

## University of Houston Master Specification

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### SECTION 26 0501 - ELECTRICAL BASIC MATERIALS AND METHODS

Maintain Section format, including the UH master spec designation and version date in the center columns of the header and footer. Complete the header and footer with Project information.

Revise this Section by deleting and inserting text to meet Project-specific requirements.

This Section uses the terms "Architect" and "Engineer." Change this term to match that used to identify the design professional as defined in the General and Supplementary Conditions.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

Delete hidden text after this Section has been edited for the Project.

#### 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.
- B. The Contractor's attention is specifically directed, but not limited, to the following documents for additional requirements:
  - 1. The current version of the *Uniform General Conditions for Construction Contracts*, State of Texas, available on the web site of the Texas Facilities Commission.
  - 2. The University of Houston's *Supplemental General Conditions and Special Conditions for Construction*.

##### 1.2 DESCRIPTION OF WORK

- A. Work Included: Provide basic materials and methods for electrical construction as shown, scheduled, indicated, and specified.
- B. Types: The types of basic materials and methods required for the project include, but are not limited to:
  - 1. Conduits Installation.
  - 2. Hangers and supports.
  - 3. Attachment.
  - 4. Sleeves.
  - 5. Openings, cutting, and patching.
  - 6. Excavation, trenching, and backfilling.
  - 7. Access doors.
  - 8. Firestopping for conduit, busway, wire, and cable.
  - 9. Fire-rated partitions.
  - 10. Flame spread properties of materials.

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11. Penetration flashing and seals.
12. Escutcheon plates.
13. Cleaning and painting of electrical work.
14. Prohibited markings.
15. Tamper resistant fasteners.
16. Equipment housekeeping pads and anchor bolts.
17. Concrete.
18. Wiring device and equipment mounting heights.
19. **[Demolition and work within existing buildings.]**

### 1.3 SUBMITTALS

- A. Shop drawing submittals shall include, but not be limited to, the following:
  1. A list of proposed manufacturers and product data on hangers, supports, and methods of attachment to the structure.
  2. Excavation and trenching plan, designed and sealed by a registered Engineer. Refer to Division 1 for additional submittal requirements.
  3. Cut sheets on access doors and fire stopping materials products.
  4. Additional information as required in Section 26 0001 "Electrical General Provisions."

### 1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver components in factory-fabricated water-resistant packaging.
- B. Handle components carefully to avoid damage to components, enclosures, and finish.
- C. Store components in a clean, dry space and protect from weather.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified Engineer to design hanger and support system.

### 2.2 MATERIALS

- A. General: Refer to PART 3 - EXECUTION of this Section and other Division 26 sections for basic electrical products and materials.

## PART 3 - EXECUTION

### 3.1 CONDUIT INSTALLATION

- A. All conduits shall be concealed in pipe chases, walls, furred spaces, topping, or above the ceilings of the building unless otherwise indicated.

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- B. Conduit may be run exposed in mechanical rooms, in chases containing HVAC ductwork and plumbing pipes. Run exposed conduit parallel or at right angles to building or other construction lines in a neat and orderly manner.
- C. All conduits and surface raceways shall be supported from the structure and according to the NEC. Hanger rods with clamps shall be allowed and as herein specified.
- D. Where limited space is available above the ceilings and below concrete beams or other deep projections, conduit shall be sleeved through the projection where it crosses, rather than hung below them, in a manner to provide maximum above-floor clearance.
- E. No sleeves shall be installed through any concrete beam or other deep projection without written approval of the Architect/Engineer.
- F. Run conduit to avoid proximity to heat producing equipment, piping and flues, keeping a minimum of 15 inches clearance.
- G. Whenever possible, install horizontal conduit runs above water piping.
- H. Install all conduits a minimum of 36 inches above ceiling tiles to avoid lighting fixtures and equipment and to allow maintenance accessibility. Maintain existing conditions minimum clearance from ceiling.
- I. The Contractor shall study the Drawings and carefully lay out all work in advance of fabrication and erection in order to meet the requirements of limited spaces. Where conflicts occur, the Contractor shall meet with all involved trades and the Owner's Construction Inspector and operations personnel and resolve the conflict prior to erection of any work in the area involved.
- J. Conduit and raceway connections, rough-in and stub-up locations for equipment shall be coordinated by the Contractor to provide locations indicated on approved manufacturers equipment shop drawings. Connection, rough-in and stub-up locations shown on the Drawings are diagrammatic for general reference only.

### [VERIFY IF THE FOLLOWING IS REQUIRED]

- K. **[All main feeders for generator power from generators to generator power distribution equipment and transfer switches, and from transfer switches to emergency power distribution panels and panelboards, shall be installed as follows:**
  - 1. **All main feeders for generator power from generators to generator power distribution equipment and transfer switches, and from transfer switches to emergency power distribution panels and panelboards, shall be Type RHW two-hour rated conductors installed in an approved raceway or Type THHN conductors installed in a suitable raceway and installed in continuous two-hour rated vertical chases or stacked two-hour rated electrical rooms.**

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2. **Two-hour rated access provisions shall be provided at all junction and pull box locations in main feeders for generator power from generators to generator power distribution equipment and transfer switches, and from transfer switches to emergency power distribution panels and panelboards that are not Type RHW 2 hour rated conductors. Wire shall be rated for dry and wet locations.**
3. **Generators, generator power distribution equipment, transfer switches and emergency power distribution panels and panelboards shall be located in two-hour rated rooms.]**

### [VERIFY IF THE FOLLOWING IS REQUIRED]

#### L. [All fire alarm system main trunk wiring shall be installed as follows:

1. **Vertical riser fire alarm system main trunk wiring shall be installed in approved raceways in continuous two-hour rated vertical chases or stacked two-hour rated electrical rooms or shall be enclosed in a continuous two-hour rated enclosure. Two-hour rated access provisions shall be provided to all fire alarm wiring terminal locations in fire alarm system main trunk wiring. Where a two-hour enclosure is required, coordinate enclosure with the General Contractor.**
2. **Horizontal fire alarm system main trunk wiring from the fire alarm control panel/Fire Command Station to vertical riser locations shall be installed in approved raceways installed below a slab on grade or enclosed in an approved two-hour enclosure. Two-hour rated access provisions shall be provided to all fire alarm wiring terminal locations in fire alarm system main trunk wiring. Where a two-hour enclosure is required, coordinate enclosure with the General Contractor.**
3. **Fire rated enclosures are not required for horizontal, non-trunk fire alarm wiring on floors.]**

### 3.2 HANGERS AND SUPPORTS

- A. All supports required for the proper installation of equipment, cable tray, wireway, and conduit shall be provided as hereinafter specified unless otherwise indicated on the Drawings.
- B. All conduits throughout the building shall be supported as specified in Section 26 0533 "Electrical Raceways," unless noted differently on the Drawings, but in every case shall be adequate to support the raceway being suspended. The supports shall be from the structure to line of grade, with proper provision for expansion, contraction, vibration elimination, and anchorage. All supports must comply with NEC or more restrictive specification.
- C. Plumbing strap shall not be used to support electrical conduits. Conduit or conduit racks shall not be supported from ductwork, piping or equipment.
- D. All electrical conduits and surface raceways exposed to view shall be run parallel and perpendicular to the adjacent building construction. All hangers shall be fastened to the building structure in a manner as specified under Paragraph 3.3 "Attachment."

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- E. Single conduits running horizontally shall be supported by adjustable conduit hangers from adequately sized rods (minimum ¼ inch) from the building structure, as manufactured by Caddy, Minerallac, T&B or approved equal. Refer to Section 26 0533 “Electrical Raceways” for additional requirements.
- F. Multiple (meaning two or more) conduits running horizontally shall be supported by trapeze channels suspended on rods or bolted to vertical building members. Channels shall be as manufactured by Unistrut, Superstrut, Power-strut, Kindorf, Elcen Metal Product Co., T&B or approved equal. Conduits shall be secured to the channel with galvanized or stainless-steel clamps. Refer to Section 26 0533 “Electrical Raceways” for additional requirements.
- G. Vertical conduits, both concealed and exposed, shall be supported by clamping to vertical surfaces or by means of clamps resting on adjacent beams, or floor slabs, or both as required by the installation. Refer to Section 26 0533 “Electrical Raceways” for additional requirements.
- H. Conduits and raceways that run against building surfaces shall be supported by means recommended by the manufacturer, or by means of single- or two-hole rigid conduit clamps. Two-hole clamps shall be provided where size of conduit and installation conditions warrant. Refer to Section 26 0533 “Electrical Raceways” for additional requirements.
- I. All auxiliary steel required for conduit, cable tray, and wireway supports, etc. shall be provided by the Division 26 Contractor unless specifically indicated to be provided by others. All indoor support steel and fasteners shall be galvanized, and all outdoor support steel and fasteners shall be stainless steel.
- J. Contractor shall review all Drawings, including Structural Drawings, for details regarding supports.
- K. All supports shall be of type and arrangement to prevent excessive deflection, avoid excessive bending stresses between supports, and eliminate transmission of vibration.

### 3.3 ATTACHMENT

- A. The load and spacing on each hanger and/or insert shall not exceed the safe allowable load for any component of the support system, including the concrete that holds the inserts. Reinforcement at inserts shall be provided as required to develop the strength required.
- B. All conduits not embedded in concrete or masonry shall be securely and independently supported so that no strain will be transmitted to outlet box and pull box supports, etc. Supports shall be rigid enough to prevent distortion of conduits during wire pulling.
- C. Inserts shall be of a type that will not interfere with reinforcing, as indicated on the Structural Drawings, and that will not displace excessive amounts of structural concrete. All methods of attachment to the structure and the use of after-set inserts shall be approved in writing by the Structural Engineer.

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- D. All conduit supports shall be designed and installed to avoid interference with other piping, hangers, ducts, conduit, supports, building structures, equipment, etc. All conduit, cable tray, and wireway shall be installed with due regard to expansion and contraction, and the type of hanger method of support, location of support, etc. shall be governed in part by this Specification.
- E. Hangers shall be attached to structure as follows:
1. Poured-in-place Concrete:
    - a. Where conduits, equipment, etc., are supported under poured-in-place concrete construction, each hanger rod shall be fitted with a nut at its upper end, which shall be set into a UL-listed universal concrete insert placed in the form work before concrete is poured.
    - b. Where inserts are placed in the bottom faces of concrete joists that are too narrow to provide adequate strength of concrete to hold the insert properly, or where a larger insert would require displacement of a bottom joist steel, the hanger rod shall be suspended from the center of a horizontal angle iron, channel iron, I beam, etc., spanning across to adjacent joists. The angle iron shall be bolted to nonadjustable concrete inserts of the "spot" type, of physical size small enough to avoid the bottom joist steel.
  2. Steel Bar Joists:
    - a. Where light loads, up to five pounds per hanger, are supported under bar joists, hanger rods may be run with a washer and two nuts.
    - b. Where larger loads are supported beneath bar joists, hanger rods shall be secured to angle irons of adequate size; each angle shall span across two or more joists as required to distribute the weight properly and shall be welded to the joists or otherwise permanently affixed at the intersection of the joist vertical and lateral elements.
  3. Steel Beams: Where loads are supported under steel beams, approved type beam clamps shall be used.
  4. Wood Framing: Where loads are supported from wood framing, hanger rods shall be attached to framing with angle clips. Attach supports on top of framing.
  5. Miscellaneous Steel: All miscellaneous steel members, angles, rods, supports, and similar items specified or required for this project shall be galvanized for indoor use or stainless steel for exterior use and where exposed to ambient conditions. All required miscellaneous steel shall be provided by Division 26 Contractor.
- F. Fastening of conduits, etc., in the building shall be as follows: To wood members - by wood screws; to masonry - by threaded metal inserts, metal expansion screws, or toggle bolts, whichever is appropriate for the particular type of masonry; to steel - machine screws or welding (when specifically permitted or directed), or bolts; and to concrete by suitable inserts anchored to reinforcing steel, and poured in place unless other means are indicated on the

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Drawings. Power-actuated fasteners (shooting) will not be acceptable for attaching conduit clamps, boxes and hanger wire unless approved by the Architect/Engineer in writing and unless anchor allows conduit and boxes to be removable.

### 3.4 SLEEVES

- A. Provide sleeves for timely placement of all conduit passing through concrete and masonry walls, partitions, floors and roofs while same is under construction.
- B. In general, a conduit sleeve shall be one size larger than the size conduit that it serves, except where larger sizes are required for manufactured water stop fittings.
- C. No sleeves shall be installed through any concrete beam or other deep projection without written approval of the Architect/Engineer.
- D. Sleeves set in concrete floor construction shall be minimum 18-gauge, galvanized steel, and shall extend 2 inches above the finished floor. Where a sleeve will be used to support a conduit riser clamp, sleeve gauge shall be increased accordingly.
- E. Sleeves for concrete or masonry walls shall be Schedule 40, galvanized steel, and shall be set flush with the finished wall.
- F. Sleeves for conduits passing through walls below grade shall be wall sleeves with corresponding segmented annular seals for the conduit size required as specified in Paragraph 3.11 "Penetration Flashing and Seals."
- G. Where sleeves are not properly set during construction and must be installed by cutting and patching, obtain direction from the Architect/Engineer prior to proceeding. All sleeves shall be fire sealed indoors. Obtain detail from Architect.
- H. Sleeves are not required where new openings are core-drilled into existing construction, unless noted otherwise on the Drawings.

### 3.5 OPENINGS, CUTTING AND PATCHING

- A. General: The Contractor shall be responsible for coordinating openings in the building construction for installation of electrical systems. Comply with the requirements of Division 1 for the cutting and patching of other work to accommodate the installation of electrical work. Except as individually authorized by the Architect/Engineer, cutting and patching of electrical work to accommodate the installation of other work is not permitted.
- B. Cut and Patch:
  - 1. Cut and patched walls, floors, etc. resulting from work in existing construction shall be coordinated with Structural Drawings for details only. Locations shall be fully coordinated with existing building conditions.

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2. Cut and patched walls, floors, etc. in new construction shall be coordinated with Structural Drawings for details.
  
- C. **Methods of Cutting:** Openings cut through concrete and masonry shall be made with masonry saws and/or core drills and at such locations acceptable to the Architect/Engineer. Impact-type equipment shall not be used except where specifically acceptable to the Architect/Engineer. Openings in precast concrete slabs for conduits, outlet boxes, etc., shall be core drilled to exact size.
  
- D. **Approval:** If holes or sleeves are not properly installed and cutting and patching becomes necessary, it shall be done at no change to the Contract amount. Undertake no cutting or patching without first securing written approval from the Architect/Engineer. Patching shall create a surface that is structurally and aesthetically equal to the surface surrounding the area patched and shall be performed by the trade whose work is involved, at no change to the Contract amount.
  
- E. **Protection:** Openings through exterior walls or roofs shall be provided with suitable covers while they are left open to protect the property or materials involved. Any openings through walls below grade shall be properly protected to prevent entrance of water or other damaging elements.
  
- F. **Restoration:** All openings shall be restored to "as new" condition under the appropriate Specification Section for the materials involved and shall match remaining surrounding materials and/or finishes. Restoration work shall be performed by the trades who originally installed the work being restored and shall be performed at no cost to the Owner or Architect/Engineer.
  
- G. **Masonry:** Where openings are cut through masonry walls, provide and install lintels or other structural supports to protect the remaining masonry. Adequate supports shall be provided during the cutting operation to prevent any damage to the masonry occasioned by the operation. All structural members, supports, etc., shall be of the proper size and shape, and shall be installed in a manner acceptable to the Architect/Engineer.
  
- H. **Plaster:** All electrical work in areas containing plaster shall be completed prior to the application of the finish plaster coat. Cutting of finish plaster coat will not be permitted.
  
- I. **Special Note:** No cutting, boring, or excavating that will weaken the structure shall be undertaken.

### 3.6 EXCAVATING, TRENCHING AND BACKFILLING

- A. **General:** The work hereunder includes whatever excavating and backfilling is necessary to install the electrical work. Coordinate the electrical work with other work in the same area, including excavating and backfilling, dewatering, floor protection provisions, other temporary facilities, other underground services (existing and new), landscape, paving, structural

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foundations, and floor slabs on grade. Coordinate with weather conditions and provide temporary facilities needed for protection and proper performance of excavating and backfilling.

- B. Standards: Except as otherwise indicated, comply with the applicable provisions of Division 31 for electrical work excavating and backfilling. Refer instances of uncertain applicability to the Architect/ Engineer for resolution before proceeding with the Work.
- C. The bottoms of trenches shall be excavated to required depths, slope and grade. The bottom of the trench shall be accurately excavated to provide firm, uniform bearing for the bottom of the raceways and ductbanks. Where mud or unstable soil is encountered in bottom of trench, it shall be removed to firm bearing and the trench shall be backfilled with bedding sand to proper grade and tamped to provide uniform firm support.
- D. The bottom of trenches shall be accurately graded to provide proper fall and uniform bearing and support for each section of the conduit on undisturbed soil or 2 inches of sand fill at every point along its entire length. In general, grading for electrical ductbanks and conduits shall be from building to manhole, and from a high point between manholes to each manhole.
- E. Exercise care not to excavate below required depth, leaving a flat bed of undisturbed earth, firm and secure, before laying cable and duct banks. In the event rock is encountered, excavate 6 inches below required depth, backfill to required depth with bedding sand, and compact to minimum 95% compaction. Contractor shall provide soil density test.
- F. All grading in the vicinity of excavation shall be controlled to prevent surface ground water from flowing into the excavations. Any water accumulated in the excavations shall be removed by pumping or other acceptable method. During excavation, material suitable for backfilling shall be stacked in an orderly manner a sufficient distance back from edges of trenches to avoid overloading and prevent slides or cave-ins. Material unsuitable for backfilling shall be wasted and removed from the site and properly disposed at Contractor's expense.
- G. Contractor shall be fully responsible for the safety of persons, materials and equipment in or near trenches or other excavations and provide all required sloping, shoring, railings and other protective provisions. Contractor shall provide a trench shoring plan and design that is sealed by a registered Engineer. Refer to Divisions 1 and 31 for additional requirements.
- H. If any unknown and/or uncharted utilities are encountered during excavation, promptly notify Architect/ Engineer and await his instructions before proceeding.
- I. If such unknown utilities are encountered and work is continued without contacting the Architect/ Engineer for instructions, and damage is caused to said utilities, the Contractor shall repair, at his own expense, such damage to the satisfaction of the Owner or utility company concerned.
- J. Trenches shall not be backfilled until all required tests have been made by the Contractor and approved by the Architect/Engineer and any local authorities having jurisdiction.

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- K. Backfill shall be compacted or cement-stabilized sand up to 6 inches above the top of conduit or ductbank. Backfill up to grade shall be in maximum 6 inch lifts with minimum 95% compaction of lifts. Refer to Division 31 for additional trenching and backfill requirements.
  
- L. Opening and Reclosing Pavement, Landscape Areas and Lawns: Where excavation requires the opening of existing walks, street, drives, other existing pavement or lawns, such surfaces shall be cut as required to install new conduit and to make new connections to existing conduits. The sizes of the cut shall be held to a minimum, consistent with the work to be accomplished. After installation of the new work is completed and the excavation has been backfilled and flooded, the area shall be patched or replaced, using materials to match those cut out or removed. Patches shall thoroughly bond with the original surfaces, shall be level with them, and shall meet all the requirements established by the authorities having jurisdiction over such areas. All removed work shall be replaced by craftsmen who regularly install the types of work being replaced.
  
- M. Excavation in Vicinity of Trees:
  - 1. All trees, including low hanging limbs within the immediate area of construction, shall be adequately protected to a height of at least 5 feet to prevent damage from the construction operations and/or equipment.
  - 2. All excavation within the outermost limb radius of all trees shall be accomplished with extreme care. All roots located within this outermost limb radius shall be brought to the attention of the Architect before they are cut or damaged in any way. The Architect will give immediate instructions for the disposition of same. Refer to Division 31 "Site Preparation" and "Clearing and Grubbing" and the Drawings for tree protection requirements.
  - 3. All stumps and roots encountered in the excavation that are not within the outermost limb radius of existing trees shall be cut back to a distance of not less than 18 inches from the outside of any concrete structure or pipeline. No chips, parts of stumps, or loose rock shall be left in the excavation. Where stumps and roots have been cut out of the excavation, clean, compacted, dry bank sand shall be backfilled and tamped.

**3.7 ACCESS DOORS**

- A. General: The Division 26 Contractor shall provide wall or ceiling access doors for installation in finished surfaces for unrestricted access to all concealed items of electrical equipment.
  
- B. Types: Doors shall be factory-finished as noted below and turned over to the General Contractor for installation. Refer to finish painting requirements specified herein below. Doors shall be as manufactured by Inryco/Milcor or an approved equal in the following styles:
  - 1. Drywall Construction Inryco/Milcor Style DW with gray prime finish
  - 2. Finished Acoustical Ceiling Tile Inryco/Milcor Style AT with door designed for tile insert
  - 3. Finished Plaster Ceiling or Walls Inryco/Milcor Style WB-PL with door designed for finish plastering
  - 4. Masonry Walls Inryco/Milcor Style M with gray prime finish

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- 5. Fire Rated Construction Inryco/Milcor Fire Rated Access Door with gray prime finish
  - 6. Fire Rated Ceiling or Ceiling Assembly Inryco/Milcor Style ATR with door designed for tile insert
- C. Selection: Access doors shall be furnished with a continuous piano hinge with screwdriver-operated flush locks and shall be a minimum of 12 inches x 12 inches. Larger sizes shall be furnished where required for proper access.
- D. Approval: Access doors shall not be installed until location and style have been approved by the Architect.

**3.8 FIRESTOPPING FOR CONDUIT, BUSWAY, WIRE AND CABLE**

- A. General: Provide a UL Systems Classified, intumescent material capable of expanding up to three to five times when exposed to temperatures beginning at 250°F for sealing all holes or voids created to extend electrical system conduit, raceways, busway, wire, cable and other components through fire-rated floors and walls to prevent the spread of smoke, fire, toxic gas and water.
- B. Fire barrier products shall be used to create through-penetration firestop systems as required. All firestop systems shall be listed in the Underwriter's Laboratories Building Materials Directory, Through Penetration Firestop Systems (XHEZ).
- C. Products manufactured by 3M/Electrical Products Division or an approved equal are acceptable, subject to shop drawing submittal approval from the Architect/Engineer.
- D. Install firestop materials according to the following UL Systems Classifications and manufacturer's recommendations:

<u>OPENING TYPE</u>	<u>UL SYSTEM CLASSIFICATION NUMBER</u>
Metal Conduit/Metal Pipe through Round Openings	No. 49, No. 95, No. 147
Busway through Rectangular Openings	No. 99
Insulated Power Cables/Telephone Cables through Openings	No. 33, No. 49, No. 149
Blank Openings/Joints/Expansion Trenches	No. 92, No. 102, No. 61
Cable Tray (Single or Double)	No. 105.
Metal Pipe/Conduit/Cables through Large Openings	No. 93.
Plastic Pipe/Plastic Conduit through Openings	No. 64b, No. 148.
All Other Firestop Systems	Per manufacturer's recommendations

- E. Provide fire rated insulation blankets around conduits where shown on Drawings. Blankets shall be one inch, 8 pound density thermo ceramic material, Thermo Ceramics Kas-Wool Fire Master Series thermal blankets or approved equal. Blankets shall be wrapped to provide continuous coverage and be secured with stainless steel bands in accordance with the manufacturer's UL listed installation instructions.

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### 3.9 FIRE-RATED PARTITIONS

- A. Coordinate locations of raceways in fire-rated partitions so as not to affect the fire rating of the partition. Notify the Architect/Engineer in writing where additional construction is required to maintain the partition fire rating.
- B. Outlet boxes installed in fire-rated partitions (two hour or less) shall not exceed 16 square inches, with a maximum of 100 square inches of wall opening per 100 square feet of wall area.
- C. Outlet boxes shall be located such that no two outlet boxes are installed closer than 24 inches on center, and securely attached to the partition studs, with at least one partition stud separating the outlet boxes.

### 3.10 FLAMESPREAD PROPERTIES OF MATERIALS

- A. Materials and adhesives incorporated in this project shall conform to NFPA Standard 255, "Method of Test of Surface Burning Characteristics of Building Materials." The classification shall not exceed a flame spread rating of 25 for all materials, adhesives, finishes, etc., specified for each system, and shall not exceed a smoke-developed rating of 50.

### 3.11 PENETRATION FLASHING AND SEALS

- A. Conduit sleeves, pitch pockets, and flashings compatible with the roofing and waterproofing installation shall be provided for all roof and wall penetrations and roof-mounted equipment and supports. Coordinate flashing details with the architectural Drawings and the roofing/waterproofing contractors.
- B. Conduits passing through walls that are exposed to weather or below grade shall pass through waterstop sleeves (new construction) or core-drilled openings (existing construction). The space between the conduit and sleeve/opening shall be sealed using segmented annular seals to prevent the entry of water or foreign materials. Segmented annular seals shall be Thunderline Incorporated, Type LS Series, Style C insulating type link seals for temperatures up to 250°F, or an approved equal. Waterstop sleeves shall be Thunderline Corporation Century-Line or equal non-corroding thermoplastic sleeves with a molded in water stop lip.

### 3.12 ESCUTCHEON PLATES

- A. Except as otherwise noted, provide chrome-plated brass floor and ceiling escutcheon plates around all pipes, conduits, etc., passing exposed through walls, floors, or ceilings, in any finished spaces except under floor and attic spaces. Plates shall be sized to fit snugly against the outside of the conduit. Plates will not be required for conduit where pipe sleeves extend above finished floor and conduit ends are sealed. All equipment rooms are classified as finished spaces.

### 3.13 PROHIBITED MARKINGS

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- A. Prohibited Markings: Markings that are intended to identify the manufacturer, vendor, or other source from which the material has been obtained are prohibited for installation within public, tenant, or common areas within the project. Also prohibited are materials or devices that bear evidence that markings or insignias have been removed. Certification, testing (example, Underwriters' Laboratories, Inc.), and approval labels are exceptions to this requirement.

### 3.14 TAMPER RESISTANT FASTENERS

- A. All exposed fasteners shall be of a tamper resistant design. All fasteners shall be of the same type whenever possible. Coordinate fastener selection with other trades to provide similar fastener types whenever possible. A minimum of three tools for use with each type of tamper resistant fastener shall be furnished to the Owner at the time of substantial completion.

### 3.15 EQUIPMENT HOUSEKEEPING PADS AND ANCHOR BOLTS

- A. All floor-mounted enclosures shall be mounted on concrete housekeeping pads.
- B. Pads shall be **[nominal 5-1/2 inches high in the central plant and]** nominal 3-1/2 inches high **[in all other locations]** and shall extend a minimum of 3 inches beyond all equipment and supports while generally conforming to the shape of the equipment. **[Provide pad heights to match existing pads where located in the same room.]**
- C. Pads shall be minimum 2500 psi (28 day) concrete reinforced with No. 6, 6 inches x 6 inches welded wire mesh. Pad tops and sides shall be hard troweled smooth with a 3/4 inch bull nose on all external corners. Refer to Division 3 for additional requirements.
- D. Furnish galvanized anchor bolts with layout templates for installation in equipment pads. Bolts shall be of the size and quantity recommended by the manufacturer. Where vibration isolators are used, they shall be anchor bolted to the equipment pad.

### 3.16 CONCRETE

- A. All concrete used in light pole bases and ductbank encasement shall be 5 sack mix with 1/2 inch maximum aggregate and 3000 psi compressive strength when tested after 28 days in accordance with ASTM 039-44, "Standard Method of Test for Compressive Strength of Concrete". Refer to other Division 3 for additional requirements.
- B. Add 8 pounds of L. Sonneborn Sons, Inc. "Sonobrite Red" or and approved equal dye per cubic yard of wet mix ductbank encasement concrete to form a uniform red color throughout the concrete.
- C. Use forms except where the earth is firm enough to support the concrete. Above grade portions of pole bases shall be formed using Sonotube or an approved equal forming system.
- D. Keep concrete wet at least 48 hours after forms are removed to ensure proper curing.

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- E. Ductbanks and light pole bases shall be reinforced where noted on the Drawings. Refer to Division 3 for reinforcing steel.
- F. Ductbank concrete shall be carefully spaded during the pouring to eliminate all voids under and between the ducts and to prevent honeycombing of the exterior surfaces. Power driven tampers or agitators shall not be used unless specifically designed for the application.
- G. Generally, each run of the ductbank shall be poured in one continuous operation. Where more than one pour is necessary, each pour shall terminate in an angular plane, and reinforcing rod dowels shall be added as necessary to ensure a sound joint. Partial pours shall not terminate in horizontal or vertical planes.
- H. The concrete encasement covering the ductbank may be poured directly against the sides of the trenches if the cut is clean enough and free of loose material. All loose dirt and extraneous material shall be removed from the trenches before and during the pouring of the concrete to ensure sound envelopes. The trench bed shall be smooth and properly graded for the placement of the bottom row of spacers.

3.17 WIRING DEVICE AND EQUIPMENT MOUNTING HEIGHTS AND LOCATIONS

- A. Refer to Architectural Drawings to determine whether outlets occur in wainscot or cabinet spaces and coordinate mounting heights as required by architectural form. For example, mounting heights of outlets occurring in a tile or brick wall should be adjusted so that the outlet will occur entirely within a single course. However, all outlets in a given space shall be mounted at the same height.

**[VERIFY THE FOLLOWING]**

- B. In general, unless noted otherwise on Architectural or Electrical Drawings, mounting heights **[to device center line]** shall be as follows **[outlets occurring in tile walls shall be shifted, slightly, to allow mounting at the best suitable point in a particular tile]:**

1. Wall Switches	48 inches above finished floor.
2. Receptacles	18 inches above finished floor.
3. Receptacles	6 inches above countertops without splash backs and 4 inches above splash backs for countertops with splash backs, mounted with their long axis horizontal.
4. Clock Outlets	7 feet-6 inches above finished floor.
5. Panelboards	Mount within 78 inches to top of highest OCPD as per NEC.
6. Stairway Lighting Fixtures	Wall mounted 7 feet-6 inches above finished floor or mid-landing.
7. Fire Alarm Pull Stations	48 inches above finished floor.
8. Fire Alarm Wall-Mounted Audio/Visual Signals	6 feet 8 above finish floor or 6 inches below ceiling, whichever is lower.

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9. **[Voice and Data Processing Outlets 18 inches above finished floor.]**
  10. **[Wall Telephone Outlets 48 inches above finished floor.]**
- C. Mount vertical receptacles with the ground pin receiver down. Mount horizontal receptacles with ground pole on left.
- D. Mount receptacles, switches, and other boxes so that they are not located back-to-back in the same stud wall cavity. Boxes shall not be installed back-to-back closer than 16 inches on center; there shall be at least one partition stud separating back-to-back boxes.

### 3.18 DEMOLITION AND WORK WITHIN EXISTING BUILDINGS

- A. The Contractor shall be responsible for loss or damage to the existing facilities caused by him and his workmen and shall be responsible for repairing or replacing such loss or damage. The Contractor shall send proper notices, make necessary arrangements, and perform other services required for the care, protection and in-service maintenance of all electrical services for the new and existing facilities. The Contractor shall erect temporary barricades, with necessary safety devices, as required to protect personnel from injury, removing all such temporary protection upon completion of the work.
- B. Contractor shall provide temporary or new services to all existing facilities as required to maintain their proper operation when normal services are disrupted as a result of the work being accomplished under this project.
- C. Where existing construction is removed to provide working and extension access to existing utilities, Contractor shall remove doors, conduit, outlet boxes, wiring, light fixtures, equipment, and similar items, to provide this access and shall reinstall same upon completion of work in the areas affected.
- D. Where partitions, walls, floors, or ceilings of existing construction are indicated to be removed and reinstalled, the Division 26 Contractor shall remove and reinstall, in locations approved by the Architect, all devices required for the operation of the various systems installed in the existing construction.
- E. Outages of services as required by the new installation will be permitted, but only at a time approved by the Owner. Contractor shall allow the Owner two weeks advance notice in order to schedule required outages. The time allowed for outages will not be during normal working hours unless otherwise approved by the Owner. All costs of outages, including overtime charges, shall be included in the Contract amount.
- F. Contractor shall modify, remove, and/or relocate all materials and items so indicated on the Drawings or required by the installation of new facilities. All removals and/or dismantling shall be conducted in a manner as to produce maximum salvage. Survey the project with the

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Owner's representative before demolition begins and determine all materials that the Owner specifically chooses to have salvaged. Pre-establish with the Owner locations where salvaged materials are to be stored. Salvage materials shall remain the property of the Owner and shall be delivered to such destination as directed by the Owner. Materials and/or items scheduled for relocation and that are damaged during dismantling or reassembly operations shall be repaired and restored to good operative condition. The Contractor may, at his discretion and upon the approval of the Owner, substitute new materials and/or items of like design and quality in lieu of materials and/or items to be relocated.

- G. Existing conditions shall be noted by the Contractor at the beginning of the project. Any abandoned or existing conduit boxes, etc. shall be demoed back to their source. Also, unsafe or code violations shall be corrected by the Contractor.
- H. All items to be relocated shall be carefully removed in reverse to original assembly or placement and protected until relocated. Contractor shall clean and repair and provide all new materials, fittings, and appurtenances required to complete the relocations and to restore to good operative order. All relocations shall be performed by workmen skilled in the work and in accordance with standard practice of the trades involved.
- I. When items scheduled for relocation are found to be in damaged condition before work has been started on dismantling, the Contractor shall call the attention of the Owner to such items and receive further instructions before removal. Items damaged in repositioning operations are the Contractor's responsibility and shall be repaired or replaced by the Contractor as approved by the Owner, at no additional cost to the Owner.
- J. Service lines and wiring to items to be removed, salvaged, or relocated shall be removed to points indicated on the Drawings, specified, or acceptable to the Owner. Service lines and wiring not scheduled for reuse shall be removed to the points at which reuse is to be continued or service is to remain. Such services shall be sealed, capped, or otherwise tied-off or disconnected in a safe manner acceptable to the Owner. All disconnections or connections into the existing facilities shall be done in such a manner as to result in minimum interruption of services to adjacent occupied areas. Services to existing areas or facilities that must remain in operation during the construction period shall not be interrupted without prior specific approval of the Owner as herein specified.
- K. During the construction and remodeling, portions of the **[name of project]** shall remain in service. Construction equipment, materials, tools, extension cords, etc., shall be arranged so as to present no hazard or interruption to the occupants of the building.
- L. Certain work during the demolition and alteration phases of construction may require overtime or nighttime shifts or temporary evacuation of the occupants. Coordinate and schedule all proposed down time with the Owner's Representative at least two weeks in advance.
- M. Make every effort to minimize damage to the existing building and the Owner's property. Repair, patch, or replace as required any damage that might occur as a result of work at the site. Care shall be taken to minimize interference with the Owner's activities during

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construction. Cooperate with the Owner and other trades in scheduling and performance of the Work.

- N. Include in the Contract price all rerouting of existing conduits, wiring, outlet boxes, fixtures, etc., and the reconnecting of existing fixtures as necessitated by field conditions to allow the installation of the new systems. Furnish all temporary conduit, wiring boxes, etc., as required to maintain lighting and power service for the existing areas with a minimum of interruption.
- O. All existing lighting fixtures, switches, outlets, speakers, materials, equipment and appurtenances not included in the remodel or alteration areas are to remain in place and shall remain in service. If no longer in use, Contractor shall demo to source and determine if in use still.
- P. Electrical equipment, outlets, speakers, circuits to mechanical and building systems equipment, etc. that are to remain, but that are served by conduit and/or circuiting that is disturbed by the remodeling work, shall be reconnected in such a manner as to leave it in proper operating condition and to comply with NEC.
- Q. Existing branch circuits that are to be abandoned shall be removed all the way back to the nearest junction box or source, whichever is closest. Remove conduits the same way.
- R. Existing lighting fixtures shown to be removed and indicated to be reused, shall be cleaned, repaired, re-lamped and provided with such new accessories as may be needed for the proper installation in their new locations.
- S. New circuiting indicated to be connected to existing panels shall be connected to "spares" and/or "released" breakers as applicable, or new breakers provided where space is available. Contractor shall verify the existing panel load and feeder capacity prior to adding any additional loads.
- T. Within the remodeled or alteration areas where existing ceilings are being removed and new ceilings are installed, all existing lighting fixtures, other ceiling mounted devices and their appurtenances shall be removed and reinstalled into the new ceiling, unless otherwise shown or specified. All lay-in fixtures shall have minimum two grid wires at opposite corners as per NEC.
- U. Within the remodeled or alteration areas where existing walls are being removed, all existing lighting fixtures, switches, receptacles, other materials and equipment and their appurtenances shall be removed, where required by the remodel work either shown or specified. Remaining fixtures, etc. shall be left code compliant.
- V. Any salvageable equipment, as determined by the Owner, shall be delivered to the Owner, and placed in storage at the location of his choice. All other debris shall be removed from the site immediately including scrap materials, wiring, etc.

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- W. No portion of the fire alarm system shall be turned off, modified or changed in any way without the express knowledge and written permission of the Owner's Representative.
- X. Refer to Architectural Drawings for location of walls, ceilings, etc. being removed and/or remodeled.

END OF SECTION 26 0501