Design Aids & Standard Drawings

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2008 ICE Training

VA NRCS Engineering Webpage

- http://www.va.nrcs.usda.gov/technical/engineeringResources.html
- Contains all design tools and standard drawings approved for statewide use.
- Also contains links to engineering publications and other useful resources.
- The engineering webpage is continually updated as new tools and drawings are developed.

Design Spreadsheets

- Used to standardize and simplify calculations for various types of designs.
- Provides consistent format for design documentation.
- Currently there are 4 spreadsheets available on the webpage.
  - Pressure System Worksheet
  - Beef Waste Structure Sizing Worksheet
  - Dairy Waste Structure Sizing Worksheet
  - Manning's Equation

Standard Drawings

- Used to increase productivity by simplifying drawing creation for commonly used practices.
- Provides consistent format.
- Currently there are 24 standard drawings available on the webpage.
- Standard drawings are currently available in 3 formats:
  - .dwg
  - .dwf
  - .pdf

Virginia Standard Cover Sheet

Design Copy Routing: ____ Cooperators Folder ____ Landowner ____ Contractor ____ Supplier

Notes

1. The landowner/operator is responsible for obtaining and complying with all permits and easements. This includes all federal, state and local permits.

2. The landowner/operator is responsible for checking and complying with all local ordinances that may affect the project.

3. MISS UTILITY (1–800–257–7777 or 1–800–552–7001) must be contacted at least 3 working days before construction begins. The landowner/operator is responsible to ensure that the excavator/contractor contacts MISS UTILITY and the excavation/contractor must be able to provide the MISS UTILITY ticket number within 24 hours upon request by the NRCS representative.

4. The landowner/operator is responsible for locating any buried utilities (water lines, electric lines, telephone lines, gas lines, sewer lines, etc.) in the work area that are not covered by the MISS UTILITY program.

5. Prior to beginning construction, the cover sheet must be signed by NRCS, the landowner/operator and the excavator/contractor. The landowner/operator is responsible to inform the excavator/contractor of their responsibilities by providing them a copy of the cover sheet. The excavator/contractor must sign the cover sheet acknowledging that they understand their responsibilities and the landowner/operator must return the signed cover sheet to the NRCS employee or office providing assistance. If requested by NRCS, the landowner/operator shall arrange for a meeting between the contractor and NRCS to review the construction drawings and specifications prior to construction.

6. NRCS makes no representation of the existence or nonexistence of utilities. The presence or absence of utilities on the construction drawings does not assure that there are or are not utilities in the work area.

7. The excavator/contractor is responsible for knowing and following the appropriate safety standards required by the Virginia Safety and Health Codes Board.

8. The landowner/operator shall notify the local NRCS or SWCD representative at least one week prior to when construction is to start, and at the times specified in this construction plan and attached specifications.
NRCS or SWCD representative telephone number _____.

9. Any deviation from these construction drawings and specifications without written approval from NRCS may result in this practice not meeting NRCS specifications and the withdrawal of technical assistance for this project.

Date
Designed
Drawn
Checked
Approved

Site Location Map

Scale 1 inch = _____ feet

Benchmark Descriptions

TBM # _____

_____

_____

_____ Elevation (assumed) _____

TBM # _____

_____

_____

_____ Elevation (assumed) _____

These construction drawings and attached specifications have been reviewed and all parties understand what is required. (Sign and date below)

Landowner/Operator _____

Contractor _____

NRCS Representative _____

Index of Sheets

Sheet No.	Title

Specifications

No.	

Table of Estimated Quantities

Item	Unit	Est. Quantity

"AS BUILT" DOCUMENTATION

Date Completed _____

Certified By and Date _____

ENGINEERING JOB CLASS _____

REVISIONS		
DATE	APPROVED	TITLE
01/04	MAT LYONS	SCE

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

File Name VA-SO-100-CoverSheet.dwg

Drawing Name 11x17 COVER SHEET

Sheet 1 of

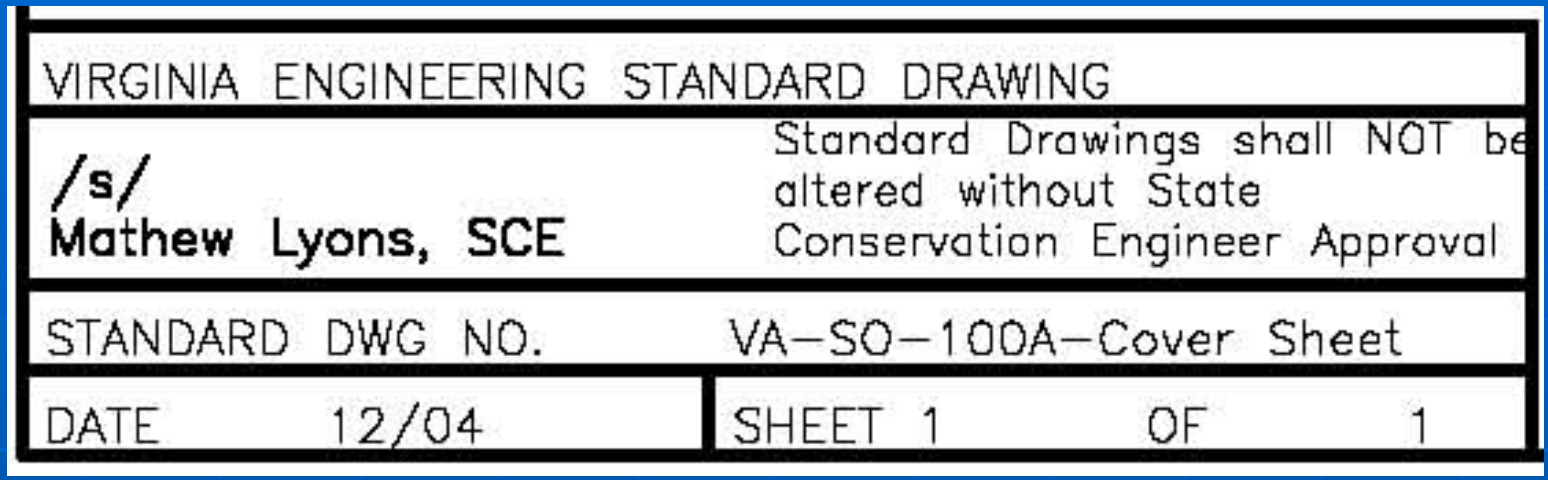
VIRGINIA ENGINEERING STANDARD DRAWING

/s/ Mathew Lyons, SCE

Standard Drawings shall NOT be altered without State Conservation Engineer Approval

STANDARD DWG NO. VA-SO-100A-Cover Sheet

DATE 12/04 | SHEET 1 OF 1



VIRGINIA ENGINEERING STANDARD DRAWING	
/s/ Mathew Lyons, SCE	Standard Drawings shall NOT be altered without State Conservation Engineer Approval
STANDARD DWG NO.	VA–SO–100A–Cover Sheet
DATE 12/04	SHEET 1 OF 1

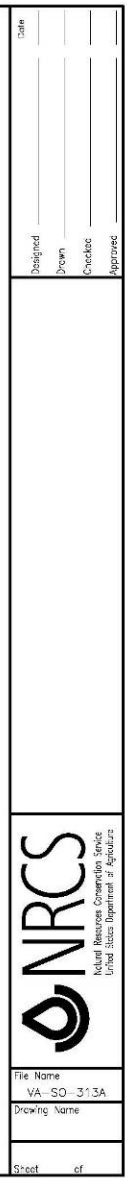
All Standard Drawings will have the State Conservation Engineer's signature that shall not be altered.

If the standard drawing does not fit the situation then a custom drawing is needed.

Plan View Sheet

Used for showing location, alignment, topographic features, dimensions, detail layout, etc.

- North towards the top of the sheet
- Water flows from left to right

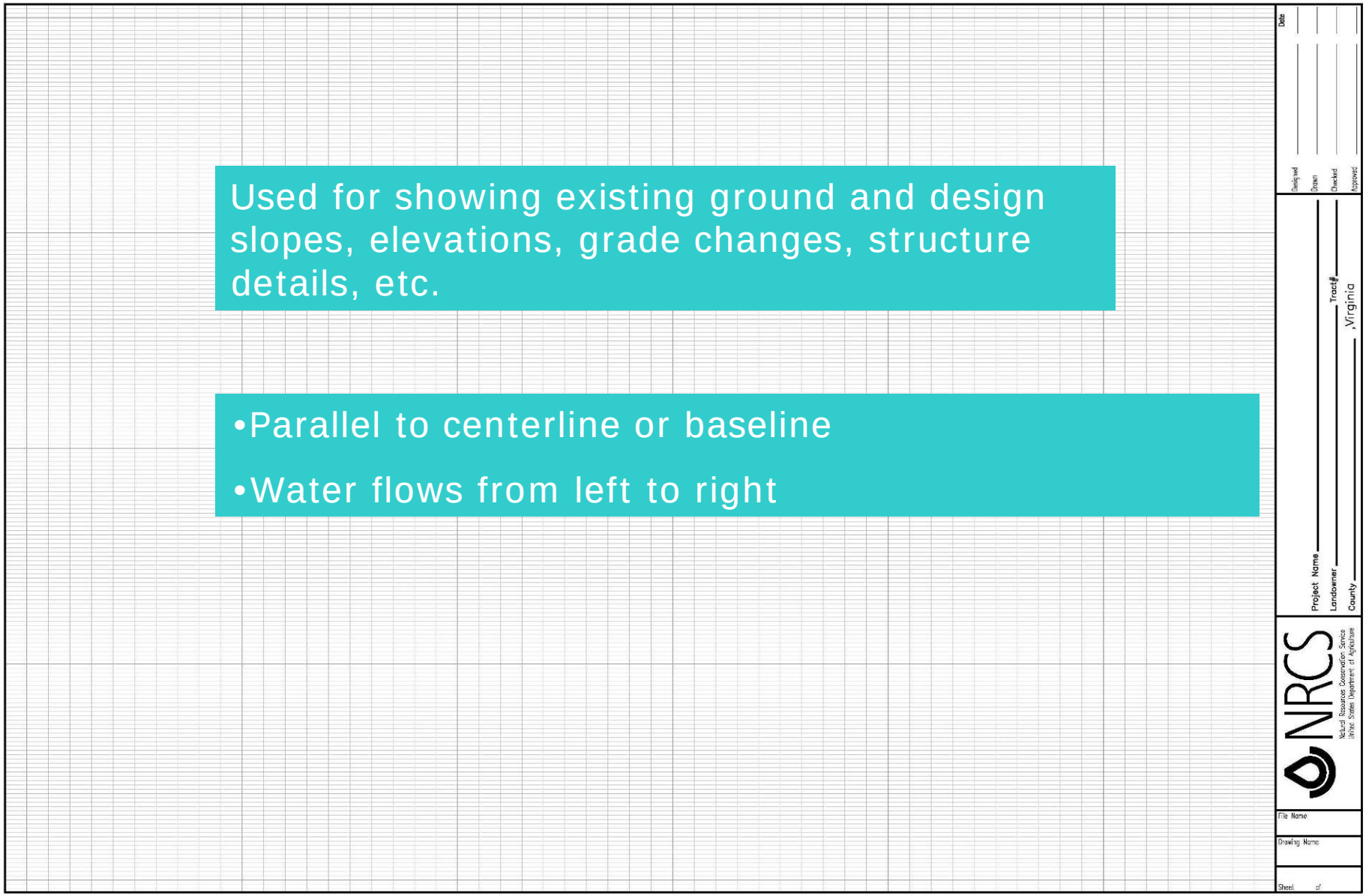


Cross-Section Sheet

Used for showing existing ground and design slopes, elevations, grade changes, structure details, etc.

- Perpendicular to centerline or baseline
- Plotted as looking in direction of increasing stationing

Profile Sheet



Used for showing existing ground and design slopes, elevations, grade changes, structure details, etc.

- Parallel to centerline or baseline
- Water flows from left to right

Plan/Section Sheet

Used for showing location, alignment, topographic features, dimensions, detail layout, etc.

Used for showing existing ground and design slopes, elevations, grade changes, structure details, etc.

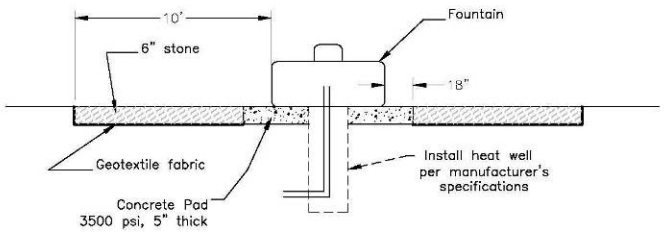
Plan/Profile Sheet

- Used for showing location, alignment, topographic features, dimensions, detail layout, etc.
- Should be oriented so that stationing on plan view lines up with stationing on profile.

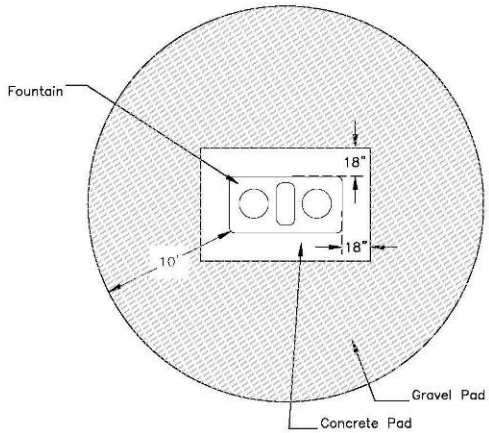
Used for showing existing ground and design slopes, elevations, grade changes, structure details, etc.

Frost-Free Trough Standard Drawing

Frost–free Fountain Installation– Side View



Frost–free Fountain Installation– Top View



Construction Notes

1. The watering facility shall be installed according to Virginia Watering Facility Standard (614).

2. The concrete pad for the fountain shall extend a minimum of 18" past the edges of the fountain. The pad dimensions recommended by the manufacturer will be used if the dimensions are larger. Concrete shall be 3500 psi installed a minimum of 5" thick. 6"x6" 6/6 gage welded wire mesh reinforcing will be used in the 5" slab. Position the hole for the heat well and pipes per manufacturer's recommendations.

3. The fountain must be attached to the concrete pad per manufacturer's recommendations.

4. A valve shall be installed in the line to regulate flow to the fountain. The valve should be installed in housing that is weatherproof, well drained, and easily accessible. It must also be protected from livestock. High quality ball valves are recommended. Valves installed in the field may be housed in water–meter boxes, concrete casing, or other suitable housing.

5. All backfill for pipelines under the fountain shall be compacted to the degree required to prevent caving after construction.

6. The foundation under and around the fountain location shall be cleared of all material not suited for the subgrade, including sod. All loose surface soil shall be removed to undisturbed material.

7. The fountain site shall be free draining.

8. A protective surface shall be placed around the fountain according to Virginia Heavy Use Area Protection Standard (561). At the minimum, install geotextile fabric around the pad and place VDOT #357 stone six inches deep in a ten foot radius around the fountain. A two inch cap of VDOT #57 or #21A can be placed on the #357. Other types of stone may be installed with approval of the designer.

9. Geotextile shall meet the minimum requirements in Virginia Construction Specification VA–795 Geotextiles, page VA–795–4.

10. Seed all disturbed areas at the rates given in Virginia Construction Specification VA–706. Seeding: page VA–706–3

* If seeding is done outside recommended seeding dates, a nurse crop is to be used.

Estimated Materials Quantities

Quantity	Unit	Item

VIRGINIA ENGINEERING STANDARD DRAWING	
/s/ Mathew Lyons, SCE	Standard Drawings shall NOT be altered without State Conservation Engineer Approval
STANDARD DWG NO.	VA–SD–902–Frost Free Trough
DATE 10/05	SHEET 1 OF 1

Designed | Drawn | Checked | Approved | Date

Project Name | Tract# | Landowner | County, Virginia

NRCS Natural Resources Conservation Service, United States Department of Agriculture

File Name | Drawing Name | Sheet of

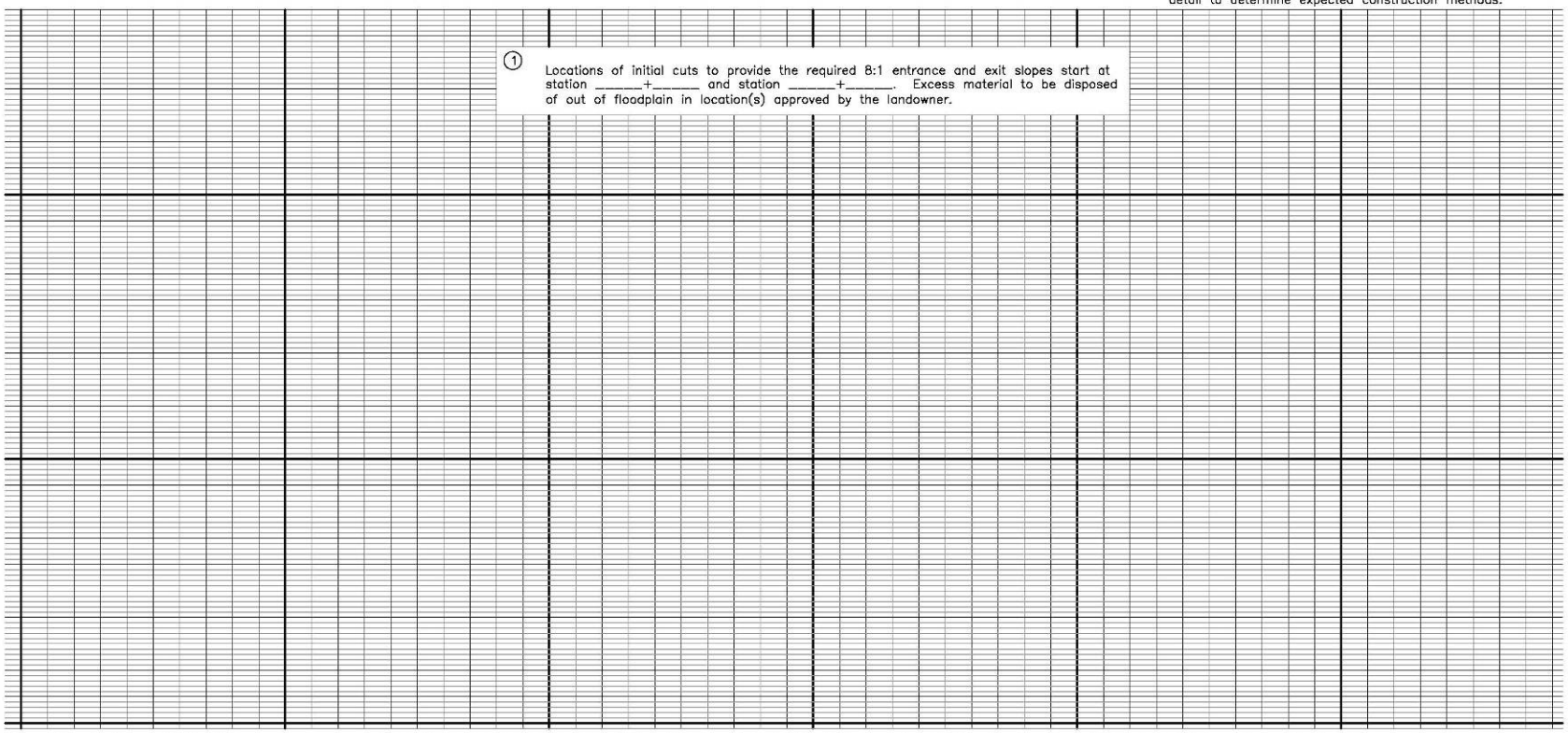
Stream Crossing Standard Drawing, Sheet 1

Scale: 1" Horizontal = _____ feet
1" Vertical = _____ feet

TBM Description & _____
TBM Elevation: _____

Stream Cross-Section

Numbers in circles correspond to Design Notes listed at the bottom of this sheet. Match number to appropriate detail to determine expected construction methods.



Date
Designed
Drawn
Checked
Approved

Stream Crossing/Access Design Notes

1) Locations of the initial cuts to provide 8:1 slopes are shown. Ramp slope to be 8:1 or flatter. Grade side slopes to 3:1 if they are to be seeded. Grade to 2:1 if they are to be armored with VDOT #1 stone over geotextile. Excess material to be disposed of out of floodplain in location approved by landowner.

2) If necessary to provide a solid bottom to the crossing, the existing streambed may be excavated six inches (or until a stable foundation is reached) and backfilled with VDOT #1 stone. If no stone is needed to harden the stream bottom, then stone on ramps needs to be placed so the ramps blend naturally into the existing streambed. Do not place stone that will obstruct the natural flow path of the stream. Any stone placed to harden channel bottom must be installed below the existing natural grade of the stream.

3) Geotextile used will have the following minimum specifications (non-woven is recommended):
* 120 pound minimum tensile strength.
* 320 pound minimum bursting strength.
* Elongation at failure greater than 50%.
* 90 pound minimum puncture strength.
* 70% minimum residual tensile strength in 150 hours exposure to Ultraviolet light.

4) Geotextile will be keyed on both ends per manufacturer's specifications and stapled in place.

5) If the livestock will have access to the slopes they shall be armored with stone (See note 1). If the fencing will restrict access then the slopes may be seeded. All seeding will be done according to the Plant Establishment Guide for Virginia.

6) The minimum ramp armor for streams will be 3 inches of VDOT #57 or #357 stone placed over 6 inches of VDOT #1 stone placed over geotextile. Refer to sheet 2 of 2 for drawings of the actual layer details. Additional finer stone may be brought in as a cap to provide a more suitable hoof-contact zone if the crossing will be used on a frequent basis by livestock.

7) Fencing shall be of type, extent, and location as required and approved by local NRCS or Conservation District personnel.

8) Construct fencing across the stream so that it is not directly anchored to the permanent riparian fencing. This will keep the permanent fencing from being torn down along with the fencing across the stream in the event of a flood. The cross-stream fencing may be anchored to separate posts erected next to the riparian fencing. This will allow for easier repair should the cross-stream fencing be torn down. Cross-stream fencing shall be of a type approved by local NRCS or Conservation District personnel.

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

File Name VA-ENG-SQ-INT601.dwg
Drawing Name Stream Crossing Design Sheet
Sheet of

VIRGINIA ENGINEERING STANDARD DRAWING

/s/
Mathew Lyons, SCE

Standard Drawings shall NOT be altered without State Conservation Engineer Approval

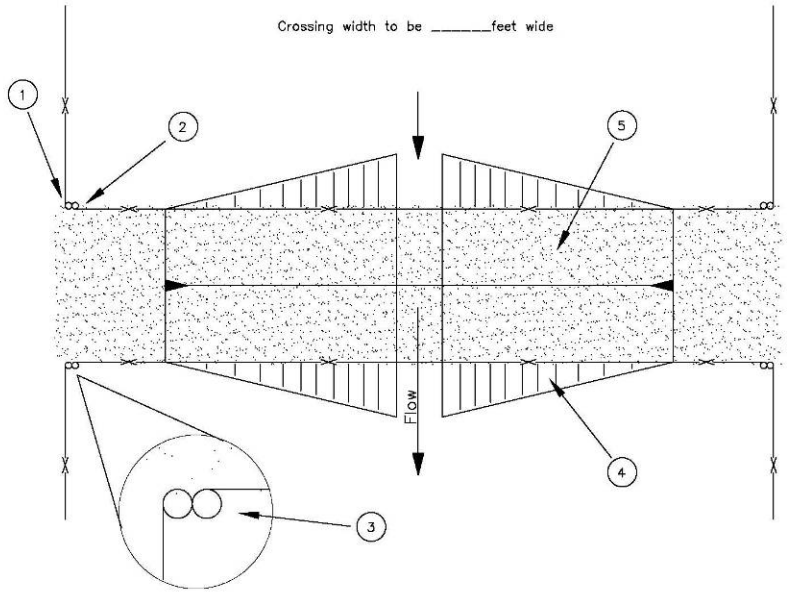
STANDARD DWG NO: VA-ENG-SQ-601

DATE 2/05 SHEET 1 OF 2

Stream Crossing Standard Drawing, Sheet 2

Typical Plan View

Showing typical fencing detail (no scale)



1) End Permanent riparian fencing here.

2) Begin cross stream riparian fencing here.

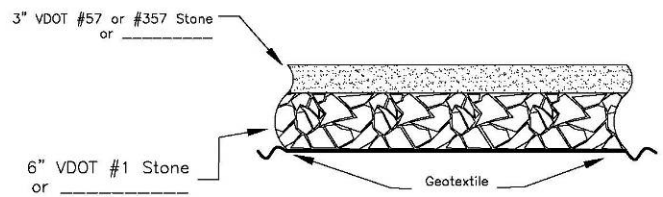
3) Cross the stream with fencing that is not attached directly to the permanent riparian fencing. Double fence posts at the fence intersections will prevent permanent fence damage in a flood. Type of fence to be approved by local NRCS or Conservation District.

4) Seed side slopes according to the Plant Establishment Guide for Virginia if fence runs along edge of ramp. If the fence must be installed along top of slope or the side slopes are too steep to be stable then armor the slope with 4" to 6" thick layer of VDOT #1 stone over geotextile. Side slopes must be 2:1 or flatter.

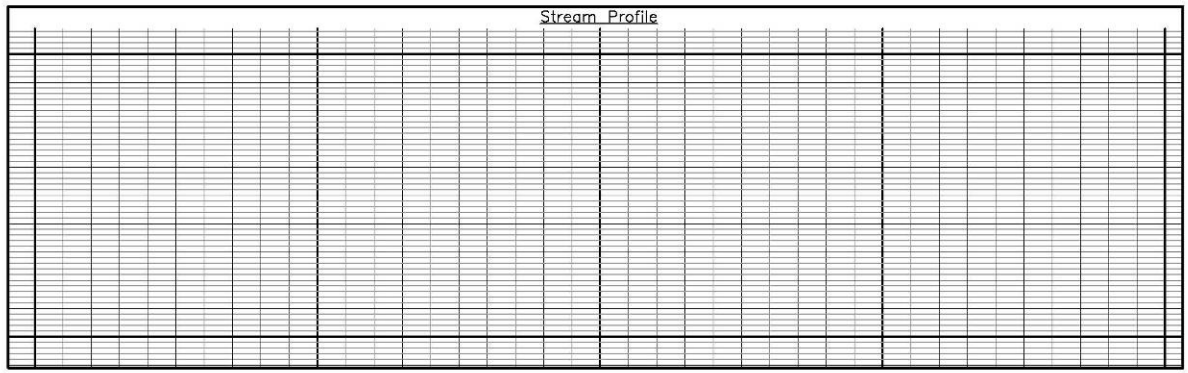
5) Ramp slopes are to be 8:1 or flatter.

Typical Stone Layer

for Streams Flowing 6 FPS or less



Stream Profile



Notice to Landowners and Contractors– Unless otherwise specifically shown by means of plan view, profiles, and elevations, this construction plan represents only surface conditions and layout requirements. No representation is made by the NRCS, USDA, as to the existence of unmarked underground hazards. Prior to the start of construction, it is the responsibility of the landowner to contact Miss Utility of Virginia at 1–800–552–7001 or 1–800–257–7777.

VIRGINIA ENGINEERING STANDARD DRAWING	
/s/ Mathew Lyons, SCE	Standard Drawings shall NOT be altered without State Conservation Engineer Approval
STANDARD DWG NO:	VA–ENG–SC–801
DATE 2/06	SHEET 2 OF 2

Date
Designed
Drawn
Checked
Approved

Project Name
Landowner
County
Tract#
,Virginia

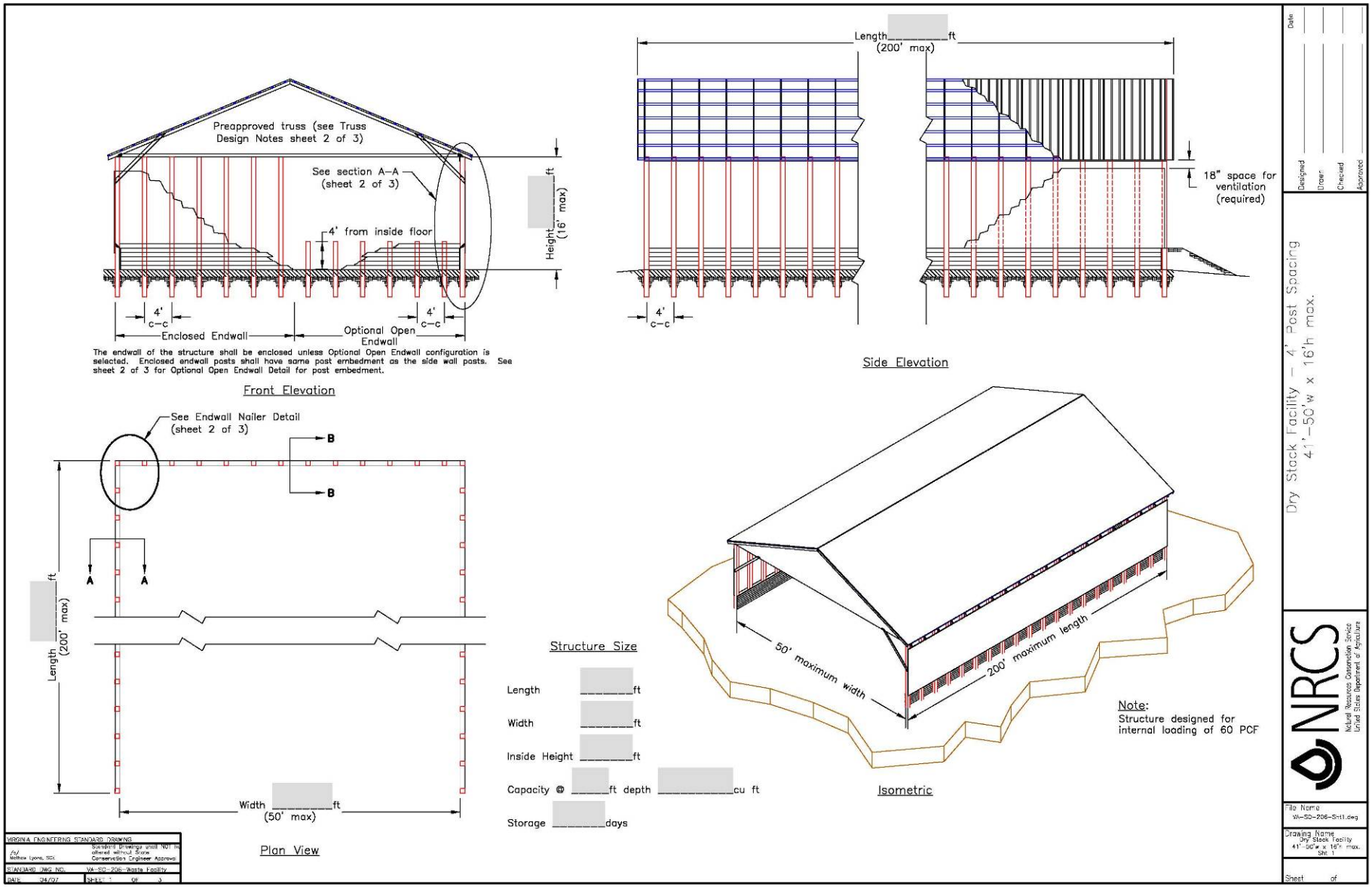
NRCS
Natural Resources Conservation Service
United States Department of Agriculture

File Name
VA–ENG–SC–NT501.dwg

Drawing Name
Stream Crossing Design Sheet

Sheet of

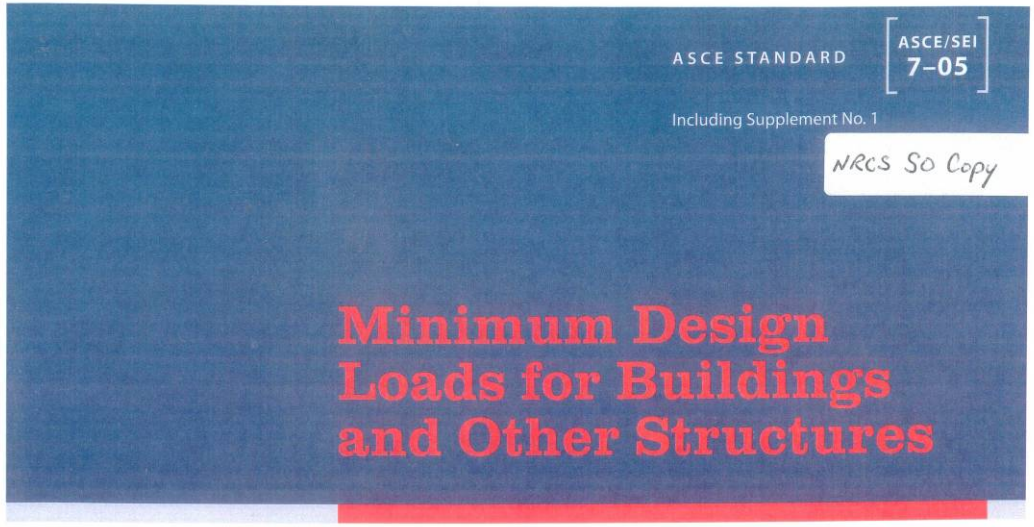
Animal Waste Structure Standard Drawings

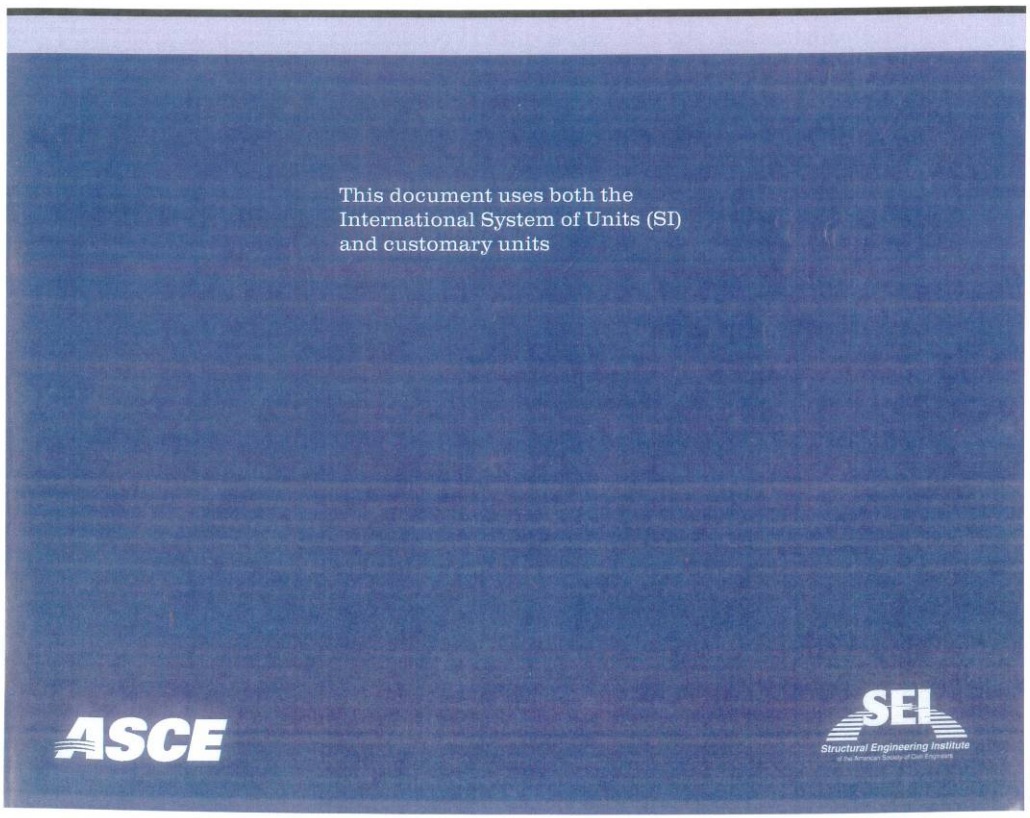


Why can’t we just use structure drawings from NRCS in another state?

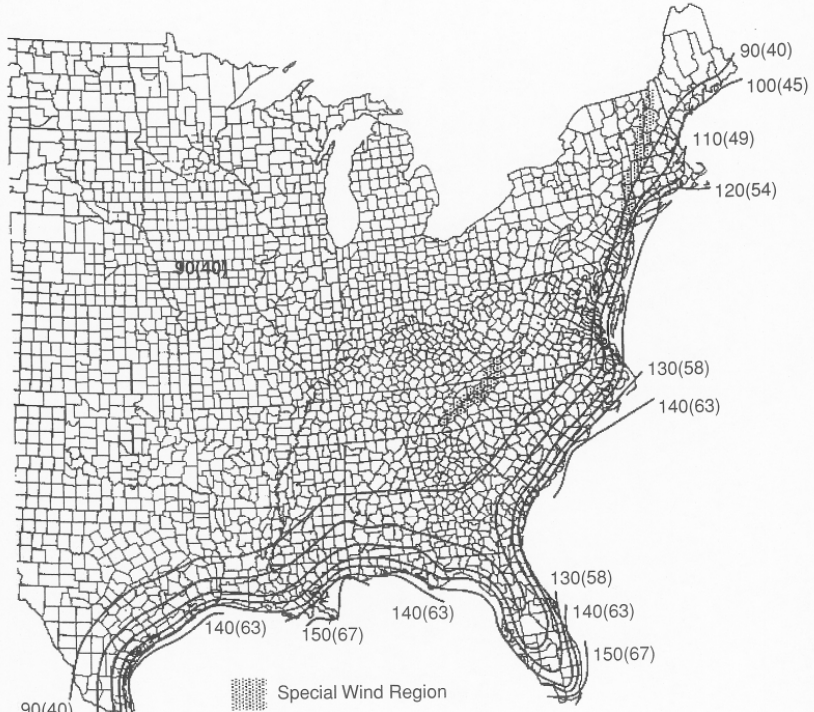
- SCE has no design documentation for the drawings
- Structures in other states have different climatic design criteria
- The climatic design criteria for structures has changed in the last few years
  - Wind loading (3 second gust)
    - 90 mph inland
    - 120 mph on coast
  - Snow loading
    - 10 psf in a few counties
    - 35 psf in mountains

American Society of Civil Engineers Standard 7-05





ASCE 7
Wind Speed Map



Location	V mph	(m/s)
Hawaii	105	(47)
Puerto Rico	145	(65)
Guam	170	(76)
Virgin Islands	145	(65)
American Samoa	125	(56)

Notes:
1. Values are nominal design 3-second gust wind speeds in miles per hour (m/s) at 33 ft (10 m) above ground for Exposure C category.
2. Linear interpolation between wind contours is permitted.
3. Islands and coastal areas outside the last contour shall use the last wind speed contour of the coastal area.
4. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.

FIGURE 6-1 continued
BASIC WIND SPEED

ASCE 7
Snow Load Map

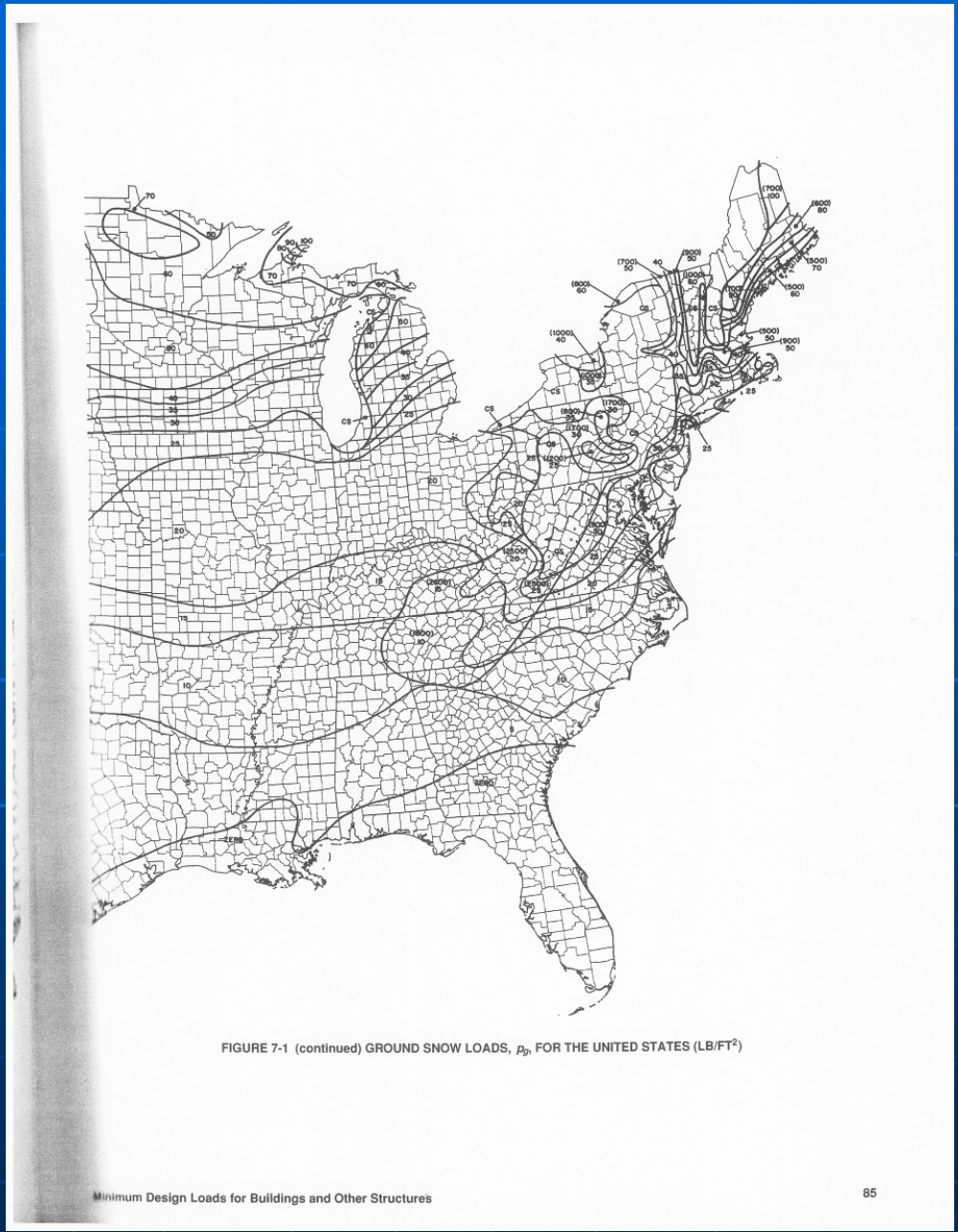


FIGURE 7-1 (continued) GROUND SNOW LOADS, p_g, FOR THE UNITED STATES (LB/FT^2)

Standard Drawings

- Standard drawings cannot be modified without prior approval of the state conservation engineer (SCE).
  - If standard drawings are modified, the block titled “Virginia Engineering Standard Drawing” in the lower left corner needs to be removed.
- Standard drawings from other states may be used
  - With prior approval from the SCE
  - Individual w/ appropriate level of EJAA

- “Does this meet VA NRCS standards?”

In Review…

- Where are the official copies of the VA NRCS standard drawings located?
- What VA NRCS standard drawing is required on all engineering designs?
- If a VA NRCS standard drawing is modified for a custom design, what needs to be taken off of the drawing?

Questions?