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Avoid the Wet Basement Blues: Construction Methods Guarantee Success

APPALACHIAN State University has a thriving construction program. We teach basic construction techniques, job management, estimating and a number of material and science courses. Students, faculty and friends have asked me numerous times to help them deal with wet basements. This article details a time-proven solution I've successfully used that will empower construction students.

An Ugly Problem and Its Solutions

A damp basement can be a nightmare, especially after mildew creates its eye-watering, nose-offending stencil. You can either stay above ground or arm yourself with the knowledge that will allow you to successfully build underground.

You have two enemies to overcome: damp air condensing on interior walls and ground water penetrating the exterior. Conquer these problems, and a basement will stay dry.

Preventing Condensation

You can address condensation by drying or heating the air in a basement to raise it above the dew point. The simple way to do both is with dehumidifiers. They are expensive to operate, but you have to pay to live below grade! Basement walls and floors, which stay around 55°, will allow condensation unless heated. The condensation will grow mildew and mold, which ruin the space. Dehumidifiers also stir the air with their fans, which reduces the chance of having a cold damp spot.

You'll want to install drains for the dehumidifiers so they can empty continuously. Otherwise, they will likely be forgotten and overflow or stay full, which shuts off the dehumidifier. Consider, as an example, my current house. I have a standard-size dehumidifier in each of the back corners of my daylight basement. The basement is finished, but all of the block walls are open to the dried air.

I left a 3" air gap between the interior stud walls and the exterior block walls. The stud walls are insulated with fiberglass batt and have a poly vapor barrier facing the air gap. (see Fig. 1.) The air gaps open into corner rooms with the dehumidifiers. The interior walls keep warm, moist air away from the cool block. The vapor barrier protects the studs and insulation. The air gap provides some insulation for the interior rooms and allows the block walls to dry if they leak water.

The basement of my six-year-old house has no odor. Previously, I suffered through five houses with damp basements. Living in them gave me plenty of time and Incentive to solve the problem!

The design of my current basement has worked because the basement was dry to start with. You have to build a house like a ship at sea to keep it dry. This means shedding most of the water away from the house and creating a way for what you can't shed to leave the house.

Preventing Water Penetration

My house is in the mountains of North Carolina, at 3,300 feet. We have cool summers, mild winters and few mosquitoes-but substantial rain. The heaviest rains come from the southeast when hurricane clouds dump up to an inch per hour as they squeeze over the mountains. Good gutters, which pipe water away from the house, are the first protection against the rain. During construction, my basement flooded twice before I had gutters installed. (Gutters offer the further benefit of adding 6" to the overhang for summer sun protection.)

The second protection against rain is a waterproof apron around the house that diverts runoff. At my house, the ground slopes away from the house and is covered with plastic and topped with rock mulch. In a number of low spots, the plastic ends in yard drains connected to the gutter piping. The driveway slopes away from the house. An attached garage, front porch and decks protect more of the house. The exposed southern wall doesn't need an apron because it is below the basement grade. Water collects here in a gravel trench and drain pipes.

This may seem like a lot of work, but think about the smelly basements you've been in!

The third protection involves sealing the block and providing a path for the water to flow down the walls and away. Follow this procedure:

1. Dig a big enough hole to allow working room in the trench between the wall and the dirt. (You might as well plan on hand digging the trench out a few times for cave-ins and rain.)
2. Paint the block wall with cement. Stucco is better, but you can roll on a pasty mix of cement much faster than applying stucco. This seals the pores in the block and makes the tar coat that follows go on smoother. To make the cement paste you need a big drill, a heavy-duty stirring blade, a five-gallon bucket, a heavy roller with extension and a resolve to get covered in dirt and cement. Mix the cement to the consistency of ketchup and it will do a good job.
3. Tar the walls-a job even messier than painting with cement. Tar is black, nasty stuff. Wear safety glasses and pray for a breeze, since the smell is overpowering.
4. Cover the walls with heavy polyethylene. Let the poly drape over the foundation. If you're working on a big house, overlap and caulk or tar the vertical seams to form a seal. Water under pressure will find any and all possible paths.
5. Cover the plastic with closed-cell blue-board (Styrofoam). The blue-board protects the plastic from punctures and provides some insulation for the block walls. We nailed the blue-board to the block and covered the nails with duct tape to seal the walls.

Next you have to provide a path for the water to flow away. Water builds .43 pounds per square inch of pressure for every foot of height. Thus, the water pressure at the bottom of a 10-foot wall can be 4 psi.

Covering the wall with used carpet that leads to the footer drainpipe provides a path for water and reduces the hydraulic pressure. While you'll find many commercial products available to

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move the water down the wall, I saw reusing old carpet as doing my part for green building. Saving money didn't hurt either!

I nailed the carpet to the joist band with the fuzzy side in. The water soaks into the carpet, runs down the wall and out by a slotted 4" footer drain. Cut the carpet away from the joist band after grading. Lay your pipe on the footer over the plastic and cover it with gravel. Then cover the gravel with landscape fabric. The fabric lets water through while keeping dirt out.

The treatment, as described to this point, protects the walls, but you also need to guard the slab. Most building specifications call for 4" of gravel under the slab, though few houses have it. The 4" of gravel provides a path for water under the slab to escape. Methods for ensuring that water can get out from under the slab will vary from house to house.

My house has step footers with two layers of block below the slab on the south side. I knocked small holes through the block leading to the footer drain. You will have to dig a sump pit and use a pump if you can't gravity drain from the basement.

Finally, you need to cover the 4" gravel layer with a heavy vapor barrier before the slab is poured. I used two layers of 6-mil plastic, with 2' of overlap. This vapor barrier keeps the slab dry. Note that the plastic has to be thick enough to survive walking on while pouring the slab.

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