

SECTION 22 0502 - EXCAVATION, BACKFILL & COMPACTION FOR UTILITY TRENCHES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.
- B. Division 31 - Earthwork

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Excavation, backfill and compaction associated with utility construction including such related features as protection of adjacent utilities and structures, maintenance and protection of traffic, cutting paved surfaces, support of excavation, control of excavated materials, dewatering, piping, bedding, disposal of excavated materials, and all work related to providing all utilities and structures in connection with sanitary sewer piping.

1.3 DEFINITIONS

- A. Backfill: Stone materials or imported structural fill materials.
- B. Bedding Course: Layer placed over the excavated subgrade in a trench before laying a pipe.
- C. Utilities: Include on-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.4 SUBMITTALS

- A. Refer to Division 01 Specifications for submittal procedures
- B. Certificates: Submit certification attesting that the composition analysis of pipe embedment and select material stone backfill materials meet specification requirements.

1.5 QUALITY ASSURANCE

- A. Codes and Standards: Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.
- B. Testing and Inspection Service: Owner shall hire an independent testing and inspection agency to perform all soil testing during earthwork operations.
- C. Testing Laboratory Qualifications: To qualify for acceptance, the testing laboratory must demonstrate to Architect's satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct required field and laboratory testing without delaying the progress of the work.
- D. Testing & Inspection Agency: The Owner will provide and pay for the services of a Independent Testing & Inspection Agency who will have the responsibility of determining what subgrade is acceptable or unacceptable and must be removed by the Contractor. The imported fill or imported structural fill shall be installed and compacted under the direction and observation of the Independent Testing & Inspection Agency. The Independent Testing & Inspection Agency will also document quantities of all materials on a daily basis. The Independent Testing & Inspection Agency will also monitor other earthwork that the Owner determines.

1.6 PROJECT CONDITIONS

- A. Excavation and Rock Removal:
 - 1. General:
 - a. The Contractor shall complete the excavation as indicated on the drawings and in Division 01.
 - b. When excavation has reached required subgrade elevations, notify Architect or Independent Testing & Inspection Agency, who will make an inspection of conditions. If the Independent Testing & Inspection Agency determines that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as to the extent directed by the Independent Testing & Inspection Agency.
 - 2. Excavation Classifications: Refer to Division 01 and Division 31.
- B. Compaction of Backfill:
 - 1. Placing of Fill Materials: Place the specified structural fill, stone backfill and in all areas, in layers not more than 6" in loose depth for material compacted by heavy compaction equipment, and not more than 4" in loose depth for material compacted by hand-operated tampers.

2. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification.
3. Place imported structural fill, backfill and fill materials evenly adjacent to structures to required elevations. Prevent wedging action of backfill against structure by carrying material uniformly around structure to approximately same elevation in each lift.
4. Compaction: Provide fill compaction to minimum percentage of density specified for each area classification indicated below. Correct improperly compacted area or lifts as directed by Architect or Construction Manager if density tests indicated inadequate compaction.
 - a. Percentage of Maximum Density Requirements: Compact to not less than the following percentages of maximum dry density, in accordance with ASTM D 698.
 - 1) Under concrete building slabs, under concrete foundations and footings, compact each layer of imported structural fill material at 98 percent of maximum dry density. Extend compacted area beyond the exterior face of the building a distance equal to the depth of fill at that area but not less than 10 feet.
 - 2) Under exterior concrete and asphalt paving compact each layer of backfill or fill material at 98 percent of maximum dry density.
 - 3) Under lawn or unpaved areas, compact each layer of backfill or fill material at 95 percent of maximum dry density.
 - 4) At exterior face building foundation walls and walls beyond the exterior of the face of the building, each layer of backfill or fill shall be compacted to 95 percent of maximum dry density.
 - 5) At asphalt and concrete paving the top 6 to 8 inches of subgrade under the paving and aggregate base course shall be compacted to 98 percent of the maximum dry density. The aggregate base course shall also be compacted to 100 percent of the maximum dry density.

C. Protection of Existing Utilities and Structures:

1. Take all precautions and utilize all facilities required to protect existing utilities and structures. In compliance with Act 199 (2004) of the General Assembly of Pennsylvania, advise each Utility at least three (3) working days in advance of intent to excavate, do demolition work and give the location of the job site. Request cooperative steps of the Utility and suggestions for procedures to avoid damage to its lines.
2. Advise each person in physical control of powered equipment used in excavation or demolition work of the type and location of utility lines at the job site, the Utility assistance to expect, and procedures to follow to prevent damage.
3. Immediately report to the Utility and the Architect any break, leak or other damage to the lines or protective coatings made or discovered during the work and immediately alert the occupants of premises of any emergency created or discovered.
4. Allow free access to Utility personnel at all times for purposes of maintenance, repair and inspection.

1.7 COLD WEATHER PROTECTION

- A. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F

PART 2 PRODUCTS

2.1 PIPE BEDDING OR EMBEDMENT MATERIAL

- A. Refer to details on drawings.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Layout utility trenchwork and establish extent of excavation by area and elevation. Designate and identify datum elevation and project engineering reference points. Set required lines, levels, and elevations.
- B. Notify Architect of unexpected subsurface conditions and discontinue work in area until notified to resume work.
- C. Maintain and protect existing utilities identified by utility users within the Work area.
- D. Verify that structure walls are braced to support surcharge forces imposed by backfilling operations.

3.2 PROTECTION OF ADJACENT WORK

- A. Underpin adjacent structures which may be damaged by excavation work, including utilities and pipe chases.
- B. Grade excavation top perimeter to prevent surface water runoff into excavation or to adjacent properties.

3.3 EXCAVATION

- A. Width of Excavation:
 - 1. Pipelines:
 - a. Excavate trenches, including laterals, to a width necessary for placement and jointing of the pipe, and for placing and compacting pipe embedment under, around and over the pipe.

- b. Shape trench walls completely vertical from trench bottom to at least two (2) feet above the top of the pipe.
- c. For pressure pipeline fittings, excavate trenches to a width that will permit placement of concrete thrust blocks. Provide earth surfaces for thrust blocks that are perpendicular to the direction of thrust and are free of loose or soft material.

B. Length of Open Trench:

- 1. Do not advance trenching operations more than 200 feet ahead of completed pipeline.

3.4 SUPPORT OF EXCAVATION

- A. Support excavations with sheeting, shoring, and bracing or in the case of pipeline construction, a "trench box" as required to comply with State, and local laws and codes.
- B. Install adequate excavation supports to prevent ground movement or settlement to adjacent structures, pipelines or utilities. Damage due to settlement because of failure to provide support or through negligence or fault of contractor in any other manner, shall be repaired at contractor's expense.
- C. Withdraw shoring, bracing, and sheeting as backfilling proceeds unless otherwise directed by the Architect.
- D. The neglect, failure or refusal of the Architect to order the use of bracing or sheeting, or a better quality, grade, or section, or larger sizes of steel or timber, or to order sheeting, bracing, struts, or shoring to be left in place, or the giving or failure to give orders or directions as to the manner or methods of placing or driving sheetings, bracing, jacks, wales, stringers, etc., shall not in any way or to any extent relieve Contractor of any responsibility concerning the condition of excavation or of any of his obligations under the Contract, nor shall any delay, whether caused by any action or want of action on the part of Contractor, or by any act of Owner and Architect or their agents, or employees, resulting in the keeping of an excavation open longer than would otherwise have been necessary, relieve contractor from the necessity of properly and adequately protecting the excavation from caving or slipping, nor from any of their obligations under the Contract relating to injury of persons or property, nor entitle them to any claim for extra compensation.

3.5 DEWATERING

- A. Keep excavations dry and free of water. Dispose of precipitation and subsurface water clear of the work.

- B. Maintain pipe trenches dry until pipe has been jointed, inspected, and backfilled, and concrete work has been completed. Prevent trench water from entering pipelines under construction.

3.6 PIPE LAYING

- A. Provide required pipe bedding placed in accordance with the Drawing Details and Specifications.
- B. Shape recesses for the joints or bell of the pipe by hand. Assure that the pipe is supported on the lower quadrant for the entire length of the barrel.
- C. Lay pipe as specified in the appropriate Section of these Specifications for pipeline construction.

3.7 BACKFILLING EXCAVATIONS

- A. Pipeline Trench:
 - 1. After pipe installation and inspection, provide material to complete the pipe embedment in accordance with the Drawing Details and Specifications.
- B. Lift Thickness Limitations:
 - 1. Lift thicknesses shall be limited to 4 inches for pipe embedment, and 6 inches maximum for pipeline trenches within paved areas and non-paved areas and for structure excavations. In no case shall maximum lift thickness placed exceed the maximum limits specified by the manufacturer's recommendations for the compaction equipment to be utilized. Compaction equipment shall not be used over the pipe until sufficient backfill has been placed to insure that such equipment will not damage or disturb the pipe.
- C. Unsuitable Backfill Material:
 - 1. Where the Independent Testing & Inspection Agency or Architect determines backfill material to be unsuitable and rejects all or part thereof due to conditions prevailing at the time of construction, remove the unsuitable material and replace with suitable backfill material. Unsuitable material shall be legally disposed of, off-site by the contractor.

3.8 FIELD QUALITY CONTROL

- A. Quality Control testing During Construction: Contractor shall coordinate with Owner's testing laboratory to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.

1. Perform field density tests in accordance with ASTM D 1556 (sand cone method) or ASTM D 2167 (rubber balloon method) as applicable.
 - a. Field density tests may also be performed by the nuclear method in accordance with ASTM D 1556. In conjunction with each density calibration check, check the calibration curves furnished with the moisture gages in accordance with ASTM D 3017.
 - b. If field tests are performed using nuclear methods, make calibration checks of both density and moisture gages at beginning of work, on each different type of material density and moisture gages at beginning of work, on each different type of material encountered, and at intervals as directed by the Architect.
2. Perform one test at each structure per foot of backfill and one test for each 50 lineal feet of pipe or fractions thereof, per foot of backfill.
3. If in opinion of Architect, based on testing service reports and inspection, subgrade or fills that have been placed are below specified density, perform additional compaction and testing until specified density is obtained. trenching and backfilling operations with Independent Testing and Inspection Agency to perform field inspections and tests during trenchwork operations. Laboratory, inspection service, and Independent Testing & Inspection Agency shall be subject to acceptance by the Architect.

3.9 DISPOSAL OF EXCAVATED MATERIAL

- A. No excavated material shall remain after completion of backfilling. Excavated material shall be removed from the construction area, and disposed of legally, off-site.

3.10 CLEANUP

- A. Upon completion of trenchwork operations, clean areas within contract limits, remove tools and equipment. Provide site clear, clean, free of debris, and suitable for site work operations.

END OF SECTION