SECTION 16111D
UNDERGROUND DUCT, MANHOLES, HANDHOLES, AND PULLBOXES

A. GENERAL

1. Minimum size manhole shall be 6 feet wide by 10 feet long by 6 feet-6 inches high. Minimum size hand hole shall be 4 feet long by 4 feet wide by 4 feet high.
2. Maximum spacing between manholes or handholes is 400 feet.
3. Minimum size pullbox shall be 18 inches long by 12 inches wide by 12 inches deep. Pullboxes shall be made from fiberglass reinforced epoxy/concrete product, similar to products made by Quazite.
4. PVC duct shall be schedule 40, and be concrete encased with a minimum of 3 inches of concrete.
5. Minimum size duct for primary electric shall be 5 inch trade size.
6. Minimum size duct for telephone shall be 4 inch trade size.
7. For 1 1/2 and smaller ducts, PVC coated rigid galvanized steel conduit may be used. and shall be concrete encased unless an exception is given by the University Project Manager.

B. MATERIALS

1. Manholes: Precast manholes meeting AASHTO H20 loading requirements are preferred. Cast in place manholes acceptable where conditions warrant. Manholes shall be located and sized to allow workable pulling tension on cables and other consideration in planning.
   a. Each manhole shall include, but not be limited to the following:
      - Manhole cover and frame, minimum size 36 inches diameter.
      - Pulling irons.
      - Cable racks.
      - Support with locking clips.
      - Cable rack insulators.
      - Sump pit.
      - Solid bottom.
      - Grounding bus.
      - Ladder.
      - A 3/4 inch diameter x 10 feet driven copper-clad steel ground rod bonded to grounding bus with approved ground lugs, or exothermic weld.
   b. Covers shall be round, minimum 36-inch diameter, heavy duty with the word “ELECTRIC” or “TELEPHONE” cast in cover as applicable.
c. Pulling irons shall be hot-dipped galvanized forged steel and located opposite middle of each receptive entrance.
d. Cable racks:
   - Cable racks shall be hot-dipped galvanized steel.
   - Racks shall have support-T-slots spaced on 1-1/2 inch centers.
e. Supports:
   - Supports shall be hot-dipped galvanized steel.
   - Supports shall be T-shaped to mate with insulators.
   - Upturned end of supports shall restrain insulators.
   - Locking clips shall keep supports from disengaging if bumped from below.
f. Insulators:
   - Insulators shall be porcelain with rounded corners and edges.
   - Insulators shall slide and lock onto supports and have locking-type grooves.
g. Sump Pit: Each pit shall be minimum of twelve inches in diameter and shall extend into granular sub-base.
h. Solid Bottom: Bottom of manhole shall be placed over base consisting of crushed non-porous rock base or gravel. Maximum size shall not exceed 1-1/2 inches any dimension and minimum dimension of 4 sieve size.
i. Grounding Bus: A copper grounding bus shall be installed in each manhole for bonding all hardware cable sheaths and ground rod. Minimum size bus 1/4 inch thickness, 3 inches wide, 18 inches long.
j. Access shall be minimum 36 inches round frame equipped with movable steel galvanized ladder placed in each manhole.
k. Manhole ground rod shall be placed close to grounding bus all located for easy access to test.

C. INSTALLATION

1. Where entering a building, PVC ducts shall be converted to PVC coated rigid galvanized steel, five feet from the building wall or foundation.
2. Bends in PVC ducts may be made up to 10 degrees by hot forming method. Cold bends are not allowed. For bends exceeding 10 degrees, PVC coated rigid galvanized steel conduit shall be used. All 90 degree bends shall be made with PVC coated rigid galvanized steel conduit.
3. Where PVC ducts cross below heavily traveled roads, schedule 80 ducts, concrete encased shall be used.
4. Duct runs between manholes or other terminating points shall be as straight as possible, sloped to drain into manhole. All bends shall be sweep-bends and minimum curvature radius of 25 feet except at risers. Duct joints shall be staggered by row and layered to provide maximum duct strength. Ducts shall enter manhole or terminating point perpendicular to the manhole or
terminating point, and must be minimum of 10 feet straight from wall of termination point. All ducts entering a building must be sloped away from building.

5. Support: Duct banks shall be supported on full bed of concrete and shall not be supported on bricks, blocks, or rocks. Support for ducts shall be on approved spacers of pre-cast concrete, high impact polystyrene or high density polyethylene (not less than .96 specific gravity) minimum spacing of spacers to be five-foot intervals. Concrete shall encase the duct bank installation a minimum of three inches on all sides. Reinforcing rod tied to side stakes to ensure full concrete flow under ducts shall be specified. Concrete envelopes shall extend through foundation and manhole walls designed so that envelope becomes a structural member providing support for bridging the area which has been excavated and backfilled for foundation or manhole walls. Concrete envelope for duct banks shall be reinforced as shown on the drawings.

6. Final Preparation: Each duct shall be cleaned and proved clear by pulling full size test mandrel through duct. Each duct shall have a 200 pound test nylon pull rope left in place, and have duct plugs installed.

7. Color Additive: The primary duct concrete envelopes shall have red concrete additive mixed in concrete for identification, unless otherwise directed by the University Project Manager who may allow coloring to be distributed on top of wet duct bank concrete. Specify AC Horn Red “Colorundum” mix approximately three and one-half pounds (3-1/2 lbs.) per sack of cement to provide identifiable red color as warning to any one digging into high voltage cable run. In addition,

8. Provide a foil backed plastic caution tape along entire length of duct bank installed 12 inches above top of concrete envelope. One tape for every twelve inches of width of concrete. Tape shall be worded “CAUTION HV ELECTRIC” for electric, or “CAUTION TELEPHONE” for telephone.

END