Section 02712

# CEMENT STABILIZED BASE COURSE

## PART 1 GENERAL

### 1.01 SUMMARY

A. This section includes:

1. Foundation course of cement stabilized crushed stone.

2. Foundation course of cement stabilized bank run gravel.

### 1.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for cement stabilized base course is on square yard basis. Separate pay items are used for each different required thickness of base course.

2. Payment for asphaltic seal cure is by gallon.

3. Refer to Section 01270 – "Measurement and Payment" for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for Work in this Section is included in total Stipulated Price.

C. Unit Price Adjustment

1. Make unit price adjustments for in-place depth determined by cores as follows:

a. Adjusted unit price shall be ratio of average thickness as determined by cores to thickness bid upon, times unit price.

b. Minimum adjustment shall be 90 percent and maximum adjustment shall be 100 percent of unit price

### 1.03 REFERENCES

A. ASTM C 131 - Standard Test Method for Resistance to Degradation of Small-Size Course Aggregate by Abrasion and Impact in Los Angeles Machine.

B. ASTM C 150 - Standard Specification for Portland Cement.

C. ASTM D 698 - Standard Test Method for Laboratory Compaction Characteristics of Soils Using Standard Effort (12,400 ft-lbf/ft$^3$ (600kN kN-m/m$^3$)).

D. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.

E. ASTM D 1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/$ft^3$ (2,700 kN-m/$m^3$)).

F. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

G. ASTM D 4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

H. ASTM D 6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

I. TxDOT Tex-101-E - Preparing Soil and Flexible Base Materials for Testing.

J. TxDOT Tex-110-E - Particle Size Analysis of Soils.

K. TxDOT Tex-120-E - Soil-Cement Testing

1.04 SUBMITTALS

A. Conform to requirements of Section 01330 – “Submittal Procedures”.

B. Submit samples of crushed stone, gravel, and soil binder for testing.

C. Submit manufacturer's description and characteristics for pug mill and associated equipment, spreading machine, and compaction equipment for approval.

1.05 RELATED REQUIREMENTS

A. Section 01270 – “Measurement and Payment”

B. Section 01330 – “Submittal Procedures”

C. Section 01454 – “Testing Laboratory Services”

D. Section 02315 – “Roadway Excavation”

E. Section 02330 – “Embankment”

F. Section 02742 – “Prime Coat”

1.06 – 1.07 NOT USED

1.08 DELIVER, STORAGE AND HANDLING

A. Make stockpiles from layers of processed aggregate 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

1.09 – 1.13 NOT USED

PART 2 PRODUCTS

2.01 MANUFACTURER(S) (NOT USED)

2.02 MATERIALS AND/OR EQUIPMENT

A. Cement

ASTM C 150 Type I; bulk or sacked

B. Water

Clean, clear; and free from oil, acids, alkali, or vegetable matter.

C. Aggregate

1. Crushed Stone: Material retained on No. 40 Sieve meeting following requirements:

a. Durable particles of crusher-run broken limestone, sandstone, or granite obtained from approved source.

b. Los Angeles abrasion test percent of wear not to exceed 40 when tested in accordance with ASTM C 131.

2. Gravel: Durable particles of bank run gravel or processed material.

3. Soil Binder: Material passing No. 40 Sieve meeting following requirements when tested in accordance with ASTM D 4318:

a. Maximum Liquid limit: 35.

b. Maximum Plasticity index: 10.

4. Mixed aggregate and soil binder shall meet the following requirements:

a. Grading in accordance with TxDOT Tex-101-E and Tex-110-E within the following limits:

| Sieve | Percent Retained | | | |
|---|---|---|---|---|
| | **Crushed Stone** | **Processed G. 1** | **Gravel G. 2** | **Bank Run Gravel** |
| 1¾ inch | 0 to 10 | 0 to 5 | - | 0 to 5 |
| ½ inch | - | - | 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 |

b. Obtain prior permission from Project Manager for use of additives to meet above requirements.

D. Asphalt Seal Cure

1. Cutback Asphalt: MC30 conforming to requirements of Section 02742 – "Prime Coat".

2. Emulsified Petroleum Resin: EPR-1 Prime conforming to requirements of Section 02742 – "Prime Coat".

E. Material Mix

1. Design mix for minimum average compressive strength of 200 psi at 48 hours using TxDOT Tex-120-E unconfined compressive strength testing procedures. Provide minimum cement content of 1½ sacks, weighing 94 pounds each, per ton of mix.

2. Increase cement content when average compressive strength of tests on field samples fall below 200 psi. Refer to Part 3 concerning field samples and tests.

3. Mix in stationary pug mill equipped with feeding and metering devices for adding 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.

4. Resulting mixture shall be homogeneous and uniform in appearance.

2.03 FABRICATION (NOT USED)

2.04 SOURCE QUALITY CONTROL

A. Perform testing under provisions of Section 01454 – "Testing Laboratory Services".

B. Perform testing for unconfined compressive strength by TxDOT Test Method Tex-120-E as follows:

1. Mold three samples each day or for each 300 tons of production.

2. Compressive strength shall be average of three tests for each production lot

PART 3 EXECUTION

3.01 GENERAL / MANUFACTURER(S) (NOT USED)

3.02 PREPARATION

A. Examination

1. Verify compacted subgrade is ready to support imposed loads.

2. Verify lines and grades are correct

B. Complete backfill of new utilities below future grade.

C. Prepare subgrade in accordance with requirements of Section 02330 – "Embankment" and Section 02315 – "Roadway Excavation".

D. Correct subgrade deviations in excess of plus or minus ¼ inch in cross section or in 16 foot length by loosening, adding or removing material, reshaping and recompacting by sprinkling and rolling.

E. Prepare sufficient subgrade in advance of base course for efficient operations

3.03 ERECTION/INSTALLATION APPLICATION AND/OR CONSTRUCTION

A. Do not mix and place cement stabilized base when temperature is below 40 degrees F and falling. Place base 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 Plans. Depth of layers shall not exceed 6 inches.

C. Spread with approved spreading machine. Conduct spreading so as to eliminate planes of weakness or pockets of non-uniformly 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 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 unless shown otherwise on Plans. Do not use longitudinal joints under frontage roads and ramps unless indicated on Plans.

F. Place base so that projecting reinforcing steel from curbs remain at approximate center of base. Secure firm bond between reinforcement and base

G. Compaction

1. 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.

2. Correct irregularities or weak spots immediately by replacing material and recompacting.

3. Apply water to maintain moisture between optimum and 2 percent above optimum moisture as determined by ASTM D 1557. Mix in with spiked tooth harrow or equal. Reshape surface and lightly scarify to loosen imprints made by equipment.

4. Remove and reconstruct sections where average moisture content exceeds ranges specified at time of final compaction.

5. 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 hair line cracking develops.

6. Compact to minimum density of 95 percent of maximum dry density at moisture content of treated material between optimum and 2 percent above optimum as determined by ASTM D 1557, unless otherwise indicated on Plans.

7. Maintain surface to required lines and grades throughout operation

H. Curing

1. 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.

2. If indicated on Plans, cover base surface with curing membrane as soon as finishing operation is complete. Apply with approved self-propelled pressure distributor at following rates, or as indicated on Plans:

a. MC30: 0.1 gallon per square yard.

b. EPR-1 Prime: 0.15 gallon per square yard.

3. Do not use cutback asphalt during period of April 16 to September 15

I. Tolerances

1. Smooth and conform completed surface to typical section and established lines and grades.

2. Top surface of base course: Plus or minus 1 ¼ inch in cross section, or in 16 foot length.

3.04 REPAIR/RESTORATION

A. Nonconforming Base Course

1. Remove and replace areas of base course found deficient in thickness by more than 10 percent, or that fail compressive strength tests, with cement-stabilized base of thickness shown on Plans.

2. Replace nonconforming base course sections at no additional cost

3.05 FIELD QUALITY CONTROL

A. Perform testing under provisions of Section 01454 – "Testing Laboratory Services".

B. Take minimum of one core at random locations per 1,000 linear feet per lane of roadway or 500 square yards of base to determine in-place depth.

C. Request additional cores in vicinity of cores indicating nonconforming in-place depths at no extra cost. When average of tests falls below required depth, place and compact additional material at no additional cost.

D. Perform compaction testing in accordance with ASTM D 1556 or ASTM D 2922 and ASTM D 6938 at randomly selected locations. Remove and replace areas that do not conform to compaction requirements at no additional cost.

E. Fill cores and density test sections with new compacted cement stabilized base.

3.06 - 3.07 NOT USED

3.08 DEMONSTRATION / TESTING AND INSPECTION

A. Perform testing under provisions of Section 01454 – "Testing Laboratory Services".

B. Perform tests and analysis of aggregate and binder materials in accordance with ASTM D 1557 and ASTM D 4318.

3.09 PROTECTION

A. Maintain stabilized base in good condition until completion of Work. Repair defects immediately by replacing base to full depth.

B. Protect asphalt membrane, when used, from being picked up by traffic. Membrane may remain in place when proposed surface courses or other base courses are to be applied.

3.10 SCHEDULES (NOT USED)

END OF SECTION