

DIVISION 300

SUBBASE AND BASE COURSES

SECTION 301 – SUBBASE

301.01 DESCRIPTION. This work shall consist of furnishing and placing one or more courses of approved gravel, crushed gravel, dense graded crushed stone, or other proportioned material on a prepared surface or at other locations.

301.02 MATERIALS. Materials shall meet the requirements of the following Subsections:

Coarse Aggregate for Concrete.....	704.02
Gravel for Subbase	704.04
Crushed Gravel for Subbase.....	704.05
Dense Graded Crushed Stone for Subbase	704.06

Certifications required shall be submitted in conformance with Subsection 700.02.

At the option of the Contractor, unless otherwise specified in the Contract, processed glass aggregate (PGA) or recycled concrete aggregate (RCA) may be used to partially replace natural aggregate in materials specified to meet the requirements of Subsections 704.04, 704.05, and 704.06. In no case shall PGA and RCA be blended under this Section.

PGA shall be a crushed and screened material with 95 percent passing a 25.0 mm (1 inch) sieve, and not more than 3 percent of the material passing the 4.75 mm (No. 4) sieve shall pass a 75 µm (No. 200) sieve.

Materials used to produce PGA shall consist of recycled glass food or beverage containers. Small amounts (less than 5 percent total) of china dishes, ceramics, plate (window or mirror) glass, or other glass products will be allowed in PGA. The PGA material shall not contain more than a trace of screw tops, plastic cap rings, or other contaminants. Amounts of contaminants greater than 1 percent by mass (weight) shall be grounds for rejection of the entire PGA batch. Glass containers containing, or having contained, toxic or hazardous materials will not be allowed and, when present, shall be grounds for rejecting the entire stockpile of PGA or PGA subbase blends.

Materials used to produce RCA shall consist of recycled concrete that has been crushed to aggregate dimensions of 6 inches or less. Small amounts of brick, block or mortar may be present in the RCA at a level not to exceed a total of five percent by weight. The RCA material shall not contain more than trace amounts of wire, steel or plastic that were associated with the original placement of the concrete or bituminous material or unreacted cementitious materials. No additional wire, steel or plastic may be added to the RCA. No discernable amounts of oils, fats, soaps, surfactants or organic contaminants shall be present in the RCA. Hazardous materials or concrete structures used to contain hazardous materials will not be allowed and when present shall be grounds for rejection of the entire stockpile of RCA or RCA subbase blends.

PGA and RCA materials shall be subjected to process control testing. PGA subbase blends shall not contain more than 10 percent by mass (weight) of PGA. RCA subbase blends shall not contain more than twenty-five percent RCA. The final blend shall conform to the specified gradation for the subbase material. The blending process shall be complete to ensure that as thorough a distribution and as uniform a mixture as practicable has been obtained. Process control tests shall be performed at a minimum frequency of one test per 2000 m³ (2500 yd³) of material produced by a stable process. A copy of each test result shall be given to the Engineer.

Prior to the use of any PGA subbase blend, the Contractor shall submit in writing, for preliminary approval of the Engineer, information identifying the sources and locations from which PGA material to be used on the project will be obtained. The Contractor shall also submit certified test results verifying that the PGA material will be in compliance with the Contract requirements. Once the sources of PGA are approved, quality assurance samples may be taken by the Engineer.

PGA subbase blends must be approved for use on the project by the Engineer in writing prior to being placed on a project. In-place blending of PGA with other materials will not be permitted.

The supplier of PGA shall provide a Type A Certification that the crushed glass material to be used does not contain toxic or hazardous substances. The supplier of RCA shall provide a Type A certification that the concrete to be used does not contain toxic or hazardous substances.

The supplier of the blended subbase material shall provide a Type C Certification that the blended aggregate meets all specified gradation and cleanliness requirements.

When specified for use on the project or as directed by the Engineer, Subbase, RAP shall include cold planed grindings which have been screened or crushed by the Contractor in order that 100% passes the 37.5 mm (1 ½ inch) sieve prior to blending.

The grindings shall be blended in equal proportions (50% by mass (weight)) with material meeting the requirements of Subbase of Crushed Gravel, Fine Graded as specified in Table 704.05A.

301.03 GENERAL CONSTRUCTION REQUIREMENTS. The subbase material shall be placed on a prepared surface with an approved spreader box or by use of other approved mechanical spreading equipment. Dumping directly on the subgrade will not be permitted. A bulldozer may be used instead of a spreader box, provided that the subbase material is first placed on the previously laid subbase and then completely removed from the area where it was first deposited.

Should segregation of the subbase occur, the Contractor shall remove and replace the material or rework it until uniform grading is obtained.

If material below subgrade becomes intermixed with the subbase, resulting in an unacceptable product, the mixture shall be removed and replaced with new subbase material.

The maximum compacted layer thickness for all subbase materials is 300 mm (12 inches). Where the finished depth of the subbase is to be greater than 300 mm (12 inches), it shall be placed and compacted in two or more layers of approximately equal thickness. In the placement of layers, all joints shall be staggered at least 300 mm (12 inches).

After each layer of subbase material is placed, it shall be graded to obtain a smooth, even surface as specified in Subsection 301.05. Following grading operations, the subbase shall be thoroughly compacted as specified in Subsection 301.06. If required, water shall be uniformly applied over the subbase materials during compaction in the amount necessary for proper consolidation. Materials containing PGA or RCA shall be compacted in the same manner as materials that do not contain recycled materials. Care will be taken to prevent excessive moisture contents in subbase materials prior to compaction. If needed, the Contractor may use material meeting the requirements of Subsection 704.02, Table 704.02B as filler to achieve the design grade when the variation of the surface is less than 25 mm (1 inch).

When it is necessary to maintain traffic over the subbase, 50 percent of the width of the roadway shall be constructed at a time. The portion under construction shall have the subbase material placed, graded, and compacted before opening to traffic. Subsequent traffic damage to the material shall be entirely the Contractor's responsibility. If the subbase loses its shape, the Contractor shall loosen, regrade, and compact as necessary.

When it is necessary to maintain traffic over the subbase, or where construction hauling occurs over the subbase, the upper 50 mm (2 inches) of subbase shall be scarified (to restore permeability in the subbase surface), compacted, and regraded as required, or replaced just prior to the placement of any pavement.

If roadway shoulders are to remain unpaved, subbase or other designated material to be placed in the shoulder area after final roadway paving shall be placed in accordance with Subsection 402.03.

301.04 SPECIFIC CONSTRUCTION REQUIREMENTS.

- (a) Subbase of Gravel. Only uniformly graded gravel from the pit shall be used. The Contractor shall manipulate the material in the pit to eliminate non-uniformly graded pockets of material.
- (b) Subbase of Crushed Gravel. When stockpiling, care shall be taken to prevent segregation in the pile.
- (c) Subbase of Dense Graded Crushed Stone. When stockpiling, care shall be taken to prevent segregation in the pile.

301.05 SURFACE TOLERANCE. The surface of the compacted subbase will be tested by the Engineer at selected locations. The variation of the surface shall at no point exceed 25 mm (1 inch). This variation shall not be maintained for a distance longer than 15 m (50 feet). The required crown and superelevation shall be maintained. All humps or depressions exceeding the specified tolerances shall be corrected by reshaping or removing defective work and replacing it with new material as directed by the Engineer. Any new material used to replace removed material shall meet the applicable gradation specification listed in Subsection 301.02.

301.06 COMPACTION. Compaction of each layer shall continue until a density of not less than 95% of the maximum dry density has been achieved.

When 1000 m³ (1250 yd³) or more of subbase material is to be placed as part of the Contract, the maximum dry density shall be determined by the Contractor in accordance with AASHTO T 180, Method D, as modified by the Agency's Materials and Research Section. Laboratory moisture-density tests shall be performed to ensure a standard error of the mean maximum dry density of less than 20 kg/m³ (one pcf). Typically, this will necessitate at least five, but no more than ten, replications of the test. The Contractor shall provide the Engineer with all test results and calculations for determining the maximum dry density, at least 10 days prior to subbase placement. The maximum dry density shall be determined after any change in source, regardless of quantity, and confirmed by repetition of the selected test method at a frequency of 10,000 m³ (12,500 yd³) when the prescribed standard error can be attained by five or less replicate tests. If more than five replicate tests are required to meet the prescribed standard error, the maximum dry density shall be confirmed at a frequency of every 5000 m³ (6250 yd³). The Engineer may reduce this frequency with the approval of the Materials and Research Engineer after the initial two maximum dry density determinations.

When less than 1000 m³ (1250 yd³) of subbase material is to be placed as part of the Contract, the maximum dry density will be determined by the Agency in accordance with AASHTO T 180, Method D, as modified by the Agency's Materials and Research Section.

Field density testing will be performed by the Agency in accordance with AASHTO T310 at locations determined by the Engineer. Compaction operations shall proceed such that the target field density as determined in accordance with this Subsection is achieved.

301.07 METHOD OF MEASUREMENT. The quantity of subbase to be measured for payment will be the number of cubic meters (cubic yards) of the type specified for use in the complete and accepted work, as determined by the plan dimensions of the compacted material, including any filler material used to achieve the design grade.

The quantity of Subbase of Crushed Gravel, Fine Graded, Truck Measurement to be measured for payment will be the number of cubic meters (cubic yards) used in the complete and accepted work, as determined by vehicle loads using three-dimensional measurement. All loads designated shall be leveled at the point of delivery when directed by the Engineer. A load ticket shall be furnished to the Engineer with each load delivered to the job site.

When specified to be paid by mass (weight), the quantity of Subbase of Crushed Gravel, Fine Graded to be measured for payment will be the number of metric tons (tons) of material in place in the complete and accepted work, as determined from the load tickets.

The quantity of Subbase, RAP to be measured for payment will be the number of metric tons (tons) of material in place in the complete and accepted work, as determined from the load tickets.

When subbase material is required for extra depth at bridge approaches, the quantity to be measured for payment will be the number of cubic meters (cubic yards) measured in place for this purpose between the lines shown on the Plans.

Materials containing PGA or RCA will be measured in the same manner as subbase materials that do not contain PGA or RCA.

301.08 BASIS OF PAYMENT. The accepted quantity of subbase will be paid for at the Contract unit price per cubic meter (cubic yard) or metric ton (ton) for the type specified. Payment will be full compensation for furnishing, blending, transporting, testing, placing, grading, and compacting the material specified and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.

Truck measurement, when not specified in the Contract, may be used when ordered by the Engineer. Truck measurement will be converted to in-place volume measurement by dividing by a factor of 1.15.

No additional payment will be made for filler material used as a replacement for the specified subbase material.

No payment will be made for the following:

- (a) Material forced into or mixed with the subgrade material.
- (b) Material placed to a depth greater than shown on the Plans.
- (c) Water used to obtain required compaction.
- (d) Removal and replacement of subbase material.
- (e) Scarifying, recompacting, or regrading of subgrade or subbase layers, when required.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
301.15 Subbase of Gravel	Cubic Meter (Cubic Yard)
301.25 Subbase of Crushed Gravel, Coarse Graded	Cubic Meter (Cubic Yard)
301.26 Subbase of Crushed Gravel, Fine Graded	Cubic Meter (Cubic Yard)
301.28 Subbase of Crushed Gravel, Fine Graded	Metric Ton (Ton)
301.35 Subbase of Dense Graded Crushed Stone	Cubic Meter (Cubic Yard)
301.40 Subbase, RAP	Metric Ton (Ton)

SECTION 303 - ASPHALT TREATED PERMEABLE BASE

303.01 DESCRIPTION. This work shall consist of furnishing and placing one or more courses of crushed gravel or crushed stone, plant mixed with bituminous material, on a prepared surface.

303.02 MATERIALS. Materials shall meet the requirements of the following Subsections:

Bituminous Material.....	702.01
Asphalt Binder.....	702.02
Emulsified Asphalt.....	702.04
Aggregate for Asphalt Treated Permeable Base.....	704.03

The grade of asphalt binder shall be as shown on the Plans, unless otherwise specified in the Contract.

The materials shall be combined and graded to meet the following composition limits by mass (weight):

Square Openings Sieve Size	Percent Passing by Mass (Weight)	Production Tolerance (Percent)
37.5 mm (1 1/2 inch)	95 to 100	--
25.0 mm (1 inch)	80 to 95	±5
12.5 mm (1/2 inch)	30 to 60	±6
4.75 mm (No. 4)	6 to 20	±7
2.36 mm (No. 8)	3 to 14	--
75 µm (No. 200)	0 to 3	--
Asphalt Content, %	1.5 to 3.0	±0.4
Mixing Temp. Range	95°-135°C (200°- 275°F)	--

No work shall be started until the Contractor has submitted the mix design to the Engineer and received the Engineer's approval. The mix design shall indicate the percentage of each ingredient to be used in the mixture. No change in the approved mix design shall be made without the written approval of the Engineer.

303.03 WEATHER LIMITATIONS. Asphalt Treated Permeable Base shall not be placed between November 1 and May 1. When it is in the public interest, the Engineer may extend the dates of the paving season. The material shall not be placed when the ambient air temperature at the paving site in the shade and away from artificial heat is 5 °C (40 °F) or lower. No material shall be placed on any frozen subbase regardless of the temperature.

303.04 BITUMINOUS MIXING PLANT AND TESTING. All plants used by the Contractor for the production of Asphalt Treated Permeable Base shall conform to all the requirements of Subsection 406.05. The use of surge bins or a drum-mix plant will not be allowed.

303.05 PREPARATION OF BITUMINOUS MATERIAL. The bituminous material shall be heated to the temperature specified in Subsection 702.06 in a manner that will avoid local overheating. A continuous supply of bituminous material shall be furnished to the mixer at a uniform temperature.

303.06 PREPARATION OF AGGREGATES. The aggregate for the mixture shall be dried and heated at the mixing plant before being placed in the mixer. Flames used for drying and heating shall be properly adjusted to avoid damaging the aggregate and depositing soot and unburned fuel on the aggregate.

303.07 MIXING. The dried aggregate sizes shall be proportioned to meet the composition limit and thoroughly mixed prior to adding the bituminous material.

The dried aggregates shall be combined with the bituminous material in such a manner as to produce a mixture that when discharged from the mixing unit is at the temperature specified in the mix design.

The Engineer will approve the quantity of bituminous material for each batch. The bituminous material shall be measured or gauged and introduced into the mixer in the quantity approved by the Engineer for the particular material being used and at the temperature as specified.

After the required quantities of aggregate and bituminous material have been introduced into the mixer, the materials shall be mixed until a complete and uniform coating of the particles and a thorough distribution of the bituminous material throughout the aggregate is secured. In any event, for a batch plant, the mixing time will be regulated by the Engineer, and a suitable locking means shall be provided for this regulation.

All plants shall have a positive means of eliminating oversized and foreign materials from being incorporated into the mixer.

303.08 HAULING EQUIPMENT. Trucks used for hauling bituminous mixture shall have tight, clean, smooth metal bodies. The Contractor shall apply a thin coat of a non-petroleum based or soap solution to prevent the mixture from adhering to the truck bodies.

Each truck body shall have a cover of canvas or other suitable material of such size sufficient to protect the mixture from the weather. When necessary to ensure delivery of material at the specified temperature, truck bodies shall be insulated, and covers shall be securely fastened.

303.09 PLACING EQUIPMENT. The bituminous concrete paver shall be a self-propelled unit with an activated screed or strike-off assembly, capable of being heated if necessary, and capable of spreading and finishing the mixture without segregation for the widths and thicknesses specified. The screed shall be adjustable to provide the desired cross-sectional shape. The finished surface shall be of uniform texture and evenness and shall not show any indication of tearing, shoving, or pulling of the mixture. The machine shall, at all times, be in good mechanical condition and shall be operated by competent personnel. Pavers shall be equipped with the necessary attachments, designed to operate electronically, for controlling the grade of the finished surface.

The adjustments and attachments of the paver will be checked and approved by the Engineer before placement of Asphalt Treated Permeable Base.

303.10 ROLLERS. Rollers shall be of the steel-wheel type and shall be in good mechanical condition, operated by competent personnel, capable of reversing without backlash, and operated at speeds slow enough to avoid displacement of the bituminous mixture. The mass (weight) of each roller shall be sufficient to compact the mixture to the required density without excessive crushing of the aggregate. Rollers shall be equipped with water tanks and sprinkling bars for wetting the rolls.

303.11 SPREADING AND FINISHING. Immediately before placing the Asphalt Treated Permeable Base, the existing prepared surface shall be cleaned of all loose or deleterious material.

Contact surfaces of cold joints, curbing, gutters, and manholes shall be coated with a thin, uniform coat of Type RS-1 emulsified asphalt immediately prior to placement of the Asphalt Treated Permeable Base against them.

The Contractor shall protect all exposed surfaces that are not to be treated from damage during all phases of the paving operation.

The bituminous mixture shall be spread and finished with the specified equipment. The mixture shall be struck off in a uniform layer to the full width required and of such depth that each course, when compacted, has the required thickness and conforms to the grade and cross-section contour specified. Bituminous concrete pavers shall be used to distribute the mixture over the entire width or over such partial width as may be practical.

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the mixture shall be spread and leveled by hand tools.

Bituminous mixture shall not be produced so late in the day as to prohibit the completion of spreading and compaction of the mixture during daylight hours, unless night paving has been approved for the project.

Trucking over material already placed will not be permitted until the material has been thoroughly compacted and has been permitted to cool to 60 °C (140 °F). When the bituminous concrete pavement consists of more than one layer, each layer shall be compacted as specified and allowed to cool to ambient air temperature before the next layer is applied.

303.12 COMPACTION. The surface shall be rolled when the mixture has reached a temperature in the range of 60°C-95°C (140°F-200°F), is in the proper condition, and when the rolling does not cause undue displacement, cracking, or shoving.

The Mix shall be compacted by two static passes of a nominal nine metric ton (10 ton) steel wheel roller, unless otherwise directed by the Engineer.

To prevent adhesion of the mixture to the rolls, they shall be kept properly moistened with water or water mixed with very small quantities of detergent or other approved material. Excess liquid will not be permitted.

Along forms, curbs, headers, walls, and other places not accessible to the rollers, the mixture shall be thoroughly compacted with hot or lightly oiled hand tampers, smoothing irons, or with mechanical tampers. Other combinations of rollers and/or methods of compacting may be used if approved in writing by the Engineer.

Unless otherwise specified, the longitudinal joint shall be rolled first. Next, the Contractor shall begin rolling at the low side of the pavement and shall proceed toward the center or high side with lapped rollings parallel to the centerline. The speed of the roller shall be slow and uniform to avoid displacement of the mixture, and the roller should be kept in as continuous operation as practical. Rolling shall continue until all roller marks and ridges have been eliminated. Rollers will not be permitted to park on any freshly laid mixture and shall set back a sufficient distance behind the paver so that a parked roller will not leave any roller depressions.

Care shall be exercised to prevent contamination of, or damage to, the asphalt treated permeable base course. If, in the opinion of the Engineer, areas of the compacted mixture that become loose and broken, mixed with dirt, or in any way defective, damaged, or contaminated, shall be removed and replaced by the Contractor at no expense to the Agency. Any area showing an excess or deficiency of bitumen shall be removed and replaced.

303.13 JOINTS. Joints between old and new pavements or between successive day's work shall be made to ensure a thorough and continuous bond between the old and new mixtures. Whenever the spreading process is interrupted long enough for the mixture to attain its initial stability, the paver shall be removed from the mat and a joint constructed.

Unless otherwise directed by the Engineer, longitudinal joints shall be offset at least 150 mm (6 inches) from any joint in the lower courses of base. Transverse joints shall not be constructed closer than 300 mm (12 inches) to the transverse joint constructed in lower courses.

303.14 SURFACE TOLERANCE. The Asphalt Treated Permeable Base shall be finished to within a grade tolerance of 15 mm (1/2 inch) provided that this tolerance is not maintained for a distance longer than 15 m (50 feet) and that the required crown or superelevation is maintained.

The surface will be tested by the Engineer using a straightedge at least 5 m (16 feet) in length at selected locations parallel with the centerline. Any variations exceeding 4.5 mm (3/16 inch) between any two contact points shall be satisfactorily eliminated. A straightedge of at least 3 m (10 feet) in length may be used on a vertical curve. The straightedges shall be provided by the Contractor.

If directed by the Engineer, depressions shall be corrected by using a mix conforming to the requirements of bituminous concrete pavement. Payment for this material will be at the Contract unit price for the Contract item Asphalt Treated Permeable Base.

303.15 TRAFFIC CONTROL. Whenever traffic must be maintained during a paving operation, uniformed traffic officers and/or flaggers shall be stationed at each end of the section being paved and at other locations as required by the Engineer. The traffic officers or flaggers shall conform to the requirements of Section 630.

Whenever one-way traffic is maintained by the Contractor, the traveling public shall not be stopped or delayed more than ten minutes, unless otherwise directed by the Engineer. Two-way traffic shall be maintained during non-working hours.

303.16 METHOD OF MEASUREMENT. The quantity of Asphalt Treated Permeable Base to be measured for payment will be the number of metric tons (tons) of mixture used in the complete and accepted work, as determined from the load tickets.

303.17 BASIS OF PAYMENT. The accepted quantity of Asphalt Treated Permeable Base will be paid for at the Contract unit price per metric ton (ton). Payment will be full compensation for furnishing, mixing, hauling, and placing the material specified and for furnishing signs, labor, tools, equipment, and incidentals necessary to complete the work.

The cost of furnishing testing facilities and supplies at the plant will be considered included in the Contract item unit price of Asphalt Treated Permeable Base.

The cost of obtaining, furnishing, transporting, and providing the straightedges required for Asphalt Treated Permeable Base will be paid for under the Contract item Testing Equipment, Bituminous.

When not specified as a Contract item, the cost of Uniformed Traffic Officers or Flaggers will not be paid for directly but will be considered incidental to the Contract item Asphalt Treated Permeable Base.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
303.30 Asphalt Treated Permeable Base	Metric Ton (Ton)

SECTION 310 - RECLAIMED STABILIZED BASE

310.01 DESCRIPTION. This work shall consist of pulverizing the existing pavement together with underlying base course material to the depth and width specified on the Plans or in the Contract, adding aggregate materials as required or as ordered by the Engineer, adding the stabilizing agent indicated on the Plans, mixing the components thoroughly and shaping and compacting the stabilized material to the desired grade and density.

310.02 MATERIALS. The pulverized material shall consist of the existing pavement blended with underlying subbase material and/or additional aggregate material and shall conform to the following gradation:

Sieve size	Percent by Mass Passing Square Mesh Sieves
75 mm (3 inches)	100
37.5 mm (1 ½ inches)	80 – 100
4.75 mm (#4)	30 - 60

Additional aggregate material added to make up grading deficiencies and/or to correct roadway geometry shall meet the requirements of Subsection 704.05 for Subbase of Crushed Gravel, Fine Graded. Water for stabilization shall conform to the requirements of Section 745.

310.03 EQUIPMENT. Pulverization shall be accomplished with a machine having positive depth control adjustments and capable of reducing the pavement material to the specified size. The pulverizing equipment shall meet the approval of the Engineer. Equipment such as a milling machine or a rock crushing plant will not be permitted.

The mixer shall be a self-propelled mixer. The mixing rotor, or rotors, shall have positive depth control to ensure a uniform depth of mixing. When Stabilization Asphalt is designated as the stabilizing agent, the mixer shall also be a combined mixer and liquid distributor. The mixer shall meet the approval of the Engineer.

The equipment for distributing the designated stabilizing agent shall be uniformly adjustable and shall be equipped to accurately verify the rate of application of the stabilizing agent at any time.

The rollers used to compact the Reclaimed Stabilized Base material shall be as specified in Subsection 310.07.

The power grader and any replacement graders shall have grade control automation.

310.04 CONSTRUCTION. The moisture content of the pulverized materials shall be uniform and within the range approved by the Agency's Materials & Research Engineer prior to the addition of the stabilizing agent. If necessary, the materials shall be manipulated with equipment approved by the Engineer to decrease the moisture content or moisture shall be added to increase the moisture content to bring it into an approved range.

The pulverized reclaimed base material shall be stabilized by thoroughly mixing the stabilizing agent with the pulverized material and regrading and compacting the resulting mixture.

When a stabilizing or dust control agent is not exclusively specified on the Plans, water shall be used as that agent to meet all requirements of this Section.

Stabilization with water shall not be performed during rainstorms nor when the ambient air temperature is below 5°C (40° F). The Contractor shall pulverize only that area of pavement that can be stabilized during the same working day.

310.05 TESTING. The Contractor shall perform all process control and quality control sampling and testing.

Process control sampling and testing shall involve taking a set of four (4) representative excavated samples from the test section, after the test section has been pulverized. The four (4) samples shall be taken at random, representing the four-quarter segments of the test section. The four (4) samples shall be sieved to determine if the process can produce the required gradation or if additional materials must be added. Following the completion of the sieve analysis, using the AASHTO T 27 procedure modified to include air drying of the material only, the materials shall be physically combined to produce a representative sample.

A moisture/density curve, representing the combined sample, shall be generated in accordance with AASTHO T 180, Method C, using a minimum of five (5) different moisture contents to determine the maximum density and optimum moisture.

The Contractor shall perform quality control tests for density using a nuclear gauge in accordance with AASHTO T 238, Method B (per compacted lift of stabilized material).

A minimum of six (6) nuclear gauge tests per lane kilometer (0.6 lane mile) of compacted reclaimed base material shall be performed. Additional tests shall be performed as necessary or as directed by the Engineer. The Contractor shall verify that the minimum target density is maintained prior to resurfacing. The Contractor shall also perform quality control tests for uniform gradation of the pulverized material at a minimum rate of one (1) test per lane kilometer (0.6 lane mile).

The Contractor shall provide the Engineer with written copies of all process control and quality control results, including test locations. These test results will not be used to determine acceptance of the Reclaimed Stabilized Base material.

Acceptance testing will be performed by Agency personnel.

310.06 TEST SECTION. The Contractor shall construct a test section to assure the Engineer that the Contractor's equipment and procedure(s) are suitable for the work specified and capable of achieving the minimum target density approved by the Engineer.

The test section shall be full roadway width and of a length approved by the Engineer. No further recycling shall be performed until all aspects of the test section and the target density are approved by the Engineer. The Contractor shall use the same equipment for building both the accepted test section(s) and performing the Reclaimed Stabilized Base work on the project unless equipment substitution is approved by the Engineer. The Engineer may require an additional test section and additional process control sampling to investigate the suitability of substituted or changed equipment. The costs of such additional testing will not be paid for directly, but will be considered incidental to the Reclaimed Stabilized Base item.

If the test section does not meet the requirements of this specification, or the density achieved does not meet the minimum target density, then the Contractor shall modify the procedure and either construct another test section or reconstruct the original test section until suitable results are obtained.

310.07 SHAPING AND COMPACTING. Shaping and compacting shall be done immediately after pulverizing. The base material shall be finished within a grade tolerance of ± 10 mm ($\pm 3/8$ inch), provided that this deviation is not maintained for a distance longer than 15 m (50 feet) and provided that the required crown or superelevation is maintained.

When additional aggregate material is added to the previously reclaimed roadway to correct geometric deficiencies, said material shall be subject to a second pass of the reclamation equipment to achieve a homogenous subbase and shall be shaped, graded, and compacted.

The Contractor shall maintain the centerline location of the roadway. The Contractor shall also be responsible for the necessary survey required to re-establish banking as shown on the Plans or as directed by the Engineer.

Compaction of the reclaimed stabilized base shall be accomplished by successive passes of a vibratory sheeps foot or pad foot roller of at least 225 KN (25 tons) of dynamic force. Final rolling shall be accomplished by a smooth steel wheel vibratory roller of at least 120 KN (13 tons) of dynamic force. The material shall be compacted to achieve at least the minimum target density approved by the Engineer.

The optimum moisture content shall be maintained throughout the duration of the project stabilizing and compaction process. Ninety-five percent (95%) of the maximum density shall be used as the minimum target density during construction, upon approval by the Engineer, in accordance with Subsections 310.05 and 310.06.

310.08 CURING AND STABILITY. The completed and cured Reclaimed Stabilized Base may be opened to traffic as approved by the Engineer. Required density and moisture content of the finished base shall be maintained until it is paved over. Any imperfections discovered shall be repaired by the Contractor as directed by the Engineer at no additional cost to the Agency.

The stabilized material shall be allowed to cure to a condition such that the free moisture content is reduced to 1.0% or less before bituminous concrete pavement is placed on it.

310.09 METHOD OF MEASUREMENT. The quantity of Reclaimed Stabilized Base to be measured for payment will be the number of square meters (square yards) constructed to the depth specified, complete in place in the accepted work. No allowance will be made for overlapping areas.

The quantity of additional aggregate material used to correct gradation or geometric deficiencies to be measured for payment will be the number of metric tons (tons) of Subbase of Crushed Gravel, Fine Graded complete in place in the accepted work as determined by weight tickets.

In the event that the depth of base to be stabilized has to be adjusted in the field, the first 50 mm (2 inches) of additional or decreased depth will not be paid for directly, but will be considered incidental to the Reclaimed Stabilized Base item. If the change in depth is greater than 50 mm (2 inches), the number of square meters (square yards) pulverized at the revised depth will be multiplied by the result of dividing the total depth actually pulverized by the original depth designated on the Plans to create an equivalent number of square meters (square yards) for which payment will then be made.

310.10 BASIS OF PAYMENT. The accepted quantity of Reclaimed Stabilized Base will be paid for at the Contract unit price per square meter (square yard). Payment shall be full compensation for furnishing, handling, transporting, and placing the necessary materials; pulverizing, adding or removing moisture; shaping, placing, and compacting the designated materials; constructing tests strips; conducting tests; maintaining the finished base until it is paved over and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.

No additional compensation will be provided for multiple passes of the reclamation equipment and additional shaping, grading, and compacting.

Water used to adjust the moisture content prior to stabilization, for stabilization when water is used as the stabilizing agent, for compacting the pulverized material and for dust control after the reclamation will not be paid for directly, but will be considered incidental to the Reclaimed Stabilized Base item.

The accepted quantity of Subbase of Crushed Gravel, Fine Graded used to correct gradation or geometric deficiencies will be paid for at the Contract unit price per metric ton (ton) under the appropriate Contract item.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
310.20 Reclaimed Stabilized Base	Square Meter (Square Yard)