PROJECT DESCRIPTION

Animal Mortality Composting

A 36' by 12' concrete pad with (3) 6' x 8” walls and having a 36' by 16’ post frame mono slope style roof (2.5/12 pitch) is to be constructed for composting animal mortalities. A 10’ x 36’ concrete apron shall be installed at the entrance for maneuvering in and out of the structure. The facility is to be located west of the double hoop livestock building as shown on the construction drawings.

Heavy Use Area Concrete

A 12’ wide x 71’ long waste transfer scrape lane with 8” x 18” curbing on both sides is to be installed starting from the south west corner of the double hoop livestock building and will terminate at the existing unloading pad. Roll curbing shall be installed where the scrape lane crosses the access road. A 10’ wide x 14’ push off ramp shall be installed overtop the existing unloading pad and will have a tractor push off safety guard and lockable chain link safety gate/fence. A new 20’ x 20’ concrete unloading pad will be constructed to the east of the existing unloading pad and will have a lockable chain link safety gate/fence and tractor guard.

Animal Walkway

A livestock animal walkway with fence shall be installed according the location on the drawings.

The farm is located in Luzerne County, PA.

CONTRACTOR’S NOTIFICATION LIST

Following is a list of key steps in the construction of the above listed practice(s) and supporting practices at which the Natural Resources Conservation Service (NRCS) Field Office must be notified before proceeding. Failure to notify the NRCS may result in inadequate inspection of construction and the inability to certify that installation meets the standards and specifications.

Notify NRCS 24 hours before:

1.  Starting Construction
2.  Excavation begins
3.  Setting of posts
4.  Setting any concrete forms
5.  Placing any concrete
6.  Construction of roof
7.  Construction of bins
8.  Final grading

Responsibility for notification will be reviewed and individual responsibilities will be assigned at the pre-construction meeting.

Prior to the purchase of any materials, certification of their compliance to the specification shall be provided. Certification can be in the form of a signed statement that materials conform or form the markings on the materials themselves. Material literature supplied by manufacturer usually satisfies the certification requirement. The documentation for material certification shall be provided to the quality assurance representative.
COMPOSTING FACILITY

CODE 317

OPERATION AND MAINTENANCE PLAN

The life of this installation can be assured and usually increased by developing and carrying out a good operation and maintenance program. Operation and Maintenance (O & M) is necessary for all conservation practices and is required for all practices installed with NRCS assistance. The land user is responsible for proper O & M throughout the life of the practice and as may be required by federal, state, or local laws or regulations. The composting facility is a treatment component of an agricultural management system for the biological stabilization of organic material.

Operation is defined as operating the practice in compliance with all laws, regulations, ordinances, and easements and in a manner that is beneficial to the environment and will permit the practice to serve its intended purpose. Maintenance includes working to prevent deterioration of the practice, repairing damage, or replacing components that may fail.

Composting has been shown to reduce the populations of coliform bacteria to undetectable levels even in the primary compost.

Operation

Composting is a biological process. It requires a combination of art and science for success. Hence, the operation may need to undergo some trial and error in the start-up of a new composting facility.

For proper composting, correct proportions of carbon, nitrogen, moisture, and oxygen should be present in the mix. Common carbon sources are sawdust or wheat straw. It is desirable because of its bulking ability, which allows entry of oxygen. Other carbon sources that could be used are peanut hulls, cottonseed hulls, sawdust, leaves, etc. Moisture management is critical and must be maintained between 40 and 55 percent.
Compost Layering Procedure

1. The first layer is one foot of sawdust place on the floor of the primary bin; if the carcass weight exceeds 200lbs, use 1.5ft of sawdust at the base.

2. A layer of carcasses is added and covered with 1 foot of sawdust. Carcasses shall be laid side-by-side and shall not be stacked on top of one another (with the exception of very small animals where mortalities can be layer up to 4 inches thick). Space animals larger than twenty pounds at least six inches apart in the layer. Four to six inches of amendment is necessary between layers of mortality for the compost system to work. Carcasses placed directly on concrete floors or against bin walls will not compost properly. Place carcasses no closer than 1 foot from the side of the bin. The 1 foot cover on the sides and on top is important to eliminate scavenging animals and minimize odors. Most problems in animal composting arise when insufficient sawdust is used in covering carcasses.

3. To place additional carcasses, “hollow-out” a cavity in the existing compost, place carcasses and cover with a minimum 1 foot sawdust. If finished compost is available, it should be used to cover the carcass to provide additional heat and bacteria to start the process. Sawdust should then be used to provide the final cover. Use a pointed dowel or rod to measure the thickness of the sawdust cover. Do not put carcasses on top of carcasses. Maintain ½ to 1 foot between carcasses to prevent a large anaerobic mass.

4. It is recommended to monitor temperatures in the bin with a long stem, dial type thermometer. When composting is proceeding properly, temperatures will reach 130 to 160 degrees Fahrenheit. Other than testing, this is the best way to prove pathogen kill. Primary bins started during cold weather may not begin composting immediately. If carcasses are buried with the proper amounts of sawdust, they will begin composting as gas temperatures warm up. There is usually enough heat in active compost to continue composting through cold weather, regardless of the ambient temperature. If sawdust is used as recommended, the insulation effect is sufficient to minimize the effects of ambient temperature. However during cold weather, incorporate mortalities into the compost as soon as possible. Frozen carcasses will take vary long to compost.

5. After the primary bin has composted for the “primary stage time” (after adding the last animal), turn the contents into the secondary bin. This step provides mixing and aeration of the material so it will reheat and compost through the secondary stage.

6. After the secondary stage has completed, the compost should appear as a dark humus type material with very little odor. Some resistant parts such as teeth may still be identifiable, but should be soft and easily crumbled. If not, reintroduce them to the primary bin. After completion of the secondary stage, the compost can be recycled or spread as per the nutrient management plan. Storage of compost for at least 30 days following completion of the secondary stage will give additional management flexibility. This is particularly important where the primary plus secondary stage is less than 90 days since land application may not be possible immediately following the secondary stage.
7. Use the finished compost for a starter material over the new carcasses composted in the primary area. This provides heat and bacteria to kick start the process. Experience has shown that up to 50% of the sawdust requirements can be filled using recycled, finished compost. However, plan to use sawdust in the amounts noted for starting up the composting operation until sufficient finished compost is available. It is important to recognize that as finished compost becomes available, 50% of the sawdust requirement must be maintained for the system to function effectively.

8. Keep fresh sawdust as dry as possible. Sawdust in the range of 40 to 50 percent moisture is recommended. If other bulking agents such as corn stover or chopped straw are used in the bin, moisture loss will be more prevalent than with sawdust. A supplemental water source will be necessary to maintain the proper moisture content necessary for composting.

9. Keep the area around the bins mowed and free of tall weeds and brush. Watch for any leaching that may occur. Using sawdust for the foundation in the primary bins will help eliminate leaching. There should be no leaching in a covered bin composting system.

10. Finished compost should be applied to supply N, P₂O₅ and K₂O requirements. The nutrient requirements for any particular crop should be based on a current soil test. Compost application rates should be calculated on its nutrient content according to a recent laboratory analysis. In the absence of a laboratory analysis the nutrient content of the compost is estimated to be:

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Nitrogen</td>
<td>-20 lbs/ton</td>
</tr>
<tr>
<td>Ammonia Nitrogen</td>
<td>-4 lbs/ton</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>-2 lbs/ton</td>
</tr>
<tr>
<td>Potassium</td>
<td>-6 lbs/ton</td>
</tr>
</tbody>
</table>

Finished compost shall be applied as per the nutrient management plan.

11. In order to assure desire operation of the composting facility, daily records should be kept during the first several compost batches. This can be helpful in identifying problems that may occur. Record keeping can be discontinued when a desirable level of operation has been achieved. It is suggested to record daily, the amount of sawdust added, the weight of the animals, and the temperature of the compost.

12. Occasionally, composters will not heat up, or will produce odors or seepage. Composting is a biological process that depends on providing nutrients and an environment favorable for vigorous bacterial growth. Common mistakes are, failure to provide all the materials needed for energy and aeration, sloppy loading, insufficient cover over the animals, insufficient sawdust between the animals. These mistakes typically result in a dense, anaerobic mass and one in which energy is limiting. Turning the compost and adding DRY sawdust will remedy these problems. Daily records are the best way to diagnose problems.

13. Maintain all runoff control to keep the site dry. A wet composting facility will be prone to failure.

14. Animals digging into the compost CAN be a problem although usually not a problem in bins. Measure must be taken if this occurs for biosecurity reasons and maintaining a
positive public perception. Maintaining 1 foot of cover over all animal parts in the bin will eliminate scavenging animals. NEVER allow animal parts to be exposed. Once an animal finds an exposed part, they are more likely to come back and dig into the compost. It is important to maintain continuous cover. Operation and management will determine the needs of the system.

15. Inspect the compost structure when it is empty. Replace any broken or badly worn parts or hardware. Patch concrete floors and curbs as necessary to assure proper operation and integrity. Examine roofed structures for structural integrity and leaks.

16. Keep all trees, shrubs, and flowers healthy in order to maintain a positive rural image.
WEBCFM 00000 POCS 07/15/16 13:21:13 20161971769-000 WR# 163820160715 NEW XCAV DSGN

========== PENNSYLVANIA UNDERGROUND UTILITY LINE PROTECTION REQUEST ==========
Serial Number--[20161971769]-[000] Channel#: [1300WEB][1083] Message Type--[NEW][EXCAVATION][PRELIMINARY DESIGN]

County--LUZERNE] Municipality--[HOLLENBACK TWP]
Work Site--[33 MEADOW LANE]
   Nearest Intersection--[SR 3011]
   Second Intersection--[CRAGLE DR]
   Subdivision--[] Site Marked in White--[N]
Location Information--
[SITES ARE 2 DAIRY OPERATIONS LOCATED ON THE WEST AND EAST SIDE OF SR 3011.
MEADOW LANE IS A DRIVE WAY LEADING TO THE SITE ON THE EAST SIDE. CRAGLE DR
IS NORTH OF THE SITES AND SHADY LANE IS SOUTH OF THE SITES.
BETWEEN TWO INTERSECTIONS]
Caller Lat/Lon--[]
Mapped Type--[P] Mapped Lat/Lon--
[41.067677/-76.079976,41.069500/-76.071981,41.068309/-76.071512,
41.066449/-76.079557]
Map Graphic--[http://www.pa1call.org/ViewMap/view.aspx?sn=20161971769]
Type of Work--[LIVESTOCK WASTE FACILITY] Depth--[4FT]

Lawful Start Dates--[ ] thru [ ] Response Due Date--[29-Jul-16]
Scheduled Excavation Date--[DESIGN]

Caller--[ANDY WODEHOUSE]
Caller Phone--[570-784-1062] Caller Ext--[127]
Excavator--[CHESSAPEAKE BAY FOUNDATION (CBF)]
Address--[702 SAWMILL RD]
City--[BLOOMSBURG] State--[PA] Zip--[17815]
FAX--[570-387-7715] Caller Type--[B]
Email--[ANDY.WODEHOUSE@PA.USDA.GOV]
Work For--[MARTIN SMITH]

Person to Contact--[WILLIAM ANDREW WODEHOUSE]
Contact Phone--[570-784-4401] Contact Ext--[119]
Best Time to Call--[6 AM TO 1 PM]

Prepared--[15-Jul-16] at [1318] by [AWODEHOUSE]
Remarks--
[SITES ARE ACTIVE LIVESTOCK OPERATIONS. BIOSECURITY IS A HIGH PRIORITY FOR LIVESTOCK OPERATIONS. PLEASE CONTACT THE LANDOWNER BEFORE ENTERING THE FARMS. MARTIN SMITH 570 336 7315]

PUD0  PUD=PPLELEC DESIGN  RG0  RG=FRONTIER COM SO  SP0  SP=SUNOCO PIPELINE
UJ0  UJ=UGI LEHIGH

Serial Number--[20161971769]-[000]
======== Copyright (c) 2016 by Pennsylvania One Call System, Inc. ========

2
To: CHESAPEAKE BAY FOUNDATION (CBF)  Attn: ANDY WODEHOUSE
Voice: 5707841062 x127  Fax: 5703877715
Re: Response to dig locate request

Thank you for dialing 811 in advance of your proposed excavation project.

Ticket: 20161971769
County: LUZERNE  Place: HOLLENBACK
Address: 33 MEADOW LN

SP:
Thank you for dialing 811 in advance of your excavation project. Our Pipeline facilities are clear and will not be in conflict with your dig request. Should the scope of the excavation area alter in any way notify 811. In addition should you have any questions please contact us at 1-888-786-3260.
For additional pipeline safety information, please follow this link to our website http://www.sunocologistics.com/Public-Awareness/26/

If you have any questions please contact Sunoco Pipeline, L.P 1(888)786-3260
For additional pipeline safety information, please follow this link to our website at http://www.sunocologistics.com/Public-Awareness/26/

This message was generated by an automated system. Please do not reply to this email.
QUALITY ASSURANCE (QA) PLAN

Customer: Martin Smith, Lazerne County
Project: Animal Mortality/Composting Facility (Roofed), Waster Transfer (scrape lane, push off, and unloading pad)

Critical Items of Work and Time of Inspections

<table>
<thead>
<tr>
<th>Workdays Inspection Req'd</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Layout excavation limits and install E&amp;S control</td>
<td>0.5</td>
</tr>
<tr>
<td>2. Excavate and establish subgrade for practices</td>
<td>Once</td>
</tr>
<tr>
<td>3. Set posts</td>
<td>1</td>
</tr>
<tr>
<td>4. Set forms and place concrete for pad</td>
<td>2</td>
</tr>
<tr>
<td>5. Set forms and place concrete for walls</td>
<td>2</td>
</tr>
<tr>
<td>6. Set forms and place concrete for waste transfer</td>
<td>3</td>
</tr>
<tr>
<td>7. Construct roof</td>
<td>3</td>
</tr>
<tr>
<td>8. Redress Topsoil, Lime, fertilize, Seed &amp; Mulch</td>
<td>0.5</td>
</tr>
</tbody>
</table>

General Items
1. OSHA standards must be followed. If safety violations are observed, the landowner, contractor, and NRCS supervisor or engineer assigned to the job must be notified.
2. The site shall be checked randomly during the construction period when the contractor is working, expected to work, or could work. These visits shall be unannounced and at random times.
3. All visits shall be documented on the SCS-CPA-6 or in the Job Diary.

Specific Work Items to be Checked
1. Ensure E&S measures are installed
2. Check for seep locations during excavation and ensure all sub-bases are free of seeps or unstable soils.
3. Ensure vegetation is well established and adequate for filter
4. Concrete mix design shall be obtained from the contractor and submit to design engineer for approval
5. Truss design shall be submitted from contractor and submit to design engineer for approval

Specific As-Built Documentation Required
1. Elevations of the top of the pad at each corner
2. Elevations of original ground and finished grade to document amount of cut and fill
3. Locations of control joints
4. Dimensions of the pad
5. Fasteners and amount installed meet design requirements

The following concur in the content of this plan and the inspection requirements and obligations:

[Signature of Designer]

Date: 8/17/2016

[Signature of Engineer for Approval]

Date: 8/17/2016

This Quality Assurance Plan was developed to ensure the designer's objectives are met and quality workmanship is performed and sets forth the minimum, but not necessarily all, inspection requirements. If additional inspection is necessary, the inspector shall inform his/her supervisor and document the additional conditions on the SCS-CPA-6.

MARTIN SMITH
Lazerne County

July 2016
CERTIFICATION OF CONFORMANCE

The undersigned primary manufacturer/supplier has furnished to:

Farmer’s Name: Martin Smith

Address 33 Meadow Lane

City/State/Zip Wapwallopen, Pa. 18660

Type of Storage: Roof

and hereby states that the quality of work and materials meets the requirements as set forth on NRCS contract drawings and Specifications No. 367 all as approved by the Natural Resources Conservation Service.

Name of Manufacturer/Supplier: ________________________________

Signature/Title/Date: _______________________________________

Description of items completed:

    Construction of manure storage structure and Heavy Use Area
In addition, the landowner and/or the following subcontractors were also involved in the installation and they hereby certify their work meets the requirements of the drawings and/or specifications as stated previously.

Landowner
Signature/Date: _______________________________________

Description of items completed:
Subcontractor
Signature/Date: _______________________________________

Description of items completed:
Received By:
Signature Title Date

Note: It is the primary manufacturer/supplier’s responsibility to obtain and furnish all required signatures.
PRE-CONSTRUCTION CHECKLIST

A meeting between the farmer, contractor, and assigned NRCS or Conservation District Technician is required to review the following checklist before construction begins. The contractor must be represented at the meeting by the foreman who will have authority to make decisions for the contractor on the job site, or by the foreman’s immediate supervisor. Both individuals must be identified below and those in attendance must sign.

Farmer and Contractor each have a copy of:

____ Plan view.
____ Cross-sections.
____ Installation sequence.
____ Construction E & S Plan.
____ Construction Specifications.
____ Construction master package.
____ Contractor’s notification list.
____ Dimensions and/or quantities of needed materials.
____ Other pertinent plans and designs.
____ Reviewed above items with the contractor and farmer.
____ Went over site and problem area(s) with contractor and farmer.
____ Laid out structure with proper cuts and fills.

The contractor and the farmer agree with the above checklist.

Construction will start on _______________.

(date)

Farmer’s Signature: _________________________________. Date: _____________.

Contractor’s Name/Signature; _________________________________. (foreman)

Contractor’s Name/Signature; _________________________________. (supervisor)

Phone: ________________________________________.

Technician’s Signature: _________________________________.

Phone: 570-674-7991_____________________________________.

Martin Smith Luzerne County March 2016
SUPERPLASTICIZERS (HRWR)

On a trial basis, superplasticizers will be allowed for use as described herein. All concrete construction shall follow NRCS Construction specification 313 except where modified. The concrete strength must be provided as per the design. The user must ensure that the proposed HRWR product meets the requirements of ASTM C 494.

GENERAL SPECIFICATION LIMITS FOR CONCRETE

<table>
<thead>
<tr>
<th>Specification Requirement</th>
<th>Superplasticized Concrete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slump</td>
<td>7 ½ inch maximum</td>
</tr>
<tr>
<td>Free Fall</td>
<td>12 feet</td>
</tr>
<tr>
<td>Structural Concrete</td>
<td></td>
</tr>
<tr>
<td>Layer Thickness</td>
<td>5 feet</td>
</tr>
<tr>
<td>Structural Concrete</td>
<td></td>
</tr>
<tr>
<td>Concrete Temperature</td>
<td>95°F - _______</td>
</tr>
</tbody>
</table>

Add superplasticizers to concrete with a 2-4” slump. Water may not be added to the mix after the superplasticizers.

Altered dosage of the air entrainment agent may be required to maintain air within specification.

It is recommended that a minimum amount of mixing time or revolutions on the drum be provided after the HRWR has been introduced. Usually 2-4 minutes (depending on total number of cubic yards to be mixed) is sufficient or 20-30 revolutions.

Forms must be designed to withstand full hydraulic pressure resulting from the near fluid state of superplasticized concrete often effective for the duration of placement. Tightness of forms is also critical since superplasticized concrete will leak through very small cracks.

Required dosages of superplasticizers increase as the temperature of concrete decreases. The amount can be significant at temperatures below 68°F.

The use of HRWR admixtures may slightly retard the setting of concrete depending on factors including temperature, initial slump, cement content, brand of HRWR, and the combination of other water reducing agents with the HRWR.

January 1995
AGRICULTURAL CONSTRUCTION SAFETY
(September 1995)

Compliance with safety regulations on agricultural projects is expected on all sites receiving federal funding or technical assistance and by all construction insurance/liability companies. Requirements may vary, however the contractor is to maintain a safe working environment for themselves, their employees, subcontractors, and others who must have access to the site. Detailed knowledge of safety regulations is the responsibility of the contractor.

Agency personnel involved with the project may also provide assistance in identifying safety concerns as they recognize them. When a safety problem is identified and brought to the contractor's attention it must be resolved. If there is a safety issue the agency personnel are instructed to refer the situation to OSHA.

These are some of the major areas of concern:

Soil Cave-In Protection
- Applies to all excavation over four feet in depth.
- OSHA has regulations set forth in Standards 29 CFR, 1926, Subpart P.
- Options include: sloping, shoring or working from a safe distance.
- See “Fact Sheet” – SOIL CAVE IN – A FATAL SLIP for general information.

FALL PROTECTION
- This applies to all areas where an individual could fall six feet or more.
- OSHA has written new guidelines as detailed in Standards 29 CFR Parts 1910 and 1926.
- This new regulation adds to the requirements for scaffolding found in 29 CFR 1926/1910, Subpart L.
- Options include: warning line system, mechanical equipment, controlled access area, covers, protection from falling objects, guardrail system, and personal fall arrest.
- This system should be written into a fall protection plan.

UNDERGROUND AND OVERHEAD UTILITY PROTECTION
- Requirements include conducting utility check via PA-ONE Call system
- Requirements include a procedure to avoid contact with above ground utilities on the work site.
Agricultural Waste System Safety Signs

It is the RESPONSIBILITY of the CONTRACTOR/INSTALLER to provide safety signs as shown below or equal. One shall be located at each entrance/access point where access can result in a fatality due to manure gases and/or drowning. Several signs are specified for larger facilities. Multiple signs are required to cover different hazards. Bilingual operations should consider using both types.

**Deadly Manure Gases Possible** – Place one sign at each entrance/access point to a below-ground manure storage pit, covered ground-level storage, a covered above-ground storage, and all manure hoppers and reception pits.

*Example locations*: Collection hoppers, agitation point for slatted pits, septic tanks that hold milking center and manure wastes and any other confined space where waste is collected.

**Drowning Hazard - Keep off Surface** – Place one sign at each entrance/access point of a manure storage pond, in-ground uncovered storage structure or on each accessible side of a storage pond.

*Example Locations*: Open storage tanks, earthen storage ponds, and HDPE lined ponds.

**During Agitation, Deadly Gases Possible** – Place one sign at each entrance/access used for agitation or transfer at a manure storage pond, manure storage structure, and all reception and transfer facilities. Place one where visitors or children might congregate.

*Example locations*: All agitation/pump out locations of manure storages and reception pits. Any areas where visitors or children might tend to congregate such as at the end of the access road near the manure storage.

**Never Dump Over Fence** – Place sign(s) on manure storage safety fence at locations adjacent to a concrete heavy use area and/or stacking facility. Operators avoid designated push-offs when manure is frozen or heavily bedded and must be reminded of the danger.

*Example locations*: Manure storage safety fence adjacent to a heavy use area or manure stacking facility.

**Sources**:  
- U.S. Municipal Supply, Inc. 1-800-222-1980  
- Local Extension Service  
- Self-Made Equal  
- Local Conservation District  
- Local Sign Making Company

IMPORTANT! Safety signs are designed to serve as a reminder of a hazard and consequences; the signs do not replace or substitute for original product warnings or labels, equipment safety literature, or specific safety training associated with manure systems and handling equipment. Owner/operators shall consult their site specific engineering designs, safety plans, and operation/maintenance plans for additional safety requirements. If no information is found, or more is needed, additional information can also be received from equipment manufacturers and distributors, county extension offices, private consultants, and NRCS offices.
Cause of Cave Ins

Cave Ins in pits and ditches cause the death of construction workers every year. Most deaths have occurred in trenches dug for utility lines. However, soil slippage can occur anywhere soil is excavated. Landslides in clay soils kill more people each year than those in sandy soils.

Most workers are careful around sand because they know it moves easily. However, many believe a thick, tough clay soil will not slip. Yet, most clay soils shrink and crack open when dry and swell when wet. This shrinkage and swelling cause slick areas to develop beneath the surface.

Some clay soils contain water-tight layers called fragipans. Water accumulating on the impervious layer lubricates the soil, increasing the probability of slippage. When a ditch or pit is dug in a soil with a fragipan or in a soil with a high shrink-swell potential, the soil will often slip, resulting in a dangerous cave in. This becomes even more likely WHEN THE SOIL IS WET.

Prevention

Occupational Safety and Health Administration (OSHA) regulations require protective action on all worker-occupied excavations unless the cut is made in stable rock, or the cut is less than five feet deep and there is no potential for a cave in to occur. Protection can be accomplished with sloping and benching, support systems, or shield systems which conform to OSHA regulations.

Sloping the sides of the excavation is the simplest protection against a cave in. If soil properties in the excavation are unknown, the excavation slopes should be no steeper than 1-1/2 horizontal to 1 vertical. If the soil can be classified as a Type A or Type B material according to the OSHA classification system (see back side), you can use a steeper slope, as shown in Figures 1 through 5.

Consult OSHA regulations when more than one soil type is exposed in an excavated slope, or when bench slopes are used. The regulations also provide details on support and shield requirements. Complete requirements are found in OSHA’s safety and health standards (29 CFR 1926, Subpart F).

Soils Information

Soil survey publications are available for most counties. This information is useful to engineers, builders, contractors and others interested in construction hazards. The publication identifies soils with fragipans and high shrink-swell potential. Other potential construction problems, such as water table, bedrock and corrosiveness, are also contained in the reports as well as information on engineering properties of soils.

Copies of soil survey reports and other soils information are available from the local office of the USDA, Natural Resources Conservation Service, or write Soils, USDA, Natural Resources Conservation Service, Suite 340, One Credit Union Place, Harrisburg, PA 17110-2993.
OSHA Soils Classification for Excavated Slopes

**Type A means** cohesive soils with an unconfined compressive strength of 1.5 ton per square foot (tsf) or greater. Examples of cohesive soils are clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as hardpan are also considered Type A. However, no soil is Type A if:

(i) The soil is fissured; or
(ii) The soil is subject to vibration from heavy traffic, pile driving, or similar effects; or
(iii) The soil has been previously disturbed; or
(iv) The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of 4H:1V or greater; or
(v) The material is subject to other factors that would require it to be classified as a less stable material.

**Type B means:**

(i) Cohesive soil with an unconfined compressive strength greater than 0.5 tsf but less than 1.5 tsf; or
(ii) Granular, cohesionless soils including; angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam; or
(iii) Previously disturbed soils except those which would otherwise be classed as Type C soil; or
(iv) Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration; or
(v) Dry rock that is not stable; or
(vi) Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than 4H:1V, but only if the material would otherwise be classified as Type B.

**Type C means:**

(i) Cohesive soil with an unconfined compressive strength of 0.5 tsf or less; or
(ii) Granular soils including gravel, sand, and loamy sand; or
(iii) Submerged soil or soil from which water is freely seeping; or
(iv) Submerged rock that is not stable; or
(v) Material in a sloped, layered system where the layers dip into the excavation on a slope of four 1/4H:1V or steeper.

**MAXIMUM ALLOWABLE SLOPES**

**Figure 1. Type A Soil**
Simple Slope, General

**Figure 2. Type A Soil**
Simple Slope, Short Term

**Figure 3. Type A Soil**
Unsupported, Vertically Sided Lower Portion, Maximum 8 Feet in Depth

**Figure 4. Type A Soil**
Unsupported, Vertically Sided Lower Portion, Maximum 12 Feet

**Figure 5. Type B Soil**
Simple Slope

**Figure 6. Type C Soil**
Simple Slope
WASTE STORAGE STRUCTURE
CONSTRUCTION SPECIFICATION

1. SCOPE

The work shall consist of furnishing materials and installing all components of the waste storage structure 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 the construction methods to be used have been reviewed and approved by the Engineer or his/her designated Representative.

2. MATERIALS

All materials used shall conform to the quality and grade noted on the drawings, set forth in Section 9, or as otherwise listed below:

PORTLAND CEMENT shall be Type I, IA, II or IIA and conform to ASTM-C150, unless otherwise set forth in Section 9. 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, type A, D, F or G, for water-reduction and set-retardation, and type 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 9.

MASONRY COMPONENTS shall meet the requirements of ASTM-C90 & C270, and placed in accordance with ACI-530.

PRECAST CONCRETE units shall comply with ACI-525 and 533.

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 SS-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.
METALS shall conform to the following standards:

- Structural steel - ASTM-A36
- Carbon steel - ASTM-A283, grade C or D; or A611, grade D; or A570, grade C or D
- Aluminum alloy - ASTM-B308, B429, B221, B210, B211, or B209
- Screws - wrought iron or medium steel
- Split or tooth-ring connectors - hot-rolled, low carbon steel conforming to ASTM-A711, grade 1015

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.

MANUFACTURED TRUSSES shall be certified as having been designed and built to Truss Plate Institute standards.

PRESSURE TREATED WOOD PRODUCTS shall be Douglas Fir, Southern Yellow Pine, or as otherwise specified on the drawings or in Section 9. 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 meets the designated quality criteria.

FASTENERS for wood structures shall be stainless steel, galvanized, or otherwise protected from corrosion due to contact with moisture, manure and associated gasses.

3. FOUNDATION PREPARATION AND CONDITIONS

All trees, brush, fences, and rubbish shall be cleared within the area of the structure, including any appurtenances, and borrow areas. All material removed by clearing and excavation operations shall be disposed of as directed by the Owner or his/her Representative. Sufficient topsoil shall be stockpiled in a convenient location for spreading on disturbed areas. All structures shall be set on undisturbed soil or non-yielding compacted material. Overexcavation must be corrected as noted on the drawings or as directed by the Engineer or his/her designated Representative.

In addition to uniformity, the existing subgrade material must have sufficient strength to support the structure and its associated loads. Organic soil or soils with high percentages of clays and silts shall be removed. 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.

Surface and subsurface drainage systems shall be installed and operating adequately to remove water from the foundation to allow for proper structure placement.

Drainfill upon which concrete is to be placed shall be covered with a geosynthetic that has an AOS between 20 and 100, inclusive.

Concrete shall not be placed until the subgrade, forms and steel reinforcements have been inspected and approved by the Engineer or his/her designated Representative. Notification shall be given far enough in advance to provide time for the inspection.

Prior to placement of concrete, the forms and subgrade shall be free of chips,
sawdust, debris, standing water, ice, snow, extraneous oil, mortar or other harmful substances or coatings.

Earth surfaces against which concrete is to be placed shall be firm and damp. Placement of concrete on mud, dried earth or uncompacted fill or frozen subgrade will not be permitted.

4. CAST-IN-PLACE CONCRETE STRUCTURES

a. Concrete Forms

Forms shall be of wood, plywood, steel, or other approved material and shall be mortar tight. The forms and associated falsework shall be substantial and unyielding and shall be constructed so that the finished concrete will conform to the specified dimensions and contours.

Form surfaces shall be smooth and essentially free of holes, dents, sags, or other irregularities. Forms shall be coated with form oil before being set into place. Care shall be taken to prevent form oil from coming in contact with steel reinforcement.

b. Concrete Mix

Concrete for structures shall have a 28-day compressive strength of at least 4000 psi, unless otherwise specified on the drawings or in Section 9. The Contractor shall be responsible for the design of the mix and certification of the necessary compressive strength. Current certification of the design mix by Penn DOT may be accepted in lieu of additional testing.

The slump shall be 3 to 6 inches (without superplasticizers, if any); the air content by volume 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 the addition, and that is not warmer than 95° F. The slump shall not exceed 7½ inches with the addition of superplasticizer.

c. Mixing and Handling Concrete

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

The supplier shall provide a batch ticket to the Owner or Technician with each load of concrete delivered to the site. The batch ticket shall state the class of concrete, any admixtures used, time out, and the amount of water that can be added at the site and still be within the design mix limits. Concrete shall be uniform and thoroughly mixed when delivered to the job site. The Contractor shall test slump and air entrainment as necessary to insure that the concrete meets the requirements of this specification. 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.

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 forms as rapidly as practical by methods that will prevent segregation of the aggregates or loss of mortar. Concrete shall be placed in the forms 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.
Concrete shall not be dropped more than 5 feet vertically unless special equipment is used to prevent segregation. Superplasticized concrete shall not be dropped more than 12 feet unless special equipment is used to prevent segregation.

Slab concrete shall be placed at the design thickness in one layer. Formed walls shall be placed in layers not more than 24-inches high, unless superplasticizer is used, in which case the maximum layer shall be 5 feet. Each layer shall be consolidated to insure a good bond with the preceding layer.

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

If the surface of a layer in place will develop its initial set, i.e., will not flow and merge with the succeeding layer when vibrated, a construction joint shall be made. Construction joints shall be made by cleaning the hardened concrete surface to exposed aggregate by sandblasting, air/water jetting, or hand scrubbing with wire brush, and keeping the concrete surface moist for at least one hour prior to placement of new concrete.

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. Exposed edges shall 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.

d. 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. In forms, this shall be accomplished by tying temperature and shrinkage steel or special tie bars (not stress steel) to the form "snap ties" or by other methods of tying. In slabs, steel shall be supported by precast concrete bricks (not clay bricks), or metal or plastic chairs. 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:

(1) Maximum reduction in cover:
  from formed and exposed surfaces - 1/4 inch from earth surfaces - 1/2 inch

(2) 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.

e. 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. Wooden forms left in place during the curing period shall be kept wet.

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. Concrete shall be wet cured or remain in forms until immediately before patching, repairs, or finishing is performed. 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.

Any construction activity which disturbs the curing material shall be avoided during the curing period. If the curing material is subsequently disturbed, it shall be reapplied immediately.

Steel tying or form construction adjacent to new concrete shall not be started until the concrete has cured at least 24 hours. Vehicles, overlying structures, or other heavy loads shall not be placed on new concrete slabs for at least three days, unless the concrete strength can be shown to be adequate to support such loads.

f. Form Removal and Concrete Repair

Forms for walls and columns shall not be removed for at least 24 hours after placing the concrete. When forms are removed in less than seven days, the exposed concrete shall be sprayed with a curing compound or be kept wet continuously for the remainder of the curing period. Forms which support beams or covers shall not be removed for at least seven days, or 14 days if they are to support forms or shoring.

Forms shall be removed in such a way as to prevent damage to the concrete. Forms shall be removed before walls are backfilled. Columns shall be at least seven days old before any structural loads are applied.

Where minor areas of the concrete surface are "honeycombed," damaged or otherwise defective, the area shall be cleaned, wetted and then filled with a dry-pack mortar. Dry-pack mortar shall consist of one part Portland cement and three parts sand with just enough water to produce a workable paste.

g. 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.
h. Concreting in Hot Weather

Concreting in hot weather shall be performed in accordance with ACI 305, 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.

i. Backfilling New Concrete Walls

Backfilling and compaction of fill adjacent to new concrete walls shall not begin in less than 14 days after placement of the concrete, except that walls that can be backfilled on both sides simultaneously may be done so within seven days.

Heavy equipment shall not be allowed within three feet of a new concrete wall. Provide compaction near the wall by means of hand tamping or small, manually-directed equipment.

5. WOOD STRUCTURES

All framing shall be true and exact. Timber and lumber shall be accurately cut and assembled to a close fit and shall have even bearing over the entire contact surfaces. Nails and spikes shall be driven with just sufficient force to set the heads flush with the wood surface. Deep hammer marks in the wood shall be considered evidence of poor workmanship and may be sufficient cause for rejection of the work.

Holes for lag screws shall be bored with a bit not larger than the body of the screw at the base of the thread. Holes for bolts shall be bored with a bit no more than 1/16" larger than the bolt diameter to achieve a snug fit without forcibly driving the bolt.

Washers shall be used in contact with all bolt heads and nuts that would otherwise be in contact with wood.

All joints shall be fastened with the number, type, and size of fasteners specified, at the locations or spacing specified.

If field cuts of pressure-treated wood expose untreated interior wood, the untreated surfaces shall be covered with two coats of a liquid preservative, as approved by the Engineer.

Roof trusses shall be handled, installed and braced according to the Truss Plate Institute’s HIB-91, “Handling, Installing and Bracing MPC Wood Trusses.”

Wood structures shall be backfilled within the limits shown on the drawings by placing material in uniform lifts not to exceed nine inches. Compaction within three feet of walls shall be accomplished by means of hand tamping or small manually-directed equipment.

6. STRUCTURES INSTALLED ACCORDING TO STANDARD DETAIL DRAWINGS PREPARED BY OTHERS

Commercially available structures shall be installed as shown on the drawings provided to and concurred in by NRCS. All materials furnished and installed shall conform to the quality and grade noted on the drawings. A site specific set of construction drawings shall be at the site during construction.

Modification of the structure outside limits shown on the drawings shall not be made without prior review and approval by the Engineer with appropriate approval authority. The Supplier or Contractor who submitted the original standard detail drawings shall be responsible for making any changes. Sufficient design
documentation to allow an adequate review of the proposed modification shall accompany any request for a change.

Within thirty (30) days of the completion of construction of the structure, the Contractor or Supplier shall furnish written certification to the Engineer that all aspects of the installation are in conformance with the requirements of the drawings and specifications.

7. BURIED TANKS

a. Tank Condition

Tanks, whether steel or fiberglass/plastic, shall have sufficient strength to withstand design loads, be watertight, and be protected from corrosion. New tanks shall have a manufacturer's certification to this effect.

Used tanks must be inspected for pitting, corrosion, and cracks that could impair the strength or watertightness. Tanks which originally stored leaded fuels may have tetraethyl lead deposits and scale on the inside. This material should be detached from the tank's interior, pumped out, and disposed of in a manner which will not pollute ground or surface waters. Also, if welding, handling, etc. is done, safety precautions should be taken to avoid ingesting or inhaling the lead or its fumes. (These tanks may have gasoline fumes or vapors in them and may explode from a spark, welding arc or torch.)

A tank that has been bent or dented will not be accepted unless adequate repairs have been made to restore the strength, watertightness, and corrosion protection. When inlet or outlet pipes or other type of openings are to be cut into one of these tanks, the reduced strength must be considered when the tank is put into use. The Steel Tank Institute's sti-P3 certification procedure shall be used to evaluate the structural integrity and assure the corrosion protection of steel tanks which have been repaired or modified.

b. Installation

Underground tanks shall be handled and installed according to the manufacturer's recommended procedures.

At a minimum, all tanks shall be set on a firm earth foundation or a full-length concrete slab covered with six inches of clean sand. The tank shall be surrounded by clean sand or well-tamped earth, free from stones and other debris. The use of saddles or "chock blocks" of any sort interferes with the proper distribution of the backfill loads and shall not be permitted.

The excavation shall be dewatered during installation and backfill operations. The backfill shall be well compacted, particularly under the tank, to provide adequate support.

Tanks shall be covered with a minimum of two feet of earth, or with not less than one foot of earth on which is placed a reinforced concrete slab not less than four inches thick.

Tank installations, which will be subjected to traffic, shall have adequate strength to withstand the anticipated overload. Tanks shall be protected against damage from vehicles passing over them by at least three feet of earth cover or by 18 inches of well-tamped earth plus either eight inches of asphaltic paving or six inches of reinforced concrete. The paving or concrete shall be placed to extend at least one foot horizontally in all directions beyond the outline of the tank.

Tanks shall not be filled or even partially filled during their installation and backfilling.

Unless high ground water levels are not expected, the site shall have a drain system to prevent ground water from flooding around the tank. Where a tank may
become buoyant due to a rise in the level of the water table or due to location in an area subjected to flooding, applicable precautions shall be taken to anchor the tank in place or dewater the site.

Openings on all underground tanks must be properly located and maintained in place during backfilling.

8. 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 with horizontal lifts of moist earth not to exceed four inches in thickness, or with other material as specified in Section 9 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 connections between pipes and structure walls and floors shall be water tight and capable of withstanding the expected operating pressures.
9. ADDITIONAL CONDITIONS WHICH APPLY TO THIS PROJECT ARE:
CONSTRUCTION SPECIFICATION
367. ROOFS and COVERS

1. SCOPE
The work shall consist of furnishing materials and installing all components of the roof or cover, 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 the construction methods to be used have been reviewed and approved by the Engineer or his/her designated Representative.

2. MATERIALS
All materials used shall conform to the quality and grade noted on the drawings, set forth in Section 8, or as otherwise listed below:

PORTLAND CEMENT shall be Type I, IA, II or II A and conform to ASTM-C150, unless otherwise set forth in Section 8. 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, type A, D, F or G, for water-reduction and set-retardation, and type 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.

MASSONRY COMPONENTS shall meet the requirements of ASTM-C90 & C270, and placed in accordance with ACI-530.

PRECAST CONCRETE units shall comply with ACI-525 and 533.

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 SS-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.

METALS shall conform to the following standards:
Structural steel - ASTM-A36
Carbon steel - ASTM-A283, grade C or D; or A611, grade D; or A570, grade C or D
Aluminum alloy - ASTM-B308, B429, B221, B210, B211, or B209
Screws - wrought iron or medium steel
Split or tooth-ring connectors - hot-rolled, low carbon steel conforming to ASTM-A711, grade 1015

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.

MANUFACTURED TRUSSSES shall be certified as having been designed and built to Truss Plate Institute standards.

PRESSURE TREATED WOOD PRODUCTS shall be Douglas Fir, Southern Yellow Pine, or as otherwise specified on the drawings or 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 meets the designated quality criteria.

FASTENERS for roofs and covers shall be stainless steel and/or galvanized in accordance with ASTM A153, and/or A653 Class G185, and Type 304 or 316, or otherwise protected from corrosion due to contact with moisture, manure and associated gasses. All fasteners, connectors, and any other metal contacting ACZA, ACQ or CA treated wood shall be stainless steel, in accordance with Supplement A below.

GEOMEMBRANES shall comply with the requirements of Construction Specification PA521A-PE/PP, as applicable.

3. FOUNDATION PREPARATION AND CONDITIONS

All trees, brush, fences, and rubbish shall be cleared within the area of the structure, including any appurtenances, and borrow areas. All material removed by clearing and excavation operations shall be disposed of as directed by the Owner or his/her Representative. Sufficient topsoil shall be stockpiled in a convenient location for spreading on disturbed areas. All structures shall be set on undisturbed soil or non-yielding compacted material. Over excavation must be corrected as noted on the drawings or as directed by the Engineer or his/her designated Representative.

In addition to uniformity, the existing subgrade material must have sufficient strength to support the structure and its associated loads. Organic soil or soils with high percentages of clays and silts shall be removed. 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.

Surface and subsurface drainage systems shall be installed and operating adequately to remove water from the foundation to allow for proper structure placement.

Drainfill upon which concrete is to be placed shall be covered with a geosynthetic that has an AOS between 20 and 100, inclusive.

Concrete shall not be placed until the subgrade, forms and steel reinforcements have been inspected and approved by the
Engineer or his/her designated Representative. Notification shall be given far enough in advance to provide time for the inspection.

Prior to placement of concrete, the forms and subgrade shall be free of chips, sawdust, debris, standing water, ice, snow, extraneous oil, mortar or other harmful substances or coatings.

Earth surfaces against which concrete is to be placed shall be firm and damp. Placement of concrete on mud, dried earth or uncompacted fill or frozen subgrade will not be permitted.

4. CAST-IN-PLACE CONCRETE STRUCTURES

a. Concrete Forms

Forms shall be of wood, plywood, steel, or other approved material and shall be mortar tight. The forms and associated falsework shall be substantial and unyielding and shall be constructed so that the finished concrete will conform to the specified dimensions and contours.

Form surfaces shall be smooth and essentially free of holes, dents, sags, or other irregularities. Forms shall be coated with form oil before being set into place. Care shall be taken to prevent form oil from coming in contact with steel reinforcement.

b. Concrete Mix

Concrete for structures shall have a 28-day compressive strength of at least 4000 psi, unless otherwise specified on the drawings or in Section 8. The Contractor shall be responsible for the design of the mix and certification of the necessary compressive strength. Current certification of the design mix by Penn DOT may be accepted in lieu of additional testing.

The slump shall be 3 to 6 inches (without superplasticizers, if any), the air content by volume 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 the addition, and that is not warmer than 95° F. The slump shall not exceed 7½ inches with the addition of superplasticizer.

c. Mixing and Handling Concrete

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

The supplier shall provide a batch ticket to the Owner or Technician with each load of concrete delivered to the site. The batch ticket shall state the class of concrete, any admixtures used, time out, and the amount of water that can be added at the site and still be within the design mix limits. Concrete shall be uniform and thoroughly mixed when delivered to the job site. The Contractor shall test slump and air entrainment as necessary to insure that the concrete meets the requirements of this specification. 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.

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 forms as rapidly as practical by methods that will prevent segregation of the
aggregates or loss of mortar. Concrete shall be placed in the forms 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.

Concrete shall not be dropped more than 5 feet vertically unless special equipment is used to prevent segregation. Superplasticized concrete shall not be dropped more than 12 feet unless special equipment is used to prevent segregation.

Slab concrete shall be placed at the design thickness in one layer. Formed walls shall be placed in layers not more than 24-inches high, unless superplasticizer is used, in which case the maximum layer shall be 5 feet. Each layer shall be consolidated to insure a good bond with the preceding layer.

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

If the surface of a layer in place will develop its initial set, i.e., will not flow and merge with the succeeding layer when vibrated, a construction joint shall be made. Construction joints shall be made by cleaning the hardened concrete surface to exposed aggregate by sandblasting, air/water jetting, or hand scrubbing with wire brush, and keeping the concrete surface moist for at least one hour prior to placement of new concrete. 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. Exposed edges shall 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.

d. 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. In forms, this shall be accomplished by tying temperature and shrinkage steel or special tie bars (not stress steel) to the form "snap ties" or by other methods of tying. In slabs, steel shall be supported by precast concrete bricks (not clay bricks), or metal or plastic chairs. 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:

(1) Maximum reduction in cover:
- from formed and exposed surfaces - 1/4 inch
- from earth surfaces - 1/2 inch

(2) 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.

e. 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. Wooden forms left in place during the curing period shall be kept wet.

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. Concrete shall be wet cured or remain in forms until immediately before patching, repairs, or finishing is performed. 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.

Any construction activity which disturbs the curing material shall be avoided during the curing period. If the curing material is subsequently disturbed, it shall be reapplied immediately.

Steel tying or form construction adjacent to new concrete shall not be started until the concrete has cured at least 24 hours. Vehicles, overlying structures, or other heavy loads shall not be placed on new concrete slabs for at least three days, unless the concrete strength can be shown to be adequate to support such loads.

f. Form Removal and Concrete Repair

Forms for walls and columns shall not be removed for at least 24 hours after placing the concrete. When forms are removed in less than seven days, the exposed concrete shall be sprayed with a curing compound or be kept wet continuously for the remainder of the curing period. Forms which support beams or covers shall not be removed for at least seven days, or 14 days if they are to support forms or shoring.

Forms shall be removed in such a way as to prevent damage to the concrete. Forms shall be removed before walls are backfilled. Columns shall be at least seven days old before any structural loads are applied.

Where minor areas of the concrete surface are "honeycombed," damaged or otherwise defective, the area shall be cleaned, wetted and then filled with a dry-pack mortar. Dry-pack mortar shall consist of one part Portland cement and three parts sand with just enough water to produce a workable paste.

g. 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.

h. Concreting in Hot Weather

Concreting in hot weather shall be performed in accordance with ACI 305, 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.

i. Backfilling New Concrete Walls

Backfilling and compaction of fill adjacent to new concrete walls shall not begin in less than 14 days after placement of the concrete, except that walls that can be backfilled on both sides simultaneously may be done so within seven days.

Heavy equipment shall not be allowed within three feet of a new concrete wall. Provide compaction near the wall by means of hand tamping or small, manually-directed equipment.

5. WOOD STRUCTURES

All framing shall be true and exact. Timber and lumber shall be accurately cut and assembled to a close fit and shall have even bearing over the entire contact surfaces. Nails and spikes shall be driven with just sufficient force to set the heads flush with the wood surface. Deep hammer marks in the wood shall be considered evidence of poor workmanship and may be sufficient cause for rejection of the work.

Holes for lag screws shall be bored with a bit not larger than the body of the screw at the base of the thread. Holes for bolts shall be bored with a bit no more than 1/16" larger than the bolt diameter to achieve a snug fit without forcibly driving the bolt.

Washers shall be used in contact with all bolt heads and nuts that would otherwise be in contact with wood.

All joints shall be fastened with the number, type, and size of fasteners specified, at the locations or spacing specified.

If field cuts of pressure-treated wood expose untreated interior wood, the untreated surfaces shall be covered with two coats of a liquid preservative, as approved by the Engineer.

Roof trusses shall be handled, installed and braced according to the Truss Plate Institute’s HIB-91, “Handling, Installing and Bracing MPC Wood Trusses.”

Wood structures shall be backfilled within the limits shown on the drawings by placing material in uniform lifts not to exceed nine inches. Compaction within three feet of walls shall be accomplished by means of hand tamping or small manually-directed equipment.

6. GEOMEMBRANE STRUCTURES

Semi-rigid and flexible covers which utilize geomembranes shall be installed as required by the manufacturer, and as otherwise set forth in Section 8 and Construction Specification PA521A-PE/PP.

7. STRUCTURES INSTALLED ACCORDING TO STANDARD DETAIL DRAWINGS PREPARED BY OTHERS

Commercially available structures shall be installed as shown on the drawings provided to and concurred in by NRCS. All materials furnished and installed shall conform to the quality and grade noted on the drawings. A site specific set of construction drawings shall be at the site during construction.

Modification of the structure outside limits shown on the drawings shall not be made without prior review and approval by the Engineer with appropriate approval authority. The Supplier or Contractor who submitted the original standard detail drawings shall be responsible for making
any changes. Sufficient design
documentation to allow an adequate review
of the proposed modification shall
accompany any request for a change.

Within thirty (30) days of the completion of
construction of the structure, the Contractor
or Supplier shall furnish written certification
to the Engineer that all aspects of the
installation are in conformance with the
requirements of the drawings and
specifications.

8. ADDITIONAL CONDITIONS WHICH
APPLY TO THIS PROJECT ARE:
Supplement A – “Guidelines for Selecting Corrosion-Resistant Fasteners for Use with Preservative-Treated Wood”

Based on a review of technical information posted by the major U. S. preservative manufacturers and selected fastener and connector manufacturers, the following guidelines summarize the current state-of-practice regarding the selection of metal fasteners and connectors for use with ACQ and copper azole (CA) preservative-treated wood:

<table>
<thead>
<tr>
<th>AWPA Use Category and Description</th>
<th>Appropriate Fastener/Connector Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>UC 3A or B – Exterior Construction, Above Ground</td>
<td>Fasteners Hot-Dipped (HD) Galvanized per ASTM A153 or Stainless Steel (SS), Type 304 or 316</td>
</tr>
<tr>
<td>UC 4A – Ground Contact or Fresh Water, Non-critical components</td>
<td>Connectors HD Galvanized per ASTM A653, Class G185 or Stainless steel, Type 304 or 316</td>
</tr>
<tr>
<td>UC 4B - Ground Contact or Fresh Water, Critical components or difficult to replace</td>
<td>Stainless steel, Type 304 or 316</td>
</tr>
</tbody>
</table>

Other Preservatives:

1. For CCA-treated wood, HD galvanized fasteners and connectors as specified above are recommended. CCA is less corrosive than ACQ and CA.
2. For ACZA-treated wood, SS fasteners and connectors as specified above are recommended. ACZA contains ammonia and is significantly more corrosive than ACQ and CA.
3. For other preservatives, the more stringent of the preservative manufacturer’s recommendations and the fastener/connector manufacturer’s recommendations should be followed.

Notes regarding NRCS-type structures:

1. Use Category UC 3A and B include railings, decking, bracing, and slats on composter bins.
2. Use Category UC 4A includes posts such as those used in composter bins.
3. Use Category UC 4B includes structural building poles and permanent wood foundations.
HEAVY USE AREA PROTECTION
CONSTRUCTION SPECIFICATION

1. SCOPE

The work shall consist of furnishing materials and installing all components of the paved surface treatment areas for heavy use area protection as outlined in this specification and the drawings.

2. MATERIALS

All materials used shall conform to the quality and grade noted on the plans, set forth in Section 6, or as otherwise listed below:

PORTLAND CEMENT shall be Type I, IA, II, or IIa and conform to ASTM-C150, unless otherwise set forth in Section 6. 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, type A, D, F or G, for water-reduction and set-retardation, and type C or E for non-corrosive accelerators.

POZZOLAN shall conform to ASTM-C618.

COAL COMBUSTION BYPRODUCTS (CCB) shall have a chemical analysis that provides adequate cementing and safety (toxicity) for the purpose intended.

CURING COMPOUND shall meet the requirements of ASTM-C309, Type 2, Class A or B, or as otherwise required in Section 6.

MASONRY COMPONENTS shall meet the requirements of ASTM-C90 & C270, and be placed in accordance with ACI-530.

PRECAST CONCRETE units shall comply with ACI-525 and 533.

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 SS-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.

AGGREGATES. Aggregates shall meet the requirements of Pennsylvania Dirt and Gravel Road Program (DSA), PennDOT Pub. 408, Section 703, for the gradations specified in the drawings or Section 6, or as otherwise set forth in Section 6.
BITUMINOUS CONCRETE. Bituminous concrete shall meet the requirements of PennDOT Pub. 408, Sections 401, 420 and 421, for the course(s) specified in the drawing or Section 6, or as otherwise set forth in Section 6.

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.

PRESSURE TREATED WOOD PRODUCTS shall be Douglas Fir, Southern Yellow Pine, or as otherwise specified on the drawings or in Section 6. 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 meets the designated quality criteria.

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 coatings shall be compatible and consistent with the preservative chemicals in the pressure treated wood. Additional guidance can be found in PA367, Roofs and Covers.

GEOTEXTILES. Geotextiles shall meet the requirements of PennDOT Pub. 408, Sections 212 and 735, for the Type and Class specified in the drawings or Section 6, or as otherwise set forth in Section 6.

ORGANIC SURFACES. Materials such as tanbark and saw dust shall be free of contaminants and rot.

3. FOUNDATION PREPARATION

Clear all trees, brush, fences, manure, and rubbish within the area to be protected, including any appurtenances, and borrow areas. All material removed by clearing and excavation operations 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 disturbed areas to facilitate seeding.

Set all base course material on undisturbed soil or non-yielding compacted material. Geosynthetics may be used, if approved by the Engineer, to further separate and/or stabilize the foundation. Over-excavation must be corrected as noted on the drawings or as directed by the Engineer or his/her designated Representative.

Surface and subsurface drainage systems shall be installed and operating adequately to remove water from the foundation to allow for proper placement of base and surface materials.

Drainfill upon which concrete is to be placed shall be covered with a geosynthetic that has an AOS between 20 and 100, inclusive.

4. BASE COURSE

The base course shall be placed on the area to the grades and thicknesses shown on the plans. The base material shall be as set forth in Section 6 and/or as shown on the drawings. The material shall be wetted and compacted by rollers or other construction equipment approved by the Engineer.

5. SURFACE TREATMENTS

a. Portland Cement Concrete
CONCRETE MIX

Unless otherwise specified in Section 6, concrete shall be proportioned to provide a minimum compressive strength at 28 days of 4,000 psi. The Contractor shall be responsible for the design of the mix and certification of the necessary strength, in accordance with ACI 301. Acceptance and certification of design mixes by PennDOT within the past year may be accepted in lieu of additional testing.

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 fieldstone. 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:

(1) Maximum reduction in cover:
   from exposed surfaces -1/4 inch
   from earth surfaces -1/2 inch

(2) 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 too 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.

MIXING AND HANDLING 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 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.

For each load of concrete delivered to the site, a batch ticket shall be provided to the Owner or Technician by the Supplier. 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 superplasticizers) 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 the addition, and that is not warmer than 95°F. The slump
shall not exceed 7\(\frac{1}{2}\) 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.

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.

If the surface of a layer in place will develop its initial set, i.e., will not flow and merge with the succeeding layer when vibrated, a construction joint shall be made. Construction joints shall be made by cleaning the hardened concrete surface to exposed aggregate by sandblasting, air/water jetting, or hand scrubbing with wire brush, and keeping the concrete surface moist for at least one hour prior to placement of new concrete.

Concrete surfaces do not require extensive finishing work; however, the surface shall be smooth and even, with no depressions that would result in surface water ponding. Careful screeding (striking-off) and/or wood float finishing shall be required. Any additional desired finishing of the surface (such as roughening for improved traction) shall be accomplished after an initial stiffening of the concrete has taken place. These requirements will be stated in Section 6 or on the drawings. 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 concrete placing is discontinued prior to completion of the entire structure, the unfinished end of the concrete shall be formed to create a proper construction or expansion/contraction joint.

**EXPANSION/CONTRACTION JOINTS**

When required in Section 6 or on the drawings, expansion/contraction joints shall contain a six-inch, Type B, vinyl waterstop with a minimum web thickness of 1/8-inch, or an approved joint sealer.

**FORM REMOVAL AND CONCRETE REPAIR**

Forms for walls and columns shall not be removed for at least 24 hours after placing the concrete. When forms are removed in less than seven days, the exposed concrete shall be sprayed with a curing compound or be kept wet continuously for the remainder of the curing period. Forms which support beams or covers shall not be removed for at least seven days, or 14 days if they are to support forms or shoring.

Forms shall be removed in such a way as to prevent damage to the concrete. Forms shall be removed before walls are backfilled. Columns shall be at least seven days old before any structural loads are applied.

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 accomplishing the repair must be approved by the Engineer prior to beginning the repair work. Where minor areas of the concrete surface are "honeycombed," damaged or otherwise defective, the area may be cleaned, wetted and then filled with a dry-pack mortar. Dry-pack mortar shall consist of one part Portland cement and three parts...
sand with just enough water to produce a workable paste.

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.

CONCRETING IN HOT WEATHER

Concreting in hot weather shall be performed in accordance with ACI 305, 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.

CURING

In general, concrete shall be cured in accordance with ACI-308. Specifically, it 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. Any construction activity which disturbs the curing material shall be avoided. If the curing material is subsequently disturbed, it shall be reapplied immediately.

b. Bituminous Concrete

Bituminous concrete shall be installed in accordance with PennDOT Pub. 408, Sections 305, 320, & 400, as appropriate, and/or as otherwise set forth in Section 6.

c. Compacted Stone Aggregate

Compacted stone aggregate surfaces shall consist of the material specified in the drawing or Section 6. The material shall be moist and uniformly placed on the prepared base. The loose material shall be place to an adequate thickness so that when compacted the finished thickness is as specified. The stone aggregate shall be compacted with a vibratory smooth wheeled roller or other approved equipment to form a dense, smooth surface.

d. Other Materials and Structures

Surface treatments, such as saw dust, coal combustion byproducts, soil cement, etc., shall be placed as set forth in Section 6, and to the grades and thicknesses shown on the drawings.

6. ADDITIONAL CONDITIONS WHICH APPLY TO THIS PROJECT ARE: