

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes:

1. General hanger and support requirements for electrical equipment, conduit and cable trays not required to be vibration and/or seismically controlled.
2. Penetrations, sleeves and seals.

B. Products Installed But Not Supplied Under this Section:

1. Vibration Isolation and Seismic Control anchoring and support systems furnished under Section 200548 – Mechanical Vibration and Seismic Control.

C. Related Sections:

1. 019100 - Commissioning
2. 20 0548 - Mechanical Vibration and Seismic Control
3. 260000 - Electrical General Requirements
4. 260533 - Raceways and Boxes for Electrical Systems
5. 262416 - Panelboards
6. 262419 - Motor Control Centers
7. 262900 - Low Voltage Controllers
8. 265000 - Lighting Fixtures
9. 270536 - Cable Trays for Electrical Systems
10. 272010 - Telecom Distribution System
11. Division 09 - Painting

1.2 REFERENCES

- A. NFPA 70: National Electrical Code (NEC) latest legally enacted edition.

1.3 DESCRIPTION

- A. Provide general hanger and support requirements for electrical equipment, conduit and cable trays not required to be vibration and/or seismically controlled in accordance with the manufacture's written installation instructions and NFPA 70.
- B. Coordinate directly with Section 200548 – Mechanical Vibration and Seismic Control – Mechanical Vibration and Seismic Control to identify electrical equipment and systems which require vibration and/or seismic control bracing in addition to the requirements of this section.

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1.4 SUBMITTALS

- A. See Section 260000 - General Electrical Requirements for general submittal requirements
- B. Product Data:
 - 1. Provide manufacturers catalog data for each product specified. Indicate channel gauge and maximum load capacities of the selected products.
 - 2. Manufacturer's Installation Instructions: Include assembly instructions, recommended parts and special procedures as required.
- C. Shop Drawings:
 - 1. Provide a single shop drawing submittal which integrates the shop drawing requirements of this section along with the additional requirements of Section 20 0548 – Mechanical Vibration and Seismic Control – Mechanical Vibration and Seismic Control.
 - 2. Provide shop drawings to include the following:
 - a. Pre-engineered and field fabricated support system details for each installation location. To include but not limited to:
 - 1). Raceway and lighting fixture support.
 - 2). Conduit and control panel support.
 - 3). Cable tray and switch box support.
 - 4). Cable tray support (single and multi-tier).
 - 5). Trapeze hangers.
 - 6). Electrical equipment support.
 - b. Equipment locations and conduit and cable tray routing coordinated with mechanical equipment and systems. Indicate routing height above finished floor.
 - c. Indicate hanger type/attachment method and hanger spacing intervals.
- D. Project Record Information:
 - 1. Indicate installed locations of hangers and supports on project as-built shop drawings.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Acceptance at Site:
 - 1. Verify products are delivered in original factory packaging and are free from damage and corrosion.
 - 2. Replace equipment delivered to job site that does not comply with above requirements at no expense to the Owner.
- B. Storage and Protection:

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1. Store products in covered storage area, protected from the elements, outside the general construction area until installed.
2. Handle items to avoid damage.
3. Replace damaged items with same item in new condition.

1.6 WARRANTY

- A. Provide warranty in accordance with Section 260000 - General Electrical Requirements.

PART 2 - PRODUCTS

2.1 PRE-ENGINEERED SUPPORT SYSTEMS

A. Manufacturers:

1. Unistrut
2. Super-Strut
3. B-Line
4. K-Line
5. Erico.

B. Material:

1. Cold worked steel.
2. Type 304 stainless steel: Use for PVC, liquid-tight flex, or plastic-coated conduit installed on wood construction in outdoor, damp, corrosive or marine environments.

C. Finish:

1. Heated indoor areas: Pre-galvanized zinc coating.
2. Outdoor areas: Hot dipped galvanized finish. In addition, coat hot dipped galvanized finish channel field cuts with zinc rich paint provided by the support system manufacturer.
3. Painted areas: Paintable galvanizing or phosphatized and primed.
4. Surface metal raceways: U.L. Listed epoxy coating.

D. Channel:

1. Standard Size: 1-5/8 inch x 1-5/8 inch. Gauge thickness as required for attached load.
2. Standard Hole Pattern: Slotted. Provide solid channel in exposed public areas.

E. Nuts and Hardware:

1. Channel nuts: Hardened steel (ASTM-A675 and ASTM A36).
2. Bolts, screws and nuts: Hardened steel (ASTM-A307, ASTM A563 and SAE J429).
3. Finish: Electroplated zinc.

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- F. Fittings: Plate steel (ASTM A635). Epoxy or electroplated zinc coating.
- G. Electrical Accessories: Provide accessories from the support system manufacturer designed for the specific equipment to be supported to include but not limited to:
 - 1. Lighting fixture hangers.
 - 2. Outlet box adapters.
 - 3. Snap-in closures.
 - 4. Conduit connection plates.
 - 5. Junction box adapters.
 - 6. Strut joiners.
 - 7. "Caddy" fasteners are permitted for support of conduit to concealed metal studs and for conduit concealed above suspended acoustical ceilings.

2.2 SLEEVES, ACOUSTICAL SEALS AND FIRE-STOPPING

- A. See Part 3 - PENETRATIONS.
- B. Sleeves for pipes through fire rated and fire resistive floors and walls, and fire proofing: UL listed prefabricated fire rated sleeves and seals.

2.3 WALL/FLOOR PENETRATION WATER SEALS

- A. Mechanical seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the conduit and the wall opening.
- B. EPDM seals.
- C. 316 Stainless steel bolts and nuts.
- D. Hot-dipped galvanized or coated sleeve with full water stop flange with continuous weld on both sides.
- E. Manufacturer: Metraflex, Thunderline, Crouse-Hinds, or pre-approved equal.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prior to installation, prepare detailed shop drawings of the planned installation of hanger and support products specified by this section. Coordinate the location, type and size of hangers and supports, housekeeping pads (thickness/perimeter overhang dimensions) and roof curbs with Architectural and Structural elements utilizing the shop drawing review process.

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- B. Submit shop drawings required by this section coordinated with the seismic design and associated shop drawings required by Section 200548 – Mechanical Vibration and Seismic Control – Mechanical Vibration and Seismic Control as a single submittal.
- C. Do not install hangers and supports without approved shop drawings.

3.2 GENERAL INSTALLATION

- A. Install hangers and supports in accordance with manufacturer’s instructions, applicable Code requirements (NFPA 70) and approved shop drawings.
- B. See Section 260000 – Electrical General Requirements for electrical equipment wall mounting heights.

3.3 VIBRATION AND SEISMIC CONTROL PRODUCT INSTALLATION

- A. Install vibration isolators, seismic control and wind restraint systems in strict compliance with the manufacturer’s written instructions and certified and approved application engineering installation drawings and details in accordance with Section 200548 – Mechanical Vibration and Seismic Control.

3.4 INSERT AND ATTACHMENT INSTALLATION

- A. Inserts
 1. Provide inserts or cast-in-place channels for placement in concrete formwork.
 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 3. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 4. Use expansion type anchor bolts with pre-cast concrete including concrete masonry units within loading limits of the pre-cast material and anchor bolt manufacturer's recommendations.
 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.
 6. Plastic screw inserts and caulked lead inserts are prohibited, except for mounting instructions and control diagrams.
- B. Attach electrical equipment to structure as follows:
 1. Hollow masonry: Toggle bolts.
 2. Solid masonry and concrete: Preset inserts or expansion bolts.
 3. Structural steel: Beam clamps which engage both sides of structural member or have retaining clips or other approved means for positive engagement.
 4. Metal surfaces: Machine screws, bolts or welding.
 5. Wood construction: Wood or sheet metal screws. Bugle head drywall screws or deck screws are not allowed.

6. Do not use powder actuated fasteners for anchorage in tension applications. Obtain written permission from the Owner prior to using any type of powder powered studs.
7. Attachment to plaster or gypsum board (sheet rock) not approved. Equipment shall be attached to or supported from structure.

3.5 RACEWAY INSTALLATION

- A. Support raceways using approved types of wall brackets, ceiling trapeze hangers or malleable iron straps utilizing attachment methods described above. "Perforated plumber's strap" is not permitted as a means of support.
- B. Support raceways independent of ceiling systems, piping and ductwork. Exceptions: Lighting fixtures and outlet boxes (i.e. ceiling speaker boxes) specifically designed for attachment to suspended ceiling systems
- C. Support EMT conduit (1-1/2 inch and smaller/dry locations) using hanger rods with spring steel fasteners.
- D. Support cable trays and multi-conduit runs independently from other support systems utilizing double hanger rods at each support point.

3.6 LIGHTING INSTALLATION

- A. General
 1. Attach safety hanger wires to lighting fixtures such that in event of a ceiling suspension system failure, no part of the fixture will drop more than 6 inches below normal ceiling height. Secure each end of each wire with a minimum of three tight wraps.
- B. Fixtures (greater than 20 pounds/non-suspended ceiling applications)
 1. Support lighting fixtures from structural members capable of supporting the total weight of the fixture and independent from electrical wiring system. Attach to steel members using approved beam clamps and rods.
- C. Fixtures (suspended ceiling system applications)
 1. Positively attach lighting fixtures to suspended ceiling grid for 100 percent of fixture weight acting in any direction using positive clamping devices that fully surround the supporting member (i.e. Caddy "IDS" or equal).
 2. Provide supplemental safety hanger wires as follows:
 - a. Fixtures (weighting less than 56 pounds): Provide two 12 gauge wires or equivalent chains connected from the diagonal corners of the light fixture housing to the structure above. These wires may be slack.
 - b. Fixtures (weighting greater than 56 pounds): Provide full direct support from the structure above. Attach wires from within 3 inches of each corner of the fixture.
 - c. Pendant-hung lighting fixtures

- 1). For each fixture, provide direct support from the structure above using a minimum of two 12 gauge wires, equivalent aircraft cable or an approved alternate support system without using the ceiling suspension system for direct support. Securely attach wire/cable to fixture, route through fixture stem and securely attached to structure.
- 2). Provide loop and hook or swivel hanger assemblies fitted with a restraining device to secure stem in the support position during earthquake motion.
- 3). Support fluorescent fixtures with flexible hanger device at the attachment point to the fixture channel to preclude breaking of the support. The motion of swivels or hinged joints shall not cause sharp bends in conductors or damage to insulation.

3.7 PENETRATIONS

- A. Coordinate electrical penetrations with architectural, structural and mechanical construction details prior to installation. Set sleeves in position in concrete formwork. Provide reinforcement around sleeves as required.
- B. Provide compatible materials, fasteners, adhesives, sealants, and other products required for proper installation.
- C. Penetrations through roof, exterior walls and floors shall be weather and water tight (see floor penetration seals).
- D. Firestopping: Provide UL rated firestopping assemblies for rated roof, wall and floor penetrations in accordance with Division 7.
- E. Conduit Sleeves
 1. Provide sleeves for conduit passing through floors, walls, ceilings, or roofs.
 - a. Fabricate sleeves in non-load bearing walls from 20 gauge galvanized sheet steel conforming to ASTM A 924/A 924M.
 - b. Fabricate sleeves in load bearing walls from standard weight galvanized steel pipe conforming to ASTM A 53/A 53M.
 - c. Provide 1/2 inch clearance between conduit and sleeve opening.
 2. Provide escutcheons for conduit passing through walls, floors and ceilings in finished areas, below counters and inside closets and casework subject to view when doors are open. Size escutcheons to cover sleeves. Secure escutcheons in position.
- F. Acoustical Seals
 1. Monolithic sound walls (i.e. poured concrete or masonry): Provide wall sleeve with approximately one-inch annular space around conduit. Pack annular space with backer rod or acoustical filler as specified in Division 7. Allow a 1 inch recess at each end of sleeve. Caulk sleeve flush with flexible sealant or fire-stopping material as specified in Division 7.

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2. Where acoustical wall is a two component type, such as a staggered or double stud partition, treat each component as a separate wall. Pack and seal each half of penetration sleeve as previously specified, except that only the exposed end of each sleeve portion shall be caulked with sealant or firestop. Provide adequate separation between each sleeve.

G. Wall Penetration Seals

1. Provide pre-engineered wall penetration water seal systems for exterior wall penetrations.
2. Select appropriate wall penetration sealing systems based on conduit material and nominal conduit size in accordance with the manufacturer's selection charts.
3. Install conduit and sealing system prior to waterproofing the wall. Grout void between water seal and outside face of foundation wall to provide continuous bearing surface for waterproofing fabric.

H. Floor Penetration Seals

1. Provide pre-engineered floor penetration water seal systems for conduit floor penetrations in rooms where a pipe leak/failure could result in water damage to adjacent spaces (i.e. mechanical rooms located above the ground floor or basement) and other areas as noted.
2. Extend conduit floor penetration sleeves 2 inches above finished floor.

3.8 ROOF FLASHING

- A. Provide EDPM pipe penetration and roof curb flashing in accordance with Division 7 as an integral part of the roofing system.

3.9 FIELD QUALITY CONTROL

- A. Document each installation and operational step utilizing the approved PC/FT checklists in accordance with Section 019100 - Commissioning.

END OF SECTION 260529