

SECTION 02225

EXCAVATING, BACKFILLING AND COMPACTING FOR UTILITIES

PART 1. GENERAL

1.01 SECTION INCLUDES

- A. Excavate trenches for sanitary sewers and force mains, laterals to two (2) feet on property, manhole excavation, and for appurtenances as required.
- B. Compacted bedding under pipe.
- C. Backfilling and compaction of sanitary sewers and force mains, laterals, manholes, and related appurtenances.

1.02 RELATED SECTIONS

- A. Section 01010 - Summary of Work
- B. Section 01300 - Submittals
- C. Section 01400 - Quality Control: Testing Fill Compaction
- D. Section 01500 - Construction Facilities and Temporary Controls: Water Control in Excavations
- E. Section 02270 - Erosion Control
- F. Section 02600 - Utility Piping for Sanitary Sewers
- G. Section 02605 - Manholes
- H. Section 03300 - Cast-in-Place Concrete
- I. Section 11306 - Pump Stations
- J. Appendix A - Standard and Special Construction Detailed Drawings

1.03 REFERENCES

- A. Pennsylvania Department of Transportation Publication 408, Latest Edition
 - 1. Section 703.2, Coarse Aggregate
 - 2. Section 703.3, Select Granular Material (2A)
- B. Pennsylvania Code, Title 67, Chapter 459, Occupancy of Highways by Utilities, Latest Edition
- C. Erosion and Sedimentation Pollution Control Plan Narrative
- D. ANSI/ASTM D-698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb. (2.49 kg) Rammer and 12 inch (304.8mm) Drop.

- E. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T-99, Moisture-Density Relations of Soils, Using 5.5 lb Rammer and a 12 inch Drop.
 - 2. AASHTO T-191, Standard Method of Test for Density of Soil In-Place by the sand cone method.
- F. American Society for Testing and Materials:
 - 1. ASTM D-2321, Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.
- G. OSHA excavation standards shall apply to this contract. The Occupational Safety and Health Administration (OSHA) has amended its Construction Standards for Excavation, 29 CFR, Part 1926, Subpart P.
- H. The existing standards regulate the use of support systems, sloping and trenching systems and other systems of protection against excavation cave-ins. In addition, the standards regulate the means of access to and egress from excavations, employee exposure to vehicular traffic, falling loads, hazardous atmosphere, water accumulation and unstable structures in and adjacent to excavations.
- I. References to Registered Professional Engineer in OSHA specifications shall mean an Engineer employed or retained by the Contractor and does not apply to the Authority's Engineer.

1.04 SUBMITTALS

- A. Submit under provisions of Section 01300, Sources of Supply for Backfill Materials.

1.05 TRENCHING REGULATIONS

- A. In open trenching or boring on State and Township highways, the Contractor shall be governed by the conditions, restrictions, and regulations made by the Pennsylvania Department of Transportation and Township Supervisors. All such regulations shall be considered part, as if included, plus Section 02151.
- B. The Contractor shall be responsible at all times for carrying out all excavation operations in a safe and prudent manner to protect all workmen and the public from unreasonable hazard. The necessary sheeting and bracing should be determined in accordance with the field conditions encountered. All applicable OSHA requirements must be strictly adhered to.

1.06 EXCAVATION

- A. Normally, all excavation shall be unclassified.
- B. When rock excavation is classified, pay widths for trenches is shown on Standard Detail Drawing Nos. 15 and 17.

1.07 BLASTING

- A. Blasting, if required, shall be permitted only with the written authorization of the Authority. The

Contractor shall submit to the Authority his blasting plan of operation at least two (2) working days in advance of intended implementation. Blasting operations shall be performed in conformance with all applicable local and state laws, municipal ordinances and OSHA specifications. The Contractor shall use mats for all blasting work. Blasting operations shall be conducted only during the hours approved by the Authority. The Blaster shall be licensed in the State of Pennsylvania to perform such work.

- B. The Contractor shall conduct all rock excavation operations, including blasting, in a manner which will avoid damage to structures, properties, and utilities. Any damages resulting from rock excavation operations, including blasting, shall be remedied by the Contractor at no expense to the Authority. The Contractor shall be solely responsible for defending any claims resulting from his rock excavation operations, including blasting, and shall make whatever adjustment is required at his own expense. Blasting bonds and/or insurance necessary on State, Township, or Borough highway rights-of-way are to be obtained by the Contractor at his own expense on behalf of the Authority.

1.08 TRAFFIC MAINTENANCE

- A. The Contractor shall be required to submit to the Authority for review and approval his maintenance and traffic control plan prior to beginning construction. The plan shall be based upon the latest publication of the PennDOT Publication 203.
- B. The Contractor shall furnish the necessary guards, watchmen, warning lights and similar items necessary to maintain state highway and other road/street traffic in accordance with PennDOT requirements. In general, the Contractor will not be permitted to interrupt traffic without specific arrangements for detouring traffic in accordance with PennDOT requirements. When traffic cannot be detoured, a minimum of 1/2 the roadway width shall be open at all times with traffic control.

1.09 WORK DURING INCLEMENT WEATHER

- A. The Authority reserves the right to order cessation of work during inclement weather.

1.10 ACCESS AND INSPECTION

- A. All work in this section is subject to Inspection by the Authority or its representative and shall have full access to the project for same.

1.11 PROTECTION

- A. Assume the risks attending and presence or proximity of overhead or underground public utility and private lines, pipes, conduits, and support work for same, existing structures and property of whatever nature. Damages and expenses for direct or indirect injury to such structures or to any person or property by reason of them or by reason of injury to them, whether such structures are or are not shown on the Drawings, rests solely with the Contractor.
 - 1. Outside Rights-of-Way: Take necessary precautions to protect trees, shrubs, lawns and such other landscaping from damage. Restitution work for damages rests solely with the Contractor and at no expense to the Authority.
 - 2. Pipe Supports: Adequately support underground pipes or conduits exposed as a result of excavations. Provide adequate support along their entire exposed length by timber or planking. Install such supports in such manner that backfilling may be performed without dislodging such pipes or conduits. Place and carefully compact Clean Earth Backfill or Aggregate Backfill, as required, around the supports and leave such supports in place as a guard against breakage due to backfill settlement. No additional payment will be due the Contractor for support material left in place or for the labor of installing and maintaining

supports.

3. Temporary Protective Construction:
 - a. Temporary Fence Barricade: Erect and maintain substantial temporary fences surrounding excavation to prevent unauthorized persons entering such areas.
 - b. Barricades: Furnish and erect substantial barricades at crossings of trenches or along trenches to protect the traveling public.
 - c. Excavation Covers: Cover open excavation when work therein is suspended or left unattended, such as at the end of a workday. For such covers, use materials of sufficient strength and weight to prevent their removal by unauthorized persons.
 - d. Remove temporary protective construction at the completion of work on the project.
- B. Structure Supports: When passing buildings or any structure which by their construction or position might bring a great pressure upon the trenches, the right is reserved by the Engineer to require that such buildings or structures be underpinned or supported and protected or special sheeting be driven or that short lengths of trench be opened at one time.

PART 2. PRODUCTS

2.01 BACKFILL MATERIALS

- A. Type I: Granular materials meeting the specifications of PDT Pub. 408, Section 703.3.
- B. Type II: Material such as sand, quarry waste, and screenings all with no gradation larger than one (1) inch.
- C. Type III: Suitable excavated material free of debris, organic material, and rock larger than three (3) inches.

2.02 BEDDING

- A. Coarse aggregate conforming to PDT Pub. 408, Section 703.2
 1. For piping having a diameter of twenty-four (24) inches and less, use AASHTO No. 8 Coarse Aggregate.

2.03 CONCRETE BACKFILL

- A. Concrete shall meet the requirements of Section 03300, Cast-in-Place Concrete for Class B (2500 PSI/28 Days).

PART 3. EXECUTION

3.01 EXAMINATION

- A. The Contractor's attention is directed to his responsibilities in accordance with Act 172. Any underground utilities shown on construction drawings should be verified prior to beginning construction.
- B. Maintain and protect existing utilities remaining which pass through work area.
- C. Before starting any earthwork activity under this Section, the Contractor shall insure that all Erosion and Sedimentation Controls are in place.
- D. Verify backfill materials to be used are acceptable.
- E. Verify that survey benchmarks and intended elevations for Work are as shown on the Drawings.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Protect plant life, lawns, and other features remaining as a portion of final landscaping.
- C. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.
- D. In the event of damage, immediately make all repairs and replacements as required by the Authority and at no additional cost to the Authority.

3.03 EXCAVATION

- A. Where trenching occurs through bituminous or concrete pavement, the edge(s) shall first be cut through full depth to preclude distortion of remaining edge(s) during excavation.
- B. Excavate subsoil required for sanitary sewer piping, manholes, and appurtenances. Allow for six (6) inches (minimum) bedding/support depth. Use laser to maintain grade specified.
- C. Cut trenches sufficiently wide to enable installation of utilities and allow inspection. Refer to Standard Drawing Detail typicals.
- D. Excavation shall not interfere with normal forty-five (45) degree bearing splay of foundations.
- E. Correct unauthorized excavation at no cost to Authority.
 - 1. Unforeseen conditions encountered, such as sinkholes, shall be stabilized at a negotiated price.
- F. Correct areas over-excavated by error with backfill of Types I or II material, satisfactorily compacted.
- G. The Contractor shall dewater all trenches to provide a dry trench bottom for the installation of the sewer pipe. Trench water shall be discharged by pumps or by other means to natural drainage channels, storm drains, or other points upon written approval of the Authority and in compliance with regulations of the Fish Commission, SCS, and DER. Where pumping is required, the Contractor shall provide sufficient pump capacity to maintain the trench bottom in a dry condition.
- H. Remove excess material not being used to an approved on-site waste area or dispose of legally at

Contractor's expense.

3.04 BEDDING

- A. Place six (6) inches of bedding material for pipe bedding (pipe cushion). Continue bedding material to twelve (12) inches over pipe. Hand work material around pipe haunches and pipe to preclude misalignment and grade changes. Pipe which is damaged or moved out of alignment shall be re-laid by the Contractor at his expense.

3.05 BACKFILLING

- A. Backfill trenches to contours and elevations with unfrozen materials of the SPECIFIED type.
- B. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- C. Employ a placement method that does not disturb or damage pipe in trench.
- D. Backfill ABOVE twelve (12) inches over Pipe: Place and compact materials in continuous layers not exceeding eight (8) inches in compacted depth using standard compaction equipment. No Hydra-Hammers shall be used.
 - 1. PennDOT and all other improved Municipal public access roads, public gravel roads and improved shoulders. - Type I
 - a. Refer to PennDOT Chapter 459 - Occupancy of Highways by Utilities.
 - 2. Unimproved PennDOT areas, Commercial and Private areas - Type III if available, if not, use Type I.
- E. Refer to Sub-Section 2.01 for material specifications.
- F. Maintain optimum moisture content of backfill materials to attain required compaction density.
- G. Remove surplus backfill materials from site.

3.06 CONCRETE BACKFILL

- A. In locations where the excavations have been carried beneath existing structures, utilities, or pipes, such that the backfill cannot be compacted in accordance with the requirements of Paragraph 3.08, the Contractor shall furnish and place concrete backfill to support such existing structures, utilities or pipes. Concrete shall be Class B.
- B. Where the volume of concrete backfill required exceeds two (2) cubic yards, boulder fragments of rock, not longer than eight (8) inches, excavated during construction may be embedded in the concrete to provide added bulk. Concrete backfill shall be vibrated as necessary to assure the structural support of the existing structure, utility, or pipe.

3.07 TOLERANCES

- A. Top Surface of Backfilling: Under paved area, plus or minus one-half (1/2) inch, from required elevation for aggregate base.
- B. Top Surface of General Backfilling: Plus or minus one (1) inch from required elevations.

3.08 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01400.
- B. Tests and analysis of fill material will be performed in accordance with ANSI/ASTM D-698 and with Section 01400.
- C. Compaction testing will be performed in accordance with ASTM D-698 and with Section 01400 if required by the Authority.
 - 1. Compaction Requirements:
 - a. PennDOT, Township, Borough Roadways, and Commercial Areas:
 - (1) 100% of determined dry weight density of backfill material at optimum moisture content.
 - b. Other Areas:
 - (1) 90% of determined dry weight density of backfill material at optimum moisture content.
 - c. Visual inspection of non-movement under compaction equipment may be used where material is too coarse for testing.
- D. The use of HYDRA-HAMMER for compacting backfill in trenches is prohibited until 2 feet over top of pipe is completed by other equipment.
- E. The use of puddling or jetting for compacting backfill in trenches is prohibited.
- F. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Authority.
- G. Frequency of Tests: Maximum of Every Two (2) Feet
- H. In cases where the sewer construction is not on road right-of-way or improved property, it may be permissible to dispense with tamping two (2) feet above the top of the pipe.

3.09 CLEANUP

- A. Remove surplus excavated material, rubbish and other construction debris and keep such removed to a point not more than two hundred (200) feet from the open trench, unless otherwise authorized by the Engineer.
- B. After trenches and other excavations are refilled and the work completed, remove surplus excavated materials, rubbish or such other materials from the work in such manner as the Contractor may elect or provide, but subject to the Engineer's approval. Dispose of such materials off the site in a lawful manner.
- C. Evenly spread and leave in neat, smooth condition, excavated material disposed of lawfully on public property.

3.10 PROTECTION OF FINISHED WORK

- A. Protect finished Work under provisions of Section 01500.
- B. Recompress fills subjected to vehicular traffic.

