

Installing Site-Built Under-Deck Drainage

Use an EPDM roofing membrane and off-the-shelf gutter parts to build a cost-effective under-deck drainage system

by Mike Guertin

The area underneath an elevated deck is a great candidate for valuable storage space or even additional outdoor living space, if you can keep it dry. That's why I now install an under-deck drainage system on nearly every deck I build that has more than 4 feet of headroom below it. There are several commercially available under-deck drainage systems—including some that can be retrofit to an existing deck—but on new decks, I prefer to fabricate my own system

using an EPDM synthetic rubber roofing membrane and standard aluminum gutter parts. My system is fast and easy to install before the decking is laid, and it's durable as well as cost effective for me and my clients.

Commonly used on flat and low-slope roofs, EPDM is widely available at most roofing supply companies (and at some lumberyards) in two standard thicknesses—0.45 inch and 0.60 inch—in 10-foot-wide and 20-foot-wide rolls that

are 50 feet to 100 feet in length. I used to install the thicker, 0.60-inch EPDM but switched to the 0.45 several years ago with good results.

Start With a Gutter

To drain the water collected by the membrane, I install standard 5-inch aluminum “K”-style gutter, which is locally stocked, inexpensive (about \$1.10/lineal foot with hangers and caps), and simple to hang. The gutter can be located at the



Figure 1. Water from the under-deck drain system is collected by a standard “K”-style aluminum gutter. When installing a system, the author typically oversizes the rim joist to accommodate the gutter.

EPDM Membrane Layout

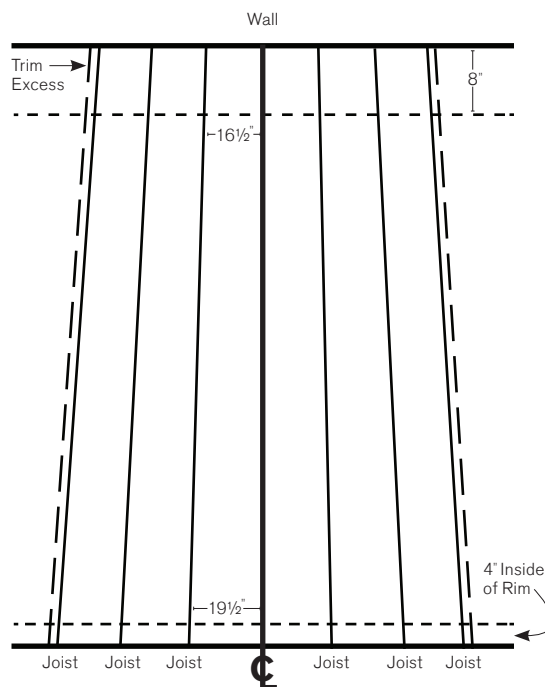


Figure 2. With 2x6 joists, the layout above will allow the membrane to drape properly over the joists. Deeper joists will require a wider spacing at the rim joist.

outside edge of the deck, the inside edge along the building, or even along a support beam beneath the joists.

Most of the decks I build have rim beams (rather than dropped beams with cantilevered joists). I generally size the rim beam deeper than the joists—I would use a double 2x12 beam with 2x8 floor joists, for example—which leaves the lower part of the beam hanging below the joists. The gutter can then be fastened to the exposed part of the beam and boxed around with trim, concealing it entirely. To position the top edge of the gutter, I snap a chalk line along the dropped portion of the beam with a slope of $\frac{1}{16}$ inch to $\frac{1}{8}$ inch per foot towards the outlet points (**Figure 1**).

EPDM Membrane

For the water to drain towards the gutter, the EPDM membrane has to droop between the joists to create a trough that

slopes down the length of the joists to the gutter. At the head of the joist bays (usually at the ledger), I allow for a 1- to 1½-inch-deep trough. At the gutter end, I let the membrane droop ½ inch shy of the full joist depth.

I’ve installed plenty of these systems and have measured out the required droops for decks with 16-inch-o.c. framing. The following lengths will work on any deck. At the head of the deck, allow 16½ inches (center of joist to center of joist) of membrane. At the gutter end, allow 19½ inches for 2x6 joists; 22½ inches for 2x8 joists; 25½ inches for 2x10 joists; and 28½ inches for 2x12 joists.

For other joist spacings, you can gauge the membrane width by using a piece of rope or strip of EPDM. Hold the piece across a joist bay and slide one end inward until you reach the target droop. Mark the cord or strip at the centerline of the joists and measure. Then repeat this step

at the opposite end of the joist bay.

Make a template. I plan the EPDM layout based on a 10-foot-wide sheet run parallel with the joists. Each 10-foot-wide sheet of EPDM will cover six 16-inch-o.c. joist bays and cross seven joists. But before cutting into the membrane, I make a full-scale template out of 4- to 6-mil plastic or an old lumber tarp. The template lets me dial in the dimensions and trim to the optimal size without the risk of wasting any EPDM. I cut the template sheet an extra 12 inches longer than the depth of the deck when there are 2x6 or 2x8 joists, and 16 inches longer for decks that are framed with 2x10 or 2x12 joists. The extra length accounts for the fan shape of the sheet and leaves 6 inches to 8 inches of membrane to lap up onto the wall.

It is easiest to mark out the template on a flat surface with chalk lines for each joist center so the membrane is nicely



Figure 3. Using a piece of black plastic (an old tarp could also be used), the author makes a template for the membrane (top left). Referring to the dimensions in Figure 2, he snaps chalk lines for the centerline and joists onto the template, then drapes the template over the deck framing so that the chalk lines are aligned with the joists (above left). He trims the template to fit, then uses the template as a pattern for cutting out the EPDM membrane (above right).

sloped along each joist bay. I start by marking the center of the sheet at each end and snapping a chalk line. Then I step off the head of the trough measurements about 8 inches down from one end of the sheet on either side of the centerline (on this project, 16½ inches, 33 inches, and 49½ inches to the left and right of center). At the gutter end, I mark the wide trough dimensions about 4 inches in from the end (19½ inches, 39 inches, and 58½ inches left and right of center) (**Figure 2**).

I snap chalk lines between the marks at the head and foot of the sheet. The excess sheet beyond the outside joist chalk lines is trimmed off to leave only 1 inch to 3 inches overhanging.

Test and final template trim. The template needs a final trim along the gutter

end so the water will drain into the center of the gutter at each joist bay. I place the template on top of the framing and align the centerline of the sheet with the middle of a joist, with about 8 inches of the sheet running up the wall, then use a hammer tacker to staple the template in place, spacing the staples about 24 inches o.c. along the joist. I leave the last foot of the sheet at the gutter end free for trimming. Then I center up the remaining chalk lines on the adjacent joists one at a time and tack-staple them the same way.

The ends of the sheet will form slight arcs along the house and the gutter. I trim the sheet along the gutter end following a line that starts where the edge of the joist and rim joist meet and runs down the drooping sheet. I continue up

the other side to the opposite joist-to-rim joint, leaving about an inch of material overhanging into the gutter. The pieces cut from the sheet will be quarter-moon shaped. Then I trim the house end to lap about 6 inches up onto the side of the house (**Figure 3**).

After trimming the plastic template in place over the deck joists, I remove it and lay it out flat on the floor. The gutter end will look scallop-shaped, and the cut along the house end will have a slight, even curve. I fine-tune the cuts by folding the sheet in half along the center chalk line and re-trimming individual curved cuts along the gutter end so they all look even.

Cutting the membrane. Then I use the template to mark out the EPDM sheets. There will be a scalloped strip that will

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Figure 4. To protect the rim joist, the author makes scuppers out of the scalloped pieces that were cut from the membrane (above left). Water flowing off the membrane will be deflected by the scuppers into the gutter (above right).

be cut away from the gutter end of the membrane, but it isn't waste. Instead, I cut it into pieces to use as scuppers that direct rushing water into the center of the gutter. So rather than lining up the gutter end of the template to the edge of a blank EPDM sheet, I hold the template back 4 inches and then mark along the scalloped edge with chalk. Sharp scissors work better than a knife to cut the membrane.

After cutting away the narrow, scalloped strip of material from the main sheet, I make crosscuts at the center of each joist line to make quarter-moon-shaped scuppers.

I snap chalk lines on the EPDM sheets after they're trimmed to shape to make it easier to line them up over the joists. The same process is repeated for marking and cutting until I have enough EPDM sheets and scuppers to cover the deck.

Installing the Membrane

I begin by installing the scupper pieces. I've installed deck drainage systems with-

out scuppers but have found that when the water flow in the troughs is heavy, water sometimes overshoots the gutter. The scuppers, centered at the rim between the joists so the bottom edge lines up with the middle of the gutter, redirect that water flow into the center of the gutter. Rust-resistant cap staples or nails are used to fasten the scupper pieces along the top of the rim and down the sides of the joists (**Figure 4**).

Then I install the EPDM membrane, fastening it to the joists with cap nails or staples spaced 2 to 3 feet apart along each joist. Cap fasteners reduce the chance that a staple or nail will pull through the EPDM. I start installing each sheet at the center joist and work towards the sides, making sure to align each chalk line with the center of each joist (**Figure 5**).

After the scuppers and EPDM drainage sheets are installed, I run a strip of self-adhering membrane over the rim beam. The strip covers the joints between the scupper pieces and protects the exposed edge of the beam.

Flashing

The EPDM membrane is self-flashing when fastened up onto the wall. There are always some wrinkles in the membrane, which I pleat onto the wall above each joist and staple as flat as possible to the wall sheathing. Since most wall cladding requires a space between the finish decking surface and the bottom edge of the siding, I install L-shaped aluminum or PVC coil stock flashing to cover and protect the black EPDM where it turns up the wall. By selecting a color that matches either the decking or the siding, the flashing becomes barely noticeable when the finishes are installed (**Figure 6**).

Tapered Strips for Drainage

The EPDM drainage troughs end when the membrane rides up and over the ledger. When the decking is installed against the house and over the ledger, there is no space beneath the boards to let water drain through and dry. To provide a gap, I fasten $\frac{3}{8}$ -inch-thick by 2-foot- to 4-foot-long tapered strips of

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Figure 5. Working from the center, workers use cap fasteners to attach the membrane to the joists (top). A strip of self-adhering flashing tape covers the joints between the scuppers and protects the rim joist (above).

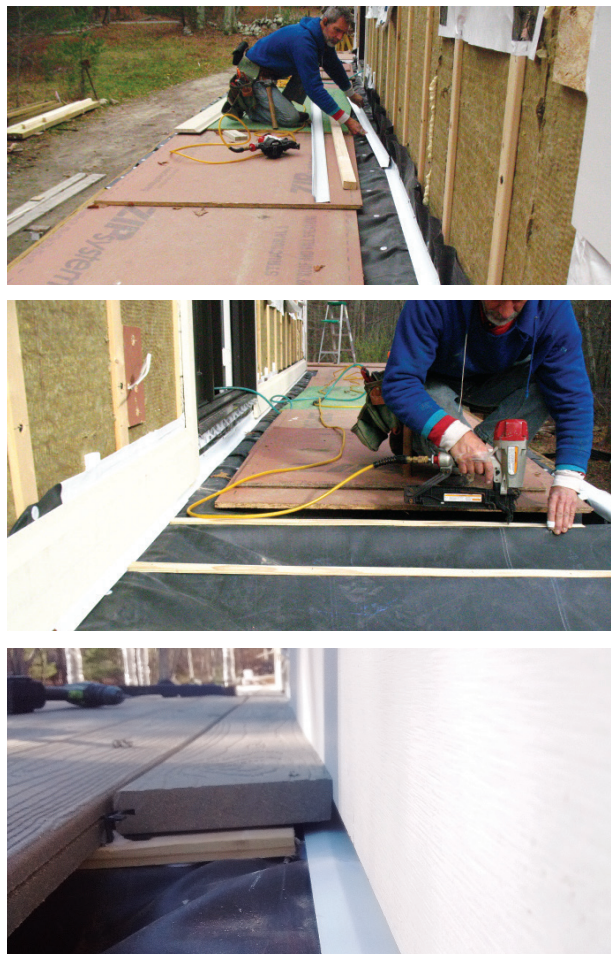


Figure 6. Aluminum flashing covers the joint where the membrane turns up the wall (top). Tapered PT strips installed over the joists provide drainage (center). Some siding requires a gap between its bottom edge and the decking, but not in this case (above).

pressure treated lumber over the EPDM at each joist location with stainless steel staples. Any water that enters the joint between the decking board and the house can drain onto the membrane instead of being trapped between the decking and flashing.

A similar situation occurs over the rim beam, where there's no gap between decking and membrane to let water drain. The driving factor to how I approach this problem is how dry I want the space beneath the deck to be at the outside edge. Because leaks that occur at the outside edge of the deck are less likely

to cause damage than those against the wall, I sometimes just apply the decking directly over the beam, sandwiching the EPDM between. Other times, I apply PT wood strips over the full length of the joists from the wall to the outside of the rim beam—this lets water drain and dry over the ledger and the beam. And sometimes I install reverse-tapered wood strips with a 1/4-inch butt over the beam and tapering towards the house.

The tapered strips may also meet the ventilation requirement for some types of plastic and composite decking brands, which require a minimum ventilation

area beneath the boards. Always check with the manufacturer's requirements when selecting decking to see if they permit under-deck drainage systems.

Under the Deck

When the space under the deck will be used for storage, there's usually no reason to apply a finish ceiling. But when the area will be used as outdoor living space, I use a couple of different finish combinations, depending on the client's budget and preference. The most economical finish is to wrap the beam and gutter with aluminum or vinyl coil stock and then

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Figure 7. To finish the system, the gutter can be boxed in and the bottom of the joists covered with vinyl soffit (above left). Another option is to install a dropped beadboard ceiling that covers the gutter and rim joist (top right). Though not required, a ceiling applied to the bottom of the joists gives the space a finished look (above right).

install vinyl soffit beneath the joists. A more attractive finish is to box the beam and gutter in with 1-by PVC, composite, or wood trim boards and cover the underside of the joists with tongue-and-groove, shiplap, or other profiled ceiling boards (**Figure 7**).

Maintenance

Leaves and debris will inevitably fall between the deck boards and down into the troughs. Regular rain events will usually flush everything clean, though decks that are located under coniferous or small-leaved deciduous trees may col-

lect more debris than an ordinary rain will wash away. So I always install access points for periodic washing. The simplest approach is to face-screw one or two courses of decking along the house and just inside the rim beam. The screwed boards can be removed so the drainage system can be hosed out and the gutter cleaned, if necessary.

Lifespan and Cost

EPDM roofing has a 20-year to 30-year or longer lifespan when exposed on a flat roof. Given that the membrane is shaded and protected from damage by the deck-

ing, I'm hoping for a 50- to 75-year lifespan for my drainage systems.

Materials for an EPDM drainage system—0.45 membrane, gutter, and accessories—cost about \$0.75 per square foot. Vinyl soffit material and accessories to finish the ceiling cost about \$1 per square foot. Solid cladding and trim to finish the ceiling and box the beam and gutter cost between \$2 and \$4 per square foot (or more), depending on the materials. ❖

Mike Guertin is a builder and remodeler in East Greenwich, R.I., and a frequent presenter at JLC Live. Photos by author.