

# WASTE STORAGE POND CONSTRUCTION SPECIFICATION

## 1. SCOPE

The work shall consist of furnishing materials and installing all components of the waste storage pond as outlined in this specification and the drawings.

Construction work covered by this specification shall not be performed between December 1 and the following March 15 unless the site conditions and/or construction methods to be used have been reviewed and approved by the Engineer.

## 2. MATERIALS

### a) CONCRETE

Unless otherwise set forth in Section 8, the following materials are to be used for concrete portions of the waste storage pond:

PORTLAND CEMENT shall be Type I, IA, II or IIA and conform to ASTM-C150. If Type I or II is used, an air-entrainment agent shall be used.

CONCRETE AGGREGATE shall meet the requirements and gradation specified in ASTM-C33. Coarse aggregate shall meet the gradation for size numbers 57 or 67.

WATER used in mixing or curing concrete shall be clean and free from injurious amounts of oil, acid, salt, organic matter or other deleterious substances.

REINFORCEMENT BARS shall be grade 40 or higher, and shall conform to ASTM-A615, A616, or A617. Welded wire fabric reinforcement shall conform to ASTM-A185 or A497. Reinforcement shall be free from loose rust, oil, grease, curing compound, paint or other deleterious coatings.

CONCRETE ADMIXTURES shall conform to ASTM-C260 for air entrainment, and ASTM-C494, Types A, D, F, or G, for water-reduction and set-retardation and Types C or E for non-corrosive accelerators.

POZZOLAN shall conform to ASTM-C618, Class F, except loss of ignition shall not exceed 3.0 percent.

CURING compound shall meet the requirements of ASTM-C309, Type 2, Class A or B, or as otherwise required in Section 8.

PREFORMED EXPANSION JOINT FILLER shall conform to the requirements of ASTM-D1752, Type I, II, or III, unless bituminous type is specified, in which case it shall conform to ASTM-D994 or D1751.

JOINT SEALERS shall conform to the requirements for ASTM-C920, Federal Specification 55-S-210A, or Federal Specification TT-S-227, as appropriate for the specific application.

WATERSTOPS: vinyl-chloride polymer types shall be tested in accordance with Federal Test Method Standard No. 601, and shall show no sign of web failure due to brittleness at a temperature of -35 degrees Fahrenheit. Colloidal (bentonite) waterstops shall be at least 75 percent bentonite in accordance with Federal Specification SS-S-210A. Non-colloidal waterstops shall only be used if approved by the Engineer.

b) BITUMINOUS CONCRETE shall meet the requirements of Penn DOT Specifications, Sections 401, and 420 or 421. Coarse aggregate shall meet the requirements of PennDOT Specifications, Section 703.2, Type A.

c) BASE COURSE AND DRAINFILL AGGREGATE shall meet the requirements of Penn DOT Specifications, Section 703.2, Type A, Coarse Aggregate.

d) FLEXIBLE MEMBRANE LINERS shall meet the requirements of Specification 521A.

e) WOOD shall be graded and stamped by an agency accredited by the American Lumber Standards Committee as meeting the required species, grade, and moisture content. In the absence of such a stamp, the Contractor or material supplier shall provide written certification that the wood products meet the designated quality criteria.

f) PRESSURE TREATED WOOD PRODUCTS shall be Douglas Fir, Southern Yellow Pine, or as otherwise specified on the drawings or in Section 8. Unless otherwise set forth in Section 8, they shall be treated with preservatives in accordance with the American Wood Preservers Association (AWPA) Standard C16, "Wood Used on Farms, Pressure Treatment." Each piece shall bear the AWPA stamp of quality. In the absence of such a stamp, the Contractor or material supplier shall provide written certification that the pressure treated wood products meet the designated quality criteria.

g) FASTENERS for wood structures shall be stainless steel, galvanized, or otherwise protected from corrosion due to contact with moisture, manure and associated gasses. The protective coating shall be compatible and consistent with the preservative chemicals in the pressure treated wood.

### 3. SITE PREPARATION

All trees, brush, fences, and rubbish shall be cleared within the area of the pond,

including any embankment, ramp, or appurtenances, and any borrow areas. All stumps, roots and rubbish shall be removed from these areas to a depth of at least six inches below the existing ground surface. All material removed by the clearing and grubbing operation shall be disposed of as directed by the Owner or his/her Representative. Sufficient topsoil is to be stockpiled in a convenient location for use on the embankment and other disturbed areas to facilitate seeding.

### 4. CORE TRENCH

Where specified, a core trench shall be excavated along or parallel to the centerline of the earthfill, as shown on the drawings. The width of the trench shall be governed by the equipment used for excavation and backfill, with the minimum bottom width being four feet.

If a core trench is specified, the minimum depth shall be two feet or the depth shown on the drawings. If large boulders or bedrock is encountered in the excavation, the minimum depth will not be required if, in the opinion of the Engineer, the trench cannot be excavated to the required depth. The bedrock or boulders shall be cleared of all loose materials to insure adequate compaction of backfill material to the rock. The side slopes of the trench shall be one-on-one or flatter, or as otherwise shown on the drawings.

The backfill material for the core trench shall be the most impervious material available and shall be compacted as set forth in Section 6 for embankment fill. Where rock is encountered, the fill material shall be placed in three-inch layers and compacted by hand or mechanical tampers. Back-filling shall continue in three-inch layers until the depth of fill over the rock is such that acceptable density may be obtained by using construction equipment with a maximum of six-inch layers for the compaction operation.

## 5. PIPES

Excavation for pipes shall be made to the grades and lines shown on the drawings or as indicated by construction stakes. Care should be taken not to excavate below the depths specified. Excavation below grade shall be corrected by placing firmly compacted layers of moist earth to provide a good foundation. If rock or boulders are exposed in the bottom of the excavation, they shall be removed to a minimum depth of eight inches below the invert grade of the pipe and any appurtenances, and replaced with firmly compacted earth to the specified grade.

Pipes shall be backfilled in horizontal lifts of moist earth not to exceed four inches in thickness, or with other material as specified in Section 8 or in the drawings. Each lift shall be compacted by hand tampers or other compaction equipment, however at no time shall driven equipment tires or tracks be within two feet of pipes or appurtenances.

All pipe inlets and outlets within the storage pond shall be installed with a watertight seal around the pipes to prevent migration of contaminated liquids along the pipe.

## 6. EMBANKMENT

The fill material for the embankment shall be obtained from within the required excavation or the designated borrow area(s) as specified in Section 8 or in the drawings. The material shall be free from stumps, wood, brush, roots, sod, rubbish, and other matter that may decay. It should also be free of stones over two inches in diameter where compacted by hand or mechanical tampers, or over six inches in diameter where compacted by rollers or other driven equipment. Frozen material shall not be placed in the fill nor shall the fill material be placed on a frozen foundation.

Prior to placing the fill material on any portion of the foundation, that portion shall be scarified, plowed, or disked to a depth of three inches. All objectionable material, i.e., other than the mineral soil that has been identified for use as fill, exposed by this operation shall be disposed of as directed by the Owner.

The placing and spreading of fill material shall be started at the lowest part of the section under construction and carried up in layers of six inches. The layers shall slope slightly towards the pond to prevent puddles and provide for faster runoff in case of rain. Where possible, the layers should extend over the entire area of the fill. The distribution and gradation of the materials throughout the fill shall be such that there are no lenses, pockets, streaks or layers of material differing substantially in texture or gradation from the surrounding material. The most porous borrow material shall be placed on the downstream portions of the embankment.

Each layer of fill material shall be compacted by routing the construction equipment so that all parts of each layer are equally compacted. Each layer shall receive at least three passes of a sheepsfoot roller or five passes of a loaded carryall, unless otherwise specified on the drawings. Fill material should contain sufficient moisture so that it can be formed into a ball without crumbling. If water can be squeezed out of the ball, it is too wet to compact properly.

## **7. LININGS (including full, partial, and ramps)**

### **A. FOUNDATION PREPARATION**

The bottom of the pond shall be excavated to the designated subgrade and be inspected by the Engineer before work proceeds. All exposed rock surfaces will be cleaned for inspection. Open joints, fractures, solution channels, pockets of coarse material, and groundwater seeps will be brought to the attention of the Engineer. Open bedrock conditions shall be treated as specified in Section 8 or in the drawings. Coarse material and wet foundation conditions shall be over excavated and replaced with at least one foot of compacted soil as directed by the Engineer. Fill shall be placed as described in Section 6.

The subgrade shall be free of debris, organic matter, free water, ice, snow, mortar, or other harmful substances. Placement of linings on mud, uncompacted fill or frozen material will not be permitted. The subgrade shall be moist and dampened with water, if necessary. The surface of the subgrade shall be scarified to a depth of three inches prior to placement of liner material or fill. If a liner other than soil is to be used, the surface of the scarified subgrade shall be compacted with a smooth wheeled roller as described in Section 6.

In addition to uniformity, the existing subgrade material must have sufficient strength to support the lining and its associated loads. A base course (a layer of granular material placed on the subgrade prior to placement of concrete) may be used to improve the stability of the foundation. In addition, geosynthetics may be used, if approved by the Engineer, to further separate and/or stabilize the foundation. Subsurface drainage may also be used to stabilize localized soft areas, however it will then be necessary to treat the drainage if it contains effluent from the stored wastes.

Drainfill (not base course) upon which concrete is to be placed shall be covered with a geosynthetic which has an AOS between 20 and 100, inclusive.

Linings shall not be placed until the subgrade or base course has been inspected and approved by the designated inspector. Notification shall be given far enough in advance to provide time to schedule the inspection.

### **B. CONCRETE SLABS (Portland Cement)**

#### **(1) Mixing and Handling**

Concrete, unless otherwise specified in Section 8, shall be proportioned to provide a minimum compressive strength at 28 days of 3,000 psi. The Contractor shall be responsible for the design of the mix and certification of the necessary strength, in accordance with ACI 301. Current certification of the design mix by Penn DOT may be accepted in lieu of additional testing. A batch ticket shall be provided to the Owner or Technician by the Supplier for each load of concrete delivered to the site. As a minimum, this ticket shall show the design strength, time out, admixtures (if any), and amount of water that may be added (if any) on site and still be within the design mix limits. The Contractor shall test slump and air entrainment as necessary to insure that the concrete meets the requirements of this specification.

The slump shall be three to six inches (without super-plasticizers) and the air content shall be five to seven percent of the volume of the concrete. Admixtures such as superplasticizers, water-reducers and set-retarders may be used provided they are approved by the Engineer prior to concrete placement and are used in accordance with the manufacturer's recommendations. Superplasticizers (ASTM C494, Type F or G) may be added to concrete that has a 2 to 4 inch slump before addition, will not be

dropped more than 12 feet, and is not warmer than 95° F. The slump shall not exceed 7½ inches with the addition of superplasticizer.

Concrete shall be uniform and thoroughly mixed when delivered to the job site. Variations in slump of more than one inch within a batch will be considered evidence of inadequate mixing and shall be corrected or rejected. No water in excess of the amount called for by the job design mix shall be added to the concrete.

In general, concrete shall be transported and placed in accordance with ACI-304, of which some specific interpretations are set forth below.

For concrete mixed at the site, the mixing time after all cement, aggregates and water are in the mixer drum shall be at least 1-1/2 minutes.

Concrete shall be conveyed from the mixer to the lining as rapidly as practical by methods that will prevent segregation of the aggregates or loss of mortar. Concrete shall be placed within 1-1/2 hours after the introduction of cement to the aggregate unless an approved set-retarding admixture is used in the mix. During periods of hot weather, it may be necessary to reduce this time.

Slab concrete shall be placed at the design thickness in one layer. Concrete shall not be dropped more than 5 feet vertically.

Immediately after placement, concrete shall be consolidated by spading and vibrating, or spading and hand tamping. It shall be worked into corners and around all reinforcement and embedded items in a manner which prevents segregation. Excessive vibration which results in segregation of materials will not be allowed. Vibration must not be used to make concrete flow in forms, slabs, or conveying equipment.

Concrete surfaces do not require extensive finishing work; however, the surface shall be smooth and even with concrete paste worked to the surface to fill all voids. The concrete surface must be watertight. Careful screeding (striking-off) and/or wood float finishing shall be required, unless otherwise shown on the drawings.

Concrete slabs shall be placed at the design thickness in one layer. Any additional desired finishing of the surface (such as roughening for improved traction on ramps) shall be accomplished after an initial stiffening of the concrete has taken place. Exposed edges should be chamfered, either with form molding or molding tools. The addition of dry cement or water to the surface of screeded concrete to expedite finishing is not allowed. If placing is discontinued prior to completion of the entire floor, the unfinished end of the concrete shall be formed to a vertical surface, to create a proper construction or expansion/contraction joint.

## (2) Expansion/Contraction Joints

Unless otherwise specified on the drawings, expansion/contraction joints shall be provided at a maximum spacing in either direction of 30 feet. All contraction and expansion joints shall contain 1/2-inch thick expansion joint material.

When required in Section 8 or on the drawings, expansion/contraction joints shall also contain a six-inch, Type B, vinyl waterstop with a minimum web thickness of 1/8-inch, or an approved joint sealer.

## (3) Concreting in Cold Weather

Concreting in cold weather shall be performed in accordance with ACI-306R-88. In addition, the contractor shall provide a written plan at least 24 hours in advance of placing concrete in cold weather, and shall have the necessary equipment and materials on the job site before the placement begins.

#### (4) Concreting in Hot Weather

Concreting in hot weather shall be performed in accordance with ACI 305R-99, of which some specific interpretations are set forth below.

The supplier shall apply effective means to maintain the temperature of concrete below 90 degrees Fahrenheit during mixing and conveying. Exposed surfaces shall be continuously moistened by means of fog spray or otherwise protected from drying during the time between placement and finishing, and during curing. Concrete with a temperature above 90 degrees Fahrenheit shall not be placed.

#### (5) Reinforcing Steel Placement

Reinforcement shall be accurately placed and secured in position in a manner that will prevent its displacement during the placement of concrete.

Steel shall be supported by precast concrete bricks (not clay bricks), metal or plastic chairs, or hard field stone. Except for dowel rods, placing steel reinforcement into concrete already in place shall not be permitted.

The following tolerances will be allowed in the placement of reinforcing bars shown on the drawings:

- (a). Maximum reduction in cover:
  - from exposed surfaces - ¼ inch
  - from earth surfaces - 1/2 inch
  
- (b). Maximum variation from indicated spacing: 1/12th of indicated spacing

Splices of reinforcing bars shall be made only at the locations shown on the drawings, unless otherwise approved by the Engineer. Unless otherwise required, welded wire fabric shall be spliced by overlapping sections at least one full mesh dimension plus two inches. All reinforcement splices shall be in accordance with ACI 318.

Reinforcing steel shall not be welded unless approved by the Designer.

The ends of all reinforcing steel shall be covered with at least 1-1/2 inches of concrete.

#### (6) Curing

Concrete shall be prevented from drying for at least seven days after it is placed. Exposed surfaces shall be kept continuously moist during this period by covering with moistened canvas, burlap, straw, sand or other approved material unless they are sprayed with a curing compound.

Concrete, except at construction joints, may be coated with a curing compound in lieu of continuous application of moisture. The compound shall be sprayed on moist concrete surfaces as soon as free water has disappeared but shall not be applied to any surface until patching, repairs and finishing of that surface are completed. Curing compound shall not be allowed on any rebars.

Curing compound shall be applied in a uniform layer over all surfaces requiring protection at a rate of not less than one gallon per 150 square feet of surface. Surfaces subjected to heavy rainfall or running water within three hours after the curing compound has been applied, or otherwise damaged, shall be resprayed.

Vehicles, overlying structures, or other heavy loads shall not be placed on new concrete linings for at least three days, unless the concrete strength can be shown to be adequate to support such loads. Any construction activity which disturbs the curing material shall be avoided. If the curing material is subsequently disturbed, it shall be reapplied immediately.

#### (7) Concrete Repair

Concrete that is damaged or otherwise defective shall be removed and replaced, or where feasible, repaired. The Engineer will determine the required extent of removal, replacement or repair. The plan for affecting the repair must be approved by the Engineer prior to beginning the repair work.

### C. BITUMINOUS CONCRETE

The construction and testing of bituminous concrete shall comply with Penn DOT Specifications, Section 401. Unless otherwise specified in Section 8 or on the drawings, the following course thicknesses shall be used at the locations shown on the drawings:

BC1 - [for ramps and other surfaces where heavy (>1000 lb/wheel) unloading equipment will operate]:

- 4 inches of base course of No. 2A or OGS
- 2.5 inches of binder course (1D - 2BC)
- 2 inches of wearing course (1D - 2WC)

BC2 - [for linings which will have light-vehicle ( $\leq 1000$  lb/wheel) traffic or no concentrated loads]:

- 3 inches of wearing course (1D - 2WC)

Compacting equipment shall be compatible with the foundation and course density requirements.

### D. CLAY LINERS

The clay liner shall consist of the material designated in Section 8 or in the drawings, and shall be placed as described in Section 6, to the compactive effort and with the moisture content designated in Section 8.

### E. OTHER LINERS

Other liners, e.g. flexible membrane, shall be installed in accordance with Specification 521A.

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**8. ADDITIONAL CONDITIONS WHICH  
APPLY TO THIS PROJECT ARE:**