

SECTION 301 — TRAFFIC-BOUND BASE

301.01 DESCRIPTION. Construct traffic-bound base courses with one or more courses of coarse aggregate on a prepared subgrade.

When the Contract provides for traffic-bound surfacing of road approaches, private entrances, and turnouts in conjunction with other highway surfacing or paving operations, perform such work according to Section 112.

301.02 MATERIALS. Furnish aggregate conforming to Section 805.

301.03 CONSTRUCTION.

301.03.01 Preparation of Subgrade. Prepare and maintain the subgrade according to Section 207.

301.03.02 Placing Aggregates. Spread the aggregate in the number of courses and at the rate of application indicated in the Contract to the width and depth specified. Place additional aggregate to strengthen weakened areas as the Engineer directs.

When practical, route hauling equipment uniformly over all portions of the previously laid courses of the base. The Department will not require any additional compaction. Obtain the Engineer's permission prior to revising this procedure for distribution of aggregate.

301.04 MEASUREMENT. The Department will measure the quantity in tons according to Section 109.

301.05 PAYMENT. The Department will make payment for the completed and accepted quantities under the following:

<u>Code</u>	<u>Pay Item</u>	<u>Pay Unit</u>
00020	Traffic-Bound Base	Ton

The Department will consider payment as full compensation for all work required under this section.

SECTION 302 — DENSE GRADED AGGREGATE BASE (DGA) AND CRUSHED STONE BASE (CSB)

302.01 DESCRIPTION. Construct the base on a prepared subgrade.

302.02 MATERIALS.

302.02.01 Aggregate. Conform to Section 805.

302.02.02 Water. Conform to Section 803.

302.02.03 Mixer. Equip the mixer with a water flow system with a positive cut-off control that will stop the flow of water simultaneously with any stoppage in the flow of aggregate and with valves or other devices that can be easily reset when a change in the rate of flow is desired.

302.03 CONSTRUCTION. Prepare the subgrade according to Section 207, and keep it free from irregularities.

When reshaping and compacting or scarifying and reshaping is not specified for existing traffic-bound surfaces, grade and shape to the grade and cross section required.

Construct shoulders according to Section 209.

302.03.01 Mixing. Thoroughly mix the aggregate and water in a pugmill type mixer, unless another type mixer is approved. Add water as needed to compact to the specified in-place density.

302.03.02 Transporting. Transport the plant-mixed material to the project without loss or segregation. Cover each truck load with a heavy canvas sheet to reduce the loss of moisture during transit when the time between loading the truck and spreading the mixture exceeds 30 minutes.

302.03.03 Placing and Spreading. Place and shape the mixture by power equipment, to the specified lines, grades, cross sections, and depths, without segregation.

Place, spread, shape, and compact in a manner that is as continuous as practical during each day's run. Wet the base as directed during shaping and compaction operations to maintain the moisture content at the level necessary to ensure proper compaction.

When the required thickness of base is no more than 8 inches for CSB and 6 1/2 inches for DGA and the Engineer is satisfied that acceptable compaction can be achieved throughout the full depth, place the material in one layer. Otherwise, place the material in 2 or more layers of no less than 3 inches.

Wet the subgrade or previous base layer as directed before placing the base material.

302.03.04 Compacting.

A) Control Strips. Before constructing the base, complete a control strip to determine the level of compaction necessary to achieve the target density for the remaining base course. Construct additional control strips whenever a change is made in the source, gradation, type of subgrade, type of base aggregate, layer thickness, or as the Engineer requires.

Compact with an effort greater than or equal to that produced by a 16-ton pneumatic roller, or a 8-ton steel-wheel vibratory roller. Operate vibratory rollers according to the manufacturer's instructions.

Leave each control strip in place to become part of the project. Complete at least one control strip for each layer of base material. Unless the Engineer approves otherwise, construct the control strip to a minimum length of 500 feet

and to the full width of the aggregate base course. Use the same equipment and procedures intended for the construction of the remainder of the base course. After 2 passes of the compaction equipment the Department will mark and take 3 density measurements at randomly selected sites, at least 2 feet from the edge of the base. The Department will take density measurements at the same 3 locations after subsequent passes of the compaction equipment. Compact the control strip until no further increase in density can be obtained from additional passes.

The Engineer will visually inspect the base material after each pass to determine if the aggregate is being crushed into fine material. If the aggregate is being crushed, cracked, shoved, or shows other signs of distress, cease compaction efforts. If compaction of the base is not satisfactory, use other methods to achieve satisfactory results.

Regardless of lift thickness, the Department will require a control strip to establish a roller pattern.

- B) Target Density.** After completing compaction of the control strip, the Engineer will conduct 10 field density measurements at random locations in the control strip and average the 10 measurements to obtain the target density for the compaction of the base.
- C) Field Density Measurement.** When the total compacted thickness is more than 4 inches, the Engineer will determine the field density with nuclear gauges. When the total compacted thickness is 4 inches or less, the Engineer will determine compaction by nuclear gauge or make acceptance by visual inspection.
- D) Test Sections.** The Engineer will divide the remaining length of the project into test sections of approximately 2,500 square yards with a depth equal to that of the control strip; divide each test section into 5 equal segments; take density measurements at a random location within each segment; and require the test sections average density to be 98 percent of the target density or greater with no individual measurement less than 95 percent of the target density.

When the average density of a test section does not meet the density required above, cease laydown operations, and either provide additional compaction effort or rework the entire test section to obtain the required average density. When an individual density measurement does not meet the required density, provide additional compaction efforts or rework the area represented by that measurement to meet the required density.

- E) General.** Maintain the initial layers of base to a uniform grade and cross section during compaction. Shape the final layer with additional material when necessary.

When trimming the final layer to the final grade with an automatic grading machine, provide a layer approximately 1/2 to one inch above grade for continuous cutting. After making the final pass with the grading machine, wet and roll the base with a static roller. The Engineer will recheck density to ensure the material still conforms to the density requirements. Reuse excess material removed by the grading machine in shoulders, islands, or other areas where aggregate stone base is specified, but not under roadway pavement.

Use manually operated mechanical tampers in areas inaccessible to power equipment.

Do not add fines to meet target density.

302.03.05 Maintenance and Protection. Restrict traffic on the completed base to the minimum necessary to complete the work, and maintain public traffic. Moisten areas subjected to traffic, as directed, to avoid the loss of fine materials. If desired, use a dilute emulsified asphalt for dust control.

Before constructing succeeding courses, check for damage, such as raveling and lost density, and recheck the grade and cross section. Make corrections as necessary.

Make every reasonable effort to completely cover the aggregate base course with the specified pavement courses before suspending work for the winter months. When the base

course is not completely covered with the specified pavement courses, determine and perform all work necessary to protect and maintain the uncompleted work during the winter months. Perform all work necessary to acceptably repair or restore the uncompleted work before the beginning of spring paving operations. Obtain the Engineer's approval for all work necessary to protect, maintain, and repair the base.

302.03.06 Surface Tolerances. Ensure that the surface of the top course of the base is smooth and uniform. When performing final grading, trim the base to within $\pm 1/2$ inch of the specified cross section and $\pm 3/8$ inch in 10 feet from the specified longitudinal grade at any location or to an accuracy allowing the succeeding courses to meet their specified surface and thickness tolerances, whichever is stricter.

Furnish all devices and labor necessary to check the surface.

302.04 MEASUREMENT. The Department will not measure water used to moisten the subgrade, for mixing the base material, and to maintain moisture during compaction and maintenance of the base for payment.

The Department will measure the quantity of plant-mixed materials according to Section 109. The Department will not make deductions for water in the mixture.

The Department will not measure construction of control strips, any necessary reworking of control strips, or test sections for additional payment.

The Department will not measure dust control for payment.

The Department will not measure for payment any extra materials, methods, or construction techniques, the Engineer determines not to be a part of the specified construction, to protect, maintain, or repair any portion of the uncompleted work during the winter months.

The Department will measure and deduct material wasted from trimming the final grade.

302.04.01 Dense Aggregate Base. The Department will measure the quantity in tons.

302.04.02 Crushed Stone Base. The Department will measure the quantity in tons.

302.05 PAYMENT. The Department will pay for the completed and accepted quantities under the following:

<u>Code</u>	<u>Pay Item</u>	<u>Pay Unit</u>
00001	DGA Base	Ton
00003	Crushed Stone Base	Ton

The Department will consider payment as full compensation for all work required under this section.

SECTION 303 — PAVEMENT DRAINAGE BLANKET

303.01 DESCRIPTION. This section covers pavement drainage blankets. For JPC pavements, construct either an asphalt-treated or cement-treated drainage blanket. For asphalt pavements, construct an asphalt-treated or cement-treated drainage blanket as the Contract specifies.

303.02 MATERIALS.

303.02.01 Aggregate. Use crushed stone conforming to Sections 804 and 805.

303.02.02 Asphalt Binder. Conform to Section 806, PG 64-22.

303.02.03 Cement. Conform to Section 801, Type I or III.

303.02.04 Water-Reducing Admixture. Conform to Subsection 802.01, Type A, D, F, or G.

303.02.05 Water. Conform to Section 803.

303.02.06 Curing Compound. Conform to Subsection 823.02.

303.03 CONSTRUCTION.

303.03.01 Composition.

A) Asphalt-Treated Drainage Blanket (ATDB). Use No. 57 aggregate or a gradation within the master range in the following table:

<u>Sieve Size</u>	<u>Percent Passing</u>
1 1/2 inch	100
3/4 inch	85-100
1/2 inch	35-65
No. 4	0-20
No. 8	0-10
No. 200	0-4

Test gradation according to KM 64-407, KM 64-433, or KM 64-620.

Use an asphalt binder content of 1.5 to 2.5 percent by weight of the mixture.

When using a porous aggregate, increase the asphalt binder content as needed to compensate for asphalt absorption by the aggregate. Submit aggregate samples and a proposed JMF for approval according to KM 64-421. Maintain the JMF asphalt binder content within ± 0.5 percentage points as determined according to KM 64-405, KM 64-436, or AASHTO T 308.

Asphalt binder content will be based on visual inspection of the extent the aggregate is coated. The Department will not adjust payment due to adjustment of the asphalt binder content.

Request adjustments in the JMF gradation if deemed necessary to increase stability of the drainage blanket, providing the revised JMF gradation and asphalt binder content are maintained within the specified limits.

B) Cement Treated Mixture. Provide Size No. 57 aggregate. Submit aggregate samples and proposed cement content, and the Engineer will perform testing as necessary to determine if the proposed mix design is acceptable.

Ensure the mix design conforms to the following:

- 1) Minimum compressive strength of 400 psi shall be attained in 72 hours ± 6

- hours. Determine the compressive strength according to KM 64-305, except the specimen shall remain in the mold until the time of the test.
- 2) Maximum water/cement ratio of 0.37.
 - 3) Use a water-reducing admixture.

303.03.02 Placement of Drainage Blanket.

A) ATDB. All requirements of Section 403 for asphalt mixtures apply, except as follows:

- 1) Maintain the temperatures of the materials and the mixture, in degrees Fahrenheit, within the following ranges:

	<u>Minimum</u>	<u>Maximum</u>
Aggregate	200	260
Asphalt Binder	200	260
Mixture at Plant	200	260
Mixture When Placed	180	260

- 2) Avoid excess drainage of the asphalt binder while being stored.
- 3) Compact the ATDB using a smooth-wheel roller. Do not use vibrating rollers. Avoid over rolling to the extent that aggregate particles are broken.
- 4) The surface of the ATDB shall be smooth and uniform, and shall reasonably conform to the specified lines, grades, and typical section. The completed ATDB shall meet the surface tolerances specified in Subsection 403.03.11 for base courses. Perform any corrective work necessary using asphalt mixtures the Engineer approves. The Department will not allow procedures or mixtures that might produce fine material that would tend to clog or reduce drainage.
- 5) Allow the ATDB to cure at least 10 hours, or as the Engineer directs, before placing subsequent courses.

B) Cement-Treated Drainage Blanket.

- 1) Plant, Mixing, and Hauling. Conform to the applicable batch plant, mixing procedures, and hauling equipment requirements of Section 501 for JPC pavement.
- 2) Placing and Spreading. Use spreading, consolidation, and finishing equipment that conforms to the requirements of Section 501, or is approved by the Engineer upon demonstration of satisfactory performance on a test strip of approximately 3,000 square yards.
- 3) Compaction. Compact the material with a steel-wheeled, tandem roller weighing approximately 10 tons, unless the drainage blanket is placed by a slip-form paver and the Engineer determines consolidation is acceptable without rolling. Compact within 30 minutes after spreading by completing at least 2 complete coverages of the drainage blanket with the roller. Provide sufficient equipment and rollers to ensure that no more than 1.25 hours elapse between the time that water is added to the combined aggregate and cement and the time the final compaction is completed.
- 4) Curing. Cure by one of the following methods immediately after spreading and compacting the drainage blanket:
 - a) Cover the entire surface and exposed edges of the drainage blanket with transparent or white plastic of at least 4 mils thickness. For asphalt pavements, hold the plastic in place with aggregate or other acceptable means for at least 3 days. Immediately repair any damage occurring to the plastic during the curing period.

- b) Membrane-cure according to Subsection 601.03.17 B). For JPC pavements, the Department will waive the curing time requirements.
- 5) Surface Finish. The surface of the drainage blanket shall be smooth and uniform, and shall reasonably conform to the specified lines, grades, and cross section. Ensure the completed drainage blanket does not show a deviation greater than 1/4 inch from a 10-foot straightedge, and the cross slope does not deviate more than 1/4 inch in 5 feet from the specified cross slope.
- 6) Perform any corrective work necessary using mixtures the Engineer approves. The Department will not allow procedures or mixtures that might produce fine material that would tend to clog or reduce drainage.
- 7) Weather Limitations and Protection. Mix and place the cement treated material when the air temperature in the shade, away from artificial heat, is 45 °F and rising. Unless otherwise authorized in writing by the Engineer, discontinue mixing and placing the cement-treated material when a descending air temperature in the shade, and away from artificial heat, reaches 50 °F.

303.03.03 Maintenance and Protection. Limit traffic over the drainage blanket to the minimum necessary for succeeding or adjacent work. Prevent contamination of the drainage blanket by dust, dirt, or mud. Remove and replace portions of the blanket that is contaminated to the extent that the drainage is clogged or reduced at no additional cost to the Department.

Preserve the integrity of the subgrade, base courses, perforated pipe, pavement drainage blanket, and the subsequent paving courses. Control the gross weights and types of hauling vehicles so no component is damaged by hauling for construction of the next component.

Do not operate trucks or other equipment longitudinally directly over the perforated pipe.

Repair damage to any of the various items, except damage caused by public traffic, at no cost to the Department.

303.03.04 Overlaying of Drainage Blankets. Exercise extreme caution when placing asphalt mixtures near or over underdrains to avoid displacing or damaging the drain.

- A) **Asphalt Mixture Overlay.** When asphalt pavement is constructed on a treated drainage blanket, place the first course using a paver mounted on tracks if rubber-tired pavers cause displacement of the drainage blanket.

Compact asphalt base according to Subsection 403.03.10.

Allow the first course of asphalt mixture to cure overnight before placing the succeeding course.

Place the thickness of asphalt base on treated drainage blankets according to Subsection 403.03.06.

- B) **JPC Pavement Overlay.** Place without damaging the drainage blanket or underdrain system. Use anchor hooks of sufficient length to extend through the drainage blanket and hold the load-transfer assemblies securely in place.

303.04 MEASUREMENT.

303.04.01 Drainage Blanket-Type II (ATDB). The Department will measure the quantity in tons according to Subsection 402.04. Asphalt mixtures used for leveling the surface of the completed drainage blanket will be measured in tons as drainage blanket.

303.04.02 Drainage Blanket-Type III (Cement-Treated). The Department will measure the quantity in square yards according to Section 109.

303.04.03 JPC Pavement Drainage Blanket. The Department will measure the quantity in tons according to Subsection 303.04.01 or 303.04.02 as appropriate.

303.05 PAYMENT. The Department will pay for the completed and accepted quantities under the following:

<u>Code</u>	<u>Pay Item</u>	<u>Pay Unit</u>
00018	Drainage Blanket-Type II - Asphalt Treated	Ton
00019	Drainage Blanket-Type III - Cement Treated	Square Yard
00022	JPC Pavement Drainage Blanket	Ton

The Department will make payment for Drainage Blanket-Type II (ATDB) according to the Lot Pay Adjustment Schedule for Specialty Mixtures in Section 404.

The Department will consider payment as full compensation for all work required under this section.

SECTION 304 — GEOGRID REINFORCEMENT FOR SUBGRADE AND AGGREGATE BASE COURSES

304.01 DESCRIPTION. This specification covers geogrid used for the reinforcement of subgrade and aggregate bases.

304.02 MATERIALS. Furnish geogrid composed of polypropylene or high-density polyethylene resins.

304.02.01 Physical Requirements. Furnish the specified geogrid type conforming to the Physical Requirements Table. Ensure that each geogrid shipment is accompanied by a manufacturer's certification listing minimum average roll specification values of each lot number for those properties listed in the table.

PROPERTY	TEST METHOD	TYPE 1 (Min. Avg. Roll Values)	TYPE 2 (Min. Avg. Roll Values)
True Initial Modulus in use MD XMD	GRI-GG1 1	15,170 lb/ft 24,685 lb/ft	32,980 lb/ft 44,725
True Tensile Strength in use at 2% Strain MD XMD	ASTM D 4595	280 lb/ft 450 lb/ft	410 lb/ft 600 lb/ft
True Tensile Strength in use at 5% Strain MD XMD	ASTM D 45952	580 lb/ft 920 lb/ft	810 lb/ft 1,340 lb/ft
Junction Strength MD XMD	GRI-GG2 3	765 lb/ft 1,170 lb/ft	1,080 lb/ft 1,780 lb/ft
Minimum Aperture Size MD XMD	I. D. Calipered	1 inch 1 3/8 inches	1 inch 1 3/8 inches

1. GRI is defined as the Geosynthetics Research Institute. As modified by AASHTO Standard Specification for Highway Bridges, 1997 Interim, using a single rib having the greater of 3 junctions or 8 inches and tested at a strain rate of 10 percent per minute based on this gauge length without deforming from testing performed on a single layer of the multi-layer product.
2. Tensile strength at 5 percent strain shall be reported without artificially deforming, manipulating, or massaging the test specimen under load before measuring such resistance or employing an artificial secant or offset tangent.
3. GRI is defined as the Geosynthetics Research Institute. As modified by AASHTO Standard Specification for Highway Bridges, 1997 Interim, using a single rib having the greater of 3 junctions or 8 inches and tested at a strain rate of 10 percent per minute based on this gauge length.

304.02.02 Packaging, Shipment, and Storage. Ensure that each roll is labeled with the manufacturer's name, product type, lot number, roll number, manufactured date, and roll dimension. Protect the geogrid from direct sunlight, ultraviolet rays, temperatures greater than 120 °F, mud, dirt, dust, and debris during all periods of shipment and storage. Keep geogrids dry until installation, and do not store directly on the ground.

304.03 CONSTRUCTION.

304.03.01 Geogrid Representative. Ensure that a representative of the geogrid manufacturer is on the project when work begins, and remains on call as the project progresses, to advise the Engineer.

304.03.02 Surface Preparation. Prepare the surface according to Section 207 or Section 302.

304.03.03 Geogrid Placement. Place geogrids at the proper elevation and alignment, in continuous strips without joints, seams, or connections according to the manufacturer's recommendations. Verify the geogrid orientation (roll direction).

Geogrid may be temporarily secured in place with staples, pins, sand bags or backfill as required by fill properties, fill placement procedures, or weather conditions as the Engineer directs.

304.03.04 Aggregate Placement. Place aggregate over the geogrid according to the Contract. Place, spread, and compact the aggregate in such a manner that minimizes the development of wrinkles and movement in the geogrid. The Department will require a minimum loose fill thickness of 6 inches prior to operation of tracked vehicles over the geogrid. Keep the turning of tracked vehicles to a minimum to prevent displacement of the fill and damage to the geogrid. Rubber tired equipment may pass over the geogrid reinforcement at slow speeds (less than 10 mph) when integrally-formed geogrid is used. Avoid sudden braking and sharp turning movements. Repair any damage caused during placement or by vehicles.

304.03.05 Sampling and Testing. The Department will sample the geogrid at the project site according to KM 64-113 at a frequency the Engineer determines. The Department will test the geogrid for all properties possible given the testing equipment availability. When the Department determines that an individual sample fails to meet any specification requirement, the Department will reject that roll and sample 2 additional rolls from the same lot. When the Department determines that either of these 2 additional samples fails to comply with any part of the specification, the Department will reject the entire quantity of rolls represented by that sample.

304.04 MEASUREMENT. The Department will measure the quantity of geogrid in square yards. The Department will not measure geogrid when the contract indicates that the geogrid are incidental to the work being performed or when no separate bid item for geogrid is listed in the proposal. The Department will not measure providing the geogrid manufacturer's representative for payment and will consider it incidental to the geogrid.

304.05 PAYMENT. The Department will make payment for the completed and accepted quantities under the following:

<u>Code</u>	<u>Pay Item</u>	<u>Pay Unit</u>
00005	Geogrid Reinforcement for Subgrade	Square Yard

The Department will consider payment as full compensation for all work required under this section.