

# Repair Made

Culvert Cost and HydInfra

Spring 2016 Training

**Repair Made List  
for 2016  
Culvert Cost**

List order is based on:

- 1) Most likely repair type
- 2) Repair types that are similar
- 3) More important or expensive type
- 4) Cleaning types and unlikely items towards bottom of list

Find Culvert Cost  
on the IHUB

Repair Made:	Description of Repair Made:
Trench New Pipe	Install a new pipe by trenching through the road, then fill and compact the trench. May re-pave the road. Usually includes pipe removal. Repaired Length = length of new pipe.
Slipline	Slide a pipe-like liner into the culvert then grout the void between the host pipe and the liner. May install new aprons. Repaired Length = length of slipliner.
Replace Aprons	Remove old aprons and place new ones, and maybe replace a few pipe sections. Repaired Length = 0 (if aprons only) or the length of the pipe sections that are reset or replaced.
Reset	Move aprons and maybe pipe sections back into place to fix joint separations or separated apron. The repair includes filling, compacting bedding and adding ties. May install new pipe sections (but not aprons) with Reset. Repaired Length = 0 (if aprons only) or is the length of the pipe sections that are reset or replaced. (If sections don't move, read Joint Repair).
Extension	Lengthen the existing pipe by adding pipe sections and reset or replace aprons, fill and compact and sometimes pave. Repaired Length = length of pipe sections added.
Joint Repair	Fix broken or separated joints by installing internal bands or sleeve, filling a gap in the joint, or covering joint from the outside of the pipe -- without moving the pipe itself. May include filling voids in road bed. Repaired Length = 0. Please record the number of joints fixed in the Comments.
Hole Repair	Patch isolated holes in the pipe wall and sometimes includes filling voids in road bed. Repaired Length = length of hole repairs in feet. (See Paved Invert for extensive invert repairs).
Paved Invert	Fix the invert of the pipe by pouring, troweling or covering the invert with concrete or other material, usually in a larger metal pipe (accessible for interior repair). May also include filling voids in road bed. Repaired Length = length of paved invert.
Fill Voids	Replace the road bed material that has washed out from around the pipe, but the pipe itself is not repaired. Road fill material can be grout, lightweight cellular grout or chemical expanding foam grout, hot mix, millings or other fill. Repaired Length = estimate the length of void filled along the pipe.
Abandon Only	Plug and abandon existing pipe but NOT install a pipe at same location. Repaired Length= 0
Remove Only	Remove existing pipe but NOT install a pipe at same location. Includes road repair. Repaired Length = 0
Other	If the repair is not listed, use "Other" and describe the repair in the comments. Repaired Length = length of pipe repaired.
None*	If it's not a repair and not on the list but important enough to record, then use "None" and describe the task in comments. Repaired Length is probably 0. Use "None" as Repair Made for Pipe Videos .
Cleaning*	Remove dirt or debris from inside a pipe or within 5 feet of an apron. Minor cleaning is 4 hours or less of labor. Major cleaning includes more than 4 hours labor or the use of a jetter or major equipment. Repaired Length = length of pipe cleaned.
Ditch Cleaning*	Remove dirt or debris from a ditch. Repaired Length = length of ditch cleaned.
Ice Removal*	Remove ice to prevent ice or water on roadway. Repaired Length = length of removed ice.
Beavers*	Remove or discourage beavers or beaver dams or other critters. Includes exploding dams and trapping contracts. Repaired Length = 0
Jack	Jacking is not used by Maintenance as a method to install pipes by pounding them through the roadway. It is omitted from the 2015 Culvert Cost list of Repair Made.
Cured-In-Place-Pipe	Cured In Place Pipe is not used by Maintenance as a method to line pipes with a resin-filled tubular liner. It is omitted from the 2015 Culvert Cost list of Repair Made.

Notes:  
 \* Cleaning-related items and None (not a repair) on the Repair Made list are optional to record in the Culvert Cost app. Each District can choose whether or not to record Cleaning, Ditch Cleaning, Ice Removal, Beavers and None.  
 1) Repairs of Culverts are required to be entered in the Culvert Cost app.  
 2) A Culvert has 2 open ends and carries water under a roadway embankment.  
 3) "Culvert" does NOT include storm drain, flumes, drain tile, ditches, ponds, erosion, or infiltration areas.  
 4) Cleaning is included as part of many Repair Made types.

Print the PDF

# Repair Made List

for repair definitions.

Read the notes.

# Repair Made:

- Trench New Pipe
- Slipline
- Replace Aprons
- Reset
- Extension
- Joint Repair
- Hole Repair
- Paved Invert
- Fill Voids
- Remove Only
- Abandon Only
- Other

## District's Option:

- \*None
- \*Cleaning
- \*Ditch Cleaning
- \*Ice Removal
- \*Beavers

## Not in 2015 app:

- ~~• Jack~~
- ~~• Cured In Place Pipe~~

# “None” or “Other”

*when nothing else fits*

- Use “None” if it’s NOT a repair  
(does not address the *structural* condition)
- Use “Other” if it is a repair but not on the list
- Use Comment to describe the None or Other

# Repair Made Examples

# Trench New Pipe

- Trench New Pipe
- Slipline
- Replace Aprons
- Reset
- Extension
- Joint Repair
- Hole Repair
- Paved Invert
- Fill Voids
- Remove Only
- Abandon Only
- Other

Install a new pipe by trenching through the road, then fill and compact the trench. May re-pave the road. Usually includes pipe removal. Repaired Length = length of new pipe.



Metro Drainage Crew MN 13 Polypropylene Pipe



# Trench New Pipe



# Slipline

Slide a pipe-like liner into the culvert then grout the void between the host pipe and the liner. May install new aprons. Repaired Length = length of slipliner.

- Trench New Pipe
- **Slipline**
- Replace Aprons
- Reset
- Extension
- Joint Repair
- Hole Repair
- Paved Invert
- Fill Voids
- Remove Only
- Abandon Only
- Other



# Replace Aprons

Remove old aprons and place new ones, and maybe replace a few pipe sections. Repaired Length = 0 (if aprons only) or the length of the pipe sections that are reset or replaced.

- Trench New Pipe
- Slipline
- **Replace Aprons**
- Reset
- Extension
- Joint Repair
- Hole Repair
- Paved Invert
- Fill Voids
- Remove Only
- Abandon Only
- Other



Photos D6 Adam Miller

# Reset

- Trench New Pipe
- Slipline
- Replace Aprons
- **Reset**
- Extension
- Joint Repair
- Hole Repair
- Paved Invert
- Fill Voids
- Remove Only
- Abandon Only
- Other

Move aprons and maybe pipe sections back into place to fix joint separations or separated apron. The repair includes filling, compacting bedding and adding ties. May install new pipe sections (but not aprons) with Reset. Repaired Length = 0 (if aprons only) or is the length of the pipe sections that are reset or replaced.





# Reset

Move aprons and maybe pipe sections back into place to fix joint separations or separated apron. The repair includes filling, compacting bedding and adding ties. May install new pipe sections (but not aprons) with Reset. Repaired Length = 0 (if aprons only) or is the length of the pipe sections that are reset or replaced.

- Trench New Pipe
- Slipline
- Replace Aprons
- **Reset**
- Extension
- Joint Repair
- Hole Repair
- Paved Invert
- Fill Voids
- Remove Only
- Abandon Only
- Other



D6 photos from Adam Miller

# Extension

Lengthen the existing pipe by adding pipe sections and reset or replace aprons, fill and compact and sometimes pave.  
Repaired Length = length of pipe sections added.

- Trench New Pipe
- Slipline
- Replace Aprons
- Reset
- **Extension**
- Joint Repair
- Hole Repair
- Paved Invert
- Fill Voids
- Remove Only
- Abandon Only
- Other



Extension is making an existing pipe longer. Let's pretend there was an existing culvert at the top. Apologies to D6 Adam Miller for misusing his photo.



# Joint Repair

Fix broken or separated joints by installing internal bands or sleeve, filling a gap in the joint, or covering joint from the outside of the pipe -- without moving the pipe itself. May include filling voids in road bed. Repaired Length = 0.

- Trench New Pipe
- Slipline
- Replace Aprons
- Reset
- Extension
- **Joint Repair**
- Hole Repair
- Paved Invert
- Fill Voids
- Remove Only
- Abandon Only
- Other



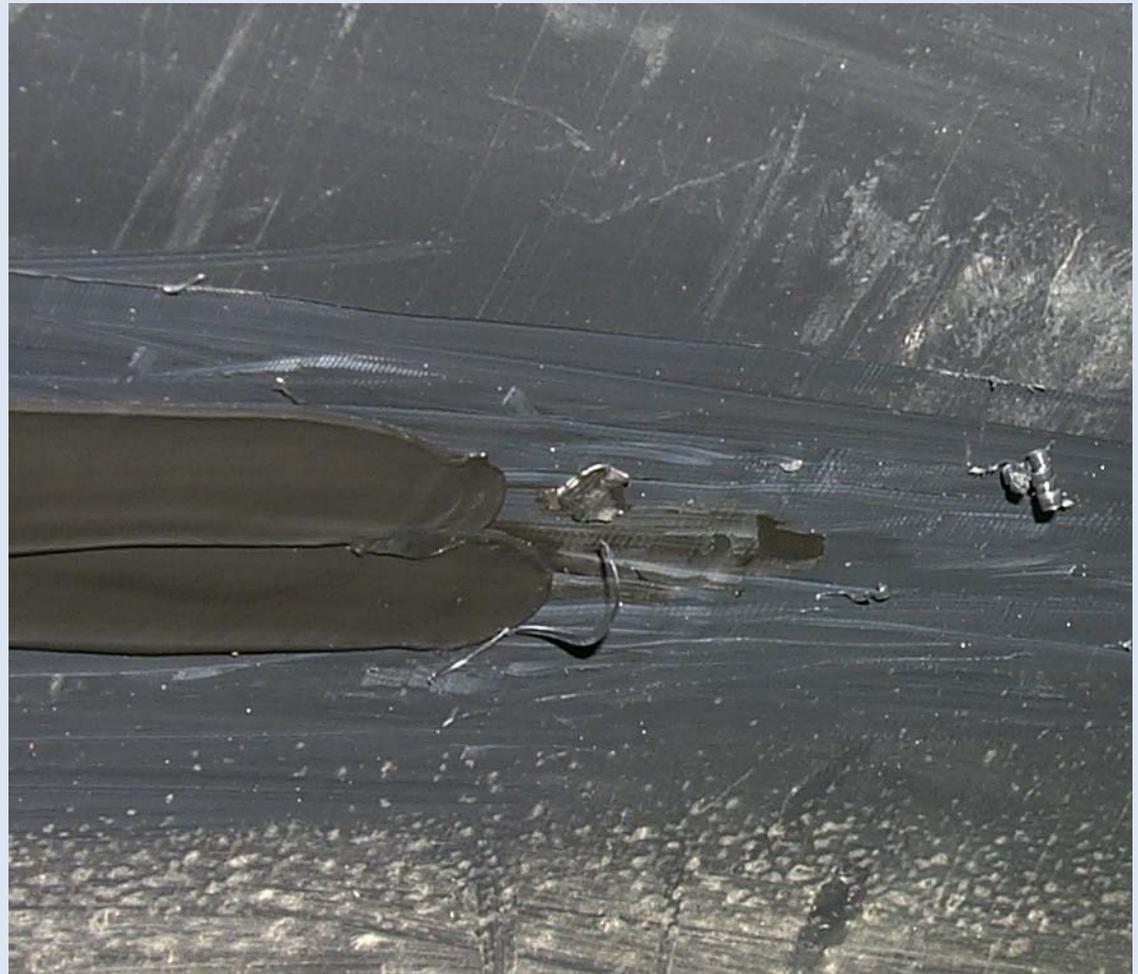
**Please record the number of joints fixed in the Comments!**



# Hole Repair

- Trench New Pipe
- Slipline
- Replace Aprons
- Reset
- Extension
- Joint Repair
- **Hole Repair**
- Paved Invert
- Fill Voids
- Remove Only
- Abandon Only
- Other

Patch isolated holes in the pipe wall and sometimes includes filling voids in road bed. Repaired Length = length of hole repairs in feet. (See Paved Invert for extensive invert repairs).



Photos D6 HDPE pipe repair

# Paved Invert

- Trench New Pipe
- Slipline
- Replace Aprons
- Reset
- Extension
- Joint Repair
- Hole Repair
- **Paved Invert**
- Fill Voids
- Remove Only
- Abandon Only
- Other

Fix the invert of the pipe by pouring, troweling or covering the invert with concrete or other material, usually in a larger metal pipe (accessible for interior repair). May also include filling voids in road bed. Repaired Length = length of paved invert.



D6 Paved Invert  
Repair, Coughlin 2011

# Paved Invert

- Trench New Pipe
- Slipline
- Replace Aprons
- Reset
- Extension
- Joint Repair
- Hole Repair
- **Paved Invert**
- Fill Voids
- Remove Only
- Abandon Only
- Other

Fix the invert of the pipe by pouring, troweling or covering the invert with concrete or other material, usually in a larger metal pipe (accessible for interior repair). May also include filling voids in road bed. Repaired Length = length of paved invert.



Paved Invert repair, done in 1971, on steel plate culvert still looks good in 2015. Has a channel that keeps most flows away from galvanized steel sides. 2005 Photo from Bergstrand, D1

# Fill Voids

- Trench New Pipe
- Slipline
- Replace Aprons
- Reset
- Extension
- Joint Repair
- Hole Repair
- Paved Invert
- **Fill Voids**
- Remove Only
- Abandon Only
- Other

Replace the road bed material that has washed out from around the pipe, but the pipe itself is not repaired. Road fill material can be grout, lightweight cellular grout or chemical expanding foam grout, hot mix, millings or other fill. Repaired Length = estimate the length of void filled along the pipe.



Fill road Voids is a temporary fix. The underlying pipe had holes that caused the void in road. Photo at MnDOT Oakdale Office

# Remove Only

Remove existing pipe but NOT install a pipe at same location. Includes road repair. Repaired Length = 0

- Trench New Pipe
- Slipline
- Replace Aprons
- Reset
- Extension
- Joint Repair
- Hole Repair
- Paved Invert
- Fill Voids
- **Remove Only**
- Abandon Only
- Other



# Abandon Only

Plug and abandon existing pipe but NOT install a pipe at same location. Repaired Length= 0

- Trench New Pipe
- Slipline
- Replace Aprons
- Reset
- Extension
- Joint Repair
- Hole Repair
- Paved Invert
- Fill Voids
- Remove Only
- **Abandon Only**
- Other



Photo D6

# Other

If the repair is not listed, use "Other" and describe the repair in the comments. Repaired Length = length of pipe repaired.

- Trench New Pipe
- Slipline
- Replace Aprons
- Reset
- Extension
- Joint Repair
- Hole Repair
- Paved Invert
- Fill Voids
- Remove Only
- Abandon Only
- **Other**



D1 stone culvert with plywood repair

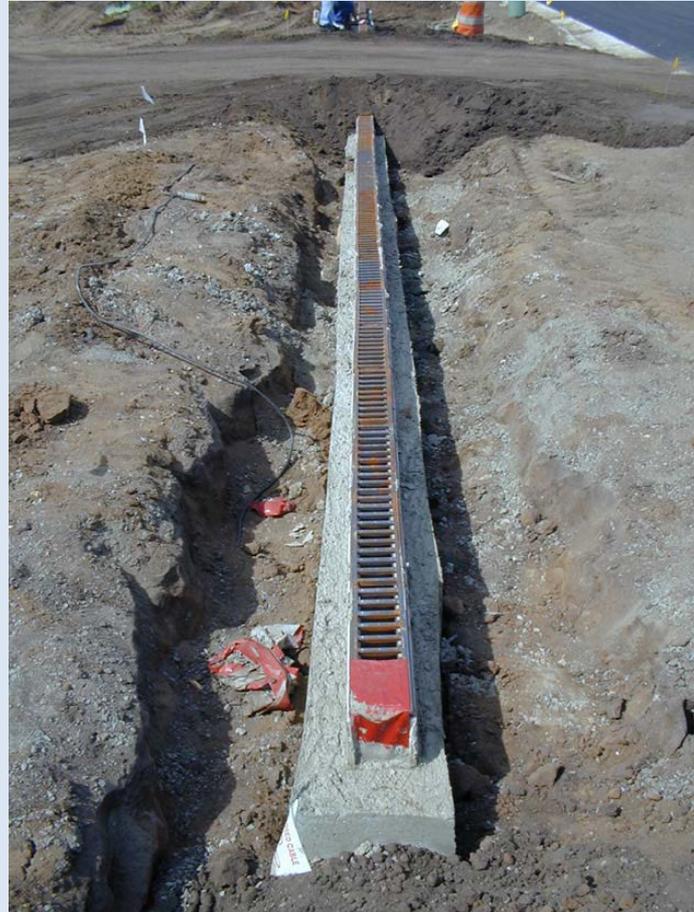


# Other

If the repair is not listed, use "Other" and describe the repair in the comments. Repaired Length = length of pipe repaired.

*Capture Other Repair or Not Culvert*

- Trench New Pipe
- Slipline
- Replace Aprons
- Reset
- Extension
- Joint Repair
- Hole Repair
- Paved Invert
- Fill Voids
- Remove Only
- Abandon Only
- **Other**



Slotted drain is not culvert but is District's option to record. Photo D2

# Other: Erosion Repair without culvert work

If the repair is not listed, use "Other" and describe the repair in the comments. Repaired Length = length of pipe repaired.

- Trench New Pipe
- Slipline
- Replace Aprons
- Reset
- Extension
- Joint Repair
- Hole Repair
- Paved Invert
- Fill Voids
- Remove Only
- Abandon Only
- **Other**



# Cleaning-related Work or Maintenance that's Not a Repair

\*None

\*Cleaning

\*Ditch Cleaning

\*Ice Removal

\*Beavers

\*Each District can choose whether or not to record Cleaning, Ditch Cleaning, Ice Removal, Beavers and None.

# None

If it's not a repair and not on the list but important enough to record, then use "None" and describe the task in comments. Repaired Length is probably 0. Use "None" as Repair Made for [Pipe Videos](#) .

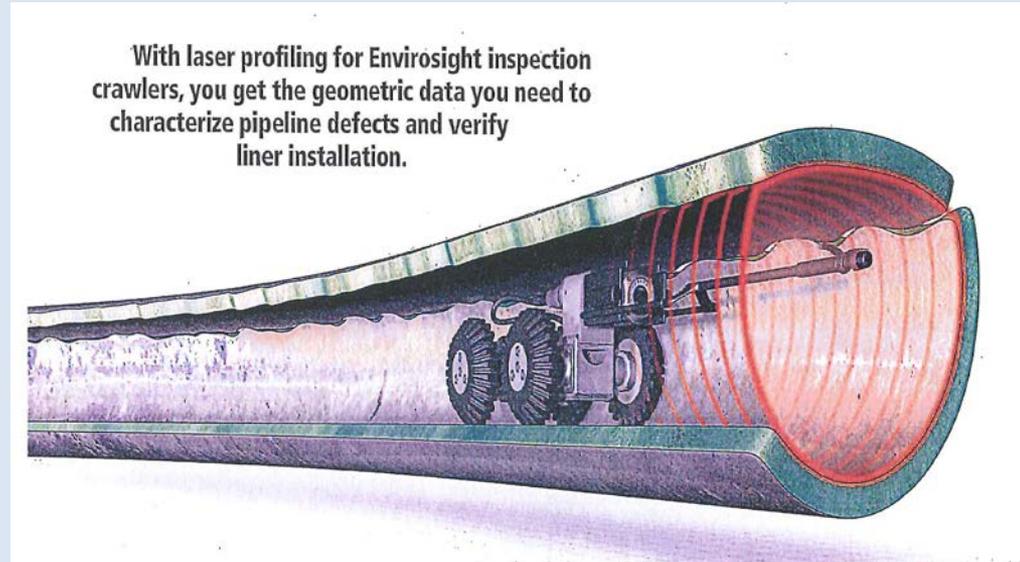
\*None

\*Cleaning

\*Ditch Cleaning

\*Ice Removal

\*Beavers



# Cleaning

\*None

\*Cleaning

\*Ditch Cleaning

\*Ice Removal

\*Beavers

Remove dirt or debris from inside a pipe or within 5 feet of an apron. Minor cleaning is 4 hours or less of labor. Major cleaning includes more than 4 hours labor or the use of a jetter or major equipment. Repaired Length = length of pipe cleaned.



Also use “Clean Done” flag: Major (4+ hours Labor), Minor, None. Photo from D8 Oellian

# Ditch Cleaning

Remove dirt or debris from a ditch. Repaired Length = length of ditch cleaned.

- \*None
- \*Cleaning
- \*Ditch Cleaning
- \*Ice Removal
- \*Beavers



“Cleaning” focuses on the culvert end. Use “Ditch Cleaning” if the largest cost is in the ditch, even if aprons were also cleaned. Photo from D6 Adam Miller

# Ice Removal

Remove ice to prevent ice or water on roadway.  
Repaired Length = length of removed ice.

\*None

\*Cleaning

\*Ditch Cleaning

**\*Ice Removal**

\*Beavers



Photos D1



# Ice Removal



“This happened on Saturday / Sunday Feb 21 / 22 just east of Aitkin on highway 210. Likely spring fed ditch... downstream entrance pipe froze (no snow cover and minus 26 degrees).”

“Crews mobilized on Sunday to steam out the entrance pipe and scrape the ice off the highway.”

Bob Nibbe, D3 Hydraulics Engineer



# Beavers

Remove or discourage beavers or beaver dams or other critters. Includes exploding dams and trapping contracts. Repaired Length = 0

- \*None
- \*Cleaning
- \*Ditch Cleaning
- \*Ice Removal
- \*Beavers



Photo D1 Beavers discouragement with Clemson Leveler

# Beavers

Remove or discourage beavers or beaver dams or other critters. Includes exploding dams and trapping contracts. Repaired Length = 0

\*None

\*Cleaning

\*Ditch Cleaning

\*Ice Removal

\*Beavers



Beaver dam at RP 318.8 RT on TH 23. The box culvert is about 8' and the dam was about 7.5'. Not the best spot for the excavator to work in. We used tree about 14 inch in diameter and 25 feet long to break it loose.

**Find Culvert Cost information on the IHUB**

**Search for “Culvert”**

# Contractor proves you can Trench New Pipe without clothing : )



Installation of Kenyon pipe in the '90s

S:\Hydraulics\Design\_Aids\Pipes and Materials\Case Studies\HDPE Kenyon pictures\ Kenyon PP 2006