SECTION 260553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Identification for raceways.

2. Identification of power and control cables.

3. Identification for conductors.

4. Warning labels and signs.

5. Instruction signs.

6. Equipment identification labels.

7. Miscellaneous identification products.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with

requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:

1. White letters on a black field.

2. Legend: Indicate voltage

C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

2.2 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Colors for Raceways Carrying Circuits at 600 V and Less:

1. White letters on a black field.

2. Legend: Indicate voltage

C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather-

and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

2.4 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.5 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.

2. 1/4-inch grommets in corners for mounting.

3. Nominal size, 7 by 10 inches.

D. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."

2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.6 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.

2. Punched or drilled for mechanical fasteners.

3. Framed with mitered acrylic molding and arranged for attachment at applicable

equipment.

B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.

2.7 EQUIPMENT IDENTIFICATION LABELS

A. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

1. For Normal Systems: Black with White lettering.

2. For Normal/Emergency systems: Red with White lettering.

3. For Emergency Only Systems: Red with Yellow lettering.

4. UPS Systems: Blue with White lettering.

2.8 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.

2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.

3. Temperature Range: Minus 40 to plus 185 deg F.

4. Color: Black except where used for color-coding.

B. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.

1. Minimum Width: 3/16 inch.

2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.

3. UL 94 Flame Rating: 94V-0.

4. Temperature Range: Minus 50 to plus 284 deg F.

5. Color: Black.

C. Apply cable ties suitable for the conditions of installation. Refer to Part 3.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

G. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

H. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. In Spaces Handling Environmental Air: Plenum rated.

I. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and equal to or greater than 120 V to ground: Identify with self-adhesive vinyl label. Install labels at 10-foot maximum intervals.

B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage, using colors as defined in Part 2 “Equipment Identification Labels.” System legends shall be as follows:

1. Emergency Power.

2. Power.

3. UPS.

C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.

a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
b. Colors for 208/120-V Circuits:

1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.
4) Neutral: White.

c. Colors for 480/277-V Circuits:

1) Phase A: Brown.
2) Phase B: Orange.
3) Phase C: Yellow.
4) Neutral: Gray

d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

D. Power-Circuit Conductor Identification, More than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use wraparound vinyl tape.

E. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

F. Conductors to Be Extended in the Future: Attach marker tapes to conductors and list source.

G. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.

2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.

3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

H. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels

1. Comply with 29 CFR 1910.145.

2. Identify system voltage with black letters on an orange background.

3. Apply to exterior of door, cover, or other access.

4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

a. Power transfer switches.
b. Controls with external control power connections.

J. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

K. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transfer load shedding and all emergency operations and equipment.

L. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch high letters on 1-1/2-inch high label; where two lines of text are required, use labels 2 inches high.
b. Outdoor Equipment: Engraved, laminated acrylic or melamine label
c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be self-adhesive, engraved , laminated acrylic or melamine label.
b. Enclosures and electrical cabinets.
c. Access doors and panels for concealed electrical items.
d. Emergency system boxes and enclosures.
e. Enclosed switches.
f. Enclosed circuit breakers.
g. Enclosed controllers.
h. Variable-speed controllers.
i. Push-button stations.
j. Contactors.
k. Remote-controlled switches, dimmer modules, and control devices.
l. UPS equipment.

+ + END OF SECTION + +

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following lighting control devices:

1. Time switches.

2. Indoor occupancy sensors.

3. Lighting contactors.

B. Related Sections include the following:

1. Division 26 Section "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.3 DEFINITIONS

A. LED: Light-emitting diode.

B. PIR: Passive infrared.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show installation details for occupancy and light-level sensors.

1. Interconnection diagrams showing field-installed wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For each type of product 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.

1.6 COORDINATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 TIME SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Intermatic, Inc.
2. Leviton Mfg. Company Inc.
3. Paragon Electric Co.; Invensys Climate Controls.
4. TORK.

B. Electronic Time Switches: Electronic, solid-state programmable units with alphanumeric display; complying with UL 917.

1. Contact Configuration:
2. Contact Rating: 30-A inductive or resistive, 120 - 277 V ac
3. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program on selected channels.
4. Astronomic Time: All channels.
5. Battery Backup: For schedules and time clock.

C. Electromechanical-Dial Time Switches: Type complying with UL 917.

1. Contact Configuration:
2. Contact Rating: 30-A inductive or resistive, 120-277-V ac) 20-A ballast load, 120 - 277-V ac
3. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program.
4. Astronomic time dial.
5. Eight-Day Program: Uniquely programmable for each weekday and holidays.
6. Skip-a-day mode.
7. Wound-spring reserve carryover mechanism to keep time during power failures, minimum of 24 hours.

2.2 INDOOR OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hubbell Lighting.

2. Cooper Controls.

3. Sensor Switch, Inc.

4. Watt Stopper (The).

B. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.

1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.

3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.

a. Two-relay dry contacts minimum, as part of the relay unit assembly. Second contact wired to BAS system.

4. Mounting:

a. Sensor: Suitable for mounting in any position on a standard outlet box.
b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.

6. Bypass Switch: Override the on function in case of sensor failure.

7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc keep lighting off when selected lighting level is present.

C. PIR Type: Ceiling mounting; detect occupancy by sensing a combination of heat and movement in area of coverage.

1. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in.

2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.

3. Detection Coverage (Corridor): Detect occupancy within 90 feet when mounted on a 10-foot high ceiling.

D. Ultrasonic Type: Ceiling mounting; detect occupancy by sensing a change in pattern of reflected ultrasonic energy in area of coverage.

1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.

E. Dual-Technology Type: Ceiling mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on-off functions shall be selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.

2. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.

3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.

2.3 LIGHTING CONTACTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ASCO Power Technologies, LP; a division of Emerson Electric Co.

2. Eaton Electrical Inc.; Cutler-Hammer Products.

3. Square D; Schneider Electric.

4. TORK.

B. Description: Electrically operated and mechanically held, combination type with nonfused disconnect, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).

2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.

3. Enclosure: Comply with NEMA 250.

2.4 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14, 16 or 18 AWG as allowed per NEC. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 CONTACTOR INSTALLATION

A. Mount electrically held lighting contactors with elastomeric isolator pads, to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 WIRING INSTALLATION

A. Wiring Method: Comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size shall be3/4-inch.

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

A. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."

1. Identify controlled circuits in lighting contactors.

2. Identify circuits or luminaries controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.

2. Operational Test: Verify operation of each lighting control device, and adjust time delays.

B. Lighting control devices that fail tests and inspections are defective work.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.7 DEMONSTRATION

A. Coordinate demonstration of products specified in this Section with demonstration requirements for low-voltage, programmable lighting control system specified in Division 26 Section "Network Lighting Controls."

B. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices. Refer to Division 01 Section "Demonstration and Training."

+ + END OF SECTION + +

SECTION 262726
WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Receptacles, receptacles with integral GFCI, and associated device plates.

2. Twist-locking receptacles.

3. Wall-box motion sensors.

4. Hospital-grade receptacles.

5. Snap switches and wall-box dimmers.

6. Communications outlets.

7. Floor service outlets, poke-through assemblies, service poles, and multi-outlet assemblies.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

F. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.

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. Comply with NFPA 70.

1.6 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.

1.7 EXTRA MATERIALS

A. Furnish extra materials described in subparagraphs below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Service Outlet Assemblies: One for every 10, but no fewer than one.

2. Poke-Through, Fire-Rated Closure Plugs: One for every ten floor service outlets installed, but no fewer than two

3. TVSS Receptacles: One for every 10 of each type installed, but no fewer than two of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).

2. Leviton Mfg. Company Inc. (Leviton).

3. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2.2 STRAIGHT BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with Fed. Spec W-C-596D as verified by UL and NEMA tests WD-1, 3.02 through 3.10 and UL498, configuration NEMA 5-20R.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Hubbell; HBL5351 (single), CR5352 (duplex).
b. Leviton; 5891 (single), 5352 (duplex).
c. Pass & Seymour; 5381 (single), 5352 (duplex).

2. For MRI areas, use receptacle with non-ferrous construction, Pass and Seymour 8300 IMRI or equal.

B. Hospital-Grade, Duplex Convenience Receptacles, 125 V, 20 A: Comply with requirements for convenience receptacles, and UL 498 Supplement SD.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Hubbell; HBL8310 (single), HBL8300H (duplex).
b. Leviton; 8310 (single), 8300 (duplex).
c. Pass & Seymour; 9301-HG (single), 9300-HG (duplex).

C. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Hubbell; HBL8300SG.
b. Leviton; 8300-SGG.
c. Pass & Seymour; 63H.

2. Description: Labeled to comply with NFPA 70, "Health Care Facilities" Article, "Pediatric Locations" Section.

D. All receptacles shall be back and side wired. Use of pre-wired pigtail receptacles that accommodate Fed Spec receptacles and GFCI's shall be an acceptable substitution. All pre-wired receptacles shall have a crimped and welded right angle application within the connector.

2.3 GFCI RECEPTACLES

A. General Description: Straight blade, feed -through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, Fed. Spec WB 896, and include indicator

light that is lighted when device is tripped.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Pass & Seymour; 2084.
b. Hubbell GF 8300.

C. Hospital-Grade, Duplex GFCI Convenience Receptacles, 125 V, 20 A: Comply with all requirements for GFCI receptacles and UL 498 Supplement SD. Provide unit with self-test capability.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Hubbell; GFR8300HST.
b. Leviton; 6898-HG.
c. Pass & Seymour; 2095-SHG.

2.4 TWIST-LOCKING RECEPTACLES

A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration L5-20R, and UL 498.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Hubbell; HBL2310.
b. Leviton; 2310.
c. Pass & Seymour; L520-R.

B. Isolated-Ground, Single Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Hubbell; IG2310.
b. Leviton; 2310-IG.

2. Description: Comply with NEMA WD 1, NEMA WD 6 configuration L5-20R, and UL 498. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.5 SNAP SWITCHES

A. Comply with Fed Spec – WC 596, NEMA WD 1 and UL 20.

B. Switches, 120/277 V, 20 A, 2 hp at 240 V, 1 hp at 120 V.:

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
   b. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
   c. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).

C. Pilot Light Switches, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Hubbell; HPL1221PL for 120 V and 277 V.
   b. Leviton; 1221-PLR for 120 V, 1221-7PLR for 277 V.
   c. Pass & Seymour; PS20AC1-PLR for 120 V.

2. Description: Single pole, with neon-lighted handle, illuminated when switch is "ON."

D. Key-Operated Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Cooper; 2221L.
   b. Hubbell; HBL1221L.
   c. Leviton; 1221-2L.
   d. Pass & Seymour; PS20AC1-L.

2. Description: Single pole, with factory-supplied key in lieu of switch handle.

E. Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Hubbell; HBL1557.
   b. Leviton; 1257.
   c. Pass & Seymour; 1251.

F. Key-Operated, Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Hubbell; HBL1557L.
   b. Leviton; 1257L.
   c. Pass & Seymour; 1251L.

2.6 WALL-BOX DIMMERS

A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.

B. Control: Continuously adjustable slider with single-pole or three-way switching. Comply with UL 1472.

C. Incandescent Lamp Dimmers: 120 V; control shall follow square-law dimming curve. On-off switch positions shall bypass dimmer module.

1. 600 W; dimmers shall require no derating when ganged with other devices.

D. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.7 FAN SPEED CONTROLS

A. Modular, 120-V, full-wave, solid-state units with integral, quiet on-off switches and audible frequency and EMI/RFI filters. Comply with UL 1917.

2.8 OCCUPANCY SENSORS

A. Wall-Switch Sensors:

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Hubbell; AT120 for 120 V, AT277 for 277 V.
   b. Leviton; ODS 15-ID.

2. Description: Adaptive-technology type, 120/277 V, adjustable time delay up to 20 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft.

3. Products: Subject to compliance with requirements, provide one of the following:

   a. Hubbell; ATD1600WRP.
   b. Leviton; ODW12-MRW.
   c. Watt Stopper (The); DT-200.

4. Description: Dual technology, with both passive-infrared- and ultrasonic-type sensing, 120/277 V, adjustable time delay up to 30 minutes, 110-degree field of view, and a minimum coverage area of 1200 sq. ft.

B. Wide-Range Wall-Switch Sensors:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Hubbell; ATP120HBRP.
b. Leviton; ODWHB-IRW.
c. Pass & Seymour; HS1001.
d. Watt Stopper (The); CX-100-3.

2. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 150-degree field of view, with a minimum coverage area of 1200 sq. ft.

2.9 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.

2. Material for Finished Spaces: Steel with white baked enamel, suitable for field painting

3. Material for Unfinished Spaces: Galvanized steel

4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, die-cast aluminum with lockable cover.

2.10 FLOOR SERVICE FITTINGS

A. Type: Modular, flush-type dual-service units suitable for wiring method used.

B. Compartments: Barrier separates power from voice and data communication cabling.

C. Service Plate: Round, die-cast aluminum with satin finish.

D. Power Receptacle: NEMA WD 6 configuration 5-20R, gray finish, unless otherwise indicated.

E. Voice and Data Communication Outlet: Blank cover with bushed cable opening.

2.11 POKE-THROUGH ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the

following:

1. Hubbell Incorporated; Wiring Device-Kellems.

2. Pass & Seymour/Legrand; Wiring Devices & Accessories.

3. Square D/ Schneider Electric.

4. Thomas & Betts Corporation.

5. Wiremold Company (The).

B. Description: Factory-fabricated and -wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service outlet assembly.

1. Service Outlet Assembly: Flush type with two simplex receptacles and space for two RJ-45 jacks

2. Size: Selected to fit nominal 4-inch cored holes in floor and matched to floor thickness.

3. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.

4. Closure Plug: Arranged to close unused 4-inch cored openings and reestablish fire rating of floor.

2.12 MULTIOUTLET ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hubbell Incorporated; ALU 4800 Series.

2. Wiremold Company (The); ALA 4800 Series

3. Monosystems, Inc.; SWA 4800 Series

B. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

C. Raceway Material: Metal, with manufacturer's standard finish.

D. Wire: No. 12 AWG. Minimum, or as indicated on electrical drawings.

2.13 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices Connected to Normal Power System: As selected by Architect,

unless otherwise indicated or required by NFPA 70 or device listing.

2. Wiring Devices Connected to Uninterruptible Power System: Red.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B. Coordination with Other Trades:

1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.

2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.

3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.

4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.

2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.

3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

4. Existing Conductors:

a. Cut back and pigtail, or replace all damaged conductors.
b. Straighten conductors that remain and remove corrosion and foreign matter.
c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were

complete.

2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.

3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.

4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.

5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.

6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.

7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.

8. Tighten unused terminal screws on the device.

9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the left.

2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.

2. Verify that dimmers used for fan speed control are listed for that application.

3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with white-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.

2. Test Instruments: Use instruments that comply with UL 1436.

3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.

2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.

3. Ground Impedance: Values of up to 2 ohms are acceptable.

4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.

5. Using the test plug, verify that the device and its outlet box are securely mounted.

6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Test straight blade hospital-grade convenience outlets for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz.

+ + END OF SECTION + +

SECTION 265113
INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes all interior luminaires complete with sockets, reflectors, diffusers, shades, holders, lamps, ballasts, protective devices and all other required appurtenances.

B. Include all wiring connections to branch circuits, control switches, and controllers.

1.2 RELATED WORK

A. Section 260500, General Electrical Provisions

B. Section 260923, Lighting Control Devices

1.3 REGULATORY AGENCIES

A. Conform to the applicable requirements of the following agencies' most current edition of regulations and standards, unless otherwise stated:

1. American National Standards Institute (ANSI)

2. Illuminating Engineering Society of North America (IESNA)

3. Federal Communications Commission (FCC)

4. Environmental Protection Agency Green Lights Program

1.4 SUBMITTAL AND SAMPLES

A. Submit Shop Drawings and Product Data in accordance with Section 013300.

B. Shop Drawings shall be in the form of standard catalog cuts and/or factory assembly drawings, and shall indicate the following:

1. Luminaire Type

2. Luminaire and Lamp/Ballast voltage

3. Luminaire and Lamp wattage

4. Complete photometric data

5. Manufacturer's name and catalog number including all fixture options

6. Lamp and ballast types and manufacturer's name

7. Warranty information for lamps and ballasts

8. Lamp color temperature (CCT), color rendering index (CRI), and beam spread.

C. Submit sample luminaires as directed by Architect.

D. Submit application, installation and start up instruction. Submit within 30 days of shop drawing approval to facilitate the commissioning process outlined in Division 01.

E. Submit Operation and Maintenance information, to provide the content of the Operation and Manuals, specified in Sections 017823, relative to systems and equipment of this section. All submittals must be provided in hard copy and electronic copy in Portable Document Format per Section 013300.

1.5 COORDINATION

A. Prior to ordering luminaires, verify exact type of ceiling to be used for each space. Refer to Division 9 and Reflected Ceiling Plans.

B. Coordinate to avoid conflicts between luminaires and Mechanical and Plumbing piping, ductwork, supports, fittings and equipment.

C. Furnish to other trades, plaster frames, trim rings, etc., where required.

1.6 WARRANTY

A. T8 and T5/T5HO Fluorescent lamps shall have a warranty for a minimum of two (2) years from the date of Owner occupancy at project completion, against defects in material or workmanship. Should a lamp fail during the warranty period, a new lamp shall be supplied at no charge. The replacement lamp shall be identical to or an improvement upon the original lamp.

B. Electronic Ballasts shall have a warranty for a minimum of five (5) years, against defects in material or workmanship, from the date of Owner occupancy at project completion. Should a ballast fail during the warranty period, a new ballast shall be supplied to the Owner at no charge, and a labor allowance of $15.00 for each defective ballast shall be supplied to the Owner. The replacement ballast shall be identical to, or an improvement upon, the original design of the malfunctioning ballast.

C. Fluorescent Dimming Ballasts: Provide a minimum three (3) year warranty against defects in material or workmanship, from the date of Owner occupancy at project completion. Should a ballast fail during the warranty period, a new ballast shall be supplied to the Owner at no charge, and a labor allowance of $15.00 for each defective ballast shall be supplied to the Owner. The replacement ballast shall be identical to, or an improvement upon, the original design of the malfunctioning ballast.

D. Electronic Metal Halide Ballasts: Provide a minimum three (3) years warranty against defects in material or workmanship from the date of Owner occupancy at project completion. Should a ballast fail during the warranty period, a new ballast shall be supplied to the Owner at no charge, and a labor allowance of $25.00 for each defective ballast shall be supplied to the Owner. The replacement ballast shall be identical to, or an improvement upon, the original design of the malfunctioning ballast.

1.7 WORK INSTALLED BUT FURNISHED BY OTHERS

A. Receive, unpack, check, install and lamp luminaires furnished by others and be responsible for them until finally accepted. Maintain a record of all damaged or imperfect luminaires and store same as and where directed.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Luminaires

1. Refer to “Lighting Fixture Schedule” on the Drawings.

B. Incandescent and Halogen lamps

1. Osram-Sylvania

2. Philips

3. General Electric

4. Ushio

C. Fluorescent Lamps

1. Osram-Sylvania

2. Philips

3. General Electric

D. HID Lamps

1. Osram-Sylvania

2. Philips

3. General Electric

4. Venture

E. Tubular Fluorescent Lamp Ballasts

1. Universl Lighting Technolgoies

2. Advance Transformer Co.

3. Osram-Sylvania

4. General Electric

F. Compact Fluorescent Lamp Ballasts

1. Robertson

2. Advance Transformer Co.

3. Universal Lighting Technologies

4. Osram-Sylvania

G. Magnetic HID Lamp Ballasts

1. Advance Transformer Co.

2. Universal Lighting Technologies

3. Sylvania

H. Metal Halide Electronic Ballasts

1. Aromat Matsushita

2. Advance Transformer Company

3. Sylvania

I. Fluorescent Emergency Battery Ballasts

1. Bodine

2. Lithonia

J. Tubular Fluorescent Dimming Ballasts, Continuous Dimming

1. Lutron

2. Advance Transformer Co.

K. Compact Fluorescent Dimming Ballasts, Continuous Dimming from 100%-10% or 5% Light Output

1. Lutron

2. Advance Transformer Co.

3. Philips

4. Energy Savings Inc.

L. Substitutions

1. Refer to requirements listed in Division 1. Acceptable alternate manufacturers are listed on Lighting Fixture Schedule. If no equal is shown, only the specified fixtures is acceptable.

2.2 FLUORESCENT, INCANDESCENT, AND HID LUMINAIRES

A. Unpainted luminaire parts shall be either anodized aluminum, noncorrosive grade stainless steel or an equivalent noncorrosive material.

B. Luminaire housing and door frame shall be fully sealed against light leakage. Light leaks between ceiling trims of recessed luminaires and ceiling will not be acceptable.

C. Alzak parabolic cones shall be guaranteed against fading for a minimum of two (2) years. In the event of premature fading, luminaire manufacturer shall replace cones and pay for both labor and material costs.

D. Luminaires shall have low iridescent reflectors, baffles, and louvers.

E. Adjustable luminaires shall be capable of being locked into position. Aim and adjust all adjustable luminaires to the satisfaction of the Owner and the Architect.

F. Compact fluorescent luminaires shall be manufactured specifically for compact fluorescent lamps with ballasts integral to the luminaire. Providing assemblies designed to retrofit incandescent luminaires is prohibited except when specifically indicated. Luminaires shall use lamps as indicated on Lighting Fixture Schedule.

G. Where plastic lenses, diffusers or shields are specified, provide 100% virgin acrylic, Plexiglas or Lucite. Frameless lenses shall have a minimum thickness of 0.16 inches and shall be guaranteed against undue deflection. Unless otherwise specified, “framed” plastic lenses shall be of sufficient thickness to assure rigidity within lens frame and be guaranteed against undue deflection.

H. Luminaires shall bear U.L. or other Nationally Recognized Testing Laboratory (NRTL) inspection label. Furnish test report on request.

I. All recessed luminaires shall have housing of sufficient size to adequately dissipate heat and shall have mounting yoke and proper ceiling trim.

J. Reflector and lamp positions shall provide highest efficiency and even reflector brightness.

K. Recessed luminaires shall be removable from below to provide access to outlet or prewired luminaire box.

L. All luminaires in wet/damp locations shall be fitted with seals and gaskets to form a weatherproof, watertight assembly, and shall be of rust resistant construction and finish.

M. Unless otherwise noted, all luminaires using metal halide lamps with ANSI rating "E", low voltage “MR” and “AR” lamps, and quartz “Q” single and double-ended lamps, shall be equipped with a clear protective safety glass integral with the luminaire and provided by the luminaire manufacturer.

N. Luminaires used as air handling registers shall meet requirements of NFPA 90A. All fluorescent air handling luminaires shall have air slots that are outwardly identical. Some luminaires shall be air supply type, with dual slots and a single or double side connection with an elbow, others shall be air return type with the same slots as the supply luminaires, and the remaining static luminaires are to have slots which are to be closed off above ceiling. Refer to Division 15 Drawings to determine quantity and exact location of each of the types required. Deliver all air supply, return fittings and back covers to Contractor for Division 15 for installation. Fluorescent air handling troffers to be heat exchange type (air return through lamp chamber).

O. Recessed incandescent luminaires shall be prewired with junction box as an integral part of assembly and equipped with thermal protection as required.

P. Type "X" directional exit signs shall have directional indicating chevrons pointing in the direction of travel.

Q. For fluorescent luminaires it kitchens and food preparation areas, mechanical and electrical rooms, provide a clear polycarbonate protective sleeve over lamp, with 95% minimum light transmission.

2.3 LAMPS

A. Correlated color temperature (CCT), color rendering index (CRI), wattage, bulb type, and beam spread shall be as specified on Lighting Fixture Schedule. Values for CRI are minimum requirements.

B. Tubular Fluorescent Lamps:

1. Average rated life shall be minimum 20,000 hours, is based on three (3) hours of operation per start.

2. All T8 lamps shall be low-mercury type, TCLP-compliant, to meet the U.S. Environmental Protection Agency's (EPA) 1990 Toxic Characteristic Leaching Procedure (TCLP).

C. Compact Fluorescent Lamps:

1. Average rated life shall be minimum 10,000 hours.

2. Lamps shall have a minimum CRI of 82.

D. Screw Base Compact Fluorescent Lamps:

1. Average rated life shall be minimum 8,000 hours.

2. Lamps shall have a minimum CRI of 892.

E. Metal Halide Lamps:

1. Standard metal halide lamps: Clear (65 CRI at 4000K)Coated (70 CRI at 3900K), for enclosed luminaires, universal burn, mogul base, wattage as indicated in

Lighting Fixture Schedule.

2. Low-wattage metal halide lamps: ClearCoated for enclosed luminaires, universal burn, medium base, 70 CRI at 3200K,75 CRI at 3500K,85 CRI at 3000K (available for 70 and 100 watt lamps), wattage as indicated in Luminaire Schedule.

3. Low wattage metal halide lamps for open luminaires: ClearCoated for open or enclosed luminaires, universal burn, 70 CRI at 3200K, wattage as indicated in Luminaire Schedule.

4. Double-ended metal halide lamps: Clear, horizontal burn +/- 45 degrees, 75 CRI at 3000K,75 CRI at 4300K,85 CRI at 3000K, wattage as indicated in Luminaire Schedule.

5. PAR metal halide lamps: 81 CRI at 3000K for PAR 20, PAR 30, PAR 38 lamps,93 CRI at 4000K for PAR 38 lamps,spot; 10 degreesflood; 30 degreeswide flood; 65 degrees.

F. Incandescent Lamps: Incandescent lamps shall be halogen type unless otherwise noted.

2.4 BALLASTS

A. General: Ballasts for fluorescent and HID luminaires shall be suitable for the electrical characteristics of the supply circuits to which they are to be connected, and shall be suitable for operating the specified lamps.

B. Electronic Fluorescent Ballasts (non-dimming)

1. Unless otherwise indicated in the Luminaire Schedule, ballasts shall be solid-state, full output type (minimum 0.87 ballast factor) for use on all fluorescent lamps (except 2 pin compact fluorescent).

2. All ballasts shall be U.L. listed, Class “P”, high power factor, 90% or above.

3. Unless otherwise noted, only single two-lamp, three-lamp, and four-lamp fluorescent ballasts shall be used in any one luminaire. Utilize tandem wiring to accommodate.

4. Ballasts shall have a Class “A” sound rating or better.

5. Total harmonic distortion (THD) shall be less than 20% 10%

6. Ballasts shall have an average lamp current crest factor of less than 1.7.

7. Ballasts shall meet minimum efficiency standards of Public Law No. 100-357, National Appliance Energy Conservation Amendments of 1988, and meet requirements of the FCC regulations Part 18, Governing Electromagnetic and Radio Frequency interference.

8. Ballasts shall have a frequency of 20-40 kHz to minimize interference and

operate without visible flicker.

9. Maximum ballast case operating temperature shall not exceed 60 degrees C.

10. Compact fluorescent T2, T4, and T5 lamp ballasts shall include an end of life shutdown circuit.

11. The electronic ballast shall support a sustained short to ground or open circuit of any output leads without damage to the ballast.

12. Starting method shall be rapid or programmed start for all ballasts controlled by occupancy sensors or as noted on Lighting Fixture Schedule.

13. All luminaires of the same type must contain the same ballast from the same manufacturer. No exceptions will be allowed.

C. 2-pin, T4, compact fluorescent lamp ballasts: Provide high power factor type ballast.

D. Fluorescent emergency battery ballasts: Emergency lighting shall be provided by using a standard fluorescent luminaire equipped with an emergency ballast. This emergency ballast shall consist of a high-temperature, maintenance-free nickel cadmium battery, charger and electronic circuitry contained in ballast case. A solid-state charging indicator light to monitor the charger and battery, double-pole test switch, and installation hardware shall be provided or factory installed in the luminaire. Test switch shall be operable from outside of the luminaire, and pilot light shall be visible from outside of the luminaire. The emergency ballast shall be capable of operating at reduced illumination in the emergency mode one or two (2-foot, 3-foot, 4-foot, or U-lamp) T5, T8, or T12 lamps, 36-40 watt T5 twin tube fluorescent lamps, or 9-26 watt compact fluorescent lamps for a minimum of 90 minutes. The ballast shall produce 900 to 3,000 lumens initial emergency light output for T5, T8, or T12 lamps and 475 to 970 lumens initial emergency light output for compact fluorescent lamps. Ballasts shall comply with emergency standards set forth by the current NEC. The emergency ballast shall be U.L. listed for installation either inside or on top of the luminaire.]

E. Tubular fluorescent dimming ballasts:

1. Electronic dimming ballast manufacturer shall provide single, two and three lamp electronic dimming ballasts, as required.

2. Ballast manufacturer shall functionally test each electronic dimming ballast at the low, medium and high end of the dimming range.

3. Ballast manufacturer shall provide a toll-free phone number, with 24-hour access, to specifically service technical and application questions.

4. Dimming range of electronic dimming ballasts shall be from 100% to 10% or 1% illuminance level, as noted on Lighting Fixture Schedule.

5. Electronic dimming ballasts shall not be damaged by miswiring line voltage and control wire inputs.

6. Electronic dimming ballasts shall withstand 4,000 volt surges as specified in ANSI C62.41.

7. Electronic dimming ballast shall preheat lamp cathodes before applying arc voltage to ensure rated lamp life is not diminished.

8. Electronic dimming ballasts shall internally limit inrush current to not exceed three amps at 277 volts or seven amps at 120 volts to avoid computer problems, nuisance circuit breaker trips and control contact malfunctions.

9. Electronic dimming ballast shall have a power factor greater than 0.9, a ballast factor greater than 0.85, total harmonic distortion less than 20% at full light output (magnitude diminishes as dimmed), and a lamp current crest factor less than or equal to 1.7.

10. Electronic dimming ballasts shall be U.L. listed and Class P thermally protected.

11. Light level output shall be continuous, even and flicker free over the entire dimming range.

12. Electronic dimming ballast shall be inaudible in a 27dB ambient throughout the dimming range.

13. Electronic dimming ballast shall be capable of striking lamps at any light level without first flashing to full light.

14. Electronic dimming ballasts must comply with FCC Part 18 regulations for non-consumer RF lighting devices.

15. Electronic dimming ballasts shall have a minimum starting temperature of 50 degrees F.

16. Lead length from electronic dimming ballast to lamp socket shall not exceed seven feet for T8 or three feet for T5 lamps.

17. Ballast shall be controlled by a compatible dimmer.

18. Ballast shall be controllable via a Class 1 or Class 2 low voltage 0-10 VDC circuit.

F. Compact fluorescent dimming Ballasts:

1. Ballasts shall dim 4-pin quad compact fluorescent lamps, T5 long twin tube type fluorescent lamps and 4-pin triple tube lamps as required.

2. Ballasts shall be U.L. listed, Class P and meet ANSI C62.41 (IEEE Publication 587, Category A) standards for surge suppression.

3. Dimming shall be smooth and continuous without flicker down to at least 10% or 5% light output, as noted on Lighting Fixture Schedule.

4. One and two lamp ballasts shall dim evenly when controlled by the same dimmer.

5. Ballast shall be inaudible in a 27dB ambient throughout the dimming range.

6. Ballasts shall be capable of striking lamps at any light level without first flashing to full light.

7. Ballasts must comply with FCC Part 18 regulations and shall not interfere with other properly installed electrical equipment.

8. Ballasts shall be controlled by a compatible dimmer.

G. HID ballasts: Low wattage/heat, high power factor, constant wattage, encased and potted, with "A" sound rating. Voltage rating in accordance with selected lamps, luminaires and available power supply. Integral ballasts on recessed type luminaires shall have built-in thermal protection. Construction shall be such that open circuit operation will not reduce lamp life.]

H. Electronic metal halide ballasts:

1. The metal halide electronic ballast shall not have more than +/- 2% variation in output power with a +/- 10% variation in input line voltage.

2. The metal halide electronic ballast shall not have more than +/- 2% variation in output power within all ranges of accepted ANSI lamp voltages.

3. The metal halide electronic ballast shall have a "square wave" output whose frequency does not exceed 200Hz.

4. The metal halide electronic ballast shall be equipped with a "turn off" safety function to prevent excessive pulsing of failed lamps.

5. The metal halide electronic ballast shall comply with FCC Part 18C, Class A. Furthermore, the manufacturer must show documentation showing that the ballast meets or exceeds the non-consumer limits for EMI and RFI.

6. The metal halide electronic ballast shall have a total harmonic distortion of less than 10%.

7. The metal halide electronic ballast shall have a lamp current crest factor of less than 1.3.

8. The metal halide electronic ballast shall have a power factor of 0.95 or greater.

9. The metal halide electronic ballast shall have an "A" sound rating.

10. The metal halide electronic ballast shall be thermally protected to shut off when temperatures reach unacceptable levels.

11. The metal halide electronic ballast shall be U.L. and C.U.L. listed or recognized.

PART 3 - EXECUTION

3.1 LUMINAIRE INSTALLATION

A. Do not install reflector cones and visible trim of luminaires until completion of plastering, ceiling tile work, painting, and general cleanup. Installation of reflector cones and visible trim of luminaires shall be carefully coordinated with ceiling openings to prevent light leaks at the ceiling plane. Handle cones and trim carefully to avoid scratching or finger printing. Luminaires shall be completely clean at time of acceptance by Owner.

B. Securely fasten recessed luminaires supported by suspended ceilings to the ceiling framing members with four approved earthquake clips per luminaire. Each clip shall have a capacity of 100% of the luminaire weight acting in any horizontal direction. Install clips as recommended by luminaire manufacturer.

C. Surface mounted luminaires that are supported by the suspended ceiling system shall be securely fastened to the ceiling framing members with two approved earthquake clamping device that completely surround the framing members. Provide a No. 9 gauge safety wire securely fastened to each clamping device and the structure above. Each clamping device shall have a capacity of 100% of the luminaire weight acting in any horizontal direction.

D. Suspended luminaires: Provide hangers capable of supporting twice the combined weight of luminaires supported by hangers. Provide with swivel hangers to ensure a plumb installation. Hanger shall be cadmium-plated steel with a swivel-ball tapped for the conduit size indicated. Hangars shall be shock-absorbing type where indicated. Hangars shall allow luminaires to swing within an angle of 20 degrees. Brace pendants four feet or longer provided in shops or hangers to limit swinging. Single unit suspended fluorescent luminaires shall have twin-stem hangers. Multiple unit or continuous row fluorescent luminaires shall have a tubing or stem for wiring at one point and a tubing or rod suspension provided for each unit length of chassis, including one at each end. Rods shall be a minimum 0.18 inch diameter.

E. Suspended luminaires shall be securely fastened to the structure above each luminaire with No. 9 gauge wire at a minimum of two locations for every four feet of luminaire length. Provide a minimum of two No. 9 gauge wire for each luminaire less than four feet.

F. Acoustical tile suspension ceiling systems will be provided with hanger wires located within six inches of each corner of the luminaire under Section 095123. Where required by local codes, where ceiling systems are not seismically braced or where the weight of luminaires may cause deformation of the suspended ceiling, provide independent seismic restraint supports for luminaires connected to the structure above. The amount of deformation allowed is specified in Section 0952130.

G. Drywall suspension ceiling systems will be provided with supplemental steel stud channels at luminaire locations for supporting luminaires to the ceiling system under Section 092216. Securely fasten recessed and/or surface mounted luminaires to steel channels with approved earthquake clips or clamping devices. Where required by local

codes, where ceiling systems are not seismically braced or where the weight of the luminaire may cause deformation of the suspended ceiling, provide independent seismic restraint supports for luminaires connected to the structure above. The amount of deformation allowed is specified in Section 092216.

H. Where MC or AC cable is not used or allowed, connect luminaires to outlet boxes with six foot lengths of flexible conduit (Greenfield) and luminaire wire. Where MC or AC cable is used, provide all recessed luminaires with flexible conduit connection to an accessible outlet box located at the side of the ceiling opening. Locate box so that luminaires can be readily moved into adjacent ceiling modules and to provide access to space above ceiling. Support flexible conduit from structure. Do not lay on ceiling tiles or attach to any other support systems.

I. Properly align all surface type luminaires. Bolt together so that alignment will be permanent.

3.2 LAMP INSTALLATION

A. Do not install lamps for permanent use until operating voltage is verified and established and until luminaires have been washed/cleaned for acceptance by Owner. Burn in all fluorescent lamps for 100 hours prior to acceptance by Owner.

B. Install lamps in accordance with lamp and luminaire manufacturer's instructions.

3.3 BALLAST INSTALLATION

A. Luminaire manufacturer shall install ballasts at factory unless specifically indicated otherwise. Mount on rubber grommets or other sound isolating material to reduce noise transmission to luminaire body.

B. Ballasts and auxiliary equipment not installed as a part of a luminaire assembly shall be enclosed in accessible, permanently installed approved type metal cabinets which must be properly identified with nameplate, see Section 265113.

3.4 WASTE MATERIALS

A. Protection

1. Work Procedure: Furnish labor, materials, services and equipment necessary for the removal of PCB containing lighting ballasts in accordance with local, state, or federal regulations. Package and mark PCB as required by EPA and DOT regulations and dispose of in accordance with EPA, DOT and local regulations at a certified waste disposal site.

2. Special Hazards: PCBs shall not be exposed to open flames or other high temperature sources since toxic decomposition byproducts may be produced.

3. PCB Caution Label: 40 CFR 761, Subpart C. Affix labels to PCB waste containers. Provide label with sufficient print size to be clearly legible, with bold print on a contrasting background, displaying the following: "CAUTION: Contains PCBs (Polychlorinated Biphenyls)".

B. Work Operations: Ensure that work operations or processes involving PCB or PCB-contaminated materials are conducted in accordance with 40 CFR 761 and the applicable requirements of the section, including, but not limited to:
Obtaining advance approval of PCB storage sites.

1. Notifying Owner and Architect prior to commencing the operation.

2. Reporting leaks and spills to the Owner and Architect.

3. Cleaning up spills.

4. Inspecting PCB and PCB-contaminated items and waste containers for leaks and forwarding copies of inspection reports to the Owner and Architect.

5. Maintaining inspection, inventory and spill records.

C. PCB Spill Cleanup Requirements

1. PCB Spills: Immediately report to the Owner and Architect any PCB spills on the ground or in the water, PCB spills in drip pans, or PCB leaks.

2. PCB Spill Control Area: Rope off an area around the edges of a PCB leak or spill and post a "PCB Spill Authorized Personnel Only" caution sign. Immediately transfer leaking items to a drip pan or other container.

D. PCB Spill Cleanup

1. 40 CFR 761, Subpart G. Initiate clean up of spills as soon as possible, but no later than 48 hours of its discovery. Mop up the liquid with rage or other conventional absorbent. The spent absorbent shall be properly contained and disposed of as solid PCB waste.

2. Records and Certifications: Document the cleanup with record of decontamination in accordance with 40 CFR 761, Section 125, Requirements for OCB Spill Cleanup. Provide certification of decontamination.

3.5 TESTS

A. Completely test entire installation and leave in satisfactory operating condition.

+ + END OF SECTION + +