

**804 AGGREGATES FOR SOILS AND BASE COURSE CONSTRUCTION****804.01 GENERAL**

Samples of excavated trench and embankment material, borrow fill material for trenches and embankments, and sub grade gravel shall be submitted by the Contractor to the Chief Engineer with test results. Soils shall be free from snow, ice, frozen materials, trash, brick, clay lumps, broken concrete, tree roots, sod, ashes, cinder, glass, plaster, vegetable matter and any other foreign matter.

The Chief Engineer will approve or disapprove the material based on the test results submitted or have analyses made on excavated material prior to use of excavated material as backfill. For excavated trench material, a minimum of one analysis will be made for each 500 feet of trench.

Sampling will be performed in accordance with AASHTO T 2; the sample shall be prepared in accordance with AASHTO T 27 and AASHTO T 88; the percentage of wear shall be determined in accordance with AASHTO T 96. The liquid limit shall be determined in accordance with AASHTO T 89; and the plasticity index shall be determined in accordance with AASHTO T 90.

**804.02 EMBANKMENT BACKFILL**

Material used in embankments shall meet the following specifications and may be rejected on visual inspection pending the testing of representative samples. No gravel or stone shall be larger than 3 inches in any dimension. The material shall have at least 10 percent, but not more than 35 percent, by weight, passing the No. 200 sieve. The soil shall have a liquid limit of not greater than 40 and a plasticity index of 6 to 15 inclusive. In confined embankment areas, the minimum plasticity index need not apply. Compaction of materials for embankment fill shall meet the density requirements per [203.03](#).

**804.03 BLANKET SOIL**

Blanket material shall consist largely of clays or mixtures of silts and clays that when compacted will present a relatively impervious surface to prevent the entrance of water. In no case shall it be principally composed of sands or coarser material. Liquid limit shall be a minimum of 50 and plasticity limit index shall be a minimum of 20. Permeability shall be a minimum of  $10^{-6}$  cm/sec.

**804.04 BASE COURSE AND/OR STRUCTURAL BACKFILL**

Material approved for use as a base course shall have a minimum CBR of 25 (AASHTO T 193) when prepared in accordance with AASHTO T 180-Method D.

**(A) CRUSHED STONE BASE.** Crushed aggregate shall consist of crushed stone having hard, strong, durable particles, and conforming to the applicable requirements of AASHTO M147 for Bases.

Additional fine aggregate shall consist of material of the same type and quality as specified above for the coarse aggregate. The use of soil fines or natural sands will not be permitted.

The coarse aggregate and additional fine aggregate shall be so proportioned as to produce a final mixture meeting the following gradation requirements, including the tolerances:

Sieve Designation	Percent Passing by Weight	Job Mix Tolerances (Percent Passing by Weight)
2 inch	100	- 2
1-1/2 inch	95-100	+ or - 5
3/4 inch	70-92	+ or - 8
3/8 inch	50-70	+ or - 8
No. 4	35-55	+ or - 8
No. 30	12-25	+ or - 5
No. 200	0-8	+ or - 3

**(B) RECYCLED CRUSHED CONCRETE FOR BASE.** Recycled crushed concrete may be used in lieu of base material only if specified in the contract documents.

Materials of this type for use in base course shall meet the following specification requirements.

The combined aggregate for this use shall consist of crushed concrete or mortar, crushed stone, and crushed or uncrushed sand and gravel. Materials that break up under alternate freezing and thawing or wetting and drying shall not be used.

Coarse aggregate retained on the No. 10 sieve shall have a percentage of wear of not more than 50 in accordance with AASHTO T 96 and should have a minimum California Bearing Ratio of 25.

The fraction passing the No. 200 sieve shall not be greater than 2/3 of the fraction passing the No. 40 sieve. The fraction passing the No. 40 sieve shall have a liquid limit not greater than 25 and a plasticity index not greater than 6.

The composite material shall be free from organic matter, asphalt, bricks, lumps or balls of clay and other non-concrete material, and shall conform to the following grading requirements, including the tolerances:

Sieve Designation	Percent Passing By Weight	Job Mix Tolerances Percent Passing By Weight
2-1/2 inch (63mm)	100	-2
2 inch (50mm)	90-100	±5
3/4 inch (19mm)	60-90	±8
No. 4 (4.75mm)	30-60	±8
No. 10 (2.00mm)	20-45	±6
No. 40 (0.425mm)	10-30	±5
No. 200 (0.075mm)	4-12	±3

(C.) **SLAG FOR BASE COURSE.** The quality and grading requirements for slag used as a base course shall conform to [804.04\(A\)](#).

#### 804.05 TRENCH BACKFILL

Material used in trench backfill shall be a well graded soil- aggregate mixture with ten percent, but no more than 35 percent, by weight, passing the No. 200 sieve. The soil shall have a liquid limit not greater than 40 and a maximum plasticity index of 10. Recycled crushed concrete may be used in lieu of trench backfill if approved by the Chief Engineer.

Within one foot of the pipe, no gravel or stone shall be larger than 1-1/2 inches in any dimension.

For remainder of trench, no gravel or stone shall be larger than four (4) inches in any dimension, and not larger than one inch within two feet of finish grade.

Backfill shall be free from snow, ice, frozen materials, trash, brick, clay lumps, broken concrete, tree roots, sod, ashes, cinders, glass, plaster, organic matter and any other foreign matter.

Backfill shall have a minimum dry weight density of 100 pounds per cubic foot.

Backfill shall have a uniform moisture content suitable for compaction to the specified density. The Contractor shall moisten or dry soils materials to obtain a suitable, uniform moisture content. If the materials are of such nature that heaving, pumping, rutting, or shearing occurs in the compacted backfill under the action of construction equipment, even though soil meets density requirements, affected material shall be replaced to limits as directed.

#### 804.06 TRENCH SUBGRADE GRAVEL

Gravel to backfill trench undercut areas shall be per AASHTO M-43, Grading Size No. 57.

#### 804.07 FLOWABLE BACKFILL

(A) **DESCRIPTION.** This work shall consist of placing flowable backfill in lieu of compacted soil or aggregate backfill in underground utility lines.

(B) **MATERIALS.** Materials used in flowable backfill shall conform to the requirements of the following specifications and standards:

Hydraulic Cement - [801.01](#).

Fly Ash - AASHTO M 295, Class F.

Water - [822.01](#).

Aggregates - [803.01](#).

Admixtures - [814.04](#) and [814.05](#).

Do not use calcium accelerators with fly ash.

- (C) **MIX DESIGN.** The mix design for flowable backfill shall be provided by the Contractor. Flowable backfill shall have a design compressive strength of 50 to 150 psi. at 28 days when tested in accordance with AASHTO T23. The Contractor shall be responsible for providing a flowable mixture using these guidelines and adjusting the mixture design as called for by circumstances or as may be directed by the Chief Engineer. The Contractor shall submit a mix design for approval supported by laboratory test data for one (1), three (3) and twenty eight (28) day compressive strengths. The mix design shall be approved by the Chief Engineer prior to beginning work.

- (D) **CONSTRUCTION.** Mixing and transporting shall be in accordance with [Section 501](#) or by other methods approved by the Chief Engineer.

When used as backfill for pipe and floatation or misalignment occurs, correct alignment shall be assured by means of straps, soils anchors or other approved means of restraint.

- (E) **MEASURE AND PAYMENT.** The unit of measure for Flowable Backfill will be the cubic yard, complete in place. Payment for Flowable Backfill will be made at the contract unit price per cubic yard, which payment shall include furnishing and placing flowable backfill and for all materials, labor, tools, equipment and incidentals necessary to complete the work.

When not shown as a pay item in the contract documents, flowable backfill will be measured as specified above; however, it will be considered as a substitution for the appropriate item and payment will be made at the contract unit price per cubic yard for that item. Such price shall be full compensation for furnishing and placing flowable backfill and for all materials, labor, tools, equipment and incidentals necessary to complete the work.