CITY OF SAN ANGELO

ITEM 132

EMBANKMENT

132.1 DESCRIPTION.

This Item shall govern for the placement and compaction of all materials necessary for the construction of roadway embankments, levees, and dykes or any designated section of the roadway where additional material is required.

132.2 MATERIAL.

Materials may be furnished from required excavation in the areas shown in the Plans or from off right-of-way sources obtained by the Contractor and meeting the requirements herein. All embankment shall consist of suitable earth material such as rock, loam, clay, or other such materials as approved by the City that will form a stable embankment.

132.3 CONSTRUCTION METHODS.

(1) General. Prior to placing any embankment, all work in accordance with Part II – Construction Details, Item 100, "Prepare Right-of-Way", shall have been completed on the areas over which the embankment is to be placed. Stump holes or other small excavation in the limits of the embankments shall be backfilled with suitable material and thoroughly tamped by approved methods before commencing embankment construction. The surface of the ground, including disk-loosened ground or any surface roughened by small washes or otherwise, shall be restored to approximately its original slope by blading or other methods. Where shown on the Plans or required by the City, the ground surface thus prepared shall be compacted by sprinkling and rolling.

The City shall be notified sufficiently in advance of opening any material source to allow performance of any required testing.

Unless otherwise shown on the Plans, the surfaces of unpaved areas (except rock) which are to receive embankment shall be loosened by scarifying to a depth of at least six inches. Hillsides shall be cut into steps before embankment materials are placed. Placement of embankment materials shall begin at the low side of hillside and slopes. Materials which have been loosened shall be recompacted simultaneously with the new embankment materials placed upon it. The total depth of loosened and new materials shall not exceed the permissible depth of the layer to be compacted.

Trees, stumps, roots, vegetation or other unsuitable materials shall not be placed in embankment.

Unless otherwise shown on the Plans, all embankments shall be constructed in layers approximately parallel to the finished grade of the roadbed.

Embankments shall be constructed to the grade sections shown on the Plans or as established by the City. Each section of the embankment shall correspond to the detailed section or slopes established by the City. After completion of the roadway, it shall be continuously maintained to its finished section and grade until the project is accepted.

(2) Constructing Embankments.

(a) Earth Embankments: Earth embankments shall be defined as those composed principally of material other than rock, and shall be constructed of acceptable material from approved sources.

Unless otherwise specified, earth embankments shall be constructed in successive layers for the full width of the individual roadway cross section and in such lengths as are best suited to the sprinkling and compacting methods utilized.

Layers of embankment may be formed by utilizing equipment and methods which will evenly distribute the material.

A minor quantity of rock or broken concrete encountered in the construction of this project may be incorporated in the lower layers of the embankment if acceptable to the City. Or, it may be placed in the deeper fills, in accordance with the requirements for the construction of rock embankments, provided such placement of rock is not immediately adjacent to structures or in areas where bridge foundations are to be constructed. Also, rock or broken concrete may be placed in the portions of embankments outside the limits of the completed roadbed width where the size of the rock or broken concrete prohibits its incorporation in the normal embankment layers. All exposed reinforced steel shall be cut and removed from the broken concrete.

Each layer of embankment shall be uniform as to material, density and moisture content before beginning compaction. Where layers of unlike materials abut each other, each layer shall be featheredged for at least 100 feet, or the material shall be so mixed as to prevent abrupt changes in the soil. No material placed in the embankment by dumping in a pile or windrow shall be incorporated in a layer in that position, but all such piles or windrows shall be moved by blading or similar methods. Clods or lumps of material shall be broken and the embankment material mixed by blading, harrowing, disking or similar methods until a uniform material of uniform density is achieved in each layer.

It shall be the responsibility of the Contractor to secure a uniform moisture content throughout the layer by such methods as may be necessary.

(b) Embankment Adjacent to Culverts: As a general practice, embankment material placed adjacent to any portion of any structure and in the first two (2) layers above the top of any culvert or similar structure shall be free of any appreciable amount of gravel or stone particles more than four inches in greatest dimension and of such gradation as to permit thorough compaction. When, in the opinion of the City, such material is not readily available, the use of rock or gravel mixed with earth will be permitted, in which case no particle larger than 12 inches in greatest dimension and six (6) inches in least dimension may be used. The percentage of fines shall be sufficient to fill all voids and insure a uniform and thoroughly compacted mass of proper density.

(3) Compaction Method. Compaction of embankments shall be by "Ordinary Compaction" or "Density Control" as shown on the Plans.

(a) Ordinary Compaction. When "Ordinary Compaction" is shown on the Plans, the following provisions shall govern:

Each layer shall not exceed eight (8) inches of loose depth, unless otherwise directed by the City. Each layer shall be compacted in accordance with the provisions governing the Item or Items of "Rolling". Unless otherwise specified on the Plans, the rolling equipment shall be as approved by the City. Compaction shall continue until there is no evidence of further compaction. Prior to and in conjunction with the rolling operation, each layer shall be brought to the moisture content directed by the City, and shall be kept leveled with suitable equipment to insure uniform compaction over the entire layer. Should the subgrade, for any reason or cause, lose the required stability or finish, it shall be recompacted and finished at the Contractor's expense.

(b) Density Control. When "Density Control" is shown on the Plans, the following provisions shall apply:

Each layer shall be compacted to the required density by any method, type and size of equipment which will give the required compaction. The depth of layers, prior to compaction, shall depend upon the type of sprinkling, mixing and compacting equipment used. However, maximum depth (16 inches loose and 12 inches compacted) shall not be exceeded unless approved by the City. Prior to and in conjunction with the rolling operation, each layer shall be brought to the moisture content necessary to obtain the required density and shall be kept leveled with suitable equipment to insure uniform compaction over the entire layer.

Each layer shall be sprinkled and compacted to the extent necessary to provide the density specified below, unless otherwise shown on the Plans.

DESCRIPTION	DENSITY, PERCENT	MOISTURE
Non-Swelling Soils with plasticity index less than 20	Not less than 95	+/- 2% of optimum
Swelling soils with plasticity index of 20 to 35	Not less than 95	+/- 2% of optimum
Swelling soils with plasticity index over 35	Not less than 95	+/- 2% of optimum

The density determination will be made in accordance with Test Method Tex-114-E / ASTM D 698.

Field density determination by nuclear gage will be made in accordance with Test Method Tex-115-E / ASTM D 2922 for field density and ASTM D 3017 for moisture content.

After each layer of earth embankment is complete, tests as necessary may be made by the City. When the material fails to meet the density requirements or should the material lose the required stability, density, moisture or finish before the next course is placed or the project is accepted, the

layer shall be reworked as necessary to obtain the specified compaction, and the compaction method shall be altered on subsequent work to obtain specified density. Such procedure shall be subject to the approval of the City.

Excessive loss of moisture shall be construed to exist when the subgrade soil moisture content is four percent less than the optimum.

The Contractor may be required to remove a small area of the layer in order to facilitate the taking of density tests. Replacement and compaction of the removed material in the small area shall be at the Contractor's expense.

132.4 TOLERANCES.

The tolerances shall be as follows:

(1) Grade Tolerances.

(a) Stage Construction: Any deviation in excess of 0.1 foot in cross section and 0.1 foot in 16 feet measured longitudinally shall be corrected by loosening, adding or removing the material, reshaping and recompacting by sprinkling and rolling.

(b) Turnkey Construction: Any deviation in excess of 1/2 inch in cross section and 1/2 inch in 16 feet measured longitudinally shall be corrected by loosening, adding or removing the material, reshaping and recompacting by sprinkling and rolling.

(2) Density Tolerances. The City may accept the work provided not more than one out of the most recent three (3) density tests performed is outside the specified density and provided that the failing test is no more than three (3) pounds per cubic foot outside the specified density.

132.5. MEASUREMENT.

This Item will be measured as follows:

(1) General. Shrinkage or swellage factors will not be considered in determining the calculated quantities.

(2) Class 1. Embankment will be measured in its original, natural position, and the volume computed in cubic yards by the method of average end area.

(**3) Class 2.** Embankment will be measured by the cubic yard in vehicles as delivered on the road.

(4) Class 3. Is a Plans quantity measurement Item and the quantity to be paid for will be that quantity shown in the proposal and on the "Estimate and Quantity" sheet of the contract Plans, except as may be modified by General Note. If no adjustment of quantities is required, additional measurements or calculations will not be required.

132.6. PAYMENT.

The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “Embankment”, of the compaction method, type and class specified. This price shall be full compensation for furnishing embankment; for hauling; for placing, compacting, finishing and reworking; and for all labor, royalty, tools, equipment and incidentals necessary to complete the work.

When “Ordinary Compaction” is shown on the Plans, all sprinkling and rolling will not be paid for directly, but will be considered subsidiary to this Item, unless shown on the Plans.

When “Density Control” is shown on the Plans, all sprinkling and rolling will be considered subsidiary to this Item.

When subgrade is constructed under this project, correction of soft spots in the subgrade will be at the Contractor's expense.