Water Facility Basics

Installation

By Jim Tate Conservation Specialist Hanover-Caroline SWCD 2006

Revised by John Cooke CET 2007

Preconstruction Meeting with Landowner/Contractor

- Make sure landowner/producer understands the fundamentals of the design.
- Make sure the person doing the actual work understands the fundamental elements of the design.
- Review required elements
- Review minimum standards
- Review areas of possible variation
- Discuss schedule and timetable
- Make sure person doing the work has the design
- Discuss potential problems
- Discuss dealing with unanticipated problems

Pipeline Installation Items to Review

- Specification **VA745 PLASTIC PIPE**
- Types of pipe PE, PVC, Galvanized Steel, ect.
- Depth of pipe Protect pipe from freezing and traffic
- Sleeving of pipe Protect pipe from abrasion
- Fittings and connections
- Valves and valve box locations
- Preparation for trough installation Pipe has to go in first.
- Gravity or pressure system Is positive grade necessary?
- Trench Safety
- Pressure check

Sleeving Situations

- Pipe trench through rocky rough ground

- Pipeline running under a high traffic area

Leaks

This leak is easy to find.

But not all are, especially with smaller pipes buried two feet or more in the ground.

Pipelines must be pressure tested before backfilling to check for leaks.

A Plumbing Short Course

- Some plumbing materials
  1. Copper
  2. Black Steel (Gas Pipe)
  3. Galvanized steel
  4. PVC
  5. CPVC
  6. Polyethylene (PE)
  7. Pex
- Everyone wants to use something different and about half of it is suitable.
- **Specifications…..VA745 Pipelines**

Valves

Take a quick walk through the plumbing section of your local hardware store sometime. The selection of valves is staggering. Valves can be purchased by……

- Material
- Action
- Method of installation
- Connection
- Size
- Application

Ball Valve

Gate Valve

Valves – Types and Location

Left… Glued PVC ball valve for trough

Right …Brass threaded ball valve

Left…Brass gate valve

Right…Long pipeline run with trough branch and shutoff every 600 ft

Fittings

- If you thought valves were confusing…….
- There are many more fitting types than there are valves
- But sorted along the same principles

Fittings Basics

- Material should be consistent with pipe material for the most part.
- Materials can be interchanged and upgraded
- Fittings come in both male and female connections.
- Basics
  - PVC pipe uses glue PVC fittings, but can use galv. steel fittings.
  - Black plastic pipe uses mostly insert fittings and clamps.
  - Galvanized pipe uses galvanized fittings and brass fittings
  - Copper pipe uses copper and brass.

I don't intend for you to know how to plumb from this discussion. I do intend for you to know what you are seeing in the field. A few minutes in a hardware store looking at plumbing materials could be very helpful.

Fittings


1


2


3


4

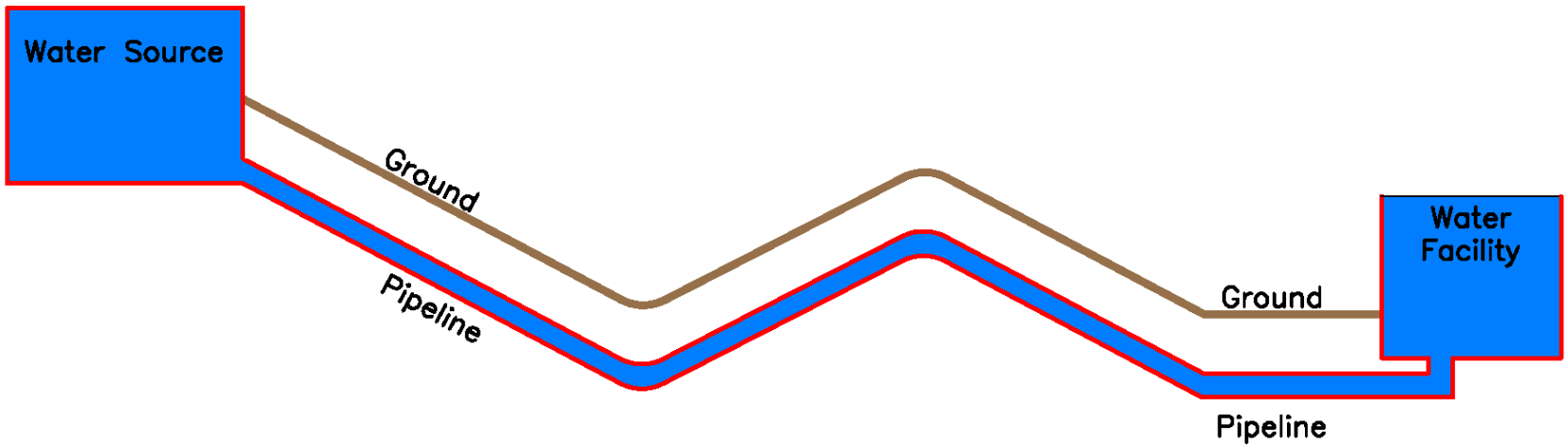

5


6

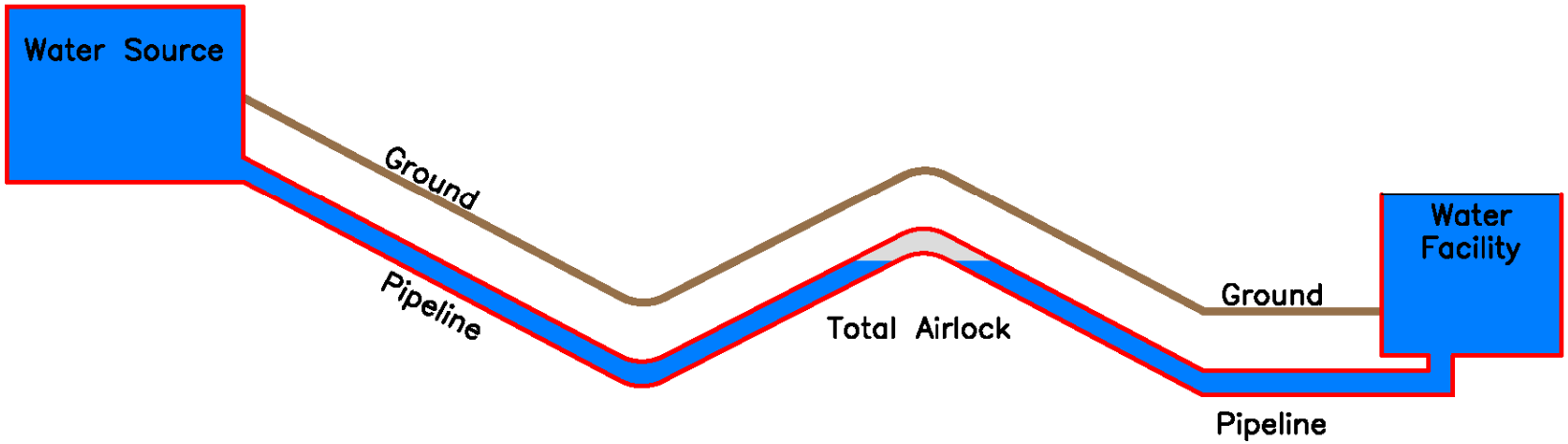
Air Locks

- One of the major considerations in pipelines, **especially gravity pipelines**, is air-locking, or a partial or complete blockage of water flow by air pockets trapped at high points along the pipeline. Air can enter pipelines in a number of ways:
- Initial filling of the line in the spring - the line will be full of air and the air will have to be expelled before the system can operate
- "Gulping" at the inlet - if the inlet is not far enough below the surface of the water, a vortex can form allowing air to enter the pipe
- Dissolved air released from the water - at high points along the pipeline the pressure may be reduced enough that air dissolved in the water bubbles out of solution - this is of concern especially with siphons
- Entry to the line at a stock tank that is installed as a flow-through trough
- Air locks can be partial or total; that is, they can either completely block flow, or they can partially block the flow, reducing the desired flow rate. The following sketches illustrate total and partial air locks:

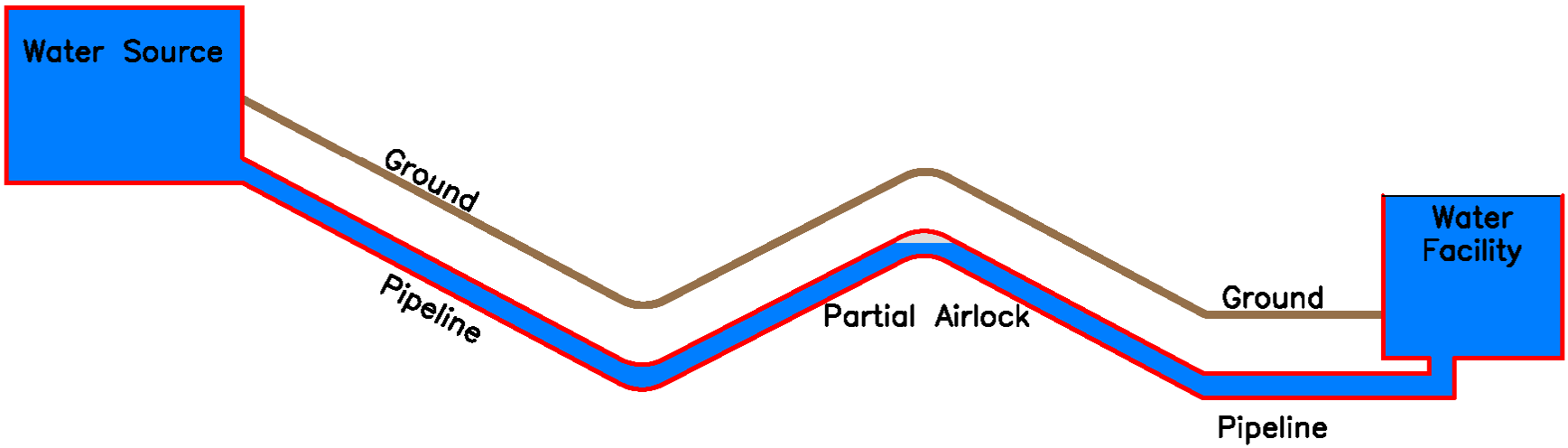
Air Locks


Water Source
Ground
Pipeline
Ground
Water Facility
Pipeline

Total Air Lock



Partial Air Locks

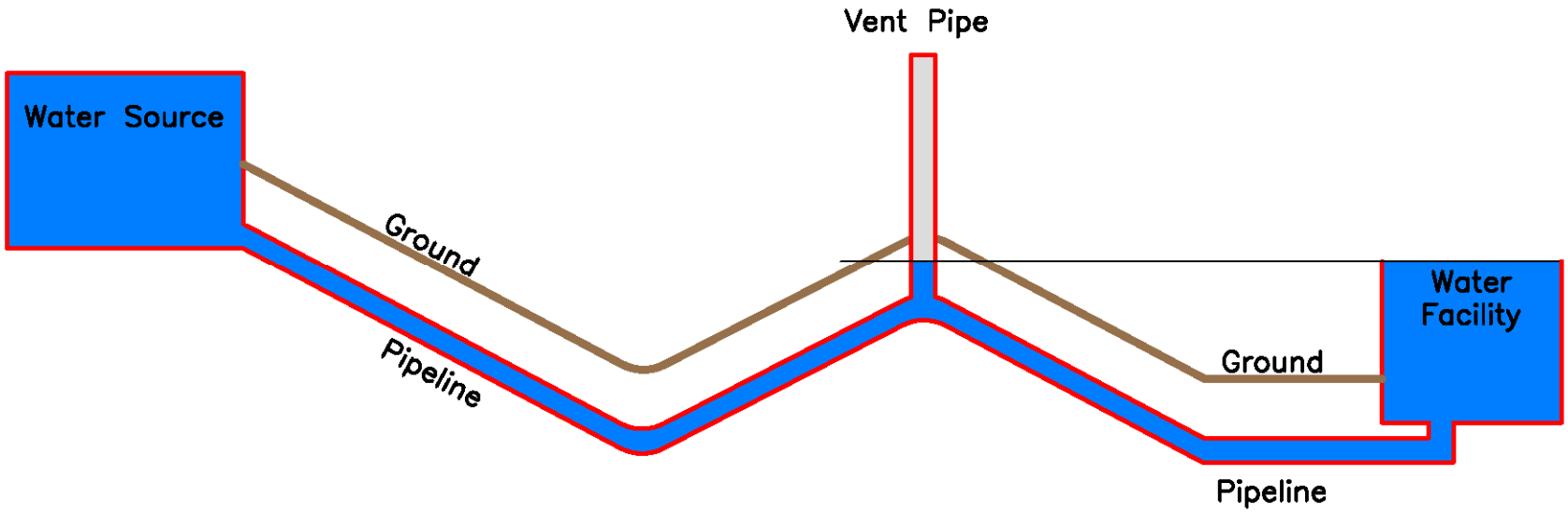


Dealing with Air Locks

- The occurrence of air-binding in pipelines can be prevented in a number of ways:
- Insure that air does not enter the pipeline - while this is obvious, in a practical sense, it is probably not possible to completely prevent air from entering a pipeline.
- Install the pipe on a continuous grade without undulations or high points - the topography may make such an installation impractical.
- Periodically remove air from high points with stand-pipes or air-release valves - this will work on most systems except siphons.
- Insure that the flow velocity is sufficient to flush any air out of the line.
- Adding a water trough at the high spot is a possible solution

This is an advanced topic. If the possibility exists, solicit assistance. You are not expected to be able to cure an airlock. You do need to be able to recognize the potential for the problem and what causes it. Prevention is the best cure here. Airlocks should be discussed with the landowner and the contractor BEFORE the pipeline is installed.

Venting To Prevent An Air Lock



Watering Facility Installation
Items to Review

- Specification **VA772 Watering Facility, Trough or Tank**
- Type of water system Pressure or Gravity
- Types of trough Precast Concrete, Frost-free, HETT, ect.
- Water level control Float valve, stand pipe, other
- Fittings and connections
- Valves and valve box locations
- Preparation for trough installation
- Trench Safety
- Pressure check

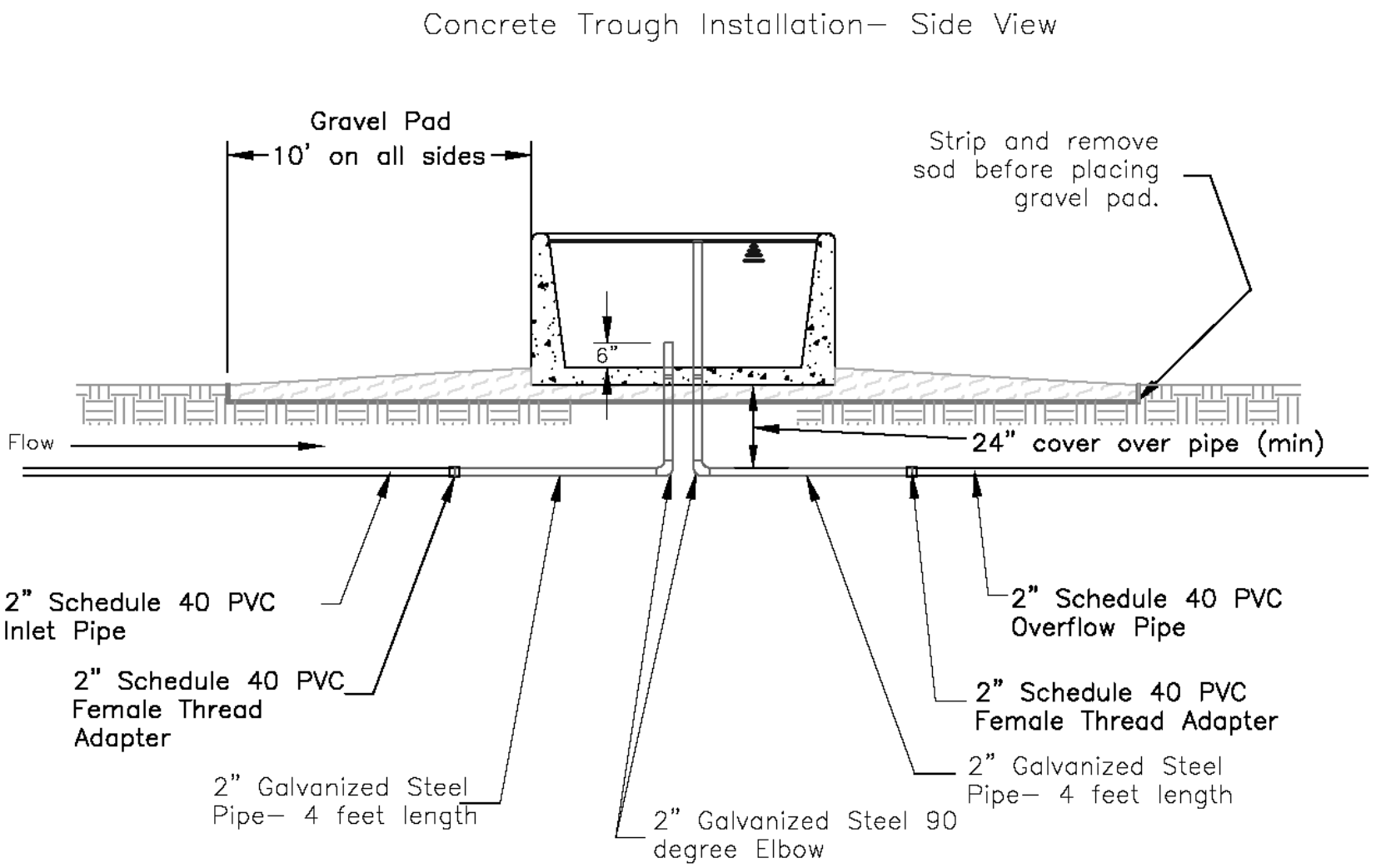
Trough Installations

How a trough is installed depends on what kind you are going to install.

- Concrete (precast and cast in place)
- HETT (Heavy Equipment Tire Trough)
- Frost-free
- Heated
- Animal powered

Precast Concrete Trough

Typical Installation



Cast in Place Concrete Trough in Rockbridge Co.

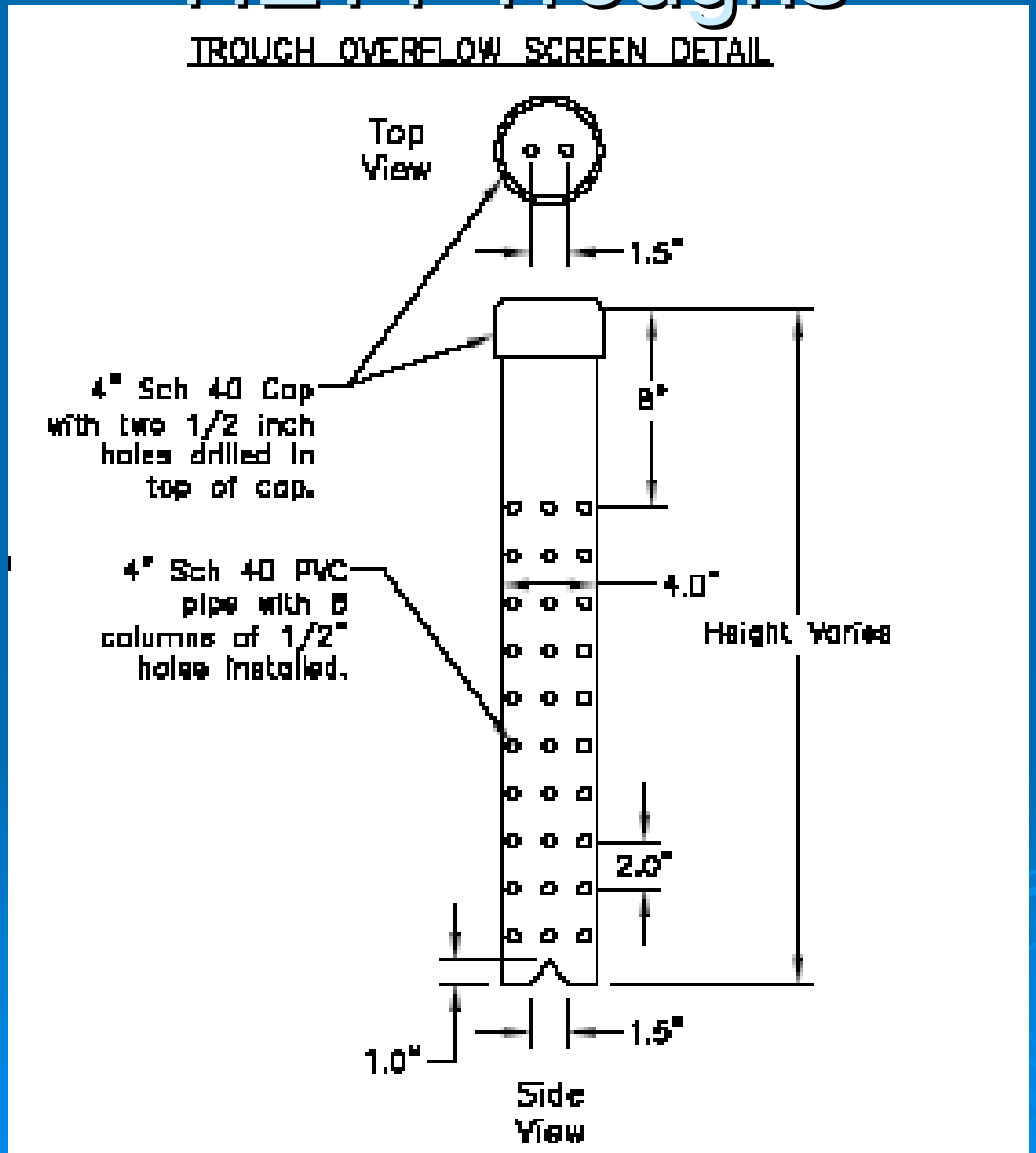
Cast in Place Concrete Trough In WV

HETT

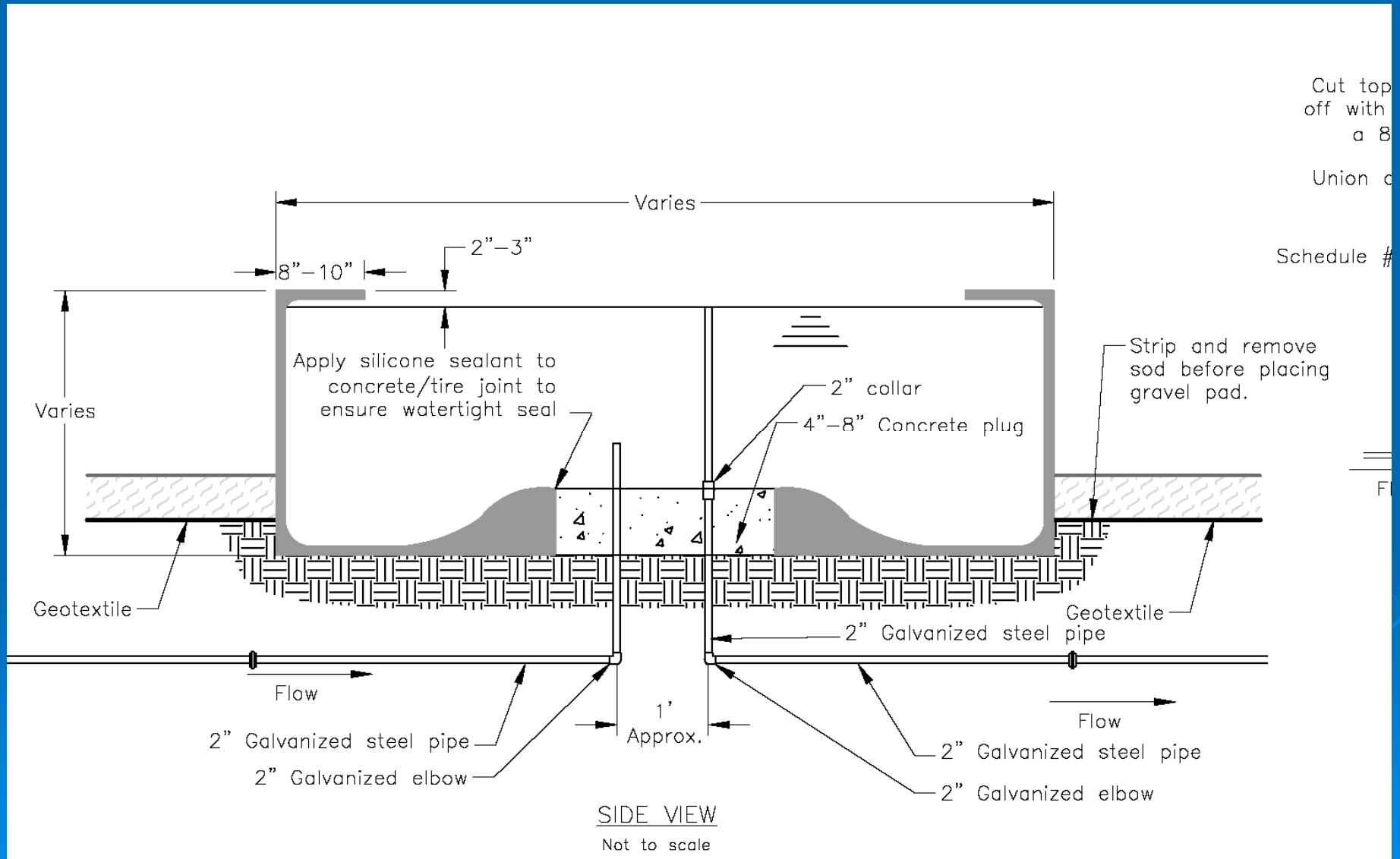
Heavy Equipment Tire Trough

HETT in Washington Co.

Algae Guard for Concrete and HETT Troughs

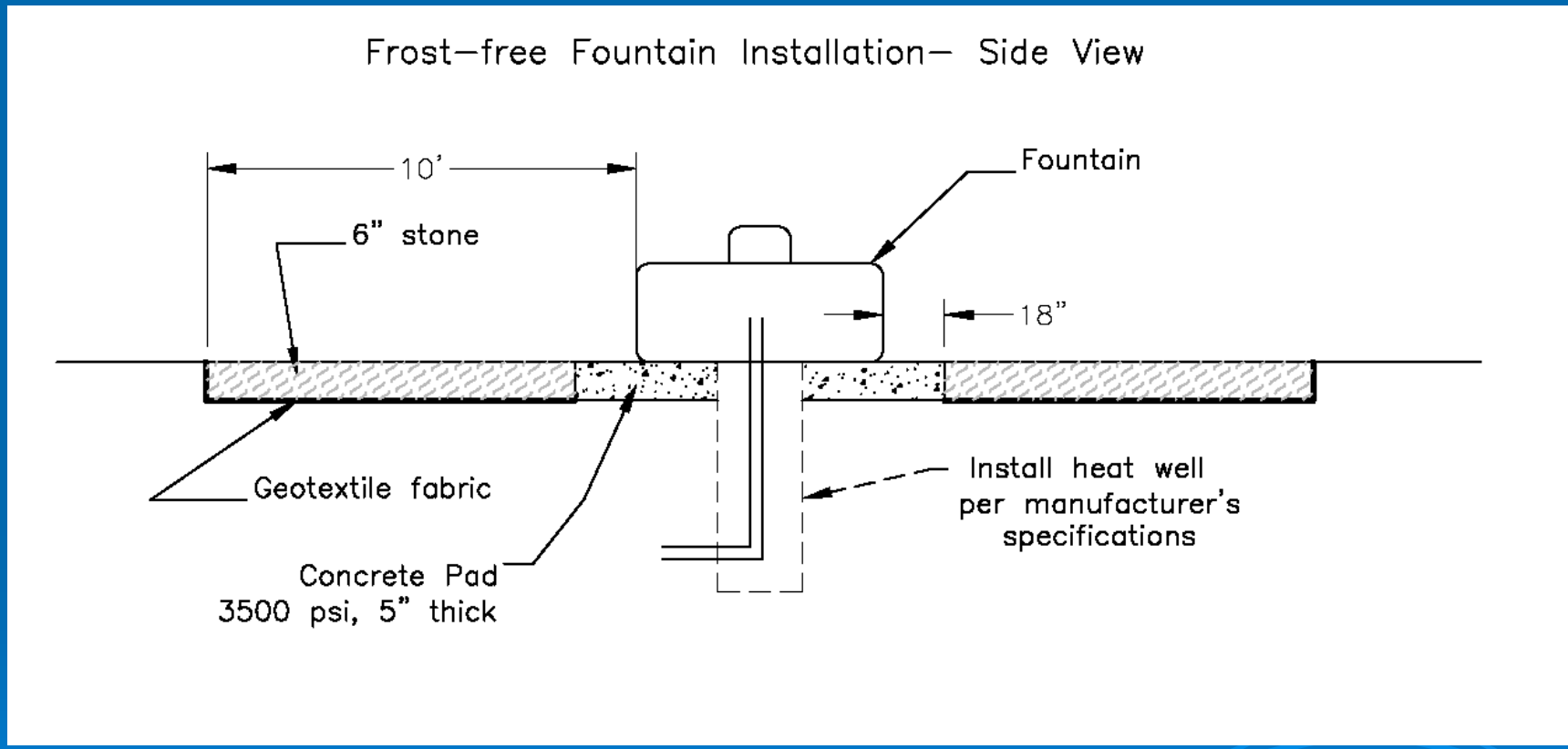


Typical Installation



Frost-Free Troughs
Unheated and Heated

Typical Installation



Earth Tube

A ground tube is three to four feet long and 10” to 12” in diameter. The tube allows the heat stored naturally in the earth to trough.

Above: Earth tube four feet in ground with water line into tube. Pad not yet poured. Line not insulated yet . Used for frost-free Richie trough.

Below: Earth tube in concrete with insulated pipe and electric wire for auxiliary heat. This site is for a Nelson Bowl trough.

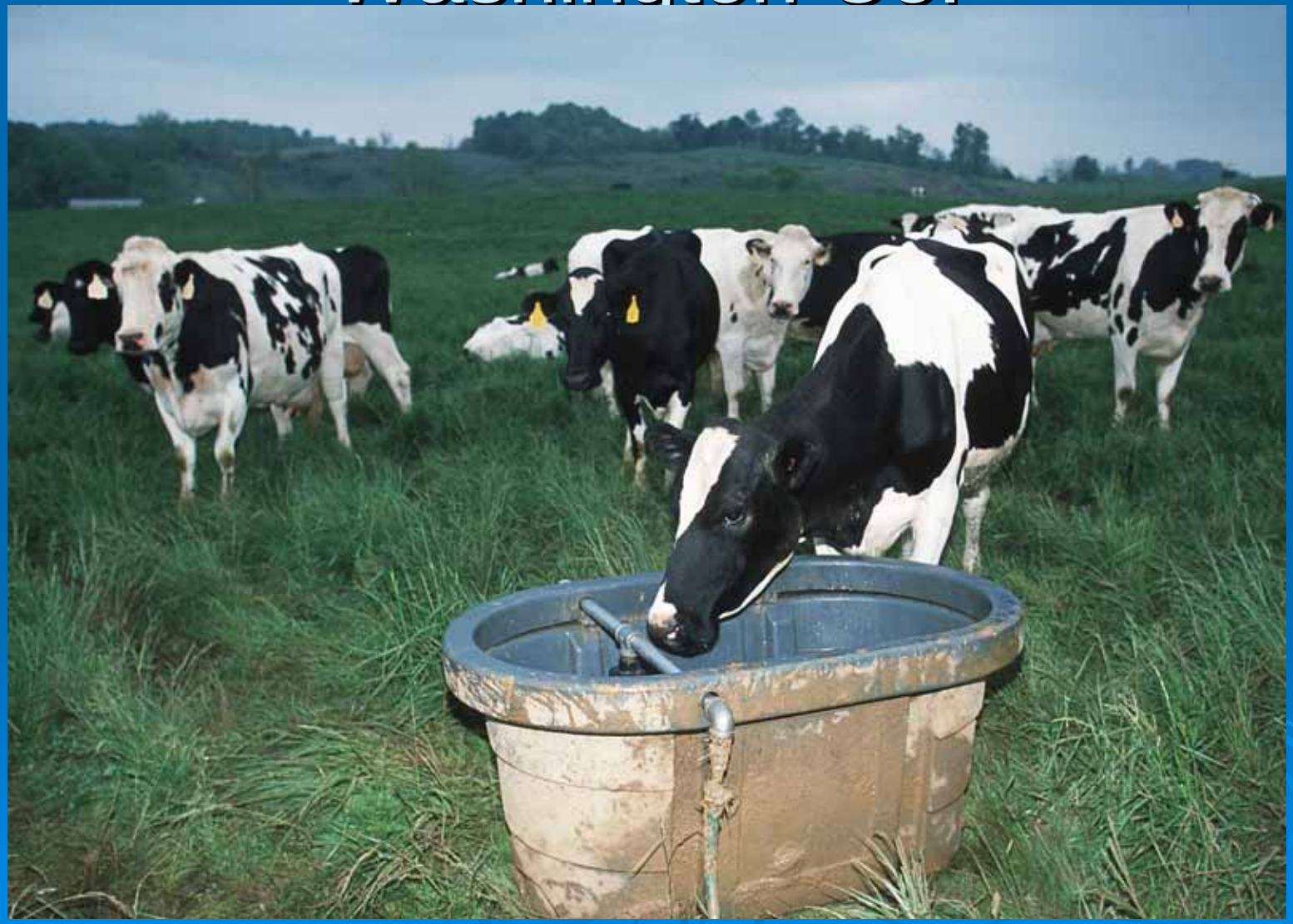
Portable Troughs

A 300 gallon Rubbermaid Brute trough

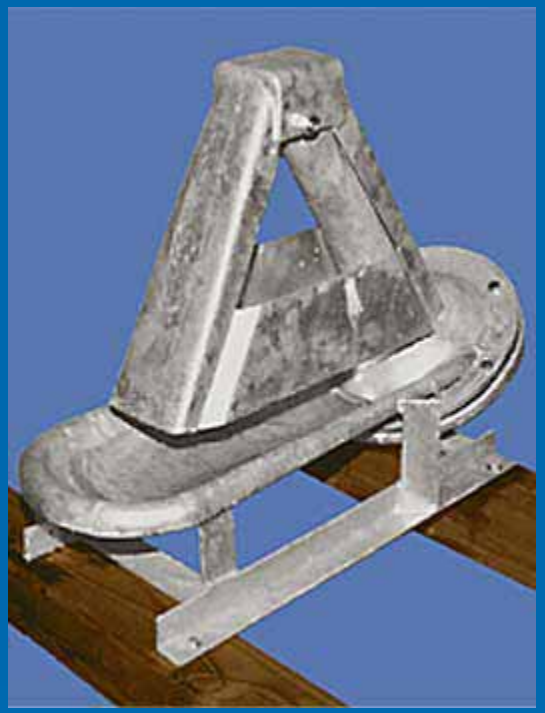
Portable troughs go well with quick connect valves and couplers.

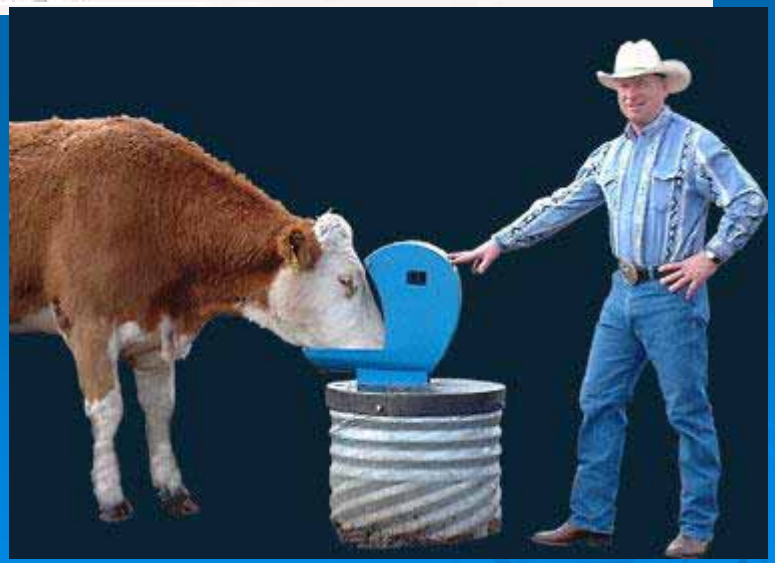
A 60 gallon trough with built in valve used with portable electric fence

Portable Water System in Washington Co.



Animal Powered





Nose pump in Iowa

Nose Pump from Pond

Frost-Free Nose Pump

System operating in Alberta, Canada

The author is looking for someone brave enough to try one in Virginia.

Hey ….

Even a horse can do it

Concrete Pad Installation

- Size — Concrete has a high upfront cost.
  Pad size is a factor to consider.
- Specifications
  VA-731. UNREINFORCED CONCRETE CONSTRUCTION
  VA-732. REINFORCED CONCRETE CONSTRUCTION
- Location — How much grading will be necessary.
- Finish — Concrete needs to be rough…. non slip.

Concrete Pads

Concrete Pad for Cattle

12 ft X 12 ft Pad

Grading and Site Preparation

Concrete thickness

Was this really the best possible location?

- Site should be in a high or level location.
- Site should be well drained.
- Site should not be in natural drainage ways.

If none of these are present ARMOR, ARMOR, ARMOR with stone and gravel.

Specifications Available on the NRCS eFOTG

CONSTRUCTION SPECIFICATIONS
For
(Insert Project Name and/or Landowner Name)
(Insert County Name) County, Virginia

List of Specifications

Title	No.	Pages
Structure Removal	VA-703	1
Seeding	VA-706	3
Site Preparation	VA-707	1
Salvaging and Spreading Topsoil	VA-708	1
Removal of Water	VA-711	1
Excavation	VA-721	1
Earthfill	VA-723	3
Diversions and Waterways	VA-727	2
Plastic (PVC, PE) Pipe	VA-745	3
Watering Facility, Trough or Tank	VA-772	3
Timber Fabrication and Installation	VA-783	2

Learn ‘em and love ‘em……..If in doubt read ‘em

Safety

Miss Utility of Virginia: For ALL excavation work ANYWHERE in Virginia! Call 1-800-552-7001

- Miss Utility is the free "one call" Virginia communications center for excavators, contractors, property owners, and those planning any kind of excavation or digging. The Miss Utility center notifies participating utilities of the upcoming excavation work so they can locate and mark their underground facilities in advance to prevent possible damage to underground utility lines, injury, property damage and service outages.
- The "Miss Utility Law" (Virginia Underground Utility Damage Prevention Act) requires that Miss Utility be called at least 3 working days in advance of the planned work to allow time for marking, that the marks be respected and protected, and that excavation be completed carefully. References to "working day" means every day, except Saturdays, Sundays, and legal state and national holidays.

Safety

Above

Backhoe Tip over

One fatality

Bucket came loose

One fatality

When you find yourself in a hole…the first thing to do is stop digging

The End