SECTION 33 41 66

DRAIN FILL

PART 1 GENERAL

1.01 SUMMARY

A. Provide Drain Fill for drainage blankets and as riprap bedding as shown and as specified. Comply with applicable provisions of Divisions 00 and 01.

1.02 RELATED SECTIONS

01 57 60 - Construction Dewatering.
31 20 00 - Earth Moving and Embankments.
33 42 15 - Piping and Accessories.

1.03 SUBMITTALS

A. Drain Fill Source: At least two weeks prior to start of construction, submit source and sample results of proposed Drain Fill materials.

B. Test Report:

1. Grain size analysis in accordance with ASTM C136 of proposed Drain Fill to demonstrate acceptability of source.
2. Optimum moisture-maximum density curve for fill materials in accordance with ASTM D1557.

C. Make submittals in accordance with Section 01 33 00.

1.04 TESTING

A. A/E will perform tests to verify Drain Fill in place. These tests are not intended to provide Contractor with information needed to assure proper execution of work and test performance will not relieve Contractor of responsibility of performing tests for that purpose.

B. At least one grain size analysis will be performed for each type of Drain Fill for each 100 lin ft along the embankment where Drain Fill is placed. Contractor shall provide A/E free access to placed material for purpose of obtaining samples for testing. Samples will be obtained from in-place, compacted Drain Fill.

C. Contractor shall arrange and pay for soil sampling and testing by a qualified testing agency, acceptable to Owner and independent of Contractor.

D. Field Testing:

1. Perform a minimum of one field density test for each vertical foot of Drain Fill for every 100 lin ft of Drain Fill placement.
2. Field density tests shall be in accordance with ASTM D6938 or ASTM D1556.
3. Where soil materials do not conform to type or density specified, soil shall be replaced or reworked to conform. Cost of extra tests for replaced or reworked areas shall be paid for by Contractor.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Drain Fill aggregates shall be stored and handled by methods that prevent segregation of particle sizes or contamination by other materials.

PART 2 PRODUCTS

2.01 DRAIN FILL MATERIALS

A. Drain Fill aggregates shall be sand, gravel, crushed stone or mixtures thereof, composed of clean, hard, durable mineral particles free from organic matter, clay balls, soft particles, excessive fine-grain soils, or other substances that would interfere with their free-draining properties.

1. Not more than 15 percent, by weight, shall be flat, elongated particles.
2. Not more than 5 percent of material finer than a No. 4 sieve shall be crushed limestone.
3. Material passing the No. 200 shall be non-plastic.

B. Drain Fill shall comply with the following gradation by weight:

	Percent Passing		
Sieve Designation	Type 1[(1)]	Type 2[(2)]	Drain Gravel[(3)]
1"			
3/4"		100	
1/2"			100
3/8"	100	90-100	85-100
No. 4	95-100	20-55	10-30
No. 8	80-100	5-30	0-10
No. 16	50-85	0-10	0-5
No. 30	25-60		
No. 50	5-30	0-5	
No. 100	0-10		
No. 200	0-5		

[(1)] ASTM C33 Fine Aggregate
[(2)] ASTM D448 No. 89
[(3)] ASTM No. 8

C. Type 1 Drain Fill shall have a minimum moisture content of 10%. Additional water may be added in the field.

PART 3 EXECUTION

3.01 DRAINFILL COMPACTION TEST

A. Contractor shall construct a Type 1 testing area at a location off the dam footprint. The purpose of this test area is to construct a large enough test area to place and compact Type 1 Drain Fill by the methodology selected by Contractor.

B. Provide minimum two weeks notice to A/E of when test will be completed. Test to be completed under observation of A/E and SEO.

C. Test shall be conducted by placing a one foot sacrificial layer of Type 1 Drain Fill. A second lift, placed using a maximum 8” lift thickness, will be placed and compacted by the contractors chosen methodology.

D. Contractor shall arrange and pay for soil sampling and testing of the compacted Type 1 Drain Fill by a qualified testing agency, acceptable to Owner and independent of Contractor. Testing agency shall complete at least two (2) field density tests on the test section (using either ASTM D6938 or ASTM D1556) to determine if specified level of compaction is achieved. Testing agency shall also complete one (1) grain size analysis (using ASTM C136) to ensure compaction method does not result in an unacceptable level of particle breakdown.

E. If specified compaction is not achieved, additional test compaction efforts will be required until specified compaction and gradation is achieved.

F. A/E and Contractor shall document the required compaction effort to achieve design compaction and this methodology shall be used for placement of Type 1 Drain Fill on the project.

G. Placement of Type 1 Drain Fill may not occur until A/E and SEO approve of the Contractor's proposed compaction method.

3.02 PREPARATION

A. Foundation surfaces and trenches shall be clean and free of organic matter, loose soil, foreign substances, and standing water when Drain Fill is placed. Earth surfaces upon or against which Drain Fill will be placed shall not be scarified.

B. Contaminated Drain Fill near edge of each excavation section shall be removed prior to continuation of placement of Drain Fill.

C. Do not prepare any more base than can be satisfactorily covered that same working day.

3.03 PLACEMENT

A. Drain Fill shall not be placed until subgrade has been inspected and approved by A/E. Drain Fill shall not be placed over or around pipe or drain tile until installation of pipe or tile has been inspected and approved.

B. Type 1 Drain Fill shall be placed uniformly in layers not more than 8 in. deep before compaction. When compaction is accomplished by manually controlled equipment, layers shall be not more than 8 in. deep. Material shall be placed in a manner to avoid segregation of particle sizes and to ensure continuity and integrity of all zones. No foreign materials shall be allowed to become intermixed with or otherwise contaminate Drain Fill.

C. Type 2 Drain Fill shall be place to lines shown. Place Type 2 material to form a smooth uniform layer around drain pipes.

D. Traffic shall not be allowed to cross over drains at random. Equipment crossovers shall be maintained, and number and location of such crossovers shall be established and approved prior to beginning of Drain Fill placement. Each crossover shall be cleaned of all contaminating materials and shall be inspected and approved by A/E before additional Drain Fill is placed.

E. Damage to foundation surface or to sides or bottoms of trenches occurring during placement of Drain Fill shall be repaired before Drain Fill placement is continued.

F. Upper surface of Drain Fill constructed concurrently with adjacent zones of earth fill shall be maintained at an elevation at least 1 ft above upper surface of adjacent fill.

G. Drain Fill over or around pipe or drain tile shall be placed in a manner to avoid displacement of pipe or tile in line or grade.

3.04 CONTROL OF MOISTURE

A. Type 1 Drain Fill shall be near saturated during placement. When addition of water is required, it shall be applied in such a way as to avoid excessive wetting of adjacent earth fill.

3.05 COMPACTION

A. Type 1: Compact to 70% relative density. Avoid over compaction of Drain Fill. A/E will compare stockpiled and in-place Drain Fill samples and particle breakdown by over compaction cannot exceed 2%.

B. Type 2 and Drain Gravel: No compaction of Type 2 drain material and Drain Gravel will be required beyond that resulting from placing and spreading operations.

END OF SECTION