

**SECTION 16010
ELECTRICAL GENERAL**

PART 1 -GENERAL

1.01 SECTION INCLUDES

- A. The electrical work commences with the point of electrical service owned by the local power company and includes furnishing all material and labor for a complete electrical installation.
- B. The requirements of Division I apply to all work hereunder. The General and Special Conditions are a part of this Division of the Specifications and all provisions contained therein which affect this work are as binding as though incorporated herein.

1.02 DEFINITIONS

- A. Provide: Furnish, install, and connect.
- B. Product Data: Catalog cuts and descriptive literature.
- C. Shop Drawings: Factory prepared specific to the installation.
- D. Indicated: Shown on the Drawings.
- E. Noted: Indicated or specified elsewhere.

1.03 SUBMITTALS

- A. Make all submittals in accordance with the requirements of Division I. Approval drawings consist of shop drawings, product data and other information as noted in the individual equipment sections. Except as noted, submittal information is for approval and equipment may not be installed until submittals have been returned with stamped approval.
- B. Information required "for reference" such as product samples, similar unit test reports and time current curves is for the purpose of determining the suitability of a product, selecting breaker settings, etc. This information is to be submitted at the same time as approval data; however, this information will not be returned and stamped approval is not required prior to installation.
- C. Except as noted, installation instructions are not required to be submitted. However, it is the Contractor's responsibility to obtain installation information from the manufacturer for all equipment prior to installing the equipment.

1.04 QUALITY ASSURANCE

- A. Provide the complete electrical installation in accordance with the National Electrical Code (NFPA 70), Life Safety Code (NFPA 101), and in accordance with applicable local codes. Obtain all necessary permits and have all work inspected by appropriate authorities.
- B. All products shall be designed, manufactured, and tested in accordance with industry standards. Where applicable, date for industry standards is that in effect on the date of Advertisement of the Project.

American National Standards Institute (ANSI)

American Society for Testing and Materials (ASTM)

Federal Specifications (FS)

Institute of Electrical and Electronics Engineers (IEEE)

Insulated Cable Engineers Association (ICEA)

National Electrical Manufacturers Association (NEMA)

National Fire Protection Association (NFPA)

Underwriters Laboratories, Inc. (UL)

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Ship products to the job site in their original packaging. Receive and store Products in a suitable manner to prevent damage or deterioration. Keep equipment upright at all times.
- B. Investigate the spaces through which equipment must pass to reach its final destination. Coordinate with the manufacturer to arrange delivery at the proper stage of construction and to provide shipping splits where necessary.

1.06 PROJECT/SITE CONDITIONS

- A. Power will be supplied by the utility company overhead distribution system. Verify and comply with all power company requirements. Make necessary arrangements with the power company for temporary service requirements.

PART 2 - PRODUCTS

2.01 SOURCE QUALITY CONTROL

- A. Furnish record drawings in accordance with the requirements of Division I. Record drawings consist of submittal data as listed above, operation and maintenance data, and as-built drawings. Record drawings are to reflect the final installation, including any changes during approval, manufacturing tests, and installation.
- B. In addition to other required sets, furnish one set of operation and maintenance data for all apparatus requiring service. This set is to be bound in hardback, 3-ring binder(s) located in a hinged metal cabinet in the main electrical room and shall include:
 - Title page with project name; installing contractor's name, address and telephone number; date of installation and warranty period.
 - Index sheet.
 - Complete manufacturer's operation and maintenance data with tabs (corresponding to the index) separating each item or system. Include the name, address, and phone number of the nearest sales and service organization for each item.
- C. Submit the results of any tests required in the individual equipment sections directly to the Owner from testing agency.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. The complete installation is to be accomplished by skilled electrical tradesmen, with certified or suitably qualified individuals performing all special systems installation and testing. All workmanship shall be of the highest quality, sub-standard work will be rejected.

- B. Schedule the work and cooperate with all trades to avoid delays, interferences, and unnecessary work. If any conflicts occur necessitating departures from the Drawings and Specifications, details of departures and reasons therefore shall be submitted immediately for the Engineer's consideration.
- C. Prior to final inspection, clean all dirt, mud and construction debris from all boxes, cabinets, manholes and equipment enclosures.

3.02 DEMONSTRATION

- A. Prior to request for final review, test all systems and repair or replace all defective work. Submit, with request for final review, written certification that all electrical systems are complete and operational.
- B. At the time of final review of electrical work, demonstrate the operation of electrical systems. Furnish labor, apparatus and equipment for systems' demonstration.
- C. After final review and acceptance, turn over to the Owner all keys for electrical equipment locks. Present to the Owner or the Owner's designated representative, demonstrations and oral instructions for proper operation and maintenance of the electrical equipment and systems.

END OF SECTION 16010

**SECTION 16110
RACEWAY SYSTEMS**

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Rigid metal conduit.
- B. Flexible metal conduit.
- C. Liquid tight flexible conduit.
- D. Non-metallic (PVC) conduit.
- E. Electrical Metallic Tubing.

1.02 SUBMITTALS

- A. Provide product data.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Conduit: Allied, Republic, Triangle or Wheatland.
- B. PVC Conduit: Amoco, Carion or Certainteed.
- C. Flexible Conduit: Anaconda, Thomas & Betts, Electric Flex or Triangle.
- D. Substitutions: Products equal to those listed.

2.02 MATERIALS

- A. Rigid Metal Conduit
Conduit: UL 6; ANSI C80. 1; hot dip galvanized; minimum size 3/4-inch.
- B. Flexible Metal Conduit
Conduit: UL 1; FS WW-C-566; single steel continuous strip with galvanized coating; minimum size 1/2-inch.
- C. Liquid tight Flexible Conduit
Conduit: UL listed liquid tight consisting of extruded thermoplastic. Minimum size 3/4-inch. Exception: Where connected to devices with manufacturer supplied 1/2 match conduit size to hub size.
- D. Rigid Non-metallic (PVC) Conduit
Conduit: NEMA TC-2; Schedule 40 PVC. Minimum size 1".
- E. Electrical Metallic Tubing (EMT)
EMT: ANSI C80.3; hot dip galvanized mild strip steel; minimum size 1/2-inch.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Conduit Installation

Cut conduit square using a saw or pipe cutter and de-burr ends. Paint threads with zinc compound. Bring conduit to the shoulder of fittings and couplings and fasten securely. All connections are to be wrench tightened and electrically continuous. No running threads are permitted.

Use conduit hubs for fastening conduit to cast boxes, and for fastening conduit to sheet metal boxes in damp or wet locations. Use conduit bodies to make sharp changes in direction. For sizes 2-inches and larger, use 'LD' or similar fittings to permit a straight pull from either direction.

The maximum length between pull points is 400 feet. This length shall be reduced by one foot for each degree of bend.

Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2-inch size. Crushed or deformed conduits may not be installed.

Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.

Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture. Install threaded PVC end caps on conduits stubbed up for future use.

Provide a 200 pound tensile strength polyolefin line pulled through and tied off at each end of all empty conduits.

Install expansion joints where conduit crosses building expansion joints and for straight runs in excess of 100 feet.

Where conduit penetrates fire-rated walls and floors, provide mechanical fire-stop fittings with UL listed fire rating equal to wall or floor rating.

Provide watertight seals, equal to OZ type WSK or FSK, where conduit penetrates exterior walls and where conduit passes between spaces normally at different temperatures. Seal duct bank and underground conduit entry with GE or Dow silicone sealant.

Provide silicone sealant equal to Dow or GE for conduit entry in outlet boxes and equipment enclosures (all conduit ends except pull boxes and fittings) for the following areas:

Any Conduit entering electrical room from outside.

In locations where the conduit cannot be turned, provide three pieces threaded rigid couplings. Provide clamp backs for conduits on exterior or damp surfaces to prevent the raceway from bearing directly on the damp surface.

Route conduits in slabs above the bottom reinforcing and below the top reinforcing. Maximum size for conduits in slabs above grade is 1-inch. Route so conduits in slabs above grade do not cross.

Protect conduit threads from rust and damage during construction.

PVC Conduit Bends: Do not use methods which will deform or change the physical

characteristics of the conduit. Use PVC-coated rigid steel factory elbows for bends in runs longer than 100 feet, and in runs which have more than two bends, regardless of length. Exception: Where concrete encased in slab or ductbank, GRS elbows may be used in lieu of PVC coated.

Wipe plastic conduit clean and dry before joining. Apply full even coat of cement to entire area that will be inserted into fitting. Let joint cure for 20 minutes minimum.

PVC Coated Conduit: Exercise care not to damage the coating during cutting, threading, bending, and assembly. Follow the manufacturer's installation instructions. Use vise jaws, bending equipment, strap wrenches, and other tools which are specifically designed for coated conduits. Do not use chain vise, pipe wrench, channel locks or the like. Nicks or small damaged areas (1/2-inch maximum) may be repaired with a manufacturer approved compound. Replace items if coating is damaged in excess of 1/2-inch.

Conductor Protection: Provide bushings on metallic and bell ends on PVC conduits unless conduit terminates in a hub or similar fitting.

B. Conduit Arrangement and Support

Arrange conduit to maintain headroom and present a neat appearance. Run exposed conduits parallel or perpendicular to building surfaces and adjacent piping. Group conduit in parallel runs where practical and provide rack space for 25 percent additional conduits. Use concentric bends for parallel runs.

Avoid sources of heat when possible. Where unavoidable, maintain 3-inch clearance when crossing hot pipes and 12-inch clearance between parallel hot pipes, flues, heating appliances and other heat sources.

Support conduits to prevent distortion of alignment by wire pulling operations. Fasten single conduits with one hole malleable iron straps. For multiple runs use channel and clamps. Wire, perforated pipe straps and the like are not acceptable support means.

Support conduit at a maximum of eight feet on center and within three feet of each box, cabinet, or fitting. Hang trapeze assemblies with threaded rods not less than 3/8-inch diameter. Remove all temporary supports prior to pulling conductors.

3.02 PROTECTION SCHEDULES

A. Conduit Schedule

Use rigid steel conduits underground outside the building (PVC is optional), under building slabs on grade (PVC is optional) and thru roof systems.

Use flexible steel conduit for connections to lights, motors, transformers and other vibrating equipment.

EMT may be used above grade in buildings.

Use liquid tight flexible steel conduit for flexible connections subject to weather or water entry.

Use PVC conduit (optional) for parking lot light branch circuits, underground outside the building, and under building slabs on grade.

END OF SECTION 16110

**SECTION 16120
WIRES AND CABLES**

PART 1 - GENERAL**1.01 SECTION INCLUDES**

- A. Building wire.
- B. Cable.
- C. Wiring connections and terminations.

1.02 SUBMITTALS

- A. Submit product data.

PART 2 - PRODUCTS**2.01 MANUFACTURERS**

- A. Conductors: Equal to Aetna, American, Cablec, Continental, Okonite, Pirelli, Southwire or Triangle.
- B. Connectors: Equal to Burndy, Thomas & Betts, Ideal or OZ.
- C. Pulling Compounds: Water soluble, equal to Polywater J.
- D. Wire and Cable Markers: Plastic, split sleeve or tubing type, equal to Brady Type XC or T & B Type SM.

2.02 EQUIPMENT

- A. Building Wire

Thermoplastic Insulated Building Wire: NEMA WC-5.

Feeder and Branch Circuits: Single conductor; 98 percent conductivity copper; 75 degrees C; 600 volt PVC insulated with nylon jacket; Type THWN/THHN. Minimum size #12 AWG.

Control Circuits: Same as specified above for feeder and branch circuits, except minimum size #14 AWG.

PART 3 - EXECUTION**3.01 INSTALLATION**

- A. General Wiring Methods

Use only stranded conductors. Exception: Solid conductors size #12 and #10 AWG may be used for receptacle branch circuit wiring.

Use 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 75 feet, and for 20 ampere, 277 volt branch circuit home runs longer than 200 feet.

Place an equal number of conductors for each phase of a circuit in same raceway or cable.

Identification: All conductors shall be identified throughout the electrical system. For control conductors use wiremarkers at all terminals and connections. Color code

power circuit conductors as follows:

	120/208 Volt System	277/480 Volt System
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow

	120/208 Volt System	277/480 Volt System
Neutral	White	Grey
Ground	Green	Green

For conductors #8 AWG and larger color coding may be accomplished with 1-inch wide colored tape applied at each end of the conductor or at points where conductor is accessible so as to be visible inside the enclosure.

Neatly train and lace wiring inside boxes, equipment and panelboards. Support to prevent conductor movement under fault conditions.

B. Wiring Installation In Raceways

Unless otherwise indicated, install all conductors in conduit.

Pull all conductors into a raceway at the same time. Thoroughly swab raceway system before installing conductors. Use wire pulling lubricant for all pulls. Do not exceed the manufacturer's pulling tension.

Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.

C. Wiring Connections And Terminations

Avoid unnecessary splices. Splice only in accessible junction or outlet boxes.

Make connections to circuit breakers, disconnect switches, panel mains, etc. with solderless lugs.

Use mechanical connectors for splices, taps, fixture and motor connections. Exception: Square thread helical spring plastic cap (wire nut) type connectors are acceptable for solid conductor splices and taps.

Use insulated throat, spade type crimp on connectors for strap screw device terminals. Exception: Receptacle back wiring provisions may be used for terminating solid conductors.

Where possible use connectors with integral, insulating covers. Otherwise tape uninsulated conductors and connectors to 150 percent of the insulation value of conductor.

Thoroughly clean wires before installing lugs and connectors.

Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.

3.02 FIELD QUALITY CONTROL

- A. Inspect wire and cable for physical damage and proper connection.
- B. Torque test conductor connections and terminations to manufacturer's recommended values.
- C. Continuity Tests: Ring all conductors for continuity and replace any open conductors.
- D. Ground Fault Tests: Meggar all feeder circuits for grounds. Compile and submit a list of meggar readings. Replace all conductors measuring less than 5 megohms to ground.

END OF SECTION 16120

**SECTION 16130
BOXES AND FITTINGS**

PART 1 - GENERAL**1.01 SECTION INCLUDES**

- A. Rigid metal conduit fittings.
- B. Flexible metal conduit fittings.
- C. Liquid tight flexible conduit fittings.
- D. Non-metallic (PVC) conduit fittings.
- E. Electrical Metallic Tubing fittings.
- F. Outlet boxes.
- G. Pull and Junction boxes.

1.02 SUBMITTALS

- A. Provide product data.

PART 2 - PRODUCTS**2.01 MANUFACTURERS**

- A. Fittings: Appleton, Crouse-Hinds, Oz or Thomas & Betts.
- B. Boxes shall be equal to Appleton, Crouse Hinds, Raco, or Steel City,
- C. Substitutions: Products equal to those listed.

2.02 MATERIALS

- A. Rigid Metal Conduit Fittings

Fittings and Conduit Bodies: NEMA FB-1; zinc coated; taper-threaded type, material to match conduit.

- B. Flexible Metal Conduit Fittings

Fittings and Conduit Bodies: NENIA FB-1; malleable iron squeeze type.

- C. Liquid tight Flexible Conduit Fittings

Fittings and Conduit Bodies: NEMA FB-1; compression type with O-ring.

- D. Rigid Non-metallic (PVC) Conduit Fittings

Fittings and Conduit Bodies: NEMA TC-3.

- E. Electrical Metallic Tubing (EMT) Fittings

Fittings and Conduit Bodies: NEMA FB-1; steel or malleable iron, compression type with insulated throat. Indenter or set screw type connectors are not acceptable.

F. Outlet Boxes

Sheet Metal Outlet Boxes: NEMA OS-1; galvanized steel, with ½ inch male fixture studs where required.

Non-metallic Outlet Boxes: NEMA OS-2.

Cast Outlet Boxes: Cast ferrous alloy with galvanized or cadmium finish, deep type, gasketed cover, threaded hubs.

Floor Boxes: Full adjustable, cast iron, water and concrete tight.

G. Pull and Junction Boxes

Sheet Metal Boxes: NEMA OS-1; galvanized steel. Boxes larger than 12-inches in any dimension use hinged enclosure.

Cast Metal Boxes: NEMA 250; Type 4, galvanized cast iron box and cover, neoprene gasket, stainless steel cover screws, UL listed as raintight. Provide flat-flanged type for surface mounting and outside flange recessed cover type for underground use. Boxes for sidewalk or other traffic areas to have appropriate duty cover with non-skid finish.

PART 3 - EXECUTION**3.01 PREPARATION****A. Coordination of Box Locations**

Provide boxes as shown on the Drawings, and as required for splices, taps, wire pulling and equipment connections.

Box locations shown on the Drawings are approximate unless dimensioned. Verify box locations prior to rough-in. Coordinate mounting heights and locations of outlet mounted above counters, benches, backsplashes, and other furnishings.

3.02 INSTALLATION**A. Box Installation**

Do not install boxes back-to-back in walls. Provide minimum 6-inch separation, except provide minimum 24-inch separation in acoustic-rated walls.

Locate boxes in masonry walls to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat openings for boxes. Provide grout around boxes to securely anchor in place.

Support boxes independently of conduits openings.

Use multiple-gang boxes where more than one device is mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.

In inaccessible ceiling areas, position outlets and junction boxes within 6-inches of recessed luminaires to be accessible through luminaire ceiling opening.

Provide recessed outlet boxes in finished areas; secure boxes to interior wall and

partition studs, accurately positioning to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes.

Align wall-mounted outlet boxes for switches, thermostats, and similar devices. Align adjacent devices at different elevations in one vertical line. Set floor boxes level and flush with finish flooring material.

Field drill conduit holes in tap, junction and pull boxes so as to afford the maximum bending radius for the conductors.

Label cover of junction boxes with circuit numbers of conductors in the box.

Avoid underground junction boxes in branch circuit wiring. All splits in circuits must be made at fixtures.

Cover plates are required for all junction boxes. Provide size to match box size. Snugly secure to each box with a minimum of 2 threaded fasteners.

END OF SECTION 16130

**SECTION 16140
WIRING DEVICES****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Switches.
- B. Receptacles.
- C. Cover Plates.

1.02 SUBMITTALS

- A. Submit product data.

PART 2 - PRODUCTS**2.01 EQUIPMENT**

- A. Switches

FS W-S-896, 20 amp, 120-277 volt. Color: Ivory.

Acceptable Manufacturers: "Hubbell", "Leviton", "P & S", or equal; use one manufacturer throughout project.

- B. Receptacles

NEMA WD-1, 20amp, 120-277 volt, nylon face. Colors: Ivory - general purpose; Orange - isolated ground, dedicated; Brown - other dedicated.

Acceptable Manufacturers: "Hubbell", "Leviton", "Pass & Seymour", "Arrowhart", "Bryant" or equal; use one manufacturer throughout project.

- C. Cover Plates

Jumbo size; Interior: Brushed stainless steel; Exterior: Self-closing, die-cast aluminum.

Bushed center hole for telephone outlet covers.

PART 3 - EXECUTION**3.01 INSTALLATION**

- A. General

Secure devices to outlet boxes without depending on device plates to pull them tight. Install a bonding jumper between all devices and outlet boxes.

- B. Switches

Mounted vertically; One-way switches shall have "ON" position UP.

Mount at 48" A.F.F. to bottom of switch box.

- C. Receptacles

General Mounting: Vertically, ground hole down, bottoms of outlet boxes at 16" A.F.F., set on top of second CMU course. All adjacent items aligned.

Horizontal Mounting: All outlets above countertops; locate bottom of box at first CMU course line above top of splash. All adjacent items aligned.

Grounding: Green ground wire connected from the ground lug on the receptacle to a screw in the back of the outlet box or with an approved grounding strap.

END OF SECTION 16140

**SECTION 16170
MOTOR AND FEEDER DISCONNECT SWITCHES**

PART 1 - GENERAL**1.01 SECTION INCLUDES**

- A. Disconnect Switches.
- B. Motor Starters.
- C. Fuses.

1.02 SUBMITTALS

- A. Submit product data.

PART 2 - PRODUCTS**2.01 EQUIPMENT**

- A. Disconnect Switches

UL-98 and NEMA KS-1; 600 volt; heavy duty; quick make, horsepower and I2t rated. Provide lever type operating handle directly connected to the switch mechanism; rocker types are not acceptable. Include padlocking provisions and nameplate clearly indicating "ON" and "OFF" positions. Equip all switches with a ground lug and, where neutral conductors are scheduled, provide insulated neutral lugs.

Fusible Switches: Equip with rejection clips for fuse types noted.

Enclosure: Stainless steel meeting NEMA 1, 3R, 4X or 12 requirements as specified on the Drawings.

- B. Motor Starters

Manual Starters: NEMA ICS-2; general purpose type; trip-free mechanism; with overload relays. Provide pushbutton operation for integral horsepower sizes, and toggle switch or lever for fractional sizes.

Magnetic Starters: NEMA ICS-2; NEMA size 1 minimum; magnetically held contactor with field replaceable coil and contacts; bimetallic or melting alloy overload relay, manually reset. Starters shall be rated in accordance with NEMA size designations; fractional sizes and ratings per IEC recommendations are not acceptable.

Magnetic Starter Controls: All controls are 120 volts. Equip each starter with a control power transformer fused on the primary and secondary. Provide starter and overload relay auxiliary contacts for red run light, green stop light and amber overload light on the enclosure door. Provide one spare normally open starter auxiliary contact, and door mounted start-stop pushbuttons or hand-off-auto selector switch as indicated.

Combination Starters: Molded case circuit breaker rated 30,000 AIC.

Enclosure: Stainless steel meeting NEMA 1, 3R, 4X and 12 requirements as specified on the Drawings.

- C. Fuses

Fuses: Current limiting, non-renewable type, rated 200,000 AIC, with rejection feature; Class J for ratings 600 amp and below and Class L for ratings 601 amp and above.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Disconnect Switches

Provide switches with voltage, ampere, and number of poles as indicated on the Drawings.

Switches are non-fused type, unless drawings note otherwise, or the switch is used as a disconnect for an item of equipment with a maximum fuse size designated on the nameplate. In such cases, provide fusible type with appropriate fuse. If fusible switches protect conductors with an ampacity less than the rating of the switch, provide a nameplate on the inside front cover of the switch designating the maximum allowable fusing.

Install switches so they are rigidly supported and readily accessible. Where mounted on stud walls, provide a plywood backboard secured to the studs with the switch secured to the backboard. Provide stainless steel mounting channel or phenolic spacers to give nominal 1/2-inch separation from concrete walls in wet or damp locations.

For disconnect switches serving motors with space heaters, provide lamecoid nameplate engraved "WARNING - Motor space heater energized with switch open".

B. Individual Motor Starters

Select and install heater elements in motor starters to match installed motor characteristics. Do not use NEC motor full load ampere data for heater selection.

Provide a typed label inside each motor starter enclosure door identifying the motor served and listing the motor nameplate data. Provide an engraved nameplate on the exterior of the enclosure door identifying the motor served, the horsepower, voltage and phase rating.

Install starters so they are rigidly supported and readily accessible. Where mounted on stud walls, provide a plywood backboard secured to the studs with the starter secured to the backboard. Provide stainless steel mounting channel or phenolic spacers to give nominal 1/2-inch separation from concrete walls in wet or damp locations.

C. Fuses

Equip all fusible devices with fuses. Replace all blown fuses up to final acceptance of the Project. At the completion of the Project, turn over to the Owner spare fuses for each type and size installed; six each for ratings 60 amps and below, and three each for ratings above 60 amps.

END OF SECTION 16170

**SECTION 16500
LIGHTING**

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Interior luminaries and accessories.
- B. Exterior luminaries and accessories.
- C. Lamps.
- D. Ballasts.

1.02 SUBMITTALS

- A. Submit product data. Include dimensions, accessories, installation and construction details, and photometric data.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Fixtures: As indicated in the Lighting Fixture Schedule or on the Drawings.

2.02 EQUIPMENT

- A. Lamps

Fluorescent Lamps: Cool white; all by same manufacturer.

Fluorescent PL Lamps: 2700 degrees K, all by same manufacturer.

Metal Halide HID Lamps: Phosphor coated.

- B. Ballasts

Use ballasts designed to operate on the voltage to which they are connected.

Fluorescent Ballasts: UL 935, ANSI C82.1; labeled Certified Ballast Manufacturers (CBM) certified by Electrical Testing Laboratories (ETL); high power factor type (unless indicated otherwise). Use Class P ballast with sound rating "A" (unless otherwise noted). Use fixtures and ballasts designed and constructed to limit the ballast case temperature to 90 degrees C when installed in an ambient temperature of 40 degrees C.

HID Ballasts: UL 1029 and ANSI C82.4; constant wattage autotransformer (CWA) or regulator, high power factor type, (unless otherwise indicated). Use single-lamp ballasts with a minimum starting temperature of minus 30 degrees C and designed for installation in a normal ambient temperature of 40 degrees C. Use ballasts constructed so that open circuit operation will not reduce the average life.

2.03 ACCESSORIES

- A. Interior Luminaries And Accessories

Provide fixtures as shown in the Lighting Fixture Schedule on the Drawings.

Where flat acrylic lenses are specified in fluorescent fixtures, use 100 percent virgin acrylic, 0.125-inch thickness.

Provide fixture housings and frames to match the ceilings called for on the Architectural Drawings.

Recessed Incandescent Luminaries: Prewired type with thermal protection.

HID Luminaries: Pre-wired, with integral ballast.

B. Exterior Luminaries And Accessories

Provide low temperature ballasts, with reliable starting to -20 degrees F.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install lamps in luminaries and lampholders.
- B. Install fixtures to center or replace acoustical tile sections. Support fixtures from the building structure through the use of the ceiling support system, where the ceiling support system is designed for the lighting fixture's weight. Fluorescent lighting fixtures installed in exposed ceiling grid ceilings: provide two "safety clips" or "safety hooks" for securing fixture to ceiling grid, and located at opposite corners of fixture.
- C. Where fluorescent fixtures are installed in exposed grid ceilings provide a 14 gauge galvanized Safety hanger wire which attaches the fixture to the building structural system to prevent the fixture from falling due to movements in ceiling suspension channels. Attach the safety wire to fixture at a point other than where safety clips are attached.
- D. Provide suspended fixtures with swivel hangers and threaded rod. For single-unit suspended fluorescent fixtures, provide twin suspension hangers.
- E. Support surface lighting fixtures of more than 10 pounds in weight with threaded rods from the building structure.
- F. Install plaster frames for lighting fixtures recessed in plastered ceilings.
- G. HID Luminaries: Use power hook hangers rated 500 pounds minimum or provide safety chain between ballast and structure. Provide safety chain between reflector and ballast.

3.02 FIELD QUALITY CONTROL

- A. Relamping

Relamp luminaries at completion of work for any fixture that burns out.

3.03 ADJUSTING

- A. Touch up luminaire and pole finish at completion of work.
- B. Mount continuous rows of luminaries in straight line. Utilize alignment clips between reflectors, where applicable.

3.04 CLEANING

- A. Clean lenses and diffusers at completion of work. Clean paint splatters, dirt and debris from installed luminaries.

END OF SECTION 16500