



# Division 260543

# Duct Bank

## DESIGN GUIDE

## 1 General

### 1.1 Introduction

- A. This section applies to the following:
  - 1. Conduit
  - 2. Duct banks
  - 3. Manholes/Vaults
  - 4. Handholes
- B. Metal hardware installed in below grade vaults has been a maintenance issue on campus due to corrosion over time. Confirm with the ELSM if anti-corrosion measures are required for below grade metal hardware during the design.

## 2 Materials

### 2.1 Metal Conduit

- A. Rigid steel conduit (ANSI C80.1).

### 2.2 Rigid Plastic Conduit

- A. NEMA TC 2, Schedule 40 PVC.



- B. Fittings and conduit bodies shall be NEMA TC 3.

## 2.3 Fiberglass Conduit Sweeps

- A. NEMA TC 14, Fiberglass reinforced epoxy suitable for below grade installation.

## 2.4 Precast Concrete Manholes

- A. Description: Pre-cast manhole with modular interlocking sections complete with accessories.
- B. Nominal Inside Dimensions: 8'-0" x 10'-0"
- C. Inside Depth: 7'-0"
- D. Base Section: Include sump
- E. Riser Casting: 18 inch
- F. Frames and Covers: 30 inch diameter, Cast Iron, Traffic Rated H-20. Provide cover marked "ELECTRIC".
- G. Duct Entry Provisions: Single duct knockouts and/or window knockouts on all sides.
- H. Duct Entry Locations: located on each side of the manhole.
- I. Duct Entry Size: 4 inch or 6 inch as indicated in the drawings.
- J. Cable Pulling Irons: Use galvanized rod and hardware. Locate opposite each duct entry. Provide watertight seal.
- K. Cable Rack Inserts: Minimum load rating of 800 pounds.
- L. Cable Rack Mounting Channel: Manholes shall have three fiberglass or PVC coated steel channels installed on each sidewall for cable racking and cable support.
- M. Cable Racks: Underground Devices Inc., Rack Model CR36 or approved equal. Provide (2) cable racks per manhole sidewall.
- N. Cable Supports: Underground Devices Inc., Arm Model RA14 or approved equal. Provide (2) cable support arms per sidewall.



- O. Ladder: Aluminum, rung ladder, with top hook to engage manhole riser casting. Provide one ladder. Match ladder length to specified manhole depth.
- P. Sump Covers: None.

## 2.5 Precast Concrete Pad Switch & Transformer Vaults

- A. Description: Pre-cast manhole with modular interlocking sections complete with accessories. Provide precast top with 30" round steel access cover and cable block outs.
- B. Nominal Inside Dimensions: 8'-0" x 10'-0"
- C. Inside Depth: 7'-0"
- D. Description: Pre-cast vault with 4 pulling irons. Provide offset 30" round access opening.
- E. Access Cover shall be H20 rated for full traffic loading. Label "ELECTRIC".
- F. Pad Switch – (2) 58" x 24" cable block outs.
- G. Transformer – (1) blockout sized per transformer manufacturer data.
- H. Nominal Inside Dimensions: 5'-0" x 10'-6"
- I. Inside Depth: 6'-6"
- J. Duct Entry Provisions: Single duct knockouts and/or window knockouts on all sides.
- K. Duct Entry Locations: located on each side of the vault.
- L. Duct Entry Size: 4 inch
- M. Cable Pulling Irons: Use galvanized rod and hardware. Locate opposite each duct entry. Provide watertight seal.
- N. Cable Rack Inserts: Minimum load rating of 800 pounds.
- O. Cable Rack Mounting Channel: Manholes shall have three fiberglass or PVC coated steel channels installed on each sidewall for cable racking and cable support.



- P. Cable Racks: Underground Devices Inc., Rack Model CR36 or approved equal. Provide (2) cable racks per manhole sidewall.
- Q. Cable Supports: Underground Devices Inc., Arm Model RA14 or approved equal. Provide (2) cable support arms per sidewall.
- R. Ladder: Aluminum, rung ladder with top hook to engage manhole riser casting. Provide one ladder. Match ladder length to specified manhole depth.

## 2.6 Handholes

- A. Enclosures shall be Polymer Concrete construction with minimum dimensions of 18" L x 11" W x 18" D. Provide larger enclosure per the NEC based upon the quantity and size of conduits entering and exiting the enclosure.
- B. Enclosures shall be open bottom with bolted and gasketed heavy duty cover. Label cover ELECTRIC.
- C. Enclosure load test rating shall be minimum Tier 22.

## 2.7 Accessories

- A. Underground Warning Tape: 4 inch wide plastic tape, detectable type, colored red.
- B. Duct bank spacers: Underground Devices Inc. or equal. The duct bank spacer type, size, and spacing shall be selected to match the drawings for conduit installation and concrete encasement.

# 3 Execution

## 3.1 Duct Bank Installation

- A. Prior to the start of construction, request existing vault butterfly diagrams from the ELSM for the area of work. The existing vault butterfly diagrams shall be field verified for accuracy during construction. Record any observed differences for as-build documentation at the end of the project.



- B. Provide suitable materials to form the duct bank pour to support the concrete installation. Where approved by the ELSM, the use of adjacent soil as the concrete pour form is permitted.
- C. Vibrating of concrete during pouring of duct banks is required.
- D. Install duct with minimum slope of 4 inches per 100 feet (0.33 percent). Slope duct away from building entrances.
- E. Provide separation between electrical duct banks and other utilities as follows:
  - 1. 12" minimum separation from most utilities
  - 2. 18" minimum separation from gas lines
  - 3. 36" minimum separation from water service lines
  - 4. Contact the ELSM if minimum separation cannot be met.
- F. Install, operate and maintain pumps or dewatering equipment required for control of water in trenches, manholes, handholes, vaults and excavations during the construction period.
- G. Join nonmetallic duct using adhesive as recommended by manufacturer.
- H. Install no more than equivalent of three 90 degree bends between pull points. Ninety-degree horizontal bends shall be made using large radius type.
- I. Terminate duct at manhole entries using end bell.
- J. Stagger duct joints vertically in concrete encasement 6 inches minimum.
- K. Use suitable separators and chairs installed not greater than 5 feet on centers.
- L. Provide minimum 3-inch minimum concrete cover at bottom, top, and sides of ductbank.
- M. Provide No. 4 steel reinforcing bars in each corner of concrete encased ductbank. Join rebar every 10' with No. 4 steel reinforcing bar vertical hoops. Provide minimum 18" overlap on vertical linear reinforcing bar splices and minimum 24" overlap on horizontal reinforcing bar splices. Provide minimum 1-1/2" of concrete cover at



reinforcing bars and minimum 1-1/2" of space between reinforcing bars and adjacent conduits.

- N. Connect to existing concrete encasement using rebar dowels. Provide minimum 24" overlap of rebar for connections between separate concrete pours.
- O. Connect concrete ductbank to manhole walls using rebar dowels attached with epoxy.
- P. Provide suitable pull string in each empty duct.
- Q. Interface installation of underground warning tape with backfilling. Install tape 12 inches below finished surface.
- R. Underground horizontal and vertical 90 degree sweeps shall be made with fiberglass conduit for conduits 1-1/4" and larger.
- S. Horizontal 90 degree sweeps shall be large radius sweeps with a minimum radius of 48".
- T. Vertical 90 degree sweeps shall have a minimum radius of 24" for conduits smaller than 3" and shall have a minimum radius of 48" for conduits 3" and larger.
- U. Where existing lawn areas are disturbed by excavation, new sod shall be provided to repair lawn areas back to original conditions.

### **3.2 Precast Manhole & Vault Installation**

- A. Install manholes plumb.
- B. Attach cable racks to inserts after manhole installation is complete.
- C. Provide grounding and bonding of vault interior. Field apply ocal spray plastic coating on all exposed metal hardware and metal supports after vault interior grounding is complete.

### **3.3 Handhole Installation**

- A. Provide a minimum of 6" of gravel below each handhole.



### **3.4 Project Closeout**

- A. Coordinate final naming of installed manholes with the ELSM to match the existing campus naming convention based on campus mapping grid and sub grid. Include final naming of manholes within as-build drawings.
- B. Contractor shall provide updated butterfly diagrams for each new and modified manhole to match installed conditions. Include updated butterfly diagram information within as-build drawings in CAD and PDF format. Request existing record butterfly diagrams from the ELSM at the start of the project.

## **4 Appendix**

### **4.1 Reserved for future.**

