

## **SECTION 27 14 00 - EXTERIOR PATHWAYS**

### **PART 1 - GENERAL**

#### **1.1 WORK INCLUDED**

- A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents.

#### **1.2 SCOPE**

- A. Minimum composition requirements and/or installation methods for the following materials and work are included in this section:
  - 1. Trenching and Excavation
  - 2. Underground Duct
  - 3. Manholes, Vaults and Handholes

#### **1.3 SUBMITTALS**

- A. Product data for:
  - 1. Precast manholes, handholes.
  - 2. Underground duct

#### **1.4 QUALITY ASSURANCE**

- A. The installation shall comply with the applicable sections of the BICSI "Customer Outside Plant Design Manual."
- B. The contractor shall engage the services of a qualified installer for all excavation and restoration work.
- C. 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 of the Owner's Representative. 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.

#### **1.5 PROJECT CONDITIONS AND REQUIREMENTS**

- A. The following conditions apply to excavation:
  - 1. Identify and 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.
- B. Obtain as built drawings from the owner for all previous underground work done on the campus. Field verify location of the existing underground utilities and cabling that is shown on these plans. Use tracing equipment as required.
- C. The contractor shall be responsible for the repair all existing utilities that are identified on existing as built drawings or construction documents that are damaged during the installation of contract work.
- D. The contractor shall sub contract a qualified mechanical or plumbing contractor to repair any underground piping that is damaged as a result of the installation of contract work.

## PART 2 - PRODUCTS

### 2.1 TRENCHING AND EXCAVATION FILL

- A. Sand: Clean, coarse, 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>		<u>Percent Passing</u>	
		<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>		<u>Percent Passing</u>	
		<u>Maximum</u>	<u>Minimum</u>
4 in.	---	100	
1 in.	100	60	
#4	85	25	
#16	60	10	
#50	30	4	
#200	5	---	

- 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 pick holes and have "Communications"," cast in 2" high lettering on the cover.
- D. Floors shall be 6 inches thick with a 12" diameter sump hole. In wet soil, provide reinforced floor with 5/8" bars, 8 inches on center.
- E. Provide 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.
- H. Refer to details on drawings for additional information.
- I. Acceptable Manufacturers: Lakelands Precast or approved equal.

## **2.3 EXTERIOR EXPOSED DUCT**

- A. External conduits shall be provided in 10 ft. straight lengths with factory installed reverse spin coupling for easy assembly without turning outer shell. Reverse spin coupling shall have 3 set screws to prevent coupling from backing off, before or after installation. Conduit shall be Galvanized Steel Raceway. See 16110 for GRS conduit spec.

- B. Conduit shall have (3) 1-1/4" I.D. innerducts that are factory installed. 3-cell innerduct color scheme shall be white, grey, grey.
- C. Innerducts shall be pre-lubricated to meet Bellcore GR356-CORE coefficient of friction requirements. Innerduct assembly alignment shall be maintained by internal spacers.
- D. Coupling body shall have an O-ring gasket to provide resistance to pull out and a water-tight seal. Coupling body shall have inward tapering holes for easy innerduct alignment. Coupling body shall have integrally molded, readily visible alignment marker.
- E. Provide deflection joint to allow 3/4" movement in all axis, and a total bend of up to 30 degrees. Provide fixed galvanized steel bends or flexible metal conduit bends to allow changes in direction. Fixed or flexible bends shall be provided with factory installed reverse spin coupling. Fixed or flexible bends shall have Nylon 6 innerduct to prevent "burn through" due to friction when tapes, ropes, or cables are installed.
- F. Design Make: Carlon Multi-Cell Galvanized Steel Raceway System

## **2.4 DIRECT BURIED UNDERGROUND DUCT**

- A. Rigid Non-Metallic PVC Conduit with Pre-lubricated innerducts for a very low coefficient of friction. Provide (3) 1 1/4" I.D. ducts.
- B. PVC innerducts shall expand and contract at the same rate as outerduct.
- C. Heavy wall conduit: Schedule 80, constructed of polyvinyl chloride UL listed for direct burial and normal above ground use.
- D. Anti-reversing gaskets on coupling body for easy joining.
- E. Complete assembly shall be Jettable using high speed air blowing systems.
- F. O-ring gasket at base of coupling bell for water proofing.
- G. Inward tapering holes on coupling body innerduct alignment.
- H. Terminators for standard, pull-through, and jet-through applications as required.
- I. Provide Standard and slip sleeve couplings for field cuts and repairs.
- J. Provide Termination kits for sealing inner and outerducts with innerduct sealing plugs with rope tie. Standard terminators for end terminations, pass-through (jet-through) terminators allow bridging innerducts across a vault to allow for unassisted pulling (or jetting) of cable through the vault. Box terminators for end terminations into aboveground cabinets.
- K. Provide a 6" wide marker tape above duct 18" below grade.
- L. Design Make: Carlon "Multi-Gard PVC"

## **PART 3 - EXECUTION**

### **3.1 RIGHTS-OF-WAY**

- A. The contractor shall be responsible for coordinating and filing all right of way permits for road crossing. Coordinate with the Town of Greece Highway department.

### **3.2 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 Owner's Site Representative and other trades. furnish schedule of operations to Owner and each trade. 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.
  - 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. There may be existing underground electric and telephone utilities. Obtain the existing site survey plans prior to beginning work. Identify utilities shown on the plans.

2. Report immediately any utility lines encountered.
3. Notify Underground Facilities Protection Organization (UFPO), where same exists, before starting work. 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, 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 Owner. 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 1918 of Penal Law of State of New York with regard to work in vicinity of combustible gas piping. Immediately report damage or injury to utility lines to Owner's Representative and involved jurisdiction. 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 New York 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 same to Owner' 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. 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.

H. 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.

I. 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 owners 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 Owner's Representative. Maintain daily accounting. No claim for extra compensation honored except through procedures outlined above.
  - a) Blasting:
    - (1) Should rock be encountered which cannot be removed with a 3/4 cu. yd. capacity power shovel without drilling and blasting, blasting shall be done by a licensed Contractor. Work shall be accomplished entirely at the Contractor's risk and he shall accept liability for resultant damage. The transportation, handling, storage, and the use of explosives shall be performed in accordance with the provisions of local and state laws and authorities having jurisdiction, and in accordance with ANSI A10.2.

J. 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

**3.3 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.
- E. Where possible conduits entering manholes shall be splayed. Use center conduit entrances only where splaying is not possible. Refer to table 3-27 of the BICSI



"Customer Outside Plant Design Manual." for options. Use the first choice wherever possible.

- F. Seal all conduits watertight after conduits or ductbanks are complete.

### **3.4 UNDERGROUND DUCTBANKS**

- A. Ductbanks shall have 4" diameter multi cell conduits. Encase all underground raceways on the campus in concrete envelopes. Form concrete envelope around raceways, 3" minimum thickness concrete at top, bottom and sides of raceways, conduits on 7-1/2" centers both directions with concrete between raceways. Top of concrete envelope shall be finished not less than 24" below finished grade, except where under building slabs. Open trench for its complete length before concrete is poured; if any obstructions are encountered, make provisions to avoid them. Support raceways minimum 3" above bottom of trench before pouring. Furnish and install precast concrete, plastic or fiber spacers. Stagger couplings.
- 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.
- E. Where ductbanks penetrate foundation, footings or outside walls, rigid metallic conduits with expandable rubber shields shall be used.
- F. Where ducts enter manholes they shall be centered as nearly as possible to the center between roof and floor and end walls.
- G. Where possible, the trench walls shall act as forms for concrete encasement. Provide wood forms where soil conditions require it.
- H. Securely tie raceways in place to prevent floating.
- I. Pull iron-shod mandrel not more than 1/4" smaller than bore of raceway to remove concrete and other obstructions. Clean raceway by drawing cylindrical brushes through duct.
- J. Provide metallic elbows where conduits rise out of ground.
- K. Provide nylon pull strings in all cells of multi cell raceway.
- L. Seal all conduits watertight prior to pour.
- M. Provide bushings at each conduit termination.
- N. In locations where non-metallic raceways are used, change to heavy wall metallic conduit of same internal diameter before rising out of ground; provide metallic conduit elbows at conduit rise.
- O. Carry concrete envelope to a point 12 inches minimum above grade or floor slab

at rise point if allowed by site conditions and equipment to be installed. Slope top of concrete away from raceway, chamfer edges. Where raceways rise above grade and terminate in building, provide conduit sealing bushing on each raceway.

- P. Place conduit in straight lines. Seal, completely waterproof, all duct joints, then complete concrete encasement. Place direct-bury conduit tier-by-tier method, backfilling each layer to achieve proper spacing. Elbows shall have a minimum radius of 42 in. Follow proper low temperature installation procedures as recommended by PVC conduit vendor. Repair or replace all existing utilities and facilities damaged, due to ductbank installation, as part of contract.
- Q. Provide a bushing at each conduit termination unless fitting at box where conduit terminates has hubs designed in such a manner to afford equivalent protection to conductors. Provide grounding type insulated bushings on all conduit sizes 1-1/4" trade size and larger, and on all feeder raceways regardless of size.

**END OF SECTION**