the essence in the performance of the Work under this Agreement.**

Design-Build Firm shall commence the Work within _____ calendar days from the Commencement Date, established in each Phase's Notice to Proceed. No Work shall be performed at the Project site prior to such Commencement Dates. Design-Build Firm shall provide _____ hours notice prior to beginning the Work. The Work shall be substantially completed within _____ calendar days from the Commencement Date. The Work shall be fully completed and deemed ready by the County for final completion within _____ calendar days from the Substantial Completion Date. The Contract Time shall be the time period from the Commencement Date to the date of final completion totaling _____ calendar days (herein "Contract Time").

B. County and Design-Build Firm recognize that, since time is of the essence for this Agreement, the County will suffer financial loss if the Work is not substantially completed within the time specified. Should Design-Build Firm fail to substantially complete the Work within the time period noted above, County shall be entitled to assess, as liquidated damages, but not as a penalty, **$ 3,000 .00** for each calendar day thereafter until Substantial Completion is achieved. The Project shall be deemed to be substantially completed by the County on the date that the County's Project Manager certifies in writing that the construction of the Project, or specified part thereof, is sufficiently completed in accordance with the Contract Documents, so that the Project or specified part can be utilized for the purposes for which it is intended. Along with such certification, the Architect shall compile a "punch list" of any remaining exceptions that do not adversely affect the use of the Project. Completion of these items will be required prior to final payment as provided herein.

C. Design-Build Firm hereby expressly waives and relinquishes any right which it may have to seek to characterize the above noted liquidated damages as a penalty, which the parties agree represents a fair and reasonable estimate of the County's actual damages at the time of contracting if Design-Build Firm fails to substantially complete the Work in accordance with the progress schedule.

D. When any period of time is referenced to by days herein, it shall be computed to exclude the first day and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day shall be omitted from the computation, and the last day shall become the next succeeding day which is not a Saturday, Sunday or legal holiday.

SECTION 7. EXHIBITS INCORPORATED

The following documents are expressly agreed to be incorporated by reference and made a part of this Agreement.

Exhibit A: General Terms and Conditions
Exhibit B: Form of Performance and Payment Bonds
Exhibit C: Insurance Requirements
Exhibit D: Form of Release and Affidavit
Exhibit E: Form of Application for Payment
Exhibit F: Form of Change Order
Exhibit G: Owner Direct Purchases- FORM OF0205 (if applicable)
Exhibit H: Contract Definitions
Exhibit I: Design Criteria Package
Exhibit J: Schedule of Project Fees
Exhibit K: Not Used
Exhibit L: Not Used
Exhibit M: Pre-Construction Fee proposal
Exhibit N: Not Used

Exhibit O: Project Schedule
Exhibit P: GMP Amount Detail
Exhibit Q: Information Package
Exhibit R: If Required

SECTION 8. NOTICES

A. All notices required or made pursuant to this Agreement by the Design-Build Firm to the County shall be in writing and delivered by hand or by United States Postal Service Department, first class mail, postage pre-paid, return receipt requested, addressed to the following:

Taco Pope, County Manager
Nassau County Board of County Commissioners
96135 Nassau Place, Suite 1
Yulee, Florida 32097

B. All notices required or made pursuant to this Agreement by County to Design-Build Firm shall be made in writing and shall be delivered by hand or by United States Postal Service Department, first class mail, postage pre-paid, return receipt requested, addressed to the following:

_____
_____
_____
_____
Attention: _____

C. Either party may change its above noted address by giving written notice to the other party in accordance with the requirements of this Section.

SECTION 9. MODIFICATION

No modification or change to the Agreement shall be valid or binding upon the parties unless in writing and executed by the party or parties intended to be bound by it.

SECTION 10. SUCCESSORS AND ASSIGNS

Subject to other provisions hereof, the Agreement shall be binding upon and shall inure to the benefit of the successors and assigns of the parties to the Agreement.

SECTION 11. GOVERNING LAW

The Agreement shall be interpreted under and its performance governed by the laws of the State of Florida, and the Parties stipulate venue for matters relating to the subject of

this Agreement shall be in the County of Nassau.

SECTION 12. NO WAIVER

The failure of the County to enforce at any time or for any period of time any one or more of the provisions of the Agreement shall not be construed to be and shall not be a waiver of any such provision or provisions or of its right thereafter to enforce each and every such provision.

SECTION 13. ENTIRE AGREEMENT

Each of the Parties hereto agrees and represents that the Agreement comprises the full and entire agreement between the parties affecting the Work contemplated, and no other agreement or understanding of any nature concerning the same has been entered into or will be recognized, and that all negotiations, acts, work performed, or payments made prior to the execution hereof shall be deemed merged in, integrated and superseded by the Agreement.

SECTION 14. SEVERABILITY

Should any provision of the Agreement be determined by a court to be unenforceable, such a determination shall not affect the validity or enforceability of any other section or part thereof.

SECTION 15. PUBLIC RECORDS

The County is a public agency subject to Chapter 119, Florida Statutes. IF THE VENDOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO THE VENDOR'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS CONTRACT, CONTACT THE CUSTODIAN OF PUBLIC RECORDS AT (904) 530-6010, RECORDS@NASSAUCOUNTYFL.COM, 96163 NASSAU PLACE, YULEE, FLORIDA 32097. Under this agreement, to the extent that the Vendor is providing services to the County, and pursuant to section 119.0701, Florida Statutes, the Vendor shall:

A. Keep and maintain public records required by the public agency to perform the service.

B. Upon request from the public agency's custodian of public records, provide the public agency with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided in this chapter or as otherwise provided by law.

C. Ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law for the duration of the Contract term and following completion of the Contract if the Vendor does not transfer the records to the public agency.

D. Upon completion of the Contract, transfer, at no cost, to the public agency all public records in possession of the Vendor or keep and maintain public records required by the public agency to perform the service. If the Vendor transfers all public records to the public agency upon completion of the Contract, the Vendor shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If the Vendor keeps and maintains public records upon completion of the Contract, the Vendor shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to the public agency, upon request from the public agency's custodian of public records, in a format that is compatible with the information technology systems of the public agency.

SECTION 16. REQUEST FOR RECORDS; NONCOMPLIANCE

A. A request to inspect or copy public records relating to a public agency's contract for services must be made directly to the public agency. If the public agency does not possess the requested records, the public agency shall immediately notify the Vendor of the request, and the Vendor must provide the records to the public agency or allow the records to be inspected or copied within a reasonable time.

B. If a Vendor does not comply with the public agency's request for records, the public agency shall enforce the contract provisions in accordance with the contract.

C. A Vendor who fails to provide the public records to the public agency within a reasonable time may be subject to penalties under s. 119.10, Florida Statutes.

[Remainder of this page intentionally left blank]

IN WITNESS WHEREOF, the Parties have executed this Agreement on the date(s) indicated below.

NASSAU COUNTY, FLORIDA, a political subdivision of the State of Florida acting by and through its duly authorized Board of County Commissioners.

DULY EXECUTED this _____ day of _____, 20___.

BOARD OF COUNTY COMMISSIONERS
NASSAU COUNTY, FLORIDA

_____

Its: Chairman

ATTEST AS TO CHAIRMAN'S
SIGNATURE:

_____
JOHN A. CRAWFORD
Its: Ex-Officio Clerk

Approved as to form by the Nassau County
Attorney:

_____
Denise C. May

DESIGN-BUILD FIRM:

By:_____
(Name)

ATTEST: Corporate Secretary

By:_____
Secretary

Its: President

[CORPORATE SEAL]

Date:_____

EXHIBIT "A"

GENERAL TERMS AND CONDITIONS

1. INTENT OF CONTRACT DOCUMENTS

1.1. It is the intent of the Contract Documents to describe a functionally complete project (or portion thereof) to be constructed in accordance with the Contract Documents. Any work, materials or equipment that may reasonably be inferred from the Contract Documents as being required to produce the intended result shall be supplied whether or not specifically called for. When words which have a well-known technical or trade meaning are used to describe work, materials or equipment, such words shall be interpreted in accordance with that meaning. Reference to standard specifications, manuals or codes of any technical society, organization or association or to the laws or regulations of any governmental authority having jurisdiction over the Project, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code, law or regulation in affect at the time the Work is performed, except as may be otherwise specifically stated herein.

1.2. If during the performance of the Work Design-Build Firm discovers a conflict, error or discrepancy in the Contract Documents, Design-Build Firm immediately shall report same to the County in writing and before proceeding with the Work affected thereby shall obtain a written interpretation or clarification from the Design-Build Firm's Architect/Engineer. Design-Build Firm shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to Design-Build Firm with the Contract Documents before commencing any portion of the Work.

1.3. Drawings are intended to show general arrangements, design and extent of Work and are not intended to serve as shop drawings. Specifications are separated into divisions for convenience of reference only and shall not be interpreted as establishing divisions for the Work, trades, subcontracts, or extent of any part of the Work. In the event of a discrepancy between or among the drawings, specifications of other Contract Document provisions, Design-Build Firm shall be required to comply with the provision which is the more restrictive or stringent requirement upon the Design-Build Firm, as determined by its Architect/Engineer. Unless otherwise specifically mentioned, all anchors, bolts, screws, fittings, fillers, hardware, accessories, trim and other parts required in connection with any portion of the Work to make a complete, serviceable, finished and first quality installation shall be furnished and installed as part of the Work, whether or not called for by the Contract Documents.

2. INVESTIGATION AND UTILITIES

2.1 Design-Build Firm shall have the sole responsibility of satisfying itself concerning the nature and location of the Work and the general and local conditions, and particularly, but without limitation, with respect to the following: those affecting transportation, access, disposal, handling and storage of materials; availability and quality of labor; water and electric power; availability and condition of roads; work area; living facilities; climatic conditions and seasons; physical conditions at the work-site and the Project area as a whole; topography and ground surface conditions; nature and quality of the surface materials to be encountered; equipment and facilities needed preliminary to and during performance of the Work; and all other costs associated with such performance. The failure of Design-Build Firm to acquaint itself with any applicable conditions shall not relieve Design-Build Firm from any of its responsibilities to perform under the Contract Documents, nor shall it be considered the basis for any claim for additional time or compensation.

2.2. Design-Build Firm shall locate all existing roadways, railways, drainage facilities and utility services above, upon, or under the Project site, said roadways, railways, drainage facilities and utilities being referred to in this Section 2 as the "Utilities". Design-Build Firm shall contact the owners of all Utilities to determine the necessity for relocating or temporarily interrupting any Utilities during the construction of the Project. Design-Build Firm shall schedule and coordinate its Work around any such relocation or temporary service interruption. Design-Build Firm shall be responsible for properly shoring, supporting and protecting all Utilities at all times during the course of the Work.

3. PROGRESS PAYMENTS FOR CONSTRUCTION PHASE

3.1. Prior to submitting its first Application for Payment, Design-Build Firm shall submit to County, for its review and approval, a schedule of values based upon the Contract Price, listing the major elements of the Work and the dollar value for each element. After its approval by the County, this schedule of values shall be used as the basis for the Design-Build Firm's Applications for Payment. This schedule shall be updated and submitted along with a completed and notarized copy of the Application for Payment form attached to the Agreement as Exhibit E.

3.2. Prior to submitting its first Monthly Application for Payment, Design-Build Firm shall submit to County a complete list of all its proposed subcontractors and materialmen, showing the work and materials involved and the dollar amount of each proposed subcontract and purchase order. The first Application for Payment shall be submitted no earlier than thirty (30) days after Commencement Date of construction.

3.3. If payment is requested on the basis of materials and equipment not incorporated into the Project, but delivered and suitably stored at the site or at another location agreed to by the County in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice or other documentation warranting that upon payment by County, the County shall receive the materials and equipment free and clear of all liens,

charges, security interests and encumbrances, together with evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect County's interest therein, all of which shall be subject to the County's prior written approval.

3.4. Design-Build Firm shall submit its Applications for Payment to the County on or before the 25th day of each month for work performed during the previous month. Invoices received after the 25th day of each month shall be considered for payment as part of the next month's application. Within ten (10) calendar days after receipt of each Application for Payment, the County shall either: (1) indicate approval of the requested payment; (2) indicate approval of only a portion of the requested payment, stating in writing the reasons therefore; or (3) return the Application for Payment to the Design-Build Firm indicating, in writing, the reason for refusing to approve payment. In the event of a total or partial denial of the Application for Payment, the Design-Build Firm may make the necessary corrections and resubmit the Application for Payment for reconsideration within ten (10) calendar days of receiving notice of refusal.

If re-submittal of the Application for Payment is refused, in whole or in part, the Design-Build Firm may submit a written request to the County Manager for an administrative decision within two (2) business days of receiving notice of refusal. Upon receiving a timely request, an administrative decision shall be rendered within ten (10) calendar days with written notification provided to the Design-Build Firm.

The County shall, within forty-five (45) calendar days after County approval of an Application for Payment, in accordance with the Local Government Prompt Payment Act (Florida Statute 218.70), pay the Design-Build Firm the amounts so approved. Provided, however, in no event shall the County be obligated to pay an amount greater than that portion of the Application for Payment approved by the County.

3.5. Except for applications for payment for work performed pursuant to Section 2.A. of the Agreement, relating to the Design Phase, County shall retain ten percent (10%) of the gross amount of each monthly payment request or ten percent (10%) of the portion thereof approved by the County for payment, whichever is less, up to fifty percent (50%) completion. Thereafter, if on schedule, the County shall retain five percent (5%) of the gross amount of each payment request. Such sum shall be accumulated and not released to Design-Build Firm until final payment is due. Any interim interest on such sums shall accrue to County.

3.6. Monthly payments to Design-Build Firm shall in no way imply approval or acceptance of Design-Build Firm's work.

3.7. Each Application for Payment shall be accompanied by Release and Affidavit, in the form attached as Exhibit D, showing that all materials, labor, equipment and other bills associated with that portion of the Work payment is being requested or have been paid in full. The County shall not be required to make payment until and unless these affidavits are furnished by Design-Build Firm.

4. PAYMENTS WITHHELD

4.1. The County may decline to approve any Application for Payment, or portions thereof, because of subsequently discovered evidence or subsequent inspections. The County may nullify the whole or any part of any approval for payment previously issued and County may withhold any payments otherwise due Design-Build Firm under this Agreement or any other agreement between County and Design-Build Firm, to such extent as may be necessary in the County's opinion to protect it from loss because of: (a) defective Work not remedied; (b) third party claims filed or reasonable evidence indicating probable filing of such claims; (c) failure of Design-Build Firm to make payment properly to subcontractors or for labor, materials or equipment; (d) reasonable doubt that the Work can be completed for the unpaid balance of the Contract Amount; (e) reasonable indication that the Work will not be completed within the Contract Time; (f) unsatisfactory prosecution of the Work by the Design-Build Firm; or (g) any other material breach of the Contract Documents. If these conditions are not remedied or removed, County may, after three (3) days written notice, rectify the same at Design-Build Firm's expense. County also may offset against any sums due Design-Build Firm the amount of any liquidated or un-liquidated obligations of Design-Build Firm to County, whether relating to or arising out of this Agreement or any other agreement between Design-Build Firm and County.

5. FINAL PAYMENT

5.1. County shall make final payment to Design-Build Firm within forty-five (45) calendar days in accordance with the Local Government Prompt Payment Act (Florida Statute 218.70) after the Work is finally inspected and accepted by County in accordance with Section 19.1 herein provided.

5.2. Design-Build Firm's acceptance of final payment shall constitute a full waiver of any and all claims by Design-Build Firm against County arising out of this Agreement or otherwise relating to the Project, except those previously made in writing and identified by Design-Build Firm as unsettled at the time of the final Application for Payment. Neither the acceptance of the Work nor payment by County shall be deemed to be a waiver of County's right to enforce any obligations of Design-Build Firm hereunder or to the recovery of damages for defective Work not discovered by the County at the time of final inspection

6. SUBMITTALS AND SUBSTITUTIONS

6.1. Design-Build Firm shall carefully examine the Contract Documents for all requirements for approval of materials to be submitted such as shop drawings, data, test results, schedules and samples. Design-Build Firm shall submit all such materials at its own expense and in such form as required by the Contract Documents in sufficient time to prevent any delay in the delivery of such materials and the installation thereof.

6.2. Whenever materials or equipment are specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular supplier, the naming of the item is intended to establish the type, function and quality required. Unless the name is followed by words indicating that no substitution is permitted, materials or equipment of other suppliers may be accepted by County if sufficient information is submitted by Design-Build Firm to allow the County to determine that the material or equipment proposed is equivalent or equal to that named. Requests for review of substitute items of material and equipment will not be accepted by County from anyone other than Design-Build Firm and all such requests must be submitted by Design-Build Firm to County within thirty (30) calendar days after Notice of Award is received by Design-Build Firm.

6.3. If Design-Build Firm wishes to furnish or use a substitute item of material or equipment, Design-Build Firm shall make application to the County for acceptance thereof, certifying that the proposed substitute shall perform adequately the functions and achieve the results called for by the general design, be similar and of equal substance to that specified and be suited to the same use as that specified. The application shall state that the evaluation and acceptance of the proposed substitute will not prejudice Design-Build Firm's achievement of substantial completion on time, whether or not acceptance of the substitute for use in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with County for the Project) to adapt the design to the proposed substitute and whether or not incorporation or use by the substitute in connection with the Work is subject to payment of any license fee or royalty. All variations of the proposed substitute from that specified will be identified in the application and available maintenance, repair and replacement service shall be indicated. The application also shall contain an itemized estimate of all costs that will result directly or indirectly from acceptance of such substitute, including costs for redesign and claims of other Design-Build Firms affected by the resulting change, all of which shall be considered by the County in evaluating the proposed substitute. The County may require Design-Build Firm to furnish at Design-Build Firm's expense additional data about the proposed substitute.

6.4. If a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents, Design-Build Firm may furnish or utilize a substitute means, method, sequence, technique or procedure of construction acceptable to the County, if Design-Build Firm submits sufficient information to allow the County to determine that the substitute proposed is equivalent to that indicated or required by the Contract Documents. The procedures for submission to and review by the County shall be the same as those provided herein for substitute materials and equipment.

6.5. The County shall be allowed a reasonable time within which to evaluate each proposed substitute. The County shall be the sole judge of acceptability, and no substitute will be ordered, installed or utilized without the County's prior written acceptance which shall be evidenced by either a Change Order or an approved Shop Drawing. The County may require Design-Build Firm to furnish at Design-Build Firm's expense a special performance guarantee or other surety with respect to any substitute.

7. DAILY REPORTS, AS-BUILTS AND MEETINGS

7.1. Unless waived in writing by County, during the Construction Phase, Design-Build Firm shall complete and submit to the County on a weekly basis a daily log of the Design-Build Firm's work for the preceding week in a format approved by the County. The daily log shall document all activities of Design-Build Firm at the Project site including, but not limited to, the following:

7.1.1. Weather conditions showing the high and low temperatures during work hours, the amount of precipitation received on the Project site, and any other weather conditions which adversely affect the Work;

7.1.2. Soil conditions which adversely affect the Work;

7.1.3. The hours of operation by Design-Build Firm's and subcontractor's personnel;

7.1.4. The number of Design-Build Firm's and subcontractor's personnel present and working at the Project site, by subcontract and trade;

7.1.5. All equipment present at the Project site, description of equipment use and designation of time equipment was used (specifically indicating any down time);

7.1.6. Description of Work being performed at the Project site;

7.1.7. Any unusual or special occurrences at the Project site;

7.1.8. Materials received at the Project site; and

7.1.9. A list of all visitors to the Project site.

7.1.10 Safety Meetings

The daily log shall not constitute nor take the place of any notice required to be given by Design-Build Firm to County pursuant to the Contract Documents.

7.2. Design-Build Firm shall maintain in a safe place at the Project site one record copy of the Contract Documents, as well as all shop drawings and other Design-Build Firm submittals and all written interpretations and clarifications issued by the County, in good order and annotated to show all changes made during construction. The annotated drawings shall be continuously updated by the Design-Build Firm throughout the prosecution of the Work to accurately reflect all field changes that are made to adapt the Work to field conditions, changes resulting from Change Orders, Work Directive Changes and Field Orders, and all concealed and buried installations of piping, conduit and utility services. All buried and concealed items, both inside and outside the Project site, shall be accurately located on the annotated drawings as to depth and in relationship to not less than two (2) permanent features (e.g. interior or exterior wall faces). The annotated drawings shall be clean and all changes, corrections and dimensions shall be given in a neat and legible manner in a contrasting color. The "As-Built" record documents, together with all approved samples and a counterpart of all approved shop drawings shall be available to County for reference. Upon completion of the Work, and as a condition precedent to Design-Build Firm's entitlement to final payment, these "As-Built" record documents, samples and shop drawings shall be delivered to County by Design-Build Firm for County.

7.3. Design-Build Firm shall keep all records and supporting documentation which concern or relate to the Work hereunder for a minimum of five (5) years from the date of termination of this Agreement or the date the Project is completed, whichever is later. County, or any duly authorized agents or representatives of County, shall have the right to audit, inspect and copy all such records and documentation as often as they deem necessary during the period of this Agreement and during the five (5) year period noted above; provided, however, such activity shall be conducted only during normal business hours.

8. CONTRACT TIME AND TIME EXTENSIONS

8.1. Design-Build Firm shall diligently pursue the completion of the Work and coordinate the Work being done on the Project by its Architect/Engineer, subcontractors and materialmen, as well as coordinating its Work with all work of others at the Project Site, so that its Work or the work of others shall not be delayed or impaired by any act or omission of Design-Build Firm. Design-Build Firm shall be solely responsible for all construction means, methods, techniques, sequences, and procedures, as well as coordination of all portions of the Work under the Contract Documents.

8.2. Should Design-Build Firm be obstructed or delayed in the prosecution of or completion of the Work as a result of unforeseeable causes beyond the control of Design-Build Firm, and not due to its fault or neglect, including but not restricted to acts of God or of the public enemy, acts of government, fires, floods, epidemics, quarantine regulations, strikes or lockouts, Design-Build Firm shall notify the County in writing within forty-eight (48) hours after the commencement of such delay, stating the cause or causes thereof, or be deemed to have waived any right which Design-Build Firm may have had to request a time extension.

8.3. No interruption, interference, inefficiency, suspension or delay in the commencement or progress of the Work from any cause whatever, including those for which County may be responsible, in whole or in part, shall relieve Design-Build Firm of its duty to perform or give rise to any right to damages or additional compensation from County. Design-Build Firm expressly acknowledges and agrees that it shall receive no damages for delay. Design-Build Firm's sole remedy, if any, against County will be the right to seek an extension to the Contract Time; provided, however, the granting of any such time extension shall not be a condition precedent to the aforementioned "No Damage For Delay" provision. This paragraph shall expressly apply to claims for early completion, as well as to claims based on late completion.

9. CHANGES IN THE WORK

9.1. County shall have the right at any time during the progress of the Work to increase or decrease the Work. Promptly after being notified of a change, Design-Build Firm shall submit an itemized estimate of any cost or time increases or savings it foresees as a result of the change. Except in an emergency endangering life or property, or as expressly set forth herein, no addition or changes to the Work shall be made except upon written order of County, and County shall not be liable to the Design-Build Firm for any increased compensation without such written order. No officer, employee or agent of County is authorized to direct any extra or changed work orally.

9.2. A Change Order, in the form attached as Exhibit F to this Agreement, shall be issued and executed promptly after an agreement is reached between Design-Build Firm and County concerning the requested changes. Design-Build Firm shall promptly perform changes authorized by duly executed Change Orders. The Contract Amount and Contract Time shall be adjusted in the Change Order in the manner as County and Design-Build Firm shall mutually agree.

9.3. If County and Design-Build Firm are unable to agree on a Change Order for the requested change, Design-Build Firm shall, nevertheless, promptly perform the change as directed by County in a written Work Directive Change. In that event, the Contract Amount and Contract Time shall be adjusted as directed by County. If Design-Build Firm disagrees with the County's adjustment determination, Design-Build Firm must make a claim pursuant to Section 10 of these General Conditions or else be deemed to have waived any claim on this matter it might otherwise have had.

9.4. In the event a requested change results in an increase to the Contract Amount, as to design the amount of the increase shall be based upon the standard hourly billing rates, according to classification of the Design-Build Firm's Architect/Engineer plus expenses to be charged at actual cost. As to the construction, the amount of the increase shall be limited to the Design-Build Firm's reasonable direct labor and material costs and reasonable actual equipment costs as a result of the change (including allowance for labor burden costs) plus a maximum ten percent (10%) markup for all overhead and profit. In the event such change Work is performed by a Subcontractor, a maximum ten percent (10%) markup for all overhead and profit for all Subcontractors' and sub-subcontractors' direct labor and material costs and actual equipment costs shall be permitted, with a maximum five percent (5%) markup thereon by the Design-Build Firm for all of its overhead and profit, for a total maximum markup of fifteen percent (15%). All compensation due Design-Build Firm and any Subcontractor or sub-subcontractor for field and home office overhead is included in the markups noted above.

9.5. County shall have the right to conduct an audit of Design-Build Firm's books and records to verify the accuracy of the Design-Build Firm's claim with respect to Design-Build Firm's costs associated with any Change Order.

9.6. The County shall have authority to order minor changes in the Work not involving an adjustment to the Contract Amount or an extension to the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes may be affected by Field Order or by other written order. Such changes shall be binding on the Design-Build Firm.

10. CLAIMS AND DISPUTES

10.1. A Claim is a demand or assertion by one of the parties seeking an adjustment or interpretation of the terms of the Contract Documents, payment of money, extension of time or other relief with respect to the terms of the Contract Documents. The term "Claim" also includes other disputes and matters in question between County and Design-Build Firm arising out of or relating to the Contract Documents. The responsibility to substantiate a Claim shall rest with the party making the Claim.

10.2. Claims by the Design-Build Firm shall be made in writing to the County within forty-eight (48) hours after the first day of the event giving rise to such Claim or else the Design-Build Firm shall be deemed to have waived the Claim. Written supporting data shall be submitted to the County within fifteen (15) calendar days after the occurrence of the event, unless the County grants additional time in writing, or else the Design-Build Firm shall be deemed to have waived the Claim. All claims shall be priced in accordance with the provisions of Subsection 9.4.

10.3. The Design-Build Firm shall proceed diligently with its performance as directed by the County, regardless of any pending Claim, action, suit or administrative proceeding, unless otherwise agreed to by the County in writing. County shall continue to make payments in accordance with the Contract Documents during the pendency of any

Claim.

11. OTHER WORK

11.1. County may perform other work related to the Project at the site by County's own forces, have other work performed by utility owners or let other direct contracts. If the fact that such other work is to be performed is not noted in the Contract Documents, notice thereof will be given to Design-Build Firm. If Design-Build Firm believes that such performance will involve additional expense to Design-Build Firm or require additional time, Design-Build Firm shall send written notice of that fact to County within forty-eight (48) hours of being notified of the other work. If the Design-Build Firm fails to send the above required forty-eight (48) hour notice, the Design-Build Firm will be deemed to have waived any rights it otherwise may have had to seek an extension to the Contract Time or adjustment to the Contract Amount.

11.2. Design-Build Firm shall afford each utility owner and other Design-Build Firm (or County, if County is performing the additional work with County's employees) proper and safe access to the site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such work and shall properly connect and coordinate its Work with theirs. Design-Build Firm shall do all cutting, fitting and patching of the Work that may be required to make its several parts come together properly and integrate with such other work. Design-Build Firm shall not endanger any work of others by cutting, excavating or otherwise altering their work and will only cut or alter their work with the written consent of the County and the others whose work will be affected.

11.3. If any part of Design-Build Firm's Work depends for proper execution or results upon the work of any other Design-Build Firm or utility owner (or County), Design-Build Firm shall inspect and promptly report to County in writing any delays, defects or deficiencies in such work that render it unavailable or unsuitable for such proper execution and results. Design-Build Firm's failure to report will constitute an acceptance of the other work as fit and proper for integration with Design-Build Firm's Work.

12. INDEMNIFICATION AND INSURANCE

12.1. Design-Build Firm shall pay on behalf of or indemnify and hold harmless the County and its, agents, officers and employees from all liabilities, damages, losses, and costs, including attorneys' fees, incurred by County to the extent caused by the negligence, recklessness, or intentional wrongful misconduct of Design-Build Firm or by any person, firm or corporation (including but not limited to the Architect/Engineer) to whom any portion of the Work is subcontracted by Design-Build Firm or resulting from the use by Design-Build Firm, or by any one for whom Design-Build Firm is legally liable, of any materials, tools, machinery or other property of County. Design-Build Firm’s obligation as provided herein shall be limited to its proportionate share of liability to the extent caused by the negligence, recklessness or intentional wrongful misconduct of Design-Build Firm or by any person, firm or corporation to whom any portion of the Work is subcontracted by Design-Build Firm, and Design-Build Firm shall not be required to pay on behalf of or indemnify

and hold harmless County where County's negligence, recklessness or intentional wrongful misconduct is determined by a court of competent jurisdiction to be the sole cause of its liabilities, damages, losses and costs, including attorney's fees and paralegal fees.

County and Design-Build Firm agree one percent (1%) of the Contract Amount paid by County to Design-Build Firm shall be given as separate consideration for this indemnification, and any other indemnification of County by Design-Build Firm provided for within the Contract Documents, the sufficiency of such separate consideration being acknowledged by Design-Build Firm by Design-Build Firm's acceptance and execution of the Agreement.

Design Build Firm agrees that such indemnification by Design Build Firm relating to any matter which is the subject of this Agreement shall extend throughout the term of this Agreement and any applicable statutes of limitations thereafter. The Design-Build Firm's obligation shall not be limited by, or in any way to, any insurance coverage or by any provision in or exclusion or omission from any policy of insurance.

12.2. Design-Build Firm shall obtain and carry, at all times during its performance under the Contract Documents, insurance of the types and in the amounts set forth in Exhibit C to the Agreement. All insurance policies shall be from responsible companies duly authorized to do business in the State of Florida and/or responsible risk retention group insurance companies or trusts which are registered with the State of Florida. Foreign or off-shore insurance carriers are not acceptable for work under this contract unless admitted to the State of Florida. All commercial insurance carriers providing the Design-Build Firm with required insurance shall be rated with a minimum financial size category of VII according to the AM Best Rating Guide, latest edition. An A or better Best Rating is "preferred"; however, other ratings if "Secure Best Ratings" may be considered. Within ten (10) calendar days after Notice of Award is received by Design-Build Firm and prior to the commencement of work, Design-Build Firm shall provide County with properly executed Certificates of Insurance to evidence Design-Build Firm's compliance with the insurance requirements of the Contract Documents. Said Certificates of Insurance shall be on forms approved by County, such as "Acord Form 25". The Certificates of Insurance shall be personally, manually signed by the authorized representatives of the insurance company/companies shown on the Certificates of Insurance, with proof that they are authorized representatives thereof. Certificates of Insurance shall be mailed to Nassau County in care of: Contract Manager, 96135 Nassau Place, Suite 6, Yulee, Florida 32097. In addition, certified, true and exact copies of all insurance policies required hereunder shall be provided to County, on a timely basis, when requested by County.

12.3. The Certificates of Insurance and required insurance policies shall contain provisions that thirty (30) days prior written notice by registered or certified mail shall be given County of any cancellation, intent not to renew, or reduction in the policies or coverages, except in the application of the aggregate limits provisions. In the event of a reduction in the aggregate limit of any policy, Design-Build Firm shall immediately take steps to have the aggregate limit reinstated to the full extent permitted under such policy.

12.4. All insurance coverages of the Design-Build Firm shall be primary to any insurance or self-insurance program carried by the County applicable to this Project. The acceptance by County of any Certificate of Insurance does not constitute approval or agreement by the County that the insurance requirements have been satisfied or that the insurance policy shown on the Certificate of Insurance is in compliance with the requirements of the Contract Documents. No work shall commence at the Project site unless and until the required Certificates of Insurance are received by the County.

12.5. Design-Build Firm shall require each of its subcontractors to procure and maintain, until the completion of the subcontractor's work, insurance of the types and to the limits specified in Exhibit C, unless such insurance requirements for the subcontractor is expressly waived in writing by the County. All liability insurance policies, other than professional liability, worker's compensation and employer's liability policies, obtained by Design-Build Firm to meet the requirements of the Contract Documents shall name Nassau County as an additional insured and shall contain severability of interest provisions. Nassau County shall also be designated as certificate holder with the address of 96135 Nassau Place, Suite 6, Yulee, Florida 32097. If any insurance provided pursuant to the Contract Documents expires prior to the completion of the Work, renewal Certificates of Insurance and, if requested by County, certified, true copies of the renewal policies, shall be furnished by Design-Build Firm within thirty (30) days prior to the date of expiration. Upon expiration of an insurance policy term during the course of work under the contract, succeeding insurance policies shall be consecutive to the expiring policy.

12.6 All liability policies shall be underwritten on the "occurrence" basis, unless otherwise approved in writing by the County Division of Risk Management. "Claims made" policies, if approved by the Risk Manager, and subsequent insurance certificates shall provide a "retro-date" which shall include the effective date of the contract. "Claims-made" renewals or carrier and policy replacements shall reflect the original "retro-date."

12.7. Should at any time the Design-Build Firm not maintain the insurance coverages required herein, the County may terminate the Agreement or at its sole discretion shall be authorized to purchase such coverages and charge the Design-Build Firm for such coverages purchased. The County shall be under no obligation to purchase such insurance, nor shall it be responsible for the coverages purchased or the insurance company or companies used. The decision of the County to purchase such insurance coverages shall in no way be construed to be a waiver of any of its rights under the Contract Documents.

12.8 Design-Build Firm shall submit to County a copy of all accident reports arising out of any personal injuries or property damages arising or alleged to have arisen on account of any work by Design-Build Firm or sub-Contractor under the contract documents.

12.9 Duty to Provide Legal Defense. To the extent permitted by law, the Design-Build Firm shall pay for and provide a legal defense for County, which shall include attorneys' fees and costs, both of which will be done only if and when requested by County, for all liabilities, damages, losses, and costs as described in paragraph 12.1 above. Such payment on the behalf of the County shall be in addition to any and all other legal remedies available to the County and shall not be considered to be the County's exclusive remedy.

13. COMPLIANCE WITH LAWS

13.1 Design-Build Firm agrees to comply, at its own expense, with all federal, state and local laws, codes, statutes, ordinances, rules, regulations and requirements applicable to the Project, including but not limited to those dealing with taxation, worker's compensation, equal employment and safety. If Design-Build Firm observes that the Contract Documents are at variance therewith, it shall promptly notify County in writing. Compliance with the above laws shall include but is not limited to: (1) the Occupational Safety and Health Act, 29 CFR 1910 and 1926, respectively, General Industry Standards and Construction Industry Standards, including regulations regarding Trenching and Shoring; (2) the Florida Workers' Compensation Law, Chapter 440, Florida Statutes; (3) Rules 38F and 38I, Florida Administrative Code; and (4) Florida Department of Transportation Manual of Traffic Control and Safe Practices. Failure to adhere to the requirements of the above named laws and regulations regarding safety and traffic control shall be grounds for an immediate work stoppage, either by County staff or the Design-Build Firm, until the deficiency is corrected.

13.2 EMPLOYMENT ELIGIBILITY VERIFICATION (E-VERIFY): Contractor must comply with F.S. 448.095 and use the United States Department of Homeland Security's E-Verify system ("E-Verify") to verify the employment eligibility of all persons hired by the Contractor during the term of this Contract to work in Florida. Additionally, if the Contractor uses subcontractors to perform any portion of the work (under this Contract), Contractor must include a requirement in the subcontractor's contract that the subcontractor use E-Verify to verify the employment eligibility of all persons hired by subcontractor to perform any such portion of the work. Answers to questions regarding E-Verify as well as instructions on enrollment may be found at the E-Verify website: www.uscis.gov/e-verify.

14. CLEANUP AND PROTECTIONS

14.1. Design-Build Firm agrees to keep the Project site clean at all times of debris, rubbish and waste materials arising out of the Work. At the completion of the Work, Design-Build Firm shall remove all debris, rubbish and waste materials from and about the Project

site, as well as all tools, appliances, construction equipment and machinery and surface materials, and shall leave the Project site clean and ready for occupancy by County.

14.2. Any existing surface or subsurface improvements, including, but not limited to, pavements, curbs, sidewalks, pipes, utilities, footings, structures, trees and shrubbery, not indicated in the Contract Documents to be removed or altered, shall be protected by Design-Build Firm from damage during the prosecution of the Work. Any such improvements so damaged shall be restored by Design-Build Firm to the condition equal to that existing at the time of Design-Build Firm's commencement of the Work.

15. ASSIGNMENT

15.1. Design-Build Firm shall not assign this Agreement or any part thereof, without the prior consent in writing of County. If Design-Build Firm does, with approval, assign this Agreement or any part thereof, it shall require that its assignee be bound to it and to assume toward Design-Build Firm all of the obligations and responsibilities that Design-Build Firm has assumed toward County.

16. PERMITS, LICENSES AND TAXES

16.1. All permits and licenses necessary for the prosecution of the Work shall be procured and paid for by Design-Build Firm. All permits or fees, including but not limited to, all license fees, permit fees, impact fees or inspection fees payable by Design-Build Firm to County have been disclosed to Design-Build Firm in the bidding documents or other request for proposal at the time the Project was let for bid. If Design-Build Firm performs any Work without obtaining, or contrary to, such permits or licenses, Design-Build Firm shall bear all costs arising therefrom. Design-Build Firm shall pay all governmental charges and inspection fees necessary for the prosecution of the Work.

16.2. Design-Build Firm shall pay all sales, consumer, use and other similar taxes associated with the Work or portions thereof, which are applicable during the performance of the Work.

17. TERMINATION FOR DEFAULT

17.1. Design-Build Firm shall be considered in material default of the Agreement and such default shall be considered cause for County to terminate the Agreement, in whole or in part, as further set forth in this Section, if Design-Build Firm: (1) fails to begin the Work under the Contract Documents within the time specified herein; or (2) fails to properly and timely perform the Work as directed by the County or as provided for in the approved Progress Schedule; or (3) commits errors or omissions in the performance of the architectural/engineering design or inspection services; or (4) performs the Work unsuitably or neglects or refuses to remove materials or to correct or replace such Work as may be rejected as unacceptable or unsuitable; or (5) discontinues the prosecution of the Work; or (6) fails to resume Work which has been suspended within a reasonable time after being notified to do so; or (7) becomes insolvent or is declared bankrupt, or commits any act of

bankruptcy; or (8) allows any final judgment to stand against it unsatisfied for more than ten (10) days; or (9) makes an assignment for the benefit of creditors; or (10) fails to obey any applicable codes, laws, ordinances, rules or regulations with respect to the Work; or (11) materially breaches any other provision of the Contract Documents.

17.2. County shall notify Design-Build Firm in writing of Design-Build Firm's default(s). If County determines that Design-Build Firm has not remedied and cured the default(s) within seven (7) calendar days following receipt by Design-Build Firm of said written notice, then County, at its option, without releasing or waiving its rights and remedies against the Design-Build Firm's sureties and without prejudice to any other right or remedy it may be entitled to hereunder or by law, may terminate Design-Build Firm's right to proceed under the Agreement, in whole or in part, and take possession of all or any portion of the Work and any materials, tools, equipment, and appliances of Design-Build Firm, take assignments of any of Design-Build Firm's subcontracts and purchase orders, and complete all or any portion of Design-Build Firm's Work by whatever means, method or agency which County, in its sole discretion, may choose.

17.3. If County deems any of the foregoing remedies necessary, Design-Build Firm agrees that is shall not be entitled to receive any further payments hereunder until after the Project is completed. All monies expended and all of the costs, losses, damages and extra expenses, including all management, administrative and other overhead and other direct and indirect expenses (including attorneys' fees) or damages incurred by County incident to such completion, shall be deducted from the Contract Amount, and if such expenditures exceed the unpaid balance of the Contract Amount, Design-Build Firm agrees to pay promptly to County on demand the full amount of such excess, including costs of collection, attorney's fees (including appeals) and interest thereon at the maximum legal rate of interest until paid. If the unpaid balance of the Contract Amount exceeds all such costs, expenditures and damages incurred by the County to complete the Work, such excess shall be paid to the Design-Build Firm. The amount to be paid to the Design-Build Firm or County, as the case may be, and this obligation for payment shall survive termination of the Agreement.

17.4. The liability of Design-Build Firm hereunder shall extend to and include the full amount of any and all sums paid, expenses and losses incurred, damages sustained, and obligations assumed by County in good faith under the belief that such payments or assumptions were necessary or required, in completing the Work and providing labor, materials, equipment, supplies, and other items therefor or re-letting the Work, in settlement, discharge or compromise of any claims, demands, suits, and judgments pertaining to or arising out of the Work hereunder.

17.5. If, after notice of termination of Design-Build Firm's right to proceed pursuant to this Section, it is determined for any reason that Design-Build Firm was not in default, or that its default was excusable, or that County is not entitled to the remedies against Design-Build Firm provided herein, then Design-Build Firm's remedies against County shall be the same as and limited to those afforded Design-Build Firm below under Subsection 18.1, Termination for Convenience.

17.6 If the Design-Build Firm refuses to allow public access to all documents, papers, letters, or other material subject to the provisions of Chapter 119, Florida Statutes, and made or received by the Design-Build Firm in conjunction with this Agreement then the County may, without prejudice to any right or remedy and after giving the Design-Build Firm and his surety, if any, seven (7) days written notice, during which period Design-Build Firm still fails to allow access, terminate the employment of the Design-Build Firm and take possession of the site and of all materials, equipment, tools, construction equipment and machinery thereon, owned by the Design-Build Firm, and may finish the project by whatever method it may deem expedient. In such case, the Design-Build Firm shall not be entitled to receive any further payment until the Project is finished. Reasonable terminal expenses incurred by the County may be deducted from any payments left owing the Design-Build Firm (excluding monies owed the Design-Build Firm for subcontract work).

18. TERMINATION FOR CONVENIENCE AND RIGHT OF SUSPENSION

18.1. County shall have the right to terminate this Agreement without cause upon seven (7) calendar days written notice to Design-Build Firm. In the event of such termination for convenience, Design-Build Firm's recovery against County shall be limited to that portion of the Contract Amount earned through the date of termination, together with any retainage withheld and reasonable termination expenses incurred, but Design-Build Firm shall not be entitled to any other or further recovery against County, including, but not limited to, damages or any anticipated profit on portions of the Work not performed.

18.2. County shall have the right to suspend all or any portions of the Work upon giving Design-Build Firm two (2) calendar days' prior written notice of such suspension. If all or any portion of the Work is so suspended, Design-Build Firm's sole and exclusive remedy shall be to seek an extension of time to its schedule in accordance with the procedures set forth in the Contract Documents. In no event shall the Design-Build Firm be entitled to any additional compensation or damages. Provided, however, if the ordered suspension exceeds three (3) months, the Design-Build Firm shall have the right to terminate the Agreement with respect to that portion of the Work which is subject to the ordered suspension.

19. COMPLETION

19.1. Upon receipt of written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the County shall promptly make such inspection and, if it finds the work acceptable and fully performed under the Contract Documents, shall promptly issue a final Certificate for Payment, stating that, on the basis of observations and inspections, the Work has been completed in accordance with the terms and conditions of the Contract Documents and that the entire balance found to be due the Design-Build Firm is due and payable. The final payment shall not become due and payable until Design-Build Firm submits: (1) the Release and Affidavit in the form attached as Exhibit D, (2) consent of surety to final payment, (3) if required by County, other data establishing payment or satisfaction of all obligations, such as receipts, releases and

waivers of liens, arising out of the Contract Documents, to the extent and in such form as may be designated by County, and (4) a published copy of the Notice of Completion as provided for in section 19.2. County reserves the right to inspect the Work and make an independent determination as to the Work's acceptability. Unless and until the County is completely satisfied, the final payment shall not become due and payable.

19.2 After the Work is ready for final inspection and acceptance by the County, a legal advertisement must be published by the Design-Build Firm in a local newspaper of a general countywide circulation at least thirty (30) days before final payment shall be made. Example of such publication is as follows:

Legal Notice of Completion

Notice is hereby given that the undersigned Design-Build Firm has completed and has ready for acceptance by the Board of County Commissioners of Nassau County, Florida, the following construction project:

_____
(Project Name and Address)

_____
(Legal Name and Address - entity of the Design-Build Firm)

Subcontractors, materialmen, and other persons having payment claims against the Design-Build Firm relating to this project should govern themselves accordingly.

20. WARRANTY

20.1. Design-Build Firm shall obtain and assign to County all express warranties given to Design-Build Firm or any subcontractors by any material men supplying materials, equipment or fixtures to be incorporated into the Project. Design-Build Firm warrants to County that any materials and equipment furnished under the Contract Documents shall be new unless otherwise specified, and that all Work shall be of good quality, free from all defects and in conformance with the Contract Documents. Design-Build Firm further warrants to County that all materials and equipment furnished under the Contract Documents shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instructions of the applicable manufacturers, fabricators, suppliers or processors except as otherwise provided for in the Contract Documents. If, within one (1) year after substantial completion and acceptance, any Work is found to be defective or not in conformance with the Contract Documents, Design-Build Firm shall correct it promptly after receipt of written notice from County. Design-Build Firm shall also be responsible for and pay for replacement or repair of adjacent materials or Work, which may be damaged as a result of such replacement or repair. These warranties are in addition to those implied warranties to which County is entitled as a matter of law. The Performance Bond shall remain in full force and effect throughout the one (1) year Warranty Period.

21. TESTS AND INSPECTIONS

21.1. County, its respective representatives, agents and employees, and any governmental agencies with jurisdiction over the Project shall have access at all times to the Work, whether the Work is being performed on or off of the Project site, for their observation, inspection and testing. Design-Build Firm shall provide proper, safe conditions for such access. Design-Build Firm shall provide County with timely notice of readiness of the Work for all required inspections, tests or approvals.

21.2. If the Contract Documents or any codes, laws, ordinances, rules or regulations of any public authority having jurisdiction over the Project requires any portion of the Work to be specifically inspected, tested or approved, Design-Build Firm shall assume full responsibility therefore, pay all costs in connection therewith and furnish County the required certificates of inspection, testing or approval. All inspections, tests or approvals shall be performed in a manner and by organizations acceptable to the County.

21.3. If any Work that is to be inspected, tested or approved is covered without written concurrence from the County, such work must, if requested by County, be uncovered for observation. Such uncovering shall be at Design-Build Firm's expense unless Design-Build Firm has given County timely notice of Design-Build Firm's intention to cover the same and County has not acted with reasonable promptness to respond to such notice. If any Work is covered contrary to written directions from County, such Work must, if requested by County, be uncovered for County's observation and be replaced at Design-Build Firm's sole expense.

21.4. The County shall charge to Design-Build Firm and may deduct from any payments due Design-Build Firm all engineering and inspection expenses incurred by County in connection with any overtime work. Such overtime work consisting of any work during the construction period beyond the regular eight (8) hour day and for any work performed on Saturday, Sunday or holidays.

21.5. Neither observations by the County nor inspections, tests or approvals by others shall relieve Design-Build Firm from Design-Build Firm's obligations to perform the Work in accordance with the Contract Documents.

22. DEFECTIVE WORK

22.1. Work not conforming to the requirements of the construction plans or Contract Documents or work conforming to the construction plans or contract documents containing errors or omissions, including, but not limited to, design flaws shall be deemed defective Work. If required by County, Design-Build Firm shall as directed, either correct all defective Work, whether or not fabricated, installed or completed, or, if the defective Work has been rejected by County, remove it from the site and replace it with undefective Work. Design-Build Firm shall bear all direct, indirect and consequential costs of such correction or removal (including, but not limited to fees and charges of engineers, architects, attorneys

and other professionals) made necessary thereby, and shall hold County harmless for same.

22.2. If the County considers it necessary or advisable that covered Work be observed by County or inspected or tested by others, Design-Build Firm, at County's request, shall uncover, expose or otherwise make available for observation, inspection or tests as County may require, that portion of the Work in question, furnishing all necessary labor, material and equipment. If it is found that such Work is defective, Design-Build Firm shall bear all direct, indirect and consequential costs of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction (including, but not limited to, fees and charges of engineers, architects, attorneys and other professionals), and County shall be entitled to an appropriate decrease in the Contract Amount. If, however, such Work is not found to be defective, Design-Build Firm shall be allowed an increase in the Contract Amount and/or an extension of the Contract Time, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction.

22.3. If any portion of the Work is defective, or Design-Build Firm fails to supply sufficient skilled workers with suitable materials or equipment, or fails to finish or perform the Work in such a way that the completed Work will conform to the Contract Documents, County may order Design-Build Firm to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of County to stop the Work shall not give rise to any duty on the part of County to exercise this right for the benefit of Design-Build Firm or any other party.

22.4. Should the County determine, at its sole opinion, it is in the County's best interest to accept defective Work, the County may do so. Design-Build Firm shall bear all direct, indirect and consequential costs attributable to the County's evaluation of and determination to accept defective Work. If such determination is rendered prior to final payment, a Change Order shall be executed evidencing such acceptance of such defective Work, incorporating the necessary revisions in the Contract Documents and reflecting an appropriate decrease in the Contract Amount. If the County accepts such defective Work after final payment, Design-Build Firm shall promptly pay County an appropriate amount to adequately compensate County for its acceptance of the defective Work.

22.5. If Design-Build Firm fails, within a reasonable time after the written notice from County, to correct defective Work or to remove and replace rejected defective Work as required by County, or if Design-Build Firm fails to perform the Work in accordance with the Contract Documents, or if Design-Build Firm fails to comply with any of the provisions of the Contract Documents, County may, after seven (7) days' written notice to Design-Build Firm, correct and remedy any such deficiency. To the extent necessary to complete corrective and remedial action, County may exclude Design-Build Firm from any or all of the Project site, take possession of all or any part of the Work, and suspend Design-Build Firm's services related thereto, take possessions of Design-Build Firm's tools, appliances, construction equipment and machinery at the Project site and incorporate in the Work all

materials and equipment stored at the Project site or for which County has paid Design-Build Firm but which are stored elsewhere. Design-Build Firm shall allow County, and their respective representatives, agents, and employees such access to the Project site as may be necessary to enable County to exercise the rights and remedies under this Subsection. All direct, indirect and consequential costs of County in exercising such rights and remedies shall be charged against Design-Build Firm, and a Change Order shall be issued, incorporating the necessary revisions to the Contract Documents, including an appropriate decrease to the Contract Amount. Such direct, indirect and consequential costs shall include, but not be limited to, fees and charges of engineers, architects, attorneys and other professionals, all court and arbitration costs and all costs of repair and replacement of work or others destroyed or damaged by correction, removal or replacement of Design-Build Firm's defective Work. Design-Build Firm shall not be allowed an extension of the Contract Time because of any delay in performance of the Work attributable to the exercise by County of County's rights and remedies hereunder.

23. SUPERVISION AND SUPERINTENDENTS

23.1. Design-Build Firm shall supervise and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Design-Build Firm shall be responsible to see that the finished Work complies accurately with the Contract Documents. Design-Build Firm shall keep on the Work at all times during its progress a competent resident superintendent, who shall not be replaced without prior written notice to County except under extraordinary circumstances. The superintendent shall be Design-Build Firm's representative at the Project site and shall have authority to act on behalf of Design-Build Firm. All communications given to the superintendent shall be as binding as if given to the Design-Build Firm. County shall have the right to direct Design-Build Firm to remove and replace its Project superintendent, with or without cause.

24. PROTECTION OF WORK

24.1. Design-Build Firm shall fully protect the Work from loss or damage and shall bear the cost of any such loss or damage until final payment has been made. If Design-Build Firm, or any one for whom Design-Build Firm is legally liable, is responsible for any loss or damage to the Work, or other work or materials of County or County's separate Design-Build Firms, Design-Build Firm shall be charged with the same, and any monies necessary to replace such loss or damage shall be deducted from any amounts due Design-Build Firm.

24.2. Design-Build Firm shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Design-Build Firm subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

25. EMERGENCIES

25.1. In the event of an emergency affecting the safety or protection of persons or

the Work or property at the Project site or adjacent thereto, Design-Build Firm, without special instruction or authorization from County is obligated to act to prevent threatened damage, injury or loss. Design-Build Firm shall give County written notice within forty-eight (48) hours after the occurrence of the emergency, if Design-Build Firm believes that any significant changes in the Work or variations from the Contract Document have been caused thereby. If the County determines that a change in the Contract Documents is required because of the action taken in response to an emergency, a Change Order shall be issued to document the consequences of the changes or variations. If Design-Build Firm fails to provide the forty-eight (48) hour written notice noted above, the Design-Build Firm shall be deemed to have waived any right it otherwise may have had to seek an adjustment to the Contract Amount or an extension to the Contract Time.

26. USE OF PREMISES

26.1. Design-Build Firm shall confine all construction equipment, the storage of materials and equipment and the operations of workers to the Project site and land and areas identified in and permitted by the Contract Documents and other lands and areas permitted by law, rights of way, permits and easements, and shall not unreasonably encumber the Project site with construction equipment or other material or equipment. Design-Build Firm shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or any land or areas contiguous thereto, resulting from the performance of the Work.

27. SAFETY

27.1. The Design-Build Firm shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. The Design-Build Firm shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

27.1.1. All employees of the Work and other persons and/or organizations who may be affected thereby;

27.1.2. All the Work and materials and equipment to be incorporated therein, whether in storage on or off the Project site; and

27.1.3. Other property on Project site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and any underground structures or improvements not designated for removal, relocation or replacement in the contract documents.

27.2. The Design-Build Firm shall comply with all applicable codes, laws, ordinances, rules and regulations of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss. The Design-Build Firm shall erect and maintain all necessary safeguards for such safety and protection. The Design-Build Firm shall notify owners of adjacent property and of underground structures

and improvements and utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation or replacement of their property. Design-Build Firm's duties and responsibilities for the safety and protection of the Work shall continue until such time as the Work is completed and final acceptance of same by County has occurred.

27.3. The Design-Build Firm shall designate a responsible representative at the Project site whose duty shall be the prevention of accidents. This person shall be Design-Build Firm's superintendent unless otherwise designated in writing by the Design-Build Firm to the County.

27.4. The Design-Build Firm shall adhere at all times to the minimum safety guidelines for construction and renovation projects as set out in Exhibit C of this Agreement.

28. PROJECT MEETINGS

Prior to the commencement of Work, the Design-Build Firm shall attend a preconstruction conference with the County to discuss the Progress Schedule, procedures for handling shop drawings and other submittals, and for processing Applications for Payment, and to establish a working understanding among the parties as to the Work. During the prosecution of the Work, the Design-Build Firm shall attend any and all meetings convened by the County with respect to the Project, when directed to do so by County. Design-Build Firm shall have its subcontractors and suppliers attend all such meetings (including the preconstruction conference) as may be directed by the County.

EXHIBIT B

PERFORMANCE AND PAYMENT BOND

BOND NO. _____

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: That

_____

_____

(Insert name, address, and phone number of contractor), as Principal, and

_____

_____,

(Insert full name, home office address and phone number of surety) as Surety, are held and firmly bound unto the Board of County Commissioners for Nassau County, Florida, 96135 Nassau Place, Yulee, Florida 32097, (904) 548-4590, as Obligee in the sum of

_____

Dollars ($_____), for the payment whereof we bind ourselves, our heirs, executors, personal representatives, successors and assigns, jointly and severally, firmly by these present.

WHEREAS, Principal has entered into a contract dated as of the _____ day of_____, 20____, with Obligee for Contract No._____,_____

_____

_____

(Insert name of project, including legal description, street address of property and general description of improvement) in accordance with drawings and specifications, which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

THE CONDITION OF THIS BOND is that if Principal:

1. Performs the Contract at the times and in the manner prescribed in the Contract; and

2. Pays Obligee any and all losses, damages, costs and attorneys' fees that Obligee sustains because of any default by Principal under the Contract; and

3. Performs the guarantee of all work and materials furnished under the Contract applicable to the work and materials, then this bond is void; otherwise it remains in full force; and

4. Principal understands and agrees that this bond shall remain in full force and effect throughout the one (1) year warranty period after substantial completion of the work.

The Surety, for value received, hereby stipulates and agrees that no changes, extensions of time, alterations or additions to the terms of the Contract or other work to be performed hereunder, or the specifications referred to therein shall in anywise affect its obligation under this bond, and it does hereby waive notice of any such changes, extensions of time, alterations or additions to the terms of the Contract or to work or to the specifications.

This instrument shall be construed in all respects as a common law bond.

In no event will the Surety be liable in the aggregate to Obligee for more than the penalty sum of this Performance Bond, regardless of the number of suits that may be filed by Obligee.

IN WITNESS WHEREOF, the above parties have executed this instrument this _____ day of _____, 20____, the name and corporate seal of each corporate party being hereto affixed and these premises duly signed by its undersigned representative, pursuant to authority of its governing body.

Signed, sealed and delivered
in the presence of:

PRINCIPAL:

_____

_____ By:_____

Name:_____

_____ Its:_____

Witnesses as to Principal

STATE OF _____

COUNTY OF _____

Sworn to (or affirmed) and subscribed before me by means of___ physical presence or ___ online notarization, this____ day of_____, 20___ by _____, as_____ of _____, a corporation, on behalf of the corporation, who is ___ personally known to me or___ produced _____ as identification and did (did not) take an oath.

My Commission Expires:

_____
(Signature)
Name:_____
(Legibly Printed)

(AFFIX OFFICIAL SEAL)

Notary Public, State of _____
Serial No., If Any: _____

ATTEST:

SURETY:_____
(Printed Name)
_____
_____
_____
(Business Address)
_____

_____
Witness

_____ (Authorized Signature)

Witness _____

(Printed Name)

OR

_____ _____

As Attorney In Fact (Attach Power)

_____

_____ _____

Witnesses _____

(Business Address)

_____

(Printed Name)

_____

(Telephone Number)

STATE OF _____

COUNTY OF _____

Sworn to (or affirmed) and subscribed before me by means of ___ physical presence or___ online notarization, this _____ day of _____, 20___ by _____, as _____ of _____ as Surety, on behalf of Surety, who is __ personally known to me or___ produced _____ as identification and did (did not) take and oath.

My Commission Expires: _____

(Signature)

Name:_____

(Legibly Printed)

(AFFIX OFFICIAL SEAL) Notary Public, State of _____

Serial No., If Any: _____

BOND NO. _____

PAYMENT BOND

BY THIS BOND, We, _____
(Insert name, address and phone number of contractor)
_____ (hereinafter called the "Principal")

and _____ (hereinafter called the "Surety"),
(Insert name)
located at _____, a surety insurer
(Insert address and phone number)
chartered and existing under the laws of the State of _____ and authorized to do business

in the State of Florida, are held and firmly bound unto the Board of County Commissioners for Nassau

County, Florida, 96135 Nassau Place, Yulee, Florida 32097, (904) 548-4590, (hereinafter called

the "County") in the sum of _____ ($_____) for

payment of which we bind ourselves, our heirs, our personal representatives, our successors and our assignees, jointly and severally.

WHEREAS, Principal and County have reached a mutual agreement relating to Contract No._____

(hereinafter referred to as the "Contract") as of _____ (the bid award date for projects thereto)

for the purpose of _____
(Insert name of project, including legal description, street address of property and general description of improvement.)
_____

_____

_____

said Contract being made a part of this Bond by this reference.

NOW, THEREFORE, THE CONDITION OF THIS BOND IS THAT IF THE PRINCIPAL:

1. Performs the contract dated _____, _____, between Principal and County for construction of _____, the contract being made a part of this bond by reference, at the times and in the manner prescribed in the contract; and

2. Promptly makes payments to all claimants, as defined in Section 255.05(1), Florida Statutes, supplying Principal with labor, materials, or supplies, used directly or indirectly by Principal in the prosecution of the work provided for in the contract; and

3. Pays County all loses, damages, expenses, costs, and attorney's fees, including appellate proceedings, that the County sustains because of a default by Principal under the contract; and

4. Performs the guarantee of all work and materials furnished under the contract for the time specified in the contract, then this bond is void; otherwise it remains in full force.

Any action instituted by a claimant under this bond for payment must be in accordance with the notice and time limitation provisions in Section 255.05(2), Florida Statutes.

BE IT FURTHER KNOWN:

1. Any changes in or under the Contract and compliance or noncompliance with any formalities connected with the said Contract or alterations which may be made in the terms of the said Contract, or in the work to be done under it, or the giving by the County of any extension of time for the performance of the said Contract, or any other forbearance on the part of the County or Principal to the other, shall not in any way release the Principal and the Surety, or either of them, their heirs, personal representatives, successors or assigns from liability hereunder, notice to the Surety of any such changes, alterations, extensions or forbearance being hereby waived.

2. Certain claimants seeking the protection of this Bond must timely comply with the strict requirements set forth in Section 255.05, Florida Statutes, and as otherwise provided by law.

3. As concerns payment for labor, materials and supplies, as affects certain claimants, no legal action shall be instituted against the Principal or Surety on this Bond after one (1) year from the performance of labor or the completion of delivery of the materials or supplies as is specifically mandated pursuant to Section 255.05, Florida Statutes.

THIS BOND DATED THE _____ DAY OF _____, 20____ (the date of issue by the Surety or by the Surety's agent and the date of such agents power-of-attorney).

Signed, sealed and delivered
in the presence of:

PRINCIPAL:

_____

_____ By:_____

Name:_____

_____ Its:_____

Witnesses as to Principal

STATE OF _____

COUNTY OF _____

Sworn to (or affirmed) and subscribed before me by means of ___physical presence or ___ online notarization, this____ day of _____, 20___ by _____, as _____, of _____, a corporation, on behalf of the corporation, who is ___ personally known to me or___ produced _____ as identification and did (did not) take an oath.

My Commission Expires:

_____
(Signature)

Name:_____
(Legibly Printed)

(AFFIX OFFICIAL SEAL)

Notary Public, State of _____

Serial No., If Any: _____

ATTEST:

SURETY:_____
(Printed Name)

_____

_____

_____ _____

Witness (Business Address)

_____

_____ (Authorized Signature)

Witness _____

(Printed Name)

OR

_____ _____

As Attorney In Fact (Attach Power)

_____

_____ _____

Witnesses _____

(Business Address)

_____

(Printed Name)

_____

(Telephone Number)

STATE OF _____

COUNTY OF _____

Sworn to (or affirmed) and subscribed before me by means of ___ physical presence or ___ online notarization, this _____ day of _____, 20____, by _____, as _____ of _____ as Surety, on behalf of Surety, who is ___ personally known to me or ___produced _____ as identification and did (did not) take an oath.

My Commission Expires: _____

(Signature)

Name:_____

(Legibly Printed)

(AFFIX OFFICIAL SEAL) Notary Public, State of _____

Serial No., If Any: _____

EXHIBIT "C"

INSURANCE AND SAFETY

GENERAL INFORMATION AND MINIMUM INSURANCE REQUIREMENTS

- ♦ Exhibit 3-A Professional Services
- ♦ Exhibit 3-B Construction Services

MINIMUM PROJECT SAFETY REQUIREMENTS

The following safety requirements represent the minimum condition, which shall be met by all Design-Build Firms and subcontractors performing work for Nassau County: Reported or observed violations of Federal and State laws and regulations, or County ordinances shall be brought to the attention of the County project manager and County's Division of Risk Management and shall be immediately corrected by the Design-Build Firm. Additionally, the County may order work to be stopped if conditions exist that present immediate danger to persons or property. The Design-Build Firm acknowledges that any such stoppage will not shift responsibility for any damages from the Design-Build Firm to the County. Failure to comply with required safety procedures shall result in the suspension of the Work of the Design-Build Firm until such time as his operations are brought into compliance. Items which are not corrected or that are disputed by the Design-Build Firm may be referred by the County's Division of Risk Management for inspection or interpretation. The Design-Build Firm shall take reasonable precautions for work place safety and shall provide reasonable protection to prevent damage, injury, or loss to employees on the work site and to other persons who may be affected by the Work.

(1) Prior to the commencement of the project, the Design-Build Firm and all subcontractors shall provide to the County a written copy of their respective safety and health plans for review as part of the pre-submittal bid package.

(2) The Design-Build Firm shall establish and maintain an access control system at the work site, including a daily sign-in log, for all visitors, including County and regulatory personnel. Prior to commencement of construction, the project manager may designate specific individuals for routine access so that their duties are not impeded. All visitors that are not pre-approved for admittance shall be escorted through the project by either a Design-Build Firm representative or by the project manager or designee.

(3) The Design-Build Firm shall provide all necessary safety equipment for County staff, employees, and visitors to enter the work site. This equipment may include hard hats, hearing protection, safety glasses, or any other safety items deemed necessary by the Design-Build Firm or required by State or Federal safety regulations.

(4) Construction vehicles on the work site shall always be operated in a safe manner. The Design-Build Firm shall take appropriate action to ensure the safety of County staff, visitors, and the general public while operating work vehicles at a "controlled" construction site. Where conditions warrant, or at the request of the County, temporary barriers shall also be established for these traffic areas.

(5) The Design-Build Firm shall prominently mark the work site and ensure its security. Site security shall include appropriate fencing, barricades, warning tape, covered walkways and warning signs. In no instance shall a work site be accessible, without obvious warning, to County staff, visitors, or the general public. At a minimum, the project site shall be posted with the appropriate trespass warning signs as specified in Section 810.09(2)(d), Florida Statutes: THIS AREA IS A DESIGNATED CONSTRUCTION SITE; ANYONE TRESPASSING ON THIS PROPERTY SHALL, UPON CONVICTION, BE GUILTY OF A FELONY; "A DANGER, CONSTRUCTION SITE. AUTHORIZED PERSONNEL ONLY," and other general safety warning signs, i.e., "HARD HAT AREA," as are deemed necessary by the Design-Build Firm and project manager.

(6) In the event barricading of a work site is not feasible, alternative measures may be used upon prior approval by the County safety Office. Alternative measures may include, but are not limited to, working during "off 'hours such as nights, weekends, or holidays, or the providing of temporary accommodations for building occupants (to be prearranged, if necessary, at the discretion of the County).

(7) The Design-Build Firm shall ensure compliance with all fire safety codes at the work site, especially as to egress, during the construction phase of an occupied facility. In no instance, (except where impractical and with the prior approval of the County's Division of Risk Management and the appropriate life safety code inspector), shall the life safety code components of an occupied facility be reduced or otherwise compromised.

A set of these construction plans, with a signature of approval by the appropriate life safety code inspector, shall be kept at each construction site and available for routine inspection. The Design-Build Firm shall communicate with each subcontractor and County's Division of Risk Management as to scheduling of events that may pose hazards or inconveniences to building occupants. The Design-Build Firm shall also ensure that appropriate scheduling information is also conveyed to the project manager.

- When a project alters a building's fire protection compartment features, such as fire barriers, smoke barriers, or corridor walls, exits must provide free and unobstructed egress. Employees shall receive notice if any alternative exits have been designated. Buildings or areas under construction must maintain escape egress for construction workers at all times. These means of egress shall be inspected daily by the Design-Build Firm.

- When a project affects fire alarms, fire detection, or fire suppression systems, of a building that is occupied, the Design-Build Firm must ensure

that such systems are not functionally impaired. Any temporary systems, which are installed, must be inspected and tested monthly by the Design-Build Firm. Employees must be notified when such temporary systems are in place.

- When any sources of ignition are present, such as welding torches, smoking by all persons shall be prohibited on any construction site and in any County facility.

(8) Noise, dust, and the use of chemical products may create inside health hazards at the work site to building occupants requiring that the Design-Build Firm to adhere to the following guidelines at a minimum:

(a) The Design-Build Firm shall initiate construction and engineering safety controls to minimize exposure of dusts, noise, and chemical odors to building occupants. These controls may involve the construction or use of temporary walls, plastic barriers, mechanical ventilation, elimination of make-up air returns from work areas, pressurizing occupied areas, or a combination of several methods. The Design-Build Firm shall coordinate all such engineering efforts with the project manager, and these control measures shall require prior approval by the County's Division of Risk Management. In cases where these efforts may not be feasible, alternative work schedules on evenings and weekends may be instituted as a part of this process.

(b) Material Safety Data Sheets (MSDS) shall be provided to the County's Division of Risk Management for all hazardous substances used on the project or brought on the job site. These products include, but are not limited to, paints, solvents, roofing compounds, and cleaning compounds.

(c) Appropriate precautions shall be taken to prevent occupant exposure to hazardous respirable dusts, contaminants, and fumes from welding, cutting, or drilling of concrete and masonry, or the operation of internal combustion engines. The Design-Build Firm shall also determine whether respirable crystalline silica, which is a potential carcinogen contained in many building products, is present at the work site. Control of dusts from these types of products and operations shall be an essential safety requirement for the Design-Build Firm.

(d) The Design-Build Firm should be aware of other buildings adjacent to his work areas and shall be prepared to take necessary actions to prevent the spread of dusts and fumes to those facilities.

(9) The Design-Build Firm shall ensure that all emergency notifications, including those for fires and medical needs, shall be promptly made by dialing County 911 dispatchers. The Caller should state the exact location of the work site emergency, the nature of the emergency, and specifically indicate if medical or fire services are needed.

(10) The Design-Build Firm agrees and understands that all County construction/renovation sites shall be subject to periodic inspection by life safety code inspectors, Florida Department of Labor and Employment Security, Division of Safety, Occupational Safety and Health Administration, Florida Department of Environmental Protection, Environmental Protection Agency, and other Federal, State, or County regulatory agencies.

(11) The Design-Build Firm shall provide adequate refuse containers for the disposal of construction debris. Refuse shall not be allowed to accumulate on the project site grounds, and the Design-Build Firm shall ensure that these containers are subsequently emptied on a regular basis.

(12) Water runoff and soil erosion from the project site shall be controlled by the Design-Build Firm pursuant to the regulations of the Florida Department of Environmental Protection.

(13) Water-based paint and stain products shall be used by the Design-Build Firm in the place of solvent-based products where the application so permits. Use of organic solvent-based products shall be used only where absolutely necessary and with the prior approval of the project manager. Lead-containing paints shall not be normally used or specified for any application. If the use of lead-containing paint is essential for a specific application, prior written approval from the County's Division of Risk Management shall be obtained before their use.

(14) The use of any products containing toxic metals, especially those regulated by Resource Conservation and Recovery Act (RCRA), (i.e. lead, chromium, barium, silver, arsenic, cadmium, mercury, selenium), on the work site shall be avoided. Prior written approval for use of these metals shall be obtained by the Design-Build Firm from the County's Division of Risk Management.

(15) The use of any radioactive materials by the Design-Build Firm on project sites shall require pre-approval. Copies of appropriate certifications, licenses, testing, and inspection records shall be provided by the Design-Build Firm to the project manager and County's Division of Risk Management for review.

(16) The County contracts out the identification and abatement of asbestos containing building materials. Asbestos abatement can only be performed by state licensed asbestos abatement Design-Build Firms. General Design-Build Firms, therefore, shall not be authorized to remove or disturb any asbestos containing materials. Although efforts are made to identify or remove such asbestos containing materials prior to renovations, the possibility exists that asbestos materials may be encountered at a work site. If so, Design-Build Firms who encounter such materials shall immediately stop work and notify the project manager and the County's Division of Risk Management.

(17) The above-cited guidelines represent minimum expectations and actions, which shall be taken by Design-Build Firms while under contract for County construction and renovation projects. These guidelines are not all inclusive and will be revised

as necessary. In the event these guidelines conflict with other contract documents, the most stringent application shall apply. Any questions or disputes should be brought to the immediate attention of the project manager and County's Division of Risk Management.

GENERAL INFORMATION AND MINIMUM INSURANCE REQUIREMENTS

COMMERCIAL GENERAL LIABILITY INSURANCE

The Contractor/Vendor shall purchase and maintain at the Contractor/Vendor's expense Commercial General Liability insurance coverage (ISO or comparable Occurrence Form) for the life of this Contract. Modified Occurrence or Claims Made forms are not acceptable.

The Limits of this insurance shall not be less than the following limits:

Each Occurrence Limit	$1,000,000
Personal & Advertising Injury Limit	$1,000,000
Fire Damage Limit (any one fire)	$ 300,000
Medical Expense Limit (any one person)	$ 10,000
Products & Completed Operations Aggregate Limit	$2,000,000
General Aggregate Limit (other than Products & Completed Operations) Applies Per Project	$2,000,000

General liability coverage shall continue to apply to "bodily injury" and to "property damage" occurring after all work on the Site of the covered operations to be performed by or on behalf of the additional insureds has been completed and shall continue after that portion of "your work" out of which the injury or damage arises has been put to its intended use.

WORKERS' COMPENSATION AND EMPLOYER'S LIABILITY INSURANCE

The Contractor/Vendor shall purchase and maintain at the Contractor/Vendor's expense Workers' Compensation and Employer's Liability insurance coverage for the life of this Contract.

The Limits of this insurance shall not be less than the following limits:

Part One – Workers' Compensation Insurance – Unlimited Statutory Benefits as provided in the Florida Statutes and Part Two – Employer's Liability Insurance	
Bodily Injury By Accident	$500,000 Each Accident
Bodily Injury By Disease	$500,000 Policy Limit
Bodily Injury By Disease	$500,000 Each Employee

*If leased employees are used, policy must include an Alternate Employer's Endorsement

AUTOMOBILE LIABILITY INSURANCE

The Contractor/Vendor shall purchase and maintain at the Contractor/Vendor's expense Automobile Liability insurance coverage for the life of this Contract.

The Limits of this insurance shall not be less than the following limits:

Combined Single Limit – Each Accident	$1,000,000

Covered Automobiles shall include any auto owned or operated by the insured Contractor/Vendor, insured Sub-Contractor/Vendor including autos which are leased, hired, rented or borrowed, including autos owned by their employees which are used in connection with the business of the respective Contractor/Vendor or Sub-Contractor/Vendor.

UMBRELLA LIABILITY INSURANCE

The Contractor/Vendor shall purchase and maintain at the Contractor/Vendor's expense Umbrella/Excess Liability (Umbrella Form) insurance coverage for the life of this Contract.

The Limits of this insurance shall not be less than the following limits:

Each Occurrence Limit	$2,000,000
Aggregate Limit	$2,000,000

PROFESSIONAL LIABILITY (ERRORS & OMISSIONS)

This additional coverage will be required for all projects involving consultants, engineering services, architectural or design/build projects, independent testing firms and similar exposures.

The Contractor/Vendor shall purchase and maintain at the Contractor/Vendor's expense Professional Liability insurance coverage for the life of this Contract.

If the contract includes a requirement for Professional Liability or Errors and Omissions insurance, the minimum amount of such insurance shall be as follows:

Each Occurrence/Annual Aggregate – **Project Specific Form**	$1,000,000
OR	
Each Occurrence/Annual Aggregate – N**on Project Specific Form**	$3,000,000

Design Professional Liability coverage will be provided on an Occurrence Form or a Claims Made Form with a retroactive date to at least the first date of this Agreement. If provided on a Claims Made Form, the coverages must respond to all claims reported within three years following the period for which coverage is required and which would have been covered had the coverage been on an occurrence basis.

ENVIRONMENTAL LIABILITY INSURANCE

This additional coverage will be required by any Contractor performing environmental and/or other investigations involving excavation, drilling, or other site disturbance activities.

The Contractor shall purchase and maintain at the Contractor's expense Environmental Liability insurance (Contractors Pollution Liability) coverage for the life of this Contract.

The Limits of insurance shall not be less than the following limits: $1,000,000 Each Loss/Aggregate

Such Coverage will include bodily injury, sickness, and disease, mental anguish or shock sustained by any person, including death; property damage including physical injury to destruction of tangible property including resulting loss of use thereof, cleanup costs, and the loss of use of tangible property that has not been physically injured or destroyed; defense including costs charges and expenses incurred in the investigation, adjustment or defense of claims for such compensatory damages; coverage for losses caused by pollution conditions that arises from the operations of the contractor including transportation.

CRIME/FIDELITY COVERAGE

This additional coverage will be required for all service providers involving information technology services, Pension consulting and administration, and similar exposures.

The Contractor/Vendor shall purchase and maintain at the Contractor/Vendor's expense Crime/Fidelity and/or Fiduciary Liability insurance coverage for the life of this Contract.

If the contract includes a requirement for expense Crime/Fidelity and/or Fiduciary Liability insurance, the minimum amount of such insurance shall be as follows:

Third Party Employee Dishonesty	$1,000,000

Contractor/Vendor shall require each of his Sub-Contractor/Vendors to likewise purchase and maintain at their expense Commercial General Liability insurance, Workers' Compensation and Employer's Liability coverage, Automobile Liability insurance and Umbrella Liability insurance, Professional Liability, Environmental Liability, Cyber and Data Security insurance coverage (as applicable) meeting the same limit and requirements as the Contractor/Vendors insurance.

Certificates of Insurance acceptable to Nassau County Board of County Commissioners for the Contractor/Vendor's insurance must be received within ten (10) days of Notification of Selection and at time of signing Agreement.

Certificates of Insurance and the insurance policies required for this Agreement shall contain an endorsement that coverage afforded under the policies will not be cancelled or allowed to expire until at least thirty (30) days prior written notice has been given to Nassau County Board of County Commissioners.

Certificates of Insurance and the insurance policies required for this Agreement will include a provision that policies, except Workers' Compensation and Professional Liability, are primary and noncontributory to any insurance maintained by the Contractor/Vendor.

Nassau County Board of County Commissioners must be named as an Additional Insured and endorsed onto the Commercial General Liability (CGL), Auto Liability, Umbrella Liability and Environmental Liability policy (ies). A copy of the endorsement(s) must be supplied to Nassau County Board of County Commissioners ten (10) days following the execution of the agreement or prior to the first date of services, whichever comes first.

> CGL policy Additional Insured Endorsement must include Ongoing and Completed Operations (Form CG2010 11 84 **OR** Form CG2010 04 13 and GC2037 04 13 edition or equivalent). Other Additional Insured forms might be acceptable but only if modified to delete the word "ongoing" and insert the sentence "Operations include ongoing and completed operations".
> CGL policy shall not be endorsed with Exclusion - Damage to Work performed by SubContractor/Vendors on Your Behalf (CG2294 or CG2295)
> CGL policy shall not be endorsed with Contractual Liability Limitation Endorsement (CG2139) or Amendment of Insured Contract Definition (CG 2426)
> CGL policy shall not be endorsed with Exclusion - Damage to Premises Rented to you (CG 2145)
> CGL policy shall include broad form contractual liability coverage for the Contractor/Vendors covenants to and indemnification of the Authority under this Contract

Certificates of Insurance and the insurance policies required for this Agreement shall contain a provision under General Liability, Auto Liability, Environmental Liability and Workers' Compensation to include a Waiver of Subrogation clause in favor of Nassau County Board of County Commissioners.

All Certificates of Insurance shall be dated and shall show the name of the insured Contractor/Vendor, the specific job by name and job number, the name of the insurer, the policy number assigned its effective date and its termination date and a list of any exclusionary endorsements.

All Insurers must be authorized to transact insurance business in the State of Florida as provided by Florida Statute 624.09(1) and the most recent Rating Classification/Financial Category of the insurer as published in the latest edition of "Best's Key Rating Guide' (Property-Casualty) must be at least A- or above.

All of the above referenced Insurance coverage is required to remain in force for the duration of this Agreement and for the duration of the warranty period. Accordingly, at the time of submission of final application for payment, Contractor/Vendor shall submit an additional Certificate of Insurance evidencing continuation of such coverage.

If the Contractor/Vendor fails to procure, maintain or pay for the required insurance, Nassau County Board of County Commissioners shall have the right (but not the obligation) to secure same in the name of and for the account of Contractor/Vendor, in which event, Contractor/Vendor shall pay the cost thereof and shall furnish upon demand, all information that may be required to procure such insurance. Nassau County Board of County Commissioners shall have the right to back-charge Contractor/Vendor for the cost of procuring such insurance. The failure of Nassau County Board of County Commissioners to demand certificates of insurance and endorsements evidencing the required insurance or to identify any deficiency in Contractor/Vendors coverage based on the evidence of insurance provided by the Contractor/Vendor shall not be construed as a waiver by Nassau County Board of County Commissioners of Contractor/Vendor's obligation to procure, maintain and pay for required insurance.

The insurance requirements set forth herein shall in no way limit Contractor/Vendors liability arising out of the work performed under the Agreement or related activities. The inclusions, coverage and limits set forth herein are minimum inclusion, coverage and limits. The required minimum policy limits set forth shall not be construed as a limitation of Contractor/Vendor's right under any policy with higher limits, and no policy maintained by the Contractor/Vendor shall be construed as limiting the type, quality or quantity of insurance coverage that Contractor/Vendor should maintain. Contractor/Vendor shall be responsible for determining appropriate inclusions, coverage and limits, which may be in excess of the minimum requirements set forth herein.

If the insurance of any Contractor/Vendor or any Sub-Contractor/Vendor contains deductible(s), penalty(ies) or self-insured retention(s), the Contractor/Vendor or Sub-Contractor/Vendor whose insurance contains such provision(s) shall be solely responsible for payment of such deductible(s), penalty(ies) or self-insured retention(s).

The failure of Contractor/Vendor to fully and strictly comply at all times with the insurance requirements set forth herein shall be deemed a material breach of the Agreement.

GENERAL INFORMATION AND MINIMUM INSURANCE REQUIREMENTS

COMMERCIAL GENERAL LIABILITY INSURANCE

The Contractor shall purchase and maintain at the Contractor's expense Commercial General Liability insurance coverage (ISO or comparable Occurrence Form) for the life of this Contract. Modified Occurrence or Claims Made forms are not acceptable.

The Limits of this insurance shall not be less than the following limits:

Each Occurrence Limit	$1,000,000
Personal & Advertising Injury Limit	$1,000,000
Fire Damage Limit (any one fire)	$ 300,000
Medical Expense Limit (any one person)	$ 10,000
Products & Completed Operations Aggregate Limit	$2,000,000
General Aggregate Limit (other than Products & Completed Operations) Applies Per Project	$2,000,000

General liability coverage shall continue to apply to "bodily injury" and to "property damage" occurring after all work on the Site of the covered operations to be performed by or on behalf of the additional insureds has been completed and shall continue after that portion of "your work" out of which the injury or damage arises has been put to its intended use.

WORKERS' COMPENSATION AND EMPLOYER'S LIABILITY INSURANCE

The Contractor shall purchase and maintain at the Contractor's expense Workers' Compensation and Employer's Liability insurance coverage for the life of this Contract.
The Limits of this insurance shall not be less than the following limits:

Part One – Workers' Compensation Insurance – Unlimited
Statutory Benefits as provided in the Florida Statutes and
Part Two – Employer's Liability Insurance

Bodily Injury By Accident	$500,000 Each Accident
Bodily Injury By Disease	$500,000 Policy Limit
Bodily Injury By Disease	$500,000 Each Employee

*If leased employees are used, policy must include an Alternate Employer's Endorsement

AUTOMOBILE LIABILITY INSURANCE

The Contractor shall purchase and maintain at the Contractor's expense Automobile Liability insurance coverage for the life of this Contract.

The Limits of this insurance shall not be less than the following limits:

Combined Single Limit – Each Accident	$1,000,000

Covered Automobiles shall include any auto owned or operated by the insured Contractor, insured Sub-subcontractor including autos which are leased, hired, rented or borrowed, including autos owned by their employees which are used in connection with the business of the respective Contractor or Sub-subcontractor.

UMBRELLA INSURANCE

The Contractor shall purchase and maintain at the Contractor's expense Umbrella Liability (Umbrella Form) insurance coverage for the life of this Contract.

The Limits of this insurance shall not be less than the following limits:

Each Occurrence Limit	$2,000,000
Aggregate Limit	$2,000,000

PROFESSIONAL LIABILITY (ERRORS & OMISSIONS)

This additional coverage will be required for all projects involving consultants, engineering services, architectural or design/build projects, independent testing firms and similar exposures.

The Contractor shall purchase and maintain at the Contractor's expense Professional Liability insurance coverage for the life of this Contract.

If the contract includes a requirement for Professional Liability or Errors and Omissions insurance, the minimum amount of such insurance shall be as follows:

Each Occurrence/Annual Aggregate Project Specific	$1,000,000

Design Professional Liability coverage will be provided on an Occurrence Form or a Claims Made Form with a retroactive date to at least the first date of this Agreement. If provided on a Claims Made Form, the coverages must respond to all claims reported within three years following the period for which coverage is required and which would have been covered had the coverage been on an occurrence basis.

ENVIRONMENTAL LIABILITY INSURANCE

This additional coverage will be required by any Contractor performing environmental and/or other investigations involving excavation, drilling, or other site disturbance activities.

The Contractor shall purchase and maintain at the Contractor's expense Environmental Liability insurance (Contractors Pollution Liability) coverage for the life of this Contract.

The Limits of insurance shall not be less than the following limits: $1,000,000 Each Loss/Aggregate

Such Coverage will include bodily injury, sickness, and disease, mental anguish or shock sustained by any person, including death; property damage including physical injury to destruction of tangible property including resulting loss of use thereof, cleanup costs, and the loss of use of tangible property that has not been physically injured or destroyed; defense including costs charges and expenses incurred in the investigation, adjustment or defense of claims for such compensatory damages; coverage for losses caused by pollution conditions that arises from the operations of the contractor including transportation.

BUILDERS RISK OR INSTALLATION FLOATER

This additional coverage will be required if the contract includes construction of or additions to above-ground buildings or structures, or installation of machinery or equipment.

The minimum amount of insurance shall be 100% of the completed value of such addition(s), building(s), or structure(s), or the installed replacement cost of value.

Contractor shall require each of his Subcontractors to likewise purchase and maintain at their expense Commercial General Liability insurance, Workers' Compensation and Employer's Liability coverage, Automobile Liability insurance, Umbrella Liability Professional Liability, Environmental Liability, Builders Risk or Installation Floater (as applicable) insurance coverage meeting the same limit and requirements as the Contractors insurance.

Certificates of Insurance acceptable to Nassau County Board of County Commissioners for the Contractor/Vendor's insurance must be received within ten (10) days of Notification of Selection and at time of signing Agreement.

Certificates of Insurance and the insurance policies required for this Agreement shall contain an endorsement that coverage afforded under the policies will not be cancelled or allowed to expire until at least thirty (30) days prior written notice has been given to Nassau County Board of County Commissioners.

Certificates of Insurance and the insurance policies required for this Agreement will include a provision that policies, except Workers' Compensation and Professional Liability, are primary and noncontributory to any insurance maintained by the Contractor.

Nassau County Board of County Commissioners must be named as an Additional Insured and endorsed onto the Commercial General Liability (CGL), Auto Liability and Umbrella Liability policy (ies). A copy of the endorsement(s) must be supplied to Nassau County Board of County Commissioners ten (10) days following the execution of the agreement or prior to the first date of services, whichever comes first.

> CGL policy Additional Insured Endorsement must include Ongoing and Completed Operations (Form CG2010 11 84 **OR** Form CG2010 04 13 and GC2037 04 13 edition or equivalent). Other Additional Insured forms might be acceptable but only if modified to delete the word "ongoing" and insert the sentence "Operations include ongoing and completed operations".
> CGL policy shall not be endorsed with Exclusion - Damage to Work performed by Subcontractors on Your Behalf (CG2294 or CG2295)
> CGL policy shall not be endorsed with Contractual Liability Limitation Endorsement (CG2139) or Amendment of Insured Contract Definition (CG 2426)
> CGL policy shall not be endorsed with Exclusion - Damage to Premises Rented to you (CG 2145)
> CGL policy shall include broad form contractual liability coverage for the Contractors covenants to and indemnification of the Authority under this Contract

Certificates of Insurance and the insurance policies required for this Agreement shall contain a provision under General Liability, Auto Liability and Workers' Compensation to include a Waiver of Subrogation clause in favor of Nassau County Board of County Commissioners.

All Certificates of Insurance shall be dated and shall show the name of the insured Contractor, the specific job by name and job number, the name of the insurer, the policy number assigned its effective date and its termination date and a list of any exclusionary endorsements.

All Insurers must be authorized to transact insurance business in the State of Florida as provided by Florida Statute 624.09(1) and the most recent Rating Classification/Financial Category of the insurer as published in the latest edition of "Best's Key Rating Guide' (Property-Casualty) must be at least A- or above.

All of the above referenced Insurance coverage is required to remain in force for the duration of this Agreement and for the duration of the warranty period. Accordingly, at the time of submission of final application for payment, Contractor shall submit an additional Certificate of Insurance evidencing continuation of such coverage.

If the Contractor fails to procure, maintain or pay for the required insurance, Nassau County Board of County Commissioners shall have the right (but not the obligation) to secure same in the name of and for the account of Contractor, in which event, Contractor shall pay the cost thereof and shall furnish upon demand, all information that may be required to procure such insurance. Nassau County Board of County Commissioners shall have the right to back-charge contractor for the cost of procuring such insurance. The failure of Nassau County Board of County Commissioners to demand certificates of insurance and endorsements evidencing the required insurance or to identify any deficiency in contractors coverage based on the evidence of insurance provided by the contractor shall not be construed as a waiver by Nassau County Board of County Commissioners of contractor's obligation to procure, maintain and pay for required insurance.

The insurance requirements set forth herein shall in no way limit Contractors liability arising out of the work performed under the Agreement or related activities. The inclusions, coverage and limits set forth herein are minimum

inclusion, coverage and limits. The required minimum policy limits set forth shall not be construed as a limitation of Contractor's right under any policy with higher limits, and no policy maintained by the Contractor shall be construed as limiting the type, quality or quantity of insurance coverage that Contractor should maintain. Contractor shall be responsible for determining appropriate inclusions, coverage and limits, which may be in excess of the minimum requirements set forth herein.

If the insurance of any Contractor or any subcontractor contains deductible(s), penalty(ies) or self-insured retention(s), the Contractor or Subcontractor whose insurance contains such provision(s) shall be solely responsible for payment of such deductible(s), penalty(ies) or self-insured retention(s).

The failure of Contractor to fully and strictly comply at all times with the insurance requirements set forth herein shall be deemed a material breach of the Agreement.

EXHIBIT “D”

RELEASE AND AFFIDAVIT

COUNTY OF NASSAU
STATE OF FLORIDA

Before me, the undersigned authority, personally appeared _____, who after being duly sworn, deposes and says:

(1) In accordance with the Contract Documents and in consideration of $_____ paid, _____ ("Design-Build Firm") releases and waives for itself and its subcontractors, materialmen, successors and assigns, all claims demands, costs and expenses, whether in contract or in tort, against the Board of County Commissioners of Nassau County, Florida, ("County") relating in any way to the performance of the Agreement between Design-Build Firm and County dated _____, 20____, for the period from _____ to _____.

(2) Design-Build Firm certifies for itself and its subcontractors, materialmen, successors and assigns, that all charges for labor, materials, supplies, lands, licenses and other expenses for which County might be sued or for which a lien or a demand against any payment bond might be filed, have been fully satisfied and paid.

(3) Design-Build Firm agrees to indemnify, defend and save harmless County from all demands or suits, actions, claims of liens or other charges filed or asserted against the County arising out of the performance by Design-Build Firm of the Work covered by this Release and Affidavit.

(4) This Release and Affidavit is given in connection with Design-Build Firm's (monthly/final) Application for Payment No. _____.

DESIGN-BUILD FIRM:

_____

_____ By:_____

Its:_____ President

_____ Date:_____ ____

Witnesses

[Corporate Seal]

STATE OF FLORIDA

COUNTY OF NASSAU

Sworn to (or affirmed) and subscribed before me by means of ___ physical presence or ___ online notarization, this _____day of_____, 20___, by _____ as _____, of _____, a _____ corporation, on behalf of the corporation, who is ___ personally known to me or ___ produced _____ as identification and did (did not) take an oath.

My Commission Expires:

_____
(Signature)

Name:_____
(Legibly Printed)

(AFFIX OFFICIAL SEAL)

Notary Public, State of _____
Serial No., If Any:_____

EXHIBIT “E”

FORM OF CONTRACT APPLICATION FOR PAYMENT

AIA DOCUMENT #G702, 1992 EDITION

EXHIBIT "F"

CONSTRUCTION CHANGE ORDER

Change Order Number _____ Contract Number PD _____
Date: _____ Dated _____ _____

To: _____
_____
_____
_____

Project Name: _____
You hereby are authorized and directed to make the following changes in accordance with terms and conditions of the Agreement:
Describe changes here;

	Dollars	Time in Calendar Days
Original Contract Amount	$_____	_____
Sum of Previous Changes	$_____	_____
This Change Order	$_____	_____
Adjusted Agreement Amount	**$**_____	

The contract substantial completion date will be **increased/decreased** by ___ calendar days due to this Change Order. The new contract substantial completion date is _____. Your acceptance of this Change Order shall constitute a modification to our Agreement and will be performed subject to all the same terms and conditions in our Agreement indicated above, as fully as if the same were repeated in this acceptance.

The adjustment, if any, to this Agreement shall constitute a full and final settlement of any and all claims arising out of or related to the change set forth herein, including claims for impact and delay cost.

The Contract Administrator has directed the Design-Build Firm to increase the penal sum of the existing Performance and Payment Bonds or to obtain additional bonds on the basis of a $25,000.00 or greater value Change Order.

☐ Check if applicable and provide written confirmation from the bonding company/agent (attorney-in-fact) that the amount of the Performance and Payment bonds have been

adjusted to 100% of the new contract amount.

Accepted: _____, 20___

By: _____
Design/Build Firm

By: _____
Architect/Engineer

By: _____
Owner

EXHIBIT “G”

OWNER DIRECT PURCHASES
SUPPLEMENTARY CONDITIONS

Title: **Owner Direct Purchases (ODP)**

I. General

The County **reserves the right** to require the Contractor to assign some or all of its subcontracts or other agreements with material suppliers directly to the County, in accordance with Rule 12A-1.094, F.A.C. This process will be referred to as Owner Direct Purchases (ODP) and is a method that **may** be utilized to create savings for the County. The County saves the amount of the sales tax, (currently 7%) when it purchases material/equipment required for a construction project directly from the manufacturer/supplier (material/equipment cost only), and simultaneously decreases the amount of the contract for the cost of the materials/equipment plus the sales tax. The contract cost reduction is accomplished through the construction change order process. Additional savings **may** also be realized if the County negotiates a cost reduction for the associated reduced premium cost for the project price guarantee, (e.g., performance and payment bond(s), irrevocable letter of credit, bank check, etc.)

EXHIBIT "H"

CONTRACT DEFINITIONS

Defined Terms

Wherever used in the Contract Documents, the following terms have the meanings indicated which are applicable to both the singular and plural thereof:

1. *Agreement* – The written contract between OWNER and DESIGN/BUILDER covering the Work; other Contract Documents are attached to or referred in the Agreement. All such documents shall be deemed to be a part of the Agreement for all purposes.

2. *Architect & Engineer* – A duly licensed individual or entity designated by DESIGN/BUILDER to perform or furnish specified Design Professional Services in connection with the Work.

3. *Asbestos* – Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

4. *Bonds* – Performance and Payment Bonds and other instruments of security.

5. *Cash Flow Projection* – A schedule prepared by DESIGN/BUILDER estimating that portion of the Contract Price to be due during each month of performance.

6. *Change Order* – A written order issued by OWNER which orders minor changes in the Work for which prices for the items of work are previously established by the Contract Documents, but which does not involve a change in the physical limits of the work or the Contract Time.

7. *Construction* – The process of performing the Work and the final end product of that process. This term may also refer to portions of the final end product. The terms construct and constructing and other similar variations of those terms also refer to Construction as defined herein. The term construction shall not be deemed to include the performance of Design Professional Services.

8. *Construction Phase Fee* – The compensation to be paid to the Design-Build Firm during the Construction Phase and include:

    8.1 Salaries or other compensation of the Design-Build Firm's employees assigned to the project at its principal office and branch offices.
    8.2 The Design-Build Firm's personnel assigned during the Construction Phase,

their duties, and responsibilities to this Project, and the duration of their assignments are shown on “Exhibit N”. Such personnel shall not be replaced without prior written consent of the Owner, which shall not be unreasonably withheld.

8.3 General operating expenses related to this Project of the Design-Build Firm’s principal and branch offices.

8.4 The costs of all data processing staff.

8.5 Salaries or other compensation of the Design-Build Firm’s employees assigned to the project at the job site. The Design-Build Firm’s personnel to be assigned to the site during the Construction Phase under the job site management and supervision fee, their duties, responsibilities, and the duration of their assignments are shown on “Exhibit N”.

8.6 General operating expenses incurred in the management and supervision of the Project, except direct costs, defined as Direct Costs to the Project and as defined in Paragraph 27 below.

8.7 Job office supplies including paper, pencils, paper clips, file folders, staples, etc., and janitorial supplies (photo copy or blue print paper not included).

8.8 Owner direct tax savings purchase program.

8.9 The costs resulting from the services provided by the architects and engineers during the Construction Phase.

9. *Contract Amount* – The amount specified in Agreement Declarations, Section 3 of the Agreement as the same may be changed from time to time pursuant to the terms and conditions of this agreement.

10. *Contract Documents* – The documents as are listed under Agreement Declarations, Section 1 of the Agreement.

11. *Contract Time* – The time stated in “Exhibit O”, the Agreement to achieve Substantial completion, and to finally complete the Work so that it is ready for final payment in accordance with article 19.1 of these General Conditions.

12. *Defective* – An adjective which when modifying the term Construction refers to Construction that is unsatisfactory, faulty or deficient, in that it does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test, or approval referred to in the Contract Documents, or has been damaged prior to OWNER’s final payment (unless responsibility for the protection thereof has been assumed by OWNER as of the time of damage pursuant to the Terms and Conditions of the Contract Documents).

13. *Design/Build Firm* – The individual or entity with whom OWNER has entered into the Agreement as indicated in the Agreement.

14. *Design Criteria Package* – The drawings and specifications and/or other graphic or written materials, criteria and information concerning OWNER’s requirements for

the Project, such as design objectives and constraints, space, capacity and performance requirements, flexibility and expandability, which show or describe the character and scope of, or relate to, the Work to be performed or furnished and which have been prepared by or for OWNER.

15. *Direct Costs to the Project* –

    15.1 Wages paid for labor (as opposed to wages paid for management or supervisory personnel) in the direct employ of "Contractor" in the performance of "The Work" and the associated overhead per this agreement.

    15.2 Cost of all materials, supplies, and equipment incorporated in the Project, including cost of transportation and storage thereof.

    15.3 Payments to Subcontractors for performance of services required in the construction of the Project.

    15.4 Costs, including maintenance and transportation of all equipment, temporary facilities and hand tools not owned by the Contractor, which are employed or consumed in the performance of "The Work".

    15.5 Rental charges on all necessary machinery and equipment, exclusive of hand tools, used at the Project site and required for performance of "The Work".

    15.6 Premium costs for all insurance and all bonds that the Contractor is required to procure per this agreement.

    15.7 Taxes, sales, use gross receipts or similar taxes related to allowable direct costs to the Project.

    15.8 Minor expenses at the site to be billed at cost, i.e., postage, telephone service, and similar petty cash items required by the Project.

    15.9 Costs for trash and debris control and removal from the site.

    15.10 Costs incurred due to an emergency affecting the safety of persons or property at the site.

    15.11 Costs for temporary facilities during construction as required by the Project.

    15.12 Upon completion of "The Work" the Design-Build Firm shall provide the required number of "as built" drawings.

    15.13 Reserve for Casualty loss. A sum shall be included in the Construction Contingency fee to protect the Work in the event of uncompensated loss. In the event this sum is not needed, it shall be returned to the Owner at the time of the issuance of the Certificate of Occupancy.

    15.14 Owner's reserve, which shall be defined as a sum of money owned by and under the control of the Owner for use as deemed necessary by the Owner for the Work.

16. *Drawings* – Those portions of the Contract Documents prepared by or for Design/Builder and approved by OWNER consisting of drawings, diagrams, illustrations, schedules and other data which show the scope, extent, and character of the work.

17. *Effective Date of the Agreement* – The date indicated in the Agreement on which it becomes effective, but if no such date is indicated it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

18. *Final Completion* – The time at which all Construction and all Work has been fully, finally, and properly completed in accordance with the Contract Documents and all other duties, responsibilities, and obligations have been performed so as to entitle the DESIGN/BUILDER to submit a bill or invoice for final payment in accordance with article 19.1 of these General Conditions. The terms *finally complete* and *finally completed* also refer to Final Completion.

19. *Guaranteed Maximum Price (GMP)* – The total maximum cost to the County for the Work performed by the Design-Build Firm including the Preconstruction Phase Fee, the Construction Phase Fee, Overhead and Profit, and the Direct Costs.

20. *Invoice or Bill* – The form which is to be used by DESIGN/BUILDER in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

21. *Laws and Regulations; Law or Regulations* – Any and all applicable laws rules, regulations, ordinances, codes and orders of any and all governmental bodies, agencies, authorities and courts having jurisdiction.

22. *Milestone* – An event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work which the DESIGN/BUILDER is required to meet. Time shall be of the essence as to any Milestone.

23. *Notice to Proceed* – A written notice given by OWNER to DESIGN/BUILDER authorizing the Work to begin and fixing the date on which the Contract Time will Commence to run.

24. *Overhead and Profit for the Construction Phase* - The compensation paid to the Contractor for the overhead, profit and general expenses as negotiated and agreed upon by the Owner, related to the construction phase of the Project, except those expenses expressly included in the Direct Costs of the Project and included in Section 4(B). Payment shall be made proportionally to the ratio of the Cost of the Work in place, and less retainage, as it bears on the GMP. The balance of the Overhead and Profit shall be paid when construction of the Project is finally completed.

25. *OWNER* – The public body, or authority, individual or entity with whom DESIGN/BUILDER has entered into the Agreement and for whom the Work is to be provided as indicated in the Agreement.

26. *OWNER's Consultant* – An individual or entity having a contract with OWNER to furnish services as OWNER's consultant with respect to the Project.

27. *OWNER's Representative* – A person designated to act as OWNER's representative with respect to DESIGN/BUILDER's performance of the Work. Such person shall have complete authority to transmit instructions, receive information, interpret and define OWNER's policies, and make decisions with respect to performance of the Work.

28. *Partial Utilization* – Use by OWNER of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work.

29. *Petroleum* – Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Wastes and crude oils.

30. *Preconstruction Phase Fee* – The compensation to be paid to the Design-Build Firm for services performed during the Preconstruction Phase and include:

    30.1 Salaries or other compensation of the Design-Build Firm's employees for services provided.
    30.2 The costs resulting from the services provided by the architects and engineers during the Preconstruction Phase.
    30.3 Costs of other services directly related to the Project.
    30.4 The Overhead and Profit related to the Preconstruction Phase.

31. *Project* – The entire undertaking of the OWNER, identified by OWNER as indicated in the exhibits of the Agreement, of which the Construction to be provided under the Contract Documents may be the whole, or a part as may be indicated elsewhere in the Contract Documents.

32. *Schedule of Values* – A schedule prepared by DESIGN/BUILDER and accepted by OWNER which divides the Work into various major components, units, or divisions and which assigns a portion of the Contract Price to each of such components, units or divisions.

33. *Site* – The real property or other areas designated in the Contract Documents as being furnished by OWNER for the performance of the Construction, storage, or access.

34. *Specifications* – Those portions of the Contract Documents consisting of written

technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Construction and certain administrative details applicable thereto.

35. *Submittal* – A written or graphic document prepared by or for DESIGN/BUILDER which is required by the Contract Documents to be submitted to OWNER by DESIGN/BUILDER. Submittal may include, but are not necessarily limited to Drawings, Specifications, Progress Schedules Shop Drawings, Samples, Cash Flow Projections, and Schedules of Values. Submittals other than Drawings and Specifications are not Contract Documents.

36. *Substantial Completion* – The time at which the Construction has progressed and the Work has been completed to the point where it is sufficiently complete, in accordance with the Contract Documents, so that the Construction can be effectively and efficiently utilized for the purposes for which it is intended without any material impairment of function. The terms substantially complete and substantially completed refer to Substantial Completion. The term Substantial Completion may be used in the Contract Documents in reference to a particular portion of the construction in which case the term will be applied as defined above only to that portion of the Construction; otherwise it shall be deemed to refer to the total Construction.

37. *Supplementary Conditions* – The part of the Contract Documents which amends or supplements these General Conditions.

38. *Work* – All labor, materials, equipment and incidentals required to fully, finally and properly complete the Construction and otherwise fully, finally and properly comply with all terms and conditions of the Contract Documents.

EXHIBIT “I”

[Design Criteria Package]

EXHIBIT "J"

Schedule of Project Fees

A) Preconstruction Phase Fee

Pursuant to Section 4(a) the design phase fee for PD 06-07.032 for the performance of design services for **[Project or Projects]**_____

_____

Shall be the amount of $_____

And shall be paid in monthly payments of $_____

Final payment of $_____

Payment shall be made in accordance with Exhibit A, Article 3.4 upon approval of payment submittal by County based on schedule and deliverables.

B) Construction Phase Fee

Pursuant to Section 4(a) the construction phase fee for PD 06-07.032 for the Construction of **[Project or Projects]**_____

_____

Shall be a fee of **[total amount]** $_____

Shall be paid in monthly payments and one final payment upon conclusion of the project of $_____

Payment shall be made in accordance with Exhibit A, Article 3.5

Final payment of $_____

C) Overhead and Profit for the Construction Phase

Pursuant to Section 4(c) the overhead and profit and general expenses for PD6-07.032, **[Project or Projects]** _____

_____ shall be **$ [negotiated per design]** _____ **$ [total amount]** _____ and shall be paid in accordance with Section 4(c).

EXHIBIT "K"

[Approved Schematic Designs/Approved Development Documents (NOT USED)

EXHIBIT "L"

[Approved GMP Drawings and Specifications]

List of Drawings

List of Documents

EXHIBIT "M"

[Preconstruction Fee Proposal]

EXHIBIT “N”

[Design Build Firm Project Personnel Roster]

NOT USED

EXHIBIT “O”

[Project Schedule]

EXHIBIT “P”

[GMP Amount Detail]

EXHIBIT “Q”

[Information Package]

EXHIBIT “Q”

[If Required]

Fire Station 90 and 70 Construction List

Station 90 Contract changes and additions

1. Location of structural footprint will be noted on non-engineered site plan. Contractors' responsibility to locate structure and all required utilities as required.
2. Installation of deep water well to provide proper flow and pressure throughout facility.
3. Installation of sanitary sewage drain field with proper septic tank.
4. Addition of 1 equipment bay for a total of 4
5. Stained and polished concrete flooring throughout living areas
6. Polished concrete flooring in equipment bays
7. Reconfigure mechanical/electrical closets for space utilization
8. Room darkening blinds installed in sleeping quarters on each window
9. Standard vinyl blinds installed in common areas
10. Gutter downspouts need to be terminated in underground drainage tile with fabric sleeve cover
11. Change range size to large open residential range / cook top with direct wall ventilation on outer wall. Move range placement to exterior wall of the kitchen.
12. Relocate main kitchen sink to center island.
13. The installed kitchen sink to be a three (3) compartment stainless steel sink
14. Additional mop sink to be located on rear porch
15. Remove DECON storage tank
16. Water heaters need to be located inside a mechanical storage room instead of on the outside wall in plain sight
17. Add re-circulator to the water heaters so hot water is always available.
18. Ensure cleanouts and drains in proper places
19. Weather strip/thresholds-door sweeps installed on all exterior doors and doors leading to equipment bays.
20. Relocate outside hose bibs or add additional hose bibs to service concrete pad areas.
21. In the truck equipment bays there should be hose bibs installed on center and outside columns
22. Stormwater drain locations in flower beds need to be finished at grade elevations.
23. Deletion of motion sensor lights in bunk rooms, replaced with standard lighted wall switches
24. Additional hallway door with window added to exercise room.
25. No automated/metering faucets on sinks, installation of standard commercial faucets.
26. No commercial toilets and automated toilet flush valves, replace with standard tank commercial toilets.
27. Include fire station lettering on marquee at road and building exterior front facing wall.
28. Addition of trailer mounted whole facility generator and switch gear. This will be listed as a separate line item.
29. Paper towel holders change to Renown model REN05173-WB
30. Soap Dispenser change to Scott KCC92145
31. Showers to be increased by one (1) foot width

Station 70 Contract changes and additions

1. Location of structural footprint will be noted on non-engineered site plan. Contractors' responsibility to locate structure and all required utilities as required.
2. Installation of public utilities water / sewer/ electric to provide proper flow and pressure throughout facility.
3. Stained and polished concrete flooring throughout living areas
4. Polished concrete flooring in equipment bays
5. Reconfigure mechanical/electrical closets for space utilization
6. Room darkening blinds installed in sleeping quarters on each window
7. Standard vinyl blinds installed in common areas
8. Gutter downspouts need to be terminated in underground drainage tile with fabric sleeve cover
9. Change range size to large open residential range / cook top with direct wall ventilation on outer wall. Move range to an exterior wall of the kitchen.
10. Relocate main kitchen sink to center island.
11. The installed kitchen sink to be a 3 compartment stainless steel sink
12. Additional mop sink to be located on rear porch
13. Remove DECON storage tank
14. Water heaters need to be located inside a mechanical storage room instead of on the outside wall in plain sight
15. Add re-circulator to the water heaters so hot water is always available.
16. Ensure cleanouts and drains in proper places
17. Weather strip/thresholds-door sweeps installed on all exterior doors and doors leading to equipment bays.
18. Relocate outside hose bibs or add additional hose bibs to service concrete pad areas.
19. In the truck equipment bays there should be hose bibs installed on center and outside columns.
20. Stormwater drain locations in flower beds need to be finished at grade elevations.
21. Deletion of motion sensor lights in bunk rooms, replaced with standard lighted wall switches
22. Additional hallway door with window added to exercise room.
23. No automated/metering faucets on sinks, installation of standard commercial faucets.
24. No commercial toilets and automated toilet flush valves, replace with standard tank commercial toilets.
25. Include fire station lettering on marquee at road and building exterior front facing wall.
26. Addition of trailer mounted whole facility generator and switch gear. This will be listed as a separate line item.
27. Paper towel holders change to Renown model REN05173-WB
28. Soap Dispenser change to Scott KCC92145
29. Installation of equipment fill fire hydrant on Station 70 property
30. Showers to be increased by one (1) foot width

Chiller Scope Preference

Contractor has the option of installing the same HVAC system detailed in the Design Criteria Package for Fire Station 71 or a chiller system that meets or exceeds the County's standard below.

Chiller: 10-40 tons or engineered equivalent.

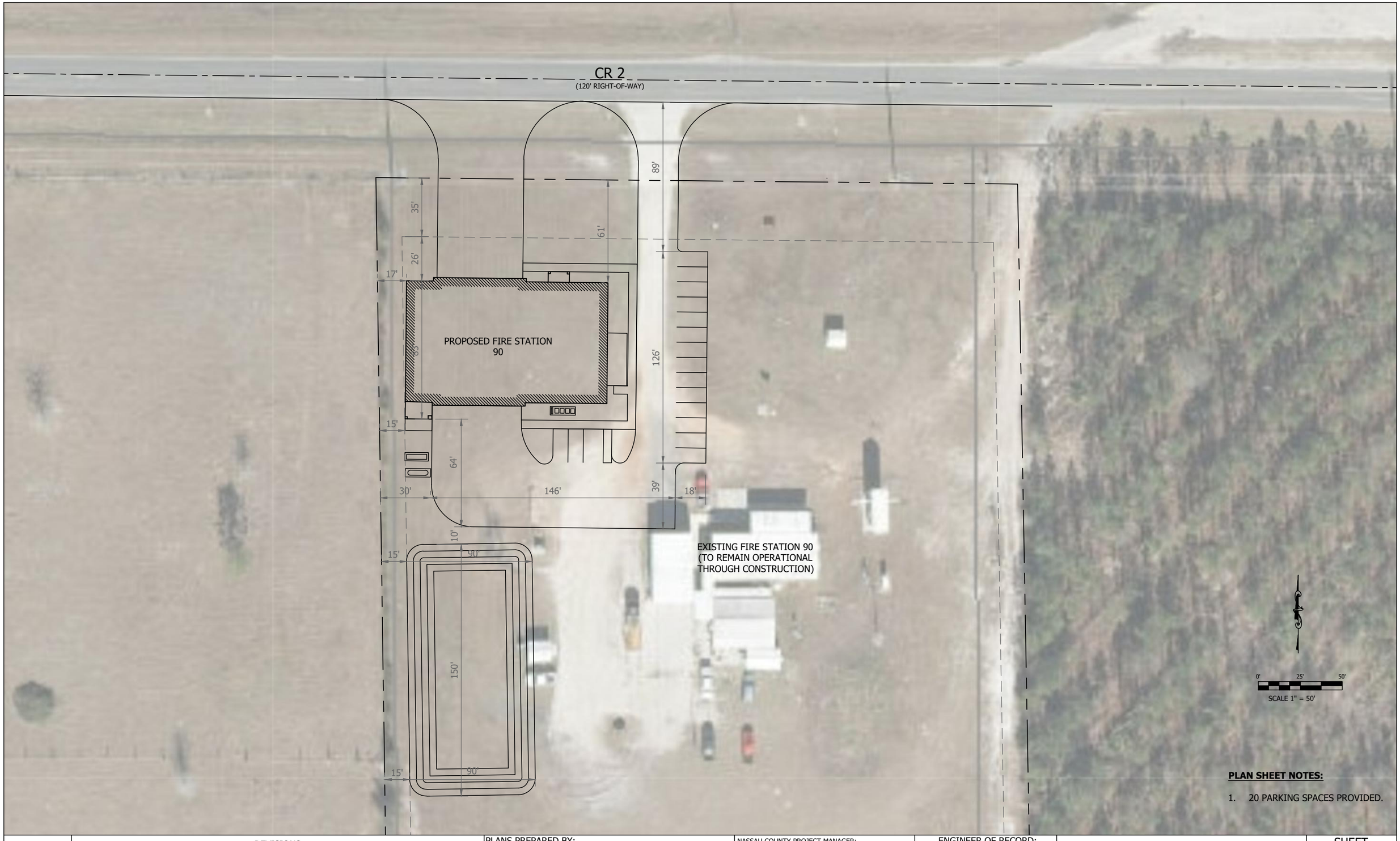
- Air cooled Scroll chiller
- Heat recovery system
- Epoxy fin coating
- Pump package
- Evaporator insulation
- Evaporator inlet strainer
- Protective base guards
- Vibration isolators
- Optional additional sound reduction system

Fan Coil units

- Ceiling mounted fan coils
- Double deflection louvers
- Factory mounted and tested water valve
- Electric reheat
- Individual wall mounted controls for max control of humidity and temp
- Placement should be in a manner for easy maintenance

Chilled Water Piping

- Piping should be installed in accordance with all codes and regulations
- Drain and ball valve should be piped in at every fan coil
- Proper insulation of all pipes, valves, and drains
- Chemical pot will be piped in at the chiller end for testing and maintenance



PLAN SHEET NOTES:

1. 20 PARKING SPACES PROVIDED.

REVISIONS			
NO.	DATE	BY	DESCRIPTION

PLANS PREPARED BY:

NASSAU COUNTY ENGINEERING SERVICES
96161 NASSAU PLACE
YULEE, FL 32097
(904) 530-6225

NASSAU COUNTY PROJECT MANAGER:
ROBERT T. COMPANION, PE

DATE: 04/06/2022 BY: RTC

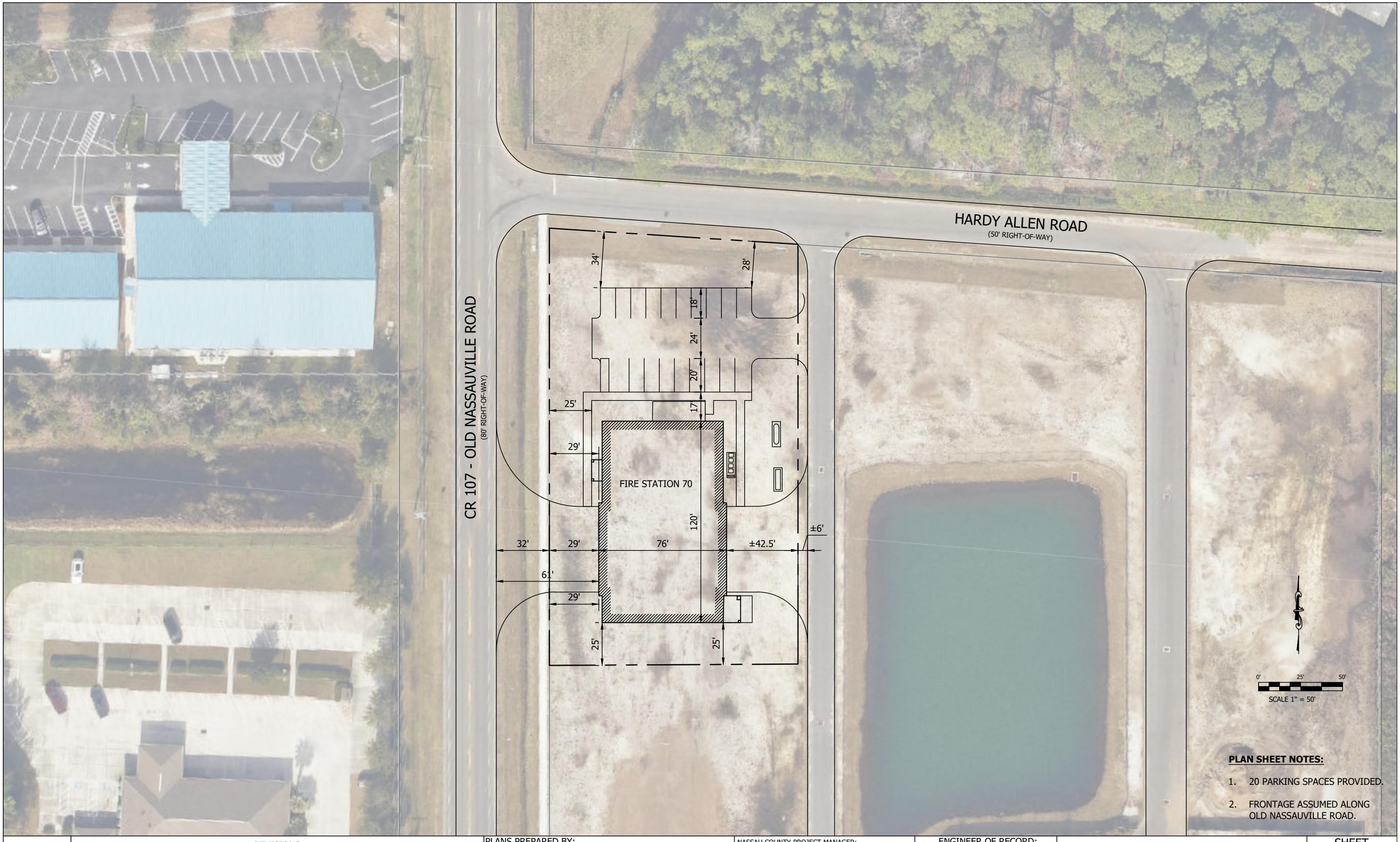
ENGINEER OF RECORD:

ROBERT T. COMPANION, PE
96161 NASSAU PLACE
YULEE, FL 32097

FIRE STATION 90 CONCEPT PLAN

PRELIMINARY LAYOUT PLANS FOR:
FIRE STATION 90 - CR 2

SHEET NO.
S-1



PLAN SHEET NOTES:

1. 20 PARKING SPACES PROVIDED.
2. FRONTAGE ASSUMED ALONG OLD NASSAUVILLE ROAD.

REVISIONS			
NO.	DATE	BY	DESCRIPTION

PLANS PREPARED BY:
NASSAU COUNTY ENGINEERING SERVICES
96161 NASSAU PLACE
YULEE, FL 32097
(904) 530-6225

NASSAU COUNTY PROJECT MANAGER:
ROBERT T. COMPANION, PE
DATE: 06/25/2021 BY: RTC

ENGINEER OF RECORD:
ROBERT T. COMPANION, PE
96161 NASSAU PLACE
YULEE, FL 32097

FIRE STATION 70 CONCEPT PLAN

PRELIMINARY LAYOUT PLANS FOR:
FIRE STATION 70 - CR 107 - OPTION 2

SHEET NO.
S-2

Nassau County - RFP NC22-030

Fire Stations 90 & 70 Design-Build

EXHIBIT 1

REFERENCE QUESTIONNAIRE

Respondent's Name: _____

(Insert Name of Company Reference is being submitted for)

Reference Company Name: _____

The person completing the Reference Questionnaire must provide a response to all of the following questions:

1. Describe the services provided by the Respondent to your organization.

_____

_____

_____

_____

_____

_____

2. Please rate your overall satisfaction with the Respondent on a scale of 1 to 5, with 1 being "least satisfied" and 5 being "most satisfied." _____

3. If you answered three (3) or less to the previous question, what could the Respondent have done to improve their rating?

_____

_____

_____

_____

4. Please indicate your level of satisfaction with the Respondent's service (i.e., processes and personnel) Use a scale of 1 to 5; with 1 being "least satisfied," and 5 being "most satisfied. _____

5. If you answered three (3) or less to the previous question, what could the Respondent have done to improve their rating?

_____

_____

_____

_____

EXHIBIT 1

REFERENCE QUESTIONNAIRE

(Continued)

Respondent's Name: _____
(Insert Name of Company Reference is being submitted for)

6. How long were past services provided or are the services currently being provided (if current, when did Respondent begin providing services?

_____

7. Would you use the services of the Respondent again? Indicate on a scale of 1 to 5: with 1 being "absolutely not" and 5 being "absolutely yes". _____

8. Additional Comments or Feedback:

_____

_____

_____

As part of this solicitation, Respondent references are considered very important. As such, Nassau County may contact and evaluate the responses it receives from each reference provided in response to this solicitation. To the extent the required reference questionnaires are not received, contact with proposed references cannot be made, or the proposed references indicate a lack of knowledge or awareness of Respondent, the same will be negatively reflected in the County's evaluation and award of points for this factor. Therefore, prior to proposing references, Respondents are encouraged to contact those individuals or entities being proposed as references in order to ensure that: (i) their contact information is current and correct; (ii) they are knowledgeable and aware of the issues for which they are being proposed as references; and (iii) they are ready, willing, able and permitted to provide the reference information being sought.

Person Responding to Reference Questionnaire: _____
(Printed Name)

_____
(Signature)

Person's Title: _____ Phone Number: _____

Email: _____

Date Reference Form Was Completed: _____

EXHIBIT 2

NASSAU COUNTY
BOARD OF COUNTY COMMISSIONERS
96135 Nassau Place, Suite 6
Yulee, Florida 32097

John Martin — Dist. No. 1 Fernandina Beach
Aaron C. Bell — Dist. No. 2 Amelia Island
Jeff Gray — Dist. No. 3 Yulee
Thomas R. Ford — Dist. No. 4 Bryceville/Hilliard
Klynt Farmer — Dist. No. 5 Callahan/West Yulee

JOHN A. CRAWFORD
Ex-Officio Clerk

MICHAEL S. MULLIN
County Attorney

TACO E. POPE, AICP
County Manager

E-VERIFY FORM UNDER SECTION 448.095, FLORIDA STATUTES

Project Name: _____

Bid No./Contract No.:_____

DEFINITIONS:

"Contractor" means a person or entity that has entered or is attempting to enter into a contract with a public employer to provide labor, supplies, or services to such employer in exchange for salary, wages, or other remuneration. "Contractor" includes, but is not limited to, a vendor or consultant.

"Subcontractor" means a person or entity that provides labor, supplies, or services to or for a contractor or another subcontractor in exchange for salary, wages, or other remuneration.

"E-Verify System" means an internet-based system operated by the United States Department of Homeland Security that allows participating employers to electronically verify the employment eligibility of newly hired employees.

Effective January 1, 2021, Contractors, shall register with and use the E-Verify System in order to verify the work authorization status of all newly hired employees. Contractor shall register for and utilize the U.S. Department of Homeland Security's E-Verify System to verify the employment eligibility of:

a) All persons employed by a Contractor to perform employment duties within Florida during the term of the contract; and

b) All persons (including subvendors/subconsultants/subcontractors) assigned by Contractor to perform work pursuant to the contract with Nassau County. The Contractor acknowledges and agrees that registration and use of the U.S. Department of Homeland Security's E-Verify System during the term of the contract is a condition of the contract with Nassau County; and

c) Should vendor become the successful Contractor awarded for the above-named project, by entering into the contract, the Contractor shall comply with the provisions of Section 448.095, Florida Statutes, "Employment Eligibility", as amended from time to time. This includes, but is not limited to, registration and utilization of the E-Verify System to verify the work authorization status of all newly hired employees. The Contractor shall also execute the attached affidavit (Exhibit "A") attesting that the Contractor does not employ, contract with, or subcontract with, an unauthorized alien. The Contractor shall maintain a copy of such affidavit for the duration of the contract; and

d) Contractor shall also require all subcontractors to execute the attached affidavit (Exhibit "B") attesting that the subcontractor does not employ, contract with, or subcontract with, an unauthorized alien. The Contractor shall maintain a copy of such affidavit for the duration of the contract.

CONTRACT TERMINATION:

a) If Nassau County has a good faith belief that a person or entity with which it is contracting has knowingly violated §448.09(1), Florida Statutes, the contract shall be terminated.

b) If Nassau County has a good faith belief that a subcontractor knowingly violated §448.095(2), but the Contractor otherwise complied with §448.095(2), Florida Statutes, shall promptly notify the Contractor and order the Contractor to immediately terminate the contract with the subcontractor.

c) A contract terminated under subparagraph a) or b) is not a breach of contract and may not be considered as such.

d) Any challenge to termination under this provision must be filed in the Circuit Court no later than twenty (20) calendar days after the date of termination.

e) If the contract is terminated for a violation of the Statute by the Contractor, the Contractor may not be awarded a public contract for a period of one (1) year after the date of termination.

EXHIBIT "A"

CONTRACTOR E-VERIFY AFFIDAVIT

I hereby certify that _____(Contractor Company Name) does not employ, contract with, or subcontract with an unauthorized alien, and is otherwise in full compliance with Section 448.095, Florida Statutes.

All employees hired on or after January 1, 2021 have had their work authorization status verified through the E-Verify system.

A true and correct copy of _____ (Contractor Company Name) proof of registration in the E-Verify system is attached to this Affidavit.

_____

Print Name:_____

Date:_____

STATE OF FLORIDA

COUNTY OF _____

The foregoing instrument was acknowledged before me by means of □physical presence or □online notarization, this _____ (Date) by _____(Name of Officer or Agent, Title of Officer or Agent) of _____(Name of Contractor Company Acknowledging), a _____(State or Place of Incorporation) Corporation, on behalf of the Corporation. He/She is personally known to me or has produced _____ as identification.

_____
Notary Public

_____
Printed Name

My Commission Expires: _____

EXHIBIT "B"

SUBCONTRACTOR E-VERIFY AFFIDAVIT

I hereby certify that _____(Subcontractor Company Name) does not employ, contract with, or subcontract with an unauthorized alien, and is otherwise in full compliance with Section 448.095, Florida Statutes.

All employees hired on or after January 1, 2021 have had their work authorization status verified through the E-Verify system.

A true and correct copy of _____ (Subcontractor Company Name) proof of registration in the E-Verify system is attached to this Affidavit.

_____

Print Name:_____

Date:_____

STATE OF FLORIDA

COUNTY OF _____

The foregoing instrument was acknowledged before me by means of □physical presence or □online notarization, this _____ (Date) by _____(Name of Officer or Agent, Title of Officer or Agent) of _____(Name of Contractor Company Acknowledging), a _____(State or Place of Incorporation) Corporation, on behalf of the Corporation. He/She is personally known to me or has produced _____ as identification.

_____
Notary Public

_____
Printed Name

My Commission Expires: _____

EXHIBIT 3

STATEMENT OF "NO RESPONSE"

If you do not intend to respond to this solicitation, please help us improve future solicitations by completing and returning this form prior to the date shown for receipt of responses to the Nassau County Board of County Commissioners, c/o Ex-Officio Clerk, Robert M. Foster Justice Center, 76347 Veterans Way, Suite 456, Yulee, FL 32097 by uploading to PlanetBids.

We have declined to respond for the following reason(s):

_____ Specifications are too restrictive (please explain below)

_____ Insufficient time to respond to the solicitation

_____ We do not offer this product/service or equivalent

_____ Our schedule would not permit us to perform

_____ Unable to meet specifications

_____ Unable to meet bond requirements

_____ Specifications unclear (please explain below)

_____ Other (please specify below)

Remarks:_____

_____

We understand that if the "No Response" letter is not executed and returned; our name may be deleted from the list of qualified vendors for Nassau County Board of County Commissioners for future projects.

_____
Typed Name and Title

_____
Company Name

_____
Address

_____ _____
Signature Date

_____ _____ _____
Telephone Number Fax Number Email Address