SECTION 02321

EXCAVATION, FILLING, AND BACKFILLING FOR STRUCTURES

PART 1 - GENERAL

1.1 Summary

A. This Section includes all necessary excavation, filling, and backfilling for structures and all related Work, including duct banks and manholes.

B. Related Work Specified Elsewhere

Trench Excavation and Backfill.....Section 02300
Concrete.....DIVISION 3

1.2 Quality Assurance

A. Reference Standards and Specifications

1. American Society for Testing and Materials (ASTM)

ASTM D1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.

ASTM D4253 - Test Method for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.

ASTM D4254 - Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.

2. Occupational Safety and Health Administration (OSHA)

Part 1926 - Safety and Health Regulations for Construction.

1.3 Submittals

A. Submit as specified in Section 01330.

B. Where selecting an option for excavation, trenching, and shoring in compliance with local, state, or federal safety regulations such as "OSHA Part 1926" or successor regulations, which require design by

a registered professional engineer, submit (for information only and not for Engineer approval) the following:

1. Copies of design calculations and notes for sloping, benching, support systems, shield systems, and other protective systems prepared by or under the supervision of a professional engineer legally authorized to practice in the jurisdiction where the Project is located.

2. Documents provided with evidence of registered professional engineer's seal, signature, and date in accordance with appropriate state licensing requirements.

PART 2 - MATERIALS

2.1 Fill and Backfill Material

A. Earth Backfill:

Use suitable material as specified in SECTION 02300, PART 2 for granular backfill.

B. Granular Fill:

Native excavated or approved import granular material, free draining and free of unsuitable materials defined herein. Granular backfill shall be non-plastic, well graded and meet the following gradation:

Sieve Size	Percent by Weight Passing
¾ inches	100
No. 4	40 - 85
No. 8	30 - 75
No. 40	10 - 50
No. 100	5 - 20
No. 200	3 - 12

2.2 Concrete

A. Includes all concrete used to restore bottom of excavation to proper elevation, and in concrete seal coats.

B. Concrete shall be as specified in DIVISION 3.

PART 3 - EXECUTION

3.1 Excavation

A. Perform as specified in Section 02300 and as follows:

1. Excavate area adequate to permit efficient erection and removal of forms.

2. Trim to neat lines where details call for concrete to be deposited against earth.

3. Excavate by hand in areas where space and access will not permit use of machines.

4. Notify Engineer immediately when excavation has reached the depth indicated. Do not proceed further until approved.

5. Restore bottom of excavation to proper elevation with compacted fill in areas overexcavated, as approved.

6. Top with 75-mm (3-inch) concrete seal coat if required to provide satisfactory subgrade for structural base slabs:

a. Seal coat shall conform to applicable requirements of DIVISION 3.

7. Use sides of trenches to form sides of duct banks where possible and where sides of trench are vertical, stable, and excavated to the proper line.

B. Sheeting and Shoring:

1. Sheeting and Shoring shall be provided when soil conditions indicate the need for sheeting and shoring.

2. Damages:

a. Repair all damage resulting from Contractor's excavation and remove and replace all undermined pavements with Owner-approved equal, either concrete or asphalt, at Contractor's expense and in accordance with Section 02630.

3.2 Filling and Backfilling

A. Granular Fill:

1. Place on prepared subgrade where indicated, prior to placing concrete in slabs on grade.

2. Lifts shall not exceed 150 mm (6 inches) in loose-layer thickness.

3. Compact to 95% relative density as referenced to ASTM D4253 and D4254.

B. Earth Backfill:

1. Backfill only after concrete has attained 70% design strength.

2. Backfill adjacent to structures only after, in the opinion of Engineer, a sufficient portion of the structure has been built to resist the imposed load.

3. Remove all debris from excavation prior to placement of material.

4. The slope bounding the excavation, if steeper than 6 horizontal: 1 vertical, shall be stepped or serrated prior to placing the backfill material.

5. Perform backfilling simultaneously on all sides of structures.

6. Place backfill in level layers not exceeding 100 to 200 mm (4 to 8 inches) in loose-layer thickness.

7. Exercise extreme care in the use of heavy equipment in areas adjacent to structures.

8. Compact to 95% of maximum dry density within the moisture content range from 2% below optimum to 2% above optimum. Optimum moisture and maximum dry density shall be determined by ASTM D1557. Accomplish without inundation or flooding.

3.3 Field Quality Assurance

A. Compaction:

1. Contractor shall, through services of an independent laboratory, test all filling and backfilling for structures to determine conformance with density relationships specified.

2. Method of test shall be as specified in SECTION 02300, PART 3.

3. The frequency of tests shall be in compliance with jurisdictional requirements.

PART 4 - MEASUREMENT AND PAYMENT – Not Applicable

END OF SECTION