



VELASCO DRAINAGE DISTRICT
Standard Specification:

Embankment

Revision Control

Revision Number	Date	Author
1.0 – Approved for use	11/07/2017	DBR – District Engineer

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1.0 Scope and Discussion

- 1.1 The work of this Section includes all earthwork operations for constructing embankments for the levees and wave barriers in the Freeport, and Vicinity, Hurricane Flood Protection System for the Velasco Drainage District.
- 1.2 The source of proposed material shall be identified and a Moisture Density Relationship shall be developed for use in quality control testing. Compliance with this specification shall be demonstrated by a record of field density and moisture content testing which adequately represents at least 80% of the work performed.
- 1.3 Provide warnings, signs, lights, barricades, and other safety features as necessary to ensure the safety of all traffic, regardless of kind.
- 1.4 Prior to earthwork operations, existing facilities and permanent objects above or below ground shall be located and adequately protected from damage.
- 1.5 The Contractor shall execute all work so as to continually maintain adequate drainage of the site.
- 1.6 The following specifications and standards of latest edition, including the amendments, addenda, and errata, listed herein form a part of this Section to the extent indicated by references thereto:

American Society for Testing and Materials (ASTM)

ASTM D 698	Moisture-Density Relations of Soils Using a 5.5 Lb. Rammer and a 12-Inch Drop
ASTM D 2922	Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 2487	Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 1140	Test Method for Material Finer than No 200 Sieve
ASTM D 4318	Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils

2.0 Materials

- 2.1 Satisfactory materials include materials classified as medium stiff, or very stiff CL, or CH clays (Liquid Limit, $LL \leq 65$) (Plastic Index, $PI \geq 15$). Satisfactory materials shall be free from roots, brush, sod, and other perishable materials.
- 2.2 Materials classified as SM, SP, SC, CL-ML, PT, OH, OL, and ML or material containing roots, brush, sod, or other perishable material shall be considered unsatisfactory materials.
- 2.3 Materials will be classified by a Testing Laboratory approved by the District in conformance to ASTM D 2487. Excavated materials from the project site may be utilized in the construction of embankments, provided these materials conform to the applicable requirements.

3.0 Embankment Construction:

- 3.1 All embankment foundation areas shall be stripped as indicated on the Drawings and as specified. After stripping the foundations in the areas specified, holes and other similar cavities or depressions shall be broken down, where so directed, to flatten out the slopes.
- 3.2 The surface of levees to receive embankment shall be loosened by scarifying or plowing to a depth of not less than four inches (4"). Before embankment materials are placed on existing levee slopes, cut keys or bench into slope in compliance. The embankment shall then be placed in layers, as hereinafter specified, beginning at the low side in part width layers and increasing the widths as the embankment is raised. The material which has been loosened shall be re-compacted simultaneously with the embankment material placed at the same elevation. See Exhibit 8.
- 3.3 The levees shall be constructed of satisfactory material as defined and obtained from borrow areas.
- 3.4 Levees shall be constructed to the lines and grades shown on the Drawings, or if no drawings, then a seaward side slope of 6 horizontal to 1 vertical and a landside side slope of 3 horizontal to 1 vertical shall be maintained. Satisfactory materials as defined herein shall be used as fill (3.5H:1V preferred).

In areas where fill must be placed over unstable subgrade, the thickness of the initial layer may be increased as required to operate construction equipment. When placing fill, dump and spread from the center of the embankment toward the outside edges so that any soft material will be progressively forced outward from the center. Soft material entrapped within the base of the embankment shall be removed, if the extent of the soft material

will jeopardize stability of the embankment.

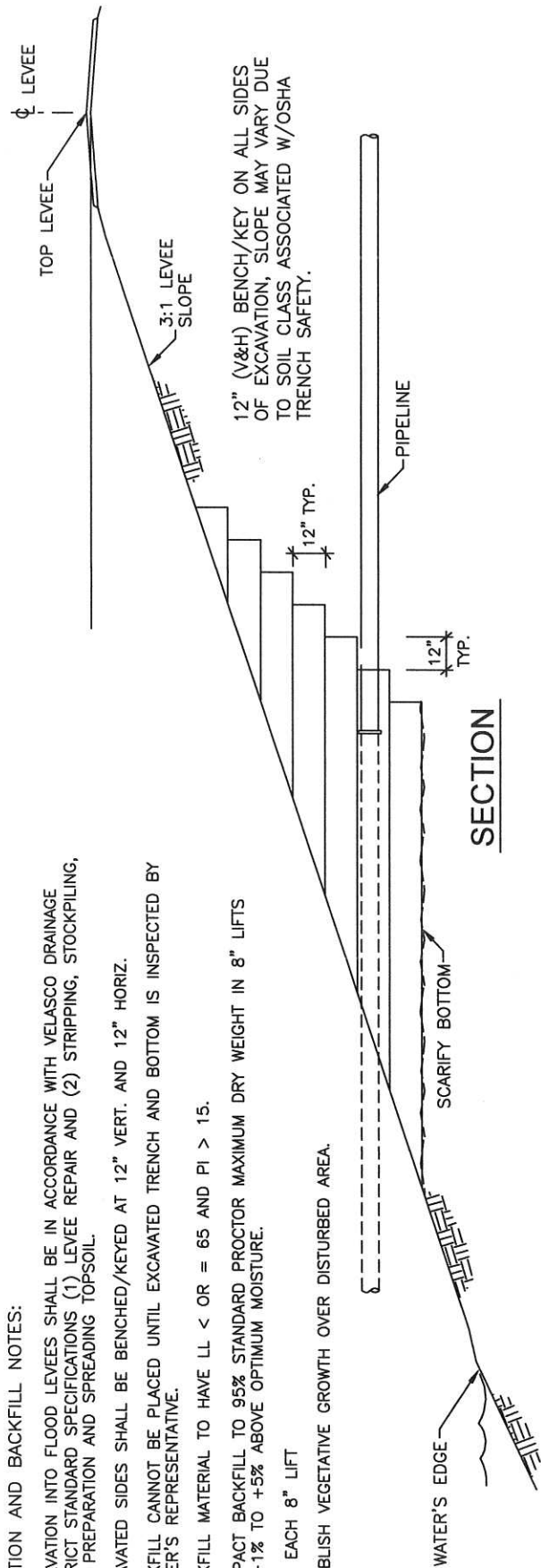
Each layer of embankment shall be uniform as to material, density, and moisture content before beginning compaction. Where layers of unlike materials abut each other, each layer shall be feather edged for at least 100 feet or the material shall be so mixed as to prevent abrupt changes in the soil. No 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 to the end that a uniform material and/or uniform density is secured in each layer. Water required for sprinkling to bring the material to the moisture content necessary for compaction shall be evenly applied and it shall be the responsibility of the CONTRACTOR to secure a uniform moisture content throughout the layer by such methods as may be necessary.

- 3.5 Each layer shall be compacted to 95% of the maximum density determined by Standard Proctor (ASTM D 698) at minus 1% to plus 5% of optimum moisture 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 and compacting equipment used, however, shall not exceed 12". Prior to and in conjunction with the compacting 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.
- 3.6 Except as otherwise specified herein, all levees shall be constructed to the net grade and cross-section shown on the Drawings, without the addition of allowance for shrinkage of the fill. A tolerance of 5/10 of 1-foot above the prescribed lines and grades will be allowed to accommodate the normal inaccuracies in earthwork construction.
- 3.7 In the event of sliding of any part of the embankment during its construction, or after its completion, but prior to its acceptance, that portion of the embankment shall be cut out, the slide removed from the embankment, and then rebuilt in accordance with these specifications.

END OF SPECIFICATION

EXCAVATION AND BACKFILL NOTES:

1. EXCAVATION INTO FLOOD LEEVES SHALL BE IN ACCORDANCE WITH VELASCO DRAINAGE DISTRICT STANDARD SPECIFICATIONS (1) LEVEE REPAIR AND (2) STRIPPING, STOCKPILING, SITE PREPARATION AND SPREADING TOPSOIL.
2. EXCAVATED SIDES SHALL BE BENCH/KEYED AT 12" VERT. AND 12" HORIZ.
3. BACKFILL CANNOT BE PLACED UNTIL EXCAVATED TRENCH AND BOTTOM IS INSPECTED BY OWNER'S REPRESENTATIVE.
4. BACKFILL MATERIAL TO HAVE LL < OR = 65 AND PI > 15.
5. COMPACT BACKFILL TO 95% STANDARD PROCTOR MAXIMUM DRY WEIGHT IN 8" LIFTS AT -1% TO +5% ABOVE OPTIMUM MOISTURE.
6. TEST EACH 8" LIFT
7. ESTABLISH VEGETATIVE GROWTH OVER DISTURBED AREA.



12" (V&H) BENCH/KEY ON ALL SIDES OF EXCAVATION, SLOPE MAY VARY DUE TO SOIL CLASS ASSOCIATED W/OSHA TRENCH SAFETY.

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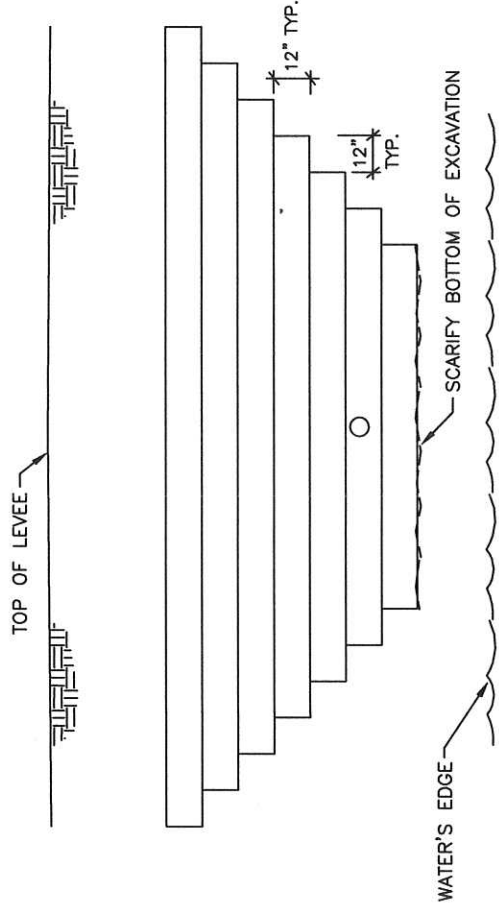


EXHIBIT - 8
(LOOKING INTO LEVEE)

EXCAVATION AND BACKFILL

N.T.S.

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