

SECTION 2221

TRENCH EXCAVATION, BACKFILL AND COMPACTION

PART 1: GENERAL

1.1 General Description of Work

- A. Excavation, shoring, dewatering, pipe bedding, trench backfill, compaction, grading and cleanup of all pipeline trenching for the project.
- B. All work must be done in accordance with these specifications and the safety requirements of the State and OSHA standards.

1.2 Job Conditions

- A. Accept site in condition existing during Contract time frame.
- B. Groundwater/surface water found during construction are conditions of the Contract and responsibility of Contractor.

PART 2: PRODUCTS

2.1 Pipe Bedding and Backfill

- A. 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.
- B. Pipe bedding shall be angular material.

2.2 Sand Backfill

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

2.3 Cradling Rock

Use crushed rock or stone with 70-100% passing 1" sieve and no more than 50% passing 3/4" sieve. Crushed oyster shells are acceptable.

2.4 Controlled Density Fill

- A. Use high slump mixture of portland cement, fly ash and fine aggregate formulated, licensed and marketed as K-Krete or equal.
- B. Provide mixture with minimum 28-day compressive strength of 70 psi with no measurable shrinkage or surface settlement.

2.5 Sheeting, Shoring and Bracing

- A. Use sound timber or structural steel.
- B. Use shapes and sizes as required.

PART 3: EXECUTION

3.1 General

A. Dewatering

1. Prevent surface water from flowing into excavation.
2. Provide equipment for handling water encountered as required. Obtain approval of proposed method of dewatering.
3. No sanitary sewer shall be used for disposal of trench water.

B. Protection of Existing Utilities

1. Notify all utilities of location and schedule of work.
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. Repair, relay or replace existing utilities damaged, destroyed or disrupted during work. Unless specified otherwise, replacement will be at the Contractor's expense.

C. Sheeting, Shoring and Bracing

1. Provide as necessary, to hold walls of excavation, prevent damage to adjacent structures, and to protect workmen and property.
2. Leave sheeting and shoring in place where removal might cause damage to work or as otherwise indicated on drawings.
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.

D. Changes in Grade

1. Minor adjustments to grades may be made from plan grades to suit unforeseen construction conflicts or conditions with approval from Engineer.
2. No additional compensation will be made for such minor changes.

3.2 Excavation and Trenching

A. General

1. Method of excavation at Contractor's option.
2. The Contractor will use caution when excavating under tree roots and under and around structures and utilities. Excavate by hand when necessary.

3. Stockpile and replace topsoil equal to pre-existing depth for surface restoration in grassed or agricultural areas where specified or shown on plans.

B. Trench Characteristics

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.
2. Width
 - a. Keep width of trench as narrow as possible and yet provide adequate room for backfilling and jointing.
 - b. Maximum trench width of 30-inch or pipe O.D. plus 18 inches where soil conditions permit.
3. Provide bell holes for each pipe joint where pipe bears on undisturbed earth.
4. Trench bottom shall be free of large stones and other foreign material.

3.3 Organic or Unstable Materials

- A. Stop work and notify Engineer.
- B. Perform remedial work as directed.
- C. If material is judged unsuitable and removal is authorized, remove and replace with trench stabilizing material as directed by Engineer.

3.4 Rock Excavation

- A. Excavate any rock to maintain minimum 6-inch clearance around pipe.
- B. Dispose of rock material not suitable for backfill as directed by Engineer.
- C. Use of explosives not permitted without prior written authorization from Owner and Engineer.
- D. Provide Special Hazard Insurance covering liability for blasting operations.

3.5 Bedding

- A. Place after bottom of trench has been excavated to proper depth and grade.
- B. Place, compact and shape bedding material to conform to barrel of pipe to insure continuous firm bedding for full length of pipe.
- C. Provide bedding as described in following table unless indicated otherwise on Plans or in Special Conditions.

	Pipe Material	Minimum Bedding Class
1.	Ductile Iron Pipe	Class D*
2.	Flexible or Composite Pipe	Class 1**
* Refers to standard detail, "Pipe Envelope Requirements", Dwg. D-10.		
** Refers to standard detail, "Flexible Pipe Bedding Requirements", Dwg. D-11.		

3.6

Trench Backfill

- A. Use excavated material backfill unless otherwise specified or directed.
- B. Use suitable backfill for all trenches within 5 feet of buildings and beneath walks, parking areas, paved streets or existing exposed utilities.
- C. Initial Backfill
 - 1. Place after pipe has been bedded and checked for alignment, grade and internal obstructions.
 - 2. Carry out in an orderly fashion after authorization to cover pipe has been given.
 - 3. Allow no more than 300 feet of trench to be open at one time.
 - 4. Do not backfill until concrete or mortar has sufficiently cured.
 - 5. Record location of connections and appurtenances before backfilling.
 - 6. Place by hand and hand tamp to not less than 12 inches above top of pipe, in approximately 4-inch layers.
 - 7. Backfill simultaneously on both sides of pipe to prevent displacement.
 - 8. Place cushion of 4 feet above pipe envelope before using heavy compacting equipment.
- D. Subsequent Backfill
 - 1. Place backfill into trench at an angle so that impact on installed pipe is minimized.
 - 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. Area under pavement and walks or within buildings shall be mechanically compacted to the top of the subgrade in 6-inch lifts to a minimum of 95 percent Standard Proctor Density.
 - 4. Areas not subject to vehicular traffic shall be backfilled and compacted in layers not more than 12 inches in depth.
 - 5. Compaction method at discretion of Contractor with following exceptions:
 - a. If in Engineer's opinion compaction method presents potential damage to pipe, it will not be allowed.
 - b. Compaction of any backfill material by flooding or jetting will require prior written authorization of Engineer.
 - 6. Mound excavated materials no greater than 6 inches in open areas only.
 - 7. Fill upper portion of trench with topsoil as specified hereinbefore.

8. No trench shall be open overnight.

E. Controlled Density Fill

1. Use where shown on plans.
2. Provide suitable forms to limit volume of controlled density fill material.
3. Protect exposed utility lines during placement.
4. Place material in accordance with suppliers' written recommendations unless directed otherwise by Engineer.

3.7 Excess Material

Dispose of waste excess excavated material as directed by Engineer.

3.8 Testing

A. Payment of failed tests will be the responsibility of Contractor.

B. Standard Proctor Density

1. ASTM D698.
2. One (1) required for each type of material encountered.

C. In Place Density

1. ASTM D1556 (Sand Cone)
2. ASTM D2167 (Balloon)
3. ASTM D3017 (Nuclear)

PART 4: MEASUREMENT AND PAYMENT

4.1 Trench Excavation

- A. Trench excavation shall be considered incidental to pipeline installation.
- B. 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

- A. 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.
- B. No allowance for waste shall be made.
- C. If Engineer orders an initial backfill material other than that specified in 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.

- D. 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.
- E. 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.
- F. 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.