

SECTION 25140
EXTERIOR PATHWAYS

PART 1 - GENERAL

1.1 SUMMARY

A. SCOPE

1. Minimum composition requirements and/or installation methods for the following materials and work are included in this section:
 - a) Trenching and Excavation
 - b) Underground Duct
 - c) Innerduct
 - d) Aerial Installations
 - e) Manholes, Vaults and Handholes

B. SUBMITTALS

1. Product data for:
 - a) Precast manholes, handholes
 - b) Ductbank materials
 - c) Aerial hardware

1.2 QUALITY ASSURANCE

- A. The contractor shall engage the services of a qualified installer for all excavation and concrete work.
- B. All work shall be done in a neat and workmanlike manner. All methods of construction, details of workmanship, that are not specifically described or indicated in the contract documents, shall be subject to the control and approval by the Network & Telecommunications Department. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.
- C. Materials and work specified herein shall comply with the applicable requirements of:
 1. The following Articles of the National Electric Code (NFPA 70)
 - a) 343 - Nonmetallic underground conduit with conductors
 - b) 346 – Rigid metal conduit
 - c) 347 – Rigid nonmetallic conduit
 2. The following National Electrical Manufacturers Association (NEMA) Standards

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- a) NEMA, RN1, 1998 PVC Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
 - b) NEMA, TC3, 1999 PVC fittings for use with Rigid PVC Conduit and tubing
 - c) NEMA. TC 6. 1999 PVC and ABS Plastic Utilities Duct for Underground Installation
 - d) NEMA, TC8, 1999 Extra strength PVC Plastic Utilities Duct for Underground Installation
 - e) NEMA, TC9, 1999 Fittings for ABS and OVC Plastic Utilities Duct and Fittings for Underground Installation
 - f) NEMA, TC 10, 1999 PVC and ABS Plastic Communications Duct and Fittings for Underground Installation
3. The following American National Standards Institute (ANSI) standards:
 - a) ANSI-C80.2 Specification for Rigid Steel Conduit, Enameled
 4. The following Telecommunications Industry Association (TIA):
 - a) ANSI/TIA/EIA – 568-B Commercial Building Telecommunications Cabling Standard
 - b) ANSI/TIA/EIA – 569-A Commercial Building Standard for Telecommunications Pathway and Spaces
 - c) EIA/TIA-606-A Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
 - d) EIA/TIA-607 Commercial Building Grounding and Bonding requirements for Telecommunications
 5. The following BICSI guidelines
 - a) BICSI Telecommunications Distribution Design Manual (9th edition)
 - b) BICSI Customer Owned Outside Plant Design Manual (2nd edition)
 - c) BICSI Telecommunications Cabling Installation Manual (2nd edition)
 6. The following U.L. Standards:
 - a) U.L. 6, 2000 Rigid Metal Electrical Conduit
 - b) U.L. 651, 1995 Schedule 40 and 80 PVC Conduit

1.3 PROJECT CONDITIONS

- A. The following conditions apply to excavation:
 1. Identify maintain and protect existing building services which cross the excavation area.
 2. Protect utilities, sidewalks, structures, pavements and other facilities from damage caused by settling, lateral movements, undermining, washouts and other hazards created by excavation work.

3. Locate and verify existing underground utilities in excavation areas. If utilities are indicated to remain, support and protect services during excavation operations.
4. Verify subsurface conditions prior to excavation work.

PART 2 - PRODUCTS

2.1 TRENCHING AND EXCAVATION FILL

- A. Sand: Clean, coarse, and free of organic matter.
- B. Crushed Stone: Crushed stone or gravel, washed, graded, free of organic materials, 1 in. to No. 4 size. Graduation per ASTM C33, Table II, Size 57, as follows:

<u>Sieve No.</u>	PERCENT PASSING	
	<u>Maximum</u>	<u>Minimum</u>
1-1/2 in		100
1 in	100	95
1/2 in	60	25
#4	10	0
#8	5	0

- C. Gravel Fill: Well-graded natural inorganic sand and gravel conforming to following graduations:

<u>Sieve No.</u>	PERCENT PASSING	
	<u>Maximum</u>	<u>Minimum</u>
4 in		100
1 in	100	60
#4	85	25
#16	60	10
#50	30	4
#200	5	0

- D. Pea Gravel: Rounded stone, 3/4 in. maximum diameter, and 1/8 in. minimum diameter. Stone crushings of 1/8 in. to 1/2 in. meeting ASTM C33, Paragraph 9.1 may also be used.
- E. Ordinary Fill: Well-graded, natural inorganic soil, meeting the following requirements:
 1. Free of organic and other compressible materials, debris and frozen materials, and of stones larger than 4 in. maximum dimension.
 2. Be of such nature and character that it can be compacted to the specified densities.
 3. Free of highly plastic clays, of materials subject to decay, decomposition, or dissolution, and of cinders, ash and other corrosive materials.

4. Maximum dry density of not less than 115 lbs. per cu. ft.
5. Material from excavation on the site may be used as ordinary fill if it meets the above requirements.

2.2 MANHOLES, VAULTS AND HANDHOLES

- A. Provide pre-cast or cast-in-place reinforced concrete designed for H-20 loading.
- B. Shall have angled corners, cut on 45 degrees for optimum cable racking.
- C. Covers and frames shall be cast iron, with a minimum opening of 27" suitable for H-20 loading. Covers shall have open pick holes and have "Telephone", "Communications", "Signal" or "CATV" cast in 2" high lettering on the cover, per Network & Telecommunication Department directive.
- D. Floors shall be 6 inches thick with a 12" diameter sump hole. In wet soil, reinforced floor with 5/8" bars, 8 inches on center.
- E. Adjust frame to grade by providing a minimum two courses of bricks with all joints fully filled with mortar both inside and outside the collar. Provide layer of mortar on top course for bricks.
- F. Provide cable racks with "T" slots for attaching support hooks. Provide two per wall.
- G. Provide pulling irons on each wall 12" below duct.

2.3 DUCTBANKS

- A. Ductbanks shall have 4" diameter PVC ducts.
- B. Concrete for encapsulating ducts shall be 3/8" aggregate with a nominal compressive strength of 3000 pounds per square inch.
- C. Provide a minimum of four #5 continuous reinforcement bars the entire length of the ductbank.
- D. Concrete shall be 3" thick at the top, bottom and sides of ducts.
- E. Where ductbanks penetrate foundation, footings or outside walls, rigid metallic conduits with expandable rubber shields shall be used.
- F. Provide a 6" wide warning marker tape above duct 18" below grade.

2.4 INNERDUCT

- A. Shall be 1" or 1 1/4" in diameter as called for on the drawings.
- B. Shall be orange in color.
- C. Acceptable Manufacturers:
 1. .

2.5 AERIAL INSTALLATIONS

- A. Messenger Strand System
 1. Provide 3/16" diameter 7-wire galvanized "6M" steel messenger strand as noted on the drawings. Messenger strand to be manufactured to ASTM A475 specifications and be accepted by both REA and Bell Telephone

standards. Strand to be at least a utilities grade, have a minimum breaking strength of 5,500 pounds, have a left lay and have at least an "A" rated galvanized coating weight.

2. Strand Attachments:
 - a) Provide and install the appropriate S guy bolts, B beam clamps, wall straps, brackets, etc., as necessary to adequately support the strand as typically indicated.
 - b) S guy bolts (or commonly called anchor rods or thimbleye bolts) shall be a minimum 5/8" diameter with a straight shank and be designed for attaching messenger strand deadends. The bolt length shall be at least 4" longer than the width of the structural steel flange it will be attached to.
 - c) B beam clamps, or approved equivalent, shall be designed to be used for dead-ending strand on the flange of structural steel members (columns and beams). B beam clamp shall be designed to be used with a 5/8" S guy bolt.
3. Strand Connectors:
 - a) Provide and install all B strand connectors, suspension/cable clamps, grounding tap clamps, hangers, 1-bolt and 3-bolt clamps to adequately support the strand as typically indicated
 - b) For strand runs in excess of 15' between structural columns, additional 1/2" rod supports and appropriate strand clamps (either 3-hole clamps or Kindorf C-708 supports) shall be provided and installed on minimum 25' centers, per the project manager's direction.
4. Strand Cable Rings:
 - a) Provide and install cable rings, or equivalent, to all strand runs after strand is installed. Rings shall be spaced on maximum 16" centers with the latching ring oriented in the same direction. Ring size required for each strand run shall be identified on the drawings.

PART 3 - EXECUTION

3.1 EXCAVATION AND TRENCHING

A. Preparatory Work

1. Build lines to grade and elevations shown. Provide stakes, grade boards, cleats, nails, instruments. Locate and stake each new run for its entire length. Verify elevations given. Start excavation at low point. Notify Engineer of elevation discrepancies. Protect marks and stations. Before excavating work, coordinate with Network & Telecommunication department. Furnish schedule of operations to Network & Telecommunication department. Provide and maintain temporary bridges, walks and bridges over excavations where underground utility lines, sewers, water lines, etc., cross access roads, walks, and streets.

Make necessary arrangement with authorities having jurisdiction. Provide the services of a Licensed Surveyor for layout of the following: WRITE SPECIAL

2. Examine substrates, areas and conditions, with the installer present, for compliance with requirements for installation tolerances and other conditions affecting installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Protection

1. Provide bracing, shoring, sheathing and other work for: protection of personnel, the contract work, excavations, trees, shrubs, existing structures, and surrounding properties. Slope sides of excavations to comply with local codes and ordinances. Provide, erect, and maintain barricades, warning signs, flags, and lights to provide protection for work, workmen, public, and property. Plank walks, pavements, and curbs to be crossed by equipment. Protect adjacent property, existing fences, trees, shrubs, roads, curbs, sidewalks, manholes, hydrants, and other items:
2. Restore, repair, rebuild or replace any such items damaged or destroyed to condition equal to that existing before such damage occurred.
3. Establish conditions, before starting work, by taking photographs to determine state to which existing conditions must be restored. Submit such photographs notarized, identified and dated for record.

C. Existing Utilities

1. Every attempt has been made to indicate existing utilities as accurately as possible from existing drawings, surveys, and data. Report immediately other utility lines encountered, but not shown on the drawings. Notify New York State Underground Facilities Protection Organization (UFPO), where same exists, before starting work. Phone **1-800-962-7962** for information and location of nearest organization address and telephone number. Verify exact location of existing utility lines where work crosses existing utilities and where connections are to be made by test hole before starting work. Notify utility companies, municipalities, Rensselaer Polytechnic Institute organizations, and other involved jurisdictions when excavation occurs within vicinity of existing underground service such as sewers, water, electric, gas, telephone, including such services owned by Rensselaer Polytechnic Institute. If existing service lines, utilities and utility structures which are to remain in service are uncovered or encountered during this excavation, they shall be protected from damage, and securely supported as directed and approved by the involved jurisdiction. Comply with Section 753 of Penal Law of New York with regard to work in vicinity of combustible gas piping. Immediately report damage or injury to utility lines to Fire Department, Police Department and appropriate utility company (e.g. NIMO). Repair or replace utility lines damaged or injured as directed and approved by the involved jurisdiction. Excavate by hand in proximity to existing underground utility lines; take extreme care when excavating around ductbanks carrying energized cable. Remove plug or cap inactive or abandoned utilities

encountered during construction operations. The location of such utilities shall be noted on the record drawings. Verify "inactivity" of services with involved jurisdiction before start of work.

- D. Cutting and Patching
1. Before starting work, obtain necessary permits and pay fees and charges for same. Cut paved areas as called for, perpendicular to surface and in straight saw-cut lines. Replace pavements, roadways, streets, blacktop areas, walks, disturbed by excavating operations with materials equal to adjacent pavements.
- E. Methods
1. Provide for buried work in contract both inside and outside of building. Excavate to proper depth and width for installation work as called for and comply with rules set forth by << State>> Department of Labor. Remove materials including masonry work, rubble, earth, brickwork, concrete, sand, debris, abandoned pipe lines, drains and sewers, rocks, boulders, and concrete, all of which is considered "earth excavation." Provide for legal disposition of excess excavated materials. Make allowance for gravel fill, sand bases, form work, floor slabs, manholes, anchor and thrust blocks, sheet piling, drainage pumps, and work space. Start excavation at rough grade and provide form work and sheet piling where required.
 2. Trench excavation:
 - a) By open cut, to proper depth and grade no wider than required for placement of work and not more than 100 ft. in advance of utility being installed.
 - b) Should trench bottom be wet, unstable, and/or otherwise incapable of supporting the contract work, immediately report it to Network & Telecommunication Department Representative. Should it be deemed unsuitable, excavate to depth as directed and back fill with gravel to trench depth, or provide concrete cradling.
 - c) Should rock be encountered, excavate 6 in. deeper and fill space between trench bottom and pipe with coarse sand, well tamped to form firm bed.
- F. Shoring, bracing, sheathing:
1. In addition to governing codes, protect sides of excavations with sheeting and bracing where necessary to prevent sliding or caving of banks and to protect adjacent structures. Remove as back fill is placed.
 2. Provide at locations adjacent to existing manholes, hydrants, and similar items.
- G. General excavation:

1. As required for all buried work. This shall include, but not be limited to, piping, tanks, ductbanks, conduits, footings, manholes, anchors, concrete pads, thrust blocks, fixture bases, and other work in contract.

H. Backfill

1. Provide bedding around piping with coarse sand from 6 in. below to 8 in. above. Apply by hand and compact under and at sides by mechanical means
2. Piping, jackets and sand bed must be inspected and tested prior to backfill of any nature. Provide necessary anchors, thrust blocks, for testing.
3. Fill remainder of trench in 12 in. layers, use ordinary fill material, except as otherwise specified. Do not use frozen material. Remove boulders, stones, broken rock, wood, bricks, blocks, and debris from fill material before backfill operation.
4. Under roadways, manholes, drives, parking areas, walks, slabs, on grade and at utility entrance to building provide backfill in 6 in. layers with gravel or crushed stone, free from organic or other unsuitable material, to grade. Thoroughly compact each layer.
5. Compaction to not less than 95% density compared to maximum laboratory tests by weight, per modified ASTM D1557-64T, latest editions, method "A" under slab on grade, roadways, drives, and other paved areas and 85% for general grading. Submit certified results of tests by an approved soil testing laboratory.

I. Removal of water

1. Provide pumps, hoses, pipe, labor and fuel, necessary to keep excavations free of water accumulation. Maintain and operate equipment. Discharge water in manner not interfering with any trade's work and not to undermine or disturb existing or adjacent structures or land. Grade to prevent surface water from flowing into all excavations and trenches. Do not discharge dirt, backfill, debris, into sanitary or storm drainage systems.

J. Rock Excavation

1. Rock Excavation defined as:
 - a) Ledge rock requiring blasting or air hammer for removal.
 - b) Boulders in excess of 1-1/2 cu. yds. in size. Demonstrate that material in question cannot be removed with a 1-1/2 yd. backhoe or shovel.
 - c) Procedure: Should rock be encountered, remove only upon written order of the Network & Telecommunication Departments representative.
2. Measurement of rock excavation, for purpose of payment to Contractor, will be taken 1 ft. wider than ductbank, manhole, pipe or conduit being installed. No allowance made for additional rock taken out accidentally or

for convenience of Contractor beyond amount required for installation of work. Rock excavation claimed must be measured each day and verified by Network & Telecommunication Departments Representative. Maintain daily accounting. No claim for extra compensation honored except through procedures outlined above.

a) Blasting: NOT ON CAMPUS

K. Job completion

1. On completion of the work, clean the entire site; remove surplus earth, large stones and debris, to off-site legal disposal. Remove tools and equipment and leave the entire area in a neat condition.
2. Rough grade to 6 in. below finished grade. Scarify subsoil to depth of 2 In. to achieve bond between topsoil and subsoil.
3. Repave, reseed and completely restore the area to the condition prior to the start of excavation and trenching work

I<<Additional Customer specific restoration requirements, such as seed mix, straw, run-off, catch-basin cleaning of run-off material, settling, periodic watering, racking of stone, top-soil mix, who performs first few cuttings, etc. >>

3.2 MANHOLES, VAULTS AND HANDHOLES

- A. Locate to avoid unnecessary hazards and cause minimum interference with normal traffic flow. Locate outside traveled parts of road wherever possible.
- B. Seal all conduits watertight after conduits or ductbanks are complete.
- C. Coordinate the installation with the Division 16 contractor's work.

3.3 DUCTBANKS

- A. Where ductbanks enter manholes they shall be centered as nearly as possible to the center between roof and floor and end walls.
- B. Where possible, the trench walls shall act as forms for concrete encasement. Provide wood forms where soil conditions require it.
- C. Securely tie raceways in place to prevent floating.
- D. Clean raceway to remove any concrete, dirt or other obstructions, by drawing cylindrical brushes through duct [with prior approval from the Network & Telecommunication Department].
- E. Provide metallic elbows where conduits rise out of ground.
- F. Seal all conduits watertight prior to pour.
- G. Provide bushings or bell ends at each conduit termination.

3.4 AERIAL INSTALLATION

- A. Fasten cable messenger strand to buildings and poles using galvanized steel wall straps, suspension clamps, etc.

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- B. Use an approved cable guide and lashing device to secure the cable to messenger strand.
- C. Clamp cable to exterior of building with approved galvanized steel cable clamps.

END OF SECTION