Drain or Sump Pump Installed in Basements or Crawlspaces

Last Updated: 06/19/2014

Scope

Install a drain or sump pump in homes with a basement or crawlspace. General instructions for installing a sump pump are as follows. For additional details see the Description tab.

1. Select a location in the basement or crawlspace.
2. Dig a hole or remove the concrete floor.
3. Place gravel in the bottom of the sump pit and place the liner.
4. Install the sump pump, wiring, and the discharge pipe with the check valve.
5. Cover with a gasketed, airtight cover.

DOE Zero Energy Ready Home Notes

The DOE **Zero Energy Ready Home program** requires that builders comply with EPA Indoor airPLUS. The **Indoor airPLUS checklist** (Item 1.1) requires that builders install a drain or sump pump in basements and crawlspaces (exception: free-draining soils). In EPA Radon Zone 1, a check valve should also be installed. The Indoor airPLUS Construction Specifications notes for item 1.1, Site and Foundation Drainage, that builders should install a drain or sump pump in basement and crawlspace floors, discharging to daylight at least 10 ft. outside the foundation or into an approved sewer system.

Exceptions: Installation of a drain or sump pump is not required in homes with slab-on-grade foundations and in areas of free-draining soils identified as Group 1 (Table R405.1, **2009 IRC**) by a certified hydrologist, soil scientist, or engineer through a site visit. In EPA Radon Zone 1, if a drain tile discharges to daylight, install a check valve at the drain tile outfall (see Indoor airPLUS Construction Specification 2.1).

ENERGY STAR Certified Homes Notes

The **ENERGY STAR Certified Homes National Program Requirements** addresses sump pumps in the Water Management System Builder Checklist, item 1.7, which states “Sump pump covers mechanically attached with full gasket seal or equivalent.” See the guide **Gasketed/Sealed Sump Covers** for more information about meeting this ENERGY STAR requirement.

Description

Bulk water must be drained from the lowest portions of the foundation (below the interior finish floor level): this is the function of the footing drain, which is in turn drained to daylight or to a sump pit and pumped out (see Figure 1). The drain or sump (Figure 2) keeps ground water levels below interior floor levels and also drains away any water that has been collected by the foundation wall drainage system.

The outflow from the sump pit must be directed to a storm sewer (if permitted by your local municipality) or a dry well away from the foundation. Depositing the outflow next to the foundation will result in simply "recycling" water in and out through the foundation drainage system. The sump pit should have an airtight cover for indoor air quality reasons; if not covered, the sump can allow soil gases (including radon, water vapor, herbicides, termiticides, methane, etc.) into the home, which can be detrimental to occupant health. See the guide **Gasketed/Sealed Sump Covers** for more information about covering the sump pit.

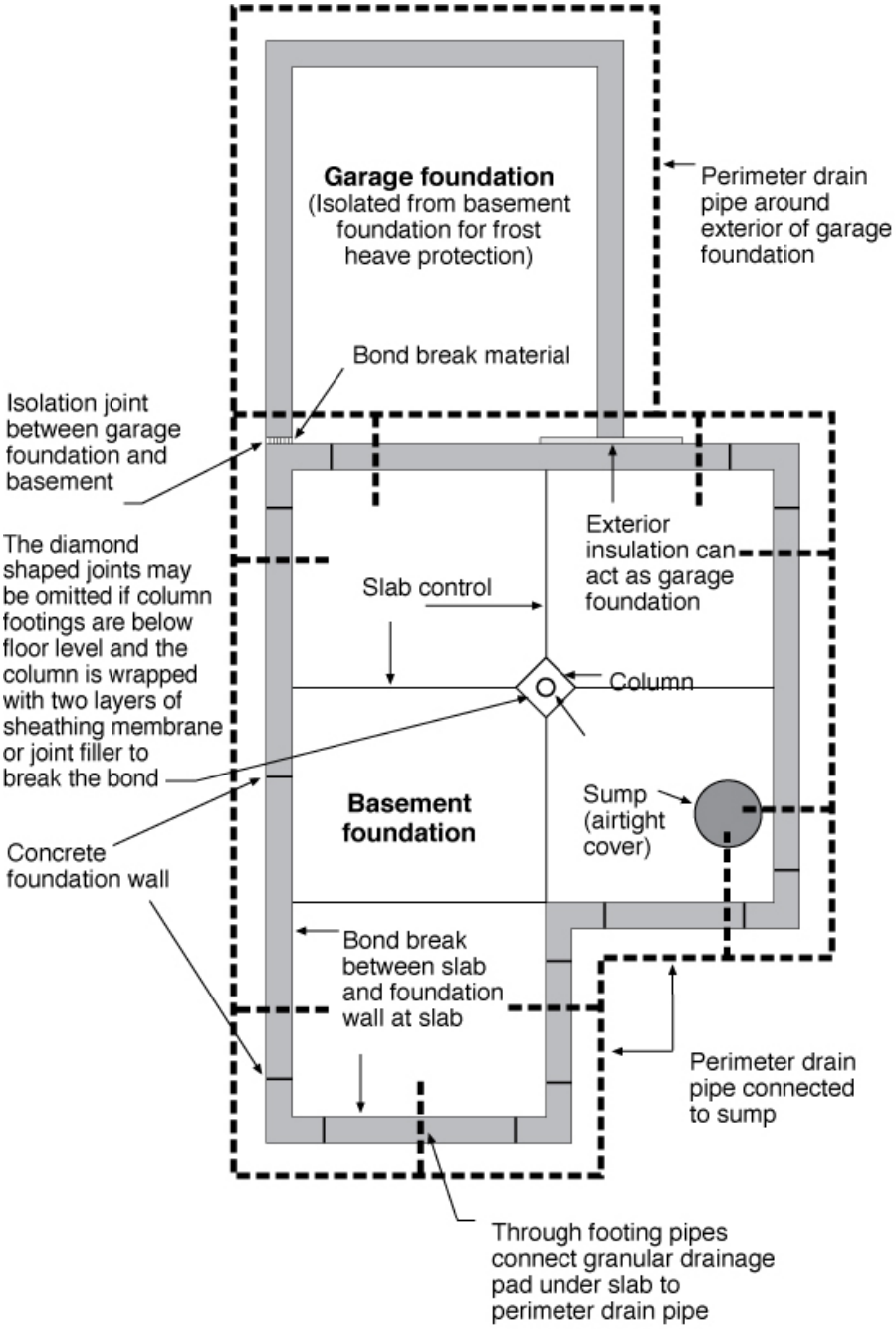

Figure 1. Basement plan showing sump pump location and perimeter drain that empties to the sump pit. (Image courtesy of **BSC**)

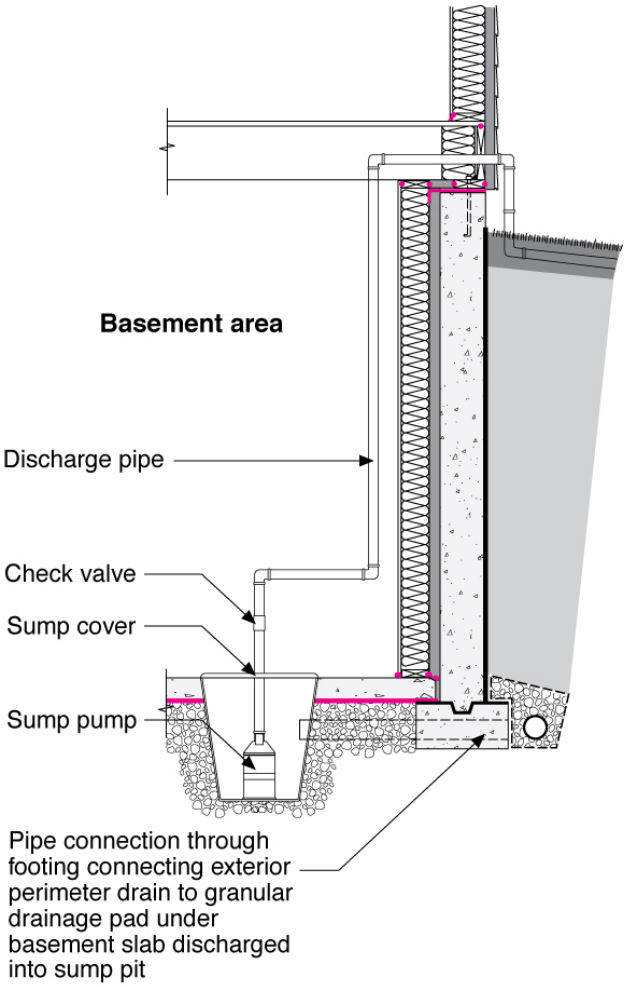

Figure 2. The sump pump is installed in the basement or crawlspace floor to collect water from the foundation drainage piping and pump it out and away from the house to a storm sewer or dry well. (Image courtesy of **BSC**)

How to Install a Sump Pump

1. Select a location in the basement or the crawlspace. The sump pump should be located in the lowest spot of the floor, near a wall so the discharge pipe can be easily directed outside and near an electrical outlet to power the sump pump. Select a sump pump with a tight fitting, gasketed cover that is mechanically fastened. Sump covers that permit observation of conditions in the sump pit are recommended.

2. For a retrofit case, dig a hole or remove the concrete floor 6 to 10 inches deeper and wider than the sump liner. For new construction, the hole should be approximately the same size as the sump liner (see Figure 3).

3. Fill the bottom of the sump pit with gravel and place the liner. Connect the sump pit to the perimeter drain or the sub-slab gravel field by using a perforated sump pit liner or through-footing pipes that are connected to the perimeter drain. In a retrofit case, fill the sump pit with additional gravel around the sump liner and place a layer of concrete at the edge of the liner.

Figure 3. Install the sump pit liner. (Image courtesy of **BSC**)

4. Install the discharge pipe to direct water out and away from the building. Install a check valve to prevent discharged water from flowing back into the sump pit when the sump pump turns off. Place the pump in the sump pit and plug it in (Figure 4). Make sure the float is unobstructed. The outlet may need to be a GFCI (ground fault circuit interrupter) safety outlet - refer to the **National Electrical Code (NEC)**.

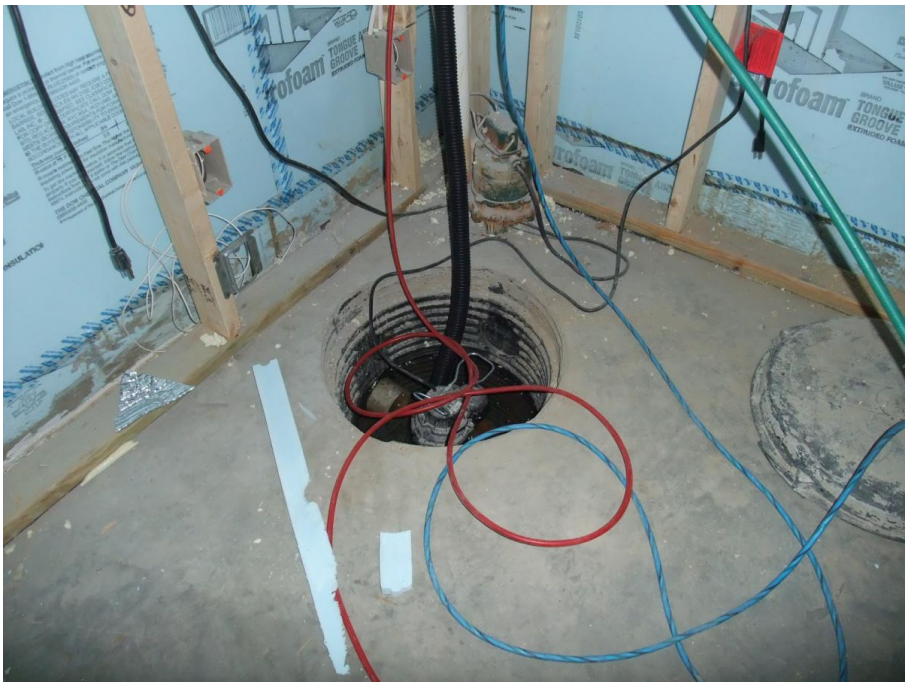

Figure 4. Install the sump pump. (Image courtesy of **BSC**)

5. Place the airtight cover on the sump and connect the last section of the discharge pipe (Figure 5). See the guide **Gasketed/Sealed Sump Covers** for more information.
6. If the sump is installed in a concrete slab, caulk around the outside edge of the sump pit liner where the liner meets the concrete (**EPA 1994**). If the sump is installed in a crawlspace with a dirt floor covered by a polyethylene vapor barrier, ensure that polyethylene covers the ground around the sump pump and is taped to the rim of the liner.

Figure 5. Install the sump pump cover. (Image courtesy of **BSC**)

Ensuring Success

Test the sump pump system to ensure that water is properly discharged out and away from the building. Verify the cover is tightly placed over the sump pit to prevent soil gases from entering the building.

Climate

No climate specific information applies.

Training

Right and Wrong Images

Display Image: WM19_SumpPump-Right_BSC_2012 resized.jpg
Courtesy Of: BSC

Display Image: ES_WMSBC_1.7_PG26_43b_32311_0.jpg

Reference: Water Management System Builder Checklist Guide

Author(s): EPA
Organization(s): EPA

Guide describing details that serve as a visual reference for each of the line items in the Water Management System Builder Checklist.

Display Image: ES_WMSBC_1.7_PG26_43b_32311_0.jpg

Reference: Water Management System Builder Checklist Guide

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Reference: Water Management System Builder Checklist Guide

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Organization(s): EPA

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Reference: Water Management System Builder Checklist Guide

Author(s): EPA
Organization(s): EPA

Guide describing details that serve as a visual reference for each of the line items in the Water Management System Builder Checklist.

Display Image: ES_WMSBC_1.7_PG26_45e_32311_0.jpg

Reference: Water Management System Builder Checklist Guide

Author(s): EPA
Organization(s): EPA

Guide describing details that serve as a visual reference for each of the line items in the Water Management System Builder Checklist.

Display Image: ES_WMSBC_1.7_PG26_45e_32311_0.jpg

Reference: Water Management System Builder Checklist Guide

Author(s): EPA
Organization(s): EPA

Guide describing details that serve as a visual reference for each of the line items in the Water Management System Builder Checklist.

CAD

None Available

Compliance

The Compliance tab contains both program and code information. Exact code language is copyrighted and may require purchase from the publisher. While we continually update our database, links may have changed since posting. Please contact our webmaster if you find broken links.

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ENERGY STAR Certified Homes

The ENERGY STAR Certified Homes National Program Requirements addresses sump pumps in the Water Management System Builder Checklist, item 1.7, which states “Sump pump covers mechanically attached with full gasket seal or equivalent.” See the guide **Gasketed/Sealed sump Covers** for more information about meeting this ENERGY STAR requirement.

2009 International Residential Code (IRC)

Chapter 30 Sanitary Drainage, Section P3007 Sumps and Ejectors

Chapter 33 Storm Drainage, Section P3303 Sumps and Pumping Systems

2012 International Residential Code (IRC)

Chapter 30 Sanitary Drainage, Section P3007 Sumps and Ejectors

Chapter 33 Storm Drainage, Section P3303 Sumps and Pumping Systems

More Info.

Access to some references may require purchase from the publisher. While we continually update our database, links may have changed since posting. Please contact our webmaster if you find broken links.

Case Studies

None Available

References and Resources*

1. **Builder's Guide to Cold Climates**
   Author(s): Lstiburek
   Organization(s): BSC
   Publication Date: January, 2006
   Book presenting the best techniques for energy and resource efficient residential construction in the colder climates of North America.

2. **Building Radon Out, A Step-by-Step Guide On How To Build Radon-Resistant Homes**
   Author(s): EPA
   Organization(s): EPA
   Publication Date: April, 2001
   Document detailing how to build radon-resistant homes.

3. **Bulk Water Control Methods for Foundations**
   Author(s): Ueno, Lstiburek
   Organization(s): BSC
   Publication Date: January, 2011
   Report about the fundamental concepts that must be understood at the planning or initial nspection of existing homes regarding surface and ground water management.

4. **DOE Zero Energy Ready Home National Program Requirements**
   Author(s): DOE
   Organization(s): DOE
   Publication Date: August, 2015
   Standard requirements for DOE's Zero Energy Ready Home national program certification.

5. **ENERGY STAR Certified Homes, Version 3 (Rev. 07) Inspection Checklists for National Program Requirements**
   Author(s): EPA
   Organization(s): EPA
   Publication Date: June, 2013
   Standard document containing the rater checklists and national program requirements for ENERGY STAR Certified Homes, Version 3 (Rev. 7).

6. **Radon Mitigation Standards**
   Author(s): EPA
   Organization(s): EPA
   Publication Date: January, 1994
   Standard providing information on contractors who offer radon control services to homeowners.

7. **Technical Guidance to the Indoor airPLUS Specifications**
   Author(s): EPA
   Organization(s): EPA
   Publication Date: October, 2015
   Website providing technical guidance to help home builders and their subcontractors, architects, and other housing professionals understand the intent and implementation of the specification requirements of the IAQ labeling program.

8.

Water Management System Builder Checklist Guide
Author(s): EPA
Organization(s): EPA
Publication Date: February, 2011
Guide describing details that serve as a visual reference for each of the line items in the Water Management System Builder Checklist.

*Publication dates are shown for formal documents. Dates are not shown for non-dated media. Access dates for referenced, non-dated media, such as web sites, are shown in the measure guide text.

Contributors to this Guide

The following Building America Teams contributed to the content in this Guide.

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