



Attachment "F"

Revised Section 02220

Excavation & Backfill for Pipe Systems

SECTION 02220
EXCAVATION AND BACKFILL FOR PIPE SYSTEMS

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

- A. Clearing, excavating, grading and backfilling as required for the construction of pipe and other underground utility systems and appurtenances.

1.2 QUALITY ASSURANCE

- A. Comply with Chapter 90-96 of the Laws of Florida (The Trench Safety Act) and OSHA Standard 29 CFR, Section 1926.650 Subpart P.
- B. References:
 - 1. American Society for Testing and Materials (ASTM):
 - a) ASTM D1556-90; Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
 - b) ASTM D1557-91; Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.
 - c) ASTM D2487-90; Classification of Soils for engineering Purposes.
 - d) Florida Department of Transportation (FDOT), "Standard Specifications for Road and Bridge Construction," latest edition, (FDOT)

PART 2 - PRODUCTS

1.1 PRODUCTS AND MATERIALS

- A. Bedding Material:
 - 1. For use below the water table or in wet trenches: pea rock, 3/4 inch washed rock, or similar material.
 - 2. Pipe bedding material for use in dry trenches: lime rock screenings, sand or other fine inorganic material.
- B. Additional Backfill Material:
 - 1. "Satisfactory Fill Materials" include materials classified in ASTM D2487 as GW, GP, SW, and SP properly worked by Contractor to obtain optimum moisture and compaction. Maximum size of rock limited to 3 inches. Use 2-inch maximum size for the top 2 feet below the finish indicated grade.
 - 2. Stones or rocks:
 - a) Not larger than three inches in diameter.
 - b) When placed within one foot of piping and appurtenances: Not larger than two inches in diameter.
 - c) When placed within one foot of PVC piping: Not larger than one inch in diameter.
- C. Fill Brought from Off-site: Provide test results and source certification that fill materials do not contain any hazardous materials such as heavy metals, organics, or petroleum products.

PART 3 - EXECUTION

1.2 PREPARATION

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- A. Perform all clearing necessary for the proper installation of all piping and appurtenances.
- B. Transplant, relocate, protect and preserve plantings, shrubbery, trees, or other landscape materials subject to damage resulting from excavation and other site operations. Replace damaged landscape materials and plant materials.
- C. Relocate, brace, protect and preserve utility poles, structures, and other site improvements subject to damage resulting from excavation and other site operations. Repair damaged site improvements.

1.3 PROJECT CONDITIONS

- A. Existing Utilities:
 - 1. Protect existing utilities from movement, settlement, or other damages according to General Conditions.
- B. Trench Safety Act: Provide trench safety systems at all trench excavations where workers may be exposed to moving ground or cave-ins regardless of depth of trench. Ensure all trenches comply with OSHA "Trench Safety Act".

1.4 FIELD QUALITY CONTROL

- A. Excavations:
 - 1. Perform all excavations of every description and of whatever substances encountered, including rock excavations, to the dimensions and depth necessary for installation of utility systems as specified or to remove deleterious materials.
 - 2. All excavations: Made by open cut.
 - 3. Trench walls:
 - a) Kept vertical.
 - b) Sheeted and braced as necessary to protect the safety of workmen, the general public, this or other work or structures, or to maintain specified trench widths.
 - c) Wood sheeting or certain designs of steel sheeting: cut off sheeting at a level 2 feet above the top of the installed pipe and leave in place that portion below that level.
 - d) Interlocking steel sheeting: remove sheeting after use providing removal can be accomplished without disturbing the bedding, pipe or pipe alignment.
 - e) Damage to the pipe bedding, pipe or alignment of the constructed utility caused by removal of sheeting: Replace affected portion of the Work at no additional cost to City.
 - f) Open trench ahead of pipe laying operations: Not more than 100 linear feet.
 - g) Slope trench sides to a stable angle of repose of the excavated material in areas where trench widths are not limited by Right-of-Way and easement widths, property line restrictions, existing adjacent improvements, including pavements, structures and other utilities, or maintenance of traffic.
 - h) Safely constructed movable shield, "box" or "mole": use in place of sheeting when the trench is opened immediately ahead of the shield and closed immediately behind the shield as pipe laying proceeds inside the shield.
 - 4. Trench Access: Provide ladders or steps.
 - 5. Pipe trenches for utility lines:
 - a) Excavate to a width within the limits of the top of the pipe and the trench bottom to provide a clearance on each side of the pipe barrel, measured to the face of the excavation or sheeting, if used, of 8 inches to 12 inches.
 - b) Manhole excavations: Of sufficient depth to permit their construction on the undisturbed bottom of the excavation.
 - 6. Materials removed from the trenches:

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- a) Store and dispose of excavated materials in a manner that will not interfere with traffic on public streets and sidewalks.
 - b) Do not store or place excavated materials on public or private property outside the City's property line.
 - c) Properly dispose of unsuitable materials such as muck and organically contaminated fill off site.
 - d) Materials suitable for use as backfill: Hauled to and use in areas where not enough suitable material is available from the excavation.
- B. Excess suitable material: Dispose of within the limits of the project as directed by the Project Consultant. Finish grade the disposal area.
- 1. Excavation of Unclassified Material:
 - a) Materials encountered during the excavating to the depth and extent specified and indicated on drawings may include rock, concrete, masonry, or other similar materials.
 - b) No adjustment will be made in the Contract Price because of the presence (or absence) of rock, concrete, masonry, or other similar materials.
- C. Removal of Water:
- 1. All excavations:
 - a) Free from water before pipe or structures are installed.
 - b) Extreme Water Conditions: Contractor may elect to utilize extreme water conditions methods specified elsewhere in this document.
 - 2. Control water flow on site:
 - a) Meet State and Federal "SWPPP" flow containment programs and approvals. Restrict flow from one site area to another by installing temporary dams or plugs within the pipe provided they are suitably removed and do not damage the lining of the pipe.
 - b) All work shall be conducted in strict accordance with the "SWPPP" plan.
 - c) Installed lines, except for water distribution lines: May be used to convey trench water, provided the pipe lining is not damaged and the line is cleaned out prior to acceptance of the work.
 - 3. Dewatering:
 - a) Provide all necessary pumps, under drains, well-point systems, and other means for removing water from trenches and other parts of the Work.
 - b) Continue dewatering operations until the backfill has progressed to a sufficient depth over the pipe to prevent flotation or movement of the pipe in the trench and so that it is above the natural water table.
 - 4. Water Disposal:
 - a) Do not cause injury to public health, to public or private property, to the work completed or in progress, to the surface of the streets, or cause any interference with the use of the same by the public.
 - b) All disposal of surface water shall be based on "SWPPP" approved plan.
 - c) Do not start excavation until receiving approval of proposed water disposal method.
- D. Pipe Bedding:
- 1. Excavate pipe trenches to a level of 8 inches below the outside bottom of the proposed pipe barrel.
 - 2. Backfill resulting excavation with pipe bedding material, up to the level of the lower one-half of the proposed pipe barrel.
 - 3. Tamped and compact backfill to provide proper bedding for the pipe and then shape bed to receive the pipe.
 - 4. Provide bedding under the branch of all fittings to furnish adequate support and bearing under the fitting.

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5. Excavations below the levels required for installation of the pipe bedding, except for "Additional Excavation": Backfill with bedding material, tamp, compact and shape to provide proper support for the proposed pipe, at no additional cost to the City.
- E. Backfill under Maintenance Access Structures, Inlets and Meter Vaults:
1. Fill excavations below the levels required for the proper construction of Maintenance Access Structures or meter vaults with 3/4 inch washed rock.
- F. Trench Stabilization:
1. No claim for extras or additional payment will be considered for cost incurred in the stabilization of trench bottoms, which are rendered soft or unstable as a result of construction methods, such as improper or inadequate sheeting, dewatering or other causes.
 2. Do not install pipe when such conditions exist.
 3. Contractor: correct such conditions so as to provide proper bedding or foundations for the proposed installation at no additional cost to the City.
- G. Backfill:
1. Backfilling of utility trenches: not allowed until the work has been approved by the City, and other jurisdictional inspectors as applicable.
 2. Provide pressure tests as required by codes and jurisdictional authorities.
 3. Uncover any work, which is covered or concealed without approved inspections at no cost to the City.
 4. Partial backfill: May be made to restrain the pipe during pressure testing.
 5. Provide additional or supplemental backfill materials as necessary from on-site or off-site sources.
 6. Placing Backfill:
 - a) Place selected backfill material containing no stone or rocks larger than 2 inches in 12-inch layers and thoroughly tamp to a depth of 12 inches over the top of the pipe.
 - b) Provide thorough support for the branch of all service connection fittings.
 - c) Preserve the alignment and gradient of the installed pipe.
 - d) Waterlines or Force Main Pipes: Place remainder of the backfill in layers, not to exceed 12 inches, and compact with mechanical tampers or other suitable equipment to obtain a density of not less than 95 percent of its maximum density.
 - e) Sewer Pipes:
 - i. Backfill to a depth of 30 inches over the pipe by placing backfill material in 12 inch layers and thoroughly compact with mechanical tampers to obtain a density of not less than 95 percent of maximum density.
 - ii. Place remainder of backfill in layers not to exceed 12 inches, and compact with mechanical tampers or other suitable equipment to obtain a density of not less than 95 percent of maximum density.
 - f) Within paved areas of trench excavation: construct base and surfacing constructed as based upon ASTM D1557-91 and compacted to 98 percent maximum density.
 - g) Partially backfill no more than 100 feet of trench with pipe in place at any time.
- H. Compaction and Densities:
1. Methods of control and testing of backfill construction are:
 - a) Maximum density of the material in trenches: Conform to AASHTO Designation T 180-74.
 - b) Field density of the backfill material in place: Conform to AASHTO Designation T 238-79.
 2. Laboratory and field density tests necessary to establish compliance with the compaction requirements of these specifications will be conducted at the Contractor's expense at intervals to be approved by the City. Tests will be made at depths and locations approved by the City.

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3. Rework and recompact trench backfill, which does not comply with the specified densities until the required compaction is secured, at no additional cost to the City. Costs for retesting such work: Paid for by the Contractor.
- I. Additional Excavation and Backfill:
1. Remove and dispose of organic material, such as roots, muck, or other vegetative matter, or other material encountered below the level of proposed pipe bedding material.
 2. Install sheeting as necessary to maintain pipe trenches within the specified limits.
 3. Backfill resulting excavation with suitable backfill material, placed in 12-inch layers tamped and compacted up to the level of the bottom of the proposed pipe bedding material.
 4. Sufficiently compact this material to protect the pipe against settlement.
 5. Provide pipe bedding as specified above.
- J. Trenching in Extreme Water Conditions:
1. General:
 - a) A combination of conditions in the substrata, water table, or method of disposal may be encountered during the course of the work, which make dewatering impossible, or only possible through the use of unusual methods.
 - b) When such conditions are encountered, but only after all reasonable means to dewater the excavation have been employed without success, the Contractor, with the concurrence of the City, may use Section 125-8.3.4 of the FDOT Standard Specifications for Road and Bridge Construction.
 2. Removal of Water: The installation of pipe, Maintenance Access Structures and appurtenances underwater will be permitted.
 3. Excavation:
 - a) Perform excavation of pipe trenches to the level of the bottom of the proposed pipe bedding as specified above:
 - i. If rock, such as lime rock or other similar hard, cemented material providing firm, unyielding trench bottoms is encountered at the level of the bottom of the proposed pipe bedding: no additional excavation required.
 - ii. If material such as sand, marl, or other material which cannot be classified as rock, is encountered at the level of the bottom of the proposed pipe bedding: Excavate pipe trench to an additional depth of 10 inches minimum, below that level.
 - iii. Provide additional excavation, and related additional backfilling made necessary by deleterious materials encountered.
 - b) Excavate for Maintenance Access Structures to be installed under water to a depth, below the outside bottom of the proposed structure to provide a minimum space of 12 inches in rock, or 24 inches in sand for the placement of drain field lime rock.
 - c) Provide longitudinally sloping plane bottom surface for the placement of pipe bedding material from the bottom of the manhole excavation, at its extremity, to a line of intersection with the bottom of the typical excavation of 10 feet measured horizontally, from the vertical plane of the manhole excavation.
 4. Pipe and Manhole Bedding:
 - a) Backfill pipe trench or manhole excavation to receive the pipe or manhole with drain field lime rock up to the level of the lower one-third (1/3) of the proposed pipe barrel, or to the outside bottom of the proposed manhole as applicable.
 - b) Tamp and compact backfill to provide proper bedding for the pipe or manhole.
 - c) Do not utilize material other than drain field lime rock as bedding material for underwater

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construction.

5. Backfill:
 - a) Backfill after the pipe is installed with drain field lime rock around the pipe and to a level even with the top of the pipe bell.
 - b) Carefully lift all backfill material, including drain field lime rock, into trench and release to fall freely when the bucket or container is at or just above water level:
 - c) Do not dump or push backfill material into trenches containing water.
 - d) Carefully ram backfill material into place in uniform layers below the existing water level.
 - e) Place and compact backfill material above the water level to densities specified above.
- K. Restoration of Existing Surfaces: Restore paved and grassed areas disturbed by the operations required under this Section as indicated on the Drawings and specified herein.
- L. Testing:
 1. See Section 01410 Testing and Quality Control, 1.04.
 2. Tests of Materials as follows;
 - a) Laboratory Tests for Moisture Content and Density: Under provisions of ASTM D1557-91, one test for each material encountered or proposed to be used.
 - b) Field Tests for Moisture Content and Density: Under provisions of ASTM D1556- 90, one test per layer per 100 linear feet of ditch.

END OF SECTION