

Technical Bulletin

Crosspipe Installation

CROSSPIPE INSTALLATION - This technical bulletin deals with techniques for proper crosspipe installation (drainage culverts, not stream pipes). Please see related technical bulletins for general pipe information or details of a "Shallow Pipe Installation."

PIPE ELEVATION

When possible, try to outlet pipes at the elevation of the natural ground. This will eliminate the need for long "tail ditches" at pipe outlets that are a constant source of maintenance and erosion. More information on pipe elevation can be found in the "Shallow Pipe Installation" Tech Bulletin.

PIPE LENGTH AND ANGLE

Pipes should be installed at an angle across the road that lines up with natural drainage patterns. This has many advantages over installing pipes straight across a road: (Figure 1)

- reduces erosion around pipe inlet and outlet that is caused when water "turns" to enter or exit the pipe
- pipe efficiency and flow capacity are increased when water does not have to turn 90° to enter the inlet
- traffic loading on the pipe is decreased since only one vehicle tire at a time is directly over the pipe
- often with longer pipes installed at an angle, it is possible to keep pipe joints away from wheel tracks

BEDDING / FILL MATERIAL— In selecting a material for use as bedding and fill around a crosspipe, frost action and compaction are the two most important concerns. When possible, the material that is excavated out of the pipe trench will make the best fill material. If this material has a lot of large rock in it, it will not compact properly and new material must be imported. Keep in mind the following when selecting a bedding material:

- Imported bedding material should be as similar as possible to existing road material. This will insure that the entire road will react in the same way to cycles of freeze and thaw.
- Any bedding material needs to be slightly moist to achieve the best compaction. Compaction is crucial both above and beside the pipe to provide proper pipe support and avoid excessive flexing.
- Some common fill materials include crushed bank run gravel, shale, and PENNDOT 2RC aggregate.

OTHER CONSIDERATIONS

- When raising the road profile, fill should be placed and compacted prior to pipe placement. After road fill is in place, excavate pipe trench and proceed with installation.
- Ensure that all pipes have at least a 1% fall.
- All pipes should have headwalls and endwalls to reduce erosion and improve pipe functionality.
- Drop-inlets (grates like on storm sewers) are not recommended for use on unpaved roads.



Photo 1
A plastic crosspipe is shown during installation. Notice the pipe bedding material, endwall, and stone at outlet.

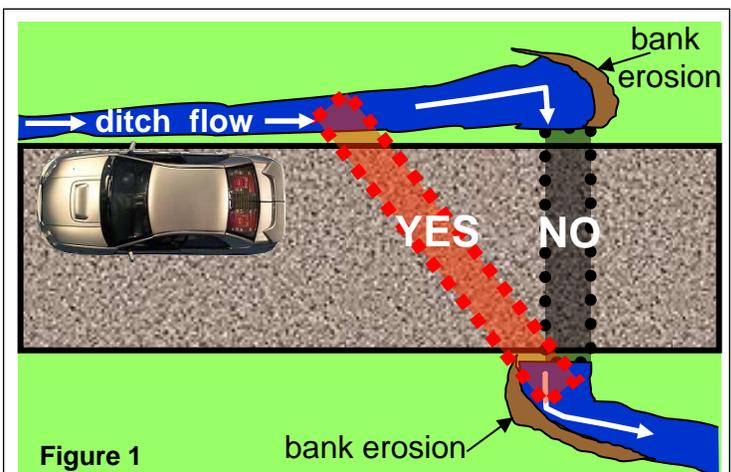


Figure 1
The crosspipe shown in black is improperly aligned straight across the road. The red pipe indicates a better pipe placement that will carry more water and cause less erosion.

CROSSPIPE INSTALLATION

- 1) Excavate Pipe Trench:** Trench should be wide enough to fit compaction device (*shown in "D"*) on both sides of pipe. Trench depth will depend on outlet elevation. Outlet pipe at natural ground elevation whenever possible to eliminate the need for a tail-ditch. Bottom of pipe inlet should be at the same elevation as the ditch. If needed, use a level to insure bottom of pipe trench has min 1% fall across entire length. (*See photo A*).
- 2) Place Pipe Bedding:** Once trench is complete, place small amount of bedding material (~3") in bottom of trench if needed. Use bedding to smooth trench bottom and achieve proper slope. Some shovel and rake work is required to spread bedding evenly. If bedding material is used to level the trench, it should be compacted before pipe placement. Use level to find any uneven spots and double-check slope (*See photo B*).
- 3) Place Pipe in Trench:** Place and align first section of pipe in trench. Pipe inlet should be located in the existing ditch line, with just enough room between the pipe and the bank for a headwall. Inlets that are too close to the road pose traffic hazards. Inlets that are too far off the road cause unnecessary bank erosion. Align additional pieces and secure together using provided collars or pipe adhesive. Look under pipe to make sure it is in constant contact with the bedding. Voids under the pipe will cause sagging upon compaction. If desired, headwall and endwall can be constructed at this time. Fill will be placed against the back of the walls in next step (*See photo 1 on front*). Otherwise, headwall and endwall can be constructed after pipe installation is complete.
- 4) Place and compact fill material around pipe:** Place bedding material around pipe until approximately 8" of material is on each side of pipe. Pipe may need to be held in place so fill material does not push or lift pipe (*See photo C*). Use a Jumping-Jack to compact fill on both sides of pipe. Compaction of the first layer of bedding material is crucial because it packs material down around the base of the pipe for support (*See photo D*). The importance of compaction cannot be overstated! Unlike metal and concrete pipes which have structural strength, plastic pipes get their strength from the material compacted tightly around them. Be careful not to puncture pipe with the foot of the Jumping-Jack while compacting. Continue to fill and compact in stages, placing approximately 8" of fill before compaction. If too much fill is placed at once, proper compaction cannot be achieved. Continue to fill and compact over top of pipe (*See photo E*). Be sure to provide adequate fill over pipe. Adequate fill varies with pipe size and construction. Plastic pipes up to 24" in diameter require a minimum of 12" of compacted cover.

