# For years, I've installed 3-foot-wide membrane as ice-dam protection along the eaves of roofs. Recently, though, a local building inspector red-tagged us because the membrane did not go up 4 1/2 feet. I thought the 3-foot width of the rolls met the code requirement. Who's right?

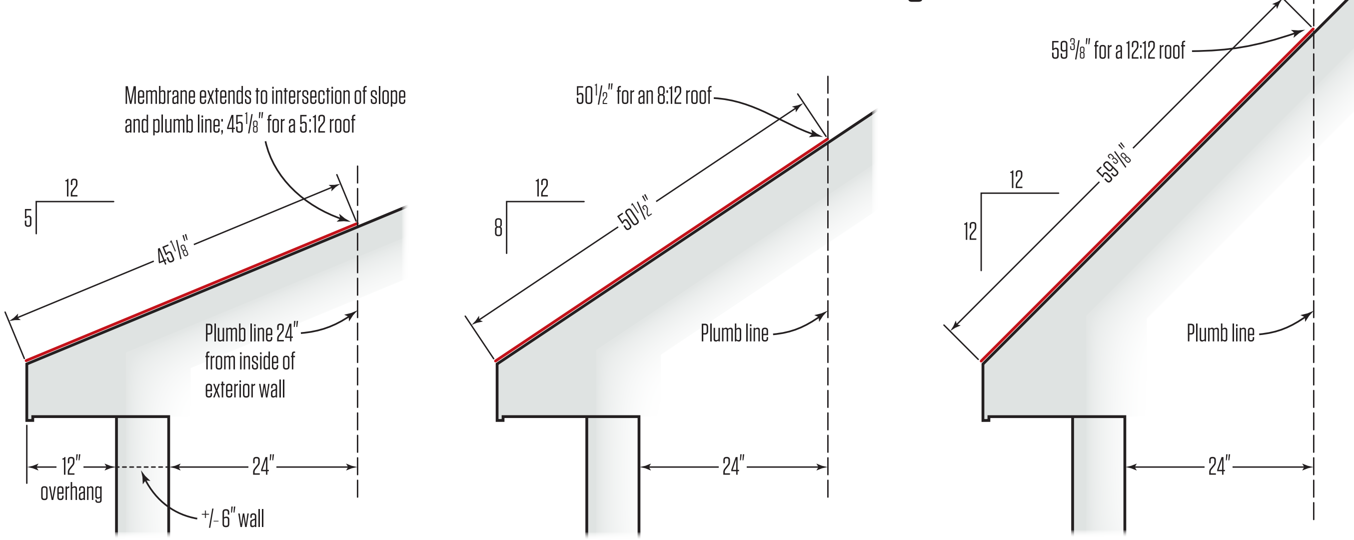
**A** Mike Guertin (instagram.com/mike_guertin), a builder and remodeler in East Greenwich, R.I., and a Roofing Workshop presenter at JLC Live, responds: The inspector is right, but before we get into why, let's be clear on the function of an ice-dam protection membrane along the eaves edge. Self-adhering membrane does not *prevent* ice-dam formation; it merely helps to prevent water that backs up behind an ice dam from leaking into the house.

Ideally, we want to reduce the chances for ice-dam formation by installing adequate roof and attic insulation, by preventing warm air from the conditioned space from leaking into the attic and warming the roof, and by ensuring good eaves-to-ridge ventilation in unconditioned attic spaces. *JLC* has published numerous articles covering best practices for roof design, roof and attic insulation, and air-sealing. But don't think that the measures described in those articles will prevent ice dams from forming in all cases—under the right conditions, other factors such as sun exposure, weather conditions, gutters, thermal bridging, and roof geometry can contribute to the formation of ice dams.

The 2015 and 2018 IRC require an "ice barrier" on roofs in "areas where there has been a history of ice forming along the eaves causing a backup of water as designated in Table R301.2(2)" [Climatic and Geographic Design Criteria]. Your local code jurisdiction fills out the table. One entry on the table is "Ice Barrier Underlayment Required." So if you build in an area where that entry is filled out with a "yes," then you have to install an ice barrier.

The code section continues on to describe what constitutes an "ice barrier," where to install it, and how far up the roof it has to be installed: "The ice barrier shall consist of not fewer than two layers of underlayment cemented together, or a self-adhering polymer-modified bitumen sheet shall be used in place of normal underlayment and extend from the lowest edges of all roof surfaces to a point not less than 24 inches inside the exterior wall line of the building."

## Ice Protection Membrane Height




**Ice protection membrane and the code.** To set the height of the ice protection membrane according to the code, measure 24 inches from the exterior wall and plumb up to the roof plane. The distance from the lower edge of the roof to the intersecting point of the slope and the plumb line is the minimum required height of the membrane. As seen here, the height of the membrane increases as the roof pitch increases.

Illustration by Tim Healey

As with many code entries, the language is slightly ambiguous, but when you break it down, it simply means that you have to install an ice barrier from the eaves edge up the roof slope until you reach a plumb line that's 24 inches from the exterior wall. The reference point on the roof slope is where that plumb line intersects with the roof sheathing. Without knowing the depth of the eaves overhang, the thickness of the exterior walls, or the pitch of the roof in the specific situation at hand, it is impossible to specify exactly how far up the roof the ice barrier actually has to go to meet code. My guess is that in your case, the building inspector made a ball-park estimate and came up with the figure of 4 1/2 feet.

To illustrate how far up the roof sheathing ice barriers have to reach, here are some examples using common slopes on roofs with a 12-inch eaves overhang (12-inch soffit). With a 5:12 roof slope, the ice barrier would have to extend 45 1/8 inches up the roof; with an 8:12 roof, the barrier would need to extend 50 1/2 inches; and with a 12:12 roof, that distance becomes 59 3/8 inches. If you have deeper eaves overhangs—say 24 inches—the ice barrier would have to be much wider. The one exception to the ice-barrier requirement is that ice barriers are not needed on detached, unconditioned accessory structures (such as sheds and detached garages).

The code language that says to measure from "the exterior wall line of the building" is not specifically defined in the code. Should that measurement be taken from the exterior face of the siding, the exterior face of the sheathing, the exterior face of the studs, the interior face of the studs, or the inside face of the drywall? In these situations, I always try to use the method that goes beyond the minimum requirements, so I'd take the 24-inch measurement from the inside face of the drywall. The Asphalt Roofing Manufacturers Association (ARMA) shows the measurement taken from the interior side of the exterior wall in Figure 7-3 of the *Residential Asphalt Roofing Manual*.

The point is that the ice barrier has to extend far enough up the roof to seal out water leaks if an ice dam does form. Here in the Northeast, the winter of 2015/2016 drove home the importance of installing ice barrier membranes according to the building code. That winter, ice dams—and resulting roof leaks—were common on houses outfitted with a single 36-inch width of ice barrier membrane, much to the surprise of the roofers who installed them. The ice dams grew so large and the backed-up melt water rose so high that the ponding water breached the top edge of the ice barrier, allowing water to pour into the house. The remedy in your case is to install another full course (3 feet) of ice barrier membrane above the one already installed, or cut a sheet to the dimension wide enough to satisfy the inspector's requirement.

## Q When I use perforated pipe in a drainage system, should the holes go up or down?

A Steven Baczek, a residential architect from Reading, Mass., who specializes in designing durable, low-energy homes, responds: I hear arguments for both methods, but it really depends on how the pipe functions in your drainage system. Before going any further, the pipe we are discussing here is heavy-duty schedule-40 PVC pipe with either two or three courses of holes with the outer courses usually 120° to each other. I don't recommend using corrugated flex-pipe in drainage systems.

When designing a water-management regimen for a home, I try to drain to daylight ("A Primer on Water Management," Jun/17). In this system, drainage pipe around the perimeter of the house links with the downspouts as well as with a perimeter drain inside the basement, all of which drain by gravity to a pipe that exits the ground at a safe distance from the building. Here, the perforated pipe has two functions: collection and conveyance, with the latter being the primary function. I place the pipe with the perforations facing up and count on the streaming water from the downspouts to help keep silt and debris from accumulating in the pipe.

I also place the perimeter piping in what I call a ground gutter, a trench filled with crushed stone and wrapped on all sides with filter fabric—a pipe within a pipe. Water draining from the walls or dripping from the eaves diffuses through the filter fabric and the crushed stone, with most of the liquid being distributed by the ground gutter. The ground gutter would need to saturate to the level of the perforations before any significant water would enter the pipe, and the likelihood of that happening is usually pretty slim. In this scenario, the pipe would have to be completely occluded with silt and mud to become ineffective.

With the perforations facing down, the primary function is collection and distribution. Even when placed in a ground gutter as described above, the pipe fills with groundwater more quickly. When more water enters one area than another, it flows to another area of the pipe and drains away. This would seem to work best in a French drain system where excess water drains to a sump pit to be pumped out. In the systems I install, it's much more difficult for the debris to be washed away with the perforations facing down. Either way, though, when silt and debris fill the pipe to the level of the perforations—essentially half the diameter of the pipe—it can no longer take on water and no longer is effective for drainage.

So there are good arguments for both methods. Having the holes facing up is just the most effective plan for the systems that I've designed. Regardless of your preference for perforation placement, I always recommend installing clean-outs in strategic locations for clearing the pipe should it become blocked or sluggish.