

## **Appendix D:**

### **GENERALLY ACCEPTED PRINCIPLES: BASEMENT FLOODING PREVENTION**

# Maintenance of Underground Pipes to Protect From Basement Flooding

Generally accepted principles



CRD

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This document summarizes the “generally accepted principals” related to the inspection, maintenance and repair of sewer laterals, stormwater laterals and foundation drains. It is designed to help professionals educate the public on issues related to these underground pipes in a consistent manner.

The document was created with significant review and feedback from stakeholder groups including:

- Insurance brokers
- Victoria Real estate board
- Home inspectors
- Plumbing professionals
- Municipal building inspectors



The document is consistent with the Canadian Standards Association (CSA) Standard for Basement Flooding (2018), which is a complex document aimed at working professionals and covering a broad range of issues that contribute to basement flooding.

The document supports efforts to reduce the amount of rainwater and groundwater entering the public sewer system from private property. By promoting camera inspections and pipe maintenance, sewer laterals are more likely to be maintained and clean water entering the sewer system will be reduced.

## CONTENTS

Pipes need maintenance .....	2
What underground pipes are on my property? .....	3
Who owns the pipes? .....	5
What are the impacts of not maintaining pipes? .....	6
Camera inspections .....	9
Fixing underground pipes .....	11
Is there a way to protect my pipes from tree roots? .....	14
What about backwater valves? .....	15
What does insurance cover? .....	16
Current trends .....	17
New homebuyer checklist .....	18
New homeowner checklist .....	18
Ongoing maintenance checklist .....	19
What do I do if I experience basement flooding? .....	19

# Pipes need maintenance

Pipes don't last forever and may require maintenance. You can find out the condition of your pipes by having them camera-inspected by a plumber or related professional.

## Types of pipe problems



Tree roots entering through cracks or gaps in pipes



Fats, oils and grease clogging pipes



Debris from gutters or cleanouts filling pipes

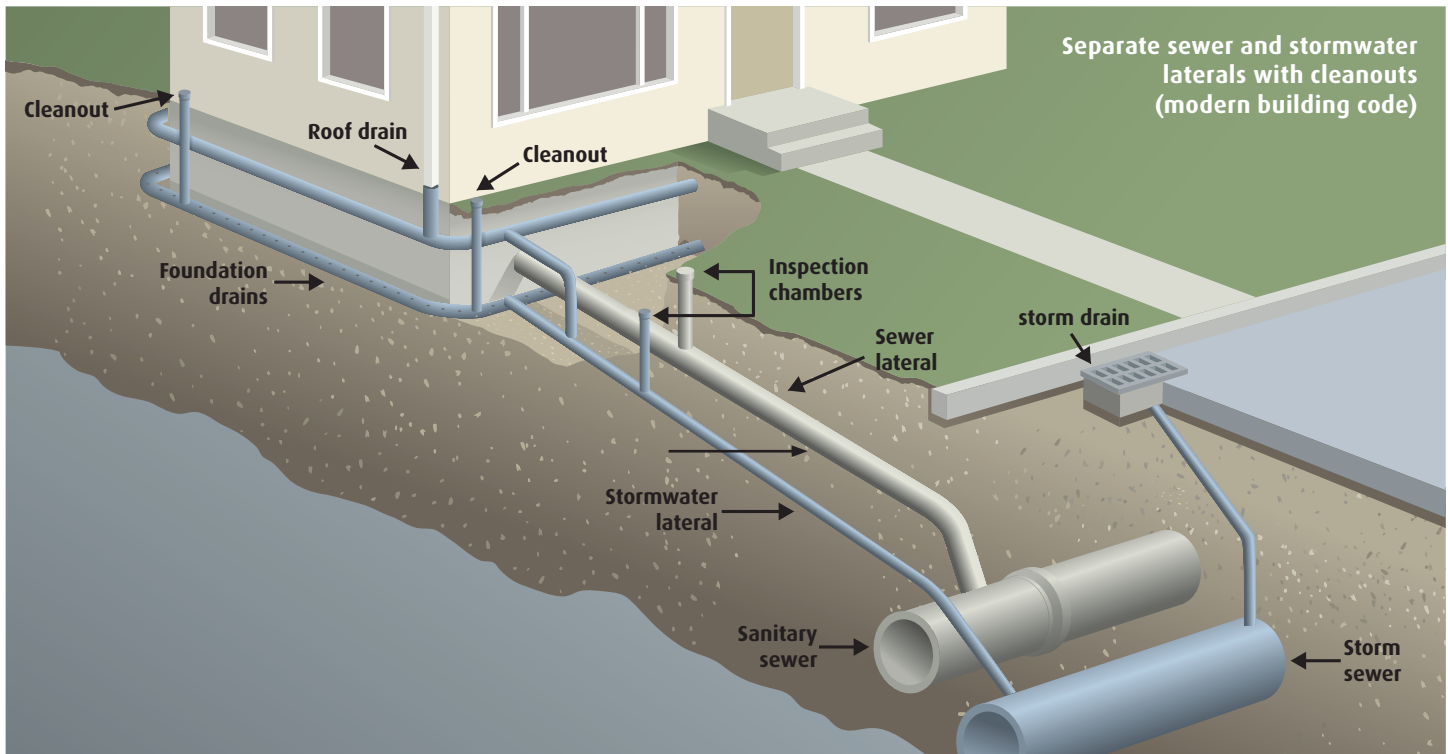


Cracks, breaks, leaks at joints or collapse from shifting ground or deteriorating material

# What underground pipes are on my property?

The plumbing code defines the pipe requirements for new homes. The following graphics summarize typical pipe configurations.

## Modern plumbing code (since mid 1990s)



**Sewer Lateral:** This pipe carries water from sinks, showers, toilets and laundry to the municipal sewer system where it is eventually gets treated at a sewage treatment plant.

**Foundation Drains:** These perforated pipes are installed around a home near the base of the foundation. They drain water away from the house to protect it from wet basements and flooding. They are also called "perimeter drains," "drain tiles" or "weeping tiles."

**Stormwater Lateral:** This pipe carries rainwater and groundwater from foundation drains and roof (through gutters and downspouts) to the municipal stormwater system for release into the environment at a stormwater outfall or seepage pit. Since 1985, the plumbing code requires installation of a stormwater pipe separate from the sewer pipe.

**Inspection Chambers:** Used for the inspection and maintenance of underground pipes, it's important to keep inspection chambers accessible and easy to find, so don't hide or bury them. These chambers are standard on homes built after 1992.

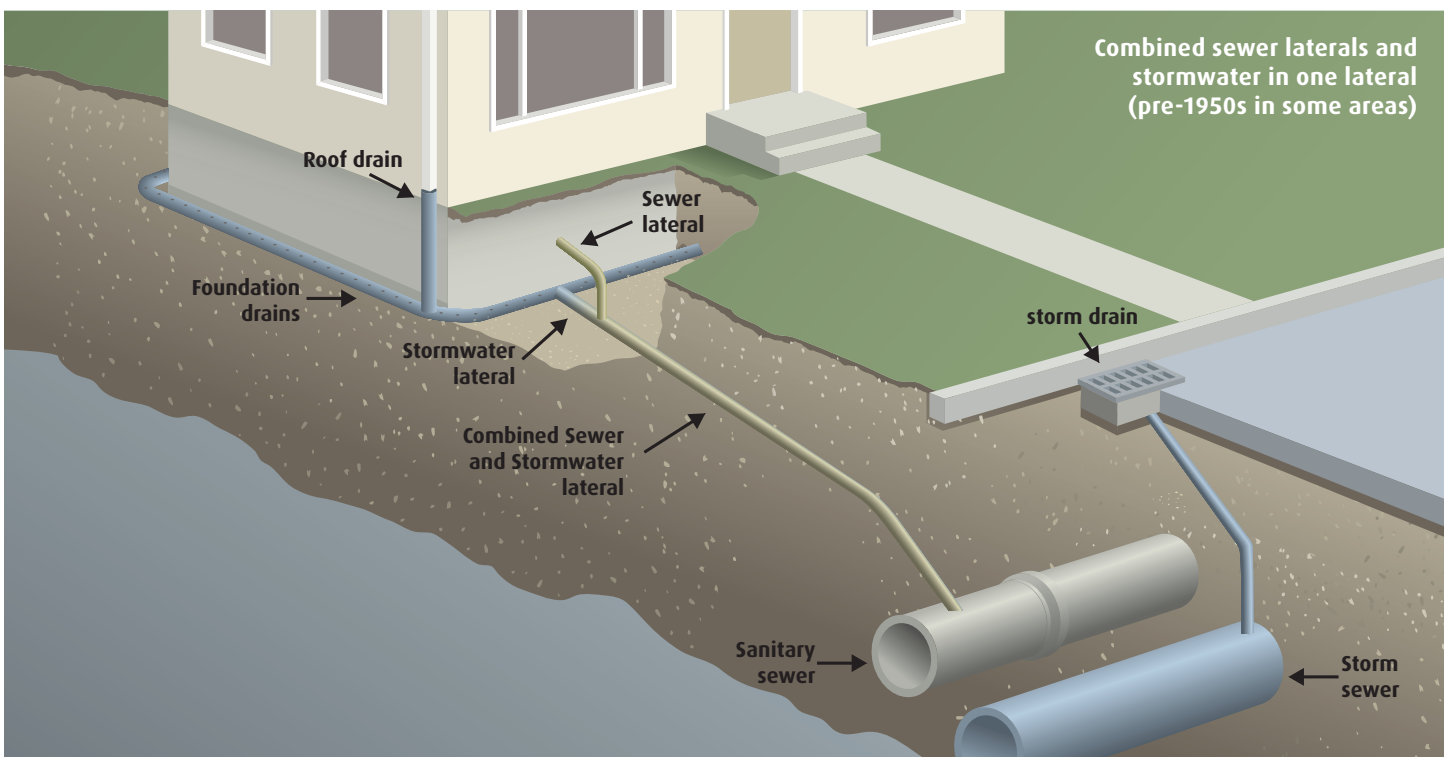
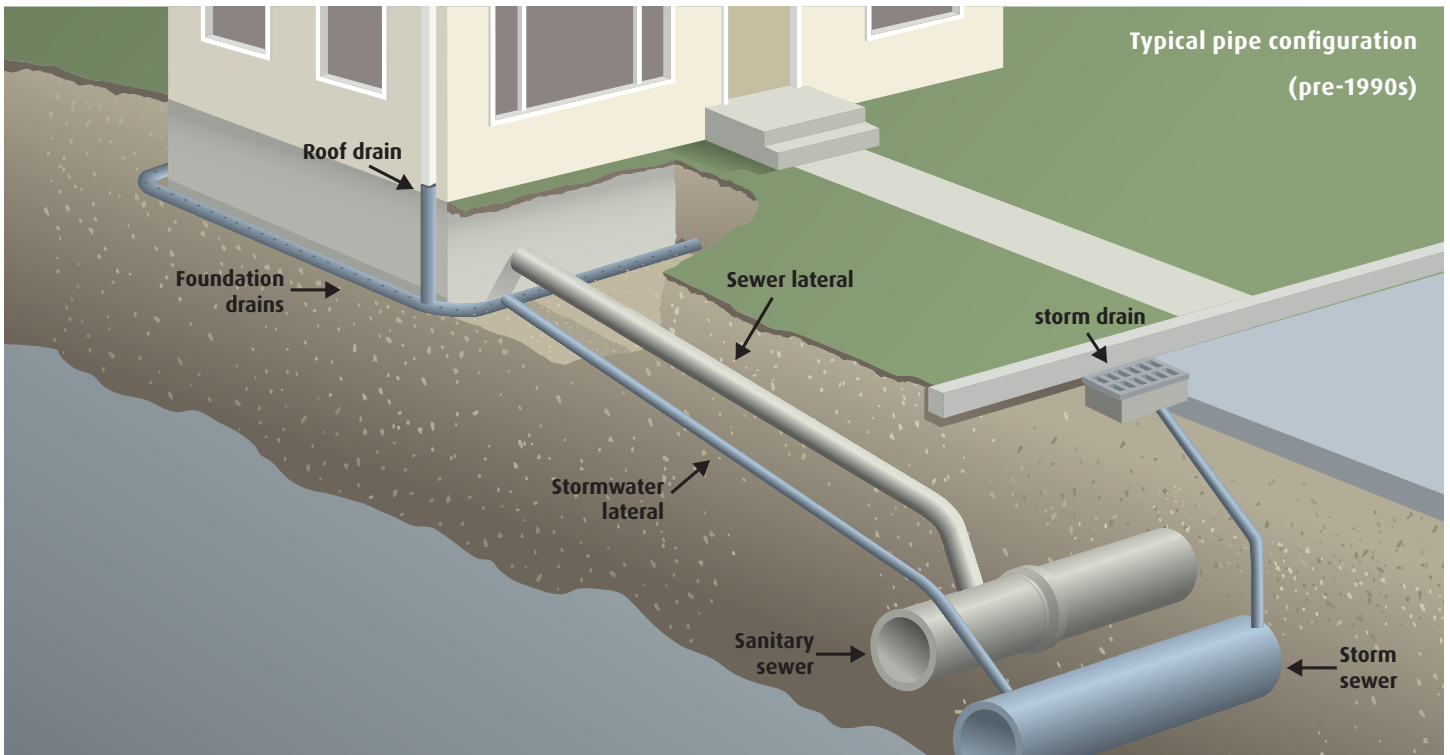
**Backwater Valves:** Can be installed to prevent sewage or stormwater from the municipal system from backing up into your basement. See page 15 for more information.

## *Do not connect stormwater drains to the sewer!*

*In general, it's against the plumbing code to connect rainwater or groundwater connections to the sanitary sewer. This is because this "clean" water can overwhelm the capacity of the sewer system which can result in overflows to the environment, beach closures and basement flooding!*

## Pre-modern plumbing code

Prior to the modern building code, it was common for roof water to discharge into the foundation drains and cleanouts were not easily accessible. The following figures show typical pipe configurations; one for separated sewers and one for combined sewers.

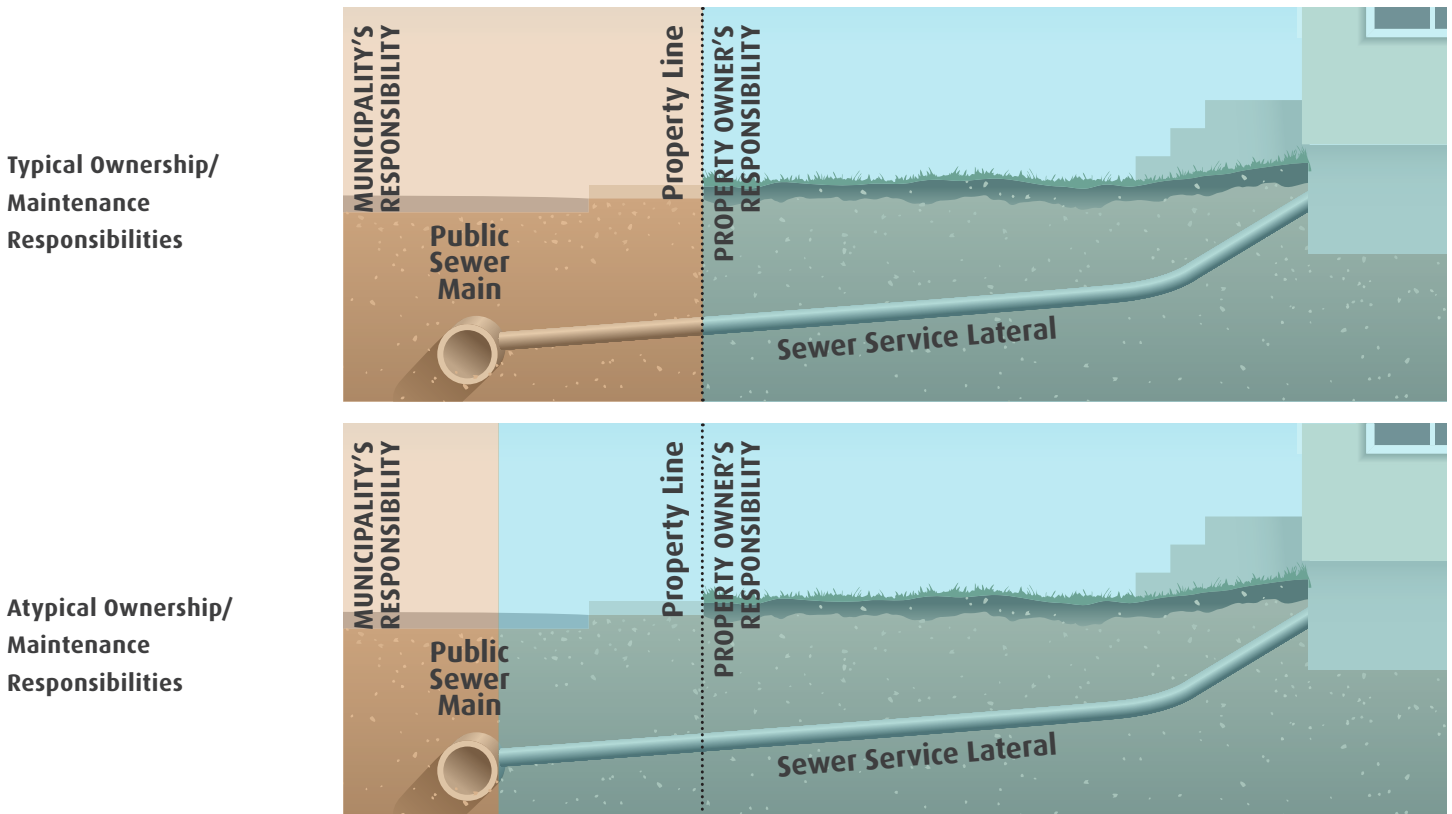


# Who owns the pipes?

As a homeowner, you are responsible for your foundation drains, and the stormwater and sewer laterals from your home to the property. Maintaining these pipes in good condition is required by municipal bylaw.

## Ownership

Check with your municipality to see if you are also responsible for the lateral between the property line and the municipal sewer main.



## Potential additional ownership responsibilities

Even in urban areas, not all homes are connected to the municipal sewer system. Some homes have septic systems or their own wastewater treatment systems. Some homes may drain stormwater into rock or gravel pits, rather than into the municipal system.

### In these cases, it's important to know:

- Homeowners are responsible for all maintenance, repair and replacement costs for these items.
- If any of these systems fail, it is the homeowner's responsibility to repair to a standard that meets the requirements of the municipality and plumbing code.
- Municipalities are not responsible for extending sewer or stormwater systems to properties not already connected—typically homes were built with the understanding that they would not be connected to the municipal system.
- Failing sewer laterals can allow groundwater to enter the sewer system. This can overwhelm the sewer system and result in sewage overflows to the environment or sewage backup into basements.



# What are the impacts of not maintaining pipes?

Pipes that are not maintained can clog or collapse. This may result in serious damage to your home and property, potential health problems for home occupants, and damage to the environment.

## Basement flooding

Personal items and interior finishes may be ruined due to water or sewage backups into basements. In addition, remediation costs can escalate if hazardous building materials are found during remediation (i.e., asbestos).

The cost and stress of remediation can be avoided with regular inspection and maintenance of your underground pipes.



## Mildew and mould

Failing foundation drains can cause excessive moisture at the foundation walls leading to mould and mildew in the basement.



## Contamination of the environment/beach closures

Underground pipes can contaminate the environment and lead to beach closures.

### For example:

- Poorly maintained leaky sewer pipes allow sewage to seep out of the pipe, contaminating soil, groundwater and nearby creeks.
- Sewer pipes erroneously connected to storm drains contaminate downstream waterways.
- Stormwater pipes erroneously connected to sewers can cause sewer overflows during large rainfall events. Sump pumps can also contribute large amounts of rainwater to the sewer system.



We all need to do our part to prevent overflows. Municipalities routinely inspect and maintain their sewers. Homeowners can do their part by inspecting and maintaining their underground pipes and ensuring that pipes are properly connected.

# Risk factors for pipe failure

Underground pipes do not last forever. They deteriorate over time and need to be replaced. Most pipes installed before the 1980s have already exceeded their expected lifespan. Some of these pipes may still be in good shape, but the risk of failure is much higher if pipes are not routinely inspected and maintained.

## Pipe material/age

In general, the pipes are the same age as the house unless they have been replaced, as summarized in the following table.

ERA OF HOME	PIPE MATERIALS	PIPE DESIGN LIFE (YEARS)	RISK LEVEL
Pre-1930s	Wood Stove (Laterals only)	75	Elevated
Pre-1940s	Asbestos Cement	75	Elevated
Pre-1960s	Clay	75	Elevated
1950–1980	Concrete	50	Moderate (Corroded by standing water in or around the pipe.)
1960–1980	Tarpaper (Laterals only)	50	High (Tar desolves over time due to hot water from dishwashers)
Pre-1990s	Big “O” Corrugated (Foundation drains only)	75	Varies based on age
1980s & Newer	Plastic Pipes (PVC/ABS)	75	Low

### Other methods for determining pipe material include:

- Confirming the pipe materials during a camera inspection.
- Ask your municipality for building permit records to see if it was replaced.
- Looking down the inspection chamber with a flashlight to see the pipe material for that specific portion of the pipe. (Inspection chamber may be a different material than the pipe.)

### Evidence of problems found through inspection

Have a home inspection conducted. Home inspectors will identify potential problems and options for addressing problems identified.

### Evidence of drainage problems include:

- Wet walls and/or flooring
- Warped wall and/or floor surface
- Musty odours
- Mushroom growth in basement carpet
- Visible staining
- Slow drains or sewage odours
- Ground above the sewer or stormwater pipes is very lush or sunken

Refer to the checklist on the back page to learn about what you can do to reduce your risk of pipe failure.

# Camera inspections

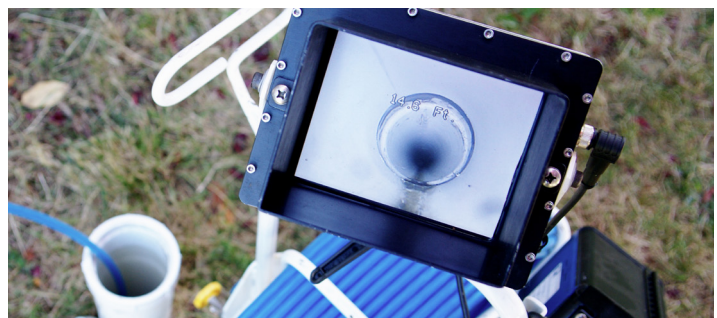
A camera inspection confirms the condition of the inside of laterals and foundation drains. The inspection camera is attached to a long cable which is attached to a viewer screen. The camera is pushed through the pipe using the long cable. The viewer screen includes a measurement showing the distance the camera has been pushed through the pipe.

## Who can do a camera inspection?

Many licensed plumbers and related professionals have equipment to send a camera down a pipe to inspect its condition. It is recommended that you hire someone who can also auger or flush the pipes, if needed, in case the camera is impeded by a blockage. Ask your plumber for the best approach for your situation.

## What to ask when getting your pipes inspected

- How much will it cost?
  - » Typically, inspections cost between \$200 and \$350 per pipe depending on the length of the pipe and the complexity of the inspection. Discounts may be available if you have multiple pipes inspected.
- Where will the pipes be accessed for the inspection?
  - » Outdoor cleanouts are the easiest way to access your pipes, but not all homes have them (especially older homes). See below for other options.
- Are there any problems? If so, get a clear description of any problems found, where they are located, estimated depths and potential impacts on surface features (i.e. gardens, driveways). Request a summary sketch, if appropriate.
- Request a digital copy of the camera inspection and make sure the video shows distances on the screen as the camera moves along the pipe.



## Riskiest pipes

*“Tarpaper pipes” (sometimes referred to as “No Corrode” or Orangeburg pipes) have a high rate of failure because the tar dissolves over time. With tarpaper pipes, it’s not a question of if they will collapse but when.*

*Many municipalities have aggressive programs to find and replace municipally owned tarpaper pipes before they collapse. Homeowners with tarpaper pipes should do the same!*

# What if my home does not have cleanouts or inspection chambers?

If your home does not have cleanouts or inspection chambers, it is likely that your underground pipes have never been inspected or maintained. The result is that your pipes have an increased risk of pipe failure.

## Plumbers recommendations

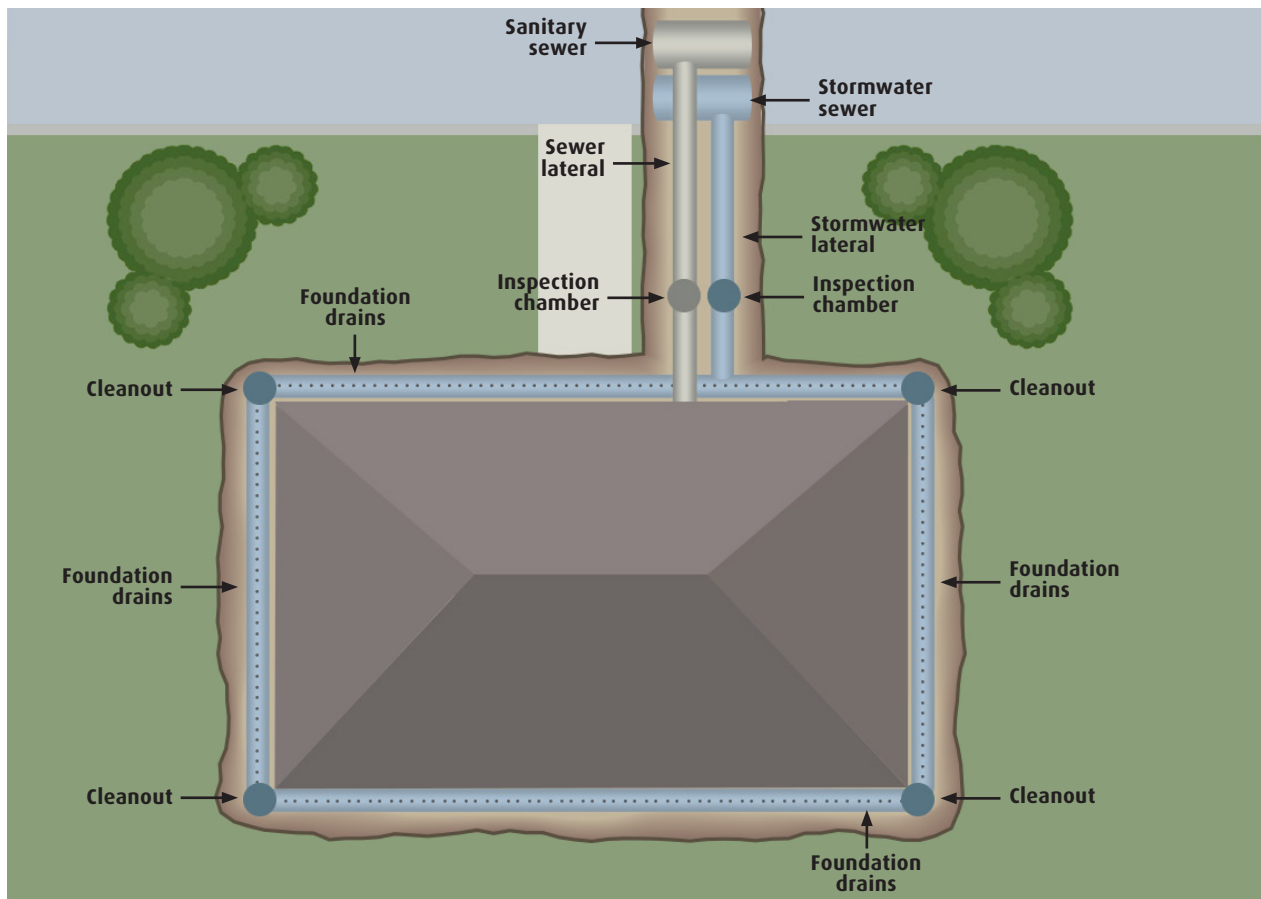
Plumbers recommend that laterals and foundation drains be inspected every 10 years with follow-up maintenance as required.

Cleanouts and inspection chambers have only been required by the building code since 1992. Most homes built prior to this time do not have them unless they were added:


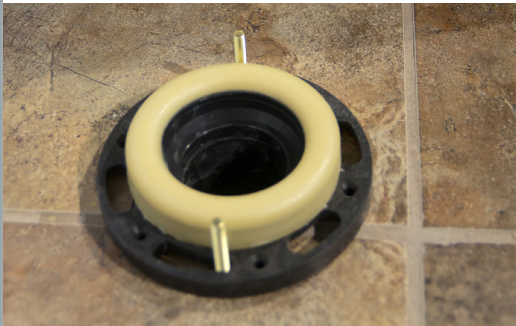
- When repairing underground pipes (potentially after basement flooding)
- To meet municipal requirements related to building permits
- To proactively inspect and maintain the underground pipes

Ask your plumber if it makes sense to add cleanouts or an inspection chamber to your home.

For context, the modern plumbing code (relevant to new homes and building permits) requires cleanouts at the corners of a house and inspection chambers on sewer and stormwater laterals. The following diagram shows an example of how this could look.



## How are pipes accessed for camera inspections?

EFFORT TO INSPECT	INSPECTION ACCESS POINTS	
	SEWER LATERAL	STORM LATERAL & FOUNDATION DRAIN
LOW	 	 
	Outdoor cleanout/Inspection Chamber	Outdoor cleanout/Inspection Chamber
MEDIUM		
	Sewer Cleanout in Basement	Foundation Drain Cleanout
HIGH		
	Removing a toilet to inspect the pipe	Disconnecting a Downspout
HIGH		
	Using a plumbing vent in the roof to inspect the sewer pipe	Adding new cleanouts if your home doesn't have them (see next section)



## Fixing underground pipes

Be proactive—fix issues identified during inspections before there is a pipe failure.

### Benefits included:

- It can save you money by:
  - » giving you time to get multiple quotes to carry out the work.
  - » allowing you to have the work completed during the low season for drain repair.
- Allows you to avoid issues related to basement flooding.
- It increases your rehabilitation options. For example, some “trenchless” rehabilitation options can only be used before a pipe has failed. (Trenchless options minimize the amount of digging required reducing impacts on driveways, landscaping, etc. See next page for details.)

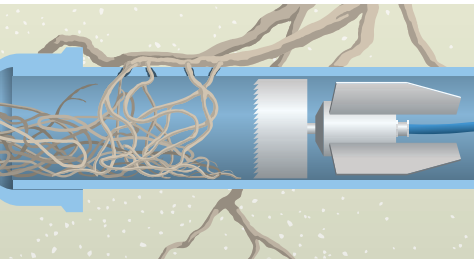
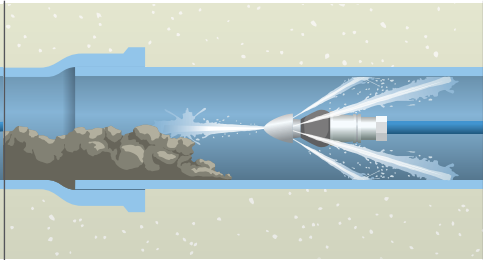
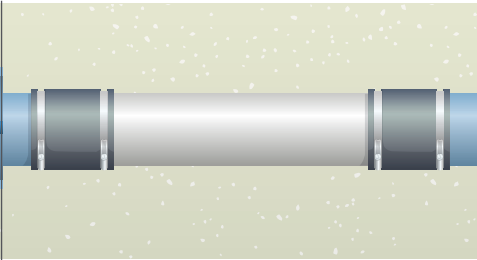
### Considerations when hiring professionals to fix your pipes:

- Work with an experienced plumber or drainage specialist.
- Get three quotes from experienced professionals.
- Ask questions about the problem and the proposed repairs or rehabilitation.
- Be sure to call or click before you dig (1-888-474-6886 or [bconecall.ca](http://bconecall.ca)) to find out the location of natural gas and other utility lines (gas lines have been known to be installed through sanitary sewer or storm laterals).
- Obtain a permit if you are replacing the pipe.



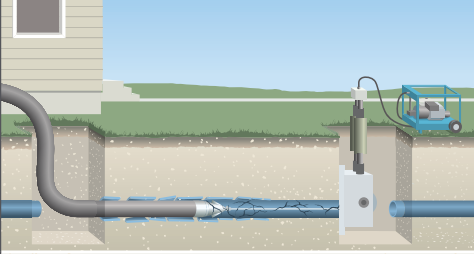
## Short term vs. long term fixes

In general, the short-term solution can help you avoid a pipe failure for a period of time whereas the long-term fixes eliminate the problem. It's best to talk to your plumber or drainage specialist to determine what is right for you.

### Quick fixes: less expensive but short-term

ROOT CUTTING	HIGH-PRESSURE WATER JETTING	SPOT REPAIRS
		
<p>Root cutting inside a pipe involves sending a rotating set of blades (roto rooter) down your pipes to cut out smaller roots.</p> <p>Warning: this does not work on dense roots and root-cutters can actually damage pipes.</p> <p>Beware that roots regrow quickly!</p>	<p>Similar to root cutting, this technique removes smaller roots with a high-pressure water jet.</p> <p>Beware that roots regrow quickly!</p>	<p>Camera inspection footage is used to determine the location of the failing or failed pipe. That specific location is then dug up and the faulty pipe is cut out and replaced.</p>
<p>\$500+</p>	<p>\$500</p>	<p>\$700-1500</p>
<p>Expected to last 3 months to 1 year</p>	<p>Expected to last 3 months to 1 year</p>	<p>Repaired section should last ~50 years</p>
<p>No surface disturbance</p>	<p>No surface disturbance</p>	<p>Digging directly above repair</p>

## Long-term fixes

OPEN TRENCH	PIPE RELINING	PIPE BURSTING
		
<p>This method involves digging a trench and replacing the existing pipe with new pipe.</p> <p>However, this method can get much more expensive if the digging impacts surface features such as driveways, decks, landscaping, etc.</p>	<p>There are multiple pipe relining methods that involve little to no digging and surface disruption to your property. In general, these methods result in a new structurally-sound pipe located within the existing pipe. For example, a cloth sleeve treated with epoxy resins can be blown into your existing pipe where it hardens into an inner fiberglass pipe.</p> <ul style="list-style-type: none"> <li>• medium-term fix</li> <li>• all roots must be removed before lining</li> <li>• avoids need to remove landscape and hardscape</li> <li>• less waste to landfill</li> </ul>	<p>This method involves digging a launch pit and an exit pit at end of the pipe (and sometimes pits in between as well). This gives access to install a new plastic pipe – usually HDPE or PVC.</p> <ul style="list-style-type: none"> <li>• can increase the size of the pipe without digging a trench to replace it</li> <li>• avoids need to fix or replace expensive landscaping or hardscaping</li> <li>• can replace a pipe that is partially collapsed, offset or has heavy root growth</li> </ul>
<p>Varies widely depending on surface landscaping needs.</p> <p>Foundation drains: \$15,000-25,000</p> <p>Storm lateral: \$2,000-4,000</p> <p>Sewer lateral: \$2,000-6,000</p>	<p>Storm lateral: \$2,000-4,000</p> <p>Sewer lateral: \$2,000-6,000</p>	<p>Storm lateral: \$2,000-4,000</p> <p>Sewer lateral: \$2,000-6,000</p>
<p>Expected to last 50 to 75 years</p>	<p>Expected to last ~50 years</p>	<p>Expected to last 50 to 75 years</p>
<p>Digging a trench to replace pipe</p>	<p>Trenchless. Minimal digging/surface disturbance</p>	<p>Trenchless. Minimal digging/surface disturbance</p>



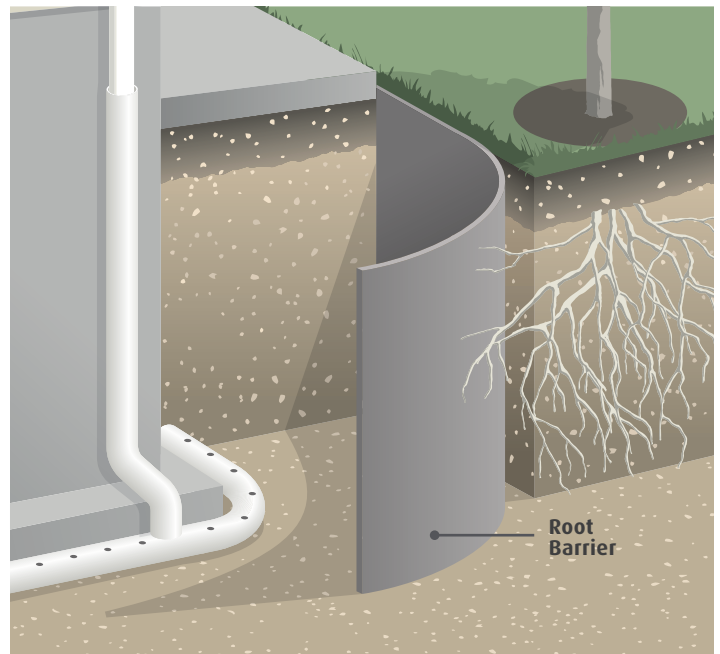


## Is there a way to protect my pipes from tree roots?

Trees are an important part of our urban environment for many reasons, but there is a risk of tree roots getting into cracks when pipes are not properly maintained.

**To minimize the risks of tree roots on pipes, consider the following:**

- If you have big trees near your pipes, be sure to regularly inspect the pipes with a camera and fix identified issues before tree roots get into the pipe and cause damage.
- Some pipe materials are joint free with a much lower risk of root intrusion (i.e. HDPE)
- When planting new trees, try to plant them at least three metres away from foundation drains and laterals. If you want the trees closer to your underground pipes, it is recommended that you first talk to an arborist to identify tree options that are less likely to damage underground pipes (i.e. smaller slower growing trees with fewer roots and smaller root balls).
- In some cases when replacing underground pipes, it can be advantageous to reroute the pipes away from the existing trees to reduce the risk of root intrusion.
- Root barriers protect the pipes from root intrusion. They can be installed relatively inexpensively during new construction or as part of an open trench pipe replacement. The suitability of root barriers is site specific as they can impact soil moisture levels and the health of nearby trees. As such, it's recommended that you consult with an arborist or related professional prior to using root barriers.



# What about backwater valves?

Backwater valves are designed to protect homes from basement flooding caused by surcharging municipal sewage and/or stormwater systems during large rainfall events. They contain a “gate” that will close should the municipal sewer or stormwater system surcharge towards your home.

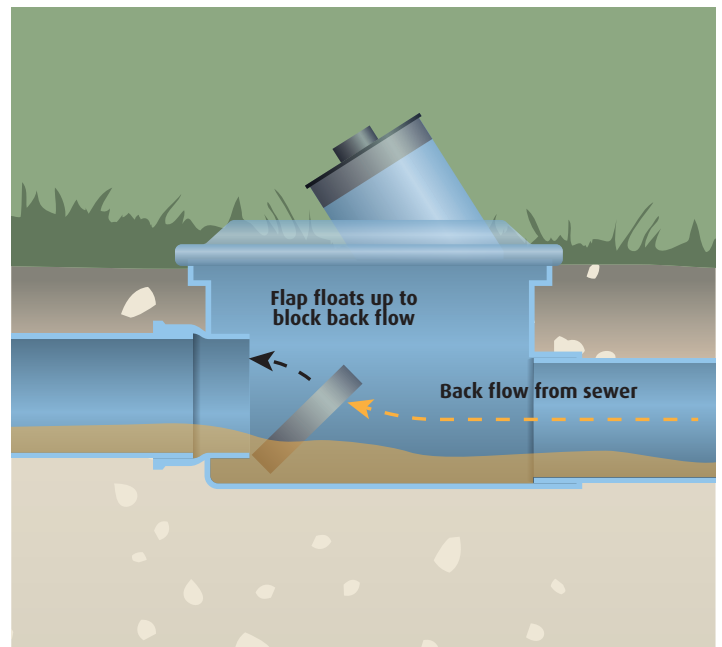
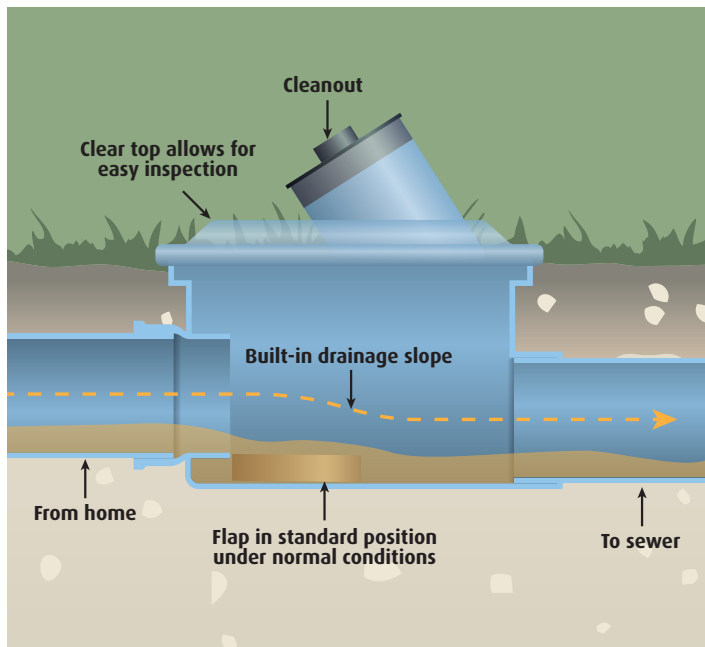
## General use

Talk to your plumber to determine if a backwater valve would be beneficial for your home. In some cases, they may be required as part of building codes.

### In general, they are useful:

- in areas prone to flooding
- for homes with basements below road level
- in areas where the municipal sewer or stormwater systems is known to surcharge

If you have a backwater valve installed, be sure to check it regularly to make sure the seal still works and there are no obstructions.



# What does insurance cover?

Homeowner or renter insurance coverage varies from policy to policy. Some policies have little to no coverage for damage related to basement flooding. Read your policy carefully and contact your provider if you have questions.

## Questions to ask your insurance broker

- Does my coverage include damage from sewer and/or stormwater backups, overland flooding, seepage or failed sump pumps?
- What is the deductible for this coverage?
- What is included:
  - » contents
  - » interior repairs (drywall, flooring, etc.)
  - » exterior repairs (pipes, landscaping, driveways, etc.)
- Can I claim any costs related to fixing pipes, landscaping, etc.?
- What is the maximum claim amount included with this coverage?



## What is typically not covered?

- Repair of laterals or foundation drains, which often requires excavation work.
- Damage to surface features impacted by excavation work. This includes damage to driveways, decks and landscaping.
- Damage resulting from groundwater leaking through walls (i.e. water damage and mould). Generally, this is never covered as the insurance industry considers this something that should be fixed as part of general maintenance.
- Damage from overland floods, unless the policy has a special insurance add-on.



## Making a claim

If you do make a claim, you will have to pay the deductible for water damage. Of course, priceless heirlooms and photo albums cannot be replaced—be sure to store these out of danger's way. Note that, if you have multiple water damage claims then insurance may become difficult to obtain, or more restrictive with higher deductibles, higher rates and potentially capping pay-outs. It is a much cheaper option to pay for maintenance in the first place!

# Current trends

The frequency and impacts associated with basement flooding are getting worse. The insurance industry expects this trend to continue for the following reasons.

## Climate change

Over the past decade, rainfall patterns have changed in some parts of Canada, resulting in more frequent and intense rainfall events. It's expected that this trend will continue and impact more parts of the country.

Both municipal and privately owned pipes are sized to address local rainfall. If rainfall patterns change, existing pipes may no longer be large enough to protect homes from rainwater during the largest rainfall events.

## Pipes deteriorate over time

It's common for homes to have pipes that have already exceeded their design life and are at increased risk of failure. In addition, leaky sewer pipes can let massive amounts of rainwater into the sewer system which can result in basement flooding and overflows downstream.

## Basement usage, upgrades and renovations

The costs associated with basement flooding is increasing as homeowners maximize the use of their basements. For example, many basements that were traditionally used for storage have been finished for personal use or turned into suites. These are much more costly to repair when damaged.

## Current examples

- Nationally, water damage has overtaken house fires to top the list of payouts related to insurance claims.
- In 2014, the average BC water damage claim costs increased by 84% over 2004, according to Aviva Canada.





## New homebuyer checklist

Underground pipes are not typically part of a home inspection when buying a home. To understand what you are buying, it's important to do the following:

- ❑ Get a professional home inspection, which will help you understand the issues and what steps to take next.
- ❑ As part of your pre-purchase review, talk to your REALTOR® about the sections of the Property Disclosure Statement that relate to underground pipes.
  - » Confirm whether the sewer drains to the municipal sewer system, a septic system or an onsite treatment system.
  - » Confirm whether stormwater from the roof drains and foundation drains drain to the municipal system, a gravel pit, etc.
- ❑ Ask whether the property has cleanouts, sump pumps and/or backwater valves and where they are located.
- ❑ Get a camera inspection of the home's underground pipes to confirm their condition, especially if the home is built before 1980 and there are warning signs identified by the home inspector.

## New homeowner checklist

- ❑ Ask your plumber whether your home would benefit from:
  - » the installation of cleanouts if your home doesn't already have these, which are very useful for inspections and cleaning
  - » the installation of backwater valves, or other options to protect from minor flooding
  - » high-level alarms on the sump pump (if applicable)
- ❑ Get a camera inspection of the pipes if the home is older than 1980 and you haven't already done so.
- ❑ If you discover "no-corrode" pipe, or cracked, clogged or collapsed pipe, be sure to have it properly rehabilitated or replaced.
- ❑ Cap off cleanout access points (some older homes don't have these).
- ❑ Install moisture alarms at the lower level of the house (particularly crawlspaces that are seldom visited).

# Ongoing maintenance checklist

## Always:

- ❑ Don't put fats, oils and grease down the drain.
- ❑ Don't put flushable wipes, napkins or paper towels down toilets or drains.
- ❑ Contact your local "Call before you dig" service line prior to digging holes.
- ❑ Avoid planting water-loving trees over your pipes (willows, maples, figs).
- ❑ Keep your inspection chambers accessible so that they can be easily used for maintenance or emergency work. Do not hide or bury them. Keep them capped to prevent water and debris from entering your pipes.

## Every year:

- ❑ Clear eavestroughs and downspouts twice a year.
- ❑ Make sure your cleanouts and inspection chambers are clear.
- ❑ If you have a backwater valve, check whether it still seals, remove any obstructions and scrub out the area under the flap with a brush. You may wish to hire a plumber to clean it out properly.

## Every 5 to 10 years:

- ❑ Have your pipes inspected with a camera about every 10 years or more often for older homes. Keep a digital copy of the camera inspection.
- ❑ Flush or auger underground pipes as needed while you have them inspected.

# What do I do if I experience basement flooding?

1. Stop all water use and toilet flushing in the house until the blockage is cleared.
2. Call a licensed plumber to determine location and cause of the leak or blockage through a camera inspection, and get it cleared.
3. If your plumber determines the blockage is on public property, call the municipality. The municipality is only responsible for clearing blockages that are NOT on private property.
4. Call your insurance broker right away if you think you need to make a claim. The insurance broker can then bring in a professional restoration company to address the issues in a timely manner, which will minimize the potential for mould.
5. Sewage contains bacteria and other contaminants—protect yourself with gloves, boots and other gear if you go into the flooded area.
6. Ask that photographs be taken prior to initiating clean up.



Making a difference...together

## Parks & Environmental Services Department

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