

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

STORAGE FACILITY – NURSERY SUBSTRATE

Interim Standard
(No.)
CODE 782



DEFINITION

A facility that provides storage for nursery pre-mixed substrate and/or material used to mix substrate.

PURPOSE

To decrease non-point source pollution of surface and groundwater resources.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all areas where substrate is mixed and/or stored for potting plants.

- where the substrate is exposed to rainfall for sufficient time that leachate will move through the substrate medium either from surface runoff or leaching through the soil.
- where temporary storage is needed in an on-going nursery operation
- where soils, geology, and topography are suitable for construction of the facility.

CRITERIA

Federal, state, and local laws. Planned work shall comply with all Federal, state, and local laws, and regulations.

Design storage volume. The minimum design volume shall be determined by the total amount of substrate and/or substrate material to be stored during the peak period for potting needs. The total volume shall include remaining material plus the new material when the supply is restocked.

Height and width of the facility will account for equipment operation needs for transfer of material both to and from the facility.

Safety. Designs shall include appropriate safety features to minimize the hazards of the facility.

To prevent spontaneous combustion, substrate in the stacking should have less than 40 percent moisture. Dry material and moist material should not be layered. In addition, the height of the stack shall not exceed 7 feet, with substrate to wood contact limited to 5 feet.

Protection. To control erosion, disturbed areas surrounding the facility shall be vegetated according to Florida NRCS conservation practice standard Critical Area Planting, Code 342.

Location. Substrate storage facilities shall be located as conveniently as possible for equipment used and access to the potting and grow out areas.

Additional Criteria for Permanent Covered Fabricated Structures

When the roofed storage facility is also to be used for the potting operation, the total volume of space will account for the necessary work area.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

Service life and durability. Planning, design, and construction shall ensure that the structure is sound and of durable materials commensurate with the anticipated service life, initial and replacement costs, maintenance and operation costs, and safety and environmental considerations.

Foundation. The foundations of fabricated storage facilities shall be proportioned to safely support all superimposed loads without excessive movement or settlement.

Structural loading. Storage structures shall be designed to withstand all anticipated loads including internal and external loads, hydrostatic uplift pressure, concentrated surface and impact loads, and water pressure due to seasonal high water table in compliance with this standard and applicable local building codes.

Structural design. The structural design shall consider all items that will influence the performance of the structure, including loading assumptions, material properties and construction quality. Design assumptions and construction requirement shall be indicated on the plans.

Concrete slabs on grade. Slab design shall consider the required performance and the critical applied loads along with both the subgrade material and material resistance of the concrete slab.

Where applied point loads are minimal and liquid-tightness is not required and the subgrade is uniform and dense, the minimum slab thickness shall be 4 inches with a minimum joint spacing of 10 feet. Joint spacing can be increased if steel reinforcing is added based on subgrade drag theory.

When heavy equipment loads are to be resisted and/or where a non-uniform foundation cannot be avoided, an appropriate design procedure incorporating a subgrade resistance parameters such as ACI 360 shall be used.

The roof wind loads shall be as specified in ASAE EP288.5, Agricultural Building Snow and Wind Loads or other controlling criteria. If the facility is to serve as part of a foundation or support for a building, the total load shall be considered in the structural design.

Additional Criteria - Stacking Facilities

Stacking facilities may be open or roofed and are efficient in reducing storage space. The anticipated stacking angle of the substrate must be considered in determining the wall height.

Stacking facilities shall be constructed of durable materials such as reinforced concrete, reinforced concrete block, or treated lumber. They shall be designed with adequate safety factors to prevent failure due to internal or external pressures, including hydrostatic uplift pressure and imposed surface loads such as equipment which may be used within, on, or adjacent to the structure. Lumber shall not be used for walls that support moving stacking elevators or similar loads.

Floor Slabs and Walls. Floors shall slope away from the entrance. Suggested grade of the floor is 0.2 or 0.3 percent.

Where concrete floors contact wooden walls or posts, the concrete and wood shall be separated by 1/2-inch preformed bituminous expansion joint material. The expansion joint material is not required where wooden walls rest on top of concrete and the resultant joint is horizontal.

Timber Walls. All timber shall be pressure-treated in accordance with ASTM D1760. Posts shall have a minimum size of 6 inches by 6 inches and be placed in the ground from 3 to 6 feet deep, depending on the design analysis. Side planking shall be treated lumber with a minimum thickness of 2 inches.

Additional Criteria for Temporary Covered Facility.

The temporary covered substrate storage facility is for occasional use where the substrate volume is small and transferred to pots within 30 days. The storage is located outside under a non-structural cover.

The storage facility shall be located.

1. Outside natural drainage ways.
2. Near natural windbreaks, where possible, to protect the covering from blowing winds.
3. Within property boundary limits as required by local laws and regulations.

There shall be positive drainage away from the temporary covered storage area in all directions. Water management practices such as

diversions and/or waterways shall be provided where needed to divert surface water away from the storage areas.

Covering. Substrate material shall be covered with opaque plastic or polyethylene sheeting having a minimum thickness of 6 mils or other waterproof covering. The sheeting must be placed over the pile with care to prevent tearing. Sheeting shall have a minimum of 24 inches of overlap. Weights shall be placed over the sheeting to anchor it and prevent tearing during high winds.

The sheeting shall be anchored at the base of the stack with sufficient weights to hold the sheeting in place. In lieu of weights, sheeting may be securely attached to screw type anchors placed on 2-foot centers around the pad.

Size. Temporary covered areas shall be designed to store the substrate material until it can be properly used as identified in the plan. The size required shall be based on the utilization schedule.

The size of the pad on which the substrate will be stored shall be determined on the basis of volume needed for the potting schedule and the anticipated height of the stack. Maximum height of stacking the material shall be 7 feet. A minimum of 4 feet of horizontal freeboard shall be allowed around the edges of the stack to properly anchor the covering and facilitate removal and utilization of the substrate.

Temporary covered storage pad. Pads shall be reasonably impermeable to ensure protection of water resources. Pads may be constructed of soil, geomembrane, or concrete.

Soil pad. Soil pads shall be constructed of clayey material (SC, CL) and shall be a minimum of 1 foot thick. Soil pads shall be installed under optimum moisture conditions and compacted in 6 to 8 inch lifts. Soil pads shall not be used where the seasonal high water table will be less than 2 feet below the bottom of the stacked substrate.

Concrete pad. Concrete pads shall be constructed on a firm foundation and shall be a minimum of 4 inches in thickness. Concrete shall have a minimum compressive strength of 4000 psi and meet NRCS Construction Specification 32, Structure Concrete. Concrete

pads shall not be used where the seasonal high water table will be less than 1 foot below the bottom of the concrete.

Geomembrane pad. If a synthetic liner is used, the pad area shall be excavated to a depth of one foot below the planned elevation and all sharp stones and other sharp material removed to prevent puncturing the liner. The liner should then be covered with one foot of soil free of stones, clogs, etc. The geomembrane shall be a minimum thickness of 20 mils. Geomembrane pads shall not be used where the seasonal high water table will be less than 1.5 feet below the bottom of the geomembrane.

The pad shall be essentially level with only enough gradient away from the center of the pad to allow drainage of water.

All disturbed areas beyond the edges of the pad shall be vegetated with an approved vegetative cover as shown in the plan.

CONSIDERATIONS

Long-term storage for periods of time greater than 30 days can be accomplished using permanent structures or through a combination of permanent and temporary storage practices.

Temporary storage areas may require land shaping, access roads, diversions, and such other practices as needed to protect the resource base.

Proper construction of the pad and maintenance of the covering should prevent leachate or percolation water through the stack and into the groundwater. The additional runoff from the covering should be considered in the water management around the stack.

Consider monitoring the temperature of the substrate stack to ensure temperature does not reach unsafe levels.

The storage facility should be located as close to the potting and transfer station as possible. Consider traffic flow for delivery and utilization.

The site should be located considering prevailing winds and landscape elements such as building arrangement, landform, and vegetation to enhance visual resources and reduce traffic safety problems.

To facilitate the removal of substrate from the storage area and prevent disturbance to the

surrounding area, consider using a permanent pad such as concrete.

Consideration should be given to economics, environmental concerns, the overall nursery management plan.

The storage facility will have very little impact the water budget. The affect will be dependent upon the size of the storage facility and pre/post development runoff calculations.

The storage facility should have an overall positive impact on water quality by storing substrate material and prevent potential polluted runoff and leachate from entering groundwater and surface water.

PLANS AND SPECIFICATIONS

Plans and specifications for substrate storage shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. Plans and specifications are to be prepared for specific field sites. Plans and specifications include construction plans, photographs, drawings, job sheets, construction specifications, narrative statements in conservation plans, and other similar documents.

Plans shall include as a minimum:

- A plan map showing the location of all storage areas, access roads to these areas, slopes, surfaces to be graded, and necessary cuts and fills.
- Dimensions of storage area including length, width and material specifications.
- Maximum height for stacking substrate.
- Type of covering and details for anchoring the cover.
- Placement of spoil from excavation for the pad.
- Auxiliary practices such as access roads, diversions, waterways, and subsurface drains, as applicable.
- Vegetative requirements.
- Copies of the plans and specifications shall be given to the landuser.

OPERATION AND MAINTENANCE

An operation and maintenance plan shall be developed that is consistent with the purposes of the practice; it's intended life, safety requirements, and the criteria for its design. The substrate storage facility should be inspected periodically to ensure that all components are operating as planned.

Soil pads may require reconstructing if soil materials are inadvertently removed during the substrate removal process. The plastic or polyethylene covering will deteriorate over time and need to be replaced. The pad, cover, and adjacent area shall be inspected after each major storm event. Needed repairs shall be completed promptly.

Where geomembranes are used, care must be taken during removal of the substrate to not damage the geomembrane.

Concrete pads shall be checked for cracks after removal of substrate. Cracks shall be repaired immediately.

Areas disturbed as a result of removing the substrate shall be vegetated immediately.

The area surrounding the field storage area shall be maintained in such a manner to prevent ponding of water and to ensure runoff is diverted from the pad.

REFERENCES

ACI 318, 360, 530
 ASAE Specifications: EP378.3, EP393.2,
 EP288.5, S288
 ASTM D 653, D 698, D 2488
 Basic Building Code, 12th Edition
 Chapter 62-522 and 62-670 F.A.C.
 Florida NRCS Conservation Practice Standard,
 Critical Area Planting, Code 342
 NRCS Construction Specification 32, Structure
 Concrete