

Section 2221

Trench Excavation, Backfill and Compaction

PART 1: General

1.1 *General Description of Work* –

1.1.1 *Topics Covered* – Excavation, shoring, dewatering, pipe bedding, trench backfill, compaction, grading, and cleanup of all pipeline trenching for the project.

1.1.2 *Requirements* – All work must be done in accordance with these specifications and the safety requirements of the State and OSHA standards.

1.1.3 *Contractor Visitation* – Prior to submittal of bid, the Contractor shall visit the site and become thoroughly familiar with site conditions existing along the route of the planned work. The Contractor shall accept site in condition existing during Contract time frame.

1.1.4 *Groundwater/Surface Water* – Management of groundwater/surface water encountered during construction are conditions of the Contract and responsibility of Contractor.

PART 2: Products

2.1 *Source Materials* – Determination of source of materials for bedding and backfill shall be responsibility of Contractor, but use of such materials shall be subject to approval of Engineer.

2.2 *Pipe Bedding and Backfill* – Pipe bedding shall be angular material.

2.3 *Sand Backfill* – (Where specified on plans). Use sand or fine aggregate with source of material subject to approval of Engineering.

2.4 *Cradling Rock* – Use crushed rock or stone with 70-100 percent passing 1-inch sieve and no more than 50 percent passing $\frac{3}{4}$ -inch sieve.

2.5 *Controlled Density Fill* –

2.5.1 *Mixture* – Use high slump mixture of portland cement, fly ash and fine aggregate formulated, licensed and marketed as K-Krete or equal.

2.5.2 *Strength* – Provide mixture with minimum 28-day compressive strength of 70 psi with no measurable shrinkage or surface settlement.

2.6 *Sheeting, Shoring, and Bracing* – All excavation and trench safety measures shall be OSHA compliant. Use sound timber or structural steel. Use shapes and sizes as required.

PART 3: Execution

3.1 General –

3.1.1 Dewatering –

3.1.1.1 Prevent surface water from flowing into excavation.

3.1.1.2 Provide equipment for handling water encountered as required. Obtain approval of proposed method of dewatering. All dewatering discharges which result in a point source discharge to surface waters of the State, as defined by Chapter 62-620 F.A.C. shall be in accordance with the State of Florida “Generic Permit for the Discharge of Produced Groundwater from any Non-Contaminated Site Activity.” All costs associated with required sampling and testing shall be borne by the Contractor. The initial testing shall be completed and results verified prior to initiation of ongoing dewatering operations. If any of the analytical test results required by the permit are exceeded, the Contractor shall terminate the discharge as promptly as can be safely accomplished and notify the ECUA Inspector and Engineer immediately.

3.1.1.3 No sanitary sewer shall be used for disposal of trench water.

3.1.2 Protection of Existing Utilities –

3.1.2.1 Contact the Sunshine811 Call Center a minimum of two (2) days prior to beginning excavation operations to have existing underground utilities located in areas of excavation work.

3.1.2.2 Locations and elevations of utilities shown on plans are to be considered approximate only. Notify utility and Engineer of conflicts between existing and proposed facilities.

3.1.2.3 Repair, relay, or replace existing utilities damaged, destroyed, or disrupted during work. Unless specified otherwise, replacement will be at the Contractor's expense.

3.1.3 Sheet piling, Shoring, and Bracing –

3.1.3.1 Provide as necessary, to hold walls of excavation, prevent damage to adjacent structures, and to protect workmen and property.

3.1.3.2 Leave sheet piling and shoring in place where removal might cause damage to work or as otherwise indicated on drawings.

3.1.3.3 When moveable trench shield is used below spring line of pipe, it shall be lifted prior to any forward movement to avoid pipe displacement.

3.1.4 *Changes in Grade* – Minor adjustments to grades may be made from plan grades to suit unforeseen construction conflicts or conditions with approval from Engineer. Additional compensation will be made for such minor changes.

3.2 *Excavation and Trenching –*

3.2.1 *General –*

- 3.2.1.1 Method of excavation at the Contractor's option.
- 3.2.1.2 The Contractor will use caution when excavating under tree roots, under and around structures and utilities.
- 3.2.1.3 Stockpile and replace topsoil equal to pre-existing depth for surface restoration in grassed or agricultural areas where specified or shown on plans.

3.2.2 *Trench Characteristics –*

- 3.2.2.1 *Depth* – As indicated for pipe installation to lines and grades required with proper allowance for thickness of pipe and type of bedding specified or indicated.
- 3.2.2.2 *Width* – Keep width of trench as narrow as possible and yet provide adequate room for backfilling and jointing. Maximum trench width of 30-inch or pipe O.D. plus 18 inches where soil conditions permit.
- 3.2.2.3 *General –*
 - 3.2.2.3.1 For pipes and equipment 6 inches or larger in nominal size, shape bottom of trench to fit bottom of pipe for 90 degrees (bottom $\frac{1}{4}$ of the circumference). Fill depressions with tamped sand backfill.
 - 3.2.2.3.2 At each pipe joint, dig bell holes to relieve pipe bell of loads and ensure continuous bearing of pipe barrel on bearing surface.
 - 3.2.2.3.3 Trench bottom shall be free of large stones and other foreign material.

3.3 *Organic or Unstable Materials –*

- 3.3.1 *Guidelines* – Stop work and notify Engineer. Perform remedial work as directed.
- 3.3.2 *Unsuitable Material* – If material is judged unsuitable and removal is authorized, remove and replace with trench stabilizing material as directed by Engineer.

3.4 *Rock Excavation –*

- 3.4.1 *Guidelines* – Excavate any rock to maintain a minimum 6-inch clearance around pipe. Dispose of rock material not suitable for backfill as directed by Engineer.
- 3.4.2 *Explosives* – The use of explosives is not permitted without prior written authorization from Owner and Engineer. If authorization to use explosives is given, the Contractor must provide Special Hazard Insurance covering liability for blasting operations.

- 3.5 *Bedding* – Place after bottom of trench has been excavated to proper depth and grade. Place, compact and shape bedding material to conform to barrel of pipe to insure continuous firm bedding for full length of pipe.

Provide bedding as described in following table unless indicated otherwise on Plans or in Special Conditions:

Pipe Bedding	
Pipe Material	Minimum Bedding Class
Ductile Iron Pipe	Class D*
Flexible or Composite Pipe	Class 1**

*Refers to ECUA standard detail, “Pipe Envelope Requirements”, D-60

**Refers to ECUA standard detail, “Flexible Pipe Bedding”, D-61

- 3.6 *Trench Backfill* –

3.6.1 *Guidelines* –

- 3.6.1.1 Use excavated material backfill unless otherwise specified or directed.
- 3.6.1.2 Use suitable backfill for all trenches within 5 feet of buildings and beneath walks, parking areas, paved streets or existing exposed utilities.

3.6.2 *Initial Backfill* –

- 3.6.2.1 Place after pipe has been bedded and checked for alignment, grade, and internal obstructions.
- 3.6.2.2 Carry out in an orderly fashion after authorization to cover pipe has been given.
- 3.6.2.3 Allow no more than 300 feet of trench to be open at one time.
- 3.6.2.4 Do not backfill until concrete or mortar has sufficiently cured.
- 3.6.2.5 Record location of connections and appurtenances before backfilling.
- 3.6.2.6 Place by hand and hand tamp to not less than 12 inches above top of pipe, in approximately 4-inch layers.
- 3.6.2.7 Backfill simultaneously on both sides of pipe to prevent displacement.
- 3.6.2.8 Place cushion of 4 feet above pipe envelope before using heavy compacting equipment.

3.6.3 *Subsequent Backfill* –

- 3.6.3.1 Place backfill into trench at an angle so that impact on installed pipe is minimized.

- 3.6.3.2 Compaction of all backfill material shall be performed in a manner that shall not crack, crush, and/or cause the installed pipe to be moved from the established grade and/or alignment.
- 3.6.3.3 Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and that are carried below bottom of such footings or that pass under wall footings. Place concrete to level of bottom of adjacent footing.
- 3.6.3.4 Area under pavement and walks shall be mechanically compacted to the top of the subgrade in 6-inch lifts to a minimum of 100 percent Standard Proctor Density.
- 3.6.3.5 Areas not subject to vehicular traffic shall be backfilled and compacted in layers not more than 12 inches in depth.
- 3.6.3.6 Compaction method at discretion of the Contractor with following exceptions:
 - 3.6.3.6.1 If in the Engineer's opinion compaction method presents potential damage to pipe, it will not be allowed.
 - 3.6.3.6.2 Compaction of any backfill material by flooding or jetting will require prior written authorization of Engineer.
- 3.6.3.7 Mound excavated materials no greater than 6 inches in open areas only.
- 3.6.3.8 Fill upper portion of trench with topsoil as specified hereinbefore.
- 3.6.3.9 No trench shall be open overnight.
- 3.6.4 *Controlled Density Fill* –
 - 3.6.4.1 Use where shown on plans.
 - 3.6.4.2 Provide suitable forms to limit volume of controlled density fill material.
 - 3.6.4.3 Protect exposed utility lines during placement.
 - 3.6.4.4 Place material in accordance with suppliers' written recommendations unless directed otherwise by Engineer.
 - 3.6.4.5 Where the backfill material is deposited in water the layer and density requirements shall not apply until a one-foot layer of comparatively dry material is obtained, but this one-foot layer shall be thoroughly compacted by tamping.
 - 3.6.4.6 If the Contractor has compaction equipment with which the required density can be obtained in thicker lifts than permitted above and upon satisfactory evidence that the proposed equipment will produce work equal in quality to that produced by the specified methods, ECUA may permit placement of granular material of soil groups A-1, A-2, or A-3 in lifts up to a maximum of three foot compacted thickness. The Contractor will be required to furnish equipment and labor to excavate and backfill test pits to be dug for the performance of density tests.

3.6.4.7 Use of thick lift compaction procedures will not be allowed for first stage backfilling (beneath the haunches) of pipe culverts and storm sewers.

3.7 *Excess Material* – Dispose of waste excess excavated material as directed by the Engineer.

3.8 *Testing* –

3.8.1 *Failed Test Payment* – Payment of failed tests will be the responsibility of the Contractor.

3.8.2 *Standard Proctor Density* –

3.8.2.1 ASTM D698.

3.8.2.2 One (1) required for each type of material encountered.

3.8.3 *In Place Density* –

3.8.3.1 ASTM D1556 (Sand Cone)

3.8.3.2 ASTM D2167 (Balloon)

3.8.3.3 ASTM D3017 (Nuclear)

PART 4: Measurement and Payment

4.1 *Trench Excavation* –

4.1.1 *Guidelines* –

4.1.1.1 Trench excavation shall be considered incidental to pipeline installation.

4.1.1.2 Payment shall be made at the contract unit price per cubic yard only if a bid item is established in the Contract.

4.2 *Backfill* –

4.2.1 *Guidelines* –

4.2.1.1 Payment for backfill shall be made at the contract unit price per cubic yard only if a separate bid item is established in the Contract.

4.2.1.2 No allowance for waste shall be made.

4.2.1.3 If Engineer orders an initial backfill material other than that specified in the Contract, it shall be paid for as an extra in price per cubic yard as compacted in place, EXCEPT if a higher-class embedment is ordered by Engineer because the Contractor has over-excavated the trench width.

- 4.2.1.4 If the Contractor over-excavates the trench width and the Engineer orders the next higher class of embedment to be used, the embedment shall be paid for as if the original specified embedment was used.
- 4.2.1.5 If the Engineer orders the excavated material to be removed and disposed of and replaced with another material and a separate bid item is not established as a bid item, the material shall be paid as an extra.
- 4.2.1.6 If the Contractor fails to compact the backfill to the density requirements, the Engineer may order the material removed and replaced at no cost to the Owner.