



VELASCO DRAINAGE DISTRICT
Standard Specification:

At Grade Pipe Crossing of Levee

Revision Control

Revision Number	Date	Revision Author
1.0 – Approved for use	11/01/2011	HSS – District Engineer
2.0	03/22/2016	HSS – District Engineer
3.0	11/07/2017	DBR – District Engineer

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1.0 Scope and Discussion

- 1.1 This specification shall govern work associated with at grade crossing on the Freeport, and Vicinity, Hurricane Flood Protection System (the “federal levee”).
- 1.2 This specification applies to routine levee repairs that do not involve raising the levee (other than a nominal amount for settlement) that does not require approval by the United States Army Corps of Engineers (USACE) as a Section 408 Review.
- 1.3 For projects requiring raising the levee, or other actions which trigger an USACE Section 408 Review as noted above, contact the Velasco Drainage District before detail planning for the work has begun, as permitting and design criteria will require substantial time when compared to a project without USACE Section 408 Review.
 - 1.3.1 In general, USACE Section 408 Review is triggered by a major action such as relocation of the levee or replacement of a levee component (such as sheet pile with an earthen levee).
 - 1.3.2 Section 408 reviews will add 30-240 days to project time line.
- 1.4 Design pipes to prevent (a) flotation if submerged, (b) scouring or erosion of the embankment slopes from leakage or currents through the use of rip rap in accordance with the standard specification and prevent damage from debris developing currents.

2.0 Site Preparation

- 2.1 Remove roots, organic material, asphalt, concrete and other miscellaneous debris for a strip equal to pipeline diameter plus five feet each side.
- 2.2 If over excavation is required (excavation below natural ground) or washouts below natural ground must be filled, fill with select material, free of organics, in 8" (nominal) lifts and compact to required density.
- 2.3 Proof roll to subgrade, or natural ground if on grade, and remove and replace soft or loose areas. Soils which rut, or deflect under moving load shall be undercut and replaced with select fill. Perform proof rolling in dry weather.

3.0 Levee Material

- 3.1 Refer to Velasco Drainage District Specification “Embankment” for soil classification and testing requirements. Structural fill for use in levee shall be tested by an acceptable geotechnical laboratory and shall be found to have the following properties.

- 3.1.1 Lean clay, free of organic or other deleterious materials; maximum clay lump size less than three inches.
- 3.1.2 Liquid Limit ≤ 65 , PI ≥ 15 (preferred)
- 3.1.3 Modify high Liquid Limit soils with lime, percentage of lime to be determined by geotechnical laboratory.

3.2 Do not use sand or sandy clay soils as levee fill.

4.0 Rip Rap under Pipeline

4.1 Install common Rip Rap, as described in the Rip Rap specification.

5.0 Piping Systems

5.1 Pipes passing over or within the levee freeboard zone of a levee should be limited to metal ductile iron or coated steel, with flexible couplings. Pipes over levee require air release valve and siphon break at crest.

5.2 Pipes with siphon breaker, and at elevation above freeboard, need not have positive closure.

5.2.1 If positive closure is required, provide on water side and provide access to the closure from levee crest.

6.0 Construction Methods

6.1 Install Riprap and Pipeline

6.1.1 Pipeline crossing over levees will require rather abrupt line grade changes at levee crest. Pipeline can cross crest inside appropriately sized casing. Ends of casing to be installed with waterproof seals.

6.1.2 If utility chooses to cover pipeline then: on levee slopes, cover the new pipeline by placing new fill uniformly on the slopes to slope away from the pipeline and parallel to the longitudinal axis of the levee. Compact according to specification. Provide a minimum of 3 feet of lean clay cover over the pipeline. The tapered longitudinal slope shall be tapered at 1V:20H or flatter. Replace grass, restore disturbed areas and reconstruct roadway.

6.2 Levee fill shall be compacted to at least 95% of standard Procter maximum dry density as

determined by ASTM D 698.

- 6.3 Place levee fill in maximum lifts of 8" of loose material and compact within the range of -1% to +5% above optimum moisture content value. If water must be added, uniformly apply and thoroughly mix into the soil by disking or scarifying.
- 6.4 Each structural lift is to be tested by a representative of the geotechnical engineer prior to constructing the subsequent lift.
- 6.5 To prevent a plane of failure between the existing levee and new levee fill, key or bench the repair section into the existing completed levee. "Step" excavation slope at minimum 1H:1V or greater to comply with OSHA safety criteria based on soil classification.

7.0 Sections

- 7.1 Maintain a maximum side slope, Protected Side of 3H:1V. (3.5H:1V is preferred)
- 7.2 Maintain maximum side slope, Flood Side of 6H:1V (for levees exposed seaward) or 3H:1V (3.5H:1V is preferred) for levees not subject to wave action.
- 7.3 Maintain the existing levee top width, reconstructed with similar materials if not earth.

8.0 Construction Documentation

8.1 Prior to Construction

- 8.1.1 Provide cross sections and plan view adequate to identify the repaired section on the ground and to show the side slopes. Note limits of repair, rip rap and other elements of the project. All designs shall have horizontal location based on NAD 83 and vertical based on NAVD 88.
- 8.1.2 Provide analysis and soil classification (Atterberg Limits) of proposed levee fill from geotechnical laboratory in conformance with ASTM D2487, ASTM 1140 and ASTM 4318.
- 8.1.3 All data and designs must bear seal of a Licensed Professional Engineer - Texas (LPE-T).

8.2 During Construction

- 8.2.1 Provide adequate supervision to accurately document that locations, elevations, etc. are incorporated in required testing and as built documentation and assure that all provisions are complied with during construction.

8.2.2 Assure that the selected geotechnical laboratory provides compaction and moisture testing as required by this Specification.

8.3 After Construction

8.3.1 Provide as built drawings, note any deviation from planned drawings as needed.

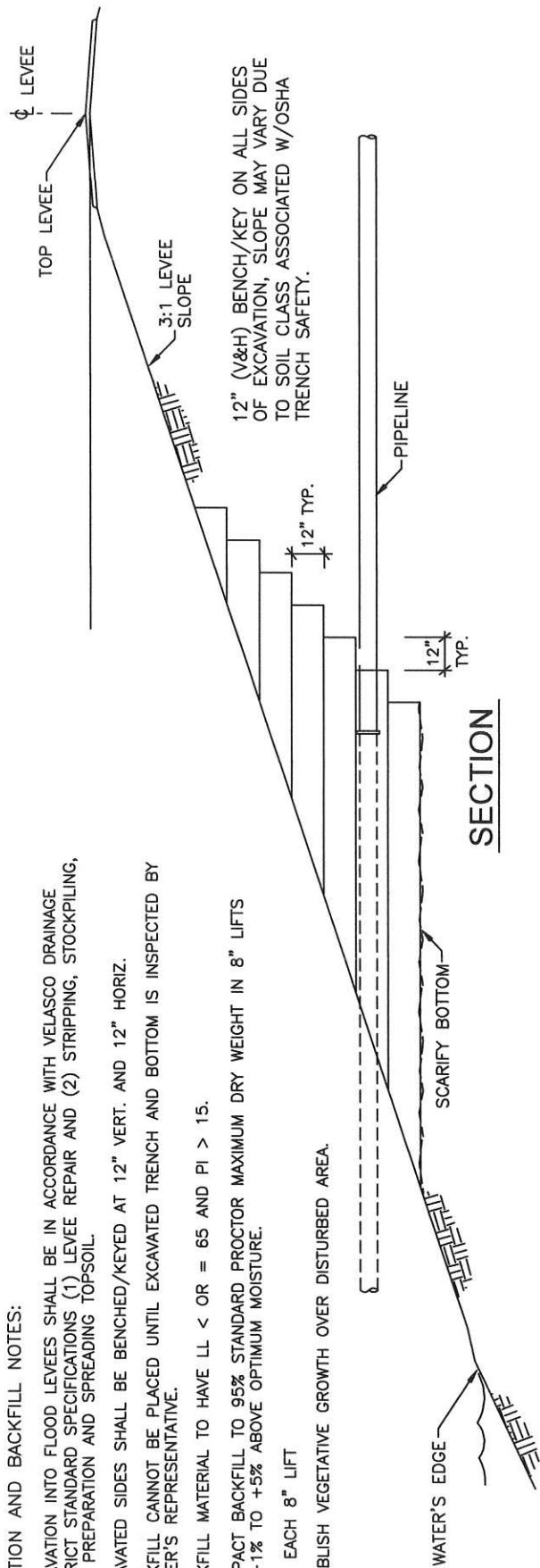
8.3.2 Provide all geotechnical test reports.

8.3.3 Assure that all submittals under Section 6.3 bear the seal of a Licensed Professional Engineer - Texas (LPE-T).

END OF SPECIFICATION

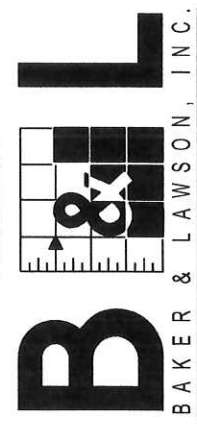
EXCAVATION AND BACKFILL NOTES:

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 BENCHED/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.

PREPARED BY:



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EXHIBIT - 8 (LOOKING INTO LEVEE)

EXCAVATION AND BACKFILL

N.T.S.