

SECTION 305

CEMENT TREATED BASE CONSTRUCTION

305.1 GENERAL: The work provided shall include the furnishing, placement and compaction of one or more courses of plant mixed Portland cement treated base course (CTB) to the lines, grades, dimensions, moisture, density and typical sections as specified in the plans and specifications, and as directed by the ENGINEER. The CONTRACTOR shall be solely responsible for the cement treated base either batched at and/or delivered to the site. A design mix for CTB shall be certified in accordance with the requirements of these specifications.

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

305.2 REFERENCES.

305.2.1 American Society for Testing and Materials (ASTM), (Latest Edition):

- C136 Standard Test Method for Sieve Analysis of Fine and Course Aggregates
- C150 Standard Specifications for Portland Cement
- D75 Standard Practice for Sampling Aggregates
- D422 Standard Test Method for Particle-Size Analysis of Soils
- D558 Standard Test Methods for Moisture-Density Relations of Soil-Cement Mixtures
- D559 Standard Test Methods for Wetting and Drying Compacted Soil-Cement Mixtures
- D560 Standard Test Methods for Freezing and Thawing Compacted Soil-Cement Mixtures
- D1632 Standard Practice for Making and Curing Soil-Cement Compression and Flexure Test Specimens in the Laboratory
- D1633 Standard Test Method for Compressive Strength of Molded Soil-Cement Cylinders
- D2419 Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
- D2922 Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods
- D2940 Standard Specification for Graded Aggregate Material for Bases or Subbases for Highways or Airports
- D3017 Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods
- D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

305.2.2 This Publication:

SECTION 113 WARRANTY AND GUARANTEE;
TESTS AND INSPECTIONS;
CORRECTIONS, REMOVAL, OR
ACCEPTANCE OF DEFECTIVE WORK
SECTION 301 SUBGRADE PREPARATION
SECTION 302 AGGREGATE BASE COURSE
CONSTRUCTION

305.3 MATERIALS.

305.3.1 Portland cement to be used or furnished under this specification shall comply either with the requirements of ASTM C150, Type II, Low Alkali (LA) cement, or as specified herein, or as specified in the Supplementary Technical Specifications, Drawings, or as approved by the ENGINEER. The CONTRACTOR shall submit 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. If required, certification of the portland cement used for each day's concrete placement, shall be submitted to the ENGINEER. Portland cement specified in an authorized design mix shall be of the same source and type for all cement treated base under that design mix identification number, as specified in the design mix.

305.3.2 Aggregates for cement treated base course shall consist of a combination of crushed stone, crushed gravel, crushed portland cement concrete, and natural or manufactured sand conforming to the requirements of SECTION 302, GRADED AGGREGATE BASE COURSE CONSTRUCTION.

305.3.3 Water used in cement treated base shall be clean and free from injurious amounts of oil, acids, alkalis, salts, organic materials, or other deleterious substances. Nonpotable water shall not be used unless the requirements of ACI 318.3.4.3.2 are met.

305.3.4 Prime coat for surface sealing of compacted cement treated base shall comply with the requirements of CSS-IH Cationic Emulsified Asphalt as specified in Section 112.

305.4 PROPORTIONING.

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

305.4.2.1 A cement treated base design mix shall be a blend of portland cement, aggregate base course and water. The design mix shall be prepared in a laboratory under the direct supervision of a New Mexico Registered Professional ENGINEER. The testing equipment used in the design development of the design mix 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 the ENGINEER. A copy of the certifications shall be provided to the ENGINEER upon his request.

305.4.2.2 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 a aggregate cement water mixture, when compacted at optimum moisture, as determined by ASTM D558, and that will comply with the requirements of TABLE 305.A.

TABLE 305.A
CEMENT TREATED BASE PROPERTIES

CHARACTERISTIC	SPECIFICATION
A. Weight Loss After 12 Cycles:	
Wetting and Drying Tests	15% maximum ASTM D559
Freezing and Thawing Tests	15% maximum ASTM D560
B. Compressive Strength (average of 2 samples)	
Samples Molded	ASTM D558 Method A
Samples Cured	ASTM D1632
Samples Tested	ASTM D1633

305.4.2.3 A submittal for cement treated base shall include but not be limited to the TABLE 305.B.

TABLE 305.B
SUBMITTAL REQUIREMENTS

- A. Design Mix Identification Number
- B. Supplier
- C. Aggregate production plant/pit
- D. Name of CONTRACTOR
- E. Construction Project Title and Number
- F. Certifications of compliance of materials
- G. Certification of compliance of design mix
- H. Proposed proportions of materials
- J. Wet Dry Test results
- K. Freeze Thaw Test results
- L. Target gradation of aggregate

- M. Optimum moisture maximum dry density relationship and graph.
- N. Compressive strength test results, average of two briquettes (each), at 2 days, 7 days, and 28 days

The submittal shall be rejected without review if the specified data is not included.

305.5 BATCHING.

305.5.1 Cement treated base shall be proportioned and mixed in a central mixing plant, either weigh batching or volume batching. 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 design mix. 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. The production configuration required for a design mix shall be maintained on file at the plant for review by the ENGINEER. Certification by the supplier that the required configuration was used in the production of cement treated base for each days production shall be maintained at the batch plant for review by the ENGINEER. Batch weights of materials and/or daily production weights will be recorded at the batch plant and maintained on file for review by the ENGINEER.

305.6 TRANSPORTATION AND PLACEMENT.

305.6.1.1 Material shall be transported in suitable vehicles with a cover. Loads of material shall be covered immediately after loading and remain covered until unloading.

305.6.1.2 The CONTRACTOR shall provide to the ENGINEER with each load of material batched and/or delivered to the job site, before unloading at the site, a copy of a delivery ticket on which is printed, stamped or written, the information defined in TABLE 302.C.

TABLE 305.C
DELIVERY TICKET INFORMATION

- A. Name of Supplier
- B. Date of Delivery
- C. Delivery Ticket Number
- D. Name of CONTRACTOR
- E. Project Name (optional)
- F. Job mix formula identification number
- G. Weight of load
- H. Time loaded

305.6.2 Material shall be placed on prepared subgrade, prepared in accordance with the requirements of SECTION 301, SUBGRADE PREPARATION, in lifts to provide a compacted thickness of not less than four (4) inches and not more than six (6) inches, to the required

limits and sections specified in the plans and specifications or as authorized by the ENGINEER.

305.6.3 Compaction of the material shall be initiated within sixty (60) minutes from the time of mixing. The material shall be compacted to an equivalent dry density greater than ninety five (95) percent of maximum dry density, at a moisture content range of optimum moisture to optimum moisture plus four (4) percent, as determined in accordance with ASTM D558. Compaction shall be completed within three (3) hours from the time of mixing as directed by the ENGINEER.

305.6.4 Upon completion of compaction, the surface of the compacted cement treated base shall be sealed with a prime coat. The prime coat shall be applied as required to provide a uniform coverage of the surface. Application shall be between 0.05 and 0.15 gallons per square yard of surface. If final surfacing is placed within 24 hours after completion of compaction, the prime coat may be waived as authorized by the ENGINEER. The surface shall be kept at compaction moisture until the next lift of material is placed in the event the prime coat is waived.

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

305.6.6 Cement treated base shall be protected from freezing for a minimum of 7 days after placement. The material shall be cured before opening to traffic in accordance with the requirements of TABLE 305.D.

TABLE 305.D
CURING TO TRAFFIC SCHEDULE

CURING TEMPERATURE RANGE °F	CURING TIME (days)
40-55	7
56-75	5
T>76	3

305.6.7 The finish surface of the graded aggregate base shall not deviate in excess of ½ inch in 10 foot when tested with a 10 foot straight edge in any direction. All deviations from this tolerance shall be corrected at no expense to the OWNER. Corrections, if required shall be completed within 3 hours of mixing and prior to placement of prime coat.

305.7 TESTING.

305.7.1 Tests shall be performed in accordance with the requirements of this specification, the supplemental technical specifications, or as required by the ENGINEER. Testing equipment used in the performance of specified testing shall be calibrated annually with calibration standards traceable to the National Bureau of Standards, Certification records shall be maintained at

the laboratory for review by the ENGINEER. A copy of the certifications shall be submitted upon request to the ENGINEER.

305.7.2 A construction sample of material supplied to a project shall be taken at a rate of one sample per each 300 tons delivered, or one sample per day, whichever is greater, or as directed by the ENGINEER. The sample shall be of such size to provide material for all tests specified. A sample shall be tested for but not limited to the properties specified in TABLE 305.E.

TABLE 305.E
CEMENT TREATED BASE FIELD TESTS

- A. Gradation
- B. Moisture content
- C. Maximum density
- D. Compressive strength
2 briquettes tested at 2 days
2 briquettes tested at 7 days

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 302.B, SECTION 302., 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. Non compliance shall necessitate that the entire lot be resampled and tested for compliance. Non complying material shall be removed and replaced as directed by the ENGINEER. The OWNER will only pay for complying material or as directed by the ENGINEER. Cost of removal and replacement of non complying material shall be the responsibility of the CONTRACTOR.

305.7.3 Field compaction tests shall be conducted in accordance with the requirements of ASTM D2922 and D3017, at the rate of one test per lift per 500 sy of material placed, or one (1) test per day, or as directed by the ENGINEER.

305.7.4.1 Test reports shall include but not be limited to the requirements of TABLE 305.F.

TABLE 305.F
TEST REPORT INFORMATION

- A. Field Data
 - Date of Sampling/Field Test
 - Project Number or Permit Number
 - Project Title
 - Material Supplier
 - Delivery Ticket Number (material sample only)
 - Design Mix identification Number
 - Location of sample/field test as defined by the project plans and specifications

Time of Sampling/field testing
Ambient temperature at time of sampling/, °F
Test results with reference specification limits

B. The laboratory test results and corresponding production limits and/or specifications.

305.7.4.2 Test results shall be reported to the ENGINEER, CONTRACTOR, and Supplier in writing, within 7 working days of completion of the sampling and or field test. Non complying test shall be reported within 1 working day of completion of the test.

305.7.4.3 The testing shall be certified to have been performed in compliance with the specifications by the NM Registered Professional ENGINEER in direct charge of the testing program.

305.8 MEASUREMENT AND PAYMENT.

305.8.1 Measurement of cement treated base course shall be by the square yard per each depth specified, complete in place.

305.8.2 Payment shall be at the contract unit price per square yard per each thickness required, complete in place which shall include all material, labor and equipment required in placing, grading, compacting the cement treated base course and prime coat/moisture control, as authorized by the ENGINEER.