

SECTION 16130
RACEWAYS, FITTINGS, SUPPORTING DEVICES, BOXES AND ACCESSORIES

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide raceways, fittings, supporting devices, boxes and accessories required for a complete system and its proper operation.
- B. 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.
- C. Raceways, fittings, etc. to be used in the Fire Alarm System are described in Section 16720, 16722, 16723 as applicable to project along with requirements specific to such systems. Installation is as described in Article 3.02 of this section.

1.02 RELATED SECTIONS

- A. Firestopping..... Section 07270
- B. Painting..... Section 09900

1.03 SUPPLEMENTAL SUBMITTALS

- A. Submit a Product Schedule indicating the item description and manufacturer name. The Schedule will be accepted by the Authority for record purposes only, provided that the items are in full compliance with the Specifications.
- B. Certificates

Provide affidavit stating that all items used are UL listed and meet the specifications.
- C. Coordination drawings for conduit buried in concrete slabs, conduit in the ground and service entrance conduit.
Provide conduit routing plan, drawn to scale, showing structural members, architectural features, HVAC and P&D items.

PART 2 - PRODUCTS**2.01 RACEWAYS**

- A. Rigid Galvanized Conduit (RGC)
Steel conduit, Schedule 40, hot dipped galvanized, with Underwriters Laboratories label stamped on each length.
- B. Electric Metallic Tubing (EMT)
Industry standard conduit with Underwriters Laboratories label stamped on each length.
- C. Flexible Metal Conduit (FMC)
Galvanized steel conduit, Underwriter Laboratories listed.
- D. Liquid-tight Flexible Metal Conduit (LTFMC)
Industry standard conduit, Underwriter Laboratories listed.

2.02 SUPPORTING DEVICES

- A. Hangers
1. Separate hangers shall be installed for supporting conduits. Wherever possible, hangers shall be supported from concrete slab by inserts.
 2. Hangers and piping installed by other trades shall not be used for supporting electric conduits.
- B. Individual and multiple pipe hangers and riser clamps including all parts and hardware shall be hot-dipped galvanized throughout. All U-bolts, clamps, attachments and hardware for hanger assembly and conduits shall be provided. Each multiple hanger shall be designed to support a load equal to or greater than the sum of the weights of the conduits, wires and hanger itself, plus 200 pounds.
- C. Use pipe straps and specified method of attachment where conduit is installed proximate to surface of steel stud or masonry construction.
1. Use hangers secured to surface with specified method of attachment where conduit is suspended from the surfaces.

- D. Use "C" beam clamps and hangers where conduit is supported from steel beams.
- E. Use deck clamps and hangers to support conduits from steel decking having hanger tabs. One conduit per tab is permitted.
 - 1. Where conduit is supported from steel decking which does not have hanger tabs, use clamps and hangers secured to decking, utilizing specified method of attachment.
- F. Use channel support system supported from structural steel for multiple parallel conduit runs.
- G. Where conduits are installed above ceiling, do not rest conduit directly on runners bars, T-Bars, etc.
 - 1. Conduit Sizes 2½" and Smaller: Support conduit from non-lightweight ceiling supports or from construction above ceiling such as beams, joists, slabs, or trusses.
- H. Conduits shall be supported within three (3) feet of any kind of fitting and at every outlet or junction box, panel, etc. This shall apply to both horizontal and vertical runs.

2.03 BOXES AND ENCLOSURES

- A. The Contractor shall provide outlet boxes and enclosures appropriate for the purpose at all locations where the Drawings require the installation of electrical devices or electrical equipment. For exposed conduit systems, the contractor shall use cast outlet boxes in all locations below 8'-0" with number of threaded hubs equal to the number of conduits, except when installing surface metal raceway contractor shall provide boxes from the same manufacturer of the surface metal raceway.
- B. Where the Contractor selects and installs an item of equipment that requires additional boxes, fittings, etc., or a modification of the conduit system indicated on the Drawings, such additional boxes, fittings, etc. shall be furnished and installed and such modifications shall be performed by the Contractor as part of this Contract, without extra compensation from the Authority.

2.04 FITTINGS AND ACCESSORIES

- A. All fittings and accessories must be UL listed and compatible with selected raceways and suitable for use

location. Compression fittings shall be provided with the installation of EMT.

2.05 CONDUIT SIZES

- A. Where conduit is required to be installed, its nominal diameter shall be not less than 3/4 inch.

2.06 SLEEVES FOR CONDUIT

- A. Provide sleeves, Schedule 40, galvanized steel, for all electrical conduits and wiring passing through foundation walls.
- B. Provide sleeves, Schedule 10, galvanized steel, for all electrical conduits and wiring passing through partitions and slabs. Proprietary sleeves that are part of an NYC approved fire stopping assembly are also acceptable.

PART 3 - EXECUTION

3.01 RACEWAY SCHEDULE

- A. Rigid Galvanized Steel Conduit (RGC)

Provide RGC as follows:

1. All outdoor raceway.

- B. Electrical Metallic Tubing (EMT)

Provide EMT for feeders and branch circuits for power, lighting and low voltage systems.

- C. Flexible Metal Conduit (FMC)

1. Concealed above hung ceiling for low voltage systems
2. Provide FMC for final conduit connection to:
 - a. Recessed lighting fixtures in suspended ceilings.
 - b. Emergency lighting battery units.
 - c. Motors
 - d. Equipment subject to vibration (dry locations).

- e. Equipment requiring flexible connections for adjustment or alignment (dry locations).
 3. In all cases, install equipment-grounding conductor in the flexible raceway and bond at each box or equipment to which flex is connected.
 4. Grounding conductors are not shown on the Drawings.
- D. Liquid-tight Flexible Metal Conduit (LFMC)
- Provide LFMC for final conduit connection to:
1. Motors and Equipment subject to vibration in damp and wet locations and for Kitchen appliances.
 2. Equipment requiring flexible connection for adjustment or alignment in damp and wet locations.

3.02 RACEWAY INSTALLATION

A. General

1. 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.
2. All conduit systems shall be mechanically and electrically continuous.
3. The ends of all conduit shall be square, carefully reamed out to full size, shouldered in the fittings, and bushed or capped wherever stubbed clear of the building.
4. Not more than four (4) 90 degree ells or bends or the equivalent shall be used in any single run of conduit. Conduits for telephone, television, video surveillance or data cable shall not have more than three (3) 90 degree bends or the equivalent. Where more bends are necessary, provide suitable code size pull boxes or fittings. All conduits for telephone, television, video surveillance or data systems cable shall have large radius bends. Pull boxes shall be installed in accessible locations.
5. Conduit installed on equipment shall not obstruct any removable panel, access door, or control. Control apparatus, outlet, junction, and pull boxes shall be installed so as not to interfere with any piping, fixtures, or equipment.

6. Complete raceway installation before starting conductor installation.
7. Conceal conduit and EMT within new finished walls, ceilings, and floors, unless otherwise indicated. Use of exposed raceways attached to new finished walls, ceilings, or slabs is not permitted.
 - a. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
8. Conduits installed across seismic separations (expansion joints) shall include, but not limited to, the following:
 - a. The conduit (rigid steel or EMT) shall be securely anchored on each side of the seismic separation with a pipe hanger per SMACNA details.
 - b. The spacing between conduit ends shall be 36" minimum.
 - c. A liquid-tight flexible metal conduit of the same size shall be installed between the conduit ends spanning the seismic separation.
 - d. The liquid-tight flexible metal conduit shall be of sufficient length to provide for a longitudinal and axial deflection of two (2)-inches minimum in all directions.
9. Terminations:
 - a. 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.
 - b. 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.
10. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with

not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.

11. Rooftop conduits (rigid steel) shall be neatly grouped and installed parallel to the building lines. Support conduits on minimum 4 inches x 6 inches on pressure treated lumber sleepers at minimum 5 feet spacing or Metallic Caddy Pyramid 50 from Erico (Polyethylene closed-cell foam and 16-gauge steel construction) or approved equal
12. Do not place conduit runs where electronic equipment, such as Interactive White Boards, are to be installed to avoid possible electromagnetic interference. Individual conduits associated with such equipment only may be in the vicinity of the equipment.

B. Exposed conduits

Exposed conduits shall be rigidly fastened to structure, or to rigid hangers or angle irons connected to structure at intervals not exceeding eight feet. Where the conduits or surface metal raceways are installed exposed, they shall follow the architectural lines of the enclosure and shall be run as to be as inconspicuous as possible. Conduits or surface metal raceways shall not be installed diagonally on ceilings, walls or columns.

C. Conduit Installed Concealed in Existing Building

Where new partition walls and new hung or furred ceilings are being erected or where existing walls are to have a new tile finish, the conduits and related equipment shall be installed concealed in walls and in hung or furred ceilings.

- D. Low voltage systems (except for the fire alarm, refer to specification section 16720) shall be installed as follows:

Existing Buildings:

1. Vertical (Riser) Raceways:

EMT

2. Horizontal Raceways:

EMT or surface metal raceway up to the outlet. Concealed flexible metal conduit may be used for low voltage systems above suspended ceiling.

- G. Raceways passing through fire-rated walls, floors, roofs, ceilings, and other areas where indicated: the space between sleeve and pipe/conduit shall be fire stopped in accordance with Section 07270 to comply with fire-rating of assembly through which it passes.
- E. Raceways passing through foundation walls shall be of watertight utilizing "Link-Seal" type gasketing. If a non-rigid penetration is required for seismic requirements above the water table design elevation, another means of watertight protection shall be provided.

3.03 CONDUIT TO MOTORS, TABLES, ETC. IN SHOPS AND OTHER ROOMS

- A. 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 (150mm) above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.
- B. Flexible Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semi recessed 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.

3.04 MOUNTING DEVICES

A. Height of Wall Outlets

Unless otherwise indicated, locate outlet boxes with their center lines at the following elevations above finished floor:

Alarm Indicating Devices	8'-0" to center where ceiling height allows a minimum of 2" clearance between ceiling and top otherwise mount so that its top is 2" below finished ceiling.
Clock	2" below finished ceiling to a maximum elevation of 10'-0".

Exit Lights	8'-0" where ceiling height allows a minimum of 6" clearance between ceilings and top light, otherwise mount exit light so that its top is 6" below finished ceiling. Adjust height and clearances as required to suit installation over doors.
Indicators	8'-0" AFF.
Single & Duplex Receptacles	1'-6"
Switches	4'-0"

3.05 PAINTING

- A. All exposed raceways and boxes in finished parts of the building shall be painted. Painting shall consist of a prime coat and a finished coat, color as selected by project architect. Factory painting will be accepted as a prime coat.

END OF SECTION

LIST OF SUBMITTALS

<u>SUBMITTAL</u>	<u>DATE SUBMITTED</u>	<u>DATE APPROVED</u>
Product Schedule	_____	_____
Certificates	_____	_____
Coordination/Routing Drawings	_____	_____