



MONTGOMERY COUNTY DEPARTMENT OF PERMITTING SERVICES
Construction Specifications For Shallow Facilities
Revised January 2009

Definition: A shallow facility is any non-structural stormwater management facility, which is constructed on or excavated into the ground, and is not defined as a pond by current [Maryland Pond-378](#) criteria. These will include but are not limited to small stormwater detention basins, and [Montgomery County sand filters](#). Specifications for [infiltration trenches](#) and [bio filtration](#) facilities will be found in the design specifications for those devices. All references to ASTM, MSHA and AASHTO specifications apply to the most recent version.

Where applicable, these specifications must be placed on the design plans. List the facilities to which these specifications apply.

I. Construction Inspection by Designated Engineer

The construction of the facility shall be under the supervision of a Registered Professional Engineer. The engineer must submit written certification that the structure and embankment have been built in accordance with the approved plans to the Department of Permitting Services (DPS) along with a record drawing, soil compaction tests, concrete tests, and other required construction documentation. This should be done immediately following the completion of the project, unless otherwise designated on the plans. The engineer shall have the responsibility and authority to make minor changes in the plans in order to compensate for unusual soil conditions encountered during construction as long as changes do not adversely affect the integrity of the facility. Major changes to the design, which may result from site conditions encountered during construction, must be reviewed and approved by the Design Engineer, and DPS prior to the initiation of construction.

II. Site Preparation

Areas designated for borrow areas, embankment, structural works, filter, and storage areas, shall be cleared, grubbed and stripped of topsoil. All trees, vegetation, roots, and other objectionable material shall be removed. Channel banks and sharp breaks shall be sloped to no steeper than 1:1.

All cleared and grubbed material shall be disposed of in a proper manner. A sufficient quantity of topsoil must be stockpiled in a suitable location for use on the embankment and other designated areas.

III. Earth Fill For Facility Embankments

A. **Material** - The fill material shall be taken from approved designated borrow areas. It shall be free of roots, stumps, wood, rubbish, stones greater than six inches, frozen or other objectionable materials. Fill material for the embankment core and cut off trench shall conform to Unified Soil Classification GC, SC, CH or CL. Consideration may be given to the use of other materials in the embankment if design and construction are supervised by a geotechnical engineer and approved by MCDPS.

B. **Placement** - Areas on which fill is to be placed shall be scarified prior to placement of fill. Fill materials shall be placed in maximum eight inch thick (before compaction) layers, which are to be continuous over the entire length of the fill. The most permeable borrow material shall be placed in the downstream portions of the embankment. Pipes or underdrains must be installed concurrent with embankment construction to avoid excavation into the completed embankment at a later time.

- C. **Compaction** - The movement of the hauling and spreading equipment over the fill shall be controlled so that the entire surface of each lift shall be traversed by not less than one tread track of the equipment or compaction shall be achieved by a minimum of four complete passes of a sheepsfoot, rubber tired or vibratory roller. Fill material shall contain sufficient moisture such that the required degree of compaction will be obtained with the equipment used. The fill material shall contain sufficient moisture so that if formed into a ball it will not crumble, yet not be so wet that water can be squeezed out.

The density of each lift shall not be less than 95% of maximum dry density with a moisture content within $\pm 2\%$ of the optimum. Each layer of fill shall be compacted as necessary to obtain that density, and is to be certified by the Engineer at the time of construction. All compaction is to be determined by AASHTO Method T-99 (Standard Proctor).

- D. **Cut Off Trench** - The cutoff trench shall be excavated into impervious material along or parallel to the centerline of the embankment as shown on the plans. The bottom width of the trench shall be governed by the equipment used for excavation, with the minimum width being two feet. The depth shall be at least two feet below existing grade or as shown on the plans. The side slopes of the trench shall be one to one, or flatter. The backfill shall be compacted with construction equipment, roller, or hand tampers to assure maximum density and minimum permeability.
- E. **Embankment Core** - The core shall be parallel to the centerline of the embankment as shown on the plans. The top width of the core shall be minimum of two feet. The height shall extend up to at least the 10-year water elevation or as shown on the plans. The side slopes shall be 1 to 1 or flatter. The core shall be compacted with construction equipment, rollers, or hand tampers to assure maximum density and minimum permeability. In addition, the core shall be placed concurrently with the outer shell of the embankment.
- F. **Earth Cuts** - For all excavation perpendicular to the centerline of the embankment, the slope of the bonding surfaces between the existing material in place and the fill to be placed shall not be steeper than a ratio of 2H:1V.

IV. Structure Backfill

Backfill adjacent to pipes or structures shall be of the type and quality conforming to that specified for the adjoining fill material. The fill shall be placed in horizontal layers not to exceed four inches in thickness and compacted by hand tampers or other manually directed compaction equipment. The material must completely fill all spaces under and adjacent to the pipe. At no time during the backfilling operation shall driven equipment be allowed to operate closer than four feet, measured horizontally, to any part of a structure. Under no circumstances shall equipment be driven over any part of a concrete structure or pipe, unless there is a compacted fill of 24 inches or greater over the structure or pipe.

Structure backfill may be flowable fill meeting the requirements of Maryland Department of Transportation, State Highway Administration Standard Specifications for Construction and Materials, Section 313 as modified. The mixture shall have a 100-200 psi; 28 day unconfined compressive strength. The flowable fill shall have a minimum pH of 4.0 and a minimum resistivity of 2,000 ohm-cm. Material shall be placed such that a minimum of six inches of flowable fill shall be under (bedding), over, and on the sides of the pipe. It only needs to extend up to the spring line for rigid conduits. Average slump of the fill shall be 7 inches to assure flowability of the material. Adequate measures shall be taken (sand bags, etc.) to prevent floating the pipe. Any adjoining soil fill shall be placed in horizontal layers not to exceed four inches in thickness and compacted by hand tampers or other manually directed compaction equipment. The material

shall completely fill all voids adjacent to the flowable fill zone. At no time during the back filling operation shall driven equipment be allowed to operate closer than four feet, measured horizontally, to any part of a structure. Under no circumstances shall equipment be driven over any part of a structure or pipe unless there is a compacted fill of 24 inches or greater over the structure or pipe. Backfill material outside the structural backfill (flowable fill) zone shall be of the type and quality conforming to that specified for the core of the embankment or other embankment materials.

V. Pipe Conduits – All pipes shall be circular in cross section.

A. Polyvinyl Chloride (PVC) Pipe - All of the following criteria shall apply for PVC pipe:

1. Materials - PVC pipe and appurtenances shall be schedule 40 PVC-1120 or PVC-1220 conforming to ASTM D-1785 or ASTM D-2241.
2. Joints and connections to anti-seep collars shall be completely watertight. Anti-seep collars are not required for pipe diameters of 6" or less.
3. Bedding - The pipe shall be firmly and uniformly bedded throughout its entire length. Where rock, soft, spongy, or other unstable soil is encountered, all such material shall be removed and replaced with suitable earth compacted to provide adequate support.
4. Backfilling shall conform to "Structure Backfill."
5. Other details (anti-seep collars, valves, etc.) shall be shown on the drawings.

B. Reinforced Concrete Pipe (RCP) - All of the following criteria shall apply for RCP pipe:

1. Materials - RCP shall have bell and spigot joints with rubber gaskets and shall meet ASTM Designation C-361. Pipes must be labeled in full accordance with ASTM C-361, including the ASTM C-361 designation on the inside of each section of pipe, and all pipes must be clearly marked by the manufacturer prior to delivery to the job site. Pipes with multiple designations will be rejected.
2. Bedding - Reinforced concrete pipe conduits shall be laid in a concrete bedding/cradle for their entire length. This bedding/cradle shall consist of high slump concrete placed under the pipe and up the sides of the pipe at least 50% of its outside diameter with a minimum thickness of 6-inches. Where a concrete cradle is not needed for structural reasons, flowable fill may be used as described in the "Structure Backfill" section of this standard. Gravel bedding is not permitted.
3. Laying Pipe - Bell and spigot pipe shall be placed with the bell end upstream. Joints shall be made in accordance with recommendations of the manufacturer of the material. After the joints are sealed for the entire line, the bedding shall be placed so that all spaces under the pipe are filled. Care shall be exercised to prevent any deviation from the original line and grade of the pipe. The first joint must be located within 4 feet from the riser.
4. Backfilling shall conform to "Structure backfill".
5. Other details (anti-seep collars, valves, etc.) shall be shown on the drawings.

VI. Sand

Sand shall be washed and meet the latest requirements of ASTM C-33 (Fine Aggregate). If the sand is to be stored on site prior to placement, it shall be protected from contamination.

Manufactured sand is not acceptable.

VII. Gravel

Gravel shall be washed and meet the requirements of the latest edition of the Maryland Department of Transportation, State Highway Administration Standards and Specifications for Construction and Materials, Section 901. Gravel size shall be as shown on the approved drawings. If the gravel is to be stored on site prior to placement, it shall be protected from contamination.

VIII. Concrete

Concrete design shall meet the requirements of ACI 350, Environmental Engineering Concrete Structures, with freezing and thawing exposures. Concrete shall be a type II or IIA cement, with a 28 day compressive strength of 4500 psi for cast in place and 5000 psi for pre-cast structures. Concrete shall also meet the requirements of Maryland Department of Transportation, State Highway Administration Standard Specifications for Construction and Materials, Section 420, Mix No. 6.

IX. Rock Riprap

Rock riprap shall meet the requirements of the latest edition of the Maryland Department of Transportation, State Highway Administration Standard Specifications for Construction and Materials, Sections 310, 311, and 902.

The riprap shall be placed to the required thickness in one operation. The rock shall be delivered and placed in a manner that will insure the riprap in place shall be reasonably homogeneous with the larger rocks uniformly distributed and firmly in contact one to another with the smaller rocks filling the voids between the larger rocks. Geotextile shall be placed under all riprap and shall be per the requirements of the latest edition of the Maryland Department of Transportation, State Highway Administration Standard Specifications for Construction and Materials, Section 921.09, Class C.

X. Stabilization

All borrow areas shall be graded to provide proper drainage and be left in a slightly condition. All exposed surfaces of the embankment, spillway, spoil and borrow areas, and berms shall be stabilized by topsoiling, seeding, liming, fertilizing, and mulching in accordance with the latest edition of the Maryland Soil Conservation Service Standards and Specifications for Critical Area Planting (MD-342) or as shown on the accompanying drawings.

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