

SECTION 02233

CEMENT STABILIZED BASE COURSE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Foundation course of cement stabilized crushed stone.
- B. Foundation course of cement stabilized bank run gravel.

1.02 UNIT PRICES

- A. Measurement for Cement Stabilized Base Course is on a square yard basis. Separate measurement will be made for each different required thickness of base course.
- B. Measurement for asphaltic seal cure is by the square yard.

1.03 SUBMITTALS

- A. Submittals shall conform to requirements of all sections and provisions of these specifications.
- B. Submit samples of crushed stone, gravel, and soil binder for testing.
- C. Submit weight tickets, certified by supplier, with each bulk delivery of cement to work site.
- D. Submit manufacturer's description and characteristics for pug mill and associated equipment, spreading machine, and compaction equipment for approval.

1.04 TESTS

- A. Testing will be performed under provisions of Section 01410 - Testing Laboratory Services.
- B. Tests and analysis of aggregate and binder materials will be performed in accordance with ASTM D1557 and ASTM D4318.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Make stockpiles from layers of processed aggregate so as to eliminate segregation of materials. Load material by making successive vertical cuts through entire depth of stockpile.

- B. Store cement in weatherproof enclosures. Protect from ground dampness.

PART 2 PRODUCTS

2.01 CEMENT

- A. ASTM C150 Type I; bulk or sacked.

2.02 WATER

- A. Water: Clean; clear; and free from oil, acids, alkali, or vegetable matter.

2.03 AGGREGATE

- A. Crushed Stone: material retained on the No. 40 Sieve meeting the following requirements:
 - 1. Durable particles of crusher-run broken limestone obtained from an approved source.
 - 2. Los Angeles abrasion test percent of wear not to exceed 40 when tested in accordance with ASTM C131.
- B. Gravel: Durable particles of bank run gravel or processed material.
- C. Soil Binder: Material passing the No. 40 Sieve meeting the following requirements when tested in accordance with ASTM D4318:
 - 1. Maximum Liquid limit: 35.
 - 2. Maximum Plasticity index: 10.
- D. Mixed aggregate and soil binder shall meet the following requirements:
 - 1. Grading in accordance with Tex-101-E and Tex-110-E within the following limits:

Sieve	Percent Retained			
	Crushed Stone	Processed GR. 1	Gravel GR. 2	Bankrun Gravel
1-3/4"	0 to 10	0 to 5	-	0 to 5
1/2"	-	-	0	-
No. 4	45 to 75	30 to 75	15 to 35	30 to 75
No. 40	55 to 80	60 to 85	55 to 85	65 to 85

2. Obtain prior permission from Owner’s Representative for use of additives to meet above requirements.

2.04 ASPHALTIC SEAL CURE

- A. Cut back asphalt: MC30 conforming to requirements of Section 02511.
- B. Emulsified petroleum resin: EPR-1 Prime conforming to requirements of Section 02511.

2.05 MATERIAL MIX

- A. Design mix for minimum average compressive strength of 200 psi at 48 hours using Tex-120-E unconfined compressive strength testing procedures. Provide minimum cement content of 1-1/2 sacks, weighing 94 pounds each sack, per ton of mix.
- B. Increase cement content if average compressive strength of tests on field samples fall below 200 psi. Refer to Part 3 concerning field samples and tests.
- C. Mix in stationary pug mill equipped with feeding and metering devices which shall add specified quantities of base material, cement, and water into mixer. Dry mix base material and cement sufficiently to prevent cement balls from forming when water is added.
- D. Resulting mixture shall be homogeneous and uniform in appearance.

2.06 SOURCE QUALITY CONTROL

- A. Testing will be performed under provisions of Section 01410 - Testing Laboratory Services.

- B. Testing for unconfined compressive strength will be performed by Test Method Tex-120-E as follows:
 - 1. Three samples will be molded each day or for each 1,000 tons of production.
 - 2. Compressive strength shall be the average of three tests for each production lot.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify compacted subgrade is ready to support imposed loads.
- B. Verify lines and grades are correct.

3.02 PREPARATION

- A. Complete backfill of new utilities below future grade.
- B. Prepare subgrade in accordance with requirements of Section 02221 and Section 02225 or Sections 02241.
- C. Correct subgrade deviations in excess of plus or minus 1/2 inch in cross section, or in 16 foot length by loosening, adding or removing material, reshaping and recompacting by sprinkling and rolling.
- D. Prepare sufficient subgrade in advance of base course for efficient operations.

3.03 PLACEMENT

- A. Do not mix and place cement stabilized base when temperature is below 40 degrees F and falling. Base may be placed when temperature taken in shade and away from artificial heat is above 35 degrees F and rising.
- B. Place material on prepared subgrade in uniform layers to produce thickness indicated on Drawings. Depth of layers shall not exceed 8 inches. Do not dump material in piles or windrows.
- C. Spread with approved spreading machine. Conduct spreading so as to eliminate planes of weakness or pockets of nonuniformly graded material resulting from hauling and dumping operations.
- D. Provide construction joints between new material and stabilized base that has been in place 4 hours or longer. Joints shall be approximately vertical. Form joint with a

temporary header or make vertical cut of previous base immediately before placing subsequent base.

- E. Use only one longitudinal joint at center line under main lanes and shoulder. Do not use longitudinal joints under frontage roads and ramps.
- F. Place base so that projecting reinforcing steel from curbs remain at approximate center of base. Secure a firm bond between reinforcement and base.

3.04 COMPACTION

- A. Start compaction as soon as possible but not more than 60 minutes from start of moist mixing. Compact loose mixture with approved tamping rollers until entire depth is uniformly compacted. Do not allow stabilized base to mix with underlying material.
- B. Correct irregularities or weak spots immediately by replacing material and recompacting.
- C. Apply water to maintain moisture between optimum and 3 percent above optimum moisture as determined by ASTM D1557. Mix in with a spiked tooth harrow or equal. Reshape surface and lightly scarify to loosen imprints made by equipment.
- D. Remove and reconstruct sections where average moisture content exceeds ranges specified at time of final compaction.
- E. Finish by blading surface to final grade after compacting final course. Seal with approved pneumatic tired rollers which are sufficiently light to prevent surface hair line cracking. Rework and recompact at areas where hairline cracking develops.
- F. Compact to minimum density of 95 percent of modified Proctor density at a moisture content of treated material between optimum and 3 percent above optimum as determined by ASTM D1557, unless otherwise indicated on the Drawings.
- G. Maintain surface to required lines and grades throughout operation.

3.05 CURING

- A. Moist cure for minimum of 7 days before adding pavement courses. Restrict traffic on base to local property access. Keep subgrade surface damp by sprinkling.
- B. If indicated on Drawings, cover base surface with a curing membrane as soon as finishing operation is complete. Apply with approved self-propelled pressure distributor at following rates, or as indicated on Drawings:
 - 1. MC30: 0.1 gallon per square yard.

2. EPR-1 Prime: 0.15 gallon per square yard.
- C. Do not use cutback asphalt during the period of April 16 to September 15.

3.06 TOLERANCES

- A. Completed surface shall be smooth and conform to typical section and established lines and grades.
- B. Top surface of base course: Plus or minus 1/4 inch in cross section, or in 16-foot length.

3.07 FIELD QUALITY CONTROL

- A. Testing will be performed under provisions of Section 01410 - Testing Laboratory Services.
- B. A minimum of one core will be taken at random locations per 1,000 linear feet per lane of roadway or 1000 square yards of base to determine in-place depth.
- C. Contractor may, at his own expense, request additional cores in the vicinity of cores indicating nonconforming in-place depths. If the average of the tests falls below the required depth, place and compact additional material at no cost to the Owner.
- D. Compaction Testing will be performed in accordance with ASTM D1556 or ASTM D2922 and ASTM 3017 at a random location near each depth determination core. Rework and recompact areas that do not conform to compaction requirements at no additional cost to the Owner.
- E. Fill cores and density test sections with new compacted cement stabilized base.

3.08 PROTECTION

- A. Maintain stabilized base in good condition until completion of work. Repair defects immediately by replacing base to full depth.
- B. Protect the asphalt membrane, if used, from being picked up by traffic. The membrane may remain in place when proposed surface courses or other base courses are to be applied.

END OF SECTION