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Design Standards

Section 3

Earthwork

SECTION 111

EARTHWORK

3-1 GENERAL

This section defines the requirements for excavation and backfill for structures, construction requirements for embankments and fills and sub-grade preparation for pavements and other surface improvements.

3-2 STRUCTURES

3-2.1 EXCAVATION FOR STRUCTURES. All structures shall be founded on undisturbed original subsoil. All unauthorized excavation below the specified structure sub-grade shall be replaced with concrete, monolithic with that of the slab above or with untreated base course thoroughly compacted into place. Sub-grade soil for all concrete structures, regardless of type or location, shall be firm, dense, thoroughly compacted and consolidated.

Course gravel or crushed stone may be used for subsoil reinforcement when approved by the City Engineer. Such material shall be applied in six inch layers, each layer being embedded in the subsoil by thorough tamping. All excess soil shall be removed to compensate for the displacement of the gravel or crushed stone and the finished elevation of any subsoil reinforced in this manner shall not be above the specified sub-grade.

3-2.2 BACKFILL AROUND STRUCTURES. Backfill around shall be placed to the lines shown on the approved drawings, or as directed. After completion of foundation footings and walls and other construction below the elevation of the final grades, and prior to backfilling, all forms shall be removed and the excavation shall be cleaned of all trash and debris. Materials for backfilling shall consist of excavated material or clean borrow material consisting of sand, gravel or other suitable material, and shall be placed in layer not exceeding six inches in compacted thickness. Each layer shall be compacted by hand or machine tampers or by other suitable equipment to a density equal to 95 percent of maximum density as measured by AASHTO T-99 method of compaction.

3-3 CONSTRUCTION OF EMBANKMENTS AND FILLS

Unsuitable materials that occur in the foundations for embankments and fills shall be removed by clearing, stripping and/or grubbing. Soils used as embankment material shall be A-4 Classification or better as detailed in Table II. All materials in embankment and fills shall be placed, moistened, and compacted as provided in the following paragraphs.

When the embankment or fill exceeds the amount of excavation, sufficient additional material shall be obtained from borrow pits provided by the contractor. All material proposed to be imported shall be subject to the review and approval of the Engineer prior to starting of hauling operations. The materials used for embankment and fill construction shall be free from sod, grass, trash, rocks larger than six (6) inches in diameter, and all other material unsuitable for construction of compacted fills.

Grading of completed embankments and fills shall bring the surfaces to a smooth, uniform condition with final grades being within 0.1 feet of the design grade. Roadway cuts generally should not exceed fifteen feet with maximum slopes of 1 1/2': 1.

3-3.1 COMPACTING EARTH MATERIALS. Fill material shall be compacted to a final density of not less than ninety percent of the AASHTO T-99 maximum laboratory density up within two feet of final grade and 95 percent maximum density in the top two feet. Permission to use specific compaction equipment or means shall not be construed as guaranteeing compaction or implying that compaction efforts will not result in damage to improvements. The Contractor shall make his own determination in this and produce a final product compacted to required density.

If mechanical densification is used, the material shall be deposited in horizontal layers having a thickness of not more than twelve inches in compacted thickness as herein specified.

Prior to and during compaction operations, the material shall have the optimum moisture content required for the purpose of compaction and the moisture content shall be uniform throughout the layers, insofar as practicable. If the moisture content is more than optimum for compaction, the compaction operations shall be delayed until such time as the material has dried to the optimum moisture content. When the material has been conditioned as hereinbefore specified, the backfill or embankment shall be compacted as follows:

(1) Under Roadways and extending one foot beyond the proposed curb line the fill or embankment material shall be compacted to a density equal to not less than 95% of maximum dry density as measured by AASHTO 1-99 method of compaction.

(2) Under Sidewalks and Driveways the fill or embankment material (to at least one foot each side of the edge of the slab) shall be compacted to a density equal to not less than 95% of maximum dry density as measured by AASHTO T-99 Method of Compaction.

TABLE 11

Soils Classification Charts for Embankment Materials

HIGHWAY RESEARCH BOARD CLASSIFICATION OF SUB-GRADE MATERIALS

You may review this table in the City Office.

See Kanab City for Subgrades and Pavement Thickness

3-4 ROAD SUB-GRADE PREPARATION

In both cut and fill areas the paving sub-grade shall be scarified to a depth of eight inches and compacted to the equivalent of 95 percent of maximum dry density as measured by AASHTO T-99. No rocks larger than two inches in diameter, organic material, soft clay, spongy material or other deleterious material will be permitted in the sub-grade. Sub-grades shall be shaped and graded to within a tolerance of 0.10 feet of design grade, and drainage shall be maintained at all times. Sub-grade shall be stabilized and compacted as directed by the Engineer. Any springs or underground water encountered in the construction of the streets will be properly disposed of in accordance with the instructions of the City Engineer.

3-5 QUALITY CONTROL

To demonstrate stability and compaction of sub-grade, the Contractor, immediately prior to laying base gravel, will proof roll the subbase as follows:

Before the placing of any type of hard surfacing on the finished sub-grade, such sub-grade shall be proof rolled with at least one pass or coverage for its full width and length with a self-propelled pneumatic roller. Ground contact pressure of all tires shall be 89-90 psi.

When the proof rolling shows an area to be unstable, it shall be brought to satisfactory stability by additional compaction, reworking, or removal of unsuitable material and replacement with acceptable material.

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