SECTION 330: CEMENT TREATED BASE COURSE

330.1 DESCRIPTION

This work shall consist of furnishing aggregate materials that have been homogeneously blended with Portland cement in a central-mix plant or a continuous mix-plant and spreading and compacting on a prepared surface in accordance with the specifications to the lines, grades, thicknesses and typical cross-sections shown in the project plans, City Standard Details, and as directed by the City Engineer or designee.

330.2 MATERIALS

330.2.1 Cement

Cement shall be Type II, low-alkali Portland cement and shall comply with the requirements of ASTM C 150 unless otherwise specified.

The Contractor shall submit a Cement Certification Letter to the City Engineer or designee at a minimum five (5) working days prior to the beginning of cement treated base course placement operations. The Cement Certification Letter shall reference an approved and current cement source appearing on the NMDOT's Approved Products List, current edition for Spec #'s 509 or 510.

In addition to the Cement Certification Letter, the Contractor shall submit a certification of compliance signed by the cement manufacturer, identifying the cement Type and source (plant location), stating the Portland cement used in the cement treated base delivered to the project complies with this specification. Portland cement specified in an approved mix design shall be of the same source and Type for all cement treated base course produced under that mix design.

330.2.2 Aggregate

Aggregate for cement treated base course shall consist of a combination of crushed stone, crushed or screened gravel, and natural or manufactured sand conforming to the requirements of Section 310, "Base Course" of these Standard Specifications . RAP shall not be used.

330.2.3 Water

Water used in cement treated base course shall be clean and free of oil, acids, alkalis, salts, organic matter or other deleterious material that will adversely affect the cement treated base course. Water used shall have a pH value of from 6.0 to 8.5 in accordance with AASHTO T26. Water shall not be used with a sulfate content or chloride content that exceeds 1,000 ppm. Care shall be taken to prevent contamination from silt, clay, organic matter, or other deleterious material. Residual water, wash water, or recycled water generated by equipment, mixer trucks, or central mixers shall not be used in the cement treated base course mixture.

330.2.4 Prime Coat

Prime Coat for surface sealing of compacted cement treated base course shall be in accordance with the material requirements of Section 420, "Prime Coat" of these Standard Specifications.

330.2.5 Mix Design

330.2.5.1 General

The preparation of a mix design and job mix formulae together with necessary sampling and testing as required for this work shall be at the Contractor's expense. Such sampling and testing shall be performed by an approved testing laboratory under the direct supervision of a New Mexico Registered Professional Engineer. Mix design and job mix formulae submittals shall state the methods used in preparing the design or formulae together with substantiating data and graphic representations as appropriate, shall respond to all pertinent material requirements listed in the technical specifications, and shall give recommendations for job procedures and job mix tolerance limits necessary to give reasonable assurance that the specification requirements will be met in the field, when appropriate. All mix design and job mix formulae, and material tests relating thereto shall be based upon tests conducted no more than twelve (12) months prior to the date the mix design is submitted.

Each mix design submitted and authorized for use under this specification shall be identified by a number, unique to that mix design and aggregate production plant/pit. If a change in material(s) from that specified in the mix design occurs during a project, the Contractor shall submit a new mix design to include the changed materials for authorization by the City Engineer or designee. A mix design shall not be used on a project without authorization by the City Engineer or designee.

330.2.5.2 Proportioning

A mix design for Cement Treated Base Course shall be submitted to the City Engineer or designee for review and approval at least five (5) working days prior to use on the project.

The Contractor shall be solely responsible for the cement treated base course mix design proportions and material batched and delivered to the site.

The cement treated base course mix design shall be a blend of Portland cement, aggregate base course and water. The mix design shall be prepared in a laboratory under the direct supervision of a New Mexico Registered Professional Engineer and shall be stamped and signed by the Engineer prior to submittal to the City Engineer or designee.

The testing equipment used in the design development of the mix design shall be calibrated annually with calibration standards traceable to the National Bureau of Standards. Certificates of calibration shall be maintained at the laboratory for review by, or submitted to, the City Engineer or designee upon request.

Aggregate shall conform to the gradation requirements of Section 310, "Base Course" of these Standard Specifications.

Portland cement shall be proportioned by percent of dry weight of aggregates. The amount of Portland cement shall be the minimum cement content that will provide an aggregate cement water mixture, when compacted at optimum moisture, as determined by ASTM D558, which complies with the requirements of Table 330.2.5.2:1, "Cement Treated Base Course Properties."

Table 330.2.5.2:1
Cement Treated Base Course Properties

Characteristic	Specification	Test Method
Compressive Strength	850 to 1000 psi @ 28 days	ASTM D558 Method A ASTM D1632 ASTM D1633

330.3 CONSTRUCTION REQUIREMENTS

330.3.1 Batching

Cement treated base course shall be proportioned and mixed in a central mixing plant unless otherwise specified. The plant shall be either the batch mixing type or the continuous mixing type. The plant shall be equipped with feeding and metering devices which will introduce the aggregates, cement and water into the mixer in the proportions specified in the authorized mix design. The plant shall be calibrated at the particular configuration, to include but not be limited to scales, belt speeds, gate settings, dispenser rates and mixing time, to proportion a specified mix within the tolerances specified in Section 510, "Portland Cement Concrete" of the NMDOT Standard Specifications for Highway and Bridge Construction, current edition.

The cement treated base course mix design shall be measured and adjusted to account for the moisture contained within the aggregates. Water shall be added only in the amount required to bring the total water content of the mixture up to the maximum shown on the authorized mix design. The maximum water shown on the authorized mix design shall not be exceeded.

The production configuration required for a mix design shall be maintained on file at the plant for review by the City Engineer or designee. Certification by the supplier that the required configuration was used in the production of cement treated base course for each days production shall be maintained at the plant for review by the City Engineer or designee. Batch weights of materials and/or daily production weights will be recorded at the batch plant and maintained on file for review by the City Engineer or designee.

330.3.2 Transportation and Placement

Mixed material shall be transported from the plant to the project site in non-agitating dump trucks or other suitable vehicles approved by the City Engineer or designee. Loads of material shall be covered immediately after loading and remain covered until unloading.

The Contractor shall provide to the City Engineer or designee with each load of material batched and/or delivered to the site, before unloading at the site, a copy of a delivery ticket on which is printed, stamped or written, the information defined in Table 330.3.2:1, "Delivery Ticket Requirements."

Table 330.3.2:1
Delivery Ticket Requirements

A.	Name of Supplier
B.	Date of Delivery
C.	Delivery Ticket Number
D.	Truck Number
E.	Name of Contractor
F.	Project Name, Project Number, and Control Number (when applicable)
G.	Job Mix Formula identification number
H.	Weight of load
I.	Time mixing initiated
J.	Time loaded

Cement treated base course shall be placed in one 4 or 6-inch lift on the prepared and approved subgrade for the full width of the base under construction and spread to a depth sufficient to achieve the specified thickness when compacted unless otherwise specified in the contract documents or approved by the City Engineer or designee. The material shall be spread with a self propelled mechanical spreader equipped with a screed that distributes and strikes off the mixture to the required width, thickness and cross-section so that it may be compacted without subsequent shaping. The surface of the subgrade shall be moistened and kept moist immediately prior to the spreading of the cement treated base course.

Construction joints shall be made in the compacted cement treated base course. A vertical transverse joint shall be made at the end of each day's work and at the end of a completed section when construction is delayed for a period of more than three (3) hours. Longitudinal construction joints will not be permitted except at converging lanes.

330.3.3 Compaction and Surface Tolerance

The cement treated base course shall be compacted to a density of at least 95% of the maximum density, as determined by AASHTO T180.

Compaction shall begin within sixty (60) minutes from the time of mixing. Compaction shall begin immediately after placing the cement treated base course on the subgrade or roadbed. No more than three (3) hours shall be allowed between the time of mixing and achieving compaction of the cement treated base course.

The surface of the cement treated base course shall be kept moist during all finishing, compacting, and trimming operations. The finished surface of the cement treated base course shall not deviate in excess of 1/2 inch when tested with a 10 foot straightedge in any direction. All deviations from this tolerance shall be corrected with the least possible displacement of the material which is to remain in place at no expense to the City. After finishing and compacting, filling of low areas will not be permitted. Cement treated base course which does not meet these finished requirements shall be

removed and replace at no cost to the City. Corrections if required shall be completed within three (3) hours of the time of mixing and prior to placing Prime Coat if it is specified at no cost to the City.

330.3.4 Prime Coat

Upon completion of compaction, the surface of the compacted cement treated base shall be sealed with a prime coat unless otherwise specified in the plans or by the City Engineer or designee. Prime coat shall be provided in accordance with Section 420, "Prime Coat" of these Standard Specifications. If final surfacing is placed within 24 hours after completion of compaction, the prime coat may be waived as authorized by the City Engineer or designee.

330.3.5 Curing

The surface of the completed cement treated base course shall be kept moist for a curing period of not less than five (5) days unless covered by a Prime Coat, or a subsequent surfacing layer as required by the plans, contract, or City Standard Details. The material shall be cured for a period of five (5) days from the time of placement before opening to traffic.

330.3.6 Temperature and Weather Limitations

Cement treated base course shall not be placed on frozen subgrade or subgrade with a surface temperature less than 40F. The material shall not be placed when the ambient air temperature is less than 40F.

330.3.7 Maintenance of Cement Treated Base Course

Damage to the cement treated base course during the curing period shall be repaired by the Contractor at no expense to the City. Repairs shall extend to the full depth of the cement treated base course.

The Contractor shall maintain the surface of the cement treated base course free from contamination with dirt, debris or other deleterious material until such time as the surface treatment is placed on the base or as approved by the City Engineer or Designee.

330.3.8 Sampling and Testing

330.3.8.1 Contractor Quality Control

The Contractor is responsible for the quality of materials and construction. The City reserves the right to obtain samples of any portion of any material at any point of the operation for the City's use. The Contractor shall administer a Quality Control Plan to provide and place cement treated base course in accordance with the City's Standard Specifications, Standard Details, Plans, and Contract unless otherwise specified by the City Engineer or designee. The Quality Control Plan shall be provided in accordance with Section 423.3.6.1 "Contractor Quality Control" and Section 901.2, "Contractor Quality Control" of the NMDOT Standard Specifications for Highway and Bridge Construction, current edition. Any reference to "Project Manager" or "District Laboratory Supervisor" shall be substituted with the words, "City Engineer or designee."

The Contractor may elect to perform its own process quality control sampling and testing to verify conformance of material requirements to the acceptance testing tolerances as specified in Section 330.3.8.2 of this Specification. The Contractor shall control operations such that the tolerances of Table 330.3.8.2:1, "Acceptance Testing Tolerances for Cement Treated Base Course" are met.

330.3.8.2 Acceptance

Quality acceptance sampling, testing and inspection of base course shall be performed by the City or a City representative at the direction of the City Engineer unless otherwise specified and shall conform to the requirements of Table 330.3.8.2:1, "Acceptance Testing Tolerances for Cement Treated Base Course."

Table 330.3.8.2:1
Acceptance Testing Tolerances for Cement Treated Base Course

Property	Point of Acceptance	Testing Frequency (minimum of)	Tolerance	Test Method
Sampling	As Specified			AASHTO T 2, 248
Gradation	Roadway	1 per 300 Ton 1 per 1500 SY 1 per Street or Site 2 per Day	Table 310.2.1:1	AASHTO T 11, 27
Density	Roadway After Compaction	1 per 500 Ton 1 per 2400 SY 1 per Street or Site 2 per Day	95% of Maximum	AASHTO T 180 AASHTO T 238, 239
Compressive Strength	Roadway	1 per 300 Ton 1 per 1500 SY 1 per day	850 psi minimum @ 28 days (Average of 2 samples tested)	ASTM D558 ASTM D1632 ASTM D1633

*If the percent passing the No. 10 sieve is less than 10% of AASHTO T-27 test procedure, this test does not need to be performed.

The average values of individual tests of all sieve size determinations shall comply with the job mix formula within the permissible tolerances shown in Table 310.2.1:1 except material passing the No. 200 sieve. Results of tests of an individual sample may fall outside the permissible limits by no more than 2 percentage points on any sieve except the No. 200 sieve.

The compressive strength shall be determined from cores obtained at 28 days. If the minimum compressive strength is not met, the contractor shall remove defective material and surfacing at its own expense and replace all removed material with acceptable material at its own expense.

This testing will be considered acceptance testing and such testing will be conducted by an independent Testing Laboratory obtained by the Contractor or as designated by the City Engineer or designee. Test results shall be submitted to the City Engineer or designee and Contractor within two working days of sampling and/or testing.

Acceptance testing for density shall be done with a portable nuclear density device.

Material placed by the Contractor/Developer that does not meet these requirements shall be removed and replaced with suitable material meeting specification requirements at the Contractor's/Developer's expense or as otherwise directed by the City Engineer or designee. Material removed shall be disposed of in an environmentally suitable location at the Contractor's/Developer's expense.

330.4 METHOD OF MEASUREMENT -

Cement Treated Base Course will be measured by the square yard or ton. Payment per unit will be inclusive of all materials incorporated into the mixture including cement.

When Cement Treated Base Course (CTBC) is to be measured by the square yard, the average width of the CTBC in place will be used in computing quantities. The length used in computing the area shall be station to station along the centerline of the roadway. All dimensions shall be as shown on the typical section of the plans or City Standard Drawings. Payment by the square yard shall not negate the requirement to provide delivery tickets with each load of CTBC delivered to the job site as required by Section 330.3.2 of these Standard Specifications.

When Cement Treated Base Course is measured by the ton, the quantity shall be based on delivery tickets provided with each load delivered to the job site as required in Section 330.3.2 of these Standard Specifications. Material wasted by the Contractor and not incorporated into the final work shall not be included in the payment quantity.

310.5 BASIS OF PAYMENT

Pay Item	**Pay Unit**
Cement Treated Base Course	Ton
Cement Treated Base Course _____in Depth	Square Yard