

INTER-BUILDING CONDUIT & MANHOLE SYSTEM

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INTER-BUILDING CONDUIT AND MANHOLE SYSTEMS

PART 1 – GENERAL

A. RELATED DOCUMENTS & INSTRUCTIONS

1. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this section.
2. The Contractor shall be responsible for the complete installation of all necessary equipment, including all conduit, inner-duct, and manholes.
3. The Contractor shall have all equipment substitutions approved by the University's agent.
4. All work specified within this section falls under the responsibility of the Electrical Contractor.
5. **Note: A coordination meeting must take place between The Contractor, a representative from the Project Management Team and a representative from The University of Delaware's Network & System Services Department before any outside plant work as specified within this document begins. Also, a representative from The University of Delaware's Network & System Services Department must approve installation of the lower half of the manhole before the top section of any specified manhole is installed.**

B. SCOPE OF WORK

Provide and install a complete Inter-Building Conduit and Manhole System as indicated in drawings as follows:

1. MANHOLES

- a. MANHOLE #1 - Provide and install XXX (X) Rotondo Precast Inc. #MH6X8-7 manhole per contract drawings.
- b. Manholes shall be installed level on all sides to ensure proper drainage to the sump.
- c. MANHOLES INSTALLED IN GRASS LANDSCAPE AREAS - The top of installed manholes shall be 2" above existing grade in the area. A minimum installation of a 6" collar with lid is required. Provide 6" and 12" grade ring riser castings as required to elevate cover flush with finished grade. Grading from the top of the lid shall be accomplished by fanning topsoil away from the collar and lid at a 10" drop in grade over a 20 ft. radius of the lid itself.

- d. MANHOLES INSTALLED IN PAVED/ROADWAY AREAS -The top of installed manholes shall be flush with the existing grade in the area. A minimum installation of a 6" collar with lid is required. Provide 6" and 12" grade ring riser castings as required to elevate cover flush with finished grade.
- e. **All manholes and hand-holes shall be completely assembled and installed at the time of the initial installation of the manhole itself. As the manhole is set, all materials shall be immediately installed within the manhole including all racking equipment and materials, the ground rod, the ladder, grade-rings, and lid. All conduits installed shall be immediately sealed on both sides of the cores with hydraulic cement on both sides of the cores, and then sealed with the specified conduit plugs. All inner-ducts when installed shall be immediately cut off to proper length and secured with the specified organizer plugs. The immediate commencement of this work will ensure that when cable installation occurs, proper and safe entry into the manholes is provided, and all routing, splicing, and protection of the cables is not compromised. All specifics of the equipment and materials to be installed are defined within the following sections of this specification.**
- f. All manholes shall have standard manhole cable racks installed. There shall be four (4) racks installed on each of the 8 ft. walls. Each rack shall be mounted to the walls by way of two (2) manhole rack supports, so that the racks are offset from the walls. Each rack shall have two (2) cable rack hooks installed for cable routing and installation. All of the above hardware shall be secured by way of 1/2" galvanized hardware, using the manufacturer's provided pre-drilled anchor holes on all walls.
- g. **Before** the top half of the manhole is set in place, a 5/8" x 10 ft. Copperweld Ground Rod shall be driven thru the provided 3/4" hole in the bottom of the structures, until a minimum of 4"/maximum 6" of the rod is protruding into the manholes. The ground rod shall then be attached to the copper bonding ribbon by way of a #6 solid copper ground wire. Upon completion of the installation of the ground rod in the supplied hole in the bottom of the manhole, the opening shall be properly sealed with hydraulic cement.
- h. Provisions shall be made to install the manholes on a base of 6" of crushed stone or gravel.
- i. A standard/supplied gasket shall be installed around the entire perimeter of the manhole walls, between the top and bottom halves of the manhole.
- j. The grade rings of installed manholes shall be centered on the manhole opening, and mortared to the roof of the manhole around the entire perimeter and up to manhole lid ring. Internal diameter of grade rings to be not less than internal diameter of manhole cover ring. Mortar between each collar, if additional collars are required.

- k. The manhole cover/lid shall be bolted/anchored to the top of the installed grade ring with ½” galvanized hardware.
- l. The manhole cover/lid shall be physically designated as a “Communications” manhole, and be traffic rated.
- m. Provide and install one (1) manhole ladder in each manhole. The ladder to be installed shall be secured to the floor with concrete anchors. The top rung of the ladder shall be no further than 15” from the top of the lid/ring. Field coordination will identify the length Inwesco 3800 series ladder to be installed. Install Inwesco WB-7 wall brackets when only one (1) 6” grade ring is required. The University of Delaware Network & System Services will supply radii brackets when the ladder installation is done in the grade ring area.
- n. All 4” conduit entry into manholes shall be accomplished by way of core-boring 6” holes thru the concrete walls of the manholes to enable a tight and proper seal around all conduits.

2. **HANDHOLES**

- a. **HANDHOLE #1** - Provide and Install XX (X) pair/pairs of Strongwell Corp. Quazite #PG3660BA24 hand-holes (stacked) per contract drawings. Install one (1) Quazite #PG3660HA12 Heavy Duty Lid/Cover on top hand hole.
- b. Hand-holes shall be installed level on all sides to ensure proper drainage to the sump.
- c. Provisions shall be made to install the hand-holes on a base of 6” of crushed stone or gravel.
- d. **HANDHOLES INSTALLED IN GRASS LANDSCAPE AREAS-** The top of installed hand-holes (concrete envelope) shall be flush with the existing grade in the area. The grading from the edge of the concrete envelope shall be accomplished by fanning topsoil away from the concrete envelope at a 2” drop in grade over a 10 ft. radius of the lid itself.
- e. **HANDHOLES INSTALLED IN PAVED/ROADWAY AREAS-** The top of installed hand-holes (concrete envelope) shall be flush with the existing grade in the area.
- f. All hand-holes shall have standard cable racks installed. There shall be two (2) racks installed on each of the 60” walls. The cable racks shall be installed in 18” lengths, starting at the top of the hand-holes. Each rack shall be mounted to the walls by way of two (2) manhole rack supports, so that the racks are offset from the walls. Each rack shall have two (2) cable rack hooks installed for cable routing and installation. All of the above hardware shall be secured by way of ½” galvanized hardware. The manhole rack supports shall be thru-bolted thru the walls of the hand-holes.

- g. All Quazite hand-holes to be installed shall be installed as per Quazite Field Applications Instruction Sheet provided in drawing set, which defines an approximate 10" wide X 10" deep sloped concrete ring to be installed around the entire perimeter of the hand-hole itself, for additional support in the event of heavy loading from motor vehicles, tractors, mowers, and other similar equipment.
 - h. All hand-holes shall be installed as per all standard Strongwell Corp. Quazite Product Field Applications sheets, including #101 and #102, and Standard Box Installation Sheet #104.
 - i. All conduit entry into hand-holes shall be 4-1/2" accomplished utilizing a Greenlee Hydraulic Knockout Punch Driver of appropriate size, or a Greenlee carbide-Grit hole-saw (cat. No. 725-4-1/2) as per Quazite Field Applications Instruction Sheets for hand-holes. All conduits shall be terminated at hand-hole with Carlon 4" box adapter part #E996N on the interior and glued to a 4" PVC bell end of the conduit on the exterior.
 - j. The hand-hole cover/lid shall be physically designate the manhole as a "Communications" manhole, and be traffic rated.
3. **TRENCHING**
- a. All conduits shall terminate in the manholes at locations on each side determined by UD Network & Systems Services. Contract drawings shall include exact locations of each conduit entry.
 - b. The center of the conduit duct-bank between manholes shall be graded slightly down towards both manholes with a nominal grade of 3" per 100 ft.
 - c. The top of the ductbank shall be a minimum of 36" below grade.
 - d. There shall be 1" of granular select backfill on the bottom of the trench beneath the ductbank.
 - e. There shall be granular select backfill tamped between and around all ducts.
 - f. There shall be 12" of granular select backfill installed and tamped above the top row of ducts.
 - g. Backfill and restoration of the trench and around each manhole shall be accomplished by way of tamping of the backfill in maximum 12" lifts.
 - h. There shall be an orange warning tape placed approximately 24" above the ductbank, as a warning to personnel involved in future excavations, indicating that Communications cabling is buried below.

4. CONDUIT & INNERDUCT

- a. Install XX (X) new 4" schedule 40 conduits from newly installed Manhole #X to the Telecommunications Room XXX. Install four (4) 1" corrugated outside/underground rated innerducts with pull ropes into one of the new 4" conduits between Manhole #X and Manhole #XX.
- b. Install XX (X) new 4" schedule 40 conduits from newly installed Manhole #X to newly installed Manhole #X. Install four (4) 1" corrugated outside/underground rated innerducts with pull ropes into one of the new 4" conduits between Manhole #X and Manhole #X.
- c. The conduit ductbanks shall be installed with plastic spacer clamps installed every 8'. The plastic spacer clamps shall create a horizontal and vertical separation of 2" between each duct.
- d. All conduit splicing/interconnects shall first be cleaned with an approved PVC conduit cleaner around the entire circumference of the straight and bell sides of the conduit. All cleaned surfaces shall be completely "primed" with an approved PVC Purple Primer, then properly bonded together using approved PVC Cement, which shall also be applied around the entire circumference of the straight and bell sides of the conduit.
- e. Where transitional changes are required; for horizontal and vertical directions, use long field sweeping bends only. The bend radius for all 4" conduits shall be 48".
- f. All 4" conduit entry into manholes shall be accomplished by way of core-boring 6" holes thru the concrete walls of the manholes to enable a tight and proper seal around all conduits.
- g. All conduits shall be centered in the cored holes, and properly sealed with hydraulic cement upon installation on both sides of the manhole walls, so as to provide a complete fill of the surrounding cavity around each conduit and core.
- h. Upon completion of proper sealing of the 4" conduits in to the manholes, the conduits shall be cut off flush and even with the inside wall of the manhole. There shall be no protrusion of any conduit beyond the inside face of the manholes.
- i. All conduits entering buildings shall be cut off flush and even with the inside wall of the Telecommunications Room. There shall be no protrusion of any conduit beyond the inside face of the wall of the Telecommunications Room.
- j. All inner-ducts that are installed shall be cut off at a length of 4" beyond the exit of the installed conduits in all manholes, hand-holes, and at the building entrance.

- k. All hand-holes shall be installed as per all standard Strongwell Corp. Quazite Product Field Applications sheets, including #101 and #102, and Standard Box Installation Sheet #104.
- l. During installation, all core bored holes not occupied by conduits shall be plugged utilizing mechanical plugs, so as not to allow dirt or debris to enter the manhole during off-hours as a result of rain or any other means.
- m. After all conduits are installed in manholes, each shall have an appropriately sized mechanical plug installed. Temporary "Universal" plugs shall be installed into conduits at all times during construction. Permanent "Eye Nut" plugs shall be installed in all conduits at completion of the installation.
- n. All conduits scheduled for placement of four (4) 1" inner-ducts shall have inner-duct organizer plugs installed, at each end of conduit. All inner-ducts installed shall have individual 1" solid "Eye-Nut" inner-duct plugs installed.
- o. All spare conduits not scheduled for inner duct placement shall have one (1) $\frac{3}{4}$ ", 2500 pull capacity Polyester Muletape #WP2500P installed. One (1) of the spare conduits in each run shall have a 6-pair 24 awg copper telco cable installed for marking the conduits as part of the Miss Utility program.

PART 2 – PRODUCTS

A. MATERIALS AND EQUIPMENT

- 1. All materials and equipment supplied shall be new and shall meet or exceed the latest published specifications of the manufacturer in all respects, and shall be UL approved. The contractor shall supply the latest model available at the time of bidding each piece of equipment.
- 2. Equipment shall include, but may not necessarily be limited to, to the following:
 - a. MANHOLE – Rotondo Precast #MH6X8-7/PCS-687 standard manhole (two-piece design) with knockout windows, sump, ground rod hole, pulling irons, ladder, and cable racks. Install standard 6" H collar for manhole frame and solid lid placement. Install Rotondo Precast #MAL-38 Heavy Duty Manhole Frame and Solid Lid, which shall be physically labeled/designated as a "Communications" manhole. Install Rotondo Precast #7R manhole ladder in each manhole (height 7 ft. 4 in.).
 - b. MANHOLE – Rotondo Precast #MH6X12-7/PCS-6127 standard manhole (two-piece design) with knockout windows, sump, ground rod hole, pulling irons, ladder, and cable racks. Install standard 6" H collar for manhole frame and sold lid placement. Install Rotondo Precast #MAL-38 Heavy Duty Manhole Frame and

Sold Lid, which shall be physically labeled/designated as a “Communications” manhole. Install Rotondo Precast #7R manhole ladder in each manhole (7 ft. 4 in.).

- c. MANHOLE LADDER- Inwesco 3800 series galvanized ladder- Specify I-3800- (length). Field verify for height before ordering, top rung of ladder shall be 15” from top of lid/ring. Brackets for ladder utilize WB7-wall brackets. If ladder projects into grade ring area of manhole UD/NSS will supply brackets.
- d. MANHOLE RACKS – Inwesco Inc. #10A14, 47-3/4” Racks.
- e. MANHOLE RACK SUPPORTS – Inwesco Inc. #10A40 Supports.
- f. MANHOLE RACK HOOKS – Inwesco Inc. #10A36 Rack Hooks.
- g. MANHOLE RACK MOUNTING GALVANIZED HARDWARE – ½” X 2” Hex-Head Cap-screws (#13 UNC Threads), ½” washers supplied on ALL Hex-Head Cap-screws, ½” Nuts, ½” Heavy Duty Concrete Expansion Anchor (#13 UNC Threads).
- h. HANDHOLES – Strongwell Corp., Quazite Products #PG3660BA24, 36”W x 60”L x 24”D, composite, stackable handholes. Utilize Strongwell Corp. Quazite #PG3660HA12 Heavy Duty Lid/Covers.
- i. HANDHOLE RACK SUPPORTS- Quazite cable rack & rack hooks (hooks part #80905)
- j. HANDHOLE CONDUIT TERMINATOR-Carlson 4” Box Adapter part #E996N with 4-1/2” drilled/punched hole.
- k. CONDUIT – Standard 4” Schedule 40 PVC Conduit with plastic spacer clamp separators installed. All spare conduits not scheduled for innerduct placement shall have one (1) ¾”, 2500 pull capacity Polyester Muletape #WP2500P installed.
- l. INNERDUCT – (1”) – ENDOT Industries #ICE-105-22-21-02, Standard, corrugated, high-density polyethylene, outside/underground rated 1” inner-ducts, color orange, with individual pull-ropes installed.
- m. INNERDUCT - (1.25”) – ENDOT Industries #ICE-125-22-21-02, Standard, corrugated, high-density polyethylene, outside/underground rated 1.25” innerducts, color orange, with individual pull-ropes installed.
- n. PVC CONDUIT CLEANER, PRIMER, CEMENT – Approved PVC conduit cleaning agent, priming agent, and cement agent.
- o. UNIVERSAL DUCT PLUG – Tyco (Jackmoon) Inc. #DPGS140-1
- p. PERMANENT EYE-NUT DUCT PLUG, 4”– Condux Inc. #8067840

- q. INNERDUCT ORGANIZER PLUG for three (3) 1-1/4" Innerduct installation Tyco (Jackmoon) Inc. #DPJM40B167S
- r. INNERDUCT ORGANIZER PLUG for four (4) 1" Innerduct installation – Tyco (Jackmoon) Inc. #DPJM40Q142S
- s. PERMANENT EYE-NUT DUCT PLUG, 1-1/4" – Condux Inc. #8067812.
- t. PERMANENT EYE-NUT DUCT PLUG, 1" – Condux Inc. #8067811.

PART 3 – EXECUTION

A. INSTALLATION PRACTICES

- 1. Installation shall include delivery, unloading, setting in place, coring through walls or other structures where required. Installation shall be performed in accordance with applicable standards, codes, requirements and recommendations of National, State and Local authorities having jurisdiction, the N.E.C. and OSHA.
- 2. All equipment, etc., shall be firmly installed, plumb and square.
- 3. All conduits should be left clean, dry and free of debris or other obstructions.
- 4. At completion of manhole and conduit installation, the manhole shall be left dry and clean of dirt, mortar, concrete, and other debris.
- 5. In areas where the exterior finish of walls is disturbed, the Contractor shall repair and refinish damaged areas so as to restore the area to its original condition.
- 6. Upon the completion of the project, the trenched area should be properly graded and seeded, so as to restore the area to its original condition. All site restoration, as well as asphalt or concrete restoration if applicable, shall be performed as per University of Delaware Facilities Management Grounds Department, and City of Newark Specifications.
- 7. The University of Delaware shall be provided with "As-Built" drawings of the system upon completion of the project.

-- END OF SECTION --