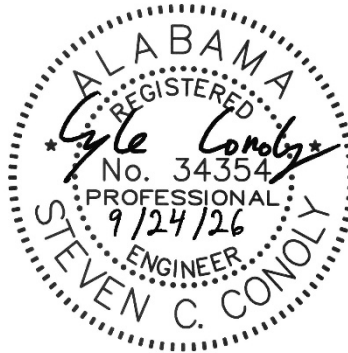


SECTION 26 0000

ELECTRICAL

The following seal, signed and dated,
acknowledge that Cyle Conoly of Mills-Conoly
Engineering, P.C. prepared these specifications:



1 GENERAL PROVISIONS

- 1.1 General Requirements: Division One is applicable in full hereto.
 - 1.1.1 Qualification of Bidders: Subcontractor for this section must have installed at least 3 similar type and size jobs, and electrical contracting shall be his primary business.
- 1.2 Work Under Other Sections: Painting of conduits, equipment, etc. (except wood backboards). Refer to Par. "Equipment Connections" regarding controls, control circuits, starters, etc.
- 1.3 Codes, Permits and Inspections: Comply with applicable laws of the community, with latest edition of NEC where not in conflict with those laws, and with the service rules of the local utility company. Obtain and pay for all permits and fees as required. After completion of the work, submit certificates of final inspection and approval from the local electrical inspector, certifying that the installation complies with all regulations governing same.
 - 1.3.1 In existing areas where renovation work takes place, bring the existing electrical work that is to remain up to the latest codes. This includes conduits anchored, open knockouts in boxes filled, etc.

- 1.4 Materials and Workmanship: All materials shall be new, UL listed where a standard has been established. Execute all work so as to present a neat and professional appearance when completed.
- 1.5 Drawings and Specifications: Consider as complementary each to the other. What is called for by one shall be as binding as if called for by both. Where conflicts occur, secure clarification from Architect in advance of bidding; otherwise provide the more expensive quality or quantity. Follow figures in preference to scale dimensions, verify all dimensions and existing conditions.
- 1.6 Conflicts, Coordination and Changes: In the event that interferences or conflicts develop, contact the Architect at once. Whether conflicts develop due to field conditions or between different contractors, the Architect shall decide what action to take or equipment to be relocated regardless of which was installed. In the interest of avoiding such conflicts, the electrical sub-contractor who is using common space such as mechanical rooms, chases, ceiling space, etc., shall coordinate his work with other trades and other parts of his own work. If, during this construction, it is discovered that necessary or desirable changes should be made, advise the Architect and secure his decision in writing.
- 1.7 Definitions: The definitions in the National Electrical Code (NEC) shall apply where referenced in the NEC. When the word "concealed" is referenced in these specifications and on the drawings, it shall mean to be out of sight. A conduit referenced to be concealed overhead would allow it to run above an accessible ceiling. The word "exposed" when referenced in these specifications and on the drawings, means to be within sight. Items "To Be Removed" shall be removed by the contractor unless followed with "by others". Removed items shall be disposed of as directed in other sections of these specifications and to comply with all codes and ordinances.
- 1.8 Cutting, Chasing and Patching: Where possible all work shall be built in as the job progresses. Where this is not possible, secure approval and do necessary cutting, chasing, etc. required. Patching shall restore disturbed surfaces to original condition.
- 1.9 Visit to Site: Before submitting a bid, visit the site and ascertain all existing conditions. Make sure adjustments in work as are required by actual conditions encountered.
- 1.10 Demolition: Remove items in renovated areas as shown or noted. Where existing electrical work is interrupted by removal of other electrical work, provide all wiring, conduit, etc. required to maintain these items in operation. The exact extent of demolition shall be as directed by architect. Removed items shall be offered to the owner. If the owner does not accept the items, then dispose of in manner that complies with ordinances, laws and codes.

- 1.11 Manufacturer's Drawings and Data: Follow procedure outlined in Section 1. Submit for approval within 20 days of award all items as indicated below. Because items must be coordinated one with another, partial submittals will not be considered. Where one manufacturer is named, a pre-bid submittal is recommended (and an addendum will be issued if enough time was provided) or equal products will be considered for approval unless stated otherwise. Similar products shall be produced by the same manufacturer. Only manufacturers with local, active, ethical and reliable representation in specifier's area will be considered.
- 1.11.1 Submit a complete list of materials proposed; include all items, even if exactly as specified. Submit manufacturer's data (and samples upon request) for all items where substitutions are desired. All substituted items shall indicate the differences in that specified from that submitted.
- 1.11.2 Submit shop drawings for the lighting fixtures, lighting controls, wiring devices, floor outlets, fire alarm system and power distribution equipment (including those exactly as specified). Before the submittals are reviewed by the engineer, there shall be a stamp or letter attached indicating the submittals were reviewed and in compliance with plans and specifications, signed by the electrical contractor. Faxed copies of submittal data will not be accepted. All data shall be readable and complete with catalog numbers, highlighted accessories and options, and detailed information to describe portions of catalog numbers.
- 1.12 C.A.D. Drawings Requests: Electrical drawings produced by Computer Aided Design are available on disk or e-mail at a minimal fee to compensate for time, materials, shipping, etc. incurred to provide the amount of detail requested. The electronic files are available in AutoCAD Release 2014 format. The accuracy of the electronic files shall be the responsibility of the person placing the request due to addenda items, change orders, etc. that may not be incorporated in the files. The files are only available for shop drawing and as-built document preparation. Written permission by the Engineer is required for uses other than that stated.
- 1.13 Testing: Upon completion of the work, conduct a thorough test in the Architect's presence, and demonstrate that all systems are in perfect working condition.
- 1.14 Demonstration: By on-off, start-stop operation, demonstrate to the owner or his representative, the use, working, resetting and adjusting of each and every system. Include hands-on instructions to the Owner for the testing of exit lights, emergency battery lighting systems, smoke detectors, etc. that must be performed periodically per codes. Submit statement initialed by the owner that such demonstration has been made.

- 1.15 Warranty: Warrant the electrical work performed in this project in proper working order. Replace, without additional charge, all work or material which may develop defects from ordinary wear and tear (damage resulting from improper handling excepted) within a period of one year from date of final acceptance.
- 1.16 Conduit Routing: Exact routing of all conduits shall be as indicated and shall be approved by Architect. No penetrations of four hour rated partitions will be allowed unless a written letter from local authority having jurisdiction is provided.
- 1.17 Fire Stops: Where conduits and electrical equipment raceways pass through partitions (walls, floors, ceilings, etc.) rated less than four hours, install a fire stop that provides an effective barrier against the spread of fire, smoke and gases. NFPA 221 prohibits conduits, pipes and wiring from passing through four hour rated partitions. Fire stop material shall be packed tight and completely fill clearance between raceways and openings fire stop material shall be 3M, Crouse-Hinds, Dow Corning, Hilti or approved equal installed in accordance with ASTM E-814. Where conduit nipples pass thru walls, provide removable pillow type firestop.
- 1.18 Operating Manuals: Provide a type written operating manual and maintenance manual to the building owner. These manuals shall include:
 - 1.18.1 Data stating equipment rating, selected options, manufacturer and catalog numbers for each piece of equipment requiring maintenance.
 - 1.18.2 Operation manuals and maintenance manuals for each piece of equipment requiring maintenance. The required routine maintenance actions shall be clearly identified.
 - 1.18.3 Names and addresses of at least one qualified service agency.
 - 1.18.4 Submittal data indicating all selected options for each piece of lighting equipment and lighting controls. Include a schedule for inspecting and recalibrating all lighting controls.
 - 1.18.5 A complete narrative of how each system is intended to operate, including recommended set points and the programmed entry data for systems on this project.

2 SERVICE (existing)

- 2.1 General: Existing service to remain.
- 2.2 Characteristics of Power: 277/480 volt, 60 cycle, 3 phase, 4 wire, wye connected with a grounded solid neutral.

3 GROUNDING

- 3.1 General: Ground the neutral conductor and various conductive materials in the building per NEC Article 250.
- 3.2 Electric System (Neutral) Ground: The current carrying neutral leg of the wiring system shall be of insulated conductor and shall be connected to the grounding electrode conductor only via the neutral connection at the service equipment.
- 3.3 Building Equipment Ground: All non-current-carrying metal parts of the wiring system (including conduit, outlet boxes, cabinets, motor frames, etc.) shall be connected to ground via equipment grounding system. A grounding conductor (copper with green insulation except where bare copper is used) shall be installed. Conduit ground is not acceptable. Provide bonding jumpers at flexible conduit connections, expansion joints, service equipment enclosure, and all other places where required for electrical continuity.

4 POWER DISTRIBUTION SYSTEM

- 4.1 Type of Wiring: Install wiring in approved raceways with conductors of the types and sizes as shown and specified herein; where no types or sizes are shown, meet NEC requirements.
- 4.2 Feeder Circuits: Provide a complete system of wiring from main service equipment to the various load centers, panels and other locations, as indicated.
- 4.3 Branch Circuits: From panels and load centers extend a complete system of wiring to all fixtures, motors, devices and other equipment. Lighting circuits shall supply lighting outlets only, except as shown otherwise. Secure approval of any departure from the circuit arrangement as shown.

- 4.4 Indication on Drawings: Numerals shown on "home runs" and by the outlet indicate the circuit arrangement in the panelboard. Crossmarks on branch circuit runs indicate the number of conductors required. No runs shall contain more than three circuits unless shown. Connect circuits to panelboards to give an evenly balanced load to the supplying feeder, based on normal usage of the connected equipment.

5 RACEWAYS

- 5.1 Applications: Raceways shall be as follows:

- 5.1.1 Where subject to moisture or mechanical injury - rigid conduit.
- 5.1.2 In concrete or solid masonry - rigid conduit.
- 5.1.3 Above furred space or in cells of hollow masonry - EMT.
- 5.1.4 Buried in earth or porous fill - rigid conduit painted with two coats of asphaltum paint (1" and larger may be plastic with ground wire except elbows and vertical runs).
- 5.1.5 Exposed in unfinished areas (Boiler, Electrical, Mechanical Rooms) - rigid conduit, IMC or EMT.
- 5.1.6 Motor and vibrating equipment connections - flexible conduit.

NOTE: The use of MC cable is not allowed on this project.

- 5.2 Rigid Conduit Material: Rigid, thickwall, zinc coated conduit by Allied, Republic, Wheatland or approved equal. Fittings shall be threaded type by Thomas & Betts, Bridgeport, or Appleton. Right and left couplings shall not be used; conduit couplings of the Erikson type shall be used at location requiring such joints.
- 5.3 Electrical Metallic Tubing (EMT) Material: Tubing shall be zinc coated by one of manufacturers named for rigid conduit. Fittings shall be steel (not cast), raintight, set screw type as manufactured by Thomas & Betts, Steel City, Bridgeport, Appleton or approved equal.
- 5.4 Flexible Conduit at Motor or Equipment Connections: Provide neoprene jacketed liquid-tight flexible conduit (with ground conductor) equal to Anaconda Sealtite. At fixture connections provide flexible steel conduit by one of manufacturers named for rigid conduit.

- 5.5 Flexible Conduit: Where existing conditions will not allow or will make very difficult the installation of rigid or EMT conduit, it will be permissible to run zinc-coated steel flexible metal conduit. This condition will not allow MC cable use. Provide with ground conductor.
- 5.6 Plastic Conduit Material: Carlon type 40 heavy wall rigid PV-Duit (Polyvinyl-chloride), or approved equal by Kraley or Southwestern with matching elbows, fittings, etc. Provide ground conductor. Change to rigid conduit for elbows up through slab or above grade.
- 5.7 Conduit Sizes: Comply with NEC, Chapter 9. Minimum size 1/2 inch.
- 5.8 Cast Metal Conduit Fittings: As manufactured by Appleton, Crouse-Hinds, Killark or approved equal, and of the form and type applicable to the installation. Not to be used where other types are specified.
- 5.9 Layout: Install all conduit concealed except in equipment rooms and where exposed runs are specifically indicated. Keep runs at least 6 inches from flues, hot water pipes and other heat sources. Eliminate trapped runs insofar as possible. Do not run conduit in cavity of exterior walls.
 - 5.9.1 Generally follow the conduit layout shown on the drawings. However, the layout is diagrammatic only and must be adjusted for structural conditions, built-in equipment and other causes. Off-sets are not indicated and must be furnished as required.
 - 5.9.2 Run concealed conduits in direct line with long sweep bends and offsets where practicable. Install exposed conduit with runs parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings, with right-angle turns consisting of cast metal fittings or symmetrical bends. Where conduits are indicated exposed overhead, runs down to wall outlets shall be concealed to wall.
- 5.10 Installation: Securely fasten conduits to all sheet metal outlets, cabinets, junction and pull boxes with locknuts and bushings taking care to see that stout mechanical and solid electrical connections are obtained. Thread rigid conduit so that ends meet in couplings; cut ends square, ream smooth and drawn up tight. Cap conduit ends to keep out water and trash during construction.
 - 5.10.1 Avoid field made bends where possible, but where necessary, use a proper hickey or conduit-bending machine. Make no bends with radius less than six times the conduit diameter, nor more than 90 degrees. Make changes in direction with pull boxes, symmetrical bends and cast-metal fittings. Replace crushed and deformed conduits.

- 5.11 Support and Anchoring: All conduits, concealed or exposed, shall be supported and substantially fastened to not more than eight feet. Support with approved types of galvanized wall brackets, ceilings trapeze, clamps, or other approved devices. Attach supporting devices with screws, bolts, expansion sleeves or other workmanlike means appropriate to the surface. In stud walls, secure to studs as required so that conduit is immovable.
- 5.12 Empty Conduit: Provide #14 galvanized fish wire with 14 inch free ends.
- 5.13 Terminated Conduit: Provide bushings on ends where auxiliary system conduit raceway is stubbed out into an attic space, adjacent to back board, etc.
- 5.14 Pull Boxes: Galvanized sheet metal screw-cover type as produced by B & C Metal Stamping Company. Provide as required to avoid excessive runs or bends between outlets (generally not over three 90 degree bends per run between boxes).
- 5.14.1 Label all junction box and pull box covers to indicate contents (F.A., Panel & Circuit Number, I.C., Etc.).
- 5.15 Installation in Concrete: At slabs on grade, elevated slabs and/or any structural slab, conduit 3/4" and smaller may run in slab if approved by Structural Engineer or Architect. Run larger conduits below slab. No conduit shall be run in or through any structural member unless approved by the structural engineer. Where adequate support cannot be obtained by wiring to reinforced steel, obtain support with solid iron stakes (which may be driven through membrane) cut off flush with slab after pouring. At turn-ups of adjacent runs of exposed conduit, obtain alignment by wiring members to a temporary horizontal member.
- 5.16 Expansion Joints: Where conduits pass through or across building expansion joints, provide hot-dipped galv. expansion fittings with bonding jumpers.

6 OUTLET BOXES

- 6.1 General: Except as noted, boxes shall be standard cold rolled steel galvanized or sherardized at least 1-1/2" deep, of metal at least 1/16" thick; sized to accommodate devices and conductors per NEC Article 370; product of Crouse-Hinds, O-Z/Gedney, Thomas & Betts or approved equal.
- 6.2 Ceiling and Wall Bracket Outlets: 4" octagonal boxes with plaster rings appropriate for finish surface.

- 6.3 Typical Boxes (For Switches, Receptacles & Auxiliary Systems): 4" square boxes ganged as required. Furnish with 3/4" plaster rings where employed in plaster, 1" tile covers where used in ceramic tile, 1" plaster rings where set in exposed concrete, and as otherwise appropriate for surface and construction.
- 6.4 Boxes in Exposed (Or Thin Coated Plastered) Masonry: Where conduit connections permit, employ solid flush-type, square cornered, masonry boxes with turned-in device holders; otherwise employ typical box with 1-1/2" square cut tile cover.
- 6.5 Boxes Used With Exposed Conduit: 4" square utility boxes. Label covers with permanent marker indicating contents (Fire Alarm, Intercom, Panel/Circuit Number, etc.).
- 6.6 Boxes Used with Recessed Lighting Fixtures: Provide a 4" square box with blank cover adjacent to each fixture group. Generally attach to underside of structure above, in accessible location, to accommodate a 4' to 6' flexible conduit connection to each fixture or fixture run.
- 6.7 Boxes in Dry-Wall Construction: Sectional type switch boxes at least 2-1/2" deep may be used instead of typical box (but not where dry wall finish is applied over masonry back-up and not where multi-gang devices occur).
- 6.8 Mounting and Supports: Boxes which are not imbedded in masonry or concrete shall be fastened to the structure in a manner specified for conduits. Each flush wall box shall be anchored to a steel back strap that spans the studs.
- 6.9 Locations: The drawings indicate approximate locations only; determine the exact location at the building in view of all structural and architectural conditions. Obtain Architect's verification of final locations. No outlets shall be mounted back-to-back in rated walls. Stagger boxes as required on opposite sides of studs, on separate studs, separate CMU blocks, etc. as required.
- 6.9.1 Where outlets at different levels are shown adjacent, install in one vertical line where possible. At counters adjust heights to avoid conflicts with splash backs, upper cabinets and other equipment.

6.9.2 No lighting controls shall be located behind an open door unless where double doors occur. Unless shown near a podium or entry into a room, locate controller outlets on the lock side of door and so that first controller in a single or gang installation is approximately 6" to 10" from the door jamb. If this section is contradictory with the plans, then contact the architect or engineer for clarification prior to rough-in. Avoid conflict with wainscot caps by adjusting height slightly up or down as directed.

6.10 Mounting Heights: Unless noted or directed otherwise, locate outlet centers above the finished floor as follows:

Lighting Controllers, generally	3' - 10"
Receptacles, generally	1' - 6"
Thermostats	3' - 10" (A.D.A. Requirement)
Television Outlets	12" below ceiling (9' max)
Telephone/Data Outlets	1' - 6"
Fire Alarm Manual Station	Operable handle at 44"
Fire Alarm Horn/Light	Light lens at 82"

7 CONDUCTORS

7.1 Material: Copper with not less than 98% conductivity; solid type THHN for No. 10 and smaller and stranded type THWN for No. 8 and larger; 600 volt insulation. Product of Triangle, Southwire, American Wire or approved equal, with manufacturer's name, type insulation, and conductor size imprinted on jacket at regular intervals.

7.2 Sizes: AWG sizes as noted. Phase and ground conductors shall not be smaller than #12. Multi-circuit runs shall contain a neutral conductor (color coded as indicated below) for each phase conductor in the run. Where branch circuit runs exceed 100 feet in length, increase to next larger size.

7.3 Installation: Do not pull conductors until conduit run is complete and the building has been closed to the weather. Use only U/L approved lubricant to facilitate pulling of conductors. No multi-wire branch circuits shall be run on this project. Provide a neutral conductor for each phase conductor per color coding scheme stated in these specifications. No more than three circuits shall be installed in a raceway unless shown otherwise.

7.4 Joints: For solid conductors, make joints with solderless type connectors (Ideal, "Wing-Nut", Buchanan "B-Cap" or approved equal). Make taps or splices of stranded conductors with T & B compression "C" or "Lock-tite" connectors, and cover with Okoweld or Scotch #33 Electrical Tape so that the insulation is equal to the conductor insulation. Fixture outlets shall have a loop or end not less than eight inches long left for connection to fixture. Conductors in capped outlets shall have taped ends. Make splices and taps only in junction boxes and wireways. Connections and splices within in-grade pullboxes or where considered wet locations shall be made with devices rated for wet locations for the number and size of the conductors (NSI Polaris Blue Insulated Connector series or approved equal U/L rated for direct burial or submersible applications).

7.5 Color Coding: Follow NEC Section 210-5. Equipment grounds shall be green. Conductors shall be identified by colored insulation throughout if wires are No. 10 AWG or smaller. For wires larger than No. 10, use colored tape band on black insulation.

Color coding for 120/208 volt system shall be:

- Phase A: Black
- Phase B: Red
- Phase C: Blue
- Neutral for Phase A: White with Black Stripe
- Neutral for Phase B: White with Red Stripe
- Neutral for Phase C: White with Blue Stripe
- Ground: Green

Color coding for 277/480 volt system shall be:

- Phase A: Brown
- Phase B: Orange
- Phase C: Yellow
- Neutral for Phase A: White or Gray with Brown Stripe
- Neutral for Phase B: White or Gray with Orange Stripe
- Neutral for Phase C: White or Gray with Yellow Stripe
- Ground: Green

8 PANELS AND SAFETY SWITCHES

- 8.1 Safety Switches: Provide for all motors and other equipment as indicated or required by Code, NEMA heavy duty type quick make quick-break, in NEMA-1 enclosure with interlocking covers. Provide with fuses as indicated. Where exposed to the weather or moisture, furnish NEMA-3R enclosures. Switches for motor circuits shall be horsepower rated. Switches shall accept only Class R Fuses. Provide with padlocks where accessible to public. (Added Addendum #1, 09/28/2026)**
- 8.2 Panels: Deadfront, UL labeled, single door type with flush combination pull, catch and lock. All locks keyed alike. Interiors factory assembled. Back boxes shall be galvanized and have a 20" minimum width. Fronts shall have standard gray factory finish. Panels used for service equipment shall be UL labeled for that use. Type, catalog and style numbers shown on the drawings refer to Square D. Equal equipment manufactured by Siemens, GE, Eaton or approved equal will be accepted; all panels and cabinets shall be by the same manufacturer. Panels shall have metal directory holders welded to door, flush metal latches and concealed trim clamps. Surface mounted panels shall have door-in-a-door construction (hinged door for easy access). No back-fed main breakers or sub-feed breakers are allowed except where approved prior to bid or noted on schedule. The main breakers shall be located at top or bottom of busbars depending on direction of feed.
- 8.2.1 The number and rating of circuit breakers and future spaces shall be as scheduled. Branch breakers in panels shall be numbered. All breakers shall have labels or be referenced to a directory indicating the load they serve. Provide a label on cover stating panel name, voltage and phase, and where it is fed from.
- 8.2.2 Circuit breakers shall be series rated so that a breaker at any point in system shall be capable of interrupting available short circuit at that point. Provide nameplate on interior trim of each panel to read "SERIES RATED FOR SHORT CIRCUIT CURRENT, NEW BREAKERS SHALL COORDINATE WITH SYSTEM". The panel used for service entrance equipment shall be UL labeled for that use. Breakers in service and/or distribution panels shall have breakers that can protect all breakers that are specified or that can be mounted into the branch panel being served. This means the feeder breaker shall protect the lowest interrupting rated breaker of any size that can be mounted into the branch panel.

- 8.3 Future Panel Circuits: Stub out six empty 1" conduits for each flush mounted panelboard to an accessible location above lay-in ceiling (or attic) and to crawl space if available. Where "space only" is indicated, provided all copper work and make provisions for mounting circuit breakers are added, no additional parts or changes to the structure or bus work are required.
- 8.4 Fuses: Provide complete set of fuses for all switches and panels. Furnish rated as shown; for motor loads size as recommended by motor supplier.
- 8.4.1 Provide Bussmann Class RK1, dual element fuses for sizes up to 600 amps and Class L, time delay for sizes 601 to 6000 amps. Equal fuses by Gould, Littelfuse or approved equal may be used.
- 8.5 Circuit Breakers: Circuit breakers shall be bolted-in-place molded case breakers. Two and three pole breakers shall have common trip action and be interchangeable with single pole breakers. Breakers indicated GFI shall have integral ground fault protection with test switch.
- 8.6 Identification: Provide identification as required in NEC 408.4. On the door provide the panel name, voltage/phase and the source of supply. All panels shall have permanent circuit markers. A typewritten directory card showing equipment and areas controlled shall be provided in holder on inside door. Panels without covers shall have nameplates mounted beside each breaker. Provide arc-flash hazard warning labels in new panels and in the existing panels where new work is performed if not existing in those panels per NEC 110.16 and 110.21.
- 8.7 Mounting: Mount panels with center of top switch or circuit 6'-0" above the floor maximum. Carefully align covers which occur side by side in finished areas.
- 8.7.1 Protect from plastering and masonry operations with temporary cardboard covers.
- 8.8 Coordination and Size Requirements: If the power distribution equipment is larger than that shown, then it is the responsibility of the contractor to modify the electrical space to incorporate the equipment and the modified layout must be acceptable to the engineer. Otherwise, another manufacturer of the equipment shall be used.

9 DRY TYPE TRANSFORMER

- 9.1 Indoor Transformers: Provide Square D NLP Series dry type transformers for non-linear loads for conversion of 480 volts Delta, 3Ø, 3W to 208Y/120 volts, 3Ø, 4W. Size shall be as noted on Riser Diagram. Transformers shall have aluminum windings, class 220 insulation, UL K-13 rated, double size neutral terminals, 115° C rise and 4-2B% taps in high voltage winding (two above and two below rated voltage). All terminals shall be completely enclosed. Internal vibration isolators shall be provided for noise control. Noise levels shall be less than NEMA standards. Equivalent transformers by Sorgel, Acme, or approved equal may be used. Provide all mounting brackets and accessories.

10 LIGHTING FIXTURES

- 10.1 General: All units UL labeled. Drivers and internal wiring to be factory installed. Catalog numbers shown are for basic units; furnish complete with flexible connections, trim and other appurtenances necessary to the installation. Coordinate frames and fixtures with ceiling construction in each room before ordering.
- 10.2 Substitutions: Reference to a specific manufacturer's product is made only to establish a standard of quality and design, and to give a general description of the basic type desired. Substitutions will be subject to the approval of the Architect.
- 10.3 LED Fixtures: All LED fixtures shall have at least the initial delivered lumen output and the color temperature stated in the lighting fixture schedule. The CRI shall be 80 or better, a life expectancy of at least 50,000 hours at 70% lumen maintenance, minimum of 5 year warranty (including driver) and shall be tested in accordance with LM-79 and LM-80.
- 10.4 LED Driver: The LED driver shall be installed in an electrical enclosure. Driver shall be provided and warranted by the lighting fixture manufacturer. Driver shall have a Class A sound rating. It shall have a life expectancy of at least 50,000 hours. It shall comply with FCC rules and regulations. Coordinate voltage of driver with the circuit connected. Coordinate 0-10 volt dimming or other method so that it will be compatible with the controls specified.
- 10.5 Coordination: Contractor shall verify voltage of fixtures with the circuits to be connected to and coordinate fixture trims with ceilings in each area prior to placing an order.
- 10.6 Installation: Lay out work as shown, and to provide attractive and efficient arrangement; coordinate with work of other trades. Provide adequate and substantial supports for fixtures. Prior to final inspection clean fixtures and lamps with a soft cloth or sponge and detergent (not soap) solution. Each fixture shall be anchored to or in ceiling, wall, etc. as approved by the architect. Adjustable fixtures (track mounted, floodlights, etc.) shall be aimed as stated or as directed by the Owner or Architect.

- 10.6.1 Securely fasten troffers in exposed grid ceiling with integral or factory furnished grid clips and to structure (separate from ceiling supports) by means of cables or wires. Cable or wire fixture supports shall comply with specifications for anchoring a lay-in ceiling system with at least a wire or cable attached at two opposite corners of each fixture. Support wires shall be independent of each other and from supporting other trades. Provide color or tagging of the fixture support wires to distinguish them from the other trades support wires.
- 10.6.2 Suspended lighting fixtures shall be complete with stems and swivel hangers. Anchor stems to support 60 pounds each. Stem swivels shall match ceiling slope. Provide swivel stems for suspended high bay type fixtures to allow fixture movement.

11 WIRING DEVICES

- 11.1 General: Manufacturers and catalog numbers listed are used to establish style, type and quality. Equal devices by Hubbell, Leviton, Legrand and Eaton will be accepted. All devices shall have plaster ears.
- 11.2 Installation: Unless otherwise noted install wall devices vertically, so that all devices of any given height will align exactly. Plates must be plumb and true with all four edges contacting wall surface. Mount receptacles with grounding terminals down. Do not install devices until plastering or other type wall covering has been completed; install ahead of painting work, but protect from paint spatter.
- 11.3 Duplex Receptacles: 125v/15a, flush duplex receptacles with side and back wiring, grounding terminal and breakoff fins for converting to 2-circuit use, Hubbell BR15. Color to be selected by the architect. Where a 20 amp circuit feeds only one receptacle, that receptacle shall be rated 20 amps (Hubbell BR20). Where indicated GFI, provide duplex receptacle with integral ground fault protection and test switch (Hubbell GFRST20). Where indicated WP, provide GFI protected weather resistant type duplex receptacle (Hubbell GFWRST20) in cast box with cast plates and lift cover.
- 11.4 Device Plates: Type appropriate for device of 302 stainless steel alloy. Provide single plate or proper gang where more than one device occurs. Furnish blank plates on outlets for future use.

- 11.5 Floor Outlet (Power & Auxiliary Systems) in Concrete Construction: Floor outlets shall be a multi-service cast iron recessed in floor type box. Wiremold Walkerbox Resource RFB series or approved equal. Provide brackets, plates, compartment separators, flush access covers, etc. as required for complete assembly. The floor box shall have two duplex receptacles and two compartments for auxiliary systems use. Wiremold # RFB4-CI-1/S36CCTCAL with two CIH/LT-B blank brackets for auxiliary systems use. See detail on plans for conduit entry and wiring instructions. Mount at exact location as directed by Architect.

12 LIGHTING CONTROLS

- 12.1 General: Provide type controller described herein and all accessories required for a complete installation. Locate occupancy sensors to monitor room or area installed as directed by the manufacturer. If a directional type, mount on ceiling in corner of room so that sensor will not detect motion outside of room. In toilets mount to cover entrance doorway and individual stalls. Low voltage units require a power supply/relay unit and shall be located above an accessible ceiling in same space. All low voltage wiring shall be in conduit unless noted. All wiring (quantity and type) shall be as recommended by the manufacturer.
- 12.2 Wall Switches: 120/277v, 20a, flush enclosed, quiet type switches. Color to be selected by Architect. Hubbell Specification Grade, 1221, 1222, 1223, 1224 series as required. Provide similar 20a and 30a switches as indicated.
- 12.3 PIR & Ultrasonic Wall Switch Sensor: Shall use PIR and ultrasonic detection and can operate on 120/277 volts. Dip switches shall be available to change operation settings. Switch shall be Hubbell LHMTS (single pole) or LHDCMTD (where indicated two pole) with cover plate or approved equal. Unit shall have at least a 5 year warranty. Color choices of device shall be white, gray, black, light almond, ivory and submitted to the architect for selection. Program for occupancy sensing (auto on) or vacancy sensing (manual on) as stated in the description. Inform the user of the space the adjustable settings available and program the switch for their preferences. Instruct the user how to operate the switch.

- 12.4 PIR & Ultrasonic Wall Dimmer Sensor: Shall use PIR and ultrasonic detection and can operate on 120/277 volts. Dimming method is 0-10 volt. Dip switches shall be available to change operation settings. Switch shall be Hubbell LHDMMTS with cover plate or approved equal. Unit shall have at least a 5 year warranty. Color choices of device shall be white, gray, black, light almond, ivory and submitted to the architect for selection. Program for occupancy sensing (auto on to 50% light output) or vacancy sensing (manual on) as stated in the description. Inform the user of the space the adjustable settings available and program the switch for their preferences. Instruct the user how to operate the switch.
- 12.5 Digital Load Control System: Provide a system of compatible products that controls the lighting and receptacles in the same room and can operate on 120/277 volts. The ceiling mounted occupancy sensors and wall switches connect to the controllers with Cat 5e cables. The components shall have at least a 5 year warranty. Connect the components as recommended by manufacturer. Many of the components specified have the same model number, but can be programed to perform different functions. Program the components to perform the function stated on the drawings. The individual components are as follows:
- Non-Dim Room Controller: Single relay room controller for one circuit of lighting control. Hubbell NXRCFX-1RD-UNV or equal.
 - One Zone Dimming Room Controller: One relay room controller with 0-10 volt dimming capable of on/off and/or raise/lower one zone of lighting. This device shall also have an integral time clock that can be used for programming a schedule of operation. Hubbell NXRCFX-1RD-UNV or equal.
 - Wall Controller (Non-Dimming): Two buttons to turn lighting on and off. Hubbell NXSW-OO or equal. Color to be selected by the architect.
 - Dimming Wall Controllers: Four buttons to turn lighting on and off and raise/lower the light level. Provide a dimming wall switch for each zone of lighting controlled. Hubbell NXSW-ORLO or equal. Color to be selected by the architect.
 - Dual Technology Occupancy Sensor on Ceiling: Ceiling mounted sensor with PIR and ultrasonic detection. Hubbell NXOS-OM with range model to cover area installed or equal.
 - Interconnection Cable: Provide pre-made or field cut Cat 5e plenum rated cables terminated with RJ45 style plugs.
- 12.6 Spare: Provide 10% of each component with a minimum of one per type. Deliver to owner at end of project.

- 12.7 Settings: Install with factory recommended settings for space located. Dip switches shall be available to change operation settings. Electrical contractor shall expect to make up to three (3) trips to the site during the one year building warranty to fine tune and adjust any occupancy sensors the owner desires.
- 12.8 Installation: All sensors shall be mounted on ceiling unless noted. Provide brackets as required for installation. Refer to wiring diagrams on the plans for multiple sensor and power supply/relay requirements, adding wall switches and loads. Provide quantity of sensors and relays as recommended by manufacturer to cover area and operate all circuits and lighting. Actual connections, conductor type and quantity required shall be as instructed by the manufacturer. Provide plenum rated cables where required. Those that require aiming shall be positioned to cover area installed. The low voltage cables and/or wiring shall be installed in conduit separate from the power conductors or run exposed in a neat and orderly manner and attached to the lighting circuit conduits within 12" from luminaire and box and at least 24" maximum intervals throughout run. Control wiring shall be run in conduit where access or replacement is not possible (in walls, above hard ceilings, etc.).
- 12.9 Submittal: Substitutions to the sensors above shall be submitted for review. Substituted products shall bring to engineer's attention all differences if their product verses that specified. Variations in the design for better operation are welcomed. Those by Watt Stopper are listed by catalog number in order to establish a standard and state features and operation desired.

13 TELEPHONE/DATA/TV SYSTEMS

- 13.1 Scope: Provide a complete system of outlets, conduit raceways and terminal backboards and/or terminal cabinets for systems as shown. Coordinate with Owner and modify layout shown as required to meet Owner's vendor or existing equipment standards.
- 13.2 Raceway System: Conduit raceway (3/4" minimum size) same as specified for power wiring. Generally outlets shall be wall outlet boxes. Provide blank plates (same specification as those in wiring device section) for one-half the outlets shown. The remainder outlets shall have plates furnished by Owner's telephone installation contractor. Install plates on outlets directed by Owner or by Architect. Provide #14 galv. pull wire in all runs, and bushings on conduit ends. At backboard terminate conduits neatly and uniformly at edge of backboard.

- 13.3 Cable Management System: Provide a suspended cable tray system or wall mounted hook system as required for conditions at site. Systems shall be complete with all bends, offsets, elbows, couplings, supports, etc. All components shall be free of burrs or sharp edges. The manufacturer of systems shall be Cable Management Solutions (Snake Tray models) or approved equal. Tray system shall be Snake Tray CM-201-6-8 or approved equal. Wall hook system shall be Snake Tray CM-501-5-8 or approved equal. Both systems shall have 4" rung spacing and be mounted every 4'. Coordinate layout with other trades. Provide level changes as required and as directed by architect.
- 13.4 Cable Hooks: Provide a system of hooks mounted to wall above accessible ceilings for support of cables. All components shall be free of burrs or sharp edges. Shall be Mono-Systems, Inc. "The Hook" system or approved equal. Hooks shall be aluminum construction, each to be 6" deep by 6" wide and spaced 36" on center. Coordinate layout with other trades. Mount on corridor wall and provide supports for spans to continue at intersections. Coordinate with ducts, piping, structure, etc. Provide level changes as required and as directed by architect. The hooks may be used for telephone, data and television systems. The fire alarm and intercom systems shall be in dedicated raceways.
- 13.5 Sleeves in Walls: Where sleeves are shown in non-rated walls, provide a 4" EMT conduit nipple through wall with plastic bushings on each end. Where sleeves are shown in rated walls, provide one of the following systems that allow cables to be installed and/or removed without disruption of sealant system:
- 13.5.1 FlameStopper Thru-Wall Fitting by Wiremold Company. Where 2" nipples are shown, provide the 2" thru-wall fitting (#FS2R-GA) with 2" EMT conduit sized per wall thickness and number indicated. Where 4" nipples are shown, provide the 4" thru-wall fitting (#FS4R-GA) with 4" EMT conduit sized per wall thickness and number indicated. Install system as directed by manufacturer's installation instructions.
- 13.5.2 EZ-Path fire rated pathway by Specified Technologies, Inc. The fire rated pathways shall be U/L listed for rating of wall penetrated. Each sleeve shall have a 3"x3"x10.5" opening with an internal sealing system. Provide number of sleeves as required to match area of conduit nipples shown. Provide all pathways, trim kits, sealant around sleeves, etc. as required for a complete installation. The above product can be found at web site www.stifirestop.com.

14 EQUIPMENT CONNECTIONS AND CONTROLS

- 14.1 General: Provide electrical connections to all equipment as shown and as described in other sections and as outlined below. For equipment supplied with portable cords provide receptacles to match plugs on cords. Connect all equipment ready for operation, in accordance with detail wiring diagrams furnished by the equipment manufacturer and in cooperation with the respective subcontractor.
- 14.2 Connections: Provide safety switches for all motors and equipment as indicated or required by NEC. Connect all motors and equipment to equipment terminal boxes with flexible conduit with ground conductor. Where terminal boxes are not provided, terminate flexible conduit in suitable conduit and make connections.
- 14.3 Disconnecting Means: All equipment required by Code to have a disconnecting means and is not furnished with the equipment, shall be provided whether shown or not. If not shown on the plans and the panel is not within sight, then provide a safety switch with fusing to meet these specifications and the codes. Where breakers in panels are serving as disconnects, then the breaker shall be HACR rated and be sized per the maximum allowable by the nameplate (coordinate sizing with equipment supplier).
- 14.4 Miscellaneous Equipment: Electric water coolers will be furnished and installed by under other sections or by Owner. Roughing in and connections for equipment shall be as directed by Suppliers. Outlet for electric water cooler shall be GFI type and mounted at an accessible location below the unit.

15 MISCELLANEOUS ITEMS

- 15.1 Nameplates: Provide 1" x 3" laminated phenolic nameplates (with 1/4" high black letters on white) on disconnect switches, panels, terminal cabinets, controllers, pullboxes, and on other equipment as required by code. Nameplates shall identify the equipment as referenced on the drawings and provide available short circuit current values where required by code. Furnish list for approval. Apply with contact bond adhesive.

END OF SECTION 26 0000