

DIVISION 300
Bases

Section 304—Aggregate Base or Surface Course

Description

304.01 Work. Furnish, haul, and place aggregate base or surface course on the subgrade or base or stockpile site approved by the CO. Work may include additive mineral filler, or binder as specified in the SPECIAL PROJECT SPECIFICATIONS. Produce aggregate by pit-run, grid-rolling, screening, or crushing methods, or procure Government-furnished aggregate, as DESIGNATED IN THE SCHEDULE OF ITEMS.

Materials

304.02 Source. Obtain materials from sources or stockpiles SHOWN ON THE DRAWINGS, or from other approved sources.

Develop and utilize Government-furnished sources in accordance with Section 611.

304.03 Gradation. Ensure that grading requirements for crushing or screening operations meet the requirements specified in Subsection 703.05.

After a representative quantity of aggregate has been produced, and before incorporating the aggregate into the work, set target values (TV's) for the required gradation within the gradation ranges shown in table 703-2 or table 703-3.

No gradation other than maximum size will be required for pit-run or grid-rolled material. For grid rolling, utilize all suitable material that can be reduced to maximum size as DESIGNATED IN THE SCHEDULE OF ITEMS. After processing on the road, remove all oversize material from the road and dispose of it as SHOWN ON THE DRAWINGS.

304.04 Quality. Ensure that all aggregate meets the quality requirements specified in Subsection 703.05, unless otherwise required in the SPECIAL PROJECT SPECIFICATIONS.

304.05 Additives. Provide additives, if required, that meet specifications in the following subsections:

Bentonite	725.20
Calcium Chloride Flake	723.02
Hydrated Lime	725.03
Lignin Sulfonate	723.03
Magnesium or Calcium Chloride Brine	723.01

304.06 Water. Develop, haul, and apply water in accordance with Section 207.

304.07 Mineral Filler. Add mineral filler to meet quality and/or gradation requirements as specified in the SPECIAL PROJECT SPECIFICATIONS.

Construction

304.08 Preparation of Roadbed. Complete the roadbed in accordance with Section 203, 306, or 309, and have it approved in writing by the CO before placing base or surface course.

304.09 Mixing & Placing. Ensure that aggregate and any required additives, water, mineral filler, and binder are mixed by method(s) as SHOWN ON THE DRAWINGS; except, if crushed aggregate products are being produced and mineral filler, binder, or additives are required, uniformly blend during crushing.

(a) Stationary Plant Method. Mix the aggregate with other required materials in an approved mixer. Add water during the mixing operation in the amount necessary to provide the moisture content for compacting to the specified density. After mixing, transport the aggregate to the jobsite while it contains the proper moisture content, and place it on the subgrade or base course using an aggregate spreader.

(b) Travel Plant Method. After the aggregate for each layer has been placed with an aggregate spreader or windrow-sizing device, uniformly mix it with other required materials using a traveling mixing plant. During mixing, add water to provide the necessary moisture content for compacting.

(c) Road Mix Method. After the aggregate for each layer has been placed, mix it with other required materials at the required moisture content until the mixture is uniform throughout. Mix aggregate and all other materials until a uniform distribution is obtained.

Spread the aggregate in a uniform layer, with no segregation of size, and to a loose depth that has the required thickness when compacted.

If the required compacted depth of any aggregate base or surface course exceeds 150 mm, place the aggregate base or surface course in two or more layers of approximately equal thickness. If the nominal maximum particle size exceeds 75 mm, place the aggregate in layers that do not exceed twice the maximum size of the specified aggregate size.

During placement of aggregate over geotextile, place aggregate in a single lift to the full depth specified, unless otherwise SHOWN ON THE DRAWINGS or in the SPECIAL PROJECT SPECIFICATIONS.

Operate hauling equipment over the surface of the previously constructed layer in a dispersed manner to minimize rutting or uneven compaction.

304.10 Compaction. Compact the aggregate using one of the following methods, as specified in the SCHEDULE OF ITEMS:

(a) **Compaction A.** Compact the aggregate by operating spreading and hauling equipment over the full width of each layer of the aggregate.

(b) **Compaction B.** Moisten or dry the aggregate to a uniform moisture content suitable for compaction. Operate rollers that meet the requirements specified in Subsection 203.15(b), (c), or (d) over the full width of each layer until visual displacement ceases, making no fewer than three complete passes.

(c) **Compaction C.** Compact each layer of aggregate to a density of at least 95 percent of the maximum density, as determined by AASHTO T 99, method C or D.

(1) **Compaction C-1.** Compact each layer of aggregate to a density of at least 96 percent of the maximum density, as determined by the Modified Marshall Hammer Compaction Method (available upon request from USDA Forest Service, Regional Materials Engineering Center, P.O. Box 7669, Missoula, MT 59807).

(d) **Compaction D.** Compact each layer of aggregate to a density of at least 95 percent of the maximum density, as determined by AASHTO T 180, method C or D.

(1) **Compaction D-1.** Compact each layer of aggregate to a density of at least 100 percent of the maximum density as determined by the Modified Marshall Hammer Compaction Method (available upon request from USDA Forest Service, Regional Materials Engineering Center, P.O. Box 7669, Missoula, MT 59807).

(e) **Compaction E.** Ensure that materials produced by pit-run and grid-rolling are visually moist and compacted using operating compaction equipment defined in Subsection 203.15(b), (c), and (d) over the full width of each layer until visual displacement ceases.

For all compaction methods, blade the surface of each layer during the compaction operations to remove irregularities and produce a smooth, even surface. When a density requirement is specified, determine the density of each layer in accordance with AASHTO T 191, T 205, T 238, T 217, T 239, T 255, or T 224.

304.11 Stockpiling. If DESIGNATED IN THE SCHEDULE OF ITEMS or if the Contractor elects to produce and stockpile aggregates prior to placement, the aggregates shall be handled and stockpiled in accordance with Section 305. Establish stockpile sites at locations SHOWN ON THE DRAWINGS or approved by the CO.

Clear and grub stockpile sites, if required, in accordance with Section 201.

304.12 Thickness & Width Requirements. Ensure that the thickness and width of the compacted aggregate conform to the dimensions SHOWN ON THE DRAWINGS, and that measurements on the compacted aggregate meet the following criteria:

- (a) The maximum variation from the specified thickness is 25 mm.
- (b) The compacted thickness is not consistently above or below the specified thickness, and the average thickness of 4 or more measurements for any 1 km of road segment is within ± 5 mm of the specified thickness.
- (c) The compacted width has a (+) 300 mm tolerance.

Measurement

304.13 Method. Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Aggregate quantities include mineral filler, binder, and water.

Payment

304.14 Basis. The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
304 (01) Pit run aggregate, maximum size _____, compaction _____	Cubic Meter
304 (02) Pit run aggregate, maximum size _____, compaction _____	Ton
304 (03) Pit run aggregate, maximum size _____, compaction _____	Lump Sum
304 (04) Grid-rolled aggregate, maximum size _____, compaction _____	Cubic Meter

Section 304

- 304 (05) Grid-rolled aggregate, maximum size _____,
compaction _____ Ton
- 304 (06) Grid-rolled aggregate, maximum size _____,
compaction _____ Lump Sum
- 304 (07) Screened aggregate, grading _____,
compaction _____ Cubic Meter
- 304 (08) Screened aggregate, grading _____,
compaction _____ Ton
- 304 (09) Screened aggregate, grading _____,
compaction _____ Lump Sum
- 304 (10) Crushed aggregate, type _____, grading _____,
compaction _____ Cubic Meter
- 304 (11) Crushed aggregate, type _____, grading _____,
compaction _____ Ton
- 304 (12) Crushed aggregate, type _____, grading _____,
compaction _____ Lump Sum
- 304 (13) Placing aggregate, compaction _____ Cubic Meter
- 304 (14) Placing aggregate, compaction _____ Ton
- 304 (15) Placing aggregate, compaction _____ Lump Sum
- 304 (16) Stockpiled aggregate, type _____,
grading _____ Cubic Meter
- 304 (17) Stockpiled aggregate, type _____,
grading _____ Ton
- 304 (18) Furnishing and applying magnesium/calcium
chloride brine Ton
- 304 (19) Furnishing and applying calcium chloride flake Ton
- 304 (20) Furnishing and applying lignin sulfonate Ton
- 304 (21) Furnishing and applying hydrated lime Ton
- 304 (22) Furnishing and applying bentonite Ton

Section 305—Stockpiled Aggregates

Description

305.01 Work. Furnish and place aggregate in a stockpile location as SHOWN ON THE DRAWINGS.

Materials

305.02 Requirements. Furnish material that conforms to specifications in the following section:

Aggregate 703

Furnish stockpiled aggregates that conform to the gradation and quality requirements specified in the SCHEDULE OF ITEMS.

After a representative quantity of aggregate has been produced, and before incorporating the aggregate into the stockpile, set TV's for the required gradation within the gradation ranges.

Construction

305.03 Stockpile Site. Prepare existing sites as necessary to accommodate the quantity of aggregate to be stockpiled and as SHOWN ON THE DRAWINGS.

Prepare new sites as follows:

- (a) Clear and grub in accordance with Section 201.
- (b) Grade and shape the site to a uniform cross section that drains.
- (c) Compact the floor of the site with at least three passes using compaction equipment conforming to Subsection 203.15.
- (d) Place, compact, and maintain a minimum 150-mm layer of crushed aggregate over the stockpile site and access roads for stabilization and to prevent contamination of the stockpiles.

305.04 Stockpile. Obtain site approval before stockpiling aggregates. Make the stockpiles neat and regular in shape. Make the side slopes no flatter than 1:1.5.

Build the stockpiles in layers not to exceed 2 m in thickness. Complete each layer before depositing aggregates in the next layer.

Construct stockpile layers by spreading aggregates with trucks or other approved pneumatic-tired equipment. Do not push aggregates into piles.

Do not dump the aggregate such that any part of it runs down and over the lower layers in the stockpile. Do not drop aggregates from a bucket or spout in one location to form a cone-shaped pile.

When operating trucks on stockpiles, avoid tracking dirt or other foreign matter onto the stockpiled material.

Space stockpiles far enough apart to prevent different aggregate gradations from mixing, or use suitable walls or partitions to separate stockpiles.

Measurement

305.05 Method. Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment

305.06 Basis. The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
305 (01) Stockpiled aggregate, section ____, grading ____	Ton
305 (02) Stockpiled aggregate, section ____, grading ____	Cubic Meter
305 (03) Preparation of stockpile site	Hectare

Section 306—Reconditioning Existing Road

Description

306.01 Work. Recondition existing road; clean ditches, cattleguards, and culverts, including inlets and outlets; remove slide material; scarify where SHOWN ON THE DRAWINGS; and shape and compact the traveled way and shoulders, including parking areas, turnouts, and approach road intersections.

Construction

306.02 Blading & Shaping. Unless otherwise SHOWN ON THE DRAWINGS, blade and shape the existing traveled way and shoulders, including turnouts, to remove minor surface irregularities. Maintain the existing cross slope or crown, unless otherwise SHOWN ON THE DRAWINGS. Establish a blading pattern that will retain the surfacing on the roadbed and provide a thorough mixing of the materials within the completed surface width.

Scarify and shape the existing traveled way and shoulders at locations and to the depth and width SHOWN ON THE DRAWINGS. Remove any rock larger than 100 mm in its greatest dimension that is brought to the surface during scarification, except as provided below.

When a base or surface course is required, remove to at least 150 mm below existing surface any rocks that protrude above the existing surface more than one-third of the depth of the base or surface course, and any rocks with exposed surface area exceeding 0.2 m². Remove all unsuitable materials and place them in areas as SHOWN ON THE DRAWINGS.

Scarify and pulverize existing bituminous surfaces, as SHOWN ON THE DRAWINGS, until all lumps are reduced to the maximum size SHOWN ON THE DRAWINGS. Incorporate the bituminous pulverized aggregate into the traveled way and shoulders.

Similarly treat the traveled way and shoulders of intersecting roads to provide a smooth transition for the distance SHOWN ON THE DRAWINGS.

306.03 Rock Reduction. Where SHOWN ON THE DRAWINGS, roll the traveled way to break down rocky material. Continue rolling until visual breakdown or visual displacement of rocky material ceases, up to a maximum of five full-width passes. A pass is defined as one complete coverage of the surface.

Use rollers that are specifically designed to break down rocky material and that meet the requirements specified in Subsection 203.15(a) or (c), unless otherwise approved by the CO.

306.04 Drainage. Grade the ditches to the typical sections and at the locations SHOWN ON THE DRAWINGS. Clean culverts to drain.

Remove excess materials from the roadbed, culverts, and ditches, and place material as SHOWN ON THE DRAWINGS.

306.05 Cattleguards. Remove the cattleguard deck prior to cleaning, and reinstall it upon completion. Clean the area beneath the cattleguard of soil and other material to the bottom of the original foundation, or as SHOWN ON THE DRAWINGS, over the entire width of the installation.

Never leave the cattleguard opening unattended or open without an adequate barricade.

306.06 Compaction. Shape and compact the traveled way and shoulders using one of the methods described in Subsection 304.10, as DESIGNATED IN THE SCHEDULE OF ITEMS.

Measurement

306.07 Method. Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment

306.08 Basis. The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
306 (01) Reconditioning of roadbed, compaction _____ Kilometer
306 (02) Reconditioning of roadbed, compaction _____ Lump Sum
306 (03) Cleaning cattleguard	Each
306 (04) Cleaning culvert	Each

Section 307—Portland Cement-Treated Base—Central Plant Mix

Description

307.01 Work. On a prepared roadbed, construct one or more courses of a mixture of aggregate, water, and cement, or a mixture of aggregate, water, fly ash, lime, and/or cement.

Treated aggregate courses are designated as cement or aggregate, water, fly ash, lime, and/or cement.

Materials

307.02 Requirements. Ensure that materials meet the requirements specified in the following subsections:

Blotter	703.12
Cement	701.01
Chemical Admixtures (Set-Retarding)	711.03
Emulsified Asphalt	702.03
Fly Ash	725.04
Fog Seal	410.10
Hydrated Lime	725.03
Subbase, Base, and Surface Course Aggregate	703.05
Water	725.01

Construction

307.03 General. Store all chemical additives in closed, weatherproof containers. Prepare the surface that the Portland cement-treated base is to be placed upon in accordance with Section 203 or 306, as applicable.

Thirty days before producing the treated aggregate mixture, submit the mix design for approval. Include the following, as applicable:

- (1) Source of each component.
- (2) Report showing the results of the following tests:
 - (a) Moisture density relationship at selected cement content or selected aggregate, water, fly ash, lime, and/or cement content.

- (b) Compressive strength data for all specimens tested, at each cement content or each aggregate, water, fly ash, lime, and/or cement content.
- (3) Target values for each aggregate sieve size specified.
- (4) 90-kg sample of aggregate.
- (5) 25-kg sample of fly ash.
- (6) 10-kg sample of hydrated lime.
- (7) 10-kg sample of Portland cement.
- (8) 2-kg sample of the retarder or other additives.

Furnish a new mix design if there is a change in the source of material. Begin production only after the mix design is approved.

At least 10 days prior to construction, submit a quality control plan for review and approval. Include all tolerance items, field tests, and measurements shown in the specification. Ensure that the plan verifies compliance with these requirements for each 500-t or smaller subplot produced. Perform field testing and measurement at statistically random points within each subplot.

307.04 Mix Design Requirements. Provide test samples with a minimum average compressive strength of 3.4 MPa, with no single test lower than 2.8 MPa.

(a) Aggregate/Cement-Treated Course. Provide a mix design, based on dry weight, within the limits shown in table 307-1.

Table 307-1.—Range of aggregate/cement mix design parameters.

Material	Percent ^a
Aggregate	90–96
Portland cement	4–10

a. By weight of total dry mix.

(b) Aggregate/Water/Fly Ash/Lime/Cement-Treated Course. Provide an aggregate, water, fly ash, lime, and/or cement mix design, based on dry weight, within the limits shown in table 307-2.

Table 307-2.—Range of aggregate, water, fly ash, lime, and/or cement mix design parameters.

Material	Percent ^a
Aggregate	75–92
Fly ash	6–20
Hydrated lime and/or Portland cement	2–5

a. By weight of total dry mix.

Mold, cure, and test samples of the aggregate, water, fly ash, lime, and/or cement mixture in accordance with ASTM C 593, parts 10 and 11, but revise the curing period from 7 to 28 days at 38 ± 2 °C.

307.05 Mixing. Do not begin mixing operations when the atmospheric temperature is expected to fall below 4 °C within 48 hours. Do not place a treated aggregate course when the underlying surface is frozen or muddy, or when it is raining or snowing. Protect the finished course from freezing for at least 7 days after mixing.

Mix the components with a stationary pugmill-type central mixing plant until a uniform mixture is obtained. The CO may require additional mixing to insure uniformity. During mixing, add sufficient water to obtain the optimum moisture content for compaction, plus 2 percent.

Equip the mixer with batching or metering devices for proportioning the components either by weight or by volume. Maintain the accuracy of the amounts of aggregate, chemical additives, and water (based on total dry weight of mixture) within the following tolerances:

Aggregate	$\pm 2.0\%$ by weight
Fly ash	$\pm 1.5\%$ by weight
Hydrated lime or cement	$\pm 0.5\%$ by weight
Water	$\pm 2.0\%$ by weight

A retarder may be used to slow initial set for a maximum of 2 hours. Dissolve retarder in water and uniformly add the solution to the mixture.

Transport the mixture in vehicles that maintain moisture content, and that prevent segregation and loss of the fine material.

307.06 Placing, Compacting, & Finishing. Maintain the moisture content (± 2 percent of optimum) during placing, compacting, and finishing.

Spread the mixture on the prepared surface in a uniform layer. Do not place the mixture in a layer exceeding 150 mm in compacted thickness. When more than one layer is necessary, shape and compact each layer before the succeeding layer is placed. Route hauling equipment uniformly over the full width of the surface to minimize rutting or uneven compaction. Shape the final layer to line, grade, and cross section.

Compact each layer full width. Roll from the sides to the center, parallel to the centerline of the road. Compact each layer of aggregate to not less than 95 percent of maximum density.

Use AASHTO T 99 to determine the maximum density. Determine in-place density using any applicable AASHTO procedure.

Do not leave any treated aggregate that has not been compacted undisturbed for more than 30 minutes. Complete the compaction and finishing within 1 hour (up to 2 hours for mixtures with a retarder) from the time water is added to the mixture. Make the compacted surface smooth, dense, and free of compaction planes, ridges, or loose material.

The finished course thickness must be within a tolerance of 13 mm from that specified. Ensure that the finished thickness is not consistently above or below the specified thickness. Finish the surface to within ± 10 mm from the staked line and grade elevation. Correct all defective areas by loosening the material, adding or removing material, reshaping, and compacting.

If the time between placing adjacent partial widths exceeds 30 minutes, provide a construction joint.

307.07 Construction Joints. For lime and fly ash mixtures, tie each day's operation into the completed work of the previous day by remixing approximately 500 mm of the completed course before processing additional sections. Add 50 percent of the original amount of lime or fly ash to the remixed material.

For cement mixtures, or when a lime or fly ash mixture remains undisturbed for more than 24 hours, make a transverse construction joint by cutting back into the completed work to form an approximately vertical face.

307.08 Curing. Minimize hauling over the unprotected treated aggregate course. Limit traffic over the treated surface to prohibit any visible deflection, rutting, raveling, or wear of the surface. Keep the completed layer or course continuously moist until the subsequent layer or course is placed. Apply all curing water under pressure through a spray bar equipped with nozzles that produce a fine, uniform spray. Place and compact the subsequent layer or course within 2 days after the treated aggregate course has been compacted and finished. Placement of the

subsequent layer or course may be deferred up to 21 days by placing a fog seal over the treated course. Do not place fog seals on intermediate layers of a course.

When a fog seal is used, keep the surface continuously moist for a minimum of 7 days after compacting and finishing. After the 7-day period, apply a diluted slow-setting emulsified asphalt at a rate of 0.45 to 1.15 L/m² to provide a continuous film over the course. Apply the fog seal in accordance with Subsection 410.10. When necessary for the maintenance of vehicular traffic, furnish and apply blotter material.

Reapply the fog seal where it has been determined that the “continuous film” has been damaged.

If the material loses the required stability, density, or finish before placement of the next course or acceptance of the work, reprocess, recompact, and add additives as necessary to restore the strength of the damaged material to that specified in the design.

Measurement

307.09 Method. Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Measure fog seal and blotter under Section 410.

Payment

307.10 Basis. The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
307 (01) _____ Portland cement-treated base, grading ____	Ton
307 (02) _____ Portland cement-treated base, grading _____, _____ -mm depth	Square Meter
307 (03) Portland cement	Ton
307 (04) Fly ash	Ton
307 (05) Hydrated lime	Ton

Section 308—Portland Cement-Treated Base—In-Place Stabilization

Description

308.01 Work. Process and incorporate chemical additives (fly ash, hydrated lime, or Portland cement) and water to a depth as SHOWN ON THE DRAWINGS.

Materials

308.02 Requirements. Ensure that materials meet the requirements specified in the following subsections:

Blotter	703.12
Cement	701.01
Chemical Admixtures (Set-Retarding)	711.03
Crushed Aggregate	703.06
Emulsified Asphalt	702.03
Fly Ash	725.04
Fog Seal	410.10
Hydrated Lime	725.03
Water	725.01

Construction

308.03 General. Scarify the road surface to the depth SHOWN ON THE DRAWINGS. Windrow the scarified materials or spread them to a uniform thickness for mixing. Remove any material that would be retained on a 50-mm sieve, along with other unsuitable materials. If additional aggregate is required, blend it with the existing material. If necessary, clean and trim all butt joints at existing pavement or structures prior to mixing.

Ensure that the subgrade supports all equipment required in the construction of the base. Prior to mixing, subexcavate soft or yielding areas and replace them with suitable materials, in accordance with Subsection 203.06(d).

At least 10 days prior to construction, submit a quality control plan for review and approval. Include all tolerance items, field tests, and measurements shown in this specification. Ensure that the plan verifies compliance with these requirements for each subplot produced that is 500 m³ or less. Perform field testing and measurement at statistically random points within each subplot.

308.04 Application. Apply additives to a dry, unfrozen surface with a surface temperature of at least 4 °C. Do not apply when there is excessive loss of additive due to washing or blowing, or when the air temperature is expected to fall below 4 °C within 48 hours.

Apply additives at the required rates using one of the following methods:

(a) **Dry Method.** Uniformly apply the additives using an approved spreader. A motor grader is not an approved spreader. Apply water using approved methods to obtain the proper moisture content for mixing and compaction.

(b) **Slurry Method.** Mix additives with water and apply as a thin water suspension or slurry using either trucks with approved distributors or rotary mixers. Equip the distributor truck or rotary mixer tank with an agitator to keep the additives and water in suspension. Make successive passes over the aggregate course until the moisture and additive content for mixing and compaction are obtained.

Maintain the application of components within the following tolerances based on total dry weight of mixture:

Fly ash	± 2%
Hydrated lime or cement	± 1%
Water	± 2%

308.05 Mixing. Perform initial and final mixing as follows:

(a) **Initial Mixing.** Mix the material until a homogeneous friable mixture is obtained.

For lime or fly ash mixtures, add sufficient water and thoroughly mix to obtain the optimum moisture content for compaction, in accordance with AASHTO T 99, plus necessary hydration moisture. Hydration moisture is 1-1/2 percent for each percent of additive in the mixture. Complete the mixing within 6 hours of additive application.

For cement mixtures, add sufficient water and thoroughly mix to obtain the optimum moisture content for compaction, in accordance with AASHTO T 99, plus 2 percent. Complete the mixing within 2 hours of cement application.

Moist cure the mixture for 2 to 4 days.

(b) **Final Mixing.** For lime or fly ash mixtures, remix the material using an approved road mixer. Retarder may be added as desired. If the remixed material contains clods, rescarify in accordance with Subsection 306.02. Do not remix Portland cement mixtures.

308.06 Compaction & Finishing. Immediately after final mixing, shape and compact each layer full width. Roll from the sides to the center, parallel to the centerline of the road. Compact each layer of aggregate to not less than 95 percent of maximum density.

Use AASHTO T 99 to determine the maximum density. Use AASHTO T 224 to correct for coarse particles. Determine in-place density using any applicable AASHTO procedure.

Do not leave any treated aggregate that has not been compacted undisturbed for more than 30 minutes. Complete the compaction and finishing within 1 hour (up to 2 hours for mixtures with a retarder) from the time water is added to the mixture. Make the compacted surface smooth, dense, and free of compaction planes, ridges, or loose material.

The finished course thickness must be within a tolerance of 25 mm from that specified. Ensure that the finished thickness is not consistently above or below the specified thickness. Finish the surface to within ± 20 mm from the staked line and grade elevation. Correct all defective areas by loosening the material, adding or removing material, reshaping, and compacting.

If the time between placing adjacent partial widths exceeds 30 minutes, provide a construction joint.

308.07 Construction Joints. For lime and fly ash mixtures, tie each day's operation into the completed work of the previous day by remixing approximately 0.5 m of the completed course before processing additional sections. Add 50 percent of the original amount of lime or fly ash to the remixed material.

For cement mixtures or when a lime or fly ash mixture remains undisturbed for more than 24 hours, make a transverse construction joint by cutting back into the completed work to form an approximately vertical face. Use crushed aggregate meeting the requirements of Subsection 703.06 to repair transverse construction joints.

308.08 Curing. Minimize hauling over the unprotected treated aggregate course. Limit traffic over the treated surface to prohibit any visible deflection, rutting, raveling, or wear of the surface. Keep the completed layer or course continuously moist until the subsequent layer or course is placed. Apply all curing water under pressure through a spray bar equipped with nozzles that produce a fine, uniform spray. Place and compact the subsequent layer or course within 2 days after the treated aggregate course has been compacted and finished. Placement of the subsequent layer or course may be deferred up to 21 days by placing a fog seal over the treated course. Do not place fog seals on intermediate layers of a course.

When a fog seal is used, keep the surface continuously moist for a minimum of 7 days after compacting and finishing. After the 7-day period, apply a diluted slow-setting emulsified asphalt at a rate of 0.45 to 1.15 L/m² to provide a continuous film over the course. Apply the fog seal in accordance with Subsection 410.10. When necessary for the maintenance of vehicular traffic, furnish and apply blotter material.

Reapply the fog seal where it has been determined that the “continuous film” has been damaged.

If the material loses the required stability, density, or finish before placement of the next course or acceptance of the work, reprocess, recompact, and add additives as necessary to restore the strength of the damaged material to that specified in the design.

Measurement

308.09 Method. Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Measure fog seal and blotter under Section 410.

Payment

308.10 Basis. The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
308 (01) Portland cement-treated base	Kilometer
308 (02) Portland cement-treated base	Square Meter
308 (03) Hydrated lime	Ton
308 (04) Portland cement	Ton
308 (05) Fly ash	Ton

Section 309—Subgrade Stabilization

Description

309.01 Work. Process and incorporate additives into the upper layer of a subgrade.

Additives are designated as fly ash, hydrated lime, or Portland cement.

On existing subgrade, remove and dispose of slide material, vegetation, or other debris from roadbed shoulders, ditches, and culvert inlets and outlets, and reshape the roadbed shoulders, ditches, and culvert inlets and outlets.

Materials

309.02 Requirements. Ensure that materials meet the requirements specified in the following subsections:

Blotter	703.12
Cement	701.01
Chemical Admixtures (Retarder)	711.03
Emulsified Asphalt	702.03
Fly Ash	725.04
Fog Seal	410.10
Hydrated Lime	725.03
Water	725.01

Construction

309.03 General. Apply stabilization additives at the rates SHOWN ON THE DRAWINGS.

Store chemical additives and admixtures in closed, weatherproof containers. Prepare the subgrade in accordance with applicable requirements specified in Section 306. Scarify and pulverize the roadbed to a depth of 150 mm. Size and shape the material for the addition of additives. Limit the quantity of material being processed to a volume that is suitable for the mixing machine.

309.04 Mixing. Do not apply additives when the surface is wet, the surface temperature is below 5 °C, or the air temperature is expected to fall below 5 °C within 48 hours after mixing. Do not apply when additive is lost due to washing or blowing.

Mix the additives with the prepared material in either a dry or a slurry state, in accordance with Subsection 308.04. Continue mixing or remixing until a homogeneous mixture is obtained. Adjust the moisture content of the mixture in accordance with Subsection 308.05.

Except for the mixing equipment, keep all traffic off the spread material until mixing is completed.

For lime and hydrated lime/fly ash mixtures, complete the first mixing within 6 hours of application, and cure the mixture for 2 to 4 days by keeping the mixture moist. Perform final mixing by uniformly remixing the material. Mixing is complete when 95 percent of all material except rock passes a 45-mm sieve, and at least 50 percent of the material passes a 4.75-mm sieve when tested in accordance with AASHTO T 27, in a nondried condition. Retarders may be added.

For Portland cement mixtures, complete the mixing within 2 hours of application.

309.05 Compacting & Finishing. Immediately after final mixing, shape and finish the mixture in accordance with Subsection 203.08(c) and (d). Within 2 days after final mixing, finish the surface to make it smooth and suitable for placing a base or surface course.

Compact treated material in accordance with Subsection 203.16(b), method 4. During compaction and until final finishing, aerate or water as necessary to maintain the moisture content within ± 2 percent of the optimum moisture content necessary for compaction. If the time between placing adjacent partial widths exceeds 30 minutes, or when tying into the previous work, provide a construction joint in accordance with Subsection 307.07.

309.06 Curing. Cure in accordance with Subsection 307.08.

If the material loses the required stability, density, or finish before placement of the next course or acceptance of the work, reprocess or recompact as necessary to restore the strength of the damaged material to that specified in the mix design.

Measurement

309.07 Method. Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Measure fog seal and blotter material under Section 410.

Payment

309.08 Basis. The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
309 (01) Subgrade stabilization with _____, _____ mm depth	Square Meter
309 (02) Hydrated lime	Ton
309 (03) Portland cement	Ton
309 (04) Fly ash	Ton

Section 310—Dust Abatement

Description

310.01 Work. Furnish and apply dust palliative and blotter material, if necessary, to a road surface.

Materials

310.02 Requirements. Furnish material of the type and grade DESIGNATED IN THE SCHEDULE OF ITEMS that meet the requirements specified in the following subsections:

Calcium Chloride Flake	723.02
Lignin Sulfonate	723.03
Magnesium or Calcium Chloride Brine	723.01

Apply product at temperatures as stated in Section 723. Use the preparation method DESIGNATED IN THE SCHEDULE OF ITEMS.

310.03 Blotter Material. Furnish blotter material that meets the requirements specified in Subsection 703.12.

Construction

310.04 Weather Limitations. Application during a light rain is acceptable, provided the dust palliative penetrates the road surface and does not flow to low areas or off of the road surface. Apply chloride brines and lignin sulfonate only when the ambient temperature is 5 °C or higher and the ground is not frozen.

310.05 Equipment. Ensure that distribution equipment applies dust palliative uniformly on variable widths of road surface. The maximum allowable variation from the specified application rate is ± 10 percent of the specified rate for individual distributor loads, and ± 2 percent of the specified rate over the total project.

For liquid products, meet the following requirements:

- (a) Application at controlled rates from 0.5 to 2.6 L/m² with uniform pressure and application.
- (b) Spray pattern from each nozzle on the spray bar is uniform across the spray bar.

- (c) Provide distribution equipment that includes accurate volume-measuring devices or a calibrated tank; a thermometer for measuring temperatures of tank contents; and a hose-and-nozzle attachment for applying material to areas inaccessible to the spray bar.

When compaction is included in the SCHEDULE OF ITEMS, provide rollers that meet the requirements specified in Subsection 203.15(b), (c), or (d).

310.06 Preparation of Road Surface. Use one or more of the following preparation and application methods, as SHOWN ON THE DRAWINGS or in the SPECIAL PROJECT SPECIFICATIONS. For all methods, apply water to the road surface or to the windrow at the times and in the quantities directed by the CO to ensure a near-optimum moisture content that will allow adequate penetration or mixing of the dust palliatives and surface materials. To accelerate penetration and absorption of calcium chloride flake materials, the road surface may be dampened prior to or after flake application.

(a) **Method 1.** Apply the dust palliative directly to the prepared and compacted surface.

(b) **Method 2.** Develop a layer of loose cushion material approximately 25 mm in depth for the full width of traveled way, and keep it in a loose condition prior to applying dust palliative.

(c) **Method 3.** Blade approximately 25 mm of the surface material into a berm on the shoulder. Then make the initial application on the exposed surface. As soon as practicable, but no more than 4 hours after application, blade the material in the berm(s) to a uniform depth across the previously treated surface, and water it if necessary to meet required water content. Then apply the second application.

For methods 2 and 3, process the road surface by blading below the elevation of raveling, washboarding, and potholes. After processing, shape the surface by blading to the required cross section as SHOWN ON THE DRAWINGS. Have the prepared surface approved in writing by the CO prior to treatment.

310.07 Application of Dust Palliative Treatment. Ensure that the dust palliative application rate and width of road surface to be covered are as SHOWN ON THE DRAWINGS or in the SPECIAL PROJECT SPECIFICATIONS. Adjust the application rate and apply the product in as many stages as necessary to assure thorough penetration and to prevent product runoff. If more than one application is required, do not apply the second application until the previous application has sufficiently penetrated the road surface.

Obtain uniform distribution at all points. Correct any overlapping or skipping between spread sections. Use blotter material to cover areas with excess dust

palliative. Protect the surface of adjacent structures and trees from spattering or marring. Discharge dust palliative material only in approved areas, and do not allow it to flow into ditches or stream courses.

310.08 Compaction. Compaction is required if included in the SCHEDULE OF ITEMS. Begin compaction as soon as the dust palliative has penetrated enough to prevent pickup of material. Operate rollers over the full width of each layer until visual displacement ceases, but make no fewer than three complete passes.

310.09 Maintenance & Opening to Traffic. Do not permit traffic on dust palliative treatment until the treatment has penetrated and cured enough to prevent excessive pickup under traffic. If it becomes necessary to permit traffic prior to that time, apply blotter material where necessary.

Measurement

310.10 Method. Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment

310.11 Basis. The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS, with the following exceptions:

- (a) If laboratory quality assurance tests indicate that the minimum magnesium or calcium chloride concentrations applied to the road surface were not as specified in Subsection 723.01, the CO may reduce payment by multiplying the pay factor as calculated below, times the contract unit price for the appropriate PAY ITEMS, times the accepted quantity. No payment will be made for brine concentrations below 20 percent.

$$\begin{aligned} \text{Magnesium Chloride Brine Pay Factor} &= \\ &1.0 - ((28\% - \text{Concentration Applied})/8\%) \end{aligned}$$

$$\begin{aligned} \text{Calcium Chloride Brine Pay Factor} &= \\ &1.0 - ((36\% - \text{Concentration Applied})/16\%) \end{aligned}$$

- (b) If laboratory quality assurance tests indicate that the minimum lignin sulfonate concentrations were not as specified in Subsection 723.03, the CO may reduce payment by multiplying the pay factor as calculated below times the contract unit price for the appropriate PAY ITEMS, times the accepted quantity. No payment will be made for concentrations below 24 percent.

$$\text{Lignin Pay Factor} = 1.0 - ((48\% - \text{Concentration Applied})/24\%)$$

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
310 (01) Magnesium chloride brine at 28 percent minimum concentration, preparation method _____	Ton
310 (02) Lignin sulfonate solution at 48 percent minimum concentration, preparation method _____	Ton
310 (03) Calcium chloride brine at 36 percent minimum concentration, preparation method _____	Ton
310 (04) Magnesium chloride brine at 28 percent minimum concentration, or calcium chloride brine at 36 percent minimum concentration, or calcium chloride flake at 77 percent minimum concentration, preparation method _____	Lump Sum
310 (05) Calcium chloride flake at 77 percent minimum concentration, preparation method _____	Ton
310 (06) Compaction	Kilometer