

Chapter 10

Pipeline Installation

CHAPTER 10 STOCKWATER PIPELINE INSTALLATION

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CHAPTER 10

PIPELINE INSTALLATION

10.1 TRENCHING

10.1.1 Backhoe Constructed Trench

Backhoe trenches are usually a minimum of 12 inches wide depending on depth. The material frequently comes out of the trench as clods, large chunks and rocks.

It is important to backfill immediately over the pipe with 4 to 6 inches of soil that is free of large rocks and clods. This sometimes can be done by carefully selecting from the excavated material.

If adequate material isn't available, then material such as sand or lime should be imported and placed around the pipe to a depth of 4 to 6 inches over the top of the pipe.

10.1.2 Trencher Constructed Trenches

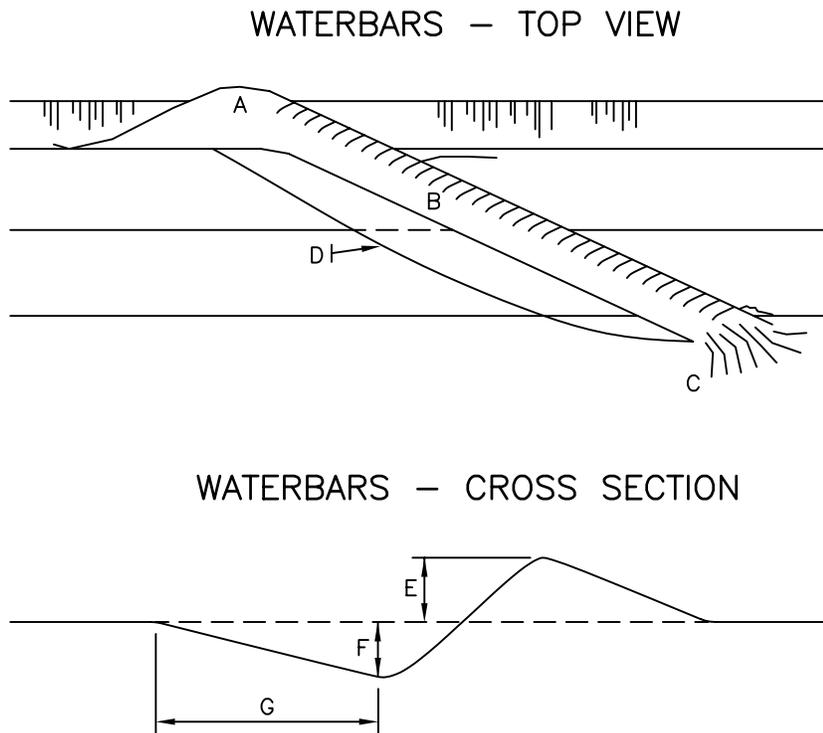
When conditions permit, trenching for pipelines which are buried from 2 to 3 feet are usually done with a narrow 4 to 6 inch wide chain trencher. Where there is little gravel or rocks and the ground is not too wet, these trenchers bring up well pulverized soil that makes good backfill material. The material is usually bulldozed back in the trench with a trencher mounted blade. Where rocks are not present, any of this material may be backfilled directly around the pipe. There is no practical way to compact the fill in these narrow trenches. Within two to five years the backfill material will usually consolidate to the maximum extent.

10.1.3 Backfilling and Maintenance

There will be low spots in the trench backfill when the material consolidates. These can be a hazard to livestock, humans, and equipment and are frequently a starting point for gully erosion.

There are three things that always should be done to minimize these problems:

1. Make it clearly understood by the landowner that there must be maintenance of the backfill each year for several years. This maintenance will consist of adding fill to low spots and repairing any erosion that may occur.
2. When backfilling, mound the soil over the trench to the maximum extent possible.
3. Construct "water bars" at right angles to the trench at periodic intervals. These are simply very small diversion dikes across the trench at locations where the trench is traveling up or down the slope. The purpose of these diversions is to prevent concentration of water in the trench and erosion of the backfill. Figure 10.1 illustrates a water bar.

Figure 10.1
WATER BAR

1. Waterbar construction for forest or ranch roads, firebreaks, & stocktrails & walkways. Specifications are average, and may be adjusted to conditions.
2. A--Bank tie-in point, out 6" to 1 foot into the roadbed.
3. B--Cross drain berm height 1 to 2 feet above the roadbed.
4. C--Drain outlet cut 8" to 16" into roadbed.
5. D--Angle drain 30 to 45 degrees downgrade with road centerline.
6. E--Up to 2 feet in height.
7. F--Depth to 18 inches.
8. G--3 to 4 feet.
9. Remember energy dissipater, waterspreaders.

10.1.4 Road Crossings

All backfill material must be compacted by some adequate means at road crossings. It may be easiest to import sand or fine gravel to fill the trench at road crossings. Rodding and hand tamping can be used to consolidate this granular material. Saturating the material will assist in compaction. Stronger pipe or better backfilling requirements can be evaluated by Area Engineer using TR-77.

10.1.5 Stream Crossing

Crossing a stream with a pipeline may be relatively simple depending on several factors - width, depth, drainage area and especially composition of the bottom.

Selection of a stable portion of the stream will be important and alignment of the pipeline might need to be changed from a preferred location in order to accommodate this. Construct the stream crossing first then bring the rest of the pipeline to it.

Cross a gravel or earth bottom stream at a right angle and dig to the maximum depth possible. Freezing probably won't be a problem but the use of burst proof pipe should be considered if the possibility exists.

Crossing a solid rock bottom stream in the Ozarks is another proposition. A lot of thought should go into selection of site and method. One method, which has worked, is to jack hammer a trench across the rock bottom. A trench, a foot deep and as wide as the backhoe bucket, has been successful. Place the water pipe in a larger section of heavy, thick walled pipe, preferably steel, for protection and backfill with a mix of fines and larger material. Pouring some concrete over the larger pipe might be considered also. Again consider using burst proof pipe and shut off valves in case of problems.

Another consideration could be running that section (across the stream) above ground at a height well above the expected high water mark. Allowance would need to be made for drainage and shutting down during freezing weather and/or non-use periods.

Keep in mind some larger streams will need all necessary permits before construction is started.

10.1.6 Safety

It is very important to have some knowledge of the location of buried pipelines, electric cables and telephone lines. A landowner usually knows the approximate location of major buried lines but may or may not know of lines to out buildings, etc. A call to the utility company and/or Missouri One Call by the landowner even in the planning stage might save some problems later. Before construction starts it's a necessity if anything major is suspected. The Missouri One Call toll free number is 1-800-344-7483.

Another safety consideration should be the depth of trenches. If trenches are deep enough and/or soil conditions appear to be making the sides unstable, connecting pipe joints, hydrants, etc. together and then lowering into the trench should be considered. Allow time for glue joint to set prior to lowering into trench. OSHA requirements shall be followed when men are working in trenches.

10.2 PIPE JOINTS

Experience has shown that the most common cause of pipeline failure is joint failure. Particular care must be taken to make joints in the manner specified in the specifications and as recommended by the manufacturer. Only materials approved for use with the specific type and rating of pipe may be used.

Polyvinyl chloride (PVC) and other rigid plastic pipes are usually joined using glued joints. Only solvents and glues designed for specific plastic type must be used. They also should be rated for temperature and conditions existing at the time of construction. Some appear to work better than others in colder than normal conditions, while others will also bond on damp pipe (used on gravity systems). A solvent cleaning and preparation process should always be done if recommended. Connections must be stabbed full depth into fittings. Pipe intended for pressure systems should have "pressure" joints, these are about 2 times as long as those for gravity systems thus allowing more surface for glue joint.

Polyethylene and other flexible plastic pipe is often connected with "stab" joints. Stab joints must be properly clamped. Two stainless steel band clamps are recommended per each side of joint or four per connection. Snaking the pipe in the trench helps keep the pipe from pulling apart.

Plastic pipe such as that used by ground source heat pump installers is usually welded by a special welder if a local installer is available.

Joints should be checked by pressure, either air or water. If the pressure tank is already installed on a pressure system, it should be left open at least 2 hours and longer if possible.

Plastic pipe connected together and placed in a trench while warm will contract as it cools off. This can pull joints apart and is the reason that care should be taken to place pipe when it is cool or allow for the contraction by snaking or other means. Backfill should never be placed when the weather is significantly below freezing.

10.3 INSPECTION DURING CONSTRUCTION

Frequent inspection during construction of stockwater pipelines may not need to be performed by the field office. We should make a point to view each contractor's work while pipe is actively being laid at least once during the construction season. If there are an unusual number of problems occurring from job to job, then more frequent visits must be made. We must provide enough inspection to assure that pipe is being installed in accordance with the drawings and specifications.

A good way to get more inspection is to enlist the aid of the landuser. The landuser has a vested interest in seeing that a good job is being done. Spending some time with the landuser explaining exactly what to look for during construction can pay big dividends.

10.4 MEASUREMENT FOR PAYMENT

Contractors usually keep track of the number of pipe lengths that are installed and then base their measurement of the installed length of pipeline on the total pipe lengths counted. The laid length is not the same as the total of nominal pipe lengths. The laid length may be 1 to 2 percent shorter than the nominal length. Pipe section lengths are not

consistently the same and there are length differences caused by couplings and fittings. Damaged or broken sections also seem to end up in the count.

The final payment length should always be measured when the pipe is in place. Frequently this is done with a measuring wheel. Sometimes a tape, chain or string measurer is used. If a wheel is used, measurements should always be run up the line and then back again. If the two measurements do not agree within two percent, the length should be remeasured. The pipeline total should be the average of at least two measurements. If a contractor's measurements are accepted, it should be on the basis of actual measurement, not a count of pipe sections.