

SECTION 16110 – RACEWAYS

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK:

- A. The accompanying General Conditions shall apply to and form a part of this Section.

PART 2 – PRODUCTS

- A. Rigid galvanized steel conduit to conform to ASA Standard C80.1 and U.L. Standard No. 6 for rigid metallic conduit, except hot dipped galvanized after threading. Conduits manufactured by Republic, Wheatland, Southwire, Clifton, Triangle or Walker.
 - 1. Fittings, ells, couplings, etc., galvanized threaded type meeting above standards. Threadless fittings not allowed.
 - 2. Terminate rigid conduit with two locknuts, one inside, one outside of the cabinet, junction or outlet and a bushing. Bushing – malleable iron with smooth bakelite ring molded into edge of bushing to prevent damage to cable, OZ Manufacturing Company, type “B” or approved equal. Where grounding bushings are required, construction of bushing similar to above except a lug provided for grounding connection, OZ type “BLG” or approved equal.
- B. Rigid intermediate grade conduit, IMC, to conform to UL Standard No. 1242; hot dipped galvanized or approved equivalent. Manufactured by Allied, Southwire, or ETP.
 - 1. All fittings, ells, couplings, etc., constructed to same standards as rigid steel conduit. Fittings – threaded type with all threads engaged. Use “Uni-swivel” couplings in dry locations only.
 - 2. Conduit terminations same as rigid steel conduit.
- C. Flexible steel conduit, “Greenfield”, continuous spirally wound and inter-locked, threadless, galvanized conforming to U.L. and CSA Standards for flexible steel conduit; manufactured by National Electrical Products or International Metal Hose Company.
 - 1. Connectors and fittings galvanized steel, threadless type with insulated throats, U.L. approved for grounding means, Thomas & Betts, Efcor, Midwest, Appleton, Raco, Steel City or ETP.

- D. Liquid tight flexible steel conduit constructed similar to flexible steel conduit above, except with polyvinyl chloride jacket, as manufactured by Anaconda "Sealtite" or Robroy – "Flex".
 - 1. Fitting Assembly – sealing type, with steel gland, nylon ring and ground cone inside locknut. All fittings with insulated throat, U.L. approved for grounding means. Fittings – Thomas & Betts, Efcor, Midwest, Appleton, Raco, Steel City or ETP.
- E. Electrical metallic tubing, EMT, threadless, steel type conforming to ASA Standard C80.3 galvanized inside and out, and with additional corrosion resistant finish. EMT manufactured by Republic, Wheatland, Pittsburgh Standard, Southwire, Clifton, Spang-Chalfont, Triangle, Walker, or ETP.
 - 1. Fittings, connectors, couplings, etc., insulated throat galvanized steel, raintight, compression type; Thomas & Betts, Efcor, ETP, Midwest, Raco, Appleton or Steel City.
- F. Plastic conduit, PVC, polyvinyl chloride compound, rated for direct burial, Schedule 40, except as noted otherwise, manufactured by Carlon, Sedco, ETP, Can-Tex or approved equivalent.
 - 1. Fittings same material as conduit and installed with watertight joint compound recommended by manufacturer.

PART 3 – EXECUTION

3.1 INSTALLATION:

- A. Install conduit as follows:
 - 1. Use rigid steel or intermediate grade conduit for:
 - a. Circuits run underground.
 - b. Circuits run in concrete in contact with earth.
 - c. Circuits in hazardous and wet locations.
 - d. Circuits exposed to mechanical damage.
 - e. All feeders (1-1/4" diameter and larger).
 - f. All motor circuits.
 - 2. Use electrical metallic tubing, EMT, for:

- a. Branch circuits (conduit 1" diameter and smaller) in dry locations.
 - b. Telephone circuits.
 - c. Auxiliary systems and controls (low voltage systems such as fire alarm nurse call sound systems, etc.).
 - d. Feeders run overhead in dry locations.
3. Use PVC conduit for:
- a. Circuits run underground where indicated.
 - b. For branch circuits in concrete slab.
 - c. Where specifically shown on drawings.
 - d. No PVC shall be exposed.
- B. Size conduit per NEC. Minimum size ½" diameter, but no more than 5 #12 installed in ½" conduit.
- C. Run conduit concealed where possible. Run concealed conduit above furred ceiling in an orderly manner. Multiple conduits grouped and run parallel.
- D. In concrete slab: Install conduits in center of concrete slabs and tie to reinforcing steel with tie wires. Do not install conduit larger than 1" in concrete slabs unless approved by Engineer. Install with minimum of 2" between parallel runs. Do not cross conduits in slab unless necessary, then only one conduit crossover in 12" space.
- E. Exposed Conduit: Use only where specifically shown or approved. Run perpendicular to building walls and partitions and tight against structure. Conceal vertical portion of conduits where possible.
- F. Paint underground metal conduit with 2 coats of asphaltum or bituminous. Make underground conduit fittings watertight using Teflon tape. Do not use split couplings and similar fittings underground and exposed to moisture. Run underground conduits minimum 24" below grade. Do not run conduit in slag fill.
- G. Paint conduit fittings and threads exposed to moisture with Rustoleum silver paint after installation.
- H. Furnish offsets required to meet field conditions. Make bends in conduit in accordance with the National Electrical Code, except make minimum radius of 6

times conduit diameter or 6" whichever is greater. Bend IMC conduit without deforming.

- I. Where conduit crossed expansion joints, install expansion type fittings OZ type EX with bonding jumper or approved equal.
- J. Make connections to equipment away from wall with conduit extensions exposed from ceiling to floor, anchored with floor flange and/or angle frame as required. Make connections to equipment with flexible conduit from tee conduit in conduit riser.
- K. Vibrating equipment and equipment requiring adjustment, i.e.: motors, transformers, etc. make final connections with flexible conduit.
- L. Isolate conduit connections to equipment on roof from roof penetration of conduit with short section of flexible conduit between roof penetration and equipment.
- M. Use liquidtight flexible conduit where exposed to moisture, oil, etc.
- N. Install conduit to avoid hot water pipes. Maintain 9" clearance of such pipes, unless closer crossings are unavoidable. Maintain minimum 1" clearance from covering of pipe crossed.
- O. Support conduit per NEC. Support individual conduits with galvanized hangers and rods as follows:

1" diameter and smaller.....1/4" dia. Rod
1-1/4" to 3" diameter.....3/8" dia. Rod
Larger than 3" diameter.....1/2" dia. Rod
- P. Individual conduit hangers – Minnerallac or approved equal. Support EMT near each joint. Support for multiple conduit runs consist of Unistrut channel as required with 1/2" diameter galvanized bolts or rods anchored to structure. Provide "U" bolt clamps for each conduit on hangers. Support vertical riser conduits with galvanized bolted clamps at each floor. Do not support conduit to ceiling support system.
- Q. Terminate conduits entering sheet metal boxes with double locknuts and bushings. Terminate conduit exposed to moisture with watertight hubs.
- R. Install appropriate seal-off where conduits exit hazardous areas, areas of temperature differential etc.
- S. Where ground conductor installed in conduits 1-1/4" and larger provide grounding bushings, and bond full size ground wire to bushings and from bushing to box or cabinet. Bond with self-tapping screw and appropriate lug. Where ground wires

are run in smaller conduits, bond to outlet and junction boxes with self-tapping screw lug. Provide other conduits with non-grounding bushings as described under another article. Provide all service entrance metallic raceways with grounding bushing and bond to ground bus; bond sized per N.E.C.

T. PVC Conduit Installation:

1. Above ground: Allow for expansion and contraction.
2. Below grade: Encase in 3" sand fill. Backfill free of large rocks and debris.
3. Make elbows, bends, etc., with heated bender when factory bends are not available.
 - a. When below slab, provide rigid elbows.
4. Make cuts with hacksaw and deburr ends.
5. Make joints as follows:
 - a. Clean outside of conduit to depth of socket, and inside of socket with approved cleaner. Apply solvent cement to interior of socket and exterior of conduit. Insert conduit in socket and rotate $\frac{1}{4}$ to $\frac{1}{2}$ turn and allow to dry.
6. Where non-metallic conduit is used for power wiring, install insulated ground wire, sized per NEC unless shown larger.

U. Sleeves:

1. Provide sleeves for raceways penetrating floor and structural members. Sleeves consist of Electrical Metallic Tubing set in forms. (Exception: Uses Schedule 40 PVC for individual ground conductors).
2. Size sleeves to allow $\frac{1}{2}$ " clearance around raceway extending from bottom of floor construction to 2" above floor, minimum sleeve size 2-1/2" diameter. After raceways are installed, seal space between the raceway and sleeve with non-hardening, fireproof, compound, CTC PR-855 sealant, T & B "Flame Safe" for 2 hour fire rating or approved equal.

END OF SECTION 16110