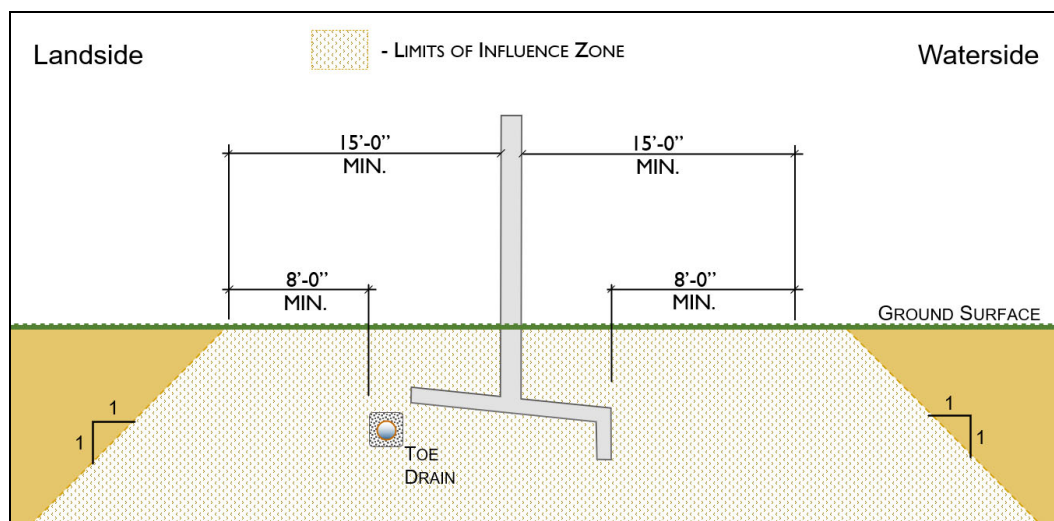
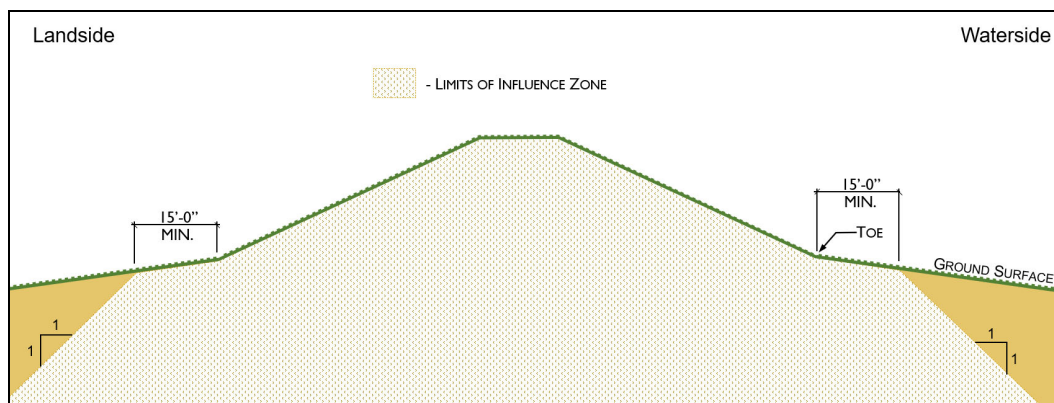


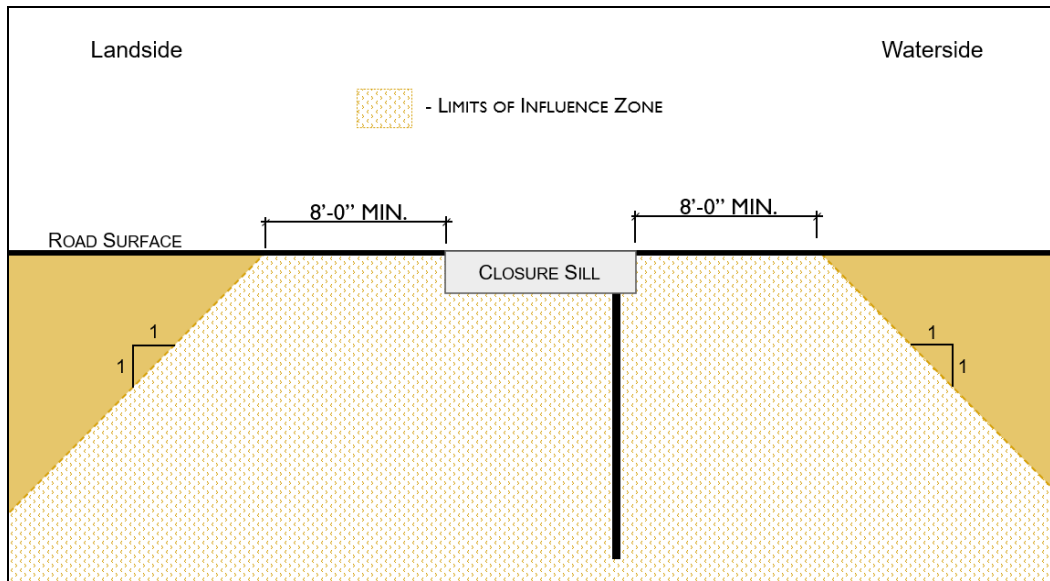


# STANDARD OPERATING PROCEDURE FOR GENERAL EARTHWORK ASSOCIATED WITH LEVEES

22 October 2021

The purpose of this SOP is to provide standards and procedures to ensure excavations near levees are properly executed and that levee systems remain structurally stable after an excavation entering the levee's Influence Zone (see figures) has been backfilled; this does not include soil test borings. While excavations outside the Influence Zone have little chance of causing destabilization of the levee, they may remove cohesive material acting as a confining layer (low-permeability soil over high-permeability sands and gravels) and must, at a minimum, be replaced in kind. Stability of an open excavation should be ensured by adhering to the requirements in OSHA's Safety and Health Regulations for Construction CFR 1926 Subpart P (also found in Section 25 of USACE's EM385-1-1), but approval by the Louisville District USACE is required before starting any earthwork within 50 feet of the levee system.





The following procedures must be followed when working within the levee's influence zone, but are also considered best practices for other locations:

- a) Clear, grub, and dispose of any woody or other undesirable vegetation prior to stripping the topsoil over the excavation area and stockpiling it for final grading.
- b) All excavated soil to be used as backfill must be protected from wetting or drying.
- c) No excavations within the Influence Zone of a floodwall or closure sill wider than a monolith width are allowed without properly designed bracing approved by the Louisville District USACE.
- d) If the excavation penetrates a cohesive layer overlying an aquifer/cohesionless stratum, the depth of the confining layer must be restored to no less than what was removed. *(This is particularly important on the landside where a reduction in thickness or loss of the confining layer could create a vulnerable exit location where seepage can initiate during high water events.)*
- e) The sides of an excavation in an area having a ground surface equal to or steeper than 3H:1V (typically within the levee embankment) must be benched into the exposed soil with level steps in preparation to receive the backfill. Excavations in areas having a ground surface flatter than 3H:1V need not be benched except as required by safety protocols in Appendix B of OSHA's CFR 1926 Subpart P.
- f) The exposed soil which will receive the backfill must not be allowed to become overly wet or dry. Over-excavation to suitable soil will be required immediately prior to backfilling if the exposed soil has become too wet or dry. Over-excavation back to stable, suitable soil is also required if the area shows signs of instability.
- g) It is typically expected that the excavated material will be used to backfill the excavation; however, if the excavated material is unsuitable as backfill (there is evidence of debris, excessive organics, etc.), then the imported backfill must have a hydraulic conductivity equal

to or less than the surrounding suitable soil, or less than  $1 \times 10^{-5}$  cm/sec in accordance with ASTM 2488, whichever is less permeable.

- h) If a portion of the excavation is to be backfilled with a cementitious material, it must conform to the requirements of "SOP - Controlled Low-Strength Material Backfill".
- i) Soil backfill shall be placed in loose lifts with thicknesses not to exceed 6 inches and compacted with a sheepsfoot roller (smooth rollers are not acceptable) to a minimum of 95 percent Standard Proctor density as determined at optimum moisture content according to ASTM D-698. Moisture control limits are to be within -1 to +3 percent of optimum. At least one compaction verification test per lift shall be performed and daily submittals provided to the Louisville District USACE.
- j) Earthwork plans and specifications for the project shall be submitted to the Louisville District for approval.
- k) Unless the disturbed area is to be paved, the stockpiled topsoil shall be used to bring the area to final grade with no less than 6 inches of thickness before seeding and covering with a bio-degradable geotextile secured per the manufacture's requirements.