Item P-152

Excavation, Subgrade, and Embankment

DESCRIPTION

152-1.1 This item covers excavation, disposal, placement, and compaction of all materials within the limits of the work required to construct safety areas, runways, taxiways, aprons, and intermediate areas as well as other areas for drainage, building construction, parking, or other purposes in accordance with these specifications and in conformity to the dimensions and typical sections shown on the plans.

152-1.2 Classification. All material excavated shall be classified as defined below:

a. Unclassified excavation (Earthwork). Unclassified excavation shall consist of the excavation and disposal of all material, regardless of its nature which is not otherwise classified. Suitable material shall be used in fill areas and shaped and compacted as specified herein. All excess suitable material shall be deposited on airport property in the location designated by the Program Manager.

b. Undercut Excavation. This item shall include the excavation of unstable subgrade material as determined by the Program Manager. It shall be the Contractor's responsibility to perform proof-rolling and/or comparative efforts on the existing subgrade prior to authorization for undercutting. Materials used to replace "undercut" areas shall be obtained from the grading operations, from offsite borrow or shall be granular backfill as further defined herein.

c. Unsuitable Excavation. This item shall include the excavation of: any materials containing vegetable or organic matter, such as muck, peat, organic silt, sod, or garbage; materials containing rubbish, trash or debris; or materials containing waste material such as bulky waste, commercial solid waste, construction and demolition waste, domestic waste, farming waste, and industrial waste. Petroleum impacted soil and hazardous waste shall NOT be considered to be unsuitable material. This item DOES NOT include clearing or clearing and grubbing waste as defined in P-151. Unsuitable material shall be disposed of off airport property at Contractor’s expense.

The following paragraphs further define some of the above listed wastes:

Bulky Wastes: large items of solid waste such as white goods, furniture, autos or large auto parts, trees, branches, stumps, and other oversize wastes whose large size precludes or complicates their handling by normal collection, processing or disposal methods.

Commercial Solid Wastes: all types of solid waste generated by stores, offices, restaurants, warehouses, and other manufacturing activities, excluding domestic and industrial waste.

Construction and Demolition Wastes: wastes other than special wastes, resulting from construction, remodeling, repair and demolition of structures and from road building. Such wastes include but are not limited to bricks, concrete and other masonry materials, rock and lumber, road spoils, rebar, asphalt, and paving material. These types of wastes are not associated with, and shall not be paid for as, demolition of the airfield as required for this project, unless directed otherwise by the Engineer.

Domestic Wastes: any solid waste (including garbage and trash derived from households [including single and multiple residences], hotel and motels, bunkhouses, ranger stations, crew quarters, campgrounds, picnic grounds, and day-use recreation areas).

Farming Wastes: the wastes (except dead animals) from the customary and generally accepted activities, practices and procedures that farmers adopt, use, or engage in during the production and harvesting of agricultural crops which include agronomic, horticultural, and silvicultural crops. However, the term does NOT include special wastes such as waste oils or other lubricants, unused fertilizers, or pesticide containers or residues.

Hazardous Wastes: means hazardous waste as defined in RCRA.

Industrial Wastes: solid wastes produced in, or generated by, industrial or manufacturing processes. The term does NOT include commercial, domestic, mining, hazardous waste regulated under subtitled C of RCRA, or oil and gas waste.

d. Drainage excavation. Drainage excavation shall consist of all excavation made for the primary purpose of drainage and includes drainage ditches, such as intercepting, inlet or outlet ditches; temporary levee construction; or any other type as shown on the plans.

e. Borrow excavation. Borrow excavation shall consist of approved material required for the construction of embankments or for other portions of the work in excess of the quantity of usable material available from required excavations. Borrow material shall be obtained from Contractor furnished pits off airport property. No material shall be excavated or brought on airport property without written permission from the Program Manager. Borrow material from non-approved pits will not be eligible for payment. Borrow excavation shall be further classified as follows:

(1) "Select borrow excavation" shall be classified as "ML" or "CL" soil in accordance with ASTM D-2487 (Unified Soils Classifications System) and shall have the properties given in the following table. If required, the Contractor shall blend materials from the Contractor furnished pits to achieve these properties.

Soil Type	Liquid Limit[1]	Plasticity Index[1]	CBR[2]
ML	No Limit	No Limit	Min 6
CL	Max 45	10 to 24	Min 6

1. When tested in accordance with ASTM D-4318.
2. When remolded to the density which will be obtained during construction, soaked and tested in accordance with ASTM D-1883.

(2) "Unclassified borrow excavation" shall be any soil not classified as "unsuitable" per Section 152-1.2(c) and which can be readily placed and compacted in embankments.

f. Pavement Excavation. This item shall include the full depth removal and disposal of existing bituminous or Portland Cement Concrete (PCC) pavement, abandoned bituminous or PCC pavement or existing bituminous or PCC shoulder pavement to proper subgrade elevation. Existing base and/or subbase may be stabilized or un-stabilized. Excavation shall be made to such depths as required to allow placement of new pavement section. Dispose of all excavated material off airport property unless otherwise directed by the Program Manager.

152-1.3 GRANULAR STONE BACKFILL

Granular backfill stone shall be CR-610 crushed stone or recycled concrete pavement.

CONSTRUCTION METHODS

152-2.1 General. Stripping will be required within all areas to receive embankment that are not presently covered by pavement or building foundation. The minimum depth of stripping shall be four (4) inches and the maximum depth shall be to the limits of the root zone.

The suitability of material to be placed in embankments shall be subject to approval by the Program Manager. All unsuitable material shall be disposed of in Contractor furnished disposal areas off airport property.

When the Contractor's excavating operations encounter artifacts of historical or archaeological significance, the operations shall be temporarily discontinued and the Program Manager notified per Section 70, paragraph 70-20. At the direction of the Program Manager, the Contractor shall excavate the site in such a manner as to preserve the artifacts encountered and allow for their removal. Such excavation will be paid for as extra work.

Areas outside the limits of the pavement areas where the top layer of soil has become compacted by hauling or other Contractor activities shall be scarified and disked to a depth of 4 inches, to loosen and

pulverize the soil. Stones or rock fragments larger than 4 inches in their greatest dimension will not be permitted in the top 6 inches of the subgrade.

If it is necessary to interrupt existing surface drainage, sewers or under-drainage, conduits, utilities, or similar underground structures, the Contractor shall be responsible for and shall take all necessary precautions to preserve them or provide temporary services. When such facilities are encountered, the Contractor shall notify the Program Manager, who shall arrange for their removal if necessary. The Contractor, at their own expense, shall satisfactorily repair or pay the cost of all damage to such facilities or structures that may result from any of the Contractor's operations during the period of the contract. When drainage pipes cross project phase limits, temporary ditches will be required unless directed otherwise by the Program Manager. Positive drainage at the site must be maintained at all times.

152-2.2 Excavation. No excavation shall be started until the work has been staked out by the Contractor and the Program Manager has obtained from the Contractor, the survey notes of the elevations and measurements of the ground surface. The Contractor and Program Manager shall agree that the original ground lines shown on the original topographic mapping are accurate or agree to any adjustments made to the original ground lines.

Digital terrain model (DTM) files of the existing surfaces, finished surfaces and other various surfaces were used to develop the design plans.

Volumetric quantities were calculated by comparing DTM files of the applicable design surfaces and generating Triangle Volume Reports. Electronic copies of DTM files and a paper copy of the original topographic map will be issued to the successful bidder.

Existing grades on the design cross sections or DTM's, where they do not match the locations of actual spot elevations shown on the topographic map, were developed by computer interpolation from those spot elevations. Prior to disturbing original grade, Contractor shall verify the accuracy of the existing ground surface by verifying spot elevations at the same locations where original field survey data was obtained as indicated on the topographic map. Contractor shall recognize that, due to the interpolation process, the actual ground surface at any particular location may differ somewhat from the interpolated surface shown on the design cross sections or obtained from the DTM's. Contractor's verification of original ground surface, however, shall be limited to verification of spot elevations as indicated herein, and no adjustments will be made to the original ground surface unless the Contractor demonstrates that spot elevations shown are incorrect. For this purpose, spot elevations which are within 0.1 foot of the stated elevations for ground surfaces, or within 0.04 foot for hard surfaces (pavements, buildings, foundations, structures, etc.) shall be considered "no change". Only deviations in excess of these will be considered for adjustment of the original ground surface. If Contractor's verification identifies discrepancies in the topographic map, Contractor shall notify the Program Manager in writing at least two weeks before disturbance of existing grade to allow sufficient time to verify the submitted information and make adjustments to the design cross sections or DTM's. Disturbance of existing grade in any area shall constitute acceptance by the Contractor of the accuracy of the original elevations shown on the topographic map for that area.

All areas to be excavated shall be stripped of vegetation and topsoil. Topsoil shall be stockpiled for future use in areas designated on the plans or by the Program Manager. All suitable excavated material shall be used in the formation of embankment, subgrade, or other purposes as shown on the plans. All unsuitable material shall be disposed of in Contractor furnished disposal areas off airport property.

The grade shall be maintained so that the surface is well drained at all times.

When the volume of the excavation exceeds that required to construct the embankments to the grades as indicated on the plans, the excess shall be used to grade the areas of ultimate development or disposed as directed by the Program Manager. When the volume of excavation is not sufficient for constructing the embankments to the grades indicated, the deficiency shall be obtained from borrow areas.

The Contractor shall perform all bracing, sheathing, or shoring necessary to implement and protect all excavations as required for safety, conformance to governing laws, or to prevent damage to surrounding items or features. The cost of said bracing, sheathing, and shoring shall be included in the unit price bid for the item requiring excavation.

In pavement areas of any type to be removed and replaced, the existing pavement shall be sawed full-depth along the limits of construction. Existing free pavement edges shall be “nicked” as required to provide a straight vertical face. Pavement to be removed shall be carefully excavated to prevent damage to existing pavement to remain. The Contractor shall replace at this expense any pavement damaged outside the limits of demolition shown. The Contractor shall use a hoe-ram or other approved equipment for pavement demolition. The use of the crane and “head-ache” ball method of demolition is prohibited.

a. Selective grading. When selective grading is indicated on the plans, the more suitable material designated by the Program Manager shall be used in constructing the embankment or in capping the pavement subgrade. If, at the time of excavation, it is not possible to place this material in its final location, it shall be stockpiled in approved areas until it can be placed. The more suitable material shall then be placed and compacted as specified. Selective grading shall be considered incidental to the work involved. The cost of stockpiling and placing the material shall be included in the various pay items of work involved.

b. Undercutting. Rock, shale, hardpan, loose rock, boulders, or other material unsatisfactory for safety areas, subgrades, roads, shoulders, or any areas intended for turf shall be excavated to a minimum depth of 12 inches below the subgrade or to the depth specified by the Program Manager. Muck, peat, matted roots, or other yielding material, unsatisfactory for subgrade foundation, shall be removed to the depth specified. Unsuitable materials shall be disposed off the airport. The cost is incidental to this item. This excavated material shall be paid for at the contract unit price per cubic yard for “Undercut Excavation”. The excavated area shall be backfilled with suitable material obtained from the grading operations or borrow areas and compacted to specified densities. Borrow material or granular material used to backfill undercut areas will be measured for payment, if the undercut has been authorized by the Program Manager. Back filling of undercut areas with material obtained from grading operations (unclassified excavation) will not be measured for additional payment but considered incidental to grading operations.

Excessive moisture content alone shall not constitute a reason for classifying any material as unstable undercut excavation. Material that is too wet for compaction but otherwise suitable as determined by the Program Manager shall be aerated, dried, and compacted at Contractor's expense. Soils which become wet from percolation of ground water after drying may be considered for undercut excavation. The Contractor shall protect all subgrade and embankment areas from excessive moisture. Such protection may include, but is not limited to, providing positive drainage and sealing off the surface of embankment areas with a smooth wheeled roller prior to rain events. The cost of said protection will be incidental to the contract cost in embankments constructed under this project. Soils excavated due to percolation of ground water shall be dried and reused in the embankment or stockpiled on airport property as directed by the Program Manager.

c. Over-break. Over-break, including slides, is that portion of any material displaced or loosened beyond the finished work as planned or authorized by the Program Manager. All over-break shall be graded or removed by the Contractor and disposed of as directed by the Program Manager. The Program Manager shall determine if the displacement of such material was unavoidable and their own decision shall be final. Payment will not be made for the removal and disposal of over-break that the Program Manager determines as avoidable. Unavoidable over-break will be classified as “Unclassified Excavation.”

d. Removal of utilities. The removal of existing structures and utilities required to permit the orderly progress of work will be accomplished by the Contractor as indicated on the plans. All existing foundations shall be excavated at least 2 feet below the top of subgrade or as indicated on the plans, and the material disposed of as directed by the Program Manager. All foundations thus excavated shall be backfilled with suitable material and compacted as specified for embankment or as shown on the plans.

e. Bridge Lifts. In unstable subgrade excavation areas where continued excavation of unstable subgrade soil does not expose firm or stable materials, the exposed foundation materials shall be stabilized by placement of 24 inches maximum of granular backfill material meeting the requirements of Section 152-1.3. The bridge lift shall be compacted by making passes with a crawler tractor of comparable size to a caterpillar D-8 crawler with dozer blade. The bridge lift shall be continuously

compacted until sufficiently stable to support embankment construction equipment. The bridge lift shall be evaluated for stability by proof-rolling in the presence of the Program Manager.

152-2.3 Borrow excavation. There are no borrow sources within the boundaries of the airport property. The Contractor shall locate and obtain borrow sources, subject to the approval of the Program Manager. The Contractor shall notify the Program Manager at least 15 days prior to beginning the excavation so necessary measurements and tests can be made by the Program Manager. All borrow pits shall be opened to expose the various strata of acceptable material to allow obtaining a uniform product. Borrow areas shall be drained and left in a neat, presentable condition with all slopes dressed uniformly. Borrow areas shall not create a hazardous wildlife attractant.

152-2.4 Drainage excavation. Drainage excavation shall consist of excavating drainage ditches including intercepting, inlet, or outlet ditches; or other types as shown on the plans. The work shall be performed in sequence with the other construction. Ditches shall be constructed prior to starting adjacent excavation operations. All satisfactory material shall be placed in embankment fills; unsuitable material shall be placed in designated waste areas or as directed by the Program Manager. All necessary work shall be performed true to final line, elevation, and cross-section. The Contractor shall maintain ditches constructed on the project to the required cross-section and shall keep them free of debris or obstructions until the project is accepted.

152-2.5 Preparation of cut areas or areas where existing pavement has been removed (Subgrade Preparation). In those areas on which a subbase or base course is to be placed, the top 12 inches of subgrade shall be compacted to not less than 100% of maximum density for non-cohesive soils, and 97% of maximum density for cohesive soils as determined by ASTM D1557. As used in this specification, "non-cohesive" shall mean those soils having a plasticity index (PI) of less than 3 as determined by ASTM D4318.

Excavation required to expose the top of the 12” Subgrade Preparation Course shall be paid for as “Unclassified Excavation”. If, at the time of excavation, it is not possible to place this material in its final location, it shall be stockpiled in approved areas as directed by the Program Manager. The subsequent rehandling of such stockpiled material shall be paid for as “Stockpiled Material”.

152-2.6 Preparation of embankment area. All sod and vegetative matter shall be removed from the surface upon which the embankment is to be placed. The cleared surface shall be broken up by plowing or scarifying to a minimum depth of 6 inches and shall then be compacted per paragraph 152-2.10.

Sloped surfaces steeper than one (1) vertical to four (4) horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for the adjacent fill.

No direct payment shall be made for the work performed under this section. The necessary clearing and grubbing and the quantity of excavation removed will be paid for under the respective items of work.

152-2.7 Control Strip. The first half-day of construction of subgrade and/or embankment shall be considered as a control strip for the Contractor to demonstrate, in the presence of the Program Manager, that the materials, equipment, and construction processes meet the requirements of this specification. The sequence and manner of rolling necessary to obtain specified density requirements shall be determined. The maximum compacted thickness may be increased to a maximum of 12 inches upon the Contractor’s demonstration that approved equipment and operations will uniformly compact the lift to the specified density. The Program Manager must witness this demonstration and approve the lift thickness prior to full production.

Control strips that do not meet specification requirements shall be reworked, re-compacted, or removed and replaced at the Contractor’s expense. Full operations shall not begin until the control strip has been accepted by the Program Manager. The Contractor shall use the same equipment, materials, and construction methods for the remainder of construction, unless adjustments made by the Contractor are approved in advance by the Program Manager.

152-2.8 Formation of embankments. The material shall be constructed in lifts as established in the control strip, but not less than 6 inches nor more than 12 inches of compacted thickness.

When more than one lift is required to establish the layer thickness shown on the plans, the construction procedure described here shall apply to each lift. No lift shall be covered by subsequent lifts until tests verify that compaction requirements have been met. The Contractor shall rework, re-compact and retest any material placed which does not meet the specifications.

The lifts shall be placed, to produce a soil structure as shown on the typical cross-section or as directed by the Program Manager. Materials such as brush, hedge, roots, stumps, grass and other organic matter, shall not be incorporated or buried in the embankment.

Earthwork operations shall be suspended at any time when satisfactory results cannot be obtained due to rain, freezing, or other unsatisfactory weather conditions in the field. Frozen material shall not be placed in the embankment nor shall embankment be placed upon frozen material. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. The Contractor shall drag, blade, or slope the embankment to provide surface drainage at all times.

The material in each lift shall be within ±2% of optimum moisture content before rolling to obtain the prescribed compaction. The material shall be moistened or aerated as necessary to achieve a uniform moisture content throughout the lift. Natural drying may be accelerated by blending in dry material or manipulation alone to increase the rate of evaporation.

The Contractor shall make the necessary corrections and adjustments in methods, materials or moisture content to achieve the specified embankment density.

The Program Manager will take samples of excavated materials which will be used in embankment for testing to obtain a Moisture-Density Relations of Soils Report (Proctor) in accordance with ASTM D 1557. A new Proctor shall be obtained for each soil type based on visual classification.

Density tests will be taken by the Program Manager for every 3,000 square yards of compacted embankment for each lift which is required to be compacted, or other appropriate frequencies as determined by the Program Manager.

If the material has greater than 30% retained on the 3/4-inch (19.0 mm) sieve, follow AASHTO T-180 Annex Correction of maximum dry density and optimum moisture for oversized particles.

Rolling operations shall be continued until the embankment is compacted to not less than 100% of maximum density for non-cohesive soils, and 95% of maximum density for cohesive soils as determined by ASTM D1557. Under all areas to be paved, the embankments shall be compacted to a depth of 12” and to a density of not less than 97% of the maximum density as determined by ASTM D1557. As used in this specification, "non-cohesive" shall mean those soils having a plasticity index (PI) of less than 3 as determined by ASTM D4318.

On all areas outside of the pavement areas, no compaction will be required on the top 4 inches which shall be prepared accordance with Item T-905.

The in-place field density shall be determined in accordance with ASTM D1556, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. The Program Manager shall perform all quality assurance density tests; Contractor is responsibility for quality control testing. If the specified density is not attained, the area represented by the test or as designated by the Program Manager shall be reworked and/or re-compacted and additional random tests made. This procedure shall be followed until the specified density is reached.

Compaction areas shall be kept separate, and no lift shall be covered by another lift until the proper density is obtained.

During construction of the embankment, the Contractor shall route all construction equipment evenly over the entire width of the embankment as each lift is placed. Lift placement shall begin in the deepest portion of the embankment fill. As placement progresses, the lifts shall be constructed approximately parallel to the finished pavement grade line.

When concrete pavement, asphalt pavement, and other embankment material are excavated at approximately the same time as the subgrade, the material shall be incorporated into the outer portion of the embankment and the subgrade material shall be incorporated under the future paved areas.

Stones, fragmentary rock, and recycled pavement larger than 1 inch in their greatest dimensions will not be allowed in the top 12 inches of the subgrade. Cement concrete pavement, asphalt pavement, and other embankment material shall not be disposed of except at places and in the manner designated on the plans or by the Program Manager.

There will be no separate measurement of payment for compacted embankment. All costs incidental to placing in lifts, compacting, discing, watering, mixing, sloping, and other operations necessary for construction of embankments will be included in the appropriate contract price for excavation, borrow, or other items.

152-2.9 Proof rolling. The purpose of proof rolling the subgrade is to identify any weak areas in the subgrade and not for compaction of the subgrade. Before start of embankment, the subgrade area shall be proof rolled with a 20-ton Tandem axle Dual Wheel Dump Truck loaded to the legal limit with tires inflated to 80/100/150 psi (or approved equal) in the presence of the Program Manger. Apply a minimum of one coverage, or as specified by the Program Manager, under pavement areas. A coverage is defined as the application of one tire print over the designated area. Soft areas of subgrade that deflect more than 1 inch or show permanent deformation greater than 1 inch shall be removed and replaced with suitable material or reworked to conform to the moisture content and compaction requirements in accordance with these specifications. Removal and replacement of soft areas is incidental to this item.

152-2.10 Compaction requirements. The subgrade under areas to be paved shall be compacted to a depth of 12 inches and to a density of not less than 97 percent of the maximum dry density as determined by ASTM D1557. The subgrade in areas outside the limits of the pavement areas shall be compacted to a depth of 12 inches and to a density of not less than 95 percent of the maximum density as determined by ASTM D1557.

The material to be compacted shall be within ±2% of optimum moisture content before being rolled to obtain the prescribed compaction (except for expansive soils). When the material has greater than 30 percent retained on the ¾ inch sieve, follow the methods in ASTM D1557 for correction of maximum dry density and optimum moisture for oversized particles. Tests for moisture content and compaction will be taken at a minimum of 3,000 square yards of subgrade. All quality assurance testing shall be done by the Program Manager.

The in-place field density shall be determined in accordance with ASTM D1556 and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938 within 12 months prior to its use on this contract. The gage shall be field standardized daily.

Density tests will be taken by the Program Manager every 3,000 square yards of completed subgrade. If a nuclear gage is used for density determination, two random readings shall be made for each 3,000 square yards.

Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

If the specified density is not attained, the entire lot shall be reworked and/or re-compacted and additional random tests made. This procedure shall be followed until the specified density is reached.

All cut-and-fill slopes shall be uniformly dressed to the slope, cross-section, and alignment shown on the plans or as directed by the Program Manager and the finished subgrade shall be maintained.

152-2.11 Finishing and protection of subgrade. Finishing and protection of the subgrade is incidental to this item. Grading and compacting of the subgrade shall be performed so that it will drain readily. All low areas, holes or depressions in the subgrade shall be brought to grade. Scarifying, blading, rolling and other methods shall be performed to provide a thoroughly compacted subgrade shaped to the lines and grades shown on the plans. All ruts or rough places that develop in the completed subgrade shall be graded, re-compacted, and retested. The Contractor shall protect the subgrade from damage and limit hauling over the finished subgrade to only traffic essential for construction purposes.

The Contractor shall maintain the completed course in satisfactory condition throughout placement of subsequent layers. No subbase, base, or surface course shall be placed on the subgrade until the subgrade has been accepted by the Program Manager.

152-2.12 Haul. All hauling will be considered a necessary and incidental part of the work. The Contractor shall include the cost in the contract unit price for the pay of items of work involved. No payment will be made separately or directly for hauling on any part of the work.

The Contractor's equipment shall not cause damage to any excavated surface, compacted lift or to the subgrade as a result of hauling operations. Any damage caused as a result of the Contractor's hauling operations shall be repaired at the Contractor's expense.

The Contractor shall be responsible for providing, maintaining and removing any haul roads or routes within or outside of the work area, and shall return the affected areas to their former condition, unless otherwise authorized in writing by the Owner. No separate payment will be made for any work or materials associated with providing, maintaining and removing haul roads or routes.

152-2.13 Surface Tolerances. In those areas on which a subbase or base course is to be placed, the surface shall be tested for smoothness and accuracy of grade and crown. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be scarified to a depth of at least 3 inches, reshaped and re-compacted to grade until the required smoothness and accuracy are obtained and approved by the Program Manager. The Contractor shall perform all final smoothness and grade checks in the presence of the Program Manager. Any deviation in surface tolerances shall be corrected by the Contractor at the Contractor's expense.

a. **Smoothness.** The finished surface shall not vary more than +/- ½ inch when tested with a 12-foot straightedge applied parallel with and at right angles to the centerline. The straightedge shall be moved continuously forward at half the length of the 12-foot straightedge for the full length of each line on a 50-foot grid.

b. **Grade.** The grade and crown shall be measured on a 50-foot grid and shall be within +/-0.05 feet of the specified grade.

On safety areas, turfed areas and other designated areas within the grading limits where no subbase or base is to placed, grade shall not vary more than 0.10 feet from specified grade. Any deviation in excess of this amount shall be corrected by loosening, adding or removing materials, and reshaping.

152-2.14 Topsoil. When topsoil is specified or required as shown on the plans or under Item T-905, it shall be salvaged from stripping or other grading operations. The topsoil shall meet the requirements of Item T-905. If, at the time of excavation or stripping, the topsoil cannot be placed in its final section of finished construction, the material shall be stockpiled at approved locations. Stockpiles shall be located as shown on the plans and the approved CSPP, and shall not be placed on areas that subsequently will require any excavation or embankment fill. If, in the judgment of the Project Manager, it is practical to place the salvaged topsoil at the time of excavation or stripping, the material shall be placed in its final position without stockpiling or further re-handling.

Upon completion of grading operations, stockpiled topsoil shall be handled and placed as shown on the plans and as required in Item T-905. Topsoil shall be paid for as provided in Item T-905. No direct payment will be made for topsoil under Item P-152.

152-2.15 Cold Milling. Milling shall be performed with a power-operated milling machine or grinder, capable of producing a uniform finished surface. The milling machine or grinder shall operate without tearing or gouging the underlaying surface. The milling machine or grinder shall be equipped with grade and slope controls, and a positive means of dust control. All millings shall be removed and disposed off Airport property. If the Contractor mills or grinds deeper or wider than the plans specify, the Contractor shall replace the material removed with new material at the Contractor's Expense.

METHOD OF MEASUREMENT

152-3.1 UNCLASSIFIED EXCAVATION (EARTHWORK). Unclassified excavation (earthwork) shall be measured by the cubic yard and shall be computed by the average end areas of design cross sections or the comparison of digital terrain model (DTM) surfaces for computation of neat line design quantities. The end area is that bound by the original ground line established by field cross-sections and the final theoretical pay line established by cross-sections shown on the plans, subject to verification by the Program Manager.

152-3.2 UNDERCUT EXCAVATION AND UNSUITABLE MATERIALS EXCAVATION. The quantity of undercut excavation and unsuitable materials excavation shall be the number of neat cubic yards measured of the undercut area or unsuitable material area as designated by the Program Manager in its original position, excavated and properly disposed of.

152-3.3 EMBANKMENT. The quantity of embankment in place shall be the number of cubic yards measured in its final position.

152-3.4 PAVEMENT EXCAVATION. Pavement excavation, as defined in Section 152-1.2(f), will be paid on the basis of the number of square yards of the various types specified, measured in its original position. Pavement excavation shall be full depth and shall include bituminous courses, portland concrete courses, stabilized and/or un-stabilized base courses and stabilized and/or un-stabilized subbase courses.

152-3.6 GRANULAR STONE BACKFILL. The granular stone backfill to be measured and paid for shall be the number of cubic yards measured in its final position as approved and accepted by the Program Manager.

BASIS OF PAYMENT

152-4.1 UNCLASSIFIED EXCAVATION. For "Unclassified Excavation (Earthwork)" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, water, labor, surveying, equipment, maintenance of drainage across construction phase lines, tools, hauling, and incidentals necessary to complete the item.

152-4.2 UNDERCUT EXCAVATION AND UNSUITABLE MATERIALS EXCAVATION. For "Undercut Excavation" and for “Unsuitable Materials Excavation” payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for all materials, equipment, labor, tools and incidentals necessary to complete the item and dispose of material off airport property regardless of the depth encountered. Only the areas authorized by the Program Manager shall be paid for.

152.4.3 EMBANKMENT IN PLACE. For "Embankment in Place", payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item..

152.4.4 PAVEMENT EXCAVATION, FULL DEPTH ASPHALT SHOULDER. For "Pavement Excavation, Full Depth Asphalt Shoulder", payment shall be made at the contract unit price per square yard of the various types of pavements. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to excavate, load, transport and dispose of the material off site, including any tipping or dump fees.

152-4.5 PAVEMENT EXCAVATION, FULL DEPTH AIRFIELD PORTLAND CEMENT CONCRETE PAVEMENT. For "Pavement Excavation, Full Depth Airfield Portland Cement Concrete Pavement", payment shall be made at the contract unit price per square yard of the various types of pavements. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to excavate, load, transport and dispose of the material off site, including any tipping or dump fees.

152-4.6 GRANULAR STONE BACKFILL. For “Granular Stone Backfill”, payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, water, labor, surveying, equipment, tools, hauling and incidentals necessary to complete this item.

Payment will be made under:

Item P-152-4.01	Unclassified Excavation, per cubic yard
Item P-152-4.02	Undercut Excavation and Disposal, per cubic yard
Item P-152-4.03	Embankment in place, per cubic yard
Item P-152-4.04	Pavement Excavation, full depth asphalt taxiway shoulder, per square yard
Item P-152-4.05	Pavement Excavation, full depth airfield Portland cement concrete pavement, per square yard
Item P-152-4.06	Granular stone backfill for undercut and unsuitable material, per cubic yard

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO T-180	Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop

ASTM International (ASTM)

ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3))
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2700 kN-m/m^3))
ASTM D6938	Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

Advisory Circulars (AC)

AC 150/5370-2	Operational Safety on Airports During Construction Software

Software

FAARFIELD – FAA Rigid and Flexible Iterative Elastic Layered Design

U.S. Department of Transportation

FAA RD-76-66	Design and Construction of Airport Pavements on Expansive Soils

END OF ITEM P-152