SECTION 31 23 33
TRENCHING, BACKFILLING AND COMPACTING FOR UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish labor, materials, tools, equipment, and services for Trenching, Backfilling and Compacting for Utilities, as indicated, in accordance with provisions of Contract Documents.

B. Definitions:
   1. Unsuitable material:
      a. Debris and/or soil material judged unsuitable by Engineer for support of slabs or other site improvements.
   2. Engineer:
      a. Soils Engineer employed by Owner and empowered to undertake necessary inspections and approvals.
   3. Rock excavation:
      a. Excavation of rock material which is sufficiently solid and of such strength that it cannot be loosened or broken down in a single pass with following equipment:
         1) Late model tractor mounted hydraulic ripper equipped with single digging point sized to use with and propelled by crawler type tractor rated at a minimum 200 net flywheel horsepower, operating in low gear.
         2) A 0.6 cubic meter 3/4 cubic yard hydraulic backhoe with a rock tooth.

C. Completely coordinate with work of other trades.

1.2 EXTRA WORK

A. Removal and replacement of unsuitable material will be paid for as extra work.
   1. Notify Owner’s agent in time to have Engineer measure and record quantity removed.
   2. Recorded quantity will be basis for payment.
   3. Include unit price per cubic meter yard on Bid Form.

B. Rock excavation will be paid for as extra work.
   1. Notify Owner’s agent in time to have Engineer measure and record quantity removed.

2. Recorded quantity will be basis for payment.
3. Include unit price on Bid Form.

1.3 QUALITY ASSURANCE

A. Compaction Density Test:
1. Standard Proctor, ASTM D698.

B. Owner will hire an independent soils laboratory to conduct in place moisture and density tests.
1. Contractor to pay for retests of material not passing initial tests.
2. Notify Owner at least 2 weeks prior to anticipated date of testing.
3. Contractor to pay additional costs if work is delayed due to Contractor’s failure to notify party as specified above.

C. Comply with aspects of “Safety Rules and Regulations for Excavation” as promulgated by State law for state in which excavation will occur.

1.4 JOB CONDITIONS

A. Verify location and existence of underground utilities.
1. Omission or inclusion of located utility items on drawings does not constitute non-existence or definite location.
2. Secure and examine local utility surveyor records for available location data.

B. Protect existing utilities from damage.
1. Repair damages to utility items.

C. Avoid overloading.

D. Keep surcharge sufficient distance back from edge of excavation to prevent slides or caving.

E. Maintain and trim excavated materials in such a manner to be as little inconvenience as possible to public and adjoining property owners.

F. Provide full access to public and private premises, to fire hydrants, at street crossings, sidewalks and other points as designated by Engineer to prevent serious interruption of travel.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Backfill Material:

1. As approved by Engineer.
2. Free of rock cobbles, roots, sod or other organic matter, and frozen material.
3. Moisture content at time of placement:
   a. Within 3 PCT of optimum moisture content.
   b. Wet dry material, as required.
   c. Dry wet material, as required or:
   d. Furnish off site material at no additional cost to Owner.

PART 3 - EXECUTION

3.1 GENERAL

A. Remove and dispose materials Engineer finds unsuitable.

B. Trench, backfill and compact for underground utilities.

3.2 TRENCH EXCAVATION

A. Excavate trenches by open cut method to depth indicated and necessary to accommodate work.

1. Permission may be granted for tunnel work for crossing under crosswalks, driveways or existing utility lines.
2. Such tunnels are limited to 3050 MM 10 FT in length.

B. Open no more than 90 M 300 LF of trench at one time, or less, as required by Engineer.

C. Failure to comply may necessitate shutdown of entire project until backfilling is performed.

D. Carry rock excavations minimum of 305 MM 12 IN below indicated invert elevations.

E. Do not excavate below indicated grades unless required to remove unsuitable material.

F. Backfill overexcavations in maximum 205 MM 8 IN lifts compacted to specified density.

G. Trench size:

1. Excavate only sufficient width to accommodate free working space.
2. Cut trench walls vertically from bottom of trench to top of pipe, conduit, or utility service.
3. Trench width at top of pipe or conduit may not exceed outside diameter of utility service by more than following dimensions:

Overall Diameter of Utility Service	Excess Dimension
840 MM and less	400 MM
more than 840 MM	600 MM

Overall Diameter of Utility Service	Excess Dimension
33 IN and less	16 IN
more than 33 IN	24 IN

H. Keep trenches free of water.

I. Brace and sheet trenches as soil conditions dictate.

J. Do not remove until backfilling has progressed to a stage that no damage to piping, utility service, or conduit will result due to removal.

3.3 PREPARATION FOR PIPE LAYING

A. See drawings and specific pipe material sections for embedment requirements.

B. When discrepancy exists between those requirements and these specifications, provide type of embedment which provides greatest load factor.

C. Types of Embedment:
1. Class A: Concrete cradle.
   a. Load factors:
      1) 2.2 - Lightly Tamped.
      2) 2.8 - Carefully tamped.
      3) 3.4 - Reinforced Concrete with p=0.4 PCT.
2. Class 4: Concrete arch type bedding.
   a. Load factors:
      1) 2.8 - Plain Concrete.

2) 3.4 - Reinforced Concrete with p=0.4 PCT.

3) 4.8 - Reinforced Concrete with p=1.0 PCT.

3. Class B: First-class bedding.

a. Shaped bottom with tamped backfill, or:

b. Compacted granular bedding with tamped backfill.

c. Load factor:

1) 1.9 - Carefully compacted backfill.

4. Class C: Ordinary bedding.

a. Granular bedding with tamped backfill.

b. Load factor:

1) 1.5 - Lightly compacted backfill.

D. Form bell holes in trenches such that only barrel of pipe is firmly supported by bedding material.

3.4 BACKFILLING

A. Do not backfill until tests are performed on system, and system complies with specified requirements.

B. Hand or pneumatic tamp backfill around and over pipe in lifts not exceeding 205 MM 8 IN loose thickness.

C. Compact to specified density.

D. Exercise care in backfilling operations to avoid displacing pipe joints either horizontally or vertically and to avoid breaking pipe.

E. Do not water flush or puddle to consolidate backfill.

3.5 COMPACTION

A. Compact trench backfill in areas under paved roads, parking areas, sidewalks and other structures as directed by Engineer to at least 95 PCT of maximum dry density.

B. In locations where trench will not be under paved areas, compact backfill to minimum 90 PCT of maximum dry density.

3.6 CLEANUP

A. Cleanup debris resulting from work.

END OF SECTION