**ITEM P-154 SUBBASE COURSE**

**DESCRIPTION**

**154-1.1** This item shall consist of a subbase course composed of granular materials constructed on a prepared subgrade or underlying course according to these Specifications, and in conformity with the dimensions and typical cross section shown on the Plans.

**MATERIALS**

**154-2.1 MATERIALS.** The subbase material shall consist of hard durable particles or fragments of granular aggregates. This material will be mixed or blended with fine sand, clay, stone dust, or other similar binding or filler materials produced from approved sources. This mixture must be uniform and shall comply with the requirements of these Specifications as to gradation, soil constants, and shall be capable of being compacted into a dense and stable subbase. The material shall be free from vegetable matter, lumps or excessive amounts of clay, and other objectionable or foreign substances. Pit-run material may be used, provided the material meets the requirements specified.

Aggregate gradation shall meet the requirements of Table 154-1, determined according to ATM 304.

**TABLE 154-1. AGGREGATE GRADATION REQUIREMENTS**

|  |  |
| --- | --- |
| **Sieve designation (Square opening)** | **Percentage by weight passing sieves** |
| 4 inch | 100 |
| 2 inch | 85-100 |
| No. 4 | 15-60 - |
| No. 200 | 0-10  |

The percent passing the No. 200 sieve will be determined on minus 3-inch material.

The portion of the material passing the No. 40 sieve shall have a liquid limit of not more than 25 and a plasticity index of not more than 6 when tested according to ATM 204 and ATM 205.

The gradations shall be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieves, or vice versa.

**CONSTRUCTION METHODS**

**154-3.1 GENERAL.** The subbase course shall be placed where designated on the Plans or as directed by the Engineer. The material shall be shaped and thoroughly compacted within the tolerances specified.

Granular subbases which, due to grain sizes or shapes, are not sufficiently stable to support the movement of construction equipment, shall be mechanically stabilized to the depth necessary to provide such stability as directed by the Engineer. The mechanical stabilization shall principally include the addition of a fine-grained medium to bind the particles of the subbase material sufficiently to furnish a bearing strength, so that the course will not deform under the traffic of the construction equipment. The addition of the binding medium to the subbase material shall not increase the soil constants of that material above the limits specified.

**154-3.2 PREPARING UNDERLYING COURSE.** Before any subbase material is placed, the underlying course shall be prepared and conditioned as specified. The course shall be checked and accepted by the Engineer before placing and spreading operations are started.

To protect the subgrade and to ensure proper drainage, the spreading of the subbase shall begin along the centerline of the pavement on a crowned section or on the high side of pavements with a one-way slope.

**154-3.3 MATERIALS ACCEPTANCE IN EXISTING CONDITION.** When the entire subbase material is secured in a uniform and satisfactory condition, such approved material may be moved directly to the spreading equipment for placing. The material may be obtained from gravel pits, stockpiles, or may be produced from a crushing and screening plant with the proper blending. The materials from these sources shall meet the requirements for gradation, quality, and consistency. The moisture content of the material shall be approximately that required to obtain maximum density. The final operation shall be blading or dragging, if necessary, to obtain a smooth uniform surface true to line and grade.

**154-3.4 GENERAL METHODS FOR PLACING.** When materials from several sources are to be blended and mixed, the subbase material, together with any blended material, shall be thoroughly mixed prior to placing on grade.

The subbase course shall be constructed in layers. Any layer shall be not less than 4 inches nor more than 10 inches of compacted thickness. The material, as spread, shall be of uniform gradation with no pockets of fine or coarse materials. No material shall be placed in snow or on a soft, muddy, or frozen course.

When more than one layer is required, the construction procedure described herein shall apply similarly to each layer.

During the placing and spreading, sufficient caution shall be exercised to prevent the incorporation of subgrade, shoulder, or foreign material in the subbase course mixture.

**154-3.5 FINISHING AND COMPACTING.** After spreading or mixing, the subbase material shall be thoroughly compacted. Sufficient compactors shall be furnished to adequately handle the rate of placing and spreading of the subbase course. The moisture content of the material shall be approximately that required to obtain maximum density.

The field density of the compacted material shall be not less than 98% of the maximum density, as determined according to ATM 207 or ATM 212. The in-place field density and moisture content shall be determined according to ATM 213.

The course shall not be rolled when the underlying course is soft or yielding or when the rolling causes undulation in the subbase. When the rolling develops irregularities that exceed 1/2 inch when tested with a 12-foot straightedge, the irregular surface shall be loosened and then refilled with the same kind of material as that used in constructing the course and again rolled as required above.

Along places inaccessible to rollers, the subbase material shall be tamped thoroughly with mechanical or hand tampers.

Watering during rolling, if necessary, shall be in the amount and by equipment approved by the Engineer. Water shall not be added in such a manner or quantity that free water will reach the underlying layer and cause it to become soft.

**154-3.6 SURFACE TEST.** After the course is completely compacted, the surface shall be tested for smoothness and accuracy of grade and crown; any portion found to lack the required smoothness or to fail in accuracy of grade or crown shall be scarified, reshaped, recompacted, and otherwise manipulated as the Engineer may direct until the required smoothness and accuracy is obtained. The finished surface shall not vary more than 1/2-inch when tested with a 12-foot straightedge applied parallel with, and at right angles to, the centerline.

**154-3.7 PROTECTION.** Work on subbase course shall not be conducted during freezing temperature nor when the subgrade is wet. When the subbase material contains frozen material or when the underlying course is frozen, the construction shall be stopped.

**154-3.8 MAINTENANCE.** Following the final shaping of the material, the subbase shall be maintained throughout its entire length by the use of standard motor graders and rollers until, in the judgment of the Engineer, the subbase meets all requirements and is acceptable for the construction of the next course.

**METHOD OF MEASUREMENT**

**154-4.1** Subbase Course will be weighed by the ton or measured by the cubic yard in final position according to GCP Subsection 90-02.

Subbase materials will not be included in any other excavation quantities.

**BASIS OF PAYMENT**

**154-5.1** Subbase Course will be paid for at the contract price, per unit of measurement, accepted in place.

Hauling and placing of these materials is subsidiary.

Payment will be made under:

Item P154.020.0000 Subbase Course – per ton

**TESTING REQUIREMENTS**

ATM 212 Determining the Standard Density of Coarse Granular Materials using the Vibratory Compactor

ATM 304 WAQTC FOP for AASHTO T 27/T 11 Sieve Analysis of Fine and Coarse Aggregates

ATM 204 WAQTC FOP for AASHTO T 89 Determining the Liquid Limit of Soils

ATM 205 WAQTC FOP for AASHTO T 90 Determining the Plastic Limit and Plasticity Index of Soils

ATM 207 WAQTC FOP for AASHTO T 99/ T 180 Moisture-Density Relations of Soils

ATM 213 WAQTC FOP for AASHTO T 310 In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)