Part 1 - General

1.01 Related Documents

A. Contract provisions, Drawings, and Division 1 Specification sections apply to work of this Section.

1.02 Summary

A. The work covered by this section includes the furnishings of all plant, labor, tools, equipment and material, and performing all operations in connection with the excavation, trenching, and backfilling for the installation of all pipelines, related structure and accessories. This includes the necessary clearing and grubbing, pavement cutting, compaction, pavement restoration, grading and cleanup, all in accordance with these technical provisions and applicable drawings. The final installation shall also meet the requirements of Section 15400, Water and Sewer Line Separation Requirements.

1.03 Related Work Specified Elsewhere

A. Clearing of Site: Section 02110.

B. Earthwork: Section 02210.

1.04 REFERENCES


B. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 kg) Rammer and 12 inch (304.8 mm) Drop.

C. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.


E. ASTM D2922 - Test Method for Density of Soil in Place by the Nuclear Method.
Part 2 - Products

2.01 Backfill Materials

A. Pipe Zone - The area around the pipe within the trench prism to a level one foot above the highest point of the pipe (top of pipe or service connection) shall be Type IIB fill as specified in Section 02210.

B. Backfill above pipe zone - The area within the trench prism above the pipe zone shall consist of on-site or imported materials as specified in Section 02210.

Part 3 - Execution

3.01 Layout and Staking

A. Property line corners are to be clearly marked at the time of final inspection with 16' rebar with 4" exposed above ground. Tiered surveyors to be to top of rebar. All layout and staking for site work shall be performed by a licensed engineer or land surveyor who is to be paid for by the Contractor and approved by the Architect/Engineer. Copies of survey notes shall be given to the Owner with one or more copies to remain on the job site at all times.

3.01 Protection of Excavation

A. The contractor shall provide suitable sheathing, shoring and bracing to protect all excavations as required to provide safe working conditions as directed by the Project Engineer and in conformance with applicable OSHA safety regulations. Damage resulting from settlement, slides, cave-ins, water pressure and other causes shall be repaired by the Contractor at his expense. Suitable signs shall be so placed as to show in advance where construction, barricades or detours exist.

B. The Contractor shall at all times perform his work so as to insure the least possible obstruction to traffic or inconvenience to the general public and the residents in the vicinity of the work, and to insure the protection of persons and property in a manner satisfactory to the Owner. No road or street shall be closed to the public except with the permission of the proper Governmental authority. Fire hydrants on or adjacent to the work shall be kept accessible to fire fighting equipment at all times.
Temporary provisions shall be made by the Contractor to insure the use of sidewalks, and the proper functioning of all gutter, sewer inlets, drainage ditches and irrigation ditches, which shall not be obstructed.

3.02 Excavation

A. General: It is expected that all excavation required for the performance of this contract shall be made by open cut methods unless otherwise shown on the drawings or required by applicable encroachment permits.

B. Grading and Staking: All grading in the vicinity of the construction shall be controlled to prevent surface water from flowing into the excavations. Any water accumulated in the excavations shall be removed by pumping or other approved methods. During excavation, materials suitable for embedment and backfilling shall be piled in an orderly manner, a sufficient distance back from the edges of the bank to avoid overloading and to prevent slides or cave-ins. Materials suitable for backfilling shall be hauled from the job site and disposed of by the Contractor at approved areas.

C. Pavement Cutting: Where it is necessary to remove sections of asphalt pavement, the asphalt shall be clean-cut with approved equipment in a neat line 6 inches back from the outside edge of the excavation in order to provide a key when restored.

1. Where it is necessary to remove sections of concrete pavement, the concrete shall be saw-cut to a depth of not less than 1-1/2 inches with neat, vertical, true lines in such a manner that the adjoining surface will not be damaged.

D. Rock Excavation: All trenching and excavation regardless of materials encountered and equipment or methods required for excavation, will be unclassified; and the cost thereof shall be considered as being included in the lump sum bid. No extra payment or change orders will be allowed for rock excavation.

E. Dewatering: The Contractor shall remove and dispose of all water entering the trenches and shall keep the trenches water free until the water main and other appurtenances are in place. In no case shall water, earth, or any foreign materials be allowed to enter the sewer or water mains.

1. No extra payment or change order will be allowed for removal of water from the utilities' excavation.

F. Excavation for Structures: Excavation for items such as manholes, valves, foundations, catch basins, culverts, subterranean form work, and other structures shall be to the necessary depth and sufficient to leave at least 12 inches of clear space between the structure's outer surface and the embankment of shoring which may be used to hold the banks.
G. Over-excavation: Whenever solid or loose rock, rocky soil with rocks larger than 3/4 inches in the largest dimension, or otherwise unsuitable soils which are incapable of properly supporting the pipe or structure are encountered in the trench bottom, such material shall be over-excavated to a minimum depth of 6 inches below the pipe or structure and removed.

1. Except at locations where over-excavation is required, care shall be taken not to excavate below the depths indicated. In the event of accidental over-excavation, the trench bottom grade will be restored in the same manner as areas intentionally over-excavated.

H. Trench Excavation: The sides of all trenches for the installation of utility piping systems shall be as nearly vertical as soil conditions permit below the level of the top of the pipe. Except for the trenching for 1 inch water service lines, the width of the trench shall not be less than 12 inches nor more than 24 inches wider that the outside diameter of the pipe barrel. Trench excavation shall be centered on pipe alignment such that a minimum clear space of 6 inches is provided on each side of the pipe. Trench width above the level of the top of the pipe may be as wide as necessary for shoring and sheeting, and for proper installation of the work.

1. The depth of all trenches shall be as indicated on the drawings. If not otherwise specified, the depth of all trenches shall be in accordance with the specifications for the installation of waterlines and sewer lines.

2. Unless otherwise required by applicable permits to be less, the maximum length of trench that may be left open at any one time shall not exceed 500 feet.

I. Cold Weather Protection: Protect excavation bottoms from freezing when temperature is less than 35 degrees F.

3.03 Placement And Compaction Of Pipe Embedment And Backfill Material

A. Pipe Embedment: Pipe embedment is defined as that material required to bring the trench bottom up to grade and that material placed alongside and above pipe to a level of at least 6 inches over the top of the pipe. The pipe embedment area is divided into three zones as defined below. Pipe embedment shall be Type IIB fill (Section 02210). Embedment and the first 6-inches of backfill above the top of the pipe in rock excavation shall be done in the presence of the A/E Inspector. Any backfilling done in violation of this provision shall be cause for removal and replacement at the expense of the contractor even though the work is found to be in accordance with these specifications.

1. Bedding: Bedding is that portion of pipe embedment zone beneath the pipe. If the native soil is suitable for bedding the pipe without over-excavation, the bottom of the trench shall be accurately shaped to provide uniform bearing and support for each section for the entire length of the pipe. Bell holes shall be excavated to provide minimum clearance of 2 inches below the coupling or bell. Imported bedding material shall likewise be placed to provide
uniform and adequate longitudinal support under the pipe. Bedding material shall be placed and compacted in lifts not to exceed 6 inches in loose measure.

2. Haunching: Haunching is that portion of the pipe embedment zone from the bottom of the pipe to the springline of pipe. Haunching material shall be placed and hand tamped to provide adequate side support to the pipe while avoiding both vertical and lateral displacement of the pipe from the proper alignment.

3. Initial Backfill: Initial backfill is that portion of the pipe embedment zone from the springline of the pipe to a minimum level of 6 inches over the top of the pipe. Initial backfill material shall be placed and compacted in lifts not to exceed 6 inches in loose measure except as otherwise required by the applicable roadway authority or permits.

B. Final Backfill: Final backfill is defined as that material between the pipe embedment zone and the ground surface. Material shall be placed and compacted in lifts not to exceed 6 inches thick in loose measure except as otherwise required by the applicable roadway authority or permits.

C. Compaction Requirements: Unless otherwise specified by applicable permits or roadway authority, bedding, haunching, initial backfill, final backfill, and gravel resurfacing shall be compacted to the following percent of the maximum density as determined by ASTM D1557. In-place densities of materials shall be determined by the sand-cone method, ASTM D1556 or by nuclear methods, ASTM D2922.

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<th>Percent of Maximum Density</th>
<th>Bedding Backfill</th>
<th>Haunching Backfill</th>
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<th>Final Backfill</th>
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<td>Under Building Slabs</td>
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</tbody>
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D. Water Jetting: The introduction of water in the pipe embedment or final backfill material shall not be permitted as a means of compaction.

3.04 Imported Backfill

A. Imported Pipe Embedment: If the native soil is unsuitable, the Contractor shall import Type A fill. Unsuitable material is defined as solid or loose rock per these specifications, soils with rocks larger than 3/4 inches in the largest dimension, or otherwise unsuitable soils which are incapable of properly supporting the pipe.
B. Imported Final Backfill: Use soil fill.

3.05 Bedding And Backfill For Structures

A. Bedding: Bedding for structures is defined as that material beneath the structure. This bedding material shall be as specified in the standard detail for each structure.

B. Backfill: Backfill for structures is defined as that material from the bottom of the structure to the ground surface. This backfill material, and required compaction of such shall be the same as that specified for the final backfill on pipelines.

3.06 Settlement Of Adjacent Structures

A. Throughout the warranty period of the contract, the Contractor shall be required to fill and compact any areas where settlement has taken place, and shall also be responsible for the settlement of any adjacent structure or object caused by any excavation performed under this contract.

3.07 Surface Restoration And Resurfacing

A. Surface Restoration: The following requirements shall be followed unless stricter specifications are set by road right-of-way crossing permits and/or other right-of-way crossing permits and/or other sections of these specifications and drawings.

B. After the piping and structures have been installed and all backfilling has been completed, areas which were disturbed shall be brought to true grades. All slopes shall be trimmed and dressed, and all surfaces graded to maintain existing drainage.

All streets, alleys, driveways, sidewalks, curbs or other surfaces which have been disturbed or damaged shall be resurfaced. All excess excavated material shall be properly disposed of by the Contractor.

3.08 Roadway Patching

A. Whenever existing roadways are disturbed during the normal course of construction, the Contractor shall restore the roads to their original condition.

B. In lieu of this special compaction, the Contractor may use a well graded level or crushed stone as backfill. The material shall be clean and may vary in size from 3/8 inch to 1-1/4 inch with not
more than 10 percent of the material less than 3/8 inch in size, it shall be compacted to 6-inch layers, as directed by the Architect/Engineer.

C. Surfacing shall be replaced where the roadway has gravel, crushed stone, or asphaltic surfacing. Gravel or crushed stone shall be replaced in quantities and locations as directed by the Architect/Engineer. Asphalt mix surfacing shall be in the roadway to a depth of 2 inches. A compacted, stabilized gravel or crushed stone base 6 inches in depth shall be placed in the roadway at all locations where surfacing is required, prior to placement of the bituminous wear course.

D. The Contractor shall obtain any and all necessary written permissions, easements, and permits from federal, state, and county agencies prior to beginning any roadway excavation.

End of Section 02221