READ THIS FIRST

The Engineer shall verify that the latest version of the Federal Aviation Administration Advisory Circular AC 150/5370-10, “Standards for Specifying Construction Of Airports” and that the latest version of the Federal Aviation Administration, Northwest Mountain Region Revision to AC 150/5370-10, “Standards for Specifying Construction Of Airports” are incorporated into this specification.

This Project Spec Document may need additional modifications to suit your project. It is recommended that you proofread each section, paying attention to any “Notes” boxes such as this one--you should remove these “Notes” sections as you go. Also, do a search for all bracket characters “ [ ] “ as they are used to show you areas containing options or project specific details (you can use Microsoft Word’s Find feature {Ctrl-F} to jump to an open bracket “ [ “ character quickly). Again, these bracket characters should be removed.

It is important that every paragraph be numbered to allow for easy referencing. If you use the document’s built in styles and formatting your outline should be fine (turn on the formatting toolbar by going to View > Toolbars > Formatting). Most paragraphs will use the style “Numbered Material” and can be promoted (Shift) or demoted (Shift-Tab).

You should not have to manually enter extra spaces, carriage returns or outline characters such as A, B, C, or 1.01, 1.02; the formatting will do this for you. The entire document is 11 pt. Arial. If you paste items in, you may need to reapply the “Numbered Material” format.

1. GENERAL
   1. SUMMARY OF WORK
      1. The location and extent of “Subbase Course (FAA)” Work is indicated in the Contract Documents. A granular sub-base shall be provided on a prepared subgrade, or underlying course, in accordance with the provisions of FAA Item P-154, Subbase Course, attached hereto.
   2. GOVERNING CODES, STANDARDS, AND REFERENCES
      1. TBD
   3. SUBMITTALS
      1. Submit materials data in accordance with Section 01 33 00 - Submittals. Furnish manufacturers’ technical literature, standard details, product specifications, and installation instructions for all products.
      2. Submittals shall include the following:
2. NOT USED
3. NOT USED
4. NOT USED

End of Section

Revision History:

05/01/2014 Conversion to 2004 CSI Numbering System

10/15/2014 Added Sole Source and Salient Characteristics Note to Part 2 and revisions

# ITEM P-154 SUBBASE COURSE

Recycled asphalt has been used in place of P-154 material. This is acceptable provided it is approved by the Airport District Office and no more than 50% is blended with new P-154 material. Excessive amounts, under heavy loads and heat, can settle. Although it can be compacted to a modified proctor it will bridge between coated particles and resist compactive effort. Recycled P-402 should not be used under any aircraft pavements since it is gap-graded, unless the virgin aggregate gradation is adjusted to meet the combined blend gradation.

## DESCRIPTION

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

## MATERIALS

A. If only one product is acceptable (single or sole source product), obtain an approved Competition Waiver and submit to the CPO Construction, Contract Administrator. The language shall read as: “Manufacturer Name, Product # XXXXX, No Equal.” Refer to CPO-6 Competition Waiver Policy for more information.

B. If a Competition Waiver is not approved or more than one product is acceptable, this section must list a minimum of 2 products plus the language “Or Approved Equal,” along with salient characteristics. Refer to CPO Construction’s Salient Characteristics Guidelines for more information.

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.

### Table 1 Gradation Requirements

|  |  |
| --- | --- |
| **Sieve designation (square openings) as per ASTM C 136 and ASTM D 422** | **Percentage by weight passing sieves** |
| 3 in (75.0 mm) | 100 |
| No. 10 (2.0 mm) | 20-100 |
| No. 40 (0.450 mm) | 5-60 |
| No. 200 (0.075 mm) | 0-8 |

The portion of the material passing the No. 40 (0.450 mm) sieve shall have a liquid limit of not more than 25 and a plasticity index of not more than 6 when tested in accordance with ASTM D 4318.

The maximum amount of material finer than 0.02 mm in diameter shall be less than 3%.

Include testing frequencies for the particle size distribution for preliminary and minimum of one per day during construction.

## 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 without movement the 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 OPERATION IN PITS. All work involved in clearing and stripping pits and handling unsuitable material encountered shall be performed by the Contractor at his/her own expense. The subbase material shall be obtained from pits or sources that have been approved. The material in the pits shall be excavated and handled in such manner that a uniform and satisfactory product can be secured.

154-3.3 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.

154-3.4 MATERIALS ACCEPTANCE IN EXISTING CONDITION. When the entire subbase material is secured in a uniform and satisfactory condition and contains approximately the required moisture, 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. It is the intent of this section of the specifications to secure materials that will not require further mixing. The moisture content of the material shall be approximately that required to obtain maximum density. Any minor deficiency or excess of moisture may be corrected by surface sprinkling or by aeration. In such instances, some mixing or manipulation may be required, immediately preceding the rolling, to obtain the required moisture content. The final operation shall be blading or dragging, if necessary, to obtain a smooth uniform surface true to line and grade.

154-3.5 PLANT MIXING. When materials from several sources are to be blended and mixed, the subbase material shall be processed in a central or travel mixing plant. The subbase material, together with any blended material, shall be thoroughly mixed with the required amount of water. After the mixing is complete, the material shall be transported to and spread on the underlying course without undue loss of the moisture content.

154-3.5.1 MIXED IN PLACE. When materials from different sources are to be proportioned and mixed or blended in place, the relative proportions of the components of the mixture shall be as designated by the Engineer.

The subbase material shall be deposited and spread evenly to a uniform thickness and width. Then the binder, filler or other material shall be deposited and spread evenly over the first layer. There shall be as many layers of materials added as the Engineer may direct to obtain the required subbase mixture.

When the required amount of materials have been placed, they shall be thoroughly mixed and blended by means of graders, discs, harrows, rotary tillers, supplemented by other suitable equipment if necessary. The mixing shall continue until the mixture is uniform throughout. Areas of segregated material shall be corrected by the addition of binder or filler material and by thorough remixing. Water in the amount and as directed by the Engineer shall be uniformly applied prior to and during the mixing operations, if necessary, to maintain the material at its required moisture content. When the mixing and blending has been completed, the material shall be spread in a uniform layer which, when compacted, will meet the requirements of thickness and typical cross section.

If mixing in place will not provide a consistent subbase material, delete paragraph 154-3.5.1.

154-3.6 GENERAL METHODS FOR PLACING. The subbase course shall be constructed in layers. Any layer shall be not less than 3 in (75 mm) nor more than 8 in (200 mm) of compacted thickness. The subbase material shall be deposited and spread evenly to a uniform thickness and width. The material, as spread, shall be of uniform gradation with no pockets of fine or coarse materials. The subbase, unless otherwise permitted by the Engineer, shall not be spread more than 2,000 sq yd (1700 sq m) in advance of the rolling. Any necessary sprinkling shall be kept within this limit. 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.

154-3.7 FINISHING AND COMPACTING. After spreading or mixing, the subbase material shall be thoroughly compacted by rolling and sprinkling, when necessary. Sufficient rollers shall be furnished to adequately handle the rate of placing and spreading of the subbase course.

The field density of the compacted material shall be at least 100 percent of the maximum density of laboratory specimens prepared from samples of the subbase material delivered to the jobsite. The laboratory specimens shall be compacted and tested in accordance with [ ]. The in-place field density shall be determined in accordance with ASTM D 1556 or ASTM D 6938. The moisture content of the material at the start of compaction shall not be below nor more than 2 percentage points above the optimum moisture content. All testing shall be done by a laboratory hired by the contractor. Density test results shall be furnished daily to the Engineer for acceptance determination.”

The Engineer shall specify ASTM D 698 for areas designated for aircraft with gross weights of 60,000 pounds (27 200 kg) or less and ASTM D 1557 for areas designated for aircraft with gross weights greater than 60,000 pounds (27 200 kg).

Include testing frequencies per square yard or cubic yard for density and moisture acceptance tests.

AASHTO T 99 or T 180 (Moisture-Density) should be specified for soils that are expected to have more than 30% retained on the 3/4 in sieve. The moisture-density relationship test procedures ASTM D 698 and D 1557 are not applicable for materials with greater than 30 retained on the 3/4 in sieve. A replacement procedure (ASTM D 4718) for the coarse material (greater than 3/4 in) is used with ASTM methods but only until up to 30 percent is retained. Maximum density testing (ASTM D 4253) may be used but it also limits the material retained on the 1-1/2 in sieve to 30 percent. The AASHTO T-99 and T-180 are similar to ASTM D 698 and D 1557, except they do not limit the replacement of the coarse material.

Material meeting the requirements of Item P-154 may be free-draining which may prevent the material from retaining sufficient moisture to meet the moisture at compaction requirements of this paragraph. If this situation occurs during field operations, minimum moisture content should be established for placement of the material.

When nuclear density gauges are to be used for density determination, testing shall be in accordance with Section 120 and ASTM D 6938.

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 in (12 mm) when tested with a 16 ft (4.8 m) 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.

Sprinkling 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.

154-3.8 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 re obtained. The finished surface shall not vary more than 1/2 in (12 mm) when tested with a 16 ft (4.8 m) straightedge applied parallel with, and at right angles to, the centerline.

154-3.9 THICKNESS. The thickness of the completed subbase course shall be determined by depth tests or sample holes taken at intervals so each test shall represent no more than 500 sq yd (420 sq m). When the deficiency in thickness is more than 1/2 in (12 mm), the Contractor shall correct such areas by scarifying, adding satisfactory mixture, rolling, sprinkling, reshaping, and finishing in accordance with these specifications. The Contractor shall replace at his/her expense the subbase material where borings are taken for test purposes.

The use of survey for thickness determination is permitted.

154-3.10 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.

154-3.11 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 The yardage of subbase course to be paid for shall be the number of cubic yards (cubic meters) of subbase course material placed, compacted, and accepted in the completed course. The quantity of subbase course material shall be measured in final position based upon depth tests or cores taken as directed by the Engineer, or at the rate of 1 depth test for each 500 sq yd (420 sq m) of subbase course, or by means of average end areas on the complete work computed from elevations to the nearest 0.01 ft (3 mm). On individual depth measurements, thicknesses more than 1/2 in (12 mm) in excess of that shown on the plans shall be considered as the specified thickness plus 1/2 in (12 mm) in computing the yardage for payment. Subbase materials shall not be included in any other excavation quantities.

## BASIS OF PAYMENT

154-5.1 Payment shall be made at the contract unit price per cubic yard (cubic meter) for subbase course. This price shall be full compensation for furnishing all materials; for all preparation, hauling, and placing of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-154-5.1 Subbase Course-per cubic yard (cubic meter)

## TESTING REQUIREMENTS

|  |  |
| --- | --- |
| ASTM C 136 | Sieve Analysis of Fine and Coarse Aggregates |
| ASTM D 422 | Particle Size Analysis of Soils |
| ASTM D 698 | Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5 lb (2.49 kg) Rammer and 12 in (305 mm) Drop |
| ASTM D 1556 | Density of Soil in Place by the Sand-Cone Method |
| ASTM D 1557 | Test for Laboratory Compaction Characteristics of Soil Using Modified Effort |
| ASTM D 6938 | In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods |
| ASTM D 4318 | Liquid Limit, Plastic Limit, and Plasticity Index of Soils |

End of Item P-154

## REFERENCES

1. AASHTO T-99 moisture-density
2. AASHTO T-180 moisture-density
3. ASTM methods
4. ASTM C 136 percentage by weight passing sieves
5. ASTM C 136 Sieve or Screen Analysis of Fine and Coarse Aggregate
6. ASTM D 698 moisture-density relationship test procedure
7. ASTM D 698 moisture-density relationship test procedure aircraft gross weights of 60,000 pounds or less
8. ASTM D 698 Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5 lb (2.49 kg) Rammer and 12 in (305 mm) Drop
9. ASTM D 1556 in-place field density
10. ASTM D 1556 Density of Soil in Place by the Sand-Cone Method
11. ASTM D 1557 moisture-density relationship test procedure
12. ASTM D 1557 moisture-density relationship test procedure aircraft gross weights greater than 60,000 pounds
13. ASTM D 1557 Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb (4.5 kg) Rammer and 18 in (457 mm) Drop
14. ASTM D 2167 in-place field density
15. ASTM D 2167 Density of Soil in Place by the Rubber-Balloon Method
16. ASTM D 2922 in-place densities
17. ASTM D 4253 maximum density testing
18. ASTM D 4318 liquid limit and plasticity index
19. ASTM D 4318 Liquid Limit, Plastic Limit and Plasticity Index of Soils
20. ASTM D 4718 moisture-density relationship test procedure
21. FAA Item P-154, Subbase Course

End of Item