

SECTION 301

SELECTED MATERIAL SUBBASE

DESCRIPTION

301.01.01 GENERAL

- A. This work shall consist of excavating and placing selected granular materials in one or more courses for subbase in accordance with these specifications and in conformity with the lines, grades, thicknesses, and typical cross sections shown on the plans or established by the Engineer. This material is designated to be placed below the Type II aggregate structural layer for pavements and is a part of the pavement structure.

301.01.02 REFERENCE CODES AND STANDARDS

- A. Related Interagency Quality Assurance Committee (IQAC) procedures at:
http://www.accessclarkcounty.com/depts/public_works/Pages/iqac.aspx

MATERIALS

301.02.01 GENERAL

- A. Material shall be as set forth in the Special Provisions.
- B. When Type I Aggregate Base is specified, the gradation acceptance limits and testing methods shall be as set forth in Subsection 704.03.03, "Type I Aggregate Base."

CONSTRUCTION

301.03.01 SUBGRADE PREPARATION

- A. The surface of the subgrade upon which the selected material is to be placed shall conform to the established lines and grade, shall be smooth and uniform, and shall be compacted to the required density. The tolerance to the plan elevation grade shall be +0 inches and -1/2 inch.

301.03.02 PLACING

- A. In producing, handling, and placing selected materials, care shall be taken to prevent segregation of the fine particles from the coarse. When the required compacted thickness is more than 6 inches, the material shall be placed in layers, none of which shall exceed 6 inches in depth after compaction, except as provided in Subsection 301.03.04, "Compaction."
- B. After the material has been uniformly deposited, it shall be thoroughly blade-mixed to the full depth of the layer by alternately blading the entire layer to the center and back to the edges of the roadbed.
1. The material shall then be spread and finished to the required cross section.
 2. At the option of the Contractor, selected material may be spread with equipment meeting the requirements of Subsection 303.03.03, "Surface Tolerances."

- C. Binder material, if required, shall be incorporated either in the surfacing aggregate at the plant where the aggregate is produced or uniformly on the roadbed in amounts designated by the Engineer.

301.03.03 WATERING

- A. Water shall be applied prior to and during all blading operations to moisten the material sufficiently to prevent segregation of the fine and coarse particles.
- B. Water shall also be applied during the compaction and maintenance stages in sufficient amounts to attain compaction and prevent raveling.

301.03.04 COMPACTION

- A. Compaction shall immediately follow the spreading operation.
 - 1. Where the required thickness is 6 inches or less, the base course may be spread and compacted in one layer.
 - 2. However, if vibratory compaction equipment approved by the Engineer is used, and the requirement for density is complied with, the compacted thickness of any one layer may be increased to 8 inches.
- B. Aggregate bases placed on road approaches and connections, street intersection areas, median strip areas, shoulder areas, and at locations that are inaccessible to the spreading equipment may be spread in one or more layers by any means to obtain the specified results.
- C. Each layer of material shall be compacted to not less than 95 percent relative compaction, except under sidewalk areas. Under sidewalk areas, the material shall be compacted to not less than 90 percent compaction.
- D. A loss of density in the upper portions of the material may occur due to the elements or for other reasons. Recomposition to the specified density will be required prior to placement of any subsequent course and no additional compensation will be allowed for such recompaction.

METHOD OF MEASUREMENT

301.04.01 MEASUREMENT

- A. The quantity of selected material base or surface to be measured for payment will be the number of cubic yards or tons complete and in place.
- B. All measurements will be made in accordance with Subsection 109.01, "Measurement of Quantities."

BASIS OF PAYMENT

301.05.01 PAYMENT

- A. The accepted quantity of selected material base or surfacing, measuring as provided above, will be paid for at the contract unit price bid per cubic yard or ton for selected material base or surface, which price shall be full compensation for stripping the pit, crushing, screening, loading, hauling, placing, compacting, and maintaining the base or surface as shown on the plans and as directed by the Engineer.
- B. All payments will be made in accordance with Subsection 109.02, "Scope of Payment."

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- C. Partial payments may be made in accordance with Subsection 109.06, "Partial Payment."
- D. Payment will be made under:

PAY ITEM

PAY UNIT

Selected Material Subbase..... Cubic Yard, Ton

SECTION 302

AGGREGATE BASE COURSES

DESCRIPTION

302.01.01 GENERAL

- A. This work shall consist of furnishing, placing, and compacting aggregate base courses constructed as specified below and in conformity with the lines, grades, thicknesses, and cross sections shown on the plans or established by the Engineer.

302.01.02 REFERENCE CODES AND STANDARDS

- A. Related Interagency Quality Assurance Committee (IQAC) procedures at:
http://www.accessclarkcounty.com/depts/public_works/Pages/iqac.aspx

MATERIALS

302.02.01 GENERAL

- A. Materials shall meet the requirements of the following subsections:

Materials	Subsection
Type I Aggregate Base	704.03.03
Type II Aggregate Base	704.03.04

CONSTRUCTION

302.03.01 SUBGRADE PREPARATION

- A. Any ruts, holes, defects, or soft yielding places which occur in the subgrade or subbase for any cause whatsoever shall be corrected and compacted to required density and stability before an aggregate base course is placed thereon.
1. The above mentioned repairs shall be made at no additional cost to Contracting Agency, except as provided for in Subsection 203.03.03, "Unsuitable Material."
 2. The tolerance to the plan elevation grade shall be +0 foot and -0.1 foot.
- B. Unless otherwise specified, the top 6 inches of subgrade shall be compacted to not less than 90 percent compaction.

302.03.02 SPREADING AGGREGATES

- A. The aggregate shall be uniformly deposited on the approved subgrade by means of the hauling vehicle with or without spreading devices. Aggregate shall be distributed over the surface to the depth specified on the plans or established by the Engineer.
- B. After base course material has been deposited, it shall be thoroughly blade-mixed to full depth of the layer by alternately blading the entire layer to the center and back to the edges of the road. The material shall then be spread and finished to the required cross section by means of a self-propelled pneumatic-tired motor grader.
- C. At the option of the Contractor, the aggregate may be spread with an approved self-propelled spreader with the aggregate ready for compaction without further shaping. If

this option is exercised, however, the operation shall become subject to the requirements of Subsection 302.03.03, "Watering and Mixing Aggregates."

- D. Reference points will be established on one side of the roadway at intervals approved by the Engineer.
- E. Furnish, place, maintain, remove, and dispose of all materials required to provide continuous line and grade control to the placing machine.

302.03.03 WATERING AND MIXING AGGREGATES

- A. The base course material and water may be mixed at the plant in a mixer approved by the Engineer.
- B. Water shall be added during the mixing operation by means of spray bars in the amount necessary to provide the optimum moisture content for compacting.
- C. After mixing to the extent that the product has a uniform homogeneous appearance, the material shall be transported to the job while it contains the proper moisture content and may be placed on the roadbed by means of an approved self-propelled aggregate spreader.
- D. If the material has dried appreciably prior to final compacting, additional water shall be added by means of a pressurized water truck to assist in compaction and to prevent raveling.

302.03.04 WATERING

- A. Water may be applied prior to and during all blading and processing operations to moisten the material sufficiently to prevent segregation of the fine and coarse particles.
- B. Water shall be applied during the compaction and maintenance stages in sufficient amounts to assist in compaction and prevent raveling.
- C. Comply with Section 210, "Watering."

302.03.05 COMPACTION

- A. Compaction shall immediately follow the spreading operation.
 - 1. Where the required thickness is 6 inches or less, the base course may be spread and compacted in 1 layer.
 - 2. However, if vibratory compaction equipment of a type approved by the Engineer is used, and the requirement for density is complied with, the compacted thickness of any 1 layer may be increased to 8 inches.
- B. Aggregate bases placed on road approaches and connections, street intersection areas, median strip areas, shoulder areas, and at locations that are inaccessible to the spreading equipment may be spread in one or more layers by any means to obtain the specified results.
- C. Each layer of material shall be compacted to not less than 95 percent compaction, except for under sidewalk areas, where the material shall be compacted to not less than 90 percent compaction.
- D. A loss of density in the upper portions of the material may occur due to the elements or for other reasons. Recomposition to the specified density will be required prior to placement

of any subsequent course and no additional compensation will be allowed for such recompaction.

302.03.06 TOLERANCE FOR FINISHED SURFACE

- A. When a 10-foot straightedge is laid in any direction, the finished surface shall not deviate at any point more than 1/2 inch from the bottom thereof.
- B. The tolerance to the plan elevation grade shall be +0 foot and -0.05 foot.

METHOD OF MEASUREMENT

302.04.01 MEASUREMENT

- A. The quantity of aggregate base to be measured for payment will be the number of cubic yards or tons complete and in place.
 - 1. The weight of material will be determined by deducting from the weight of material delivered to the work, the weight of water in excess of optimum plus one percentage point.
 - 2. Optimum moisture will be determined by AASHTO T180 by the Contractor with the moisture content determined by AASHTO T255 and confirmed by the Engineer.
 - 3. The weight of water thus deducted will not be measured for payment.
- B. Due to possible variations in the specific gravity and voids of the aggregates, the tonnage used may vary from proposal quantities and no adjustment in contract unit price will be made because of such variation.
- C. All measurements will be made in accordance with Subsection 109.01, "Measurement of Quantities."

BASIS OF PAYMENT

302.05.01 PAYMENT

- A. The accepted quantity of aggregate base material, measured as provided in Subsection 302.04.01, "Measurement," will be paid for at the contract unit price bid per cubic yard or ton for the type specified, which shall be full compensation for stripping the pit, crushing, screening, mixing, hauling, placing, compacting, and maintaining the base course as shown on the plans and as directed by the Engineer.
- B. Deviations in thickness will likely occur in placing aggregate base courses. The Contractor shall bring the various base courses to the required grade line. Payment will be limited to the number of tons or cubic yards complete and in place and no additional payment will be made for any labor or equipment used in bringing the course to grade.
- C. All payments will be made in accordance with Subsection 109.02, "Scope of Payment."
- D. Partial payments may be made in accordance with Subsection 109.06, "Partial Payment."
- E. Payment will be made under:

PAY ITEM

PAY UNIT

Type I Aggregate Base	Cubic Yard, Ton
Type II Aggregate Base	Cubic Yard, Ton

SECTION 303**PLANTMIX BITUMINOUS BASE**

DESCRIPTION

303.01.01 GENERAL

- A. This work shall consist of aggregate and bituminous material mixed in a central plant and spread and compacted on a prepared surface in accordance with these specifications and in conformance with the lines, grades, thickness, and typical cross sections shown on the plans or established by the Engineer.
- B. The requirements of Section 401, "Plantmix Bituminous Pavements - General," shall be applicable to this work, except as hereinafter specified.

MATERIALS

303.02.01 GENERAL

- A. The materials shall conform to the requirements as specified in Subsection 401.02.01, "Composition of Mixtures," through Subsection 401.02.04, "Bituminous Materials."

CONSTRUCTION

303.03.01 GENERAL

- A. The construction requirements shall conform to the requirements as specified in Subsection 401.03.01, "Bituminous Mixing Plant," through Subsection 401.03.15, "Surface Tolerances," with the exceptions contained in the following two subsections.

303.03.02 SPREADING AND FINISHING

- A. Unless otherwise specified, bituminous plantmix base shall not be placed in courses exceeding 4 inches in compacted thickness.
- B. When more than 1 course is placed, the courses shall be of approximately equal thickness.

303.03.03 SURFACE TOLERANCES

- A. The completed surfacing shall be thoroughly compacted, smooth, and free from ruts, humps, depressions, or irregularities.
 - 1. When a straightedge 10 feet long is laid on the finished surface and parallel with the centerline of the highway, the surface shall not vary more than 1/2 inch from the lower edge of the straightedge.
 - 2. The transverse slope of the finished surface shall be uniform to a degree such that no depressions greater than 1/2 inch are present when tested with a straightedge 12 feet long laid in a direction transverse to the centerline and extending from edge to edge of a 12-foot traffic lane.
- B. Any ridges, indentations, or other objectionable marks left in the surface of the bituminous mixture by blading or other equipment shall be eliminated by rolling or other means.

- C. The use of any equipment that leaves ridges, indentations, or other objectionable marks in the bituminous mixture shall be discontinued and other acceptable equipment shall be furnished by the Contractor.

METHOD OF MEASUREMENT

303.04.01 MEASUREMENT

- A. Plantmix bituminous base will be measured for payment as specified in Subsection 401.04.01, "Measurement."

BASIS OF PAYMENT

303.05.01 PAYMENT

- A. The accepted quantity of plantmix bituminous base will be paid for at the contract unit price bid per ton which shall include all asphalt cement. This price shall be full compensation for furnishing all material, mixing, loading, hauling, placing, compacting, and incidentals necessary for doing all the work involved in constructing plantmix bituminous base.
- B. All payments will be made in accordance with Subsection 109.02, "Scope of Payment."
- C. Partial payments for plantmix bituminous base aggregate may be made as set forth under Subsection 109.06, "Partial Payment."
- D. Payment will be made under:

PAY ITEM	PAY UNIT
Plantmix Bituminous Base	Ton

SECTION 304**PORTLAND CEMENT TREATED BASE**

DESCRIPTION

304.01.01 GENERAL

- A. This work shall consist of constructing 1 or more courses of a mixture of aggregate and Portland cement on a prepared surface in accordance with these specifications, in conformity with the lines, grades, thicknesses, and typical cross sections shown on the plans, or as established by the Engineer.
- B. As used in these specifications, Portland cement shall be defined as hydraulic cement.
- C. The method to be used, either plantmix or roadmix, will be at the Contractor's option.

MATERIALS

304.02.01 GENERAL

- A. Materials shall meet the requirements of the following sections and subsections:

Materials	Section/Subsection
Hydraulic Cement	701
Water	722
Aggregate for Portland Cement Treated Base	704.03.08
Liquid Asphalt	703.03.03
Emulsified Asphalt	703.03.04

CONSTRUCTION

304.03.01 PROPORTIONING

- A. Portland cement shall be applied to the mineral aggregate at the rate specified in the Special Provisions or as determined by the Engineer.

304.03.02 MIXING - ROADMIX METHOD

- A. Portland cement shall be added at the rate specified, or at a rate ordered by the Engineer.
 - 1. Variations in excess of 10 percent from the rate set will not be permitted.
 - 2. The Portland cement shall be added in a manner to ensure that correct and uniform proportions will enter the mixer at all times.
- B. The specified base material, cement, and water shall be mixed by means of a traveling mixer.
 - 1. The mixer shall be so constructed that it will pick up all the base material to be treated during the time of mixing.
 - 2. The mixer may be of the pugmill, auger, or transverse shaft type that mixes the materials by means of revolving paddles which lift all the loose material from the subgrade.

- C. The traveling mixer shall have provision for introducing water at the time of mixing through a metering device.
 - 1. The water shall be applied by means of controls that will supply a uniform ratio of water to the amount of material passing through the mixer and produce a completed mixture with a uniform moisture content.
 - 2. Leakage of water from equipment will not be permitted.
 - 3. Care shall be exercised to avoid the addition of water from any source except through the metering device.
 - 4. Mixing shall be accomplished in 2 or more passes of the material through the mixer but, in any event, mixing shall be continued until the resulting mixture is entirely uniform in cement content, moisture, and the distribution of coarse and fine particles.
 - 5. At least 1 pass shall be made before any water is added to the material.
- D. The device by which the mixer picks up the material shall be so controlled and operated on each pass of the mixer as to pick up all the material to be treated and at the same time avoid cutting into the subgrade or picking up unmixed material on successive passes of the mixer.
- E. The lengths of sections to be mixed at any 1 time shall be regulated to permit compliance with the time requirements specified herein.
- F. Should the Contractor elect to perform road-mixing operations off the roadbed at a designated location, the preparation of the material for mixing and the mixing of base material, cement, and water shall conform to the applicable provisions specified herein for preparing and mixing the materials on the roadbed.
 - 1. When the materials are road-mixed off the roadbed, the device for loading the mixed material into the transporting vehicle shall be so constructed and so operated that no untreated material will be picked up.
 - 2. The time required for loading and hauling the material shall be taken into account when determining the amount of material to be mixed at any 1 time.
- G. After final mixing operations have been completed, the mixture shall be spread and compacted as specified in Subsection 304.03.04, "Spreading."

304.03.03 MIXING - PLANTMIX METHOD

- A. Cement treated base shall be mixed at a central mixing plant by either batch mixing using revolving blade or rotary drum mixers or continuous mixing at the option of the Contractor. The aggregate and cement may be proportioned either by weight or volume.
- B. If the Contractor so elects, the base material, cement, and water may be mixed at a central plant using a pugmill, rotary drum, or a continuous type of mixer.
- C. If a pugmill or rotary drum type of mixer is used, the materials shall be proportioned by batch weights. If a continuous type of mixer is used, the materials shall be proportioned by volume.
- D. Should the Contractor elect to proportion the materials by volumetric methods and perform the mixing in a continuous type of mixer, the completed mixture shall be as uniform in character and consistency with respect to grading, cement content, and water as that obtainable by weight proportioning and batch mixing.

- E. If the Contractor elects to use a continuous type of mixer, the correct amount of aggregate introduced into the mixer shall be drawn from the storage bin by means of a continuous feeder through an adjustable calibrated gate, which will supply the correct amount of aggregate in proportion to the cement and water.
- F. The mixer shall be equipped with metering devices that will introduce the cement and water into the mixer in the specified proportions.
 - 1. The metering devices and feeder shall be interlocked and so synchronized as to maintain a constant ratio of cement and water to aggregate.
 - 2. Storage bins shall be equipped with overflow chutes for each compartment.
 - 3. A positive signal system shall be provided to indicate when the level of material approaches the strikeoff capacity of the feed gate.
 - 4. The plant shall not be permitted to operate unless this signal system is in good working condition.
 - 5. The plant shall be equipped with facilities for calibrating gate openings by weighing check samples.
- G. Water shall be proportioned by weight or volume.
 - 1. The quantity of water added to the mixture shall be adjusted to produce optimum moisture content.
 - 2. All water additions shall be made under conditions that will permit an accurate determination of the quantity of water added.
- H. Portland cement shall be added at the rate specified or at a rate ordered by the Engineer. Variations from this rate in excess of 10 percent will not be permitted.
- I. The weight of charge in a batch mixer, or the rate of feed to a continuous type mixer, shall not exceed that which will permit complete mixing of all the material. Dead areas in the mixer, in which the material does not move or is not sufficiently agitated, shall be corrected either by a reduction in the volume of material or by other adjustments.
- J. Mixing of materials shall be continued until the cement and water are evenly distributed through the mass and a uniform mixture of unchanging appearance is obtained.

304.03.04 SPREADING

- A. Prior to spreading the cement treated material, the surface of the prepared roadbed shall be moistened and kept moist, but not excessively wet, until covered by the mixture.
- B. Materials mixed at a location off the roadbed shall be deposited by means of approved spreading equipment. Dumping in piles upon the subgrade will not be permitted.
- C. The mixture shall be spread and compacted in 1 or more layers of uniform density and of the width and thickness that, after compacting and trimming, the finished subgrade or base will conform to the required grade and cross section. The mixture shall be spread for the full width of the roadbed or the traffic lane under construction.
- D. Varied Thickness Requirements:
 - 1. Where the required thickness is 6 inches or less, the mixture may be spread and compacted in 1 layer.
 - 2. Where the required thickness is more than 6 inches, the mixture shall be spread and compacted in 2 or more layers of approximately equal thickness, provided that the

- maximum compacted thickness of any 1 layer does not exceed 6 inches unless otherwise approved by the Engineer.
3. Thicknesses greater than 6 inches may be compacted in 1 layer, when it is determined by the Engineer that the thickness of the layer is compatible with the compaction equipment being used and that the specified density can be achieved.
- E. Work on each layer shall be performed in a similar manner, except that a curing seal need not be applied to a lower layer if the surface of the compacted material is kept moist until covered with the next layer. The exposed area of a lower layer shall not be greater at any time than can be covered with the next layer in 1 day of normal operations.
 - F. The mixed materials shall be spread for the full width of the subgrade or base under construction, either by 1 spreader or by several spreaders operating in a staggered position across the subgrade, unless traffic conditions require part-width construction. Should 1 spreader only be used, not more than 45 minutes shall elapse between the time of placing material in adjacent lanes at any location without trimming the longitudinal joint.
 - G. If traffic or other conditions make part-width construction of a base necessary, a windrow of shoulder material or soil shall be placed and compacted to form a choker to restrain the inner edge of the base during compacting operations.
 1. The choker shall be constructed to the same elevation as that of the compacted base, and shall be completed in advance of the spreading of the treated material.
 2. The toe of the choker shall not be less than 3 inches outside the finished trimming line of the compacted section of base material.
 3. The use of side forms, or other method that will satisfactorily retain the base material during compacting operations, will be permitted in lieu of a choker.
 - H. After a part-width section has been completed, the longitudinal joint against which additional material is to be placed shall be trimmed to the neat line of the section and with a vertical edge. Choker material and material cut away in trimming shall be used in the construction of adjacent shoulders or otherwise disposed of unless suitable for incorporation in the work.
 - I. The use of self-propelled graders will be permitted for trimming, for spreading material mixed on the roadbed, or for spreading material mixed at a location off the roadbed after such materials have been deposited in an approved manner.

304.03.05 COMPACTION

- A. The provisions contained in this subsection apply to both plantmix and roadmix methods.
- B. Cement treated base shall be compacted to a minimum of 95 percent of the laboratory maximum density as determined by ASTM D558.
- C. Compacting equipment shall produce the required compaction within the operation time limit specified in Subsection 304.03.07, "Time Requirements."
- D. Rolling shall be performed in such a manner that bumps and irregularities will be eliminated and the finished surface shall be true to the required grade and cross section within the surface tolerances specified in Subsection 304.03.06, "Finished Surface."
- E. Water shall be applied without driving equipment over the uncompacted material.
- F. Rolling shall commence by completely covering the outer edge of the material. Subsequent rolling shall lap at least 25 percent of previously compacted material.

- G. Areas inaccessible to rollers shall be compacted to the required density by other means.

304.03.06 FINISHED SURFACE

- A. Surface Tolerances:
1. The finished surface of cement treated base shall be uniform and shall not deviate at any point more than 3/8 inch from the bottom of a 10-foot straightedge laid in any direction.
 2. The surface of the finished cement treated base at any point shall not vary more than 5/8 inch above or below the grade established by the Engineer, except that when Portland cement concrete pavement is to be used on cement treated base, the surface of the finished cement treated base at any point shall not extend above the grade established by the Engineer.
- B. When the finished surface of cement treated base is outside the specified tolerances and before placing any course of material thereon, all high spots on the finished surface shall be trimmed off to within the specified tolerance.
1. The excess materials shall be removed and disposed of in a manner approved by the Engineer immediately after trimming and no loose material shall be left on the base and the area shall then be rolled again.
 2. Full compensation for trimming high spots and disposing of the trimmed material shall be considered as included in the prices paid for the contract items involved in constructing the cement treated base and no additional compensation will be allowed therefor.
- C. Cleated equipment shall not be allowed on new cement treated base unless street pads are used on the cleats.

304.03.07 TIME REQUIREMENTS

- A. Any mixture of aggregate, cement, and water that has not been compacted shall not be left undisturbed for more than 30 minutes.
- B. Not more than 2 hours shall elapse between the time water is added to the aggregate and cement and the time of completion of initial rolling.
- C. Not more than 3 hours shall elapse between the time water is added to the aggregate and cement and the time of completion of final compaction after trimming.

304.03.08 CONSTRUCTION JOINTS

- A. At the end of each day's work and when cement treated base operations are delayed or stopped for more than 2 hours, a construction joint shall be made in thoroughly compacted material, normal to the centerline of the roadbed with a vertical face.
- B. Additional mixture shall not be placed until the construction joint has been approved by the Engineer.
- C. Where cement treated base has been finally compacted more than 1 hour, longitudinal joints shall be constructed by cutting vertically into the existing edge for approximately 3 inches and the material cut away may be disposed of in the adjacent lane to be constructed.
- D. The face of the cut joints shall be moistened in advance of placing the adjacent base.

304.03.09 PROTECTION AND CURING

- A. The surface shall be kept moist at all times until the curing seal is applied. Water equipment shall be of a type which will apply moisture in a fog or mist type of application free of pressure at the surface being treated.
- B. The completed cement treated base shall be covered with a bituminous curing seal as protection against drying.
 - 1. Curing seal will be required only for the top layer of cement treated base.
 - 2. The curing seal shall be applied as soon as possible, but not later than 8 hours after the completion of final rolling.
 - 3. The surface shall be kept moist until the seal is applied.
 - 4. Curing seal shall be bituminous material, unless otherwise specified, and shall be applied at a rate of between 0.15 gallon and 0.25 gallon per square yard of surface, the exact amount to be determined by the Engineer.
 - 5. The curing seal shall be applied in accordance with the requirements of Section 407, "Seal Coat," and in sufficient quantity to provide a continuous membrane over the base.
 - 6. At the time of application of the curing seal, the surface shall be tightly knit, free from all loose material and shall contain sufficient moisture to prevent excessive penetration of the asphalt.
 - 7. If necessary to ensure this, sufficient water to fill the surface voids shall be applied immediately before the asphalt is applied.
- C. Equipment or traffic shall not be permitted on the cement treated base during the first 3 days after applying the curing seal, unless otherwise permitted by the Engineer. After traffic is allowed on the cement treated base, and there is danger of excessive surface abrasion, sand blotter may be required as determined by the Engineer.
- D. When equipment or traffic is permitted on the cement treated base and such permission is granted for the sole convenience of the Contractor, the Contractor shall protect the curing seal at no additional cost to Contracting Agency.
- E. All loose sand shall be completely removed from the cement treated base before any surfacing material is placed thereon. Full compensation for furnishing, spreading, and removing sand as specified above shall be considered as included in the contract price paid for sand blotter and no additional allowance will be made therefor.

304.03.10 WEATHER LIMITATIONS

- A. Cement treated base shall not be mixed or placed while the atmospheric temperature is below 35 degrees F, or when conditions indicate that the temperature will fall below 35 degrees F for a sustained period of 4 hours.
- B. Cement treated base shall not be placed on frozen ground and all material shall be protected from freezing and frost for a period of 5 days after placing.

METHOD OF MEASUREMENT**304.04.01 MEASUREMENT**

- A. The quantity of Cement Treated Base will be measured for payment by the square yard.

- B. The quantity of Portland Cement for Cement Treated Base will be measured for payment by the hundred weight.

BASIS OF PAYMENT

304.05.01 PAYMENT

- A. Cement treated base and subbase will be paid for by the square yard, in place, as shown on the plans or as directed by the Engineer. The price per square yard shall include payment for the furnishing of untreated base or subbase material required by the plans or specifications and shall include mixing, spreading, shaping, compacting, trimming, and curing the treated material.
- B. Portland cement for treating base and subbase will be paid for by the hundred weight for the quantity required to treat the base at the rate prescribed on the plans or directed by the Engineer.
 - 1. The price per hundred weight shall include payment for furnishing and spreading cement on the job.
 - 2. Cement will not be considered a major bid item for the purpose of adjusting quantities.
- C. Payment for curing seal will be considered as included in the price bid for cement treated base.
- D. Payment will be made under:

PAY ITEM

PAY UNIT

Cement Treated Base.....	Square Yard
Portland Cement for Cement Treated Base	Hundred Weight

SECTION 306**LIME STABILIZED SUBGRADE**

DESCRIPTION

306.01.01 GENERAL

- A. This work consists of stabilizing in place subgrade material, by combining lime and water with the pulverized subgrade material to the specified depth and compacting the mixture to the specified density, in conformance to the lines, grades, and dimensions shown on the plans and as specified in these specifications and the Special Provisions.

MATERIALS

306.02.01 SUBGRADE MATERIAL

- A. Subgrade material shall be the native in-situ soil or imported embankment material.
- B. The material to be stabilized shall be free of organic materials or other deleterious matter, and shall be limited to such a size that all the material can be passed through the mixing machine at each operation.
- C. When sulfates are found in the subgrade and embankment material, the subgrade shall be stabilized in accordance with the table below for recommended mellowing time.
- D. Soluble sulfate content shall be determined in accordance with California Test Method 417 modified to use 10 parts water to 1 part soil.

HYDRATED LIME SLURRY - SULFATE CHART

AMOUNT OF SULFATES %	RECOMMENDED MELLOW TIME
0.0 - 0.3	None
0.3 - 0.5	1 Day
0.5 - 0.8	2 - 3 Days
0.8 - 1.0	* Double Application

When sulfate rate is above 0.8 percent, Engineer review and approval is required.

* Double Application - One half of the specified hydrated lime shall be applied, mixed, and mellowed for 5 days at above optimum moisture conditions. The second half of the slurry shall then be applied, mixed, and compacted.

306.02.02 LIME

- A. Lime shall be either a hydrated lime or quicklime, and shall conform to ASTM C977.
- B. Lime may only be used in the production of a lime slurry.
- C. The direct application of dry hydrated lime or quicklime to the subgrade material is strictly prohibited.
- D. All lime shall come from a single source. If the source is changed, new information shall be submitted for the Engineer's approval.
- E. All batches of lime furnished to the project shall have the supplier's certificate of compliance.

306.02.03 WATER

- A. Water used for mixing lime slurry or curing shall be reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product.
- B. Water shall be tested in accordance with and shall meet the requirements of AASHTO T26.
- C. Water known to be of potable quality may be used without testing.

CONSTRUCTION**306.03.01 PROPORTIONING**

- A. Before commencing lime treatment work, the Contractor shall furnish in writing to the Engineer a proposed mix design determined by a testing laboratory under the direction and control of a registered professional engineer.
- B. The mix design shall be determined using the in-place soils to be stabilized and lime from the proposed supplier and shall determine the following:
 - 1. Percent of lime and rate of application of lime slurry in the treated subgrade material.
 - 2. Optimum water content during mixing, curing, and compaction.
 - 3. Gradation of in-situ mixture after treatment.
 - 4. Additional mixing or equipment requirements.
 - 5. Mellowing time requirements, if needed.
- C. The mix design shall comply with the following requirements:
 - 1. Minimum pH: 12.4 after completion of initial mixing with lime at ambient temperature, in accordance with Eades-Grim pH test method (ASTM C977, Appendix).
 - 2. Plasticity Index: Less than 3, in accordance with ASTM D4318, after 16 hours of cure time with the lime.
 - 3. Swell Potential: 1 percent or less vertical expansion of an air dried soil when inundated with water and allowed to swell at a confined pressure of 60 psf.
 - 4. Minimum Hydrated Lime Content: 5.0 percent by dry weight of the combined lime/soil mixture, in accordance with ASTM D3155.
 - 5. Minimum Unconfined Compressive Strength: At least 160 psi in 5 days of curing at 100 degrees F when tested in accordance with ASTM D1633, Method A.

306.03.02 SUBGRADE PREPARATION

- A. Subgrade material to be stabilized shall be scarified and thoroughly broken up to the full depth and width to be lime treated. The material shall then be shaped and sized for the addition of lime slurry.
- B. When the design requires treatment to a depth greater than 1 foot, the subgrade soil shall be treated in 2 equal layers.
 - 1. The top layer of soil shall be treated in place, and then removed and stockpiled. The moisture content of the stockpile shall be maintained at the specified moisture.
 - 2. The lower layer of soil to be treated shall then be treated and allowed to mellow in place.

3. After final mixing, the lower layer shall be compacted.
4. The stockpiled lime-soil mixture shall then be placed, mixed, and compacted.

306.03.03 LIME APPLICATION

- A. Lime shall be applied as a slurry to the subgrade material at the rate specified for the depth of subgrade treatment shown.
 1. The treatment rate shall be determined from a design using the subgrade materials, and shall meet the requirements in Subsection 306.03.01, "Proportioning."
 2. Rate of application shall be verified using methods outlined in ASTM D3155.
 3. Lime slurry shall be spread only on that area where the mixing operations can be completed during the same working day.
 4. Lime slurry shall not be left exposed to the air for more than 4 hours.
 5. No traffic other than the mixing equipment shall be allowed to pass over the spread lime slurry until after completion of mixing.
- B. The Engineer reserves the right to vary the rate of application of lime from the specified application rates during the progress of construction as necessary to maintain a pH of the lime/soil mixture above 12.4 and the desired characteristics of the treated subgrade.
- C. The lime shall be mixed with water in approved slakers and applied as a slurry by approved trucks with distributors or applicators approved by the Engineer.
 1. When using dry hydrate to make a slurry, agitators are mandatory in distributor trucks.
 2. The distribution of lime slurry shall be attained by successive applications over a measured section of subgrade until the proper amount of lime has been spread.
 3. The amount of lime spread shall be the amount required for mixing to the specified depth which will result in the percentage determined in the mix design.

306.03.04 MIXING

- A. The lime stabilized subgrade shall not be mixed when the ambient air temperature at ground level is below 40 degrees F or as approved by the Engineer, or when it is rainy, or when the temperature of the subgrade material is below 35 degrees F.
- B. The lime subgrade shall be maintained at a temperature of 35 degrees F or above until the lime stabilized material has been compacted.
- C. The full depth of the stabilized subgrade layer shall be mixed with an approved mixing machine.
 1. The use of disc plows or blades are strictly prohibited except in areas specified by the Engineer.
 2. The mixing machine shall make 2 or more coverages, as determined by the Engineer.
 3. Water shall be added to the subgrade material during mixing to provide a moisture content at least 3 percent above the optimum moisture content as determined by the mix design to ensure chemical reaction of the lime and subgrade material.
 4. This moisture content shall be maintained throughout the mellowing and curing time.
 5. During the mellowing period, the material shall be sprinkled as directed.

- D. Mixing and remixing shall be done as necessary to assist the lime-soil reaction, and shall continue until the combination of lime slurry and subgrade materials is free of streaks or pockets of lime, and the mixture is of uniform consistency and contains no clods or lumps greater than 1 inch or less than 60 percent passing the No. 4 sieve when tested dry.
- E. After the required mellowing time, the lime stabilized subgrade material shall be uniformly mixed for final mixing.
- F. After final mixing, the treated subgrade material shall be tested for plasticity index in accordance with ASTM D4318 and for compressive strength.
 - 1. The lime mixture shall develop compressive strength of at least 160 psi in 5 days of curing at 100 degrees F when tested in accordance with ASTM D 1633, Method A.
 - 2. Cylinders shall be molded from treated soil within 2 hours of final mixing with the material compacted to at least 95 percent compaction at the field moisture content.
 - 3. Moisture density field relationships for the treated soil shall be determined in accordance with ASTM D698.
- G. The treated subgrade shall then be tested for lime content.
 - 1. When the percentage of lime is found to be deficient less than 0.5 percent from the design, the material may be left in place.
 - 2. When the percentage of lime is deficient between 0.5 percent and 1.0 percent, payment will be made in accordance with Subsection 306.05.01, "Payment."
 - 3. When the percentage of lime is deficient more than 1.0 percent, the entire area shall be reprocessed at no additional cost to the Contracting Agency.

306.03.05 COMPACTION

- A. Compaction of the lime stabilized subgrade shall begin immediately after final mixing.
 - 1. The material shall be aerated or sprinkled as necessary to maintain the moisture content of the mixture between 0 to 3 percent above the optimum moisture content.
 - 2. The field density of the compacted mixture shall be at least 95 percent of the maximum laboratory density.
 - 3. The optimum moisture content and maximum laboratory density shall be determined in accordance with ASTM D698.
- B. Initial compaction shall be by means of sheep-foot rollers or segmented wheel rollers. Final rolling shall be with steel-wheeled or pneumatic-tired rollers. Areas inaccessible to rollers shall be compacted to the required compaction by other means satisfactory to the Engineer.
- C. In addition to the requirements specified for density, the full depth of the lime treated subgrade shown on the Drawings shall be compacted to the extent necessary to remain firm and stable under construction equipment.
 - 1. All irregularities, depressions, or weak spots which develop as determined by the Engineer shall be corrected immediately by scarifying the areas affected, adding or removing materials as required, reshaping, and recompacting by moisture conditioning and rolling.
 - 2. After each section is completed, tests will be made by the Engineer.

3. If the material fails to meet the density requirements, the material shall be reworked to meet these requirements.
4. Should the material, due to any reason or cause, lose the required stability, density, or finish before the next course or pavement is placed, the material shall be recompact and refinished at no additional cost to the Contracting Agency.

306.03.06 FINISHING AND CURING

- A. The surface of each layer of lime treated material shall be kept moist for a minimum of 1 day before further courses are added or any traffic is permitted, unless otherwise directed by the Engineer.
- B. The moisture cured duration may be reduced if a non-yielding surface is obtained to support construction traffic and either the next layer of treated soils are placed or the pavement layer is constructed, as approved by the Engineer.
- C. After the final layer of lime stabilized subgrade has been compacted, the subgrade shall be brought to the required lines and grades in accordance with the typical sections.
 1. If the surface of the finished layer is above the grade tolerance specified in this section, the excess material shall be trimmed, removed, and disposed of.
 2. No loose material shall be left in place.
 3. After trimming, the material shall be rolled with steel-wheeled or pneumatic-tired rollers.
 4. The finished surface shall not deviate by more than 0.04 feet from the actual finish grade.
 5. The surface of the course shall be maintained in a smooth condition, free from undulations and ruts, until other work is placed thereon or the work is accepted.
- D. The finish thickness of the lime stabilized subgrade shall not be deficient by more than 1 inch from the planned thickness at any point. If the thickness is deficient by more than 1 inch, the pavement structural section shall be adjusted by the Contractor to compensate for the deficiency in stabilized subgrade thickness, subject to the approval of the Engineer and at no added cost to the Contracting Agency.

METHOD OF MEASUREMENT

306.04.01 MEASUREMENT

- A. The area of lime stabilized subgrade will be measured for payment by the square yard complete in place and accepted.

BASIS OF PAYMENT

306.05.01 PAYMENT

- A. Payment shall be made at the contract unit price per square yard for the lime stabilized subgrade of the thickness specified. The price shall be full compensation for furnishing all labor, material including the lime, tools, equipment and incidentals, and for doing all the work involved in constructing the lime stabilization complete in place, as shown on the plans, and as specified in these specifications and the Special Provisions, and as directed by the Engineer. The pavement structural section shall be adjusted by the Contractor to compensate for any deficiency in stabilized subgrade thickness.

B. Payment will be made under:

PAY ITEM	PAY UNIT
Lime Stabilized Subgrade.....	Square Yard

Payment Table

% Deviation from design Lime Content	Pay Schedule % of Unit Price
less than 0.5%	100%
minus 0.51 to 0.6%	80%
minus 0.61 to 0.7%	60%
minus 0.71 to 0.8%	40%
minus 0.81 to 0.9%	20%
minus 0.91 to 1.0%	0%