

**SUB WATER DEPARTMENT
STANDARD CONSTRUCTION SPECIFICATIONS
TABLE OF CONTENTS**

**SECTION 31 23 00
EXCAVATION AND BACKFILL, GENERAL**

PART 1	GENERAL	2
1.1	Description.....	2
1.2	Submittals	2
1.3	Reference Specifications, Codes and Standards	2
A.	Commercial Standards	2
B.	Reference Standards	3
1.4	Classification of Excavation	3
A.	Unclassified Excavation	3
B.	Classified Excavation	3
1.5	Quality Assurance.....	4
1.6	Site Conditions.....	5
PART 2	PRODUCTS	5
2.1	Granular Backfill (Imported).....	5
2.2	Granular Drain Backfill Material.....	6
2.3	Controlled Low Strength Material (CLSM)	6
2.4	Select Native Fill	6
2.5	Imported Fill	6
2.6	Topsoil	7
2.7	Spoils	7
PART 3	EXECUTION	7
3.1	General.....	7
3.2	Topsoil Stripping and Stockpiling	7
3.3	Excavation	8
3.4	Rock Excavation.....	8
3.5	Grading and Filling.....	9
3.6	Topsoil Fill.....	10
3.7	Controlled Low Strength Material (CLSM)	10

PART 1 GENERAL

1.1 Description

Work covered in this section includes general excavation, fill, and backfill work.

1.2 Submittals

- A. Submit results of aggregate sieve analysis and T-180 proctor value. The submitted values shall be used for all granular material compaction testing.
- B. Submit mix proportions for Controlled Low Strength Material (CLSM). The proposed mix design shall be strength tested in accordance with ASTM D 4832 at 7, 14 and 28 days age and the results submitted to the Engineer. The Contractor shall submit to the Engineer batch weights of each batch of CLSM used during construction.
- C. See Section 01 33 00 for Contractor submittals.

1.3 Reference Specifications, Codes and Standards

A. Commercial Standards

ASTM C 94	Specification for Ready-Mixed Concrete 30
ASTM C 403	Test Method for Time of Setting Concrete Mixtures by Penetration Resistance
ASTM D 422	Method for Particle-Size Analysis of Soils
ASTM D 698	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 (AASHTO T-180)
ASTM D 2487	Classification of Soils for Engineering Purposes
ASTM D 4253	Test Methods for Maximum Index Density of Soils Using a Vibratory Table
ASTM D 4254	Test Methods for Minimum Index Density of Soils and Calculation of Relative Density

ASTM D 4832	Preparation and Testing of Controlled Low Strength Material Test Cylinders
ASTM D 6938	Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

B. Reference Standards

References herein to the “Standard Specifications for Highway Construction” shall mean The Oregon Department of Transportation, Standard Specifications for Highway Construction. References herein to “AASHTO” shall mean Association of American State Highway Transportation Officials.

1.4 Classification of Excavation

A. Unclassified Excavation

Unclassified excavation is defined as all excavation, regardless of the type, character, composition, or condition of the material encountered and shall further include all debris, junk, broken concrete, and all other material. All excavation shall be unclassified unless provided for otherwise elsewhere in these specifications.

B. Classified Excavation

1. Common Excavation

Common excavation is defined, as the excavation of all material not classified as Rock Excavation.

2. Rock Excavation

Rock excavation is defined as the removal of rock by systematic and continuous drilling and blasting, if allowed, and hammering, breaking, splitting, or other approved methods. Rock is defined as material including boulders, solid bedrock, or ledge rock, which, by actual demonstration, cannot be reasonably excavated with suitable power excavation equipment. Suitable machinery is defined as a track-mounted hydraulic excavator of the 52,800 to 72,500 pound class equipped with a single shank ripper. The Engineer may waive the demonstration if the material encountered is well-defined rock. The term "rock excavation" shall be understood to indicate a method of removal and not a geological formation.

If material which would be classified as rock by the above definition is mechanically removed with equipment of a larger size than specified, it shall be understood that any added costs for the removal of material by this method shall be included in the unit price for common excavation. Before the removal of rock by the methods described above will be permitted, the Contractor shall expose the material by removing the common material above it and then notify the Engineer who, with the Contractor or his representative, will measure the amount of material to be removed.

In trench excavations, boulders or pieces of concrete below grade larger than one half (1/2) cubic yard will be classified as rock if blasting, hammering, breaking, or splitting is actually required and used for their removal from the trench. If material, which would be classified as rock by the definition above and elsewhere within these specifications, is mechanically removed without blasting, hammering, breaking, or splitting, it will be considered common excavation. If equipment larger than the "suitable machinery" as defined above is brought on the project site for the sole purpose of rock removal without blasting, hammering, breaking, or splitting, then such removal will be considered rock excavation.

Contractor shall verify if the use of explosives for excavation of rock is allowed on this project.

1.5 Quality Assurance

- A. Soil Testing -- Soil sampling and testing to be by an independent laboratory approved by the Engineer. The frequency of testing is to be determined by the Engineer. All soil testing shall be paid for by the Contractor.
- B. Compaction Tests -- Maximum density of optimum moisture content by ASTM D698 (AASHTO T-180). In-place density in accordance with Nuclear Testing Method ASTM D2922 and D3017.
- C. Soil Classification -- All imported materials, classification in accordance with ASTM D2487.
- D. Allowable Tolerances -- Final grades shall be plus or minus 0.04 foot.
- E. In Place Testing of CLSM -- CLSM shall be tested in accordance with ASTM C 403.

- F. Compressive Tests of CLSM -- CLSM shall be compressive tested in accordance with ASTM D 4832.

1.6 Site Conditions

- A. Quantity Survey -- Contractor shall be responsible for calculations of quantities of cut and fill from existing site grades to finish grades established under this contract as indicated on the plans or specified and shall include the cost for all earthwork in the total basic bid.
- B. Dust Control -- Must meet Oregon State DEQ and Local requirements. Protect persons and property from damage and discomfort caused by dust. Water as necessary and when directed by the Engineer to quell dust.
- C. Soil Control -- Soil shall not be permitted to accumulate on surrounding streets or sidewalks nor to be washed into sewers. See provisions for erosion control.
- D. Existing Underground Utilities -- Protect active utilities encountered and notify persons or agencies owning same. Remove inactive or abandoned utilities from within the project grading limits to a depth at least twelve (12) inches below the subgrade established under this contract. All abandoned piping is to be plugged as approved by Engineer.

PART 2 PRODUCTS

2.1 Granular Backfill (Imported)

- A. Sand - Sand shall consist of fine granular material, naturally produced by the disintegration of rock, or produced from crushed gravel, and reasonably free of organic material, mica, clay, and other deleterious substances as approved. The maximum particle size shall be 1/4 inch, with a gradation which allows 90 percent to 100 percent by weight to pass a No. 4 sieve and not more than 5 percent to pass a No. 200 sieve.
- B. Crushed Aggregate --Crushed rock with 3/4 inch-0, 1 inch-0, and 1 1/2 inch-0 gradation as shown on the plans shall meet the gradation and other requirements of the Oregon Department of Transportation (ODOT) and the City of Springfield Standard Construction or the specifications of the agency having jurisdiction.

2.2 Granular Drain Backfill Material

Granular drain backfill material shall be crushed or uncrushed rock or gravel as shown on the plans and shall be clean and free-draining. Granular drain backfill material shall be the size as shown on the plans and shall meet the gradation and other requirements of the Standard Specifications for Highway Construction for such material.

2.3 Controlled Low Strength Material (CLSM)

CLSM shall be composed of cement, pozzolans, fine aggregate, water, and admixtures. CLSM shall have a low cement content, be non-segregating, self consolidating, free-flowing and excavatable material which will result in a hardened, dense, non-settling fill and a compressive strength at 28 days of 150 to 350 psi if not otherwise shown or specified.

GUIDELINES FOR CLSM MIXES

Proportions per Cubic Yard

Maximum Compressive Strength	100 - 350 psi
Maximum Mixing Water	30 - 50 gals
Cement	75 - 150 lbs
Fly Ash/Slag	200 - 350 lbs
Dry Aggregate	2100 - 3200 lbs
(Weights may need adjusting for pumpability)	

NOTE: The weights shown are only an estimate of the amount to be used per cubic yard of CDF. The actual amounts may vary from those shown if approved by the Engineer. The Contractor may submit additional data to be approved by the Engineer.

2.4 Select Native Fill

Select native fill shall consist of approved earth obtained from on-site excavations, free of peat, humus, vegetative matter, organic matter, and rocks greater than 12 inches in diameter, processed as required to be placed in the thicknesses prescribed and at the optimum moisture content to obtain the level of compaction required by these specifications.

2.5 Imported Fill

Imported fill material shall consist of approved imported earth substantially free of organic material and foreign debris. Imported fill material shall meet the requirements for select native fill as defined above and shall be approved by the Engineer.

2.6 Topsoil

The top 6 to 12 inches of existing soil containing organic matter. The Engineer's decision shall be final as to determination of what is of topsoil quality. Topsoil shall be stockpiled on site for later use in landscaping. Care shall be taken in collection of topsoil so as to preserve native seed stocks, which are valuable to restoring native species as part of finish landscaping.

2.7 Spoils

All excess material not suitable or not required for backfill and grading shall be hauled off site and disposed of at a location approved by the Engineer. The Contractor shall make arrangements for disposal of the material at no additional cost to the OWNER. A landfill permit is to be obtained by the Contractor and a copy provided to the Engineer prior to commencement of disposal.

PART 3 EXECUTION

3.1 General

- A. Prior to work in this section, become familiar with site conditions. In the event discrepancies are found, notify the Engineer as to the nature and extent of the differing conditions.
- B. Do not allow or cause any work performed or installed to be covered up or enclosed prior to required tests and approvals. Should any work be enclosed or covered up, the work shall be uncovered at the Contractor's expense.

3.2 Topsoil Stripping and Stockpiling

- A. Site within clearing limits shall be stripped of topsoil to depths approved by the Engineer, as required to obtain additional topsoil necessary to complete the work indicated on the plans or specified.
- B. Topsoil shall be free of sticks, large rocks, clods, and subsoils.
- C. Stockpile topsoil at locations approved by the Engineer for redistribution as specified. Grade the surface of stockpiles remaining over winter months to prevent ponding of water. Cover stockpiles to minimize the infiltration of water. See other provisions for erosion control.

3.3 Excavation

- A. Excavate material of every nature and description to the lines and grades as indicated on the drawings and/or as required for construction of the facility.
- B. Provide and maintain equipment to remove and dispose of water during the course of the work of this section and keep excavations dry and free of frost or ice.
- C. Project dewatering is specified elsewhere. Coordinate drainage requirements with this work. Provide temporary drainage ditches as required and regrade as indicated at completion of project.
- D. Excavated material not approved for use in the embankments or in excess of that needed to complete the work shall be hauled off site and disposed of at no expense to the OWNER.

3.4 Rock Excavation

- A. Where the bottom of the excavation encounters ledge rock and/or boulders and large stones which meet the definition of “rock” as described herein, said rock shall be removed to provide 12 inches of clearance on each side and below all structures, pipes, and appurtenances.
- B. Excavations below subgrade in rock shall be backfilled to subgrade with approved bedding material and thoroughly compacted.
- C. If explosives are allowed on this project, the Contractor shall comply with the requirements for the use and security of explosives as specified in the special provisions.
- D. Wherever the use of explosives is required during the course of the work, and if the use of explosives is allowed on this project, the Contractor shall conform to the recommendations of the Manual of Accident Prevention in Construction, published by AGC, in regard to Section 5, Explosives. Prior to commencing use of explosives, the Contractor shall submit a certificate of insurance showing coverage of blasting operating and blasting product liability to the limits required by the General Conditions. Coverage for this extra hazard shall be maintained during all blasting operations.
- C. The Contractor shall provide all necessary approved types of tools and devices required for loading and using explosives, blasting caps, and accessories, and conform to and obey all federal, state, and local laws that may be imposed by any public authority.

- D. Where excavations in hard, solid rock are to be made to depths of 10 feet or more, blasting thereof shall be done by the pre-splitting or pre shearing method, unless other methods are approved by the Engineer.
- F. When blasting rock, cover the area to be shot with blasting mats or other approved types of protective material that will prevent the scattering of rock fragments outside the excavation. The Contractor shall give ample warning to all persons within the vicinity before blasting, station people and provide signals of danger in suitable places to warn people and vehicles before firing any blasts. Fire all blasts with an electric blasting machine which shall be connected to the circuit immediately prior to the time for firing, and only then by the person who will operate the blasting machine.
- G. The Contractor shall assume all liability and responsibility connected with or accruing from blasting, or the use of explosives or dangerous material of any kind whatsoever. Such liability shall extend to include, but not be limited to, damage to work or adjacent property, injuries, lawsuits, complaints and all other adverse results, whether actual, alleged, inferred or implied.

3.5 Grading and Filling

- A. General -- Grading and filling operations shall not take place when weather conditions and moisture content of fill materials prevent the attainment of specified density. Vertical curves or roundings at abrupt changes in slope shall be established as approved by Engineer. Bring all graded areas to a relatively smooth, even grade and slope by blading or dragging. Remove high spots and fill depressions.
- B. For areas receiving surface structures or existing paved areas to be constructed or replaced by the Contractor or by others, such as railways, roadways, driveways, parking lots, and sidewalks, place clean well-graded gravel fill material (3/4 inch – 0 inch) in 6-inch lifts and compact with vibratory equipment to 95 percent maximum density unless otherwise specified.
- C. Embankment Construction -- Place fill material shown or specified in 8-inch loose lifts and compact with approved equipment. All fill material within 3 feet of the top of fill elevations shall be compacted with vibratory equipment to 95 percent maximum density unless otherwise specified. All fill material below the 3-foot limit shall be compacted with vibratory equipment to 90 percent maximum density unless otherwise specified.

3.6 Topsoil Fill

- A. Scarify prepared subgrade to a depth of four inches immediately prior to placing topsoil.
- B. Place topsoil in areas to be seeded to the depths indicated, with a minimum depth of six inches. Place loose, do not compact, and do not place in wet or muddy conditions.

3.7 Controlled Low Strength Material (CLSM)

- A. At time of placement, the CLSM must be at least 40 degrees F and ambient air temperature must be at least 34 degrees F and rising. Subgrade on which CLSM is to be placed shall be free of disturbed or soft material, debris, and water.
- B. After CLSM is placed, further construction proceeding upon it will be permitted only after initial set is attained, as measured by ASTM C 403. No traffic or construction equipment shall be allowed on CLSM for at least 24 hours after placement.

END OF SECTION