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## **Proof of Design**

**The Necessity of Post Installation Inspection**

**Written by: Derek Light, P.Eng.**



Reviewing the drainage specifications and inspection practices of the major municipalities in Western Canada has revealed a frightening trend. The majority of municipal centers do not complete a full post installation inspection of their buried infrastructure. A full inspection would call for close circuit television inspection (CCTV) and deflection testing for flexible products or CCTV and crack measurement for reinforced concrete pipe (RCP). Some locations are using a CCTV and nothing else, however CCTV is not capable of measuring deflection or crack width. Deflection and cracking are the leading indicators of future failures in flexible pipe and rigid pipe respectively. There are a number of questions municipalities and design engineers should ask about post installation inspection:

#### Rigid Pipe

- What are the current crack width limits for RCP as outlined in the local specification?
- What factors (size, location, orientation) must be addressed, and is there an appropriate way to measure those cracks?

#### Flexible Pipe (plastic and corrugated steel)

- What is the deflection limit 30 days after final backfill?
- What is the deflection limit at the end of warranty?

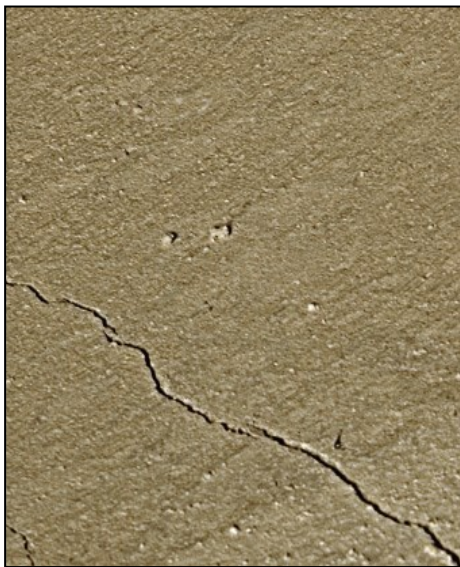


Figure 1: Flexure crack in RCP



Figure 2: Mandrel, used for deflection testing

The [Post-Installation Inspection Guide](#) answers all of the questions above. This guide is a compilation of best practices from AASHTO, American DOT's, and other agencies across the United States. A task group was formed with the sole purpose to improve post installation inspection in America. The task group scoured numerous specifications and best practices in order to produce the guide. The following bullets are from the guide:

#### All Installations

- The post-installation inspection shall be performed on 100% of all pipelines no sooner than 30 calendar days after completion of the pipe installation and final cover.

### Rigid Installations

- Longitudinal cracks with a width less than 0.05" (1.3mm) are considered minor and are not cause for remediation.
- Longitudinal cracks having a width of 0.05" (1.3mm) to 0.1" (2.5mm) shall be evaluated by the Engineer to determine if any remediation is required. Recommended remediation in more acidic soils.
- Longitudinal cracks greater than 0.1" (2.5mm) shall be remediated.

### Flexible Installations

- Deflections or ovality of less than 5% of the actual pipe diameter, either measured or certified, shall not require remediation.
- If the pipe experiences additional deficiencies combined with deflection or ovality greater than 5% but less 7.5% of the certified mean diameter, the pipe shall be evaluated by an engineer to determine whether it should be remediated or replaced.
- Pipe that is deflected or exhibits ovality exceeding 7.5% of the original diameter shall be replaced.
- Please review the guide for more information on flexible pipe failure modes.



Figure 3: HDPE pipe

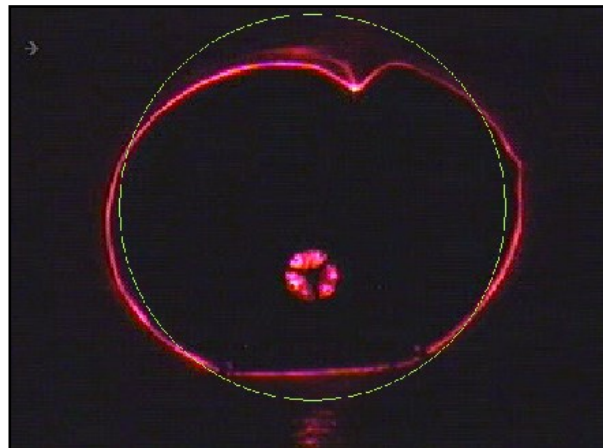


Figure 4: Laser profile of HDPE pipe

The overburden makes up the dead load in a pipe installation. The soil consolidates with time, and as a result, the dead load is increased. Thirty days following final cover, the pipe has typically experienced 75% of the total dead load, at one year following the final cover 90% of the total dead load is reached. A number of municipalities (City of Calgary included) call for post installation inspection at the end of the warranty period. The final check ensures that system they are inheriting is functioning as planned.

Contractors and developers are putting more and more pressure on municipalities and highways groups to remove/forgo post installation inspection from the specification. As a result, deficient infrastructure is inherited by the municipality and the tax payers. For the most part, contractors and developers are only responsible for the project through the warranty period,

which usually one or two years. Unless more care is shown, there will continue to be improper pipe embedment, rushed work, and over loaded pipe which will cause deficiencies and failures which end up costing millions of dollars.

It doesn't matter what pipe material is used, as long as the system is designed, installed, and inspected properly. Post installation inspection is the final design check; it is your proof of design. We all check our bills every month to see how they are performing, why wouldn't we do that with our infrastructure?



Contact us for all your precast needs:

**Derek Light, P. Eng.**

Technical Marketing Manager, Canada Region  
Cell: (403) 999-1246  
Phone: (403) 720-9324  
Derek.Light@lehighhanson.com  
www.inlandpipe.com

**Tyson Dyck, EIT**

Technical Marketing Engineer in Training  
Cell: (587) 990-8903  
Phone: (780) 448-1351  
Tyson.Dyck@lehighcement.com  
www.inlandpipe.com

**Tannis Karklin, EIT**

Technical Marketing Engineer in Training  
Cell: (204)-250-5270  
Phone: (204)-336-5013  
Tannis.Karklin@lehighhanson.com  
www.inlandpipe.com



**British Columbia**

OCEAN PIPE  
9265 Oak St.  
Vancouver, BC V6P 4B8  
Toll free tel: 1888 788 2211  
Office tel: 604 269 6700  
Fax: 604 261 6751

**Southern Alberta**

INLAND PIPE  
7336 112<sup>th</sup> Ave. NW  
Calgary, AB T3R 1R8  
Toll free tel: 1 800 268 078  
Office tel: 403 279 5531  
Fax: 403 279 7648

**Northern Alberta**

INLAND PIPE  
12250 170 Street  
Edmonton, AB T5V 1L7  
Tel: 780 448 1351  
Fax: 780 448 1354

**Saskatchewan**

INLAND PIPE  
300 10<sup>th</sup> Ave.  
Regina, SK, S4N 6G7  
Toll Free tel: 1877 974 7473  
Office tel: 204 334 4300  
Fax: 204 334 7957

**Manitoba**

INLAND PIPE  
2494 Ferrier St.  
Winnipeg, MB, R2V 4P6  
Toll Free tel: 1 877 974 7473  
Office tel: 204 334 4300  
Fax: 204 334 7957