INTERNAL JOINT SEALING

Metal Culvert Overview Flowchart
Structural Defects Flowchart (Metal)
Bedding Deficiencies Flowchart (Metal)
Hydraulic Capacity Flowchart (Metal)

1. OVERVIEW

Internal joint sealing is the method in which a mechanical leak clamp consisting of a rubber seal is installed on the inside of the pipe to provide sealing against the pipe wall on either side of the joint (Figure 1) (Cronin, 1988). The seals create non-corrosive, water-tight connections around the full inside circumference of the pipe at the joint area. Figure 2 shows the seals installed over joints in a pipe. The seals can also be installed with overlap, thus creating an interlocking sleeving system (Figure 3).

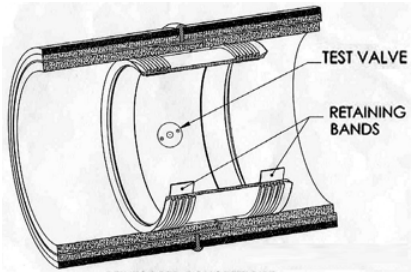

Figure 1. Rubber seal spanning the joint is held in place by stainless steel retaining bands on both sides of the joint (Cronin, 2007)

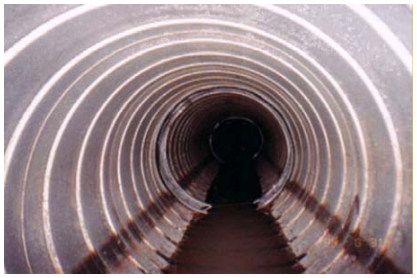

Figure 2. Internal joint seals installed in 36 in. storm drain (Cronin, 2007)

Figure 3. Installation of interlocking sleeving system (Cronin, 2007)

2. MATERIALS USED

The seals used in culvert pipes are made of EPDM rubber and the retaining bands from stainless steel.

3. APPLICABILITY

The method can be utilized in pipes from 16 in. in diameter up to 216 in. (Cronin, 1988). Seals have been installed in different pipe types, e.g., concrete, reinforced concrete, steel, VCP, and plastic pipes (PVC and HDPE). In addition to round seals, other shapes of internal joint seals (e.g., elliptical, arched) can be custom fabricated.

4. INSTALLATION PROCEDURE

The hydraulic jack installation method for internal joint seals includes the following steps (Cronin, 1988):

- Prepare the joint (clean and if necessary fill it with mortar to render the joint flush with the pipe wall and to provide a firm solid backing)
- Position the seal centering it over the joint
- Position retaining bands in the seal and expand each band
- Pressure test the installed seal
- Check for leaks (a soap solution is sprayed)

Expansion of the bands can be performed in two different ways:

- Pressurized air is introduced and maintained for a required time (at least two minutes)

- Tightening the bolts on wedge lock assemblies that are attached to the expansion bands increases the effective diameter of the bands thus expanding the bands (Figure 4). Depending on the diameter of the pipe joint being sealed, there is typically between one and four WedgeLock Assemblies on each band (Trelleborg Pipe Seals, 2009).

Figure 4. Mechanism of increasing the expansion band's diameter by tightening a bolt on an attached Wedge Lock assembly (Trelleborg Pipe Seals, 2009)

5. EXAMPLE CASE HISTORIES

Oregon DOT (ORDOT) reported using internal mechanical seals for repair of corrugated metal culverts. A 48" round culvert 100 ft long (Bauch Creek Irrigation Culvert Project), overall in good condition, had two failed joints with infiltration that were repaired (WEKO-SEAL, flexible rubber) in 2007. (John Woodroof, ORDOT, personal communication)

6. STANDARDS

ASTM C150 covers Portland cements to be used for preparation of pipe joint sealing mortars.

7. ADVANTAGES AND LIMITATIONS

The main advantage of internal joint seals is the ability to provide a flexible, watertight seal for leaking joints with a quick and simple procedure. No excavation is required, there is no expensive installation equipment, and the procedure requires short setup and installation times.

The main limitation is that the repair is limited to the joints and all other defects in the pipe need to be addressed with other rehabilitation methods. Durability could be questionable in some parts of the country (rodents like nutria eat the material, Mike Dunning, ORDOT, personal communication).

8. REFERENCES

Cronin, M., 1988. "Internal Joint Sealing of Large Diameter Pipelines," *ASCE Pipeline Infrastructure Conference*, Boston, MA, June 6-7, 1988, pp.254-258, ASCE, New York, NY.

Trelleborg Pipe Seals, 2009. *NPC - Internal Joint Seal Installation Instructions*, product information on web, http://www.trelleborg.com/upload/NPC/PDF%20Files/Installation%20Sheets/Internal%20Seal%20Installation%2006-09%20-%20A.pdf, accessed on Aug 16, 2009, Trelleborg Pipe Seals, Milford, OH

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