

## MAINTENANCE AND OPERATION

1. Documentation of Pre and Post Construction conditions within the critical area of the levee.

1.1. The sponsor has the responsibility to ensure that all improvements that pass over, under or through the walls, levees, improved channels or floodways, or construction within the critical area of the project, or any change to any feature of the works do not take place without prior determination of the COE that the construction will not adversely affect the functioning of the facility. The sponsor also has the responsibility to ensure the construction is completed in accordance with the plans and specifications approved by the COE.

1.2. Title 33 - Navigation and Navigable Waters, Chapter II - Corps of Engineers, Department of the Army, Part 208 - Flood Control Regulations, Maintenance and Operation of Flood Control Works and ER 1130-2-530 (Project Operation), are the regulation that governs the maintenance and operation of Federal flood protection projects.

1.3. Time/Date Photographs. The sponsor should require the proponent of the proposed construction project to provide time/date photographs prior to and upon completion of the construction project. This will document the preconstruction and post-construction condition within the critical area of the levee and help verify that all areas within the critical area are restored to a satisfactory condition when construction is complete. The photographs should document the pre and post construction condition of the levee slope, levee crown, aggregate surfacing, slope protection, drainage systems, closure structures, relief wells, slope and staff gages, pumping plants, and all other appurtenances impacted by the construction. A copy of the photographs should be provided to the levee sponsor and the COE.

1.4. As-Built Drawings. The proponent will also provide as-built drawings of the completed construction project to the levee sponsor and the COE to document a permanent record of the new construction.

2. Seeding and Mulching Criteria. Seeding and Mulching considerations include the recommended seeding and mulching specification and allowable seeding time frames for reestablishing adequate sod cover on the levee slope and crown disturbed by the proposed modification.

2.1. Title 33 - Navigation and Navigable Waters, Chapter II - Corps of Engineers, Department of the Army, Part 208 - Flood Control Regulations, Maintenance and Operation of Flood Control Works and ER 1130-2-530 (Project Operation), state that the sponsor shall take measures to promote the growth of sod and ER 1130-2-303, Project Operation, Maintenance Guide, Section 5, states that newly filled areas shall be sodded or seeded.

2.2. Kansas City District Requirements for Seeding and Mulching of Levee Embankments.

2.2.1. Scope. Seeding shall be required for the slopes of levees, including berms and project right-of-way limit. Other methods may be elected to accomplish seeding, apply fertilizer, and mulch different from those specified herein, provided the Corps of Engineers has reviewed and approved the proposed methods.

2.2.2. Areas. The unprotected finish surfaces and slopes of the random and impervious fill, and all disturbed construction areas, which are capable of supporting growth shall be fertilized, seeded, and mulched. Disturbed areas other than required for construction work shall be held to the minimum practicable to perform the work.

2.2.3. Fertilizer. A slow-release type fertilizer of 18-46-0 grade, uniform in composition, and free-flowing shall be provided. Fertilizer of 18-46-0 grade shall be broadcast uniformly at a rate of 300 pounds per acre over areas to be seeded. If bulk fertilizer other than 18-46-0 grade is provided, the application rate shall be varied to obtain the quantity of nitrogen, phosphoric acid, and potash equivalent to that which would be provided with the specified rate for 18-46-0 grade. If hydraulic equipment is used for the application of fertilizer it shall have a built-in agitation system with an operating capacity sufficient to agitate, suspend, and homogeneously mix slurry containing fertilizer, water and mulch. The slurry distribution lines shall be large enough to prevent stoppage. The discharge line shall be equipped with a set of hydraulic spray nozzles that will provide even distribution of the slurry on the various slopes to be treated

2.2.4. Mulch. Mulch shall be mature prairie hay, or if prairie hay is not available, straw of cereal grain such as oats or wheat, 98 percent certified germ free. Materials containing objectionable weed seeds or other species detrimental to the planting will not be acceptable. Wood cellulose fibers mulch, for use with the hydraulic application, shall consist of specially prepared wood cellulose fiber, processed to contain no growth- or germination-inhibiting factors, and dyed an appropriate color to facilitate visual metering of application of the materials. The fiber material shall be supplied in packages having a gross weight not in excess of 10 percent moisture, air-dry weight basis. The wood cellulose fiber shall be manufactured so that after addition and agitation in slurry tanks with seeds, water, and any other approved additives, the fibers in the material will become uniformly suspended to form a homogeneous slurry; and then when hydraulically sprayed on the ground, the material will form a blotter-like ground cover impregnated uniformly with seed; and which, after application, will allow the absorption of moisture and allow rainfall or mechanical watering to percolate to the underlying soil.

2.2.5. Seed. Seed shall be labeled in accordance with the latest U.S. Department of Agriculture rules and regulations under the Federal Seed Act, and shall be approved. Wet, moldy, or otherwise damaged seed will not be acceptable. All grass seed will meet minimum of 98% purity and 85% germination, as indicated on the labels. All seeds shall be blended by supplier prior to delivery. The pure live grass seed mix to be used shall be as follows (weed seed shall not exceed 0.5 percent by weight of the total of pure live seed and other material in the mixture):

<u>Kinds of Seed</u>	<u>Pounds/Acre</u>
K-31 Fescue ( <i>Festuca elatior</i> var. arund inaceal)	15
Domestic Ryegrass ( <i>Lolium perenna</i> and <i>E. Multiflorum</i> )	15
Smooth Brome ( <i>Bromus inermis</i> )	15
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Total Pounds Pure Live Seed Per Acre	45

2.2.6. Soil. Soil for repairs shall be of at least equal quality to that which exists in areas adjacent to the area to be repaired. Any soil used shall be free from roots, organic material, stones, and other materials that hinder grading, planting, and maintenance operations and is free of objectionable weed seed and toxic substances.

2.2.7. Water. Water for use in the hydraulic application of seeding, shall be free from oil, acid, alkali, salt, and other substances harmful to growth of grass, and shall be from a source approved prior to use.

2.2.8. Preparation of Ground Surface. Prior to grading and tilling, vegetation that may interfere with operations shall be mowed, grubbed, and raked. The surface shall be cleared of stumps, roots, cable, wire, and other materials that might hinder the work, or interfere with future mowing. Previously established grades shall be maintained on the areas to be seeded in a true and even condition; necessary repairs shall be made by adding soil as necessary to previously graded areas. All surfaces shall be left in an even and properly compacted condition to prevent formation of depressions. After grading, the soil shall be tilled to a depth of at least 2 inches by disking, harrowing, or other approved methods until the condition of the soil is acceptable. After tillage, all stones larger than 3 inches in diameter and other materials that might hinder the work or subsequent maintenance shall be cleared. The work shall be performed only during periods beneficial results are likely to be obtained. Work should not take place when drought, excessive moisture, or other unsatisfactory conditions prevail. Surface irregularities, resulting from tillage or fertilizing or other operations before seeding, shall be leveled prior to seeding.

2.2.9. Allowable Time Frame. Seed shall be sown only between dates of 1 March and 1 May for spring planting and 1 September and 1 October for fall planting, unless otherwise approved by the Corps of Engineers. The entire planting shall be completed by 15 May or 15 October. When delays in operations extend the work beyond the most favorable planting season for species designated or when conditions are such by reason of drought, high winds, excessive moisture, or other factors that satisfactory results are not likely to be obtained, work shall be halted as directed and resumed only when conditions are favorable or when approved alternate or corrective measures and procedures have been effected. If delay of seeding is necessary, the finished berms and levee grade shall be temporary protected with mulch. The temporary protected area shall be cleaned of weeds and the slopes restored

before seeding and mulching. If inspection during seeding operations, or after there is show of green, indicates that areas have been left unplanted, additional seed shall be sown as directed.

2.2.10. Protection, Repair, and Reseeding. Protection shall be provided against traffic or other use by erecting barricades immediately after treatment is completed, and by placing warning signs as directed, on various areas. The construction proponent is not required to guarantee a cover crop; however, the proponent is fully responsible for any damage or lack of cover caused by elements under his control.

3. Utilization of Top of Levee for Construction Access. Criteria for utilization of the top of the levee for construction access include special conditions for use of the top of levee for construction access and restoration procedures for repair of rutting and replacing aggregate. These procedures shall ensure conformance with Title 33 - Navigation and Navigable Waters, Chapter II - Corps of Engineers, Department of the Army, Part 208 - Flood Control Regulations, Maintenance and Operation of Flood Control Works which states that the levee sponsor shall be certain that the access roads to and on the levee are being properly maintained and are well shaped so as to drain readily.

3.1. Kansas City District Requirements for Construction Access. In general, and when ever possible, the top of the levee should not be used as a haul road or access road for construction. Using the top of levee for construction access could result in rutting of the levee top and damage to the crushed aggregate surfacing. If permission is given to use the levee crown as a haul road, the levee crown will require additional surfacing to support hauling operation. However, if permission is granted, under no circumstance will the levee crown be used during inclement weather and/or during high river stages. Construction of ramps by excavation on the side slopes of the levee should not be permitted, nor should the grade or cross section of the levee be altered in any manner that would lessen the degree of existing protection. In general, the levee crown will not be utilized for hauling a large number of truckloads of fill. Truck hauling generally is not permitted on the levee crown, except as approved for the placement of levee surfacing. Landside stability berms may be used as haul road if approved by the Corps of Engineers. Damages or general wear to the levee crown as a result of construction activities will be the responsibility of the construction proponent to repair. The construction proponent should remove temporary construction ramps, and scarify or otherwise loosen all haul roads, the areas occupied by ramps, and the access ways (other than existing roads) to a minimum depth of eight inches. All such surfaces should be left in a reasonably smooth condition. Levee slopes damaged by access ramps should be restored to the original geometry and seeded and mulched. Existing levee crowns and berms used as haul roads should be restored to original condition at the completion of all work

3.2. Kansas City District Requirements for Restoration of Levee Road Surface. If the top of the levee has been rutted or damaged by the approved construction activity, the construction proponent should repair the levee surface at no cost to the Federal Government or local sponsor. Ruts should be repaired by removing any remaining aggregate from the rutted area, lightly scarifying the existing levee surface, replacing any lost material with clay or silt (or a combination of the two), regrading the surface so it will properly drain, compacting with a roller to 95 percent of maximum dry laboratory density at optimum

moisture according to ASTM D-698, and replacing the crushed aggregate surfacing. Crushed aggregate surfacing should be produced from crushed hard, durable stone meeting the requirements of Section 1007, Type 1 aggregate of the Missouri State Highway Commission Standard Specifications, 1993 Edition. The surfacing material should be placed on the top of levee to achieve the total original thickness, in layers not more than three inches thick. The material should be placed in two layers, with each layer compacted with four passes of an approved smooth-drum roller weighing not less than 150 pounds per linear inch of drum, or four passes of a pneumatic tire roller capable of developing a tire contact pressure of at least 45 psi. One pass is defined as one complete coverage of the entire surface with the roller or tractor treads. The surface should be sloped to drain, prior to placement of aggregate surfacing.

#### 4. COE Inspection Requirements During Construction.

4.1. Title 33 - Navigation and Navigable Waters, Chapter II - Corps of Engineers, Department of the Army, Part 208 - Flood Control Regulations, Maintenance and Operation of Flood Control Works states that the levee sponsor should obtain advice from the COE regarding the effects of proposed improvements or alterations on the functioning of the project and information concerning methods of construction acceptable under standard engineering practice. This requirement may involve scheduling a site inspection by the Corps of Engineers during critical periods of the construction.

4.2. Kansas City District Criteria for Inspection Requirements. During the Corps of Engineers review of the plans and specifications for a proposed construction project, the Corps will identify elements of the construction project that are critical to the continued integrity of the levee. The construction proponent will be required to notify the Corps of Engineers no later than 72 hours prior to beginning construction of these elements so the Corps can schedule an inspector to be on site. The Corps will inspect all completed construction projects at the annual levee inspection.

5. Guidelines to Ensure Proper Operation of Relief Wells. The construction proponent must perform a pump test of the existing relief wells if the proposed construction may impact the proper operation of relief wells within the construction area. The pump test should be performed prior to and upon completion of the project. If a pressure relief well pump test has been conducted within one year, the results could be used as to its status if agreed upon by all parties concerned. The construction proponent must provide the proposed procedures for performing the pump test to the COE for approval.

5.1. Title 33 - Navigation and Navigable Waters, Chapter II - Corps of Engineers, Department of the Army, Part 208 - Flood Control Regulations, Maintenance and Operation of Flood Control Works states that the levee sponsor should be certain that the pressure relief wells are in good working condition, and that such facilities are not becoming clogged.

5.2. Kansas City District Criteria for Relief Well Testing after a Construction Project. Guidance for work proposed near or within a Federal Constructed Flood Control Works Project, Appendix C,

paragraph 5.4 - Testing of Wells, provides guidance regarding the testing of relief wells for proper performance.

5.3. Recommended References. EM 1110-2-1914 - Design, Construction, and Maintenance of Relief Wells includes the following guidance:

- (1) Equipment required for the pump test.
- (2) The Pump test procedure.
- (3) Backfill and Sterilization procedures.
- (4) A relief well pump test report format that should be used.