Section 02713

RECYCLED CRUSHED CONCRETE BASE COURSE

PART 1 GENERAL

1.01 SUMMARY

This Section includes recycled crushed concrete base (RCCB) course.

1.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for RCCB is on a per square yard basis, furnished and compacted in place.

2. Payment for RCCB for transitions and base repairs is on a per square yard basis.

3. Payment for RCCB for temporary driveway, roadway shoulders, and elsewhere shown on Plans is on a per square yard basis.

4. 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.

1.03 REFERENCES

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

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

C. TxDOT Tex-106-E - Calculating the Plasticity Index of Soils.

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

E. TxDOT Tex-113-E - Laboratory Compaction Characteristics and Moisture-Density Relationship of Base Materials.

F. TxDOT Tex-115-E - Field Method for Determining In-place Density of Soils and Base Materials.

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

1.04 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.

1.05 RELATED REQUIREMENTS

A. Section 01270 – "Measurement and Payment"

B. Section 01330 – "Submittal Procedures"

C. Section 01452 – "Inspection Services"

D. Section 01454 – "Testing laboratory Services"

E. Section 02315 – "Roadway Excavation"

F. Section 02330 – " Embankment"

G. Section 02336 – "Lime-Stabilized Subgrade"

H. Section 02337 – "Lime/Fly-Ash Stabilized Subgrade"

I. Section 02338 – "Portland Cement Stabilized Subgrade"

J. Section 02742 – "Prime Coat"

1.06 – 1.07 NOT USED

1.08 DELIVERY, STORAGE, AND HANDLING

A. Provide materials from stockpiles that are protected during storage from contaminates detrimental to concrete base.

B. Load material from same area of stockpile to maintain uniformity of each successive delivery to Project site.

C. 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. System Description

1. Provide RCCB with following performance:

a. Minimum 7 percent cement.

b. Minimum compressive strength: 650 psi at 14 days following TxDOT Tex-120-E.

c. Prepare concrete product in on-site or off-site pug mill, or in on-site or off-site portable concrete mixer.

2. Preliminary Design: Prepare preliminary mix with minimum cement to crushed concrete ratios of 5 percent by dry mass of materials.

a. Designate source of concrete for crushing. Follow Section 01454 – "Testing Laboratory Services" for tests of concrete from source.

b. Results of laboratory and compression tests will be used by the Engineer to select final mix design

B. Portland Cement

ASTM C 150 Type I, II, or III; bulk or sacked.

C. Water

Potable.

D. Aggregate

1. 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 is prohibited.

a. The crushed concrete shall be substantially free of foreign matter including but not limited to asphalt, base, and dirt.

b. Obtain Project Manager's written approval, prior to crushing salvaged concrete.

2. Soil Binder (classified below): Meeting following requirements when tested following TxDOT Tex-106-E:

   a. Maximum liquid limit: 35

   b. Maximum plasticity index: 10

3. Mixed Aggregate and Soil Binder: Grading following TxDOT Tex-101-E and Tex-110-E within following limits:

Sieve	**Percent Crushed Concrete Retained**
1¾ inch	0 to 10
No. 4	45 to 75
No. 40	55 to 80; classified as Soil Binder

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

   b. Bank sand may be added to mix at pug mill with prior written permission of Project Manager.

E. Asphaltic Seal Cure

1. Acquire written approval from Project Manager before curing and before proceeding with curing.

2. Use following as option to curing by sprinkling:

   a. Cut-back asphalt: MC30 following Section 02742 – “Prime Coat”.

   b. Emulsified petroleum resin: EPR-1 Prime following Section 02742 – “Prime Coat”.

F. Material Mix

1. Design mix for minimum compressive strength of 650 psi at 14 days following TxDOT Tex-120-E unconfined compressive strength.

2. Cement Ratio: Follow Paragraph 2.01A. Increase cement content in two percent steps up to 9 percent maximum when compressive strength of design mix samples fail TxDOT Tex-120-E test.

G. Mixing Equipment

Mix following paragraph 2.01A, 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.

2.03 FABRICATION (NOT USED)

2.04 SOURCE QUALITY CONTROL

A. Test following Section 01454 – "Testing Laboratory Services".

B. When directed by Project Manager, test for unconfined compressive strength following Test Method TxDOT Tex-120-E as follows:

1. Mold minimum of three samples each day or for each 500 tons of production or one for each day.

2. Compressive strength: average of 3 specimens for each sample lot.

PART 3 EXECUTION

3.01 GENERAL / MANUFACTURER(S) (NOT USED)

3.02 PREPARATION

A. Examination

1. Follow Section 01452 – "Inspection Services".

2. Verify buried utility work is complete.

3. Verify lime treatment of base is complete.

4. Verify subgrade is ready to support imposed loads.

5. Verify flatwork, foundations, projecting reinforcement and similar Work interfacing with base is in place.

6. 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", or Section 02336 – "Lime Stabilized Subgrade" and Section 02337 – "Lime-Fly Ash Stabilized Subgrade" and Section 02338 – "Portland Cement Stabilized Subgrade".

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.

F. Have sufficient products and equipment on hand to expeditiously apply base.

3.03 ERECTION/INSTALLATION APPLICATION AND/OR CONSTRUCTION

A. Mixing

Maintain moisture content of between optimum and 5 percent above optimum.

B. Placement

1. Place mixture with approved spreading equipment. Spread to eliminate planes of weakness or pockets of nonuniformly graded material resulting from hauling and dumping operations.

2. Provide approximately vertical construction joints between fresh base and base-in-place 4 hours or longer. Form joint with temporary header or make vertical cut of in-place base immediately before placing fresh base.

3. Make cold joints at center line of head-to-head parking stalls.

4. Place base so that projecting reinforcing steel from curbs remain at approximate center of base. Provide proper bond between reinforcement and base.

5. Transverse and longitudinal joints shall be vertical.

6. Unless noted otherwise, place recycled crushed concrete base in courses not to exceed 8 inches in depth. All courses shall be placed on same working day unless approved by 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.

7. Complete finishing operations within period of 6 hours after cement is added to base materials

C. Compaction

1. Start compaction maximum 3 hours 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.

a. Do not rework uncompacted material that has set up for more than 30 minutes.

b. Complete placement and compaction work within 6 hours from start of moist mixing.

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

3. Apply water to maintain moisture between optimum and 5 percent above optimum moisture.

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 or flat wheel rollers which are sufficiently light to prevent surface hair line cracking.

6. Compact to minimum density of 95 percent of dry density, following TxDOT Tex-113-E, at moisture content of treated material between optimum and 5 percent above optimum.

7. Test roadway base course compaction in accordance with TxDOT Tex-115-E.

8. Maintain surface to required lines and grades throughout operation

D. Curing

1. Moist cure for minimum of 72 hours before adding pavement courses.

2. Use sprinkling or, at option, apply following curing membrane as soon as initial set begins, using approved light-weight self-propelled pressure distributor:

a. MC30: 0.1 gallon per square yard.

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

3. Do not use cut-back asphalt during period of April 16 through September 15

E. Tolerances

1. Completed Surface: Smooth and conform to typical section and established lines and grades.

2. Top Surface of Base Course: Plus or minus ¼ inch in cross section or in 16 foot length.

3.04 REPAIR/RESTORATION (NOT USED)

3.05 FIELD QUALITY CONTROL

A. Test following Section 01454 – "Testing Laboratory Services".

B. Perform compaction tests following TxDOT Tex-113-E at randomly selected locations. Remove and replace areas failing compaction requirements at no additional cost.

3.06 – 3.07 NOT USED

3.08 DEMONSTRATION / TESTING AND INSPECTION

A. Follow Section 01454 – "Testing Laboratory Services".

B. Test and analyze aggregate and binder products following TxDOT Tex-110-E

3.09 PROTECTION

A. Maintain base in proper condition until surface is placed. Surface must be placed within 14 days after final mixing and compaction unless otherwise approved by 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 minimum 3 days. Light vehicles, used to maintain proper cure, are permitted on base after initial set or as permitted by Project Manager.

3.10 SCHEDULES (NOT USED)

END OF SECTION