

**NATURAL RESOURCES CONSERVATION SERVICE
MISSOURI CONSTRUCTION SPECIFICATION**

WETLAND RESTORATION

CODE 657

SCOPE

Use this construction specification for wetland restoration including the installation of water control structures.

Installation of conservation practices for wetland creation (658), wetland enhancement (659), and constructed wetland (656) may also use this construction specification.

GENERAL

Construction operations shall be carried out in such a manner and sequence that erosion and air and water pollution are minimized and held within legal limitations. **A land disturbance permit from the Missouri Department of Natural Resources may be needed if the disturbed area is greater than one (1) acre in size.**

Construction methods that enhance fish and wildlife will be used where practical. Trees stumps, and brush removed from the construction area may be piled for fish and wildlife habitat when approved by the landowner and engineer.

The completed job shall present a workmanlike appearance and shall conform to the line, grades, and elevations shown on the drawings or as staked in the field.

All operations shall be carried out in a safe and skillful manner. Safety and health regulations shall be observed and appropriate safety measures used. The contractor is responsible for having all utilities located at the site according to Missouri state laws prior to beginning work.

EARTH EMBANKMENTS

Foundation preparation

The foundation area shall be cleared of trees, logs, stumps, roots, brush, boulders, sod and rubbish. A minimum 3 inches of topsoil and sod shall be stripped from foundation area or as determined by the Engineer. Existing ditch channels crossing the foundation area shall be sloped 4 (horizontal - H):1 (vertical - V) or flatter and made deeper and wider as necessary to remove unconsolidated sediment, stumps, roots, and other objectionable material and to accommodate compaction equipment.

Excavation

To the extent needed, all suitable materials removed from the specified excavation shall be used in the construction of the planned earth embankments. Any spoil material not used in an earth embankment shall be stockpiled at locations shown on the drawings or as otherwise approved by the engineer.

Borrow excavation shall be located not closer than 30 feet to the toe of the levee so as not to cause slope stability or seepage problems.

Earthfill placement

The material placed in the fill shall be free of detrimental amounts of sod, frozen soil, stone over 6 inches in diameter (except for rock fills) and other objectionable material. To the extent they are suitable, excavated materials are to be used in the permanent fill. The distribution, moisture content, and gradation of materials shall be such that there will be no lenses, pockets, streaks, or layers of material differing substantially in texture or gradation from the surrounding material. Foundation areas shall be kept free of standing water when fill is being placed on them.

The placing and spreading of the fill shall be started at the lowest point of the foundation and the fill shall be brought up in approximately horizontal layers not to exceed 9 inches in thickness. Each layer shall be spread, processed, and shall be compacted by one of the following methods, as specified on the drawings:

Dozer - Complete coverage by tread or track of hauling or spreading equipment. Each lift shall not exceed 5 inches in thickness. Low ground pressure dozers (less than 6.5 psi) may not be used for compaction.

Roller - two passes of standard tamping type roller over the entire area to be compacted. Complete coverage by the treads of loaded hauling equipment is considered equivalent to two (2) passes of tamping roller. Each lift shall not exceed 9 inches in thickness.

The tamping-type roller shall have tampers or feet projecting not less than six (6) inches from the surface of the drum and shall have a minimum static load on each tamper of 250 pounds per square inch of tamping area. Tamping rollers with minimum static load on each tamper of 125 pounds per square inch of tamping area may be used if the number of passes is increased to four (4) or the thickness of lifts is reduced to four (4) inches. (Sheepsfoot or wedgefoot drum rollers are considered tamping rollers.)

Embankments shall be constructed to lines and grades shown on the drawings. Finish grade shall be smooth, uniform, and ready for seedbed preparation.

Moisture control

The moisture content of the fill material and foundation shall be such that the required compaction can be obtained. The minimum moisture content of fill material and foundation shall be such that when kneaded in the hand, the fill material will form a ball which does not readily separate. The maximum moisture content is when conditions are too wet for efficient use of the hauling and compaction equipment.

Borrow areas

All borrow areas shall be graded and left so they are protected from erosion and may be seeded. Borrow areas inside the pool area shall have side slopes of 4(H):1(V) or flatter.

EXCAVATED POOLS

Pools shall be excavated to the depths, dimensions and slopes as shown on the plans and as staked in the field. Excavated materials shall be placed in areas the designated on the plans.

If permeable layers, such as clean sands, are encountered during the excavation contact the engineer for sealing methods and requirements.

PIPES, WATER CONTROL STRUCTURES AND SPILLWAYS**Materials**

Materials required and fabrication details shall be as specified on the drawings and as shown below.

Concrete and reinforcing steel shall conform to Construction Specification 750.

Rock riprap and bedding shall be sound, durable rock conforming to gradation shown on drawings. Geotextile may be used in lieu of riprap bedding. Metal, concrete blocks, and drain materials shall be as shown on the drawings.

Geotextile fabric shall be non-woven, needle punched conforming to construction Specification 753, Geotextile.

Treated lumber shall be No. 2 grade or better, pressure treated with 0.4 pounds per cubic foot of Copper Chromate Arsenate (CCA) or equivalent. All other lumber shall be as shown on drawings.

Water control structures and pipes shall be of the type, configuration, size and materials as specified on the plans or the Additional Details section of this specification. The specified pipe materials shall have the following properties:

Solid wall polyvinyl chloride pipe (PVC) shall be 1120 or 1220 conforming to ASTM (American Society of Testing and Materials) D1785, ASTM D2241, AWWA C900 or equivalent. The SDR 35 PVC plastic pipe shall conform to ASTM D3034.

Corrugated PVC pipe with smooth interior shall conform to ASTM F949 and ribbed PVC pipe with a smooth interior shall conform to ASTM F794 with a minimum pipe stiffness of 46 pounds per square inch.

Corrugated polyethylene heavy duty tubing with smooth interior wall and pipe stiffness of 45 pounds per square inch shall be used.

Welded steel pipe shall be new and shall have a minimum nominal wall thickness of ¼ inch conforming to ASTM A53 or API (American Petroleum Institute) 5L or equivalent. If specified on the drawings or Additional Details section of this specification the pipe may be used if of good quality with no pitting, splitting or scaling with a minimum nominal wall thickness of ¼ inch.

Corrugated metal pipe shall conform to the requirements of ASTM A760, A762, A885, B745, or B790 as appropriate.

Anti-seep collars when required shall be of materials compatible with the pipe.

All pipe joints, couplers and fittings shall be compatible with the pipe, shall be installed according to the manufacturer's recommendations and shall provide a watertight connection.

Installation

Pipe conduits shall be placed on a firm foundation to the lines and grades shown on the drawings. The pipe foundation shall be covered with 1 inch of loose, moist, friable ML or CL soil material immediately prior to pipe placement.

Anti-seep collars when required are to be installed at locations shown on the drawings with watertight connections.

Selected backfill of friable ML or CL material shall be placed around structures, pipe conduits and anti-seep collars at approximately the same rate on all sides to prevent unequal pressures. Rubber tire, hand, or manually directed power tamper will be used on backfill around all conduits

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or structures. A maximum of 4 inch lifts shall be used for hand compaction and 6 inches lifts for rubber tired and manually directed power tampers. Extreme caution must be exercised in backfill and compaction around structures or conduits to prevent damage, movement, or deflection. Compaction on the bottom half of conduits must be firm to fill all voids and supply lateral support. Light weight conduits may need to be held in place to prevent uplift during compaction.

Equipment shall not be operated over any structure or conduit until there is sufficient backfill to prevent damage. This minimum cover is 3 feet for PVC pipe and 2 feet for welded steel pipe.

If coated CMP is to be used, it shall be handled in such manner as to avoid damage to the coating. All damaged areas of the pipe coating shall be repaired in accordance with the manufacturer's recommendations.

VEGETATION

Topsoil shall be added, if needed, to establish vegetation. Refer to JS-AGRON-25 for seeding and mulching recommendations or equivalent

Additional Details: _____

**NATURAL RESOURCES CONSERVATION SERVICE
MISSOURI OPERATION AND MAINTENANCE**

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OPERATION AND MAINTENANCE

- Inspect water control structure to ensure it is not damaged and is operating properly. Remove any woody material, debris, or growing timber that is interfering with the efficient use of the water control structure.
- Mow grass and weeds near any plastic pipe to reduce chance of fire damaging the pipe during vegetative maintenance.
- Inspect vegetation in wetlands. Some treatment may be needed to control undesirable vegetation.
- Repair water control structure and levee (levee) as soon as possible after damage is observed.
- Reestablish vegetative cover on levee (levee) immediately where erosion has removed established seeding.
- Maintain effective erosion control of the contributing watershed (drainage area) to prevent siltation and the resulting loss of capacity.
- Inspect levees for damage from burrowing animals such as muskrats. Some rodent control may be required to remove the hazard.

Additional Details: _____

