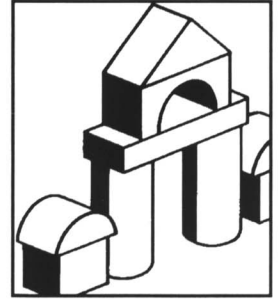

Heritage Notes

Architectural Preservation

The Basics of Site Drainage

Ron Johnson



Number 7



Introduction

Site drainage is an important component of good historic resource management, as many spring rains have proven. This *Heritage Note* will assist building owners, managers and contractors in finding the source of common drainage problems, and offer some possible solutions. Most problems associated with poor site drainage can be eliminated by one or more of these solutions. However, for more serious drainage problems, consult a professional engineer.

The Causes of Drainage Problems

Drainage problems begin when water collects where we think it shouldn't, either on the

surface or underground. Water that accumulates on the ground is referred to as "surface water." It may collect as a result of natural causes, such as rain or melting snow. It may also have human causes, such as over-zealous watering of lawns and flowerbeds, or indirect causes, such as the absence (or poor maintenance) of rain gutters and down spouts on a house. Whatever its source, surface water can usually be controlled with proper grading of the land around the building.

Water that has percolated into the soil is called "ground water." Some ground water is needed for healthy lawns and plants, but the areas near building foundations should be drained to keep ground water to a minimum and reduce the likelihood of problems. Ground water can be



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controlled through underground collection systems, but in most cases, reducing the amount of water that accumulates on the surface will also prevent or control ground water problems.

Site drainage may seem unimportant to home owners, but the problems it can cause are many. If surface water is uncontrolled, it will accumulate in low areas, drowning vegetation and leaving the area unsightly. Water that pools against a building foundation (see Fig. 1) can flow through cracks, windows or utility line passageways into basements or crawl spaces. When water stays in contact with wood siding, it can cause the wood to rot. Uncontrolled surface water will eventually soak into the ground, where it will cause more serious problems. When ground water freezes it expands, causing upheaval and cracking of concrete and asphalt slabs such as garage pads, driveways, patios and sidewalks. In extreme cases, walls and floors in basements and crawl spaces that were built water tight can be cracked and broken by hydrostatic pressure, which builds up as ground water rises. Basements that are not water tight will leak, resulting in standing water on the floors.

Site Drainage

When a drainage problem arises, the first thing you should do is find the source of the water. If your property has suddenly developed a drainage problem, you may be able to determine the cause by looking at what the neighbours are doing. With many older properties, your drainage problems may begin when the neighbours fix their own, and in doing so change drainage patterns that had been draining your property. If a neighbour has torn down an older house and built a new one, this may have an effect on the drainage patterns of your property. In this case, because the damage has already been done, the only answer is to regrade the land around your house to give your property a new drainage course. It may also be necessary to bring in fill for the low areas or dig drainage ditches (also known as swales) to re-route the water away from your house.

A note of caution before you bring in extra fill. The siding on your home or garage should be 150 mm above grade to keep it dry. If the siding is in contact with or too near the ground, rain will “splash back” onto it, causing the siding to deteriorate very quickly. Another concern about bringing in extra fill around your foundation is that many older brick and stone foundations were constructed to withstand only the vertical forces of the house itself. Adding extra lateral pressure to an older foundation wall may cause the foundation wall to bow inward and crack. Other causes of lateral force, such as parking heavy automobiles near the foundation, could also cause the foundation to shift. If the house is in a low area and drainage seems impossible, a professional engineer may be able to help by designing retaining walls or subsurface drainage.

One of the major reasons for poor site drainage is “settling” (see Fig. 1) of the soil around a foundation over time. This compacting of the soil can change the direction of flow of the surface water towards the foundation, rather than away from it. This problem is easily solved by bringing in more fill at the foundation or regrading so the grade is again away from the foundation. The situation can become complicated when sidewalks, driveways or patios built in place have also settled. They will have to be dug up, removed, then rebuilt after the grade has been corrected.

Many drainage problems can be prevented through the use of rain gutters to gather the rain and snow melt from the roof into downspouts. These should have extensions to transport the water down the side of the house and at least three metres away from the foundation (see Fig. 2). Simply dumping all the water collected in the gutters right at the foundation wall will only cause a leak at that point. When your house has rain gutters in place, they should be inspected regularly to ensure they have not separated from the eave, that they are grading towards the downspouts and are clean of debris that would block the flow of water. This system will do no good if its components are not functioning as they should.

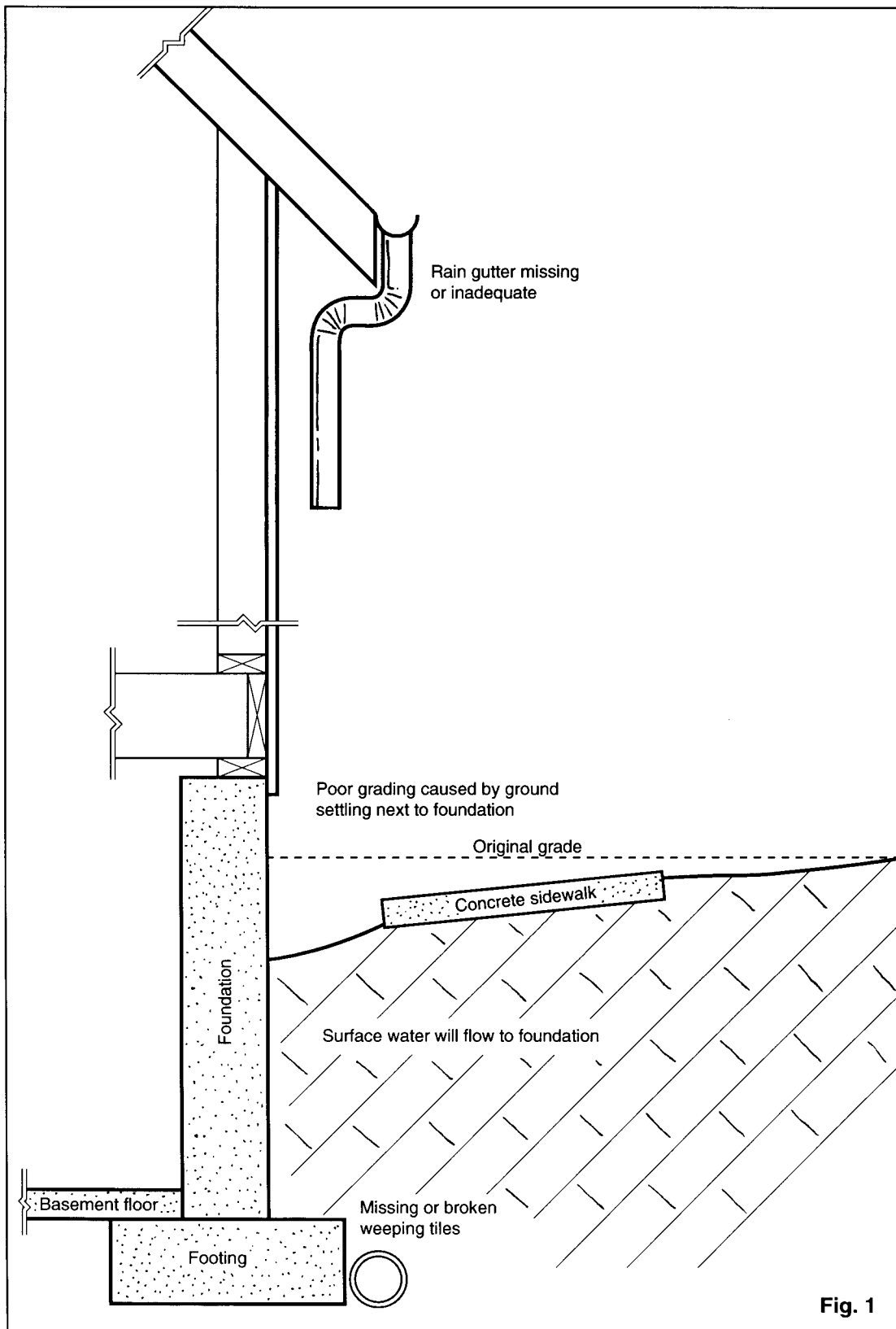


Fig. 1. Here is an example of poor drainage around a house. With no extensions on the down spout, all runoff from the roof will be deposited right at the foundation wall. The land around the house has settled, causing all rain and snow melt to flow toward the house rather than away from it. Water will run down the foundation wall and eventually into the basement.

Fig. 2. This drawing shows proper site drainage. The rain gutter is in place and in good repair, connected to down spouts with extensions to carry water away from the foundation. Note that the land around the house is graded away from the foundation, so that water runs away from it. The weeping tile around the perimeter of the house would have been installed when it was constructed and connected to the public storm sewer system.

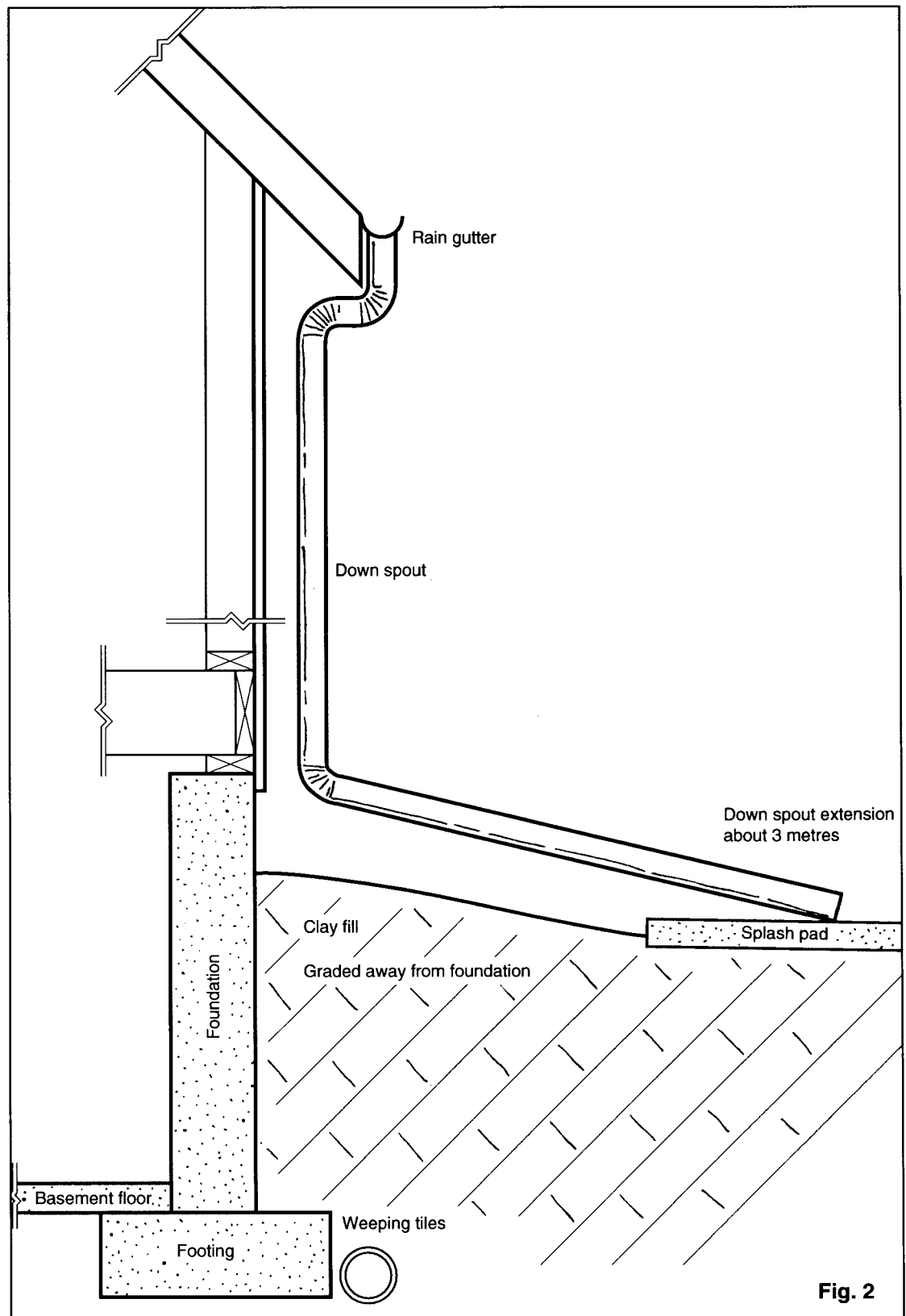


Fig. 2

Solutions

If your property has water seeping into the basement it is very important to look at the surface water drainage *before* tackling the ground water problems. Remember, the solutions for surface water problems (i.e., proper rain water gutters and grading the land away from foundations) will also prevent most ground water problems. However, in areas of high ground water your basement may still be letting in water. If this is the case, a water collection system may be necessary as well as a sump pump to remove the water from the area (see Fig. 3).

The simplest system (and the one you should try first) is to make a “sump hole” by breaking a 450 to 600 mm diameter hole through the basement floor. If water is coming in at one spot, make the sump hole as close as possible to that spot. Then excavate about 600 mm deep under the hole. If the soil under the basement floor is granular enough, ground water will flow through the soil and collect in the sump hole.

The sump hole can be finished in a number of ways. One of the easiest is to punch a number of small holes through a 20 litre pail and place it in the hole. Fill the area around the pail with clean washed gravel, choosing stones larger than the holes in the pail. This will keep the area around the sump hole from eroding into the hole yet allow the ground water to filter through into the pail. Then place a sump pump into the pail, with a discharge pipe running out of the basement and away from the foundation. This simple collection system will only work if the water is entering the basement from one location and the sump hole is near this area.

If water is entering from a number of areas around the foundation or the soil is not granular enough to allow water to flow to the sump area, a more sophisticated system may be necessary. This involves making a sump hole as above, with the addition of underground piping to channel the water to it. Once the sump hole has been dug, excavate the exterior of the foundation to the bottom of the

foundation footings, so that drain tile can be installed. Drain tile is perforated pipe specially made for this job. Lay the tile around the perimeter of the footings and join each piece together. The pipe must then be joined to the sump hole, by digging under the footing and using a “tee” connection. This creates a continuous water collection system around the foundation and into the sump hole. The completed pipe should be covered with 300 mm of clean granular fill to allow the ground water to flow in easily and also to keep dirt from plugging the holes. Again a sump pump is used to remove the water out and away from the building. This solution is a “last resort” because of the costs involved.

If you do use this system, take the opportunity to cover the foundation walls below grade with a damp proof asphalt coating. This is a simple process (once the foundation has been excavated) and the extra moisture protection is well worth it. After this, the excavation around the walls must be backfilled with clay. This is then compacted and graded away from the foundation. Topsoil for landscaping can be added on top of the fill.

Conclusion

During dry times of the year, poor site drainage is very easy to ignore. However, it is extremely aggravating during times of heavy rain or snow melt and also during the winter months when concrete pads are breaking up. Correcting poor site drainage is simple but labour intensive. However, if properly done, the work will greatly add to the life of the buildings and your enjoyment of your home.

Before You Dig

Before you start an excavation, be sure to telephone “Alberta First Call” at 1-800-242-3447 for the location of those underground utilities on the property which have been registered with the service. This easy step can save you huge repair bills for damaged utility lines and maybe even save your life. Most municipalities and counties can also advise you on drainage problems.

Fig. 3. This drawing shows a proper rain gutter and down spout and land graded away from the foundation but with the addition of a subsurface drainage system as a last line of defence. Weeping tile collects ground water as shown in Figure 2, but carries it to the sump, where it can be pumped out of the foundation and away from the house. This system would be used where there is no connection to the storm sewer.

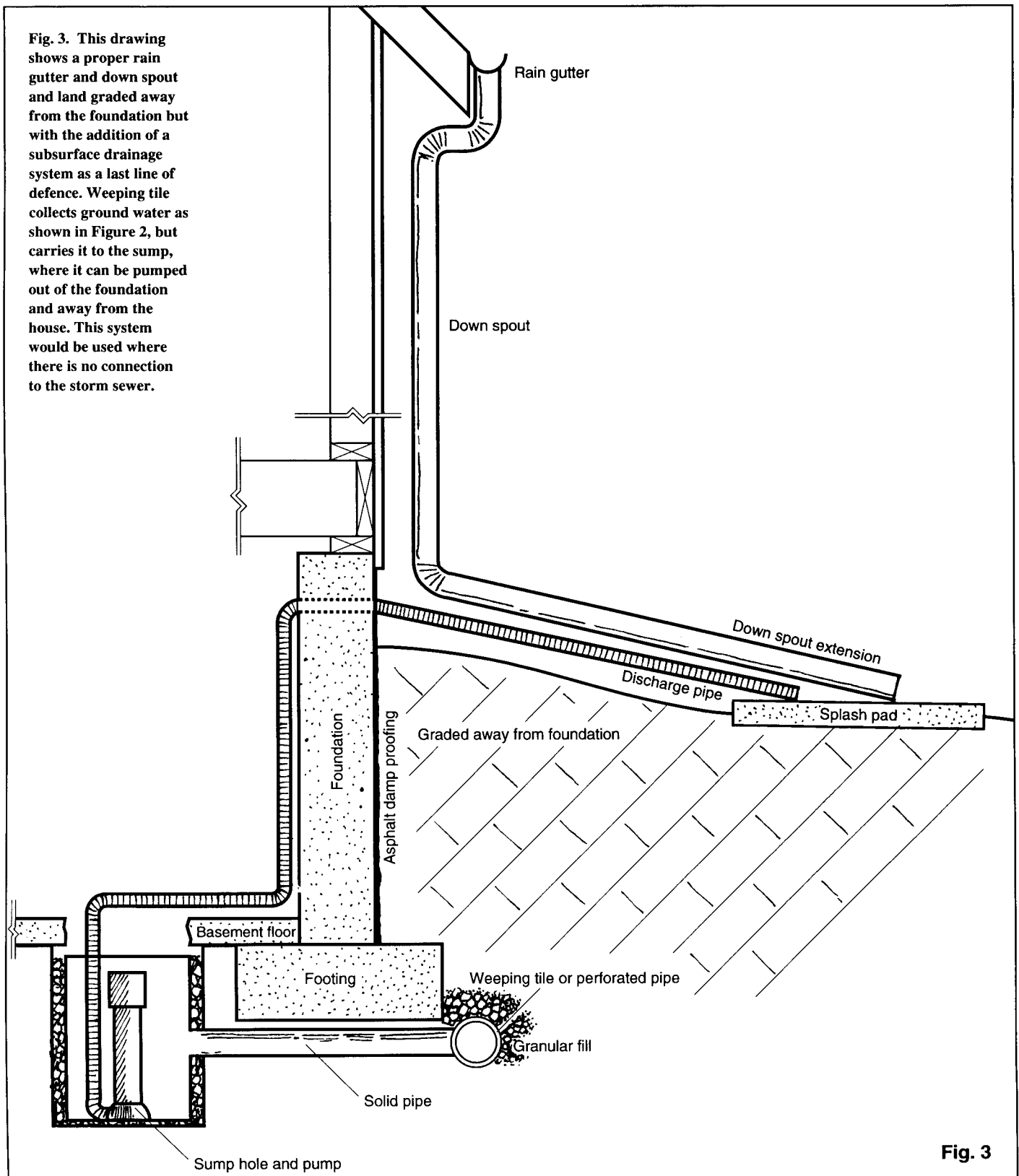


Fig. 3

If your building has been designated as a historic resource, there are other steps that must be taken before any digging begins. The legal requirements associated with designation begin as soon as the Minister serves the owner of a resource with a "Notice of Intent" to designate it. If the building has been designated as a Provincial Historic Resource, no work can be performed on the site without approval in writing from the Minister. If a building has been designated as a Registered Historic Resource, the owner is required to notify the Minister before altering or repairing the building or site. No work can begin on the property until 90 days have passed, unless the Minister consents to action earlier. This gives the Minister time to evaluate the proposal and make recommendations to the owner on the appropriateness of the intended actions. A municipality also has the power to designate a historic resource as a Municipal Historic Resource. Anyone planning to carry out alterations to a designated property should contact the planning department of the municipality.

Further information is provided in *Guidelines for the Rehabilitation of Designated Historic Resources*, available from the Historic Sites and Archives Service of Alberta Community Development.

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Even if your property is not a designated site you may find significant artifacts during excavation. As all archaeological resources are protected by the Historical Resources Act, contacting the Archaeological Survey is recommended.

Archaeological Survey,
Provincial Museum of Alberta
Alberta Community Development
12845 - 102 Avenue
Edmonton, Alberta
T5N 0M6
Phone: 453-9100

Keys to Further Information

Seaquist, Edgar O. *Diagnosing and Repairing House Structural Problems*. McGraw - Hill Book Company, 1980, p. 54-60.

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Heritage Notes are intended to provide guidance to the people of Alberta on a range of topics in the field of historic resource management. Readers' comments on the series are welcome. For more information or to order, please contact:

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