Special Specification 3016
Roller Compacted Concrete

1. DESCRIPTION

Construct roller compacted concrete (RCC) pavement. RCC will provide the final riding surface unless shown on the plans as base course where it will be covered with one or more lifts of asphalt concrete pavement.

This specification references select Sections in Items 360, 420, and 421 of the Texas Department of Transportation's Standard Specifications for Construction and Maintenance for Highways, Streets, and Bridges incorporating current Texas Department of Transportation required special provisions to the Items. Contractor must comply with Item 360, "Concrete Pavement" unless otherwise specified herein.

2. MATERIALS

Furnish materials in accordance with Section 421.2, "Materials" of Item 421, "Hydraulic Cement Concrete" and meet requirements of the following:

2.1. Aggregate. Meet the requirements of Section 421.2.6, "Aggregate" except for gradation and additional requirements shown below. For aggregate, use a well-graded aggregate and conforming to one of the combined gradation(s) shown in Table 1.

Table1
RCC Combined Aggregate Gradation

Sieve Size	RCC Surface Course - Percent Passing by Weight	RCC Base/Subbase Course - Percent Passing by Weight
1"	100	100
3/4"	100	90-100
1/2"	70-90	70-90
3/8"	60-85	60-85
#4	40-60	40-60
#16	20-40	20-40
#100	6-18	0-10
#200	0-8	-----

The surface course gradation may be used for a RCC base/subbase course. The base/subbase gradation is not allowed for a surface course mix.

The maximum Plasticity Index (PI) for materials passing the #40 sieve is four (4).

The use of recycled crushed hydraulic cement concrete as a coarse or fine aggregate is allowed. Limit recycled crushed concrete fine aggregate to a maximum of 20% of the fine aggregate.

2.2. RCC Mix Design. Design the RCC mix to meet Sections 421.4.2, "Mix Design Proportioning" and 421.4.3, "Concrete Trial Batches" except for the following;

- The requirements of Table 8 in Item 421 do not apply to RCC;
- The requirements of Table 9 along with all requirements for slump, and mix design options in Item 421 do not apply to RCC. The mix shall be stiff enough to support the compaction equipment and while containing adequate cement paste, evenly distributed, to achieve the required strengths.
- The use of Type III cement or accelerators is not allowed unless field demonstrated to allow adequate time for placement and compaction and approved by the Engineer.
- Develop design strength in accordance with the following procedure:

1. Select Aggregates meeting the requirements of Section 2.1,"Aggregate"
2. Select a minimum of three cementitious contents. (Select the cementitious contents such that one content will be at an estimated optimum content, a minimum of one additional content below estimated optimum and a minimum of one above estimated optimum)
3. Determine the optimum moisture content for each cementitious content in accordance with ASTM D 1557, "Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort."
4. Cast three samples at optimum moisture content for each cementitious content in accordance with ASTM C 1435, "Standard Practice for Molding Roller-Compacted Concrete in Cylinder Molds Using a Vibrating Hammer."
5. Unless otherwise approved, test all specimens cast for compressive strength in accordance with Tex-418-A at 28 days. Plot the obtained compressive strengths (psi) with their cementitious contents (%). Determine the optimum cementitious content to have a minimum compressive strength of 4,000 psi at 28 days.
6. If the determined optimum cementitious content varies significantly from all cementitious contents used for specimens, determine the optimum moisture content in accordance with ASTM D1557 at the determined optimum cementitious content, recast three specimens in accordance with ASTM C 1435, and test recast specimens with Tex-418-A to verify the compressive strength.

2.3. Curing Compound. Provide Type 2 membrane curing compound conforming to DMS 4650, "Hydraulic Cement Concrete Curing Materials and Evaporation Retardants." Provide SS 1 emulsified asphalt conforming to Item 300, "Asphalts, Oils, and Emulsions," for RCC pavement to be overlaid with asphalt concrete under this Contract unless otherwise shown on the plans or approved.

3. EQUIPMENT

Construct roller compacted concrete with any combination of equipment that will produce a completed pavement meeting the requirements for mixing, transporting, placing, compacting, finishing, and curing and in accordance with this specification. Meet the requirements of Section 421.3, "Equipment" except as follows. The mixing equipment will only include the Pugmill and Central-Mixed.

All equipment shall allow for the following requirements to insure quality production.

- Inspection of Equipment. Before start-up, the Contractor's equipment will be carefully inspected. Should any of the equipment fail to operate properly, cease work until the deficiencies are corrected.
- Access for Inspection and Calibration. Provide the Engineer or their representative access at all times for any plant, equipment, or machinery to be used in order to check calibration, scales, controls, or operating adjustments.
- Measurement of Materials. Meet the requirements of 421.4.5, "Measurement of Materials," except that Section 4.4.2, Table 2, "Tolerances for Mixture Ingredients" applies.

3.1. Mixing Plant. Locate the mixing plant within a thirty-minute haul time from the point of RCC placement. Use only plants capable of producing an RCC pavement mixture in the proportions defined by the final approved mix design and within the specified tolerances. The capacity of the plant must be sufficient to produce a uniform mixture at a rate compatible with the placement equipment.

If the plant is unable to produce material at a rate adequate to prevent unnecessary cold joints and frequent paver stoppages, the Engineer may halt production until such time that a plant of appropriate capacity is used. Provide and operate plants in accordance with the requirements here and Section 421.4.6, "Mixing and Delivering Concrete."

3.1.1. Pugmill Plant. Use only pugmill plants of the central plant type with a twin-shaft mixer, capable of batch or continuous mixing, equipped with synchronized metering devices and feeders to maintain the correct

proportions of aggregate, cement, pozzolan, water and chemical admixtures, capable of producing a uniform mixture. Other pugmill plant requirements are as follows:

- Aggregate Storage. If previously blended aggregate is furnished, storage may be in a stockpile from which it is fed directly to a conveyor feeding the mixer. If aggregate is furnished in two size groups, follow proper stockpiling techniques to ensure aggregate separation.
- Aggregate Feed Rate. Use aggregate bins with a feed rate controlled by a variable speed belt, or an operable gate calibrated to accurately deliver any specified quantity of material. If two aggregate size stockpile sources are used, the feed rate from each bin must be readily adjustable to change aggregate proportions, when required. Feed rate controls must maintain the established proportions of aggregate from each stockpile bin when the combined aggregate delivery is increased or decreased.
- Cement and Pozzolan Material Storage. Supply separate and independent storage silos for portland cement and pozzolan.
- Preblended Portland Cement and Pozzolan. If using on-site preblended portland cement and pozzolan (such as fly ash or slag), employ blending equipment acceptable to the Engineer and demonstrate, with a testing plan, the ability to successfully produce a uniform blended material meeting the mix design requirements. Perform testing on at least a daily basis to ensure both uniformity and proper quantities.
- Cement and Pozzolan Feed Unit. Provide a satisfactory means of dispensing portland cement and pozzolan, volumetrically or by weight, to ensure a uniform and accurate quantity of cementitious material enters the mixer.
- Water Control Unit. Use a water control unit capable of measuring the required amount of water for the approved mix by weight or volume. Ensure that the unit is equipped with an accurate metering device. Vary the amount of water to be used only with the approval of the Engineer.
- Gob Hopper. For continuous operating pugmills, provide a gob hopper attached to the end of the final discharge belt to temporarily hold the RCC discharge in order to allow the plant to operate continuously.

3.1.2. Central Mixed Rotary Drum. Provide a rotary drum batch mixer capable of producing a homogeneous mixture, uniform in color, and having all coarse aggregate coated with mortar. Equip the mixer with batching equipment to meet the following requirements;

- Weighing Equipment. Measure the amounts of cement, pozzolan, and aggregate entering into each batch of RCC by direct weighing equipment. Use only weighing equipment that is readily adjustable in order to compensate for the moisture content of the aggregate or to change the proportionate batch weights. Include a visible dial or equally suitable device that will accurately register the scale load from zero to full capacity. The cement and pozzolan may be weighed separately or cumulatively in the same hopper on the same scale, provided the cement is weighed first.
- Weigh Hoppers. Use only bulk cement and pozzolan weigh hoppers that are equipped with vibrators to operate automatically and continuously while weighing hoppers are being dumped. Ensure that the weigh hopper has sufficient capacity to hold not less than 10 percent in excess of the cementitious material required for one batch.
- Water Metering. Measure the amount of water entering each batch of RCC by weight or volume. Use only equipment capable of measuring the water to within a tolerance of plus or minus one percent and equipped with an accurate gauge or dial measuring device. Vary the amount of water to be used only with the approval of the Engineer. During batching, admit water to the mixer only through the water measuring device and then only at the time of charging.
- Mixing Time. Use only drum mixers equipped with an accurate clock or timing device, capable of being locked, for visibly indicating the time of mixing after all the materials, including the water, are in the mixer.
- Recharging. Discharge all material in the drum before recharging. Ensure that the volume of mixed material per batch does not exceed the manufacturer's rated capacity of the mixer.

3.1.3. Alternate Plants. Obtain approval from the Engineer to use other type plants. Demonstrate that the mixing equipment has the ability to produce a consistent, well-blended, non-segregated RCC mix meeting capacity requirements and tolerances of this specification. Meet the requirements of Section 421.4.6, "Mixing and Delivering Concrete."

3.2. Paver. Place RCC with an asphalt-type paver manufactured with a high-density screed subject to approval by the Engineer. Use only pavers equipped with compacting devices capable of producing an RCC pavement with a minimum of 90 percent of the maximum density in accordance with Tex-451-A (ASTM C 1040, "Standard Test Methods for In-Place Density of Unhardened and Hardened Concrete, including Roller Compacted Concrete, By Nuclear Methods") prior to any additional compaction. Ensure that the paver is of suitable weight and stability to spread and finish the RCC material, without segregation, to the required thickness, smoothness, surface texture, cross-section, and grade.

3.3. Compactors. Use self-propelled steel drum vibratory rollers having a minimum static weight of 10 tons for primary compaction. For final compaction, use either a steel drum roller, operated in a static mode, or a rubber-tired (pneumatic) roller of equal or greater weight. Use walk-behind vibratory rollers or plate tampers for compacting areas inaccessible to large rollers.

3.4. Haul Trucks. Use trucks for hauling the RCC material from the plant to the paver fitted and equipped with retractable protective covers for protection from inclement weather or excessive evaporation. To ensure adequate and continuous supply of RCC material to the paver, have a sufficient number of trucks. If the number of trucks is inadequate to prevent frequent starts and stops of the paver, cease production until additional trucks are obtained.

3.5. Water Trucks. Keep at least one water truck, or other similar equipment, on-site and available for use throughout the paving and curing process. Equip such equipment with a spreader pipe containing fog spray nozzles capable of evenly applying a fine spray of water to the surface of the RCC without damaging the final surface.

4. CONSTRUCTION REQUIREMENTS.

4.1. Submittals for Proposed RCC Mix Design and Paving/Jointing Plan

4.1.1. Proposed RCC Mix Design. Submit a proposed mix design to the Engineer for review. If accepted by the Engineer, prepare and test a trial batch mixture at the Contractor's facilities to verify that the design criteria for strength are met in accordance with 421.4.3, "Concrete Trial Batches." Perform batch mixture preparation and testing in the presence of representatives of the Engineer. Make no production until the mix design has been reviewed and the Engineer has given authorization to proceed.

4.1.2. Proposed Paving/Jointing Plan. Submit a paving plan that includes paving sequence, hand pour areas, locations of cold joints, transverse contraction joints, and joints at structures. Use following guides when develop the Paving/Jointing Plan.

- Avoid odd-shaped RCC slabs
- Avoid joint intersection angles less than 60°
- Space transverse contraction joints at 20 ft. spacing
- Saw cut the transverse contraction joint through the curb when RCC has curb.
- Appropriately make field adjustment for joint locations to meet the inlets and manholes

4.2. Storage of Materials. Meet the requirements of 421.2.8, "Storage of Materials."

4.3. Sampling and Testing of Concrete. Unless otherwise specified, all fresh and hardened concrete is subject to testing as follows:

4.3.1. Sampling Fresh Concrete. Provide all material to be tested. Fresh concrete will be sampled for testing at the discharge end if using belt conveyors or pumps. When it is impractical to sample at the discharge end, a

sample will be taken at the time of discharge from the delivery equipment and correlation testing will be performed and documented to ensure specification requirements are met at the discharge end.

4.3.2. Testing of Fresh Concrete.

- Temperature. Tex-422-A.
- In-Place Field Density Testing. Tex-451-A (ASTM C-1040)
- Making and Curing Strength Specimens. ASTM C-1435 and ASTM C-31 (for cast-in-place concrete).

4.3.3. Testing of Hardened Concrete. Only compressive strength testing in accordance with Tex-418-A will be used unless otherwise specified or shown on the plans.

4.3.4. Quality Control Test Specimens. For each day's production, up to 1500 cubic yards of mix produced, prepare at least two sets of test specimens in accordance with ASTM C-1435 and ASTM C-31 under the direct observation of the Engineer or Engineer's representative. A set of specimens consists of three cylinders. Make an additional two sets for each additional 1500 cubic yards or fraction thereof. Cure and transport the specimens to the Contractor's curing tank. The Engineer will test two cylinders for compressive strength in accordance with Tex-418-a at 7 days. If the measured compressive strength between two cylinders varies by more than 10 percent of the stronger cylinder, the Engineer will test the third cylinder and average the results of the three cylinders. Otherwise, the Engineer will average the measured compressive strengths of the two cylinders tested at 28 days to determine the compressive strength of the lot.

The Engineer may adjust compressive strength targets at 7 days as production continues based on field experience.

4.4. Mixing Process. Use the same mixture for the entire project unless otherwise stated in the project documents. If, during production, the source of hydraulic cement, pozzolan, or aggregates is changed, then suspend production and submit a new mix design to the Engineer for approval. Do not exceed the manufacturer's rated capacity for dry concrete mixtures in the mixing chamber. Keep the sides of the mixer and mixer blades free of hardened RCC or other buildups. Routinely check mixer blades for wear and replace if wear is sufficient to cause inadequate mixing.

4.4.1. Mixing Time. Use a mixing time adequate to ensure a thorough and complete mixing of all materials. Do not allow the mixing time, after all materials including water are in the mixer, to be less than 1½ minutes for one cubic yard and 20 seconds for each additional cubic yard.

4.4.2. Mixture Ingredient Tolerances. Measure mixing water, consisting of water added to the batch, ice added to the batch, water occurring as surface moisture on the aggregates, and water introduced in the form of admixtures, by volume or weight. Measure ice by weight. Correct batch weight measurements for moisture. Ensure that the mixing plant receives the quantities of individual ingredients to within the tolerances shown in Table 2.

Table 2
Tolerances for Mixture Ingredients

Material	Variation
Cementitious Materials, wt.	± 2.0%
Water, wt or volume	± 3.0%
Aggregates, wt	± 4.0%
Admixtures, wt. or volume	± 3.0%

4.4.3. Plant Calibration. Prior to commencement of RCC production, carry out a complete and comprehensive calibration of the plant in accordance with the manufacturers recommended practice.

Provide all scales, containers, and other items necessary to complete the calibration. For volumetric mixers, provide test data showing mixers meet the uniformity test requirements of Tex-472-A.

4.4.4. Daily Reports. Supply daily plant records of production and quantities of materials used that day to the Engineer. These records may be used as a check on plant calibration.

4.5. Transportation. Transport the RCC pavement material from the plant to the areas to be paved in dump trucks equipped with retractable protective covers for protection from rain or excessive evaporation. Ensure that the trucks are dumped clean with no buildup or hanging of RCC material in the corners. Have the dump trucks deposit the RCC material directly into the hopper of the paver or into a secondary material distribution system that deposits the material into the paver hopper. Dump truck delivery must be timed and scheduled so that RCC material is spread and compacted within the specified time limits.

4.6. Placing.

4.6.1. Subbase Condition. Prior to RCC placement, meet the requirements of the pertinent Item for the underlying layer and ensure that the surface of the subbase is clean and free of foreign material, ponded water, and frost. Ensure that the subbase is uniformly moist at the time of RCC placement. If sprinkling of water is required to remoisten certain areas, ensure that the method of sprinkling will not form mud or pools of freestanding water.

4.6.2. Weather Conditions.

- Cold Weather Precautions. Meet the requirements of Section 360.4.7.3, "Temperature Restrictions."
- Hot Weather Precautions. During periods of hot weather or windy conditions, take special precautions to minimize moisture loss due to evaporation. Cooling of aggregate stockpiles by shading or the use of a fine mist may be required. Protective covers may be required on dump trucks. Keep the surface of the newly placed RCC pavement continuously moist.
- Rain Limitations. Conduct no placement of RCC pavement during rain conditions sufficient to be detrimental to the finished product. Placement may continue during light rain or mists provided the surface of the RCC pavement is not eroded or damaged in any way. Use dump truck covers during these periods. The Engineer may suspend paving when, in the Engineer's judgment, the rain is detrimental to the finished product.

4.6.3. Paver Requirements. Place all RCC with an approved paver in accordance with in Section 3.2, "Paver" and the following:

- Filling the Paver. Do not allow the quantity of RCC material in the paver to approach empty between loads. Maintain the material above the auger at all times during paving. Material transfer devices are allowed at the option of the contractor.
- Stopping the Paver. Ensure that the paver proceeds in a steady, continuous operation with minimal starts and stops, except to begin a new lane. Maximum paver speed during laydown is 10 feet per minute. Higher paver speeds may be allowed at the discretion of the Engineer if the higher speeds may be obtained without distress to the final product or cause additional starts and stops.
- Surface Condition. Ensure that the surface of the RCC pavement is smooth, uniform, and continuous without excessive tears, ridges, or aggregate segregation once it leaves the paver.

4.6.4. Inaccessible/Transition Areas. When approved by the Engineer, inaccessible areas to either the rollers or the paver, or other areas such as transitions may be paved with cast-in-place concrete in accordance with the requirements of Item 360 and CPCD-14 standard sheet or as shown in the plans.

4.6.5. Adjacent Lane Pavement. Place adjacent paving lanes within 60 minutes. If more than 60 minutes elapses between placement of adjacent lanes, the vertical joint must be considered a cold joint and prepared in accordance with Section 4.8.2, "Cold Vertical Joints". At the discretion of the Engineer, this time may be increased or decreased depending on ambient conditions of temperature, wind, and humidity. Multiple pavers may be used in tandem to reduce the occurrence of cold joints.

4.6.6. Hand Spreading. Broadcasting or fanning the RCC material across areas being compacted is not permissible. Such additions of materials may only be done immediately behind the paver and before any compaction has taken place. Remove segregated coarse aggregate from the surface before rolling.

4.6.7. Segregation. Suspend placement if segregation occurs in the RCC during paving operations until the cause is determined and corrected to the satisfaction of the Engineer. If the segregation is judged by the Engineer to be severe, remove and replace the segregated area at no additional cost to the Department.

4.7. Compaction.

4.7.1. Time to Compaction. Ensure that compaction begins with the placement process and is completed within 60 minutes of the start of the mixing at the plant and in compliance with the previously submitted paving plan. The time may be increased or decreased at the discretion of the Engineer depending on ambient conditions of temperature and humidity and the use of chemical admixtures. Do not delay rolling unless approved by the Engineer.

4.7.2. Rolling. Establish the sequence and number of passes by vibratory and non-vibratory rollers to obtain the specified density and surface finish. Only operate rollers in the vibratory mode while in motion. Rubber-tire rollers may be used for final compaction. Use additional rollers if specific density requirements are not obtained or if placing operations outpace the rolling operations.

4.7.3. Rolling Longitudinal and Transverse Joints. Do not operate the roller within 2 feet of the edge of a freshly placed lane until the adjacent lane is placed. Upon placement, roll both edges of the lanes simultaneously within the allowable time. If a cold joint is planned or expected, roll the complete lane and follow cold joint procedures as specified in Section 4.8.2, “Cold Vertical Joints“ .

4.7.4. Inaccessible Areas. Compact areas inaccessible to large rollers using walk-behind rollers or hand tampers.

4.7.5. Density Requirements. Perform field density tests at a frequency of 2 for 1500 cubic yards placed as soon as possible, but no later than 30 minutes after the completion of the rolling. Only wet density is used for evaluation. The required minimum density is 98 percent of the maximum laboratory density obtained according to Tex-451-A (ASTM C 1040). The in-place density and moisture content may be determined with a nuclear moisture-density gauge. Calibrate the gauge for moisture content at the beginning of the work and at any time during the work. RCC properly placed and compacted, but not meeting the density requirements, shall be cored and tested at the Contractor's expense. If the tested area achieves 28-day design strength, it will be paid at the full unit price. If the tested area indicates strength less than 4,000 psi but greater than 3,650 psi, payment will be made in accordance with Table 3.

If the cores indicate strengths less than 3,650 psi at 28 days or longer, the Department will evaluate the results and may reject the affected area and require removal and replacement or elect to pay at an appropriate reduced rate. The Engineer may allow areas with strengths less than 3,650 psi to remain in place with no pay.

The area for pay adjustment will be determined by the Engineer and may be further defined by their direction for additional cores.

Table 3
Price Reduction

Compressive Strength (psi)	Price Reduction (percent of unit bid price)
3999-3800	5
3799-3650	15

4.8. Joints. Multiple pavers may be used in tandem to reduce the occurrence of cold joints.

4.8.1. Fresh Vertical Joints. A joint is considered a fresh joint when an adjacent RCC lane is placed within 60 minutes of placing the previous lane or as specified by the Engineer based on ambient conditions. The time may be increased or decreased at the discretion of the Engineer depending on ambient conditions of temperature and humidity and the use of chemical admixtures. Other than rolling procedures, fresh joints do not require special treatment.

4.8.2. Cold Vertical Joints. Any planned or unplanned construction joints that do not qualify as fresh joints are considered cold joints. Prior to placing fresh RCC mixture against a compacted cold vertical joint, thoroughly clean the cold joint of loose or foreign material. Wet the vertical joint face and maintain it in a moist condition immediately prior to placement of the adjacent lane.

For uncompacted surfaces or slopes more than 15 degrees from the vertical, cut the joint vertically for the full depth. Within 2 hours of final compaction, the edge of a cold joint may be cut with approved mechanical equipment. For edges cut after 2 hours, saw-cut to the full depth of the pavement.

Demonstrate any modification or substitution of the saw-cutting procedure to the Engineer for approval prior to use. In no case allow cutting of the edge to cause raveling or tearing of the surface. Moisten the cut edge immediately prior to placement of the adjacent lane.

For all longitudinal cold joints, route the joint ¼ inch wide and seal in accordance with Section 360.2.7, "Joint Sealants and Fillers."

4.8.3. RCC Pavement Joints at Structures. Line structures such as manholes, valves, or concrete curb and gutter with preformed joint filler in accordance with DMS-6310, "Joint Sealants and Fillers" for Class 6 Preformed Seals. Provide preformed joint fillers with a thickness equal to the width of the joint required and furnish in lengths equal to the width of the slabs in which they are installed. Use preformed joint filler shaped so that, after installation, the upper and lower surfaces conform to the shape of the slab and subbase surfaces. Position the lower surface of the preformed joint filler on or below the surface of the base while the upper surface is ½ inch below the surface of the slab unless otherwise specified.

4.8.4. Control Joints. Construct transverse contraction joints in the RCC pavement by sawing. Green-cut shall be utilized as soon as possible behind the rolling operation to prevent random cracking, typically one (1) to four (4) hours. Cut all joints to 1/4 the depth of the RCC pavement to a single saw blade width. Joints should be spaced at intervals of 20 ft for all pavement thicknesses and follow the guides in Section 4.1.2. Control joints shall be sealed in accordance with Section 360.2.7, "Joint Sealants and Fillers."

4.9. Multi-lift Placements. Do not exceed 60 minutes between the start of moist mixing and the end of compaction of any load of RCC in multi-layer construction. Where two or more layers are to be constructed consecutively, do not exceed 120 minutes between the start of moist mixing of the material for the bottom layer and completion of finish, grading, and compaction of the top layer. Grading or operating graders, compacting, or finishing is not allowed after the specified times have elapsed, however, the time may be increased or decreased at the discretion of the Engineer depending on ambient conditions of temperature and humidity and the use of chemical admixtures. Multiple pavers may be used in tandem to reduce the occurrence of cold joints. Keep the surface of the underlying layers moist by fog-spray until covered by the next layer.

4.10. Finishing. Ensure that the finished surface of the RCC pavement, when tested with a 10-foot straightedge or crown surface template, does not vary from the straightedge or template by more than 1/4 inch at any one point and shall be within 5/8 inch of the specified finished grade. When surface irregularities are outside these tolerances, diamond-grind the surface to meet the tolerance. Corrective measures are at the Contractor's cost and will not be reimbursed.

For final surfaces, provide a uniform diamond grind texture on all areas under traffic prior to opening to traffic. Target a diamond grind texture of 0.04 in. as measured by Tex-436-A. Correct any location with a texture less than 0.03 in. by performing additional diamond grinding.

For surfaces where an overlay is the final riding surface, unless otherwise directed, correct grade deviations greater than 1/2 in. in 16 ft. measured longitudinally or greater than 1/2 in. over the entire width of the cross-section.

4.11. Curing. Immediately after final rolling and compaction testing, keep the surface of the RCC pavement continuously moist until an approved curing compound, a suitable prime coat, or a layer of asphalt concrete is applied or for 72 hours after placement, whichever comes first. Apply water cure by water trucks equipped with fog spray nozzles, soaking hoses, sprinkling system, or other means such that a uniform moist condition on the surface of the RCC is ensured. Apply this moisture in a manner that will not erode or damage the surface of the finished RCC pavement. Use either water cure or curing compound methods in Sections 4.11. 1 and 4.11.2 .

4.11.1. Water Cure. The use of wet mat curing is allowed in accordance with Section 420.4.10. "Curing Concrete" using interim Type 1-D curing compound and wet mats.

4.11.2. Curing Compound. Do not use curing compounds when the RCC material is to be promptly covered with asphalt. Apply curing compound conforming to DMS-4650, "Hydraulic Cement Concrete Curing Materials and Evaporation Retardants" in accordance with Section 360.4.9, "Curing" with the exception of application will be prior to texturing. Provide SS-1 emulsified asphalt conforming to Item 300, "Asphalts, Oils, and Emulsions," for concrete pavement to be overlaid with asphalt concrete under this Contract unless otherwise shown on the plans or approved. Do not use emulsified asphalt when the RCC is the final surface.

4.12. Opening to Traffic. Protect the RCC from vehicular traffic during the curing period. Completed portions of the RCC pavement may be opened to light construction traffic as soon as the strength is sufficient to prevent visible damage to the RCC but no sooner than 24 hours. Water trucks will be allowed on the surface after compaction for the purposes of maintaining moisture. The pavement may be opened to unrestricted traffic after 72 hours and when the strength exceeds 2,500 psi. However, if the temperature drops below 40° F, then the period of time the temperature is below 40° F will be added to the minimum time to opening. Temperature will be based on the hourly ambient air temperature reported by the nearest National Weather Service station.

4.13. Maintenance. Maintain the RCC pavement in good condition until all work is completed and accepted at no additional cost to the Department.

4.14. Thickness and Thickness Tolerance. Provide and operate equipment capable of extracting a small (approximately 1 inch diameter or greater) core to determine the pavement thickness. Extract samples in the presence of the Engineer or Engineer's representative unless otherwise directed.

Repair the core holes using a packaged quick set repair mortar such as SikaQuick 1000 or approved equivalent or a Class 4000 or better ready mix concrete. Rod and neatly strike off the repair material.

Measure the thickness in the travel lanes of the completed RCC at staggered intervals not to exceed 500 feet in length for two-lane roads. Measure the core to the nearest 0.10 inch at three different, evenly spaced locations and record the average. Where the RCC is deficient in depth by more than 0.75 inch, take an additional core within 3 feet of the original core. If the average of the 2 cores is in excess of 0.75 inches, correct the area by removal and replacement. The extent of the area of correction will be determined by the Engineer and may be further defined by their direction for additional cores. The Engineer may allow areas in excess of 0.75 inches deficient to remain in place with no pay.

Where the thickness of a core shows to be deficient by more than 0.2 inches but 0.75 inches or less, a pay adjustment will be made in accordance with Section 6, "Payment" and Table 4. The area for pay adjustment will be determined by the Engineer and may be further defined by their direction for additional cores.

Table 4
Deficient Thickness Price Adjustment Factor

Deficiency in Thickness Determined by Cores (in.)	Proportional Part of Contract Price Allowed (adjustment factor)
Not deficient	1.00
Over 0.00 through 0.20	1.00
Over 0.20 through 0.30	0.80
Over 0.30 through 0.40	0.72
Over 0.40 through 0.50	0.68
Over 0.50 through 0.75	0.57

4.15. Ride Quality. Unless otherwise shown on plans, measure the ride quality in accordance with Item 585, "Ride Quality for Pavement Surfaces," Surface Test Type B, with Pay Adjustment Schedule 2.

5. MEASUREMENT

RCC will be measured by the square yard completed and accepted in place. Pavement constructed outside the area designated to be paved will be not be measured for payment.

6. PAYMENT

RCC will be paid for at the unit price for RCC Pavement, of the thickness specified, which price and payment will be full compensation for furnishing all materials, equipment, tools, labor, and incidentals necessary to satisfactorily complete the work. Pavement that is deficient in thickness addressed in Section 4.14, "Thickness and Thickness Tolerance" and density/strength deficiencies addressed in Section 4.7.5, "Density Requirements," but is permitted to be left in place, will be paid at the reduced unit price as provided in Tables 3 and 4 or no pay in accordance with this Item. No compensation will be made for the materials or labor involved in the removal or replacement of defective material and for diamond grinding or other corrective measures to meet requirements.

Cast-in-place concrete placed in areas as allowed under Section 4.6.4., Inaccessible/Transition Areas, will be paid as roller compacted concrete.

Concrete curbs required will be for paid for under Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."