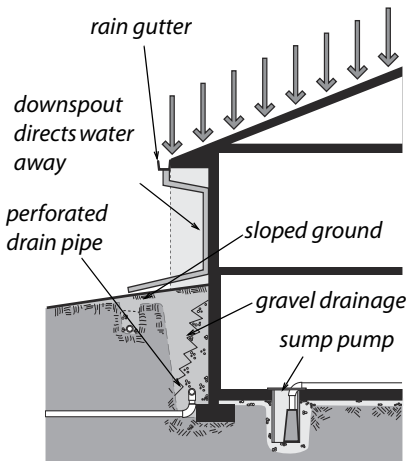


- ✓ Educate clients to avoid excessive watering around the building's perimeter. Watering lawns and plants close to the building can dampen its foundation. In moist climates, cut shrubbery back away from the foundation, allowing air to circulate near the foundation.
- ✓ Insulate air-conditioning ducts to prevent summer condensation.

## More Costly Moisture Solutions

Follow these preventive measures before trying any of the solutions in the next section.

- ✓ Install or improve air barriers and vapor barriers to pre-vent air leakage and vapor diffusion from transporting moisture into building cavities.



**Stopping water intrusion:**  
Take all necessary steps to protect homes from water intrusion.

- ✓ Add insulation to the walls, floor, and ceiling of a building to keep the indoor surfaces warmer and less vulnerable to winter condensation. During cold weather, well-insulated homes can tolerate higher humidity without condensation than can poorly insulated homes.
- ✓ Ventilate the dwelling with drier outdoor air to dilute the more humid indoor air. Ventilation is only effective when

the outdoor air is drier than the inside air, such as in winter. In summer, outdoor air may be more or less humid than indoor air depending on climate, time of day, and whether the dwelling is air conditioned. *See "Ventilation" on page 419.*

## 1.6.5 Ground-Water Drainage

*SWS Detail: 2.0201.1 Gutters; 2.0201.2 Downspouts; 2.0201.3 Grading; 2.0201.4 Sump Pumps*

Inadequate drainage is an important moisture problem for many buildings. Finish the following tasks before air sealing the floor or installing underfloor insulation, **as allowed under DOE guidelines or with non-DOE funds.**

Observe these specifications for gutters, downspouts, grading, and sump pumps.

### Rain Gutters

Comply with these specifications when installing or repairing rain gutters.

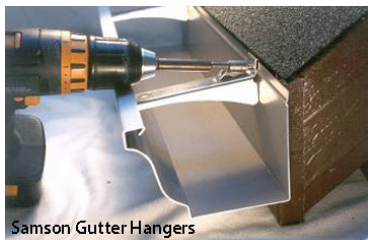
- ✓ Install or repair rain gutters as necessary, and verify that downspouts discharge rainwater at least 6 feet away from the building.
- ✓ Size gutters appropriately for the roof area they drain.
- ✓ Attach gutters with screws through fascia into sub-fascia or rafter tails.
- ✓ Fasten gutter sections together with mechanical fasteners, such as sheet-metal screws or pop rivets.
- ✓ Slope all gutters toward downspouts a minimum of  $\frac{1}{4}$  inch per 10 feet.
- ✓ Make all seams watertight using a compatible sealant, such as a butyl caulk.

- ✓ When replacing whole sections of rain gutters, prefer continuous rain gutters.

## Repair or Install Downspouts

Comply with these specifications when installing or repairing downspouts.

- ✓ Plan the size and number of downspouts, according to the area drained.
- ✓ Attach downspouts to gutters with mechanical fasteners, such as sheet-metal screws or pop rivets.
- ✓ Attach downspouts to dwellings a minimum of every 4 feet of their length with appropriate hardware and fasteners.
- ✓ Assemble downspout sections so that the upper section fits inside the lower section.
- ✓ Drain downspouts a minimum of 6 feet away from the structure.



**Gutter hangers:** Reinforced gutter hangers prevent snow and ice from detaching gutters from the building.



**Downspout terminations:** A variety of fittings like this one can drain rain water 6 feet from the building.

## Grading

Comply with these specifications when you can repair grading problems.

- ✓ Verify that the ground outside the building slopes away from the foundation.

- ✓ If the ground slopes toward the foundation or water puddles near the building, use topsoil, clean fill, and/or masonry materials, slope ground away from the building at least 6 inches per 10 feet.
- ✓ Clear all vegetation within 3 feet of the building or trim all vegetation to 1 foot clearance from the building.

### Install Sump Pumps, only if necessary

A sump pump is the most effective remedy when ground water continually seeps into a basement or crawl space and collects there as standing water. Persistent ground-water seepage may only be solved by connecting an interior perimeter drain to the sump.

- ✓ Suggest a sump pump for crawl spaces or basements with a history of flooding.
- ✓ Select a sump pump that meets the flow requirements of the home.
- ✓ Select the most energy efficient pump available. Prefer electrically commutated motors (ECM) when possible.
- ✓ Locate the sump pump where it collects water from the entire below-grade area and pumps it away from the foundation a minimum of 10 feet.
- ✓ The sump cover must not interfere with drainage and must be accessible and rigid.
- ✓ Install sump pumps according to the manufacturer's instructions.