

Transmission & Distribution
Material & Installation Specification

Concrete Duct Bank

I. General

DESCRIPTION

- A. The concrete duct banks shall consist of cast in place concrete design and configured as show on contract documents. This TDMIS drawing shows a four (4) way duct bank as a typical. Multiple cell duct banks up to sixteen (16) way shall conform to this specification. Minimum shall be two (2) way allowing for a spare.

QUALITY ASSURANCE

- A. Installer Qualifications: Only qualified personnel, with a minimum of five (5) years of experience may be assigned to duct bank construction. General construction trades shall not be acceptable as qualified installers.

II. Product

MATERIALS

- A. Conduit shall be schedule 40 PVC and / or galvanized rigid steel (GRC).
- B. Conduit spacers shall be non-metallic and shall permit concrete to flow through without movement.
- C. Concrete shall be 3000 psi, with maximum #8 aggregate, 28 Day, air 5% +/- 1%.
- D. Red color dye shall be mixed into the concrete by the concrete supplier.
- E. All buried warning tapes shall be printed on APWA approved colors to meet or exceed industry standards. 5-mil tape shall have a solid aluminum foil backing to make it easy to find underground using a non-ferrous locator. Text shall read: "Warning! Buried Electric Below" in bold capital letters, black on red background. Tape shall be 6" wide minimum. The imprinted warning message shall be "Buried, or

Encased" to prevent ink rub-off, and shall be impervious to acids, alkalis and other destructive elements found in soil. The imprint shall allow for total reflectivity. A tape must be visibly seen before it can be read.

CONFIGURATION

- A. Duct banks shall be configured 2 thru 16 ducts as shown on the contract documents.

CONSTRUCTION

- A. All reinforcing cover, shall be as noted, 3" minimum.
- B. Concrete, 3000 pounds – 28-day strength – air – 5%, +/- 1%.
- C. A 2500lb rated nylon pull string with foot indication marks shall be left in all empty or spare duct and conduits.

ENTRANCE TO VAULTS AND MANHOLES

- A. Refer to TDMIS-1014 and 1015 For entrance details when terminating in a vault or manhole or other concrete structure not including pull boxes.

III. Installation

- A. The conduit shall be installed as detailed in the plan.
- B. If the conduit is installed in an area to be paved under this or another contract, backfill shall be appropriate for the paving indicated. No other surface restoration will be required.
- C. The depth of burial shall be a minimum of 36 inches from top of the top duct to finish (surface) grade.
- D. The trench shall be dug so that any curve radius shall be as large as possible. The trench shall be dug no wider than necessary to accommodate the conduit and concrete encasement as indicated on the detailed drawings. The bottom of the trench shall be undisturbed, tamped and relatively smooth earth. Trenches which have been dug too deep at any point are to be partially refilled with excavated material and tamped solid. The sides of the trench will be trimmed smooth to provide for a uniform sheath of concrete around the conduits. The sides of the excavation


CITY OF COLUMBUS DEPT. OF PUBLIC UTILITIES – DIVISION OF POWER CONCRETE DUCT BANK		
DRAWN BY: AEC	DATE: 01/01/2018	TDMIS-1013
APPROVED: <i>[Signature]</i>		
	SHEET 1 of 5	

are to be formed where necessary to maintain a uniform trench. Excess material shall be removed from the job site.

- E. Where a conduit crosses a sewer or water line, or any other underground structure the clearance between them will need to be a minimum of one foot or large enough to permit maintenance of the system without damage to the structures. The clearances shall be coordinated with the utilities involved. A suitable support on each side of the underground structure will be built to avoid transferring any direct load onto that structure.
- F. The conduit run shall be as straight as possible. The radius of any curve shall be as large as possible to facilitate the pulling of cable. As much as possible, all vertical bends shall be such that water drains toward a manhole and not lay in the conduit. Schedule 40, 5 degree angle couplings or combinations of 5 degree angle couplings and straight sections of duct are recommended to negotiate curves. Any field bending of conduit shall be done with manufacturer recommended conduit bending equipment and procedures.
- G. Precast plastic base and intermediate spacers will be placed at 5 foot intervals that shall separate the conduits a minimum of 2 inches apart and provide a 3 inch minimum outside encasement. Burrs on the end of the conduit, as the result of sawing, must be removed prior to completing a joint. Joints shall form a continuous smooth interior surface between duct sections so that cable will not be damaged when pulled past the joint.
- H. Surfaces to be joined will be clean and free from dirt, foreign materials and moisture. The joints will be sealed with the proper cement specified by the duct manufacturer. Ducts are to be tied together with heavy cord as to securely hold the ducts in place. The open ends of the duct are to be closed with tight fitting plugs to prevent the entrance of mud or foreign material in to the duct. After conduit is installed it shall be inspected by project inspector before concrete can be poured.
- I. The concrete shall be poured as soon as possible after conduits have been placed and inspected. Ducts shall be tied down to hold them in position while the concrete is poured. The concrete shall have a slump of 4 to 5 inches. The concrete delivery chute shall be adjusted so that the fall of the concrete into the trench is minimal. A splash board shall be used to divert the flow of concrete away from the trench sides to avoid dislodging soil and stones. Concrete shall be placed always from one end of the duct section to the other end of the section. Continuous spading shall be done to ensure a flow of concrete between and under the individual ducts. A long flat tool or

spatula shall be worked carefully up and down between each vertical line of ducts to eliminate voids. The top of the concrete then shall be smoothed.

- J. No load or backfill shall be applied or other work conducted that would damage new concrete or interfere with its curing. A continuous piece of CAUTION BURIED ELECTRIC tape is to be placed above the duct during backfilling.
- K. After the ducts are installed, a flexible steel mandrel not less than 12 inches long with a cross section of 4-3/4 inches (fitted with a pulling eye at each end) shall be pulled through each conduit. By working the mandrel back and forth, obstructions such as concrete shall be removed. After the mandrel has been pulled through, a stiff 5 inch circular wire brush and a swab shall then be pulled through the duct to remove any bits of concrete, etc.
- L. A Polyaramid (equivalent to Kevlar) pulling rope, rated at 2500 pound breaking strength, with printed measurements every foot shall be installed in all spare ducts. Manufactured by Greenlee, catalog number 39245 or equal.
- M. Installation shall include all receiving, hauling, loading, unloading, rigging, rollers, anchoring, leveling, and mounting of accessories as required for a complete and operational duct bank.
- N. Over excavation shall be filled with #8 crushed limestone to flush and level with undisturbed soil.
- O. Installers shall not walk on conduits during construction.
- P. Completed duct bank shall include a proof test consisting of pulling a wire brush with a diameter 1/2" larger than the conduit in both directions, followed by pulling a steel mandrel 1/2" smaller than conduit diameter both directions with an inline dynamometer connected to indicate pulling tensions. Pulling tensions shall be recorded and witnessed by project inspector and submitted to engineer for approval. A pulling tension of over 500 pounds in either direction shall constitute failure and the entire duct bank shall be replaced at no additional cost to owner.
- Q. Duct banks shall be installed to drain to nearest manhole or vault at 3" per 100 ft. Duct bank shall crest at the halfway point to allow drainage in both directions between two manholes or vaults.

CITY OF COLUMBUS DEPT. OF PUBLIC UTILITIES – DIVISION OF POWER CONCRETE DUCT BANK		
DRAWN BY: AEC	DATE: 01/01/2018	TDMIS-1013
APPROVED: 		
	SHEET 2 of 5	

R. Bury detectable warning tape over underground electric utility lines, cables, and duct banks to warn excavators and to prevent damage, service interruption or personal injury. Warning tape shall be buried 6" above duct bank.

IV. Method of measurement

Shall be the linear foot length of completed and operational duct bank on center line from point to point. Duct banks that terminate with a transition to a riser, such as a riser pole (TDMIS-1300,1301,1302,1303) shall be measured point to point including the transition, i.e., pole to pole, pole to vault or manhole, pole to pad etc. When conduits of different sizes are contained within the same duct bank, the measurement shall assume and be based on all conduits are the same size as the largest conduit.

V. Basis of payment

Items	Unit	Description
TDMIS-1013	linear feet	Operational and proof-tested [number of ducts]-way concrete duct bank

CITY OF COLUMBUS DEPT. OF PUBLIC UTILITIES – DIVISION OF POWER CONCRETE DUCT BANK		
DRAWN BY: AEC	DATE: 01/01/2018	TDMIS-1013
APPROVED: <i>[Signature]</i>		
	SHEET 3 of 5	

DUCT BANK CALBE PULLING TENSION TEST

Work Order Number _____ Date _____

Job Name _____

Cable Data _____

Conduit Data _____

Manufacturers maximum tension _____

Measured tension (both direction):

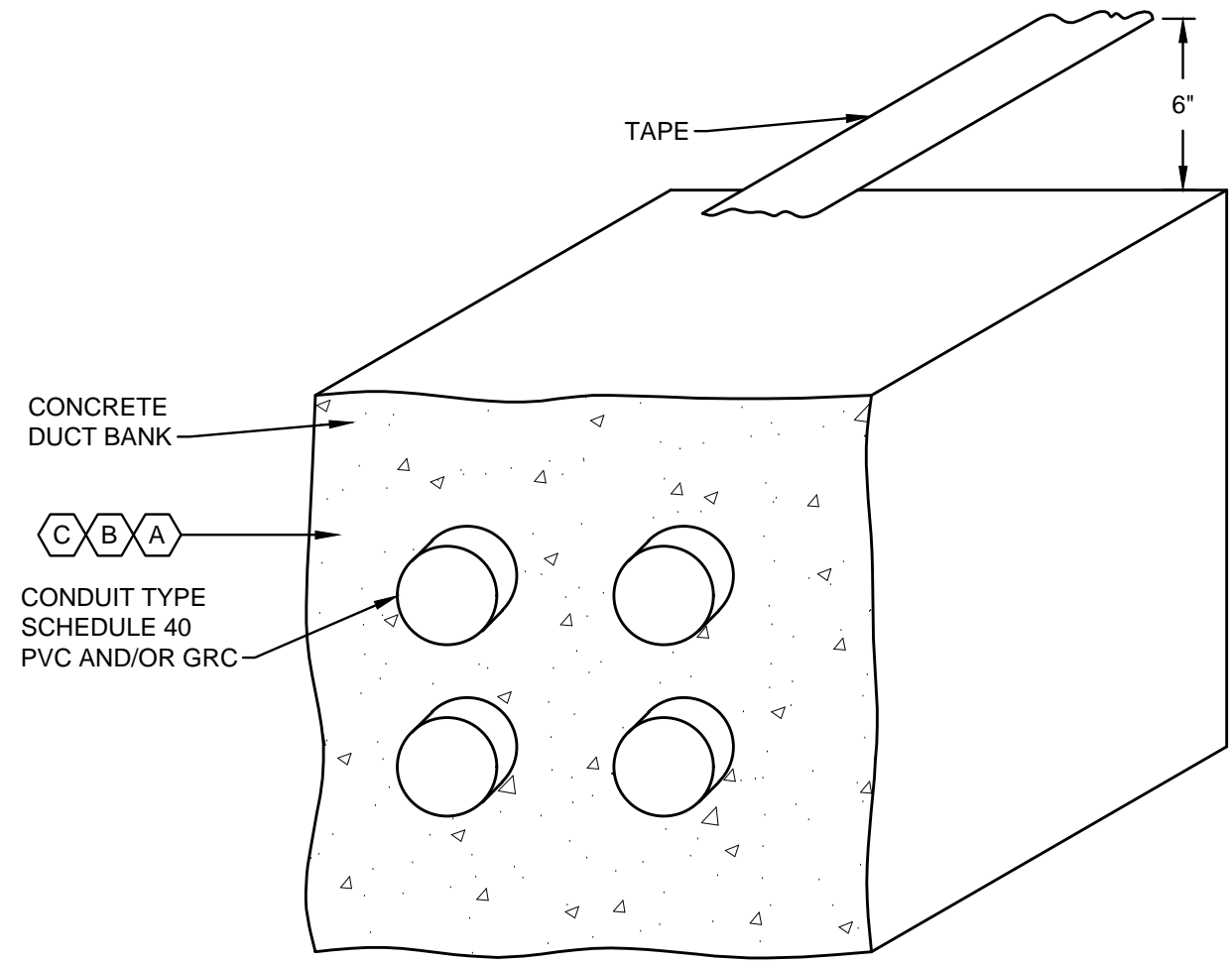
Wire brush measurement _____

Steel mandrel measurement _____

Weather Conditions _____

Air Temperature _____ Humidity _____

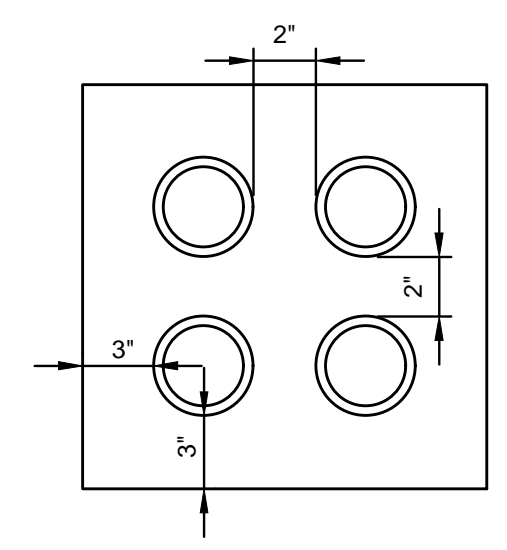
CITY OF COLUMBUS DEPT. OF PUBLIC UTILITIES – DIVISION OF POWER CONCRETE DUCT BANK		
DRAWN BY: AEC	DATE: 01/01/2018	TDMIS-1013
APPROVED: <i>[Signature]</i>		
	SHEET 4 of 5	



CONCRETE
DUCT BANK

C B A

CONDUIT TYPE
SCHEDULE 40
PVC AND/OR GRC



CODED NOTES:

- (A) DUCT BANK TO BE CONSTRUCTED ACCORDING TO DIVISION OF POWER GENERAL SPECIFICATIONS FOR CAST IN PLACE UNDERGROUND WORK
- (B) CONCRETE 3000 PSI AT 28 DAYS 5% ± 1% AIR ENTRAINED.
- (C) FORMATIONS WITH FIVE OR MORE DUCTS. WITH ONE AXIS LONGER THAN THE OTHER WILL BE MORE ECONOMICAL IF THE LONG AXIS IS VERTICAL.

CITY OF COLUMBUS, OHIO DEPT. OF PUBLIC UTILITIES - DIVISION OF POWER		
CONCRETE DUCT BANK		
DRAWN BY: AEC	DATE: 01/01/2018	TDMIS-1013
APPROVED: <i>[Signature]</i>		
SCALE: NTS	SHEET: 5 OF 5	