



SECTION 32 11 23

AGGREGATE BASE COURSE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. The WORK to be performed includes the preparation of the aggregate base course foundation; and the production, stockpiling, hauling, placing, and compacting of aggregate base course.

1.02 RELATED SECTIONS

- A. The following is a list of SPECIFICATIONS which may be related to this section:
1. Section 01 57 19, Temporary Environmental Controls
 2. Section 31 23 00, Excavation and Fill.
 3. Section 31 23 19, Dewatering.
 4. Section 31 25 00, Erosion and Sedimentation Controls
 5. Section 32 23 33, Trenching and Backfilling.
 6. Section 31 37 19, Grouted Boulders, Stcked Grouted Boulders and Grouted Boulder Retaining Walls.
 7. Section 31 62 16, Steel Sheet Piles.
 8. Section 32 15 40, Crusher Fine Surfacing.
 9. Section 32 16 00, Sidewalks, Curbs, and Gutters.
 10. Section 33 05 13, Manholes.
 11. Section 33 41 00, Reinforced Concrete Pipe.
 12. Section 33 46 00, Subdrainage.

1.03 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American Association of State Highway and Transportation Officials (AASHTO):
 - a. M147, Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base, and Surface Courses.
 - b. T11, Standard Method of Test for Materials Finer Than 75 μ m (No. 200) Sieve in Mineral Aggregates by Washing.



- c. T27, Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates.
 - d. T89, Standard Specification for Determining the Liquid Limit of Soils.
 - e. T90, Standard Specification for Determining the Plastic Limit and Plasticity Index of Soils.
 - f. T96, Standard Specification for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - g. T99, Standard Specification for the Moisture-Density Relations of Soils Using a 2.5 kg (5.5 pound) Rammer and a 305 mm (12 in) Drop.
 - h. T180, Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18-in) Drop.
 - i. T190, Standard Specification for Resistance R-Value and Expansion Pressure of Compacted Soils.
 - j. T265, Standard Method of Test for Laboratory Determination of Moisture Content of Soils.
 - k. T310, Standard Specification for In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
2. ASTM International (ASTM):
- a. C88, Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
 - b. D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³)).
 - c. D1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³(2,700 kN-m/m³)).
 - d. D1883, Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
 - e. D2419, Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
 - f. D4791, Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

1.04 SUBMITTALS

- A. CONTRACTOR shall cooperate with ENGINEER in obtaining and providing samples of all specified materials.
- B. CONTRACTOR shall submit certified laboratory test certificates for all items required in this section.



- C. CONTRACTOR shall submit tickets for each load of aggregate.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Aggregates: Aggregates for bases shall be crushed stone, crushed slag, crushed gravel or natural gravel that conforms to the quality requirements of AASHTO M147, except that the requirements for the ratio for the minus No. 200 sieve fraction to the minus No. 40 sieve fraction shall not apply. The requirements for the Los Angeles wear test shall not apply to Class 1, 2, and 3. Aggregates for bases shall meet the grading requirements as called out in the DRAWINGS. The liquid limit shall be as shown in the table and the plasticity index shall be ≤ 6 .
- B. Gradations:

Standard US Sieve Size	Percentage by Weight Passing Square-Mesh Sieves						
	LL < 35			LL < 30			
	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7
4 inches	--	100	--	--	--	--	--
3 inches	--	95 - 100	--	--	--	--	--
2½inches	100	--	--	--	--	--	--
2 inches	95 - 100	--	--	100	--	--	--
1½inches	--	--	--	90 - 100	100	--	--
1 inch	--	--	--	--	95 - 100	--	100
¾ inch	--	--	--	50 - 90	--	100	--
No. 4	30 - 65	--	--	30 - 50	30 - 70	30 - 65	--
No. 8	--	--	--	--	--	25 - 55	20 - 85
No. 200	3 - 15	3 - 15	20 max.	3 - 12	3 - 15	3 - 12	5 - 15

Note: Class 3 materials shall consist of bank or pit run material.

PART 3 EXECUTION

3.01 GENERAL

- A. Equipment:
- Equipment shall be capable of performing the WORK as described in this SPECIFICATION. Equipment that is inadequate to obtain the results specified shall be replaced or supplemented as required to meet the requirements of this SPECIFICATION. Any equipment that is used in an improper manner may be cause for rejection of the WORK if in the opinion of ENGINEER the WORK fails to meet the requirements of this SPECIFICATION.



2. Equipment used for compaction shall be the rolling type, vibratory type, or combination of both types, and shall be of sufficient capacity to meet the compaction requirements herein.

3.02 PREPARATION OF FOUNDATION

A. General:

1. The foundation shall be considered to be the finished earth subgrade, subbase course, or base course, as the case may be, upon which any subbase, base, or surface course is to be constructed.
2. Preparation of foundation for construction of a subbase, base, or surface course shall consist of the WORK necessary to restore, correct, strengthen, or prepare the foundation to a condition suitable for applying and supporting the intended course.
3. The foundation shall be prepared and constructed such that it will have a uniform density throughout. It shall be brought to the required alignment and cross section with equipment and methods adapted for the purpose. Upon completion of the shaping and compacting operations, the foundation shall be smooth, at the required density, and at the proper elevation and contour to receive the aggregate base course.
4. Unless otherwise provided, all holes, ruts, and other depressions in the foundation shall be filled with materials similar to those existing in the foundation. High places shall be excavated and removed to the required lines, grade and section.
5. Areas of yielding or unstable material shall be excavated and backfilled with stabilization rock as determined by ENGINEER. Base course material shall not be placed on a foundation that is soft, spongy, or one that is covered by ice or snow. Base course shall not be placed on a dry or dusty foundation where the existing condition would cause rapid dissipation of moisture from the base course material and hinder or preclude its proper compaction. Dry foundations shall have water applied, reworked, and compacted as necessary.
6. ENGINEER may direct CONTRACTOR to make minor adjustments in the finish grade from that shown in the DRAWINGS as may be necessary or desirable to maintain the characteristics of a stabilized foundation by minimizing the amount of cutting into or filling.

- B. Roads and Parking Areas: For aggregate base course roads and parking areas, the top six (6) inches of topsoil shall be stripped within the area to be aggregate surfaced. Following stripping of the topsoil, the upper twelve (12) inches of the subgrade shall be scarified and compacted to a minimum of ninety-five percent (95%) of the Maximum Standard Proctor Density (ASTM D698). Onsite material may be used as accepted by ENGINEER, for compacted fill for the aggregate base course. Fill shall be placed within two percent (2%) of optimum moisture content and compacted to a minimum of ninety five percent (95%) of the Maximum Standard Proctor Density (ASTM D698).



- C. Pavements: Aggregate base course used as a foundation for pavements shall be placed on the subgrade within two percent (2%) of optimum moisture and compacted to a minimum of one hundred percent (100%) of the Maximum Modified Proctor Density (ASTM D1557). The top six (6) inches of topsoil shall be stripped within the area to be aggregate surfaced. Following stripping of the topsoil, the upper twelve (12) inches of the subgrade shall be scarified and compacted to a minimum of ninety-five percent (95%) of the Maximum Standard Proctor Density (ASTM D698). Onsite material may be used, as accepted by ENGINEER, for compacted fill for the aggregate base course. Fill shall be placed within two percent (2%) of optimum moisture content and compacted to a minimum of ninety five percent (95%) of the Maximum Standard Proctor Density (ASTM D698). Deviations in aggregate base course under pavements of more than one-quarter (1/4) inch in ten (10) feet, measured with a ten-foot (10') straight edge, shall be corrected prior to pavement construction.
- D. Earth Subgrade: When the foundation is an earth subgrade it shall be prepared by removing all vegetation, excavating and removing materials, filling depressions, scarifying, shaping, smoothing and compacting to meet the required grade, section and density. Stones over six (6) inches in greatest dimension shall be removed.

3.03 PLACEMENT

- A. The aggregate base course shall be constructed to the width and section shown in the DRAWINGS. If the required compacted depth of base course exceeds six (6) inches, the base shall be constructed in two (2) or more layers of approximate equal thickness. The maximum compacted thickness of any one (1) layer shall not exceed six (6) inches.
- B. Each layer shall be constructed as far in advance of the succeeding layer as ENGINEER may direct. The WORK shall, in general, proceed from the point on the PROJECT nearest the point of supply of the aggregate in order that the hauling equipment may travel over the previously placed material, and the hauling equipment shall be routed as uniformly as possible over all portions of the previously constructed courses or layers of the base course.
- C. The material shall be deposited on the soil foundation, or previously placed layer, in a manner to minimize segregation and to facilitate spreading to a uniform layer of the required section. In the event that blending of materials is necessary to provide required gradation and properties of the material, and is done in the roadway, the same shall be accomplished by mixing the aggregate and blending material by means of blade graders, discs, harrows, or other equipment to effect a uniform distribution and gradation throughout the finished mixture. Excessive mixing and grading that will cause segregation between the coarse and fine materials is prohibited.

3.04 COMPACTION

- A. After a layer or course has been placed and spread to the required thickness, width and contour, it shall be compacted. If the material is too dry to readily attain the required density, it shall be uniformly moistened to the degree necessary during compaction operations for proper compaction.
- B. Compaction of each layer shall continue until the required density specified in Article Preparation of Foundation is reached. The surface of each layer shall be maintained



during compaction operations in such a manner that a uniform texture is produced and aggregates firmly keyed.

- C. All areas where proper compaction is not obtainable due to segregation of materials, excess fines, or other deficiencies in the aggregate shall be reworked as necessary or the material removed and replaced with aggregates that will meet this SPECIFICATION.
- D. The surface of each layer shall be kept true and smooth at all times.

3.05 MIXING

- A. Unless otherwise specified, CONTRACTOR shall mix the aggregate by any one of the three following methods:
 - 1. Stationary Plant Method: Aggregate base course and water shall be mixed in an approved mixer. After mixing, the aggregate shall be transported to the PROJECT site while it contains the proper moisture content and shall be placed on the roadbed by means of an approved spreader.
 - 2. Travel Plant Method: After the material for each layer has been placed through an aggregate spreader or windrow-sizing device, it shall be uniformly mixed by a traveling mixing plant.
 - 3. Road Mix Method: After material for each layer has been placed, the materials shall be mixed while at optimum moisture content by motor graders or other approved equipment until the mixture is uniform throughout.

3.06 SHOULDER CONSTRUCTION

- A. Shoulders shall be constructed with base course material to conform to the elevation and section shown in the DRAWINGS. No equipment shall be used which by its design or through its manner of operation will damage the pavement or curbs. Insofar as practicable, the base course material shall be placed directly on the shoulder area. Materials that are deposited outside the shoulder area, if not contaminated, shall be recovered and placed within the required limits. CONTRACTOR shall not be compensated for materials not recovered as determined by ENGINEER.
- B. Materials shall not be deposited on the pavement or surfacing during placing unless specifically permitted by ENGINEER.
- C. The base course material as placed shall be spread and compacted to the required density in layers not exceeding six (6) inches in compacted thickness. Any material inadvertently placed on the pavement shall be broomed from the pavement. The result shall not effect a change in the gradation of the shoulder material.

END OF SECTION