

SECTION 301
AGGREGATE SURFACING

301.01 DESCRIPTION

This work is producing and placing one or more courses of aggregate surfacing on a prepared surface or producing and stockpiling aggregate surfacing.

301.02 MATERIALS

301.02.1 Aggregates

Obtain aggregates from sources meeting Section 106 requirements to produce material in accordance with Subsection 701.02.1 and the following subsection requirements:

Crushed Base Course	701.02.4 and 701.02.5
Crushed Cover Aggregate.....	701.02.8
Crushed Top Surfacing	701.02.6 and 701.02.7
Sand Surfacing	701.02.3
Selected Surfacing	701.02.2

Furnish bridge end backfill in accordance with Subsection 701.13.

301.02.2 Binder

Binder material, for binding and gradation requirements, is fine, natural soil particles or crusher dust, free from grass, roots, weeds, humus, or other deleterious matter.

301.02.3 Blending Material

Blending material is selected natural or crushed mineral aggregate combined with the produced aggregate to meet specifications.

Do not use pit strippings, overburden, or other deleterious material as blending material.

Furnish and add blending material to aggregate surfacing materials when required to meet gradation requirements.

The blending material must not increase the liquid limit and plastic limit of the surfacing material.

301.02.4 Aggregate Treatment

Choose the material that will be used to treat the aggregate, which may include MC-70, emulsified prime, calcium or magnesium chloride, or other material approved by the Project Manager.

Furnish liquid magnesium or calcium chloride in accordance with Subsection 713.03 requirements. Furnish liquid asphalt in accordance with Section 702 requirements. If used, furnish MC-70 listed on the QPL.

Blotter material is material with 100% passing the ½-inch (12.5 mm) screen and having a PI of 6 or less.

301.03 CONSTRUCTION REQUIREMENTS

301.03.1 Sampling, Testing, and Acceptance

A. Production Control. Develop a quality control sampling and testing plan for production and be responsible for all sampling and testing for gradation and mechanical fracture control during aggregate production.

B. Acceptance Sampling and Testing. The Project Manager will randomly select samples taken by the Contractor and witnessed by an Inspector, for gradation and fracture testing from processed material in its final position on the roadway in accordance with MT 201. Samples for other tests will be taken at the point of production.

The following acceptance tests are used:

Gradation	MT 202
Mechanical Fracture	MT 217

The quantity represented by 5 samples is a lot when production schedules and material continuity permit. The Project Manager may establish a lot consisting of a quantity represented by 3 to 7 consecutive random samples when there are short production runs, significant material changes, or other unusual characteristics of the work.

- C. Acceptance.** Surfacing aggregates are evaluated for gradation and mechanical fracture on a lot-by-lot basis. The upper and lower limits in the gradation tables in Section 701 are the upper and lower limits in the evaluation formulas. The specified minimum fracture is the lower limit.

Acceptance is made in accordance with Subsection 105.03.2.

301.03.2 Equipment

- A. Rollers.** Use rollers in accordance with Subsection 210.03.4.
- B. Watering Equipment.** Use watering equipment in accordance with Subsection 210.03.5.
- C. Scales.** Furnish scales in accordance with Subsection 109.01.1 or use certified permanently installed commercial scales. Furnish and have readily available at least 10 50-pound (22.7 kg) weights for testing Contractor furnished scales. Furnish housing for the scale recording devices. Scale accuracy must be $\frac{1}{2}$ of 1% at any weight.

Alternate weigh methods or devices may be acceptable, if they produce the required accuracy. Platform and belt-conveyor scale requirements are as follows:

1. **Platform Scales.** Use platform scales having the length to weigh an entire vehicle in an unbroken operation.

Truck-trailer combinations may be weighed separately if the scale approaches are:

 - a. Compacted gravel or asphalt;
 - b. Long enough and level with the scale platform to accommodate the entire truck-trailer units; and
 - c. Continually maintained.

Release all brakes as the unit is weighed.
2. **Belt-conveyor Scales.** Belt-conveyor scales may be used for non-asphaltic materials when meeting the requirements of Subsection 109.01.1 and the following:
 - a. The scale meets the National Bureau of Standards requirements for belt-conveyor scales, except as modified below.
 - b. A daily static-load test is made after approximately $\frac{1}{2}$ hour of continuous belt conveyor operation and whenever the air temperature varies 15 °F (9 °C) or more. Have a calibration test performed once daily and whenever the daily static-load test shows adjustments are required.
 - c. Make calibration computations, calibration procedures and results, and related documents available for the Project Manager's review. Clearly mark test chains with calibration constants. Carry test chains and test weights in protective containers and make immediately available for belt-conveyor scale testing.
 - d. Perform accuracy checks by checking the average of 5 or more sequential payloads of hauling units on approved platform scales. The acceptable accuracy is $\pm 0.5\%$ of the payload of the average hauling unit. If the recording odometer of the belt-conveyor scales in use is graduated to 0.1-ton (91 kg) increments and is a cumulative recording process, differences in readings and variations less than

0.1-ton (91 kg) may carry over from one hauling unit to another. Conveyor weight conformation is based on the tonnage obtained from readings taken from the sealed odometer at the beginning and end of each check period. The number of check loads will be increased should the test results fluctuate.

Furnish a lock to secure the recording tape, odometer, totalizer, calibration adjustment, and clock-time imprinter. The Project Manager will lock the equipment and retain the keys before materials are delivered to the roadway.

301.03.3 Reject

Dispose of reject material produced from Department sources as directed.

301.03.4 Crushed Aggregate Course

When crushed aggregate course is a bid item, construct the aggregate surfacing section to the specified typical cross section and profile grade.

Select one of the following two options to construct the aggregate section:

1. Full depth crushed base course.
2. Top 0.15 foot (45 mm) crushed top surfacing, remaining depth crushed base course.

Indicate the selected option and the grade of crushed base course (Type "A" grade 5 or Type "A" grade 6) before beginning aggregate production. Only one grade of crushed base course will be permitted. If option 2 is selected use Type "A" grade 2 crushed top surfacing.

Quality assurance lot sizes, test intervals and material tolerances will be based upon the materials selected.

301.03.5 Aggregate Surfacing Construction

A. Surface Preparation. Do not place aggregate surfacing material on any of the following:

1. Any surface not meeting the dry density requirements for that surface;
2. A rutted or frozen subgrade or aggregate surface; or
3. Any surface not meeting grade or surface smoothness specifications.

B. Pugmill Mixing. Pugmill mix all surfacing aggregates except crushed cover aggregate.

Uniformly mix aggregate surfacing and water in a central plant pugmill mixer.

Proportion all blending material, filler, and binder by weight to within $\pm \frac{1}{2}$ of 1% of the specified quantity before mixing.

Add the water needed to reach the specified density.

Additional water may be added only once to the aggregate surfacing once it's placed on the roadway to replace moisture lost to surface evaporation. If additional water is needed, pick up the mixture and remix it in the pugmill.

After pugmilling, transport, place, and spread aggregate surfacing on the roadway.

Spread in maximum 8-inch (200 mm) compacted layers to the required grade and typical section. Spot fill low areas by scarifying roadway, spreading aggregate and compacting to specified density.

C. Road Mixing. When specified, place, mix and spread the surfacing aggregates on approved surfaces at optimum moisture using motor graders or other approved equipment.

Water may be added to the aggregate to reach optimum moisture during or after crushing.

Once uniformly mixed, spread in maximum 8-inch (200 mm) compacted layers to the required grade and typical cross section. Roller compact the spread layer.

Correct or remove equipment from the work failing to maintain uniform gradation of the material for the entire width and thickness of the roadway.

D. Compaction. Compact aggregate surfacing to 98% of the target density.

The initial target density is the average of the maximum density of at least 2 tests on samples representing the material to be compacted. Maximum density is determined in accordance with MT 230.

The Project Manager may take samples from the materials placed on the roadway. They will be tested and the results averaged to determine a new target density for the material remaining to be placed.

The Project Manager will establish a target density for each course, grade, and type of surfacing aggregate. A new target density will be established if the aggregate characteristics change.

The Department will test the lift(s) of surfacing aggregate in 2,000-foot long (610 m) sections based on full typical section width. The in-place dry density of each lift is determined within each section at 10 randomly selected locations. The average of the 10 tests must be a minimum of 98% of the target with not more than 2 out of 10 tests being less than 98% of the target. The number of tests will be pro-rated for sections with partial lengths and widths. In pro-rated sections, the average of the tests must be a minimum of 98% of target density.

Be responsible for controlling compaction and all necessary control testing.

Notify the Project Manager once compaction is complete on a section so it may be tested.

Re-compact sections not meeting density requirements.

Re-compacted sections will be tested at 10 new random locations.

Compaction and testing will continue until the section meets density requirements.

Densities will be determined in accordance with MT 212, MT 218, and MT 230.

- E. Finishing.** Finish each course of compacted aggregate surfacing to the specified grade and section. The final lift will be accepted in accordance with Subsection 105.08.

Use trimmings on the inslopes, on sections of uncompleted roadway or return to the pit area. When quantities are measured by the ton (MT), excess material returned to the pit is deducted from the pay quantities.

- F. Curing.** Allow the final lift of crushed aggregate course to cure for a minimum of 72 hours and until in-place moisture content is 2% or more below optimum moisture content or a maximum of 5% final moisture content, whichever is lower. Meet these requirements prior to aggregate treatment or paving. Notify the Project Manager when a section is complete and ready for Department testing. The in-place soil moisture content will be determined on the final lift of surfacing aggregate in 2,000-foot (610 m) long sections. Moisture content will be tested within each section at 10 random locations. Not more than 1 test may be above the target value. The number of tests will be prorated for sections with partial lengths. Additional tests may be taken at the Project Manager's discretion.

The Contractor is responsible for corrective actions on sections not meeting moisture content requirements. After corrective actions have been taken, the sections will be tested at 10 random locations or prorated as determined by the Project Manager.

- G. Restrictions.** The Project Manager may restrict equipment speed and load weights to prevent damage to existing and new work, public thoroughfares or safety.

Unstable or pumping material is unacceptable. Rework or remove and replace the material prior to placing additional lifts or materials.

- H. Surface Smoothness.** Finish the aggregate surface to the specified grade within Table 301-1 tolerances.

**TABLE 301-1
SURFACE SMOOTHNESS**

Aggregate Size	Tolerance	Distance
1½-inch (40 mm) and larger	+0.08-foot (24 mm) to -0.05-foot (15 mm)	30 feet (9.2 m)
1-inch (25 mm) and less	±0.04-foot (12 mm)	60 feet (18.4 m)

301.03.6 Shoulder Gravel

Compact shoulder gravel to provide a firm, hard surface. Finish the slope to provide a smooth surface from the edge of pavement to the catch point.

Furnish gravel in accordance with Table 301-2 gradation requirements.

**TABLE 301-2
SHOULDER GRAVEL GRADATION REQUIREMENTS**

Percentage By Weight Passing Square Mesh Sieves	
Sieve Size	Percent Passing
¾-inch (19.0 mm)	100
No. 4 (4.75 mm)	25-85
No. 200 (0.075 mm)	5-20

Cold milled pavement is not required to meet the above gradation when used as shoulder gravel.

301.03.7 Traffic Gravel

Furnish traffic gravel in accordance with Subsections 701.02.4 or 701.02.6. Traffic gravel is not evaluated in accordance with Subsection 105.03.2.

Place traffic gravel in the locations and quantities directed by the Project Manager.

Milled and/or pulverized plant mix material may be used as traffic gravel in accordance with the following conditions:

1. Submit in writing a detailed plan showing locations for the use of the milled or pulverized material. Include an updated traffic control plan and stockpile locations.
2. Place all milled/pulverized material below the finished subgrade elevation unless approved in writing by the Project Manager.
3. Do not mill/pulverize areas outside the planned limits unless approved in writing by the Project Manager.
4. 100% of the milled/pulverized material must pass the 2-inch (50 mm) sieve.

301.03.8 Aggregate Treatment

Furnish and apply aggregate treatment on aggregate surfaces. Submit the material(s) and application rates to be used for aggregate treatment to the Project Manager 10 business days before beginning the construction of the aggregate surfacing. The material must bond with the aggregate and the treated surface must be durable under vehicular traffic.

Apply aggregate treatment material and necessary blotter according to the manufacturer's recommendations.

301.03.9 Bridge End Backfill

Place bridge end backfill full width of the roadway embankment typical section to 10 feet (3.0 m) behind the base of the pile cap then ascending on a 6H:1V slope. The top of the bridge end backfill is subgrade elevation. When the bridge end backfill does not daylight at an embankment slope to provide drainage, extend the bridge end backfill 3 feet (915 mm) beyond the wingwall

and daylight to the slope facing the span. Place bridge end backfill material in conformance with moisture and density requirements of Section 301.

Do not contaminate bridge end backfill with water while performing bridge work.

301.04 METHOD OF MEASUREMENT

301.04.1 Aggregate

Aggregate surfacing, blending material, fillers, binder, water, producing, handling, mixing, hauling, placing, spreading, compacting, trimming, use of trimmings, maintenance and all necessary incidentals to complete the work is measured by the cubic yard (m³) or ton (MT), as specified.

When removing oversize surfacing material from the roadway, the oversize material is measured by the ton (MT) returned to the aggregate source, and deducted from the total surfacing material placed on the roadway.

A. Measurement by Weight. Aggregate surfacing is measured by the ton (MT) in accordance with Subsection 301.03.2(C).

Excess material removed from the roadway and returned to the pit area is deducted from the pay quantities.

B. Measurement by Volume. Traffic gravel and shoulder gravel are measured by the cubic yard (m³). Aggregate surfacing is measured by the cubic yard (m³), in accordance with Subsection 109.01, from:

1. Plan dimensions;
2. Haul vehicles; or
3. In-place roadway or stockpile volumes.

When measured in place, each course thickness of each grade of surfacing aggregate will be measured at random locations in a section. The section length and number of measurements is the Project Manager's discretion. The thickness measurements for each section are averaged and the average must equal or exceed the plan thickness. The minimum measured thickness at any location must be at least plan thickness less ½ the largest aggregate size permitted for the material.

Bring all sections of a completed course not meeting these specifications into compliance before placing the next course.

Aggregate surfacing for small or irregularly shaped areas ordered in writing by the Project Manager, are measured in the haul vehicle in accordance with Subsection 109.01.

Aggregate surfacing to fill in subgrade low areas or placed outside the lines and slopes shown in the contract or established by the Project Manager is not measured for payment.

301.04.2 Bridge End Backfill

Bridge end backfill is measured by the cubic yard (m³).

301.04.3 Reserved

301.04.4 Reserved

301.04.5 Compaction

Compaction is incidental to the aggregate surfacing.

301.04.6 Crushed Aggregate Course

The entire aggregate surfacing section will be measured as crushed aggregate course regardless of the construction option selected in accordance with Subsection 301.03.4.

301.04.7 Aggregate Treatment

Aggregate treatment is measured by the square area. Blotter material is not measured separately for payment and is to be included in the bid price for aggregate treatment.

301.05 BASIS OF PAYMENT

Payment for the completed and accepted quantities is made under the following:

<u>Pay Item</u>	<u>Pay Unit</u>
Aggregate	Cubic Yard (m ³) or Ton (MT)
Aggregate Treatment	Square Yard (m ²)
Bridge End Backfill	Cubic Yard (m ³)
Crushed Aggregate Course	Cubic Yard (m ³) or Ton (MT)
Shoulder Gravel	Cubic Yard (m ³)
Traffic Gravel	Cubic Yard (m ³)

Binder is not measured separately but is to be included in the cost for aggregate material.

Payment at the contract unit price for traffic gravel includes all costs necessary to furnish and place the gravel.

Sale of excess crushed traffic gravel meeting all specifications is the Contractor's option. Traffic gravel meeting all specifications that is crushed and stockpiled on the project, but not placed or sold, will be paid for at 35% of the contract unit price. Traffic gravel from a commercial source or a source supplying multiple projects and not transported to the project is not measured for payment. If milled/pulverized plant mix is used on any portion of the project, no payment for excess traffic gravel will be made.

Payment at the contract unit price is full compensation for all resources necessary to complete the item of work in accordance with the contract.

SECTION 302

BITUMINOUS PAVEMENT PULVERIZATION

302.01 DESCRIPTION

This work consists of processing the existing plant mix surfacing with existing crushed aggregate course, additional crushed aggregate course, or combination of these to restore the roadway section.

302.02 MATERIALS

Furnish crushed aggregate course in accordance with Subsection 701.02.1 and one of the following subsections:

Crushed Aggregate Course Type "A" Grade 5 701.02.4

Crushed Aggregate Course Type "A" Grade 6 701.02.4

302.03 CONSTRUCTION REQUIREMENTS

302.03.1 Pulverization

Pulverize the bituminous surfacing to the depth(s) specified in the contract. Pulverize the existing material so that 100% by weight passes a 2-inch (50 mm) sieve.

302.03.2 Equipment

Equipment used to pulverize the existing surfacing must not reduce the aggregate size in the existing surfacing.

302.03.3 Mixing

Add crushed aggregate course as necessary to construct the roadway to the specified typical section and profile grade. Uniformly mix the pulverized material and crushed aggregate course by pugmilling or by using the pulverization equipment.

302.03.4 Compaction

Compact the pulverized mixture in maximum 8-inch (200 mm) compacted lifts to 98% of the target density. The target density will be determined by one of the following methods:

A. Pugmill Mixing. MT 230 determines maximum density when the pulverized plant mix and crushed aggregate course are blended at a constant ratio by pugmill. The initial target density is the average of the maximum density of at least 2 tests on samples representing the material to be compacted.

B. In-place Mixing. MT 219 determines maximum density when in-place pulverized plant mix and crushed aggregate course mixtures are combined at varying ratios.

The Project Manager will determine target densities and moisture corrections. A new target density will be established if the ratio of pulverized material and crushed aggregate course change by more than 20% or the Project Manager determines the pulverized material characteristics or site conditions change.

302.03.5 Testing and Acceptance

Each lift of pulverized mixture material will be divided into 2,000-foot long (610 m) sections. The in-place dry density of each lift will be determined within each section at 10 randomly selected locations. The average of the 10 tests must exceed 98% of the target density with no more than 2 out of the 10 tests being less than 98% of the target density.

Be responsible for controlling compaction and all necessary quality control testing.

Notify the Project Manager when compaction is complete on a section so it can be tested.

Re-compact sections not meeting density requirements. Re-compacted sections will be tested at 10 new random locations.

Compaction and testing will continue until the section meets density requirements.

302.04 METHOD OF MEASUREMENT

302.04.1 Aggregate

Virgin crushed aggregate course is measured by the ton (MT) in accordance with Subsection 301.03.2(C) or by the cubic yard (m³).

302.04.2 Pavement Pulverization

Pavement pulverization is measured by the square yard (m²) based on the bottom width of the pulverized material. The contract unit price may be adjusted if the average pavement depth varies by more than 0.10-foot (30 mm) from plan and the Project Manager issues a written order to increase or decrease the pulverization depth.

302.05 BASIS OF PAYMENT

Payment for the completed and accepted quantities is made under the following:

<u>Pay Item</u>	<u>Pay Unit</u>
Crushed Aggregate Course	Ton (MT) or Cubic Yard (m ³)
Pavement Pulverization	Square Yard (m ²)

Payment at the contract unit price is full compensation for all resources necessary to complete the item of work in accordance with the contract.

SECTION 303

STOCKPILED SURFACING AGGREGATE

303.01 DESCRIPTION

This is stockpiling surfacing aggregates at the specified location.

303.02 MATERIALS

Furnish materials in accordance with Subsection 301.02 and the contract requirements.

303.03 AGGREGATE STOCKPILING METHODS

Clear stockpile sites of weeds, roots, stumps, rocks, and other contaminating matter. Dispose of this material in accordance with Subsection 201.03.5 or level as directed.

Make the stockpile floor firm, smooth, well drained, uniform in cross-section, and able to support the stockpile.

Place an aggregate bed on the floor to prevent stockpile contamination.

Construct stockpiles in at least 3 layers. Place each layer approximately 4 feet (1.2 m) high before starting the next layer. Prevent each layer from spilling down over the next lower tier.

Do not drop material stockpiled by conveyor more than 12 feet (3.7 m). Deposit the material in succeeding merging cone piles. Do not permit the piles to exceed 12 feet (3.7 m) in height. Level each completed layer to 4 feet (1.2 m) thick.

Operate stockpiling trucks to produce a stockpile width that exceeds the single dump trucks width. Do not dump over the stockpile sides.

Maintain separation between different gradation stockpiles to prevent aggregates from intermingling.

Use equipment and methods to prevent segregation, degradation, or contamination of the aggregate when constructing stockpiles or delivering materials.

Department sieve test samples are taken from the stockpile to determine degradation.

Re-mix and re-stockpile segregated stockpiles.

Bring stockpiled material failing specifications back within specifications at Contractor expense.

303.04 METHOD OF MEASUREMENT

303.04.1 Aggregate

Stockpile surfacing aggregate is measured at the stockpile site by the ton (MT) or cubic yard (m^3) in accordance with Subsection 301.04.1.

303.05 BASIS OF PAYMENT

Payment for the completed and accepted quantities is made under the following:

Pay Item

Aggregate

Pay Unit

Ton (MT) or Cubic Yard (m^3)

Payment at the contract unit price is full compensation for all resources necessary to complete the item of work in accordance with the contract.

SECTION 304

CEMENT TREATED BASE

304.01 DESCRIPTION

This work is producing and placing one or more courses of a mixture of water, hydraulic cement, and aggregate or soil on a prepared surface in conformity with the lines, grades, and thicknesses established in the contract.

304.02 MATERIALS

304.02.1 Cement

Furnish Type I or II portland cement listed on the QPL, in accordance with Subsection 551.02.1. Blended hydraulic cement that conforms to one of the following may be substituted:

AASHTO M 240 Type IP or Type IP (MS)
ASTM C1157 Type GU or Type MS

Fly ash may be used to replace a maximum of 25% of the cement by weight. Furnish fly ash in accordance with AASHTO M 295, Class C requirements. Mixtures with fly ash must meet all of the requirements of cement treated base (CTB).

304.02.2 Water

Furnish water in accordance with Subsection 713.01 requirements.

304.02.3 Aggregate

Obtain aggregates from sources in accordance with Section 106 requirements to produce aggregates in accordance with Subsection 701.02.9 requirements.

Stockpile aggregates in accordance with Subsection 303.03.

304.02.4 Blending Material

Blending material, consisting of selected natural or crushed mineral aggregate may be combined with the produced aggregate to meet gradation requirements. For fine aggregate passing the No. 40 (0.425 mm) sieve; the liquid limit may not exceed 30, and the plasticity index may not exceed 7, tested in accordance with MT 208.

304.02.5 Composition and Proportioning

Develop and submit a proposed CTB mix design for approval. Submit the mix design a minimum of 10 business days before production. Develop a mix design with cementitious materials content that:

- Ensures a 7-day unconfined compressive strength of 500 – 1,500 psi (3,450 – 10,350 kPa) in accordance with MT 216, and
- Is a minimum of 4.5% the weight of the dry aggregate.

Include the following items as part of the mix design submittal:

1. Cement and fly ash certifications;
2. Optimum moisture content and maximum density determined in accordance with MT 211;
3. Aggregate gradations determined in accordance with MT 202;
4. Soil-cement losses, moisture changes, and volume changes (swell and shrinkage) produced by the repeated wetting and drying of hardened soil-cement specimens determined by AASHTO T 135;
5. Soil-cement losses, moisture changes, and volume changes (swell and shrinkage) produced by the repeated freezing and thawing of hardened soil-cement specimens determined by AASHTO T 136. The maximum freeze/thaw weight loss is 14%;
6. 7-Day compressive strength tests determined in accordance with MT 216;

7. Atterberg limits determined in accordance with MT 208; and
8. Sand equivalent determined in accordance with MT 213, or AASHTO T 176 alternate method No. 2.

Acceptance of the mix design will be based on a review of the submitted results for all the above testing procedures.

Do not place CTB until the submitted mix design has been approved.

304.03 CONSTRUCTION REQUIREMENTS

304.03.1 Aggregate Production, Testing, and Acceptance

- A. General.** Perform all work meeting the approved job-mix target values within the specified tolerances.

Sample and test aggregates during production to control gradations.

- B. Acceptance Sampling and Testing.** The Project Manager will randomly select samples of the stockpiles taken by the Contractor and witnessed by an Inspector, for acceptance of the aggregate's physical properties, excluding combined gradations. Aggregate gradation samples will be taken before hydraulic cement and water are added to the mixture. Provide aggregate samples as directed by the Project Manager using an aggregate sampling device, just before the aggregate enters the pug mill mixer.

The approximate quantity represented by each sample is 1,500 tons (1,500 MT). Additional samples may be taken and tested.

The quantity represented by 5 samples will represent a lot whenever production schedules and material continuity permit. The Project Manager may establish a lot consisting of a quantity represented by 3 to 7 consecutive samples when there are short production runs, significant material changes, or other unusual characteristics of the work.

- C. Acceptance.** CTB is evaluated for gradation requirements on a lot-by-lot basis. Acceptance is determined in accordance with Subsection 105.03.2.

304.03.2 Weather Limitations

Do not mix or place CTB when the ambient temperature is below 40 °F (4 °C) or the ground temperature is below 35 °F (2 °C). Do not mix or place cement treated base when the weather forecast for the project site includes a predicted temperature of 25 °F or below for the following night.

Do not incorporate frozen aggregate in the CTB or place on a frozen subgrade.

304.03.3 Subgrade Preparation

Prepare the subgrade in accordance with Section 203.

Trim the subgrade to the thickness tolerances in accordance with Subsection 304.03.4.

304.03.4 Mixing and Placing

Mix the CTB in a central plant.

Proportion the aggregate and cement by weight. Water may be proportioned by weight or by volume.

Use weigh systems and meters accurate to within $\pm 0.5\%$ of the total quantity batched and are equipped to indicate the total quantity of each ingredient batched between one-half and 10 hours.

Calibrate the feed system before production mixing begins.

Periodically verify the mix ingredient proportions from the weigh indicators.

Produce CTB having a minimum of 4.5% cementitious materials. Maintain cementitious content to within $\pm 0.5\%$ of the job mix target at any periodic check and within $\pm 0.3\%$ for each day's

production. Mixing will be suspended until corrections are made if the cement content is not maintained within the above tolerances.

Do not lower cement content during production that will result in freeze/thaw losses exceeding 14% based on mix design testing.

Uniformly mix aggregate, cement, and water. Modify mix procedures when evidence of a non-uniform mix is identified.

Place CTB in 4 to 8-inch (100 to 200 mm) compacted lifts. Place all lifts required to achieve full depth within 48 hours. Replace any partial depth section damaged prior to placement of successive lifts as directed by the Project Manager at Contractor expense. Keep the compacted material of previous lifts moist until placement of successive layers. Keeping lower layers moist or furnishing and applying curing seal to partial depth layers is incidental to the CTB.

304.03.5 Compaction

Compact the CTB to 98% of the maximum dry density within 2 hours of mixing.

The moisture and density relationship is determined in accordance with MT 211 using samples taken from the aggregate stockpiles before starting mixing operations. If a moisture and density test varies from the running average (as determined in accordance with MT 216) during production, a new moisture-density relationship will be determined.

Moisture and density tests will be taken in accordance with MT 212 on the roadway approximately every 750 cubic yards (575 m³). Five tests will represent one lot of production.

Remove and re-process any un-compacted sections where the weather or contractor operation has increased the average moisture content above optimum by more than 1%. Removed mix may be re-processed as aggregate for producing CTB.

If the density of any section is less than or equal to 95% of the maximum dry density, 2 additional tests will be taken in that section and the average of all 3 test results will represent the section. The average density for the 3 tests must be at least the specified density, with none of the 3 tests less than 93% of the maximum dry density. Remove any section with an average density less than or equal to 95% of the maximum dry density. Removed mix may be re-processed as aggregate for producing cement treated base.

CTB with densities between 95% and 98% is evaluated on a lot-by-lot basis in accordance with Subsection 105.03.2.

304.03.6 Finishing

Shape the compacted surface to the specified lines, grades, and cross sections.

Finish and compact to produce a smooth, dense surface free of compaction planes, cracks, irregularities, or loose material.

Complete the surface finishing within 2 hours of compaction.

Scarify and re-compact surface deformations in the base caused by equipment.

Do not permit the moisture content to fall below the specified optimum during finishing. Apply water in a uniform fog spray.

304.03.7 Construction Joints

Construct straight vertical-faced transverse joints at the end of each day's work and when CTB operations are delayed or stopped for more than 2 hours. Do not place additional material until the transverse joint has been approved by the Project Manager.

Construct straight vertical faced longitudinal joints in compacted material that has been in place for more than one hour by cutting vertically approximately 3 inches (75 mm) from the existing edge. Dispose of the cut material in accordance with Subsection 304.03.12.

Moisten joints prior to placing adjacent CTB material. Repair all construction related damage to finished sections of the CTB at Contractor expense.

304.03.8 Protection and Curing

When the CTB is finished to grade, apply the specified bituminous curing seal at 0.15 to 0.25 gallons per square yard (0.68 to 1.13 L/m²).

Keep the CTB surface moist between the final compaction and application of the curing seal. Apply the curing seal within 48 hours of finishing the cement treated base to grade.

Before applying the curing seal, ensure the base surface is tightly knit, free of all loose material, and has sufficient moisture to prevent asphalt penetration.

Apply the specified blotter material at approximately 15 pounds per square yard (8.2 kg/m²) when directed.

The actual application rate of curing seal and blotter may be adjusted by the Project Manager.

Remove CTB areas that have absorbed the curing seal, down to a hard, clean surface, within 24 hours of the curing seal application. Re-moisten and patch the area with approved cement treated material. Re-apply the curing seal as directed by the Project Manager.

Apply the curing seal and blotter material in accordance with Section 409.

304.03.9 Curing Period

Do not perform any work on the CTB for 3 calendar days after the curing seal is applied. Do not place pavement on the CTB until the compressive strength reaches 400 psi (2760 kPa).

304.03.10 Maintenance

Maintain the finished surface and seal before placing the wearing course. Make all repairs or patches the full depth of the base. Repair damage to the curing seal or cement treated base as directed by the Project Manager at the Contractor's expense. Remove any loose material from the CTB surface prior to paving operations.

304.03.11 Surface Smoothness and Thickness Requirements

Finish CTB in accordance with Subsection 105.08.

304.03.12 Use of Trimmed Material

CTB trimmings may be used for shoulder construction in lieu of aggregate, subject to the following:

1. The shoulder subgrade is prepared in accordance with Subsection 304.03.3.
2. Hardened material is reworked to the maximum size specified for aggregate placed on the shoulder.
3. The trim material does not exceed 25% of the shoulder aggregate depth
4. The trim material is uniformly distributed in the shoulder area before spreading additional shoulder material.

304.03.13 Testing and Acceptance of CTB

Samples for determining the compressive strength will be taken in accordance with MT 201. Test method MT 216 will be used to mold cylinders for strength testing.

The approximate quantity represented by each sample is 750 cubic yards (575 m³). Additional samples may be taken and tested.

The compressive strength tests will be conducted at 7 days and the material represented will be accepted or rejected in accordance with Table 304-1. Any corrective action is at Contractor expense.

The Contractor may make additional cylinders to determine strength gain and to maintain quality control.

**TABLE 304-1
PAY FACTORS FOR CTB**

Cement Treated Base	
Lot Acceptance Strength, x psi (1 psi = 6.9 kPa)	
Strength, x (psi)	Strength Pay factor, PF
x > 2000	PF = 0.90
2000 ≥ x ≥ 500	PF = 1.0
500 > x ≥ 400	PF = 1.0 - 0.50 (500 - x) / 100
x < 400	PF = 0, remove and replace

304.04 METHOD OF MEASUREMENT

304.04.1 Cement Treated Base

CTB is measured by the cubic yard (m³) of in-place volume.

CTB placed outside the lines and grades shown in the contract or established by the Project Manager is not measured for payment.

No measurement is made of the width required for forms or equipment operations.

Gravel used in trimmings and lateral support sections outside the planned typical section dimensions is not measured for payment. Blending material is not measured for payment.

304.04.2 Curing Seal

Curing seal is measured by the gallon (L) or by the ton (MT) in accordance with Subsection 409.04.1.

304.04.3 Blotter Material

Blotter material is measured by the square yard (m²) based on the length and width of CTB placed and accepted.

304.05 BASIS OF PAYMENT

Payment for the completed and accepted quantities is made under the following:

<u>Pay Item</u>	<u>Pay Unit</u>
Blotter Material	Square Yard (m ²)
Cement Treated Base	Cubic Yard (m ³)
Curing Seal	Gallon (L) or Ton (MT)

No separate payment will be made for cement, fly ash, blending material or surface preparation. Include the cost in the unit price bid for CTB.

Payment at the contract unit price is full compensation for all necessary resources to complete the item of work in accordance with the contract.

