

**SECTION 16119 (26 05 43)**

**UNDERGROUND DUCTS AND MANHOLES**

**Part 1 -Design Directives**

Poured in place steel reinforced concrete manholes and concrete duct banks shall be installed per the details available from FOM. Conduits shall be separated by means of manufactured interlocking “chairs” spaced at no more than 5 feet apart along the length of the duct bank. Spacing between conduits shall not be less than 3 inches. Steel reinforcement of concrete duct banks shall be required only where transitioning to a structure (eg., building, manhole, utility tunnel) or where the duct bank crosses a road and or driveway. Steel reinforcement shall extend minimum five feet from structure and/or beyond edge of the road/driveway.

Raceways in steel reinforced concrete duct banks shall be schedule 40 PVC. Raceways in telecommunications and low voltage power duct banks shall be 4 inch and those used in medium voltage power applications shall be 5 inch. When a duct bank enters an existing manhole or building the following two methods are acceptable for attachment to the existing structure:

1. Core drill the existing structure and transition the PVC raceway to rigid metal conduit (ferrous) at the penetration. These rigid conduit stubs shall be a minimum of 5 feet long and shall be terminated in the existing wall through segmented link seals. The reinforcing steel of the new cast in place duct bank shall extend into the existing wall and be secured with epoxy suitable for the environment. Before the duct bank is poured the exterior of the existing wall shall be treated with water stop Rx to provide a watertight joint. Grounding bushings shall be installed on the conduit stubs inside the basement or utility vault.
2. Saw cut a window into the existing structure suitable to allow the entrance of the PVC ducts and reinforcing steel. In this arrangement the weight of the duct bank will bear on the wall through which it is installed. The duct bank reinforcing steel shall extend into the wall of the existing structure to within one inch of the interior form and be tied to this wall by the installation of rebar pins into the perimeter of the rough opening fastened with epoxy suitable for the environment. Before the duct bank is poured the interior perimeter of the rough opening shall be treated with water stop Rx to provide a watertight joint. The “window” fill shall be formed to provide a 3” recess from the manhole interior wall. Conduit bell ends shall be used where the PVC meets the interior form and shall be installed flush to the interior wall. See detail “E” on ‘Dartmouth College Electric Vault and Ductbank Details.dwg’ CAD drawing.

Grounding at manholes shall be provided per “Neutral and Bonding Connections” detail drawing available from FOM.

Electrical manhole covers shall read “ELECTRIC”

Communications manhole covers (data/voice, fiber and copper communications) shall read “TEL-COMM”

**Part 2 -Products**

No designated manufacturers

**Part 3 -Execution**

Every effort shall be made to minimize the number of bends in all duct bank systems. Field bends shall be made using a “hot box” designed for the size of PVC used. Care shall be given to duct bank routing so that very large radius sweeping turns are designed into the route as opposed to factory-made 45 and 90 degree bends. When factory 90 degree bends are used they shall be a minimum of 36-inch radius for four inch and 48 inch radius for 5 inch. Factory 90 degree bends used in duct bank construction shall be rigid metal conduit (ferrous) only.

These factory-made bends shall be protected by corrosion tape such as 3M Scotchwrap 50 or approved equal prior to the concrete pour.

Duct banks used in the medium voltage electric system shall have red dye applied to the surface at the time the concrete is poured. A red "Danger High Voltage" tape shall be installed during backfill to identify the location to future excavators.

The duct bank support "chairs" shall be spaced up from the bottom of the trench using cement brick to ensure that the proper amount of concrete is poured under the conduits. Sides of the trench may be used as the form if the width does not exceed 1 1/2 times the recommended dimension of the duct bank (width) per the details in Appendix A of this document.

The electrician shall vacuum, swab and install pull strings in every conduit of the completed duct bank. The pull string shall be permanently marked in one-foot increments to aid in wire estimation on future projects. Use Greenlee #435 pull string or approved equal.