

RACEWAYS AND BOXES

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. Related Sections include the following:
 - 1. Division 26 Section, "Underground Ducts and Raceways for Electrical Systems" for exterior duct banks, manholes and underground utility construction.
 - 2. Division 07 Section, "Penetration Firestopping" for firestopping materials and installation at penetrations through walls, ceilings, and other fire-rated elements.
 - 3. Division 26 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings, and for access floor boxes and service poles.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. FMC: Flexible metal conduit.
- D. IMC: Intermediate metal conduit.
- E. LFMC: Liquidtight flexible metal conduit.
- F. LFNC: Liquidtight flexible nonmetallic conduit.
- G. RNC: Rigid nonmetallic conduit.
- H. PVC: Polyvinyl Chloride.
- I. HDPE: High Density Polyethylene.

1.4 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

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.
- B. Comply with NFPA 70.

1.6 COORDINATION

- A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFCCableSystems,Inc.
 - 2. AlflexInc.
 - 3. AlliedTubeTriangleCentury.
 - 4. AnametElectrical,Inc.; Anaconda Metal Hose.
 - 5. InternationalMetalHose.
 - 6. Electri-FlexCo

7. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
 8. LTV Steel Tubular Products Company – Manhattan/CDT/Cole-Flex.
 9. Maverick.
 10. O-ZGedney;unitofGeneralSignal.
 11. Wheatland.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. Aluminum Rigid Conduit: ANSI C80.5.
- D. IMC: ANSI C80.6.
- E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
1. Comply with NEMA RN 1.
 2. Coating Thickness: 0.040 inch, minimum.
- F. EMT: ANSI C80.3.
- G. FMC: Zinc-coated steel.
- H. LFMC: Flexible steel conduit with PVC jacket.
- I. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
 2. Fittings for EMT: Steel, set-screw type.
 3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch, with overlapping sleeves protecting threaded joints.
- 2.2 FIRE ALARM EMT
- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Allied Tube Triangle Century.
- B. EMT conduit with bright red topcoat; Fire Alarm EMT.
- C. EMT and Fittings: ANSI C80.3.
- 2.3 NONMETALLIC CONDUIT AND TUBING
- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AmericanInternational.

2. AnametElectrical,Inc.; Anaconda Metal Hose.
 3. ArncoCorp.
 4. CantexInc.
 5. CertainteedCorp.;PipeandPlasticsGroup.
 6. ConduxInternational.
 7. ElecSys, Inc.
 8. Electri-FlexCo.
 9. Integral.
 10. Kor-Kap.
 11. LamsonandSessions:CarltonElectricalProducts.
 12. Manhattan/CDT/Cole-Flex.
 13. RACO;DivisionofHubbell,Inc.
 14. Scepter.
 15. Spiralduct, Inc./AFCCableSystems,Inc.
 16. Thomas&BettsCorporation.
- B. ENT: NEMA TC 13.
- C. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.
- D. ENT and RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.
- E. LFNC: UL 1660.
- F. HDPE: UL 651, ASTM D 3350, ASTM D 1248 Schedule 40.
- 2.4 METAL WIREWAYS
- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Hoffman.
 2. SquareD.
- B. Material and Construction: Sheet metal sized and shaped as indicated, NEMA 1.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

- D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.
- E. Wireway Covers: Hinged type as indicated.
- F. Finish: Manufacturer's standard enamel finish.

2.5 SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Airey-ThompsonSentinelLighting;WiremoldCompany(The). b. Thomas&BettsCorporation.
 - c. WalkerSystems,Inc.;WiremoldCompany(The).
 - d. WiremoldCompany(The);ElectricalSalesDivision. e. Mono-Systems, Inc.
- B. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

2.6 BOXES, ENCLOSURES, AND CABINETS

- A. Sheet Metal Outlet and Device Boxes: NEMA OS 1. Shall be used within walls or ceiling.
- B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover. Shall be used in all exposed, non-recessed, locations.
- C. Nonmetallic Outlet and Device Boxes: NEMA OS 2. Shall be used in corrosive areas.
- D. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- E. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover. Shall be used in areas exposed to water.
- F. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
- G. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

2.7 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. Description: Comply with ANSI/SCTE 77.
 - 1. Color of Frame and Cover: Gray.
 - 2. Configuration: Units shall be designed for flush burial and have open bottom, unless otherwise indicated.

3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
 4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 5. Cover Legend: Molded lettering, "ELECTRIC", "COMUNICATIONS" OR as indicated for each system service.
 6. Handholes 12 inches wide by 24 inches long and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.
- B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or a combination of the two.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hubbell: Quazite
 - b. Armorcast Products Company.
 - c. Carson Industries LLC.
 - d. CDR Systems Corporation.
 - e. NewBasis.
 - f. Christy Concrete Products.

2.8 SLEEVES FOR RACEWAYS

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch thickness as indicated and of length to suit application.
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

2.9 SLEEVE SEALS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Advance Products & Systems, Inc.
 2. Calpico, Inc.
 3. Metraflex Co.
 4. Pipeline Seal and Insulator, Inc.

- B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.
 - 1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 - 2. Pressure Plates: Carbon steel. Include two for each sealing element.
 - 3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.10 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.11 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

- A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
 - 1. Tests of materials shall be performed by a independent testing agency.
 - 2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
 - 3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Provide raceways in interior and exterior locations in accordance with the "Raceway Application Matrix" included on the drawings.
- B. Boxes and Enclosures, Exterior Aboveground: NEMA 250, Type 3R.
- C. Boxes, Enclosures, and Handholes:
 - 1. Handholes and Pull Boxes in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Non-deliberate Loading by Heavy Vehicles: Polymer concrete, SCTE 77, Tier 15 structural load rating.
 - 2. Handholes and Pull Boxes in Sidewalk and Similar Applications with a Safety Factor for Non-deliberate Loading by Vehicles: Polymer-concrete units, SCTE 77, Tier 8 structural load rating.
- D. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, nonmetallic in damp or wet locations.
- E. Minimum Raceway Size: 3/4-inch trade size.

- F. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
 - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.
- G. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.
- H. Do not install aluminum conduits in contact with concrete.

3.2 INSTALLATION

- A. Install conduit in accordance with NECA "National Electrical Installation Standards".
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."
- E. Install temporary closures to prevent foreign matter from entering raceways.
- F. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.
- G. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.
- H. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
 - 1. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
- I. Raceways Embedded in Slabs:
 - 1. Raceways embedded in slabs shall be limited to above grade concrete decks. Embedded conduit shall be limited to servicing floor boxes and equipment located in open spaces away from accessible walls.
 - 2. Install in middle 1/3 of slab thickness where practical and leave at least 2 inches (50 mm) of concrete cover.
 - 3. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
 - 4. Space raceways laterally to prevent voids in concrete.
 - 5. Run conduit larger than 1-inch trade size (DN 27) parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.

6. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 7. Conduits shall run flat. Do not allow conduits to cross.
 8. Change from ENT to RNC, Type EPC-40-PVC, rigid steel conduit, or IMC before rising above the floor.
- J. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
1. Run parallel or banked raceways together on common supports.
 2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- K. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
- L. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- M. Tighten set screws of threadless fittings with suitable tools.
- N. Terminations:
1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
 2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
- O. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- P. Provide pull string and 25% spare capacity in every branch circuit conduit.
- Q. Telephone and Signal System Raceways, 2-Inch Trade Size and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.
1. Electrical conduit (LB's) are not permitted.
 2. Conduits shall have no more than two 90 degree bends between pull points or pull boxes.
 3. Conduits shall contain no continuous sections longer than 100 ft. without a pull point/box.
 4. The bend radius of conduit must be at least 6 times the internal diameter for a conduit 2 inches or less and a radius of 10 times the diameter for a conduit greater than two inches.

5. All conduit ends shall have an insulated bushing.
- R. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.
 - S. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.
 - T. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals. Provide cover clips to cover space between connecting pieces.
 - U. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.
 - V. Do not route feeders across roof.
 - W. Provide a pull box (a handhole for outdoor applications) for each conduit run that exceeds 250 feet. Provide two pull boxes (handholes for outdoor applications) for runs that exceed 500 feet.
 - X. Route conduits in finished areas with exposed ceilings at underside of structural deck or as high as possible.
 - Y. Outlet boxes within hazardous locations shall be of the proper class and division as noted in the N.E.C.
 - Z. Offset outlet boxes on opposite sides of common walls to prevent sound transmission between adjoining rooms.
 - AA. Provide plastic bushing at end of conduits.
- 3.3 INSTALLATION OF UNDERGROUND CONDUIT
- A. Direct-Buried Conduit:
 1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 2 Section "Earthwork" for pipe less than 6 inches in nominal diameter.
 2. Install backfill as specified in Division 2 Section "Earthwork."
 3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 2 Section "Earthwork."
 4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.

- a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
- b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.
- D. Install handholes and boxes with bottom below the frost line, 42" below grade.
- E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.
- F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE INSTALLATION FOR ELECTRICAL AND COMMUNICATIONS PENETRATIONS

- A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Through-Penetration Firestop Systems."
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Rectangular Sleeve Minimum Metal Thickness:
 - 1. For sleeve cross-section rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 0.052 inch.
 - 2. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, thickness shall be 0.138 inch.
- E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- F. Cut sleeves to length for mounting flush with both surfaces of walls.
- G. Extend sleeves installed in floors 2 inches above finished floor level.
- H. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway unless sleeve seal is to be installed.

- I. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.
- J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.
- K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials. Comply with Division 7 Section "Through-Penetration Firestop Systems."
- L. Roof-Penetration Sleeves: Seal penetration of individual raceways with flexible, boot-type flashing units applied in coordination with roofing work.
- M. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- N. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between raceway and sleeve for installing mechanical sleeve seals.

3.6 SLEEVE-SEAL INSTALLATION

- A. Install to seal underground, exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.7 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Through-Penetration Firestop Systems."

3.8 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.9 CLEANING

- A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

RACEWAYS
MARCH 17, 2008

1. Interior Conduit and Fittings: Minimum conduit size for power circuits shall be 3/4-inch. Minimum conduit sized for control wiring shall be 1/2-inch.
2. Rigid galvanized threaded UL labeled conduit shall be specified for use in exterior walls, outdoors, for indoors exposed (surface) applications from floor level to 8-feet above floor, seal penetrations, and all the areas having potential to corrode or eat away by chemical action (corrosive atmosphere) and hazardous locations.
 - a. Threaded couplings shall be used with rigid conduit and IMC.
 - b. IMC may be used in place of rigid galvanized where permitted by code.
3. Steel Electric Metallic Tubing (EMT) (up to the 2-inch size) UL labeled conduit may be used in interior partitions, above ceilings, and for surface application higher than 8-feet above floor, except in corrosive and hazardous locations, where PVC coated rigid galvanized conduit is required to be used.
 - a. Insulating bushings and insulated throat fittings shall be used throughout EMT installation.
 - b. Compression fittings shall be used outdoors. Set screw type fittings may only be used indoors.
4. Plastic jacketed rigid galvanized steel conduit shall be used in corrosive atmosphere.
5. Flexible conduit used for motor make-up shall be liquid tight flexible conduit. Flexible conduit used for lighting fixture connections shall be steel, minimum size of 1/2-inch for lighting fixture whip and 3/4-inch for motor connections. Maximum length shall be 6'-0". Flexible conduit of any type shall not be used in interior partitions or in walls as a substitute for EMT, IMC or rigid steel conduit. A ground wire shall be pulled in all flexible conduits. All flexible conduits shall be supported. Distance between supports as allowed per NEC.
 - a. Liquid tight flexible metal conduit shall be used on flexible conduit applications exposed to outdoor or moist locations.
 - b. Liquid tight flexible metal conduit shall be used in raised floor computer room applications.
6. Rigid galvanized steel conduit shall be used outdoors, above grade, in damp locations.
7. Conduit installed through a building wall shall have internal and external seals. Specify link seal or equivalent.
8. Elbows used for medium voltage cable shall be long radius rigid steel.
9. Grounding: Conduit crossing building expansion joints shall have expansion provision with grounding continuity.

SURFACE RACEWAYS
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1. Surface raceway shall not be used in new construction except as approved by the University Facilities Principal Electrical Engineer.
2. Surface metallic raceway with associated coupling, boxes and fitting shall be mounted to the surface of structure for the installation of electrical conductors when approved may be used in the following locations:
 - a. In dry locations.
 - b. In Class I, Division 2 Hazardous (classified) locations and as permitted by National Electric Code (NEC).
3. Surface non-metallic raceway shall not be used.
4. Fittings and Boxes:

- a. Raceway shall have manufacturer's finish standard prime coating suitable for field painting.
- b. The acceptable manufacturers for surface raceways shall include:
 - i. The Wiremold Co.

UTILITY TUNNEL CONDUIT AND FITTINGS

MARCH 17, 2008

1. Installation requirement for corrosive and external heat generating environment. The conduit must be suitable for the best protection from corrosion in the most demanding environments such as utility tunnels, under bridges, chemical, utility plants, underground pipeline, laboratories, electrical substations, and parking lots.
2. The conduits and the fittings must meet the requirements of UL 1984 that covers conduit type AG for use above ground and/or below ground, and type BG for use below ground applications. The University requires that the manufacturer supply a letter from UL, not a "Certificate of Compliance" for the product to be approved for use in University facilities.
 - a. The preferred conduit and fittings shall be PVC coated rigid galvanized steel conduit that provides maximum protection against corrosion .
 - b. PVC Coating Rigid Galvanized Steel Conduit:
 - i. The PVC coated conduit shall be UL listed. The permitted PVC coating must have been tested and approved by UL as providing the primary corrosion protection for the rigid galvanized steel conduit.
 - ii. Applicable UL standard may include: UL 6 Standard for safety, rigid metal conduit, UL 514B Standard for Safety; Fittings for Conduit and Outlet Boxes.

UNDERGROUND RACEWAYS

MARCH 17, 2008

1. General Requirements: All underground cables of any classification shall be installed in raceway systems. All the raceways for medium/high voltage shall be 5" in size and all others for street lighting and other applications shall be sized in accordance with the projected electrical load growth in the vicinity. The conduit requirements for utility tunnels are detailed in Section 26 05 35.33 of this standard. Underground raceway systems for medium/high voltage systems shall be encased in concrete. Provide a yellow marker tape 18" above the conduits indicating "Danger Buried Conduits".

****END OF SECTION****