**SECTION** **304**

**AGGREGATE BASE COURSE**

**304.1 Description.** This work shall consist of furnishing and placing one or more courses of aggregate on a prepared subgrade in accordance with these specifications, and as shown on the plans or as directed by the engineer. The type of aggregate to be used will be specified in the contract.

**304.2 Material.** Material for Type 1, 5 and 7 aggregate bases shall be crushed stone or reclaimed asphalt or concrete which meet the requirements of Sec 1007.

**304.2.1 Temporary Recycled Material.**  T

**304.3 Construction Requirements.**

**304.3.1 Field Laboratory.** When authorized by the engineer, the contractor shall provide a Type 2 field laboratory in accordance with Sec 601. Payment for the laboratory will be made in accordance with Sec 601.

**304.3.2 Subgrade.** All work on that portion of subgrade on which the base is to be constructed shall be completed in accordance with Sec 209.2.1 prior to placing any base material on that portion. Aggregate base shall not be placed on frozen subgrade.

**304.3.3 Placing.**

**304.3.3.1** The contractor shall place base material on the roadbed as shown in the contract documents.The maximum compacted thickness of any one layer shall not exceed 6 inches. If the specified compacted depth of the base course exceeds 6 inches, the base shall be constructed in two or more layers of approximately equal thickness. The compacted depth of a single layer of the base course may be increased to 8 inches for shoulders.

**304.3.3.2** Types 1 and 5 aggregate base used for shoulders adjacent to rigid or flexible type pavement, including pavement resurfacing, shall be simultaneously deposited and spread on the subgrade. Aggregate shall not be deposited on the pavement and bladed or dozed into place.

**304.3.4 Shaping and Compacting.** Each layer shall be compacted to the specified density or dynamic cone penetration index value before another layer is placed.

**304.3.4.1** Segregated surface areas constructed of Type 1 aggregate base may be corrected by adding and compacting limestone screenings of such gradation and quantity as required to fill the surface voids, and firmly bind the loose material in place. Screenings used in correcting segregated surface areas will be measured and paid for as base material. Type 5 and Type 7 aggregate bases are intended to provide some drainage and shall not be segregated. Trimmed Type 5 and 7 aggregate base may not be reused until the material is verified as meeting the required specifications. Base material contaminated to the extent that the material no longer complies with the specifications shall be removed and replaced with satisfactory material at the contractor’s expense.

**304.3.4.2** Aggregate base shall be compacted to meet the quality control requirments found in this specification. In lieu of the density requirements for Type 1 aggregate base used for shoulders with thicknesses less than 4 inches, the aggregate shall be compacted by a minimum of three complete coverages with a 5 ton roller. Rolling shall be continued until there is no visible evidence of further consolidation.

**304.3.4.3** Water shall be applied to the Type 7 base material during the mixing and spreading operations so that at the time of compaction the moisture content is not less than 5 percent of the dry weight.

**304.3.4.4** If at any time the compacted aggregate base or subgrade ruts, pumps, or otherwise becomes unstable, the contractor, at the contractor's expense, shall restore the earth subgrade and the aggregate base to the required grade, cross section and density.

**304.3.4.5** Millings or recycled concrete shall be installed to the same dimensions shown on the plans for the aggregate base. Millings or recycled concrete shall be placed in maximum 4-inch lifts, and each lift shall be compacted by a minimum of three passes with a 10-ton roller.

**304.3.5 Maintenance.** The contractor shall maintain, at the contractor’s expense, the required density and surface condition of any portion of the completed aggregate base until either the prime coat or a succeeding course or pavement is placed.

**304.3.6 Prime Coat.** If a prime coat is specified in the contract, the contractor will be required to apply the prime coat on any completed portion of the aggregate base as soon as practical, or as otherwise specified. The contractor will not be permitted to apply prime if the moisture in the top 2 inches of the Type 1 or 5 aggregate base exceeds the higher of either (1) the average of the optimum moisture as determined by the Standard Compaction Test and the absorption of the plus No. 4 fraction, or (2) two-thirds of the optimum moisture as determined by the Standard Compaction Test.

**304.4 Quality Control.** The contractor shall control operations to ensure the aggregate base, in place, meets the specified requirements. Tests shall be taken at random locations designated by the engineer.

**304.4.1** **Deficiency Limits Determination.** When density or DCP index value tests are less than specified or when thickness measurements indicate the thickness is deficient by more than 1/2 inch from the plan thickness, additional measurements will be taken at 100-foot intervals parallel to centerline ahead and behind the tested location until the extent of the deficiency has been determined. Each measurement will be assumed as representative of the full width for a distance extending one-half the distance to the next measurement, measured along centerline, or in the case of a beginning or ending measurement, the distance will extend to the end of the base section. Any deficient areas shall be corrected by reworking or adding material within the limits of the deficiency.

**304.4.2** **Rejected Material.** When two consecutive tests for gradation, deleterious material, or plasticity index do not meet the specification limits, the material shall be removed beginning at the point where the first test was conducted.

**304.4.3** **Retained Samples.** The contractor shall retain and clearly identify the untested portion of aggregate samples for the engineer’s use. The amount retained shall be at least as large as necessary to perform the QA plasticity index, gradation and deleterious testing. The contractor shall retain the samples for 7 days after testing has been completed and the results accepted by the engineer.

**304.4.4** **% Density.**  for Type 1 and Type 5 aggregate base shallFor sand cone method, t If nuclear density test methods are used, moisture content will be determined in accordance with AASHTO T 310 and a moisture correction factor applied. d

**304.4.5** **Dynamic Cone Penetrometer Index.** Type 7 aggregate base under both roadway and shoulders shall be compacted to achieve an average dynamic cone penetration (DCP) index value through the base lift thickness less than or equal to 0.4 inches per blow, as determined by a standard DCP device with a 17.6 lb hammer meeting the requirements of ASTM D6951. DCP testing shall occur within 24 hours of placement and final compaction.

**304.4.6** **Thickness** The thickness of the placed material shall be monitored using an applicable method meeting engineer’s approval.

**304.4.7** **Gradation**AASHTO T 11 and AASHTO T 27 shall be utilized to monitor gradation compliance with Sec 1007. Samples shall be taken at point of delivery, prior to rolling.

**304.4.7.1** When production for a week is anticipated to be 1,000 tons or less, the contractor may test the material at a frequency of 1 per 250 tons with a minimum of 1 test per week in lieu of the frequency found in the QC/QA frequency table.

**304.4.8** **Deleterious**.  Using MoDOT TM 71, QC shall determine the deleterious content compliance with Sec 1007. Samples shall be taken at point of delivery, prior to rolling. Small quantities shall follow Sec 304.4.7.1

**304.4.9** **Plasticity Index**Using AASHTO T 89 and AASHTO T 90, QC shall determine the PI compliance with Sec 1007. Samples shall be taken at point of delivery, prior to rolling. Small quantities shall follow Sec 304.4.7.1

**304.4.10** **Standard Compaction** The contractor shall determine the standard maximum dry density and the optimum moisture content for Type 1 and 5 base materials and supply all test data to the engineer prior to the beginning of work. A new standard compaction test shall be performed by QC when there is evidence of changes to the material or as directed by the engineer.

**304.4.11** **Dry Weight** The contractor shall determine the dry weight for Type 7 base materials and supply all test data to the engineer prior to the beginning of work.

**304.4.12** **Nuclear Moisture Correction Factor.** Whenever nuclear gauges are used for field density, a moisture correction factor will be determined for each aggregate in accordance with MoDOT Test Method TM 35. The contractor shall supply the correction factor and all test data to the engineer prior to the beginning of work.

**304.5 Quality Assurance.**

**304.5.1 Independent QA Samples.** Unless otherwise stated, a favorable comparison shall be obtained when independent QA samples meet the same specification criteria as QC. a favorable comparison with QC compaction be obtained when the QA result is QCQA

**304.5.2 Split QA Samples.** For retained samples, the QC test results and QA test results shall compare within the following limits. The total deleterious material shall be within 2.0 percentage points. The plasticity index shall be within 2. The gradation test results shall compare within the following limits:

|  |  |
| --- | --- |
| **Sieve** | **Tolerance (%)** |
| 1/2-inch and larger | ± 5.0 |
| No. 4 | ± 4.0 |
| No. 8 | ± 4.0 |
| No. 10 | ± 3.0 |
| No. 30 | ± 3.0 |
| No. 40 | ± 2.0 |
| No. 100 | ± 2.0 |
| No. 200 | ± 1.0 |

**304.6 QC/QA Frequency Table**

|  |  |  |  |
| --- | --- | --- | --- |
| **Tested Property** | **QC Frequency** | **QA Frequency** | |
| **Independent Samples** | **Split Samples** |
| % Density | 1 per 1,000 tons, minimum of 1 per day | 1 per 4,000 tons | - |
| DCP Index |
| Thickness |
| Gradation Material | 1 per 2,000 tons, minimum of 1 per day | - | 1 per 8,000 tons |
| Deleterious |
| Plasticity Index | 1 per 10,000 tons | 1 per 40,000 tons |
| Standard Compaction | 1 per Material | 1 per Project | - |
| Dry Weight | - |
| Nuclear Moisture Correction Factor |

**304.7 Method of Measurement.** Final measurement of the completed aggregate base course will not be made except for authorized changes during construction, or where appreciable errors are found in the contract quantity. Measurement will include aggregate course placed under curb and gutter. Where required, measurement of aggregate base course, complete in place, will be made to the nearest square yard. Where the aggregate base course extends to the inslope of the shoulder, the pay limit of the aggregate base course will be measured from the mid-point of the sloped portion. The revision or correction will be computed and added to or deducted from the contract quantity.

**304.8 Basis of Payment.** The accepted quantities of aggregate base course of the thickness and type specified will be paid for at the contract unit price for each of the pay items included in the contract. Payment will be considered full compensation for water used in performing this work. When bituminous pavement cold millings or recycled crushed concrete are substituted for aggregate base, payment will be made for the aggregate base quantity provided in the plans, regardless of whether millings, recycled crushed concrete or the aggregate base is used. Payment will be considered full compensation for hauling of millings, cold milling operations, and all other material or labor necessary to substitute bituminous pavement millings for aggregate base.