

**SECTION 02705  
CRUSHED CONCRETE BASE COURSE**

**PART I: GENERAL**

**1.1 GENERAL REQUIREMENTS**

- A. Crushed concrete base course.

**1.2 MEASUREMENT AND PAYMENT**

- A. Unit Prices:
  - 1. Payment for Crushed Concrete Base Course is on a per ton basis furnished and compacted in place.
  - 2. Refer to Section 01270 – Measurement and Payment for unit price procedures.
- B. Stipulated Price (Lump Sum):
  - 1. If Contract is Stipulated Price Contract, payment for Work in this Section is included in Total Stipulated Price.

**1.3 REFERENCES**

- A. ASTM – American Society for Testing and Materials.
  - 1. ASTM C150 – Standard Specification for Portland Cement.
- B. CFTS – City of Friendswood Technical Specifications.
- C. TxDOT – Texas Department of Transportation.
  - 1. TxDOT Tex-101-E – Preparing Soil and Flexible Base Materials for Testing.
  - 2. TxDOT Tex-106-E – Calculating the Plasticity Index of Soils.
  - 3. TxDOT Tex-110-E – Determining Particle Size Analysis of Soils.
  - 4. TxDOT Tex-113-E – Laboratory Compaction Characteristics and Moisture-Density Relationship of Base Materials.
  - 5. TxDOT Tex-115-E – Field Method for Determining In-place Density of Soils and Base Materials.
  - 6. TxDOT Tex-120-E – Soil-Cement Testing.

**1.4 SUBMITTALS**

- A. Conform to requirements of Section 01330 – Submittal Procedures.
- B. Submit representative samples of crushed concrete for testing.
- C. Submit weight tickets, certified by supplier, for each delivery of recycled crushed concrete, gravel and soil binder.
- D. Submit manufacturer's description and characteristics for pug mill and associated equipment, mixer trucks, spreading and compaction equipment for approval.

**1.5 TESTS**

- A. Follow Sections 01470 – Testing Laboratory Services and 01475 – Quality Control Testing Procedures.
- B. Test and analyze aggregate and binder products per TxDOT Tex-110-E.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Provide materials from stockpiles that are protected during storage from contaminants detrimental to concrete base.
- B. Load material from same area of stockpile to maintain uniformity of each successive delivery to the Project site.
- C. Store cement in weatherproof enclosures. Protect from ground dampness.

1.7 QUALITY ASSURANCE

- A. Provide manufacturer's affidavits that material was manufactured in compliance with standards and Technical Specifications referenced in this Section.

**PART II: PRODUCTS**

2.1 SYSTEM DESCRIPTION

- A. Provide Crushed Concrete Base Course with following performance:
  - 1. Minimum seven percent (7%) cement content.
  - 2. Minimum compressive strength: Six hundred fifty pounds per square inch (650 psi) at fourteen days (14 D) following TxDOT Tex-120-E.
  - 3. Prepare concrete product in on-site or off-site pug mill or in on-site or off-site portable concrete mixer.
- B. Preliminary Design: Prepare preliminary mix with minimum cement to crushed concrete ratios of five percent (5%) by dry mass of materials.
  - 1. Designate source of concrete for crushing. Follow Sections 01470 – Testing Laboratory Services and 01475 – Quality Control Testing Procedures for tests of concrete from source.
  - 2. Results of laboratory and compression tests shall be used by the Project Manager to select final mix design.

2.2 PORTLAND CEMENT

- A. ASTM C150 Type I, II or III; bulk or sacked.

2.3 WATER

- A. Potable.

2.4 AGGREGATE

- A. Recycled Crushed Concrete: Material retained on No. 40 Sieve and durable coarse particles of crusher-run reclaimed cured Portland cement concrete, obtained from approved source. Organic material of any kind is prohibited in crushed concrete. The crushed concrete shall be substantially free of foreign matter including, but not limited to, asphalt, base and dirt.
- B. Soil Binder (classified below): Meeting following requirements when tested following TxDOT Tex-106-E:
  - 1. Maximum liquid limit: thirty-five (35).
  - 2. Maximum plasticity index: ten (10).

- C. Mixed Aggregate and Soil Binder: Grading following TxDOT Tex-101-E and Tex-110-E as specified in TABLE 4.1 – MIXED AGGREGATE AND SOIL BINDER in this Section.
  - 2. Bank sand may be added to mix at pug mill.

#### 2.5 ASPHALTIC SEAL CURE

- A. Acquire written approval from the Project Manager before curing and before proceeding with curing.
- B. Use following as option to curing by sprinkling:
  - 1. Cut-back asphalt: MC30 following Section 02730 – Prime Coat.
  - 2. Emulsified petroleum resin: EPR-1 Prime following Section 02730 – Prime Coat.

#### 2.6 MATERIAL MIX

- A. Design mix for a minimum compressive strength of six hundred fifty pounds per square inch (650 psi) at fourteen days (14 D) following TxDOT Tex-120-E unconfined compressive strength.
- B. Cement Ratio: Follow paragraph 2.1.A. Increase cement content in two percent (2%) steps up to nine percent (9%) maximum when compressive strength of design mix samples fail TxDOT Tex-120-E test.

#### 2.7 MIXING EQUIPMENT

- A. Mix following Paragraph 2.1.A, with metering devices adding specified quantities of crushed concrete, cement and water into mixer. Dry mix crushed concrete and cement prior to adding water. Produce homogeneous and uniformly mixed product.

#### 2.8 SOURCE QUALITY CONTROL

- A. Test following Sections 01470 -Testing Laboratory Services and 01475 – Quality Control Testing Procedures.
- B. When directed by the Project Manager, test for unconfined compressive strength following Test Method TxDOT Tex-120-E as follows:
  - 1. Mold a minimum of three (3) samples each day or three (3) for each five hundred tons (500 Tn) of production or one (1) for each day.
  - 2. Compressive strength: shall be the average of the minimum three (3) samples or three (3) for each production lot.

### PART III: EXECUTION

#### 3.1 EXAMINATION

- A. Follow Section 01455 – Inspection Services.
- B. Verify buried utility work is complete.
- C. Verify lime treatment of base is complete.
- D. Verify subgrade is ready to support imposed loads.
- E. Verify flatwork, foundations, projecting reinforcement and similar work interfacing with base is in place.

- F. Verify lines and grades are correct.

### 3.2 PREPARATION

- A. Complete backfill of new utilities below future grade.
- B. Prepare subgrade in accordance with requirements of Section 02115 – Embankment and Section 02135 – Excavation for Roadway or Section 02720 – Lime-Stabilized Base Subgrade and Section 02725 – Portland Cement-Stabilized Base Subgrade.
- C. Correct subgrade deviations in excess of plus or minus one-quarter inch (1/4 In) in cross section or in sixteen foot (16 Ft) 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.
- E. Have sufficient products and equipment on hand to expeditiously apply base.

### 3.3 MIXING

- A. Maintain moisture content of between optimum and five percent (5%) above optimum.

### 3.4 PLACEMENT

- A. Place mixture with approved spreading equipment. Spread to eliminate planes of weakness or pockets of nonuniformly graded material resulting from hauling and dumping operations.
- B. Provide approximately vertical construction joints between fresh base and base-in-place four hours (4 Hrs) or longer. Form joint with temporary header or make vertical cut of in-place base immediately before placing fresh base.
- C. Make cold joints at center line of head-to-head parking stalls.
- D. Place base so that projecting reinforcing steel from curbs remain at approximate center of base. Ensure proper bond between reinforcement and base.
- E. Transverse and longitudinal joints shall be vertical.
- F. Unless noted otherwise, place recycled crushed concrete base in courses not to exceed eight inches (8 In) in depth. All courses shall be placed on same working day unless approved by the Project Manager. Construction joints between new base and base previously placed shall be wetted and coated with dry cement prior to addition of new base.
- G. Complete finishing operations within period of six hours (6 Hrs) after cement is added to base materials.

### 3.5 COMPACTION

- A. Start compaction a maximum three hours (3 Hrs) after start of mixing. Compact loose mixture with approved tamping rollers until entire depth is uniformly compacted. Do not allow base to mix with underlying material.

1. Do not rework uncompacted material that has set up for more than thirty minutes (30 Min).
2. Complete placement and compaction work within six hours (6 Hrs) from start of moist mixing.
- B. Correct irregularities or weak spots immediately by replacing material and recompact.
- C. Apply water to maintain moisture between optimum and five percent (5%) above optimum moisture.
- 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 or flat wheel rollers which are sufficiently light to prevent surface hair line cracking.
- F. Compact to a minimum density of ninety-five percent (95%) of dry density, following TxDOT Tex -113-E, at moisture content of treated material between optimum and five percent (5%) above optimum.
- G. Test roadway base course compaction in accordance with TxDOT Tex-115-E.
- H. Maintain surface to required lines and grades throughout operation.

### 3.6 CURING

- A. Moist cure for a minimum of seventy-two hours (72 Hrs) before adding pavement courses.
- B. Use sprinkling or, at option, apply following curing membrane as soon as initial set begins, using approved light-weight self-propelled pressure distributor:
  1. MC30: One tenth gallon per square yard (0.1 Gal/Sy).
  2. EPR-1 Prime: Fifteen hundredths gallon of asphalt residual per square yard (0.15 Gal/Sy).
- C. Do not use cut-back asphalt during period of April 16th through September 15th.

### 3.7 TOLERANCES

- A. Completed Surface: Smooth and conform to typical section and established lines and grades.
- B. Top Surface of Base Course: Plus or minus one-quarter inch ( $\pm 1/4$  In) in cross section or in sixteen feet (16 Ft) of length.

### 3.8 FIELD QUALITY CONTROL

- A. Test following Sections 01470 – Testing Laboratory Services and 01475 – Quality Control Testing Procedures.
- B. Perform compaction tests following TxDOT Tex-113-E at randomly selected locations. Remove and replace areas failing compaction requirements at no additional cost to the City.

### 3.9 PROTECTION

- A. Maintain base in proper condition until surface is placed. Surface must

be placed within fourteen days (14 D) after final mixing and compaction unless otherwise approved by the Project Manager. Repair unacceptable base course immediately by replacing base to full depth.

- B. Curing membrane may remain in place at areas where surface courses or other base courses are applied.
- C. Prevent construction traffic on base for a minimum three days (3 D). Light vehicles, used to maintain proper cure, are permitted on base after initial set or as permitted by the Project Manager.

**PART IV: TABLES**

**4.1 MIXED AGGREGATE AND SOIL BINDER**

<b>Sieve</b>	<b>Percent Crushed Concrete Retained</b>
1 3/4 inch	0 to 10
No. 4	45 to 75
No. 40	55 to 85*
* Classified as Soil Binder	

**END OF SECTION**