SECTION 304

PORTLAND CEMENT TREATED BASE

DESCRIPTION

304.01.01 GENERAL

A. This work shall consist of constructing 1 or more courses of a mixture of aggregate and Portland cement on a prepared surface in accordance with these specifications, in conformity with the lines, grades, thicknesses, and typical cross sections shown on the plans, or as established by the Engineer.

B. As used in these specifications, Portland cement shall be defined as hydraulic cement.

C. The method to be used, either plantmix or roadmix, will be at the Contractor's option.

MATERIALS

304.02.01 GENERAL

A. Materials shall meet the requirements of the following sections and subsections:

Materials	Section/Subsection
Hydraulic Cement	***701***
Water	***722***
Aggregate for Portland Cement Treated Base	***704.03.08***
Liquid Asphalts	***703.03.03***
Emulsified Asphalt	***703.03.04***

CONSTRUCTION

304.03.01 PROPORTIONING

A. Portland cement shall be applied to the mineral aggregate at the rate specified in the Special Provisions or as determined by the Engineer.

304.03.02 MIXING - ROADMIX METHOD

A. Portland cement shall be added at the rate specified, or at a rate ordered by the Engineer.

1. Variations in excess of 10 percent from the rate set will not be permitted.

2. The Portland cement shall be added in a manner to ensure that correct and uniform proportions will enter the mixer at all times.

B. The specified base material, cement, and water shall be mixed by means of a traveling mixer.

1. The mixer shall be so constructed that it will pick up all the base material to be treated during the time of mixing.

2. The mixer may be of the pugmill, auger, or transverse shaft type that mixes the materials by means of revolving paddles which lift all the loose material from the subgrade.

C. The traveling mixer shall have provision for introducing water at the time of mixing through a metering device.

1. The water shall be applied by means of controls that will supply a uniform ratio of water to the amount of material passing through the mixer and produce a completed mixture with a uniform moisture content.

2. Leakage of water from equipment will not be permitted.

3. Care shall be exercised to avoid the addition of water from any source except through the metering device.

4. Mixing shall be accomplished in 2 or more passes of the material through the mixer but, in any event, mixing shall be continued until the resulting mixture is entirely uniform in cement content, moisture, and the distribution of coarse and fine particles.

5. At least 1 pass shall be made before any water is added to the material.

D. The device by which the mixer picks up the material shall be so controlled and operated on each pass of the mixer as to pick up all the material to be treated and at the same time avoid cutting into the subgrade or picking up unmixed material on successive passes of the mixer.

E. The lengths of sections to be mixed at any 1 time shall be regulated to permit compliance with the time requirements specified herein.

F. Should the Contractor elect to perform road-mixing operations off the roadbed at a designated location, the preparation of the material for mixing and the mixing of base material, cement, and water shall conform to the applicable provisions specified herein for preparing and mixing the materials on the roadbed.

1. When the materials are road-mixed off the roadbed, the device for loading the mixed material into the transporting vehicle shall be so constructed and so operated that no untreated material will be picked up.

2. The time required for loading and hauling the material shall be taken into account when determining the amount of material to be mixed at any 1 time.

G. After final mixing operations have been completed, the mixture shall be spread and compacted as specified in ***Subsection 304.03.04, "Spreading."***

304.03.03 MIXING - PLANTMIX METHOD

A. Cement treated base shall be mixed at a central mixing plant by either batch mixing using revolving blade or rotary drum mixers or continuous mixing at the option of the Contractor. The aggregate and cement may be proportioned either by weight or volume.

B. If the Contractor so elects, the base material, cement, and water may be mixed at a central plant using a pugmill, rotary drum, or a continuous type of mixer.

C. If a pugmill or rotary drum type of mixer is used, the materials shall be proportioned by batch weights. If a continuous type of mixer is used, the materials shall be proportioned by volume.

D. Should the Contractor elect to proportion the materials by volumetric methods and perform the mixing in a continuous type of mixer, the completed mixture shall be as uniform in character and consistency with respect to grading, cement content, and water as that obtainable by weight proportioning and batch mixing.

E. If the Contractor elects to use a continuous type of mixer, the correct amount of aggregate introduced into the mixer shall be drawn from the storage bin by means of a continuous feeder through an adjustable calibrated gate, which will supply the correct amount of aggregate in proportion to the cement and water.

F. The mixer shall be equipped with metering devices that will introduce the cement and water into the mixer in the specified proportions.

1. The metering devices and feeder shall be interlocked and so synchronized as to maintain a constant ratio of cement and water to aggregate.

2. Storage bins shall be equipped with overflow chutes for each compartment.

3. A positive signal system shall be provided to indicate when the level of material approaches the strikeoff capacity of the feed gate.

4. The plant shall not be permitted to operate unless this signal system is in good working condition.

5. The plant shall be equipped with facilities for calibrating gate openings by weighing check samples.

G. Water shall be proportioned by weight or volume.

1. The quantity of water added to the mixture shall be adjusted to produce optimum moisture content.

2. All water additions shall be made under conditions that will permit an accurate determination of the quantity of water added.

H. Portland cement shall be added at the rate specified or at a rate ordered by the Engineer. Variations from this rate in excess of 10 percent will not be permitted.

I. The weight of charge in a batch mixer, or the rate of feed to a continuous type mixer, shall not exceed that which will permit complete mixing of all the material. Dead areas in the mixer, in which the material does not move or is not sufficiently agitated, shall be corrected either by a reduction in the volume of material or by other adjustments.

J. Mixing of materials shall be continued until the cement and water are evenly distributed through the mass and a uniform mixture of unchanging appearance is obtained.

304.03.04 SPREADING

A. Prior to spreading the cement treated material, the surface of the prepared roadbed shall be moistened and kept moist, but not excessively wet, until covered by the mixture.

B. Materials mixed at a location off the roadbed shall be deposited by means of approved spreading equipment. Dumping in piles upon the subgrade will not be permitted.

C. The mixture shall be spread and compacted in 1 or more layers of uniform density and of the width and thickness that, after compacting and trimming, the finished subgrade or base will conform to the required grade and cross section. The mixture shall be spread for the full width of the roadbed or the traffic lane under construction.

D. Varied Thickness Requirements:

1. Where the required thickness is 6 inches or less, the mixture may be spread and compacted in 1 layer.

2. Where the required thickness is more than 6 inches, the mixture shall be spread and compacted in 2 or more layers of approximately equal thickness, provided that the

maximum compacted thickness of any 1 layer does not exceed 6 inches unless otherwise approved by the Engineer.

3. Thicknesses greater than 6 inches may be compacted in 1 layer, when it is determined by the Engineer that the thickness of the layer is compatible with the compaction equipment being used and that the specified density can be achieved.

E. Work on each layer shall be performed in a similar manner, except that a curing seal need not be applied to a lower layer if the surface of the compacted material is kept moist until covered with the next layer. The exposed area of a lower layer shall not be greater at any time than can be covered with the next layer in 1 day of normal operations.

F. The mixed materials shall be spread for the full width of the subgrade or base under construction, either by 1 spreader or by several spreaders operating in a staggered position across the subgrade, unless traffic conditions require part-width construction. Should 1 spreader only be used, not more than 45 minutes shall elapse between the time of placing material in adjacent lanes at any location without trimming the longitudinal joint.

G. If traffic or other conditions make part-width construction of a base necessary, a windrow of shoulder material or soil shall be placed and compacted to form a choker to restrain the inner edge of the base during compacting operations.

1. The choker shall be constructed to the same elevation as that of the compacted base, and shall be completed in advance of the spreading of the treated material.

2. The toe of the choker shall not be less than 3 inches outside the finished trimming line of the compacted section of base material.

3. The use of side forms, or other method that will satisfactorily retain the base material during compacting operations, will be permitted in lieu of a choker.

H. After a part-width section has been completed, the longitudinal joint against which additional material is to be placed shall be trimmed to the neat line of the section and with a vertical edge. Choker material and material cut away in trimming shall be used in the construction of adjacent shoulders or otherwise disposed of unless suitable for incorporation in the work.

I. The use of self-propelled graders will be permitted for trimming, for spreading material mixed on the roadbed, or for spreading material mixed at a location off the roadbed after such materials have been deposited in an approved manner.

304.03.05 COMPACTION

A. The provisions contained in this subsection apply to both plantmix and roadmix methods.

B. Cement treated base shall be compacted to a minimum of 95 percent of the laboratory maximum density as determined by ASTM D558.

C. Compacting equipment shall produce the required compaction within the operation time limit specified in ***Subsection 304.03.07, "Time Requirements."***

D. Rolling shall be performed in such a manner that bumps and irregularities will be eliminated and the finished surface shall be true to the required grade and cross section within the surface tolerances specified in ***Subsection 304.03.06, "Finished Surface."***

E. Water shall be applied without driving equipment over the uncompacted material.

F. Rolling shall commence by completely covering the outer edge of the material. Subsequent rolling shall lap at least 25 percent of previously compacted material.

G. Areas inaccessible to rollers shall be compacted to the required density by other means.

304.03.06 FINISHED SURFACE

A. Surface Tolerances:

1. The finished surface of cement treated base shall be uniform and shall not deviate at any point more than 3/8 inch from the bottom of a 10-foot straightedge laid in any direction.

2. The surface of the finished cement treated base at any point shall not vary more than 5/8 inch above or below the grade established by the Engineer, except that when Portland cement concrete pavement is to be used on cement treated base, the surface of the finished cement treated base at any point shall not extend above the grade established by the Engineer.

B. When the finished surface of cement treated base is outside the specified tolerances and before placing any course of material thereon, all high spots on the finished surface shall be trimmed off to within the specified tolerance.

1. The excess materials shall be removed and disposed of in a manner approved by the Engineer immediately after trimming and no loose material shall be left on the base and the area shall then be rolled again.

2. Full compensation for trimming high spots and disposing of the trimmed material shall be considered as included in the prices paid for the contract items involved in constructing the cement treated base and no additional compensation will be allowed therefor.

C. Cleated equipment shall not be allowed on new cement treated base unless street pads are used on the cleats.

304.03.07 TIME REQUIREMENTS

A. Any mixture of aggregate, cement, and water that has not been compacted shall not be left undisturbed for more than 30 minutes.

B. Not more than 2 hours shall elapse between the time water is added to the aggregate and cement and the time of completion of initial rolling.

C. Not more than 3 hours shall elapse between the time water is added to the aggregate and cement and the time of completion of final compaction after trimming.

304.03.08 CONSTRUCTION JOINTS

A. At the end of each day's work and when cement treated base operations are delayed or stopped for more than 2 hours, a construction joint shall be made in thoroughly compacted material, normal to the centerline of the roadbed with a vertical face.

B. Additional mixture shall not be placed until the construction joint has been approved by the Engineer.

C. Where cement treated base has been finally compacted more than 1 hour, longitudinal joints shall be constructed by cutting vertically into the existing edge for approximately 3 inches and the material cut away may be disposed of in the adjacent lane to be constructed.

D. The face of the cut joints shall be moistened in advance of placing the adjacent base.

304.03.09 PROTECTION AND CURING

A. The surface shall be kept moist at all times until the curing seal is applied. Water equipment shall be of a type which will apply moisture in a fog or mist type of application free of pressure at the surface being treated.

B. The completed cement treated base shall be covered with a bituminous curing seal as protection against drying.

1. Curing seal will be required only for the top layer of cement treated base.
2. The curing seal shall be applied as soon as possible, but not later than 8 hours after the completion of final rolling.
3. The surface shall be kept moist until the seal is applied.
4. Curing seal shall be bituminous material, unless otherwise specified, and shall be applied at a rate of between 0.15 gallon and 0.25 gallon per square yard of surface, the exact amount to be determined by the Engineer.
5. The curing seal shall be applied in accordance with the requirements of ***Section 407, "Seal Coat,"*** and in sufficient quantity to provide a continuous membrane over the base.
6. At the time of application of the curing seal, the surface shall be tightly knit, free from all loose material and shall contain sufficient moisture to prevent excessive penetration of the asphalt.
7. If necessary to ensure this, sufficient water to fill the surface voids shall be applied immediately before the asphalt is applied.

C. Equipment or traffic shall not be permitted on the cement treated base during the first 3 days after applying the curing seal, unless otherwise permitted by the Engineer. After traffic is allowed on the cement treated base, and there is danger of excessive surface abrasion, sand blotter may be required as determined by the Engineer.

D. When equipment or traffic is permitted on the cement treated base and such permission is granted for the sole convenience of the Contractor, the Contractor shall protect the curing seal at no additional cost to Contracting Agency.

E. All loose sand shall be completely removed from the cement treated base before any surfacing material is placed thereon. Full compensation for furnishing, spreading, and removing sand as specified above shall be considered as included in the contract price paid for sand blotter and no additional allowance will be made therefor.

304.03.10 WEATHER LIMITATIONS

A. Cement treated base shall not be mixed or placed while the atmospheric temperature is below 35 degrees F, or when conditions indicate that the temperature will fall below 35 degrees F for a sustained period of 4 hours.

B. Cement treated base shall not be placed on frozen ground and all material shall be protected from freezing and frost for a period of 5 days after placing.

METHOD OF MEASUREMENT

304.04.01 MEASUREMENT

A. The quantity of Cement Treated Base will be measured for payment by the square yard.

B. The quantity of Portland Cement for Cement Treated Base will be measured for payment by the hundred weight.

BASIS OF PAYMENT

304.05.01 PAYMENT

A. Cement treated base and subbase will be paid for by the square yard, in place, as shown on the plans or as directed by the Engineer. The price per square yard shall include payment for the furnishing of untreated base or subbase material required by the plans or specifications and shall include mixing, spreading, shaping, compacting, trimming, and curing the treated material.

B. Portland cement for treating base and subbase will be paid for by the hundred weight for the quantity required to treat the base at the rate prescribed on the plans or directed by the Engineer.

1. The price per hundred weight shall include payment for furnishing and spreading cement on the job.

2. Cement will not be considered a major bid item for the purpose of adjusting quantities.

C. Payment for curing seal will be considered as included in the price bid for cement treated base.

D. Payment will be made under:

PAY ITEM	**PAY UNIT**
Cement Treated Base	Square Yard
Portland Cement for Cement Treated Base	Hundred Weight