

# Groundwater Seepage

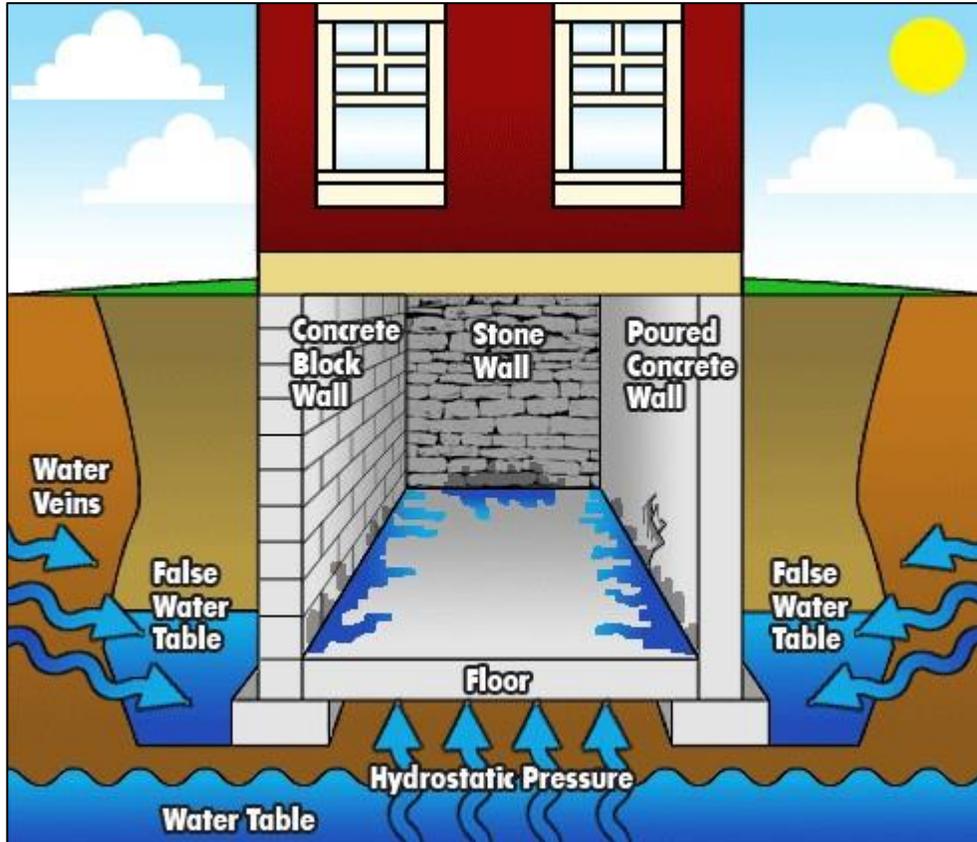
The following guide can be used by you and your crews when assessing seepage at a property. Bear in mind that this guide is not all-inclusive, and should be used in a supplementary fashion only. Always act in accordance with the work order instructions at each property.

Foundation seepage and leaks typically occur as a result of time and forces of nature. It is important to consider both the cause and the source of the seepage in order to properly address the problem. The cause will generally be a natural occurrence taking place outside the home, and the source of intrusion will often be a flaw or defect in the foundation.

## Causes of Basement Seepage and Leaks

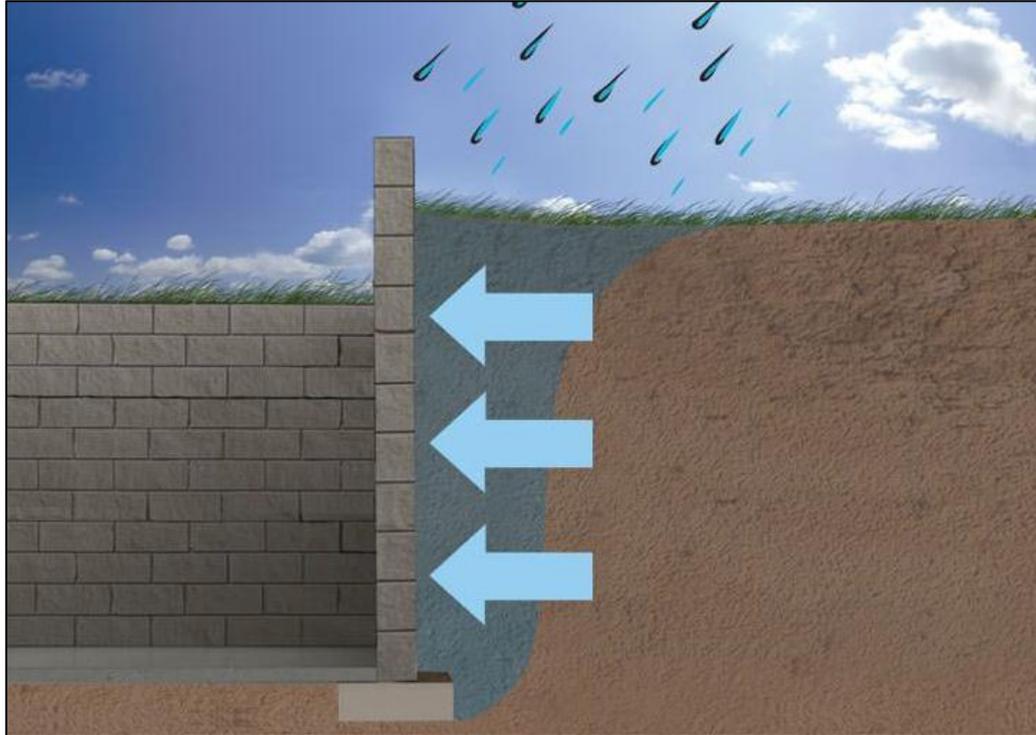
### *Hydrostatic Pressure*

The level at which water naturally sits is referred to as the “water table,” and it will vary from one location to another. A main factor contributing to the height of the water table is proximity to large bodies of water. For example, a home in Cleveland that is close to Lake Erie will typically have a much higher water table than a home in Nebraska or Kansas. When heavy rain or snowmelt occurs, the soil near the surface becomes saturated and the water table rises. When the water table rises beneath a foundation, it creates hydrostatic pressure that will force water through any small cracks or imperfections in the foundation and create leaks.



### *Lateral Pressure*

As the soil near the surface becomes saturated and absorbs water as a result of rainfall or snowmelt, the soil can expand and create sideways (lateral) pressure against the foundation walls and force water through any foundation defects and create a leak.



### *Window Wells*

This is the area that allows a basement window to exist below grade. Water can easily accumulate here and seep in around the edges of the window. Equally, if the window panes are compromised, water can enter through the cracks or breaks.



## Sources of Basement Seepage and Leaks

### *Floor Cracks*

Basement floors are typically 2 – 4 inches thick, and typically have no structural role in the home's foundation. They are there to provide a clean, solid base. Hydrostatic pressure presses upward on the basement floor, causing it to crack. These cracks will allow water to seep into the basement when the water table rises.

Sealing floor cracks to solve a seepage problem is not usually recommended - this will only allow the water pressure to build and move elsewhere. It is usually more effective to install an Interior Drain Tile System. This system relieves hydrostatic pressure by draining the water beneath the floor and directing it to a sump pump.



### *Cove Joint*

When foundations are built, they are set on a footing – a wide concrete slab that follows the perimeter of the home. The foundation walls sit on top of the footings, and the junction of the wall and footing is referred to as the cove joint. This joint may have minute cracks that allow water to be forced into the basement by hydrostatic pressure.

This type of leak can be identified by water seepage where the basement walls and floor meet, with little indication of water having traveled down the basement walls (such as in the photo below.) Recommended course of action is installing an Interior Drain Tile System. This system relieves hydrostatic pressure by draining the water beneath the floor and directing it to a sump pump. Epoxy or urethane injection at this site is not typically advisable since this would do little more than create a damming effect. The water pressure would continue to build up under the slab and force its way up elsewhere.



### *Defects in Poured Concrete Walls*

Concrete walls are poured into forms that are set on either side of the wall. These forms held together with “tie rods” that prevent the forms from separating under the lateral pressure of the concrete while it is still wet. When the forms are removed, the ends of the ties are either snapped off or removed and the hole is filled. This is a common point of water intrusion, as any voids around the tie and failed patches are a direct path for water to follow into the property. This may be referred to as a pinhole leak, a rod pocket leak, or a tie backer hole leak.



Non-structural cracks in poured concrete basement walls are a common source of leaks, and can be caused by lateral pressure or settling of the foundation.

Recommended course of action is a water plug to address the source from the exterior, used in conjunction with Exterior Water Proofing and sealing the holes from the interior with either an Epoxy Injection or Tuckpointing.

This leak should ultimately be repaired from the exterior to prevent water damming within the wall that may lead to additional damage, but an attempt to plug the leak from the interior with an Epoxy or Urethane Injection can be successful if the material can be injected all the way through to the outside soil.

### *Mortar Joints*

Minor settling or lateral pressure can cause the joints that hold brick, block, or stone together to separate and create a source of seepage. Mortar can additionally deteriorate over time, and an improper mix can be porous and allow seepage. Recommended course of action is an Interior Drain Tile System or an Exterior Waterproofing System.

Tuckpointing can be used to address dampness, but is not advisable for interior repairs if there is active water intrusion. This may create a damming effect and cause pressure to build up elsewhere.



### *Porous Spots in Walls*

Insufficient mixing of concrete or mortar, or flaws in the pouring process can create porous spots that will allow seepage over time. Some building materials (e.g. concrete block or brick) are porous by nature and can allow seepage as well. Recommended course of action is installation of an Exterior Waterproofing System.

In the event that the ability to excavate is hindered by landscaping or structures like decks or driveways, Interior Waterproofing is an additional option if water intrusion is minimal.

“Honeycomb” imperfection in concrete wall:



“Spalled” concrete:



### *Seepage over the Top of Foundation Walls*

Foundation walls are joined to the framing of the first floor walls with a “sill plate” that forms the base of the framed wall. In certain instances there may be a slight gap between the sill plate and the foundation wall that will allow water intrusion. Water entry at this location is often related to a negative grade (earth sloping toward the foundation rather than away,) or structures like decks or patios that are improperly pitched and allow rain water to run toward the house.

Recommended course of action is installation of an Exterior Waterproofing System. However, if the grading issues can be corrected without extensive time and effort being expended, this may be an acceptable solution as well.

You may also find improper or defective flashing is the culprit for this type of leak. Homes often have a brick veneer on the exterior, and water will find its way behind the brick to the wall sheathing. Weep holes will allow this water to drain away from the property at the bottom of the wall, but defective flashing may allow water to find its way inside instead. Recommended course of action is replacement of brick flashing.



### *Window Wells*

Basement windows are generally found either at or below grade, and the edges of the windows are susceptible to water intrusion. A metal, brick, or wood retaining wall, referred to as a window well, is used to hold back the earth around the window. Water can easily collect in this area and seep in around the base of the window, or through cracks or breaks in the glass. Recommendation is to ensure window well drains are present, not clogged, and properly routed.



### *Pipe Penetration Leaks*

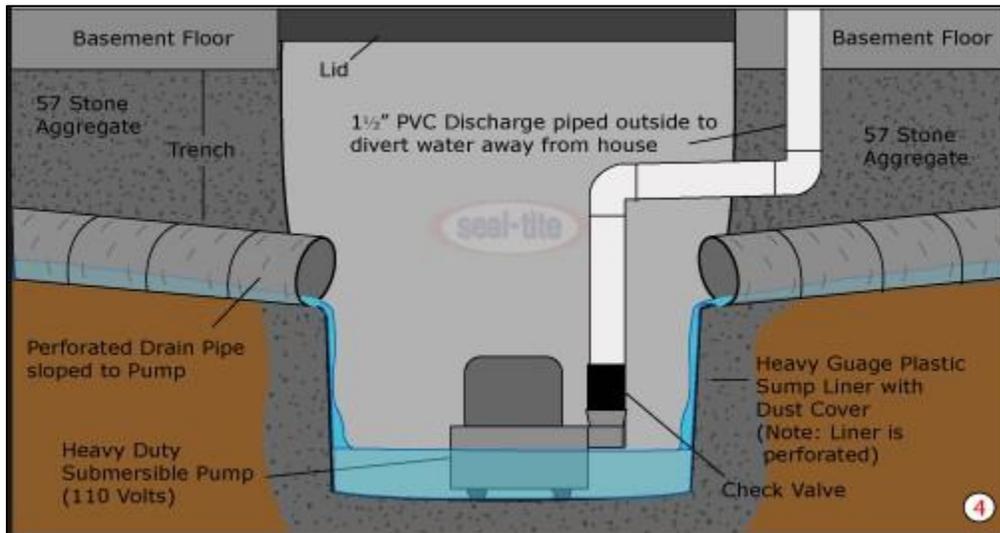
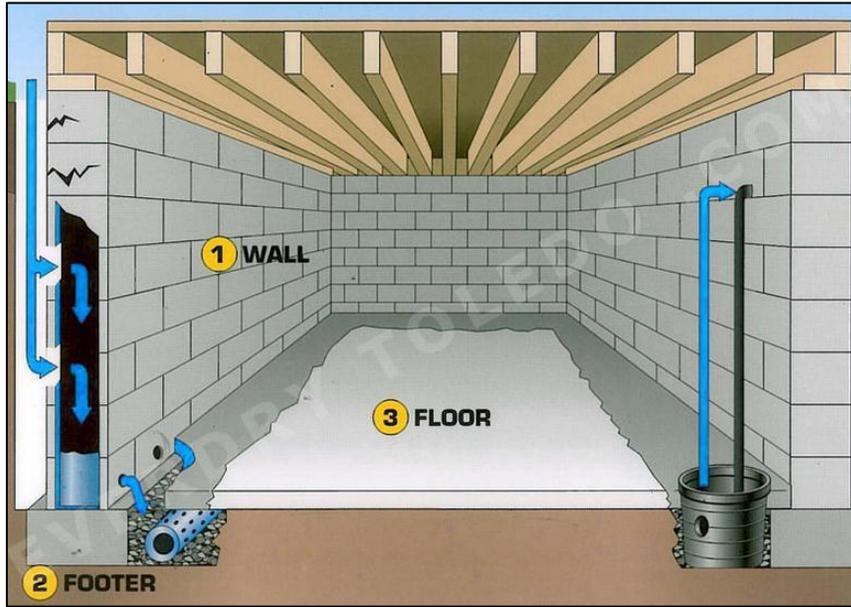
Leaks can occur from wall piping installation. A larger core hole is drilled in the foundation, and then the smaller line is fed through. There is a cement cap placed on both the interior and exterior faces of the foundation. Over time cement breaks down and the water flows in around the piping. Leaks around pipe penetrations should be patched.



## Solutions

### *Interior Drain Tile System*

Interior drain tile is embedded in washed gravel to create better drainage and is wrapped in a “sock” of filtration fabric to keep it clean and flowing. It takes in ground water through its perforations and carries it to a sump basin where the sump pump discharges it from the basement. When installed properly, interior drain tile requires no maintenance.



### *Epoxy / Urethane Injection*

Foundation wall cracks can be repaired from either the interior or the exterior by use of a two-step process where a resin is injected into the crack, and sealed with a paste on the interior wall.

Epoxy injection:



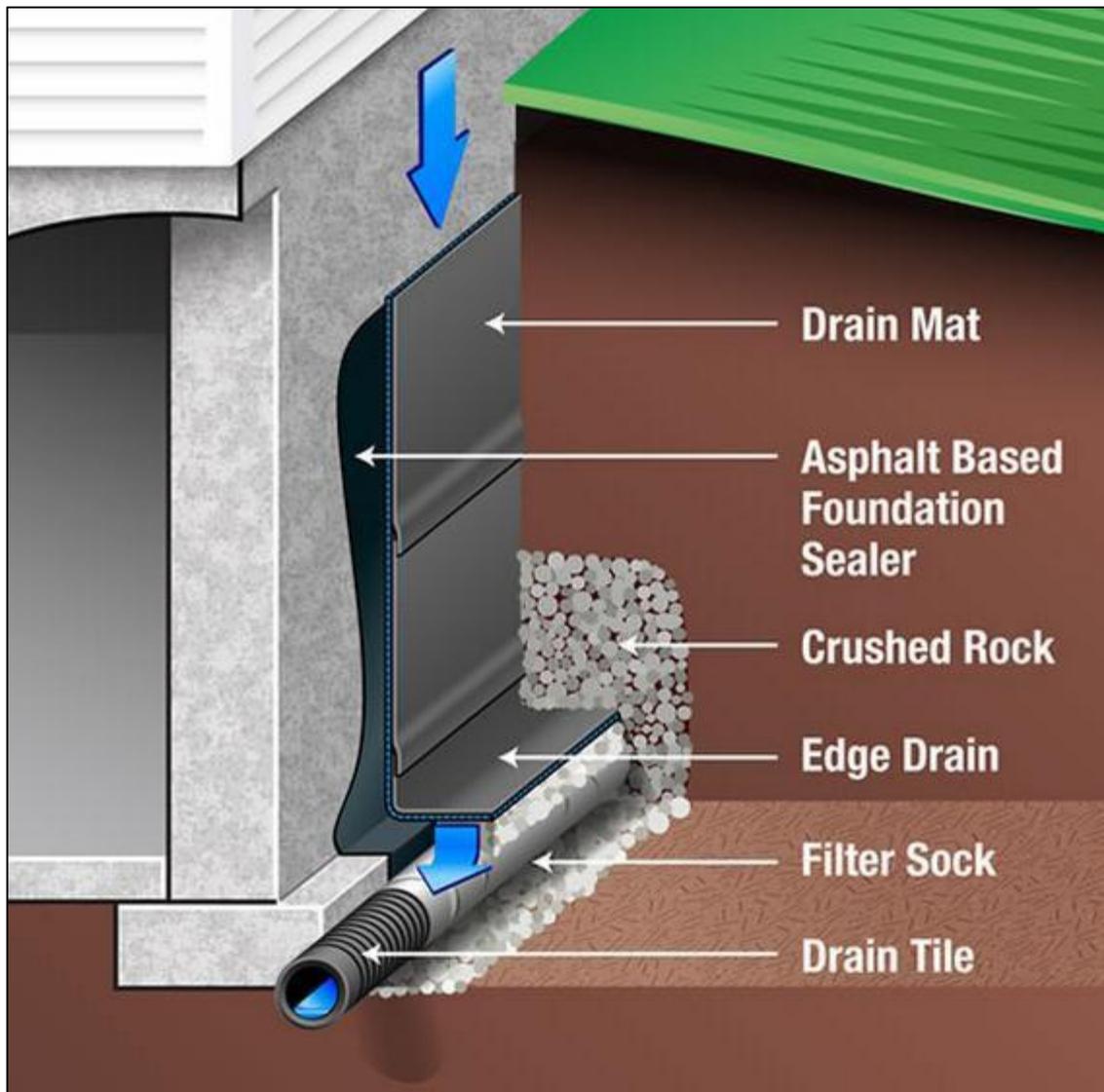
Urethane foam injection:



## Exterior Waterproofing System

This is a preferred option in finished basements, as opposed to tearing out all interior drywall in order to repair the leak from the inside. The soil around the foundation wall is excavated, and a waterproof coating and/or a rubber or asphalt embedded material is applied to the exterior foundation wall.

Exterior waterproofing is often combined with installation of perforated drain pipe or “drain tile” being laid in a trench at the base of the foundation wall and surrounded with gravel. This will enable excess water to drain away from the foundation, and is a minimal additional cost to incur once excavation for waterproofing has already been completed. The drain tile can be tied to storm drains or a sump pump to ensure the water is moved away from the foundation.



## *Interior Waterproofing Coatings*

Products such as Drylok, Thoroseal, or Xypex can be used to waterproof foundation walls that are damp (not wet.) These products are applied like a thick paint, and contain either Portland cement or a crystalline material that bond them to the wall.

These products are not effective in areas where water is physically entering through the foundation, and are expected to prevent damp conditions as opposed to stopping active water intrusion into the property.

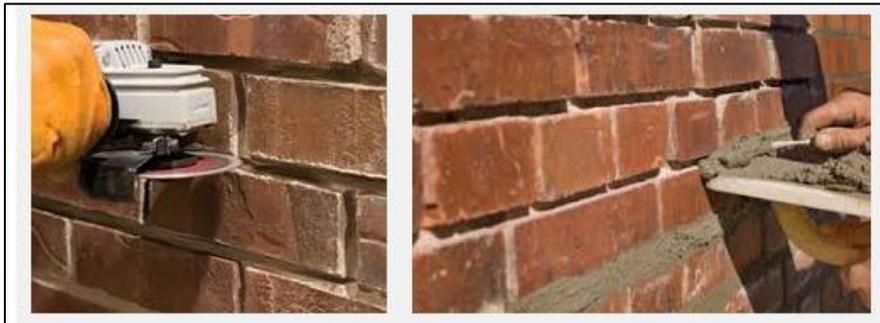


## *Tuck-Pointing*

The process of repairing a mortar joint is called tuck-pointing. This term refers to the act of tucking mortar into a damaged joint with the point of a trowel. Tuck-pointing can be used to fill cracks in mortar on the interior of the property, and will help in addressing dampness where mortar joints have separated.

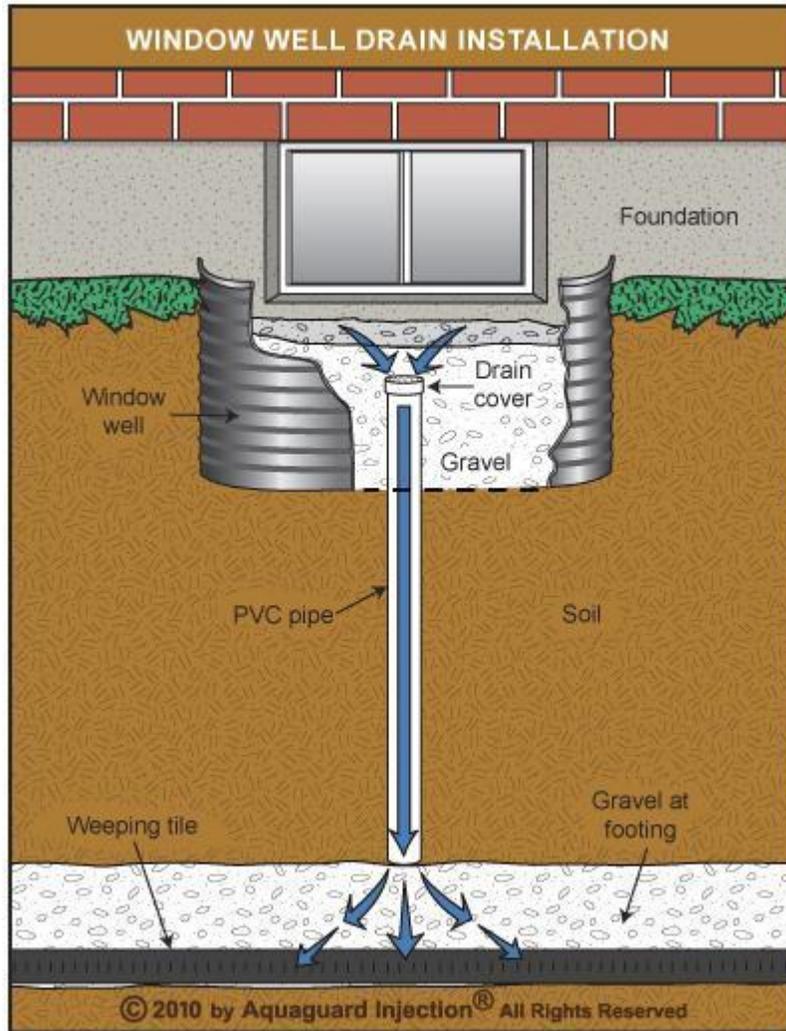
If there is active water intrusion, interior tuck-pointing is not recommended, as this will create a damming effect and allow pressure to build up in another location. Tuck-pointing cracks on the exterior of the property can successfully stop active water intrusion without a need to worry about damming or pressure because the leak is being addressed from the positive side.

When tuck-pointing, one should take care not to fill in weep holes, which are deliberate gaps in the mortar joints that allow water to pass through. These may be found at the base of a window, allowing any water that found its way in around the edges of the window a path to drain to the exterior. You may also find weep holes at the base of a foundation or retaining wall for the purpose of relieving lateral pressure by letting water pass through the wall.



## Window Well Drainage

Window wells should contain a drain that connects to a storm sewer, a dry well, or runs out to daylight. If an interior drainage system is being installed, drain tile can be brought through the wall and connected directly to the system. If a drain is not present and there is seepage around the window, a drain should be installed. If a drain is present, it should be inspected to ensure it is not clogged. In any case, a cover should additionally be installed over the window well to keep debris like grass clippings or leaves from clogging the drain.



### *Pipe Penetration Leaks*

Any prior patching should be removed to expose the gap around the pipe in the foundation wall. A series of small plastic ports are placed around the pipe and held in place with a non-shrink waterproof mortar. After the surface patch has dried an epoxy/urethane resin is injected to fill the void. These can be addressed from the exterior as well.



### *Brick Flashing Installation/Replacement*

Brick walls leak by nature, and thru-the-wall flashing will catch the water and divert it out the weep holes to the exterior of the home. If this flashing is missing or damaged, the only way to repair is removing the brick veneer at the base of the exterior wall and installing new flashing behind the brick. This will allow water to drain away from the home to the exterior.



### *Water Plug*

A water plug is a cement patch that has additives to decrease the amount of setting time, and prevent the mix from shrinking like normal cement. This type of repair should be made from the exterior, and sealed with tar or a waterproofing membrane.

