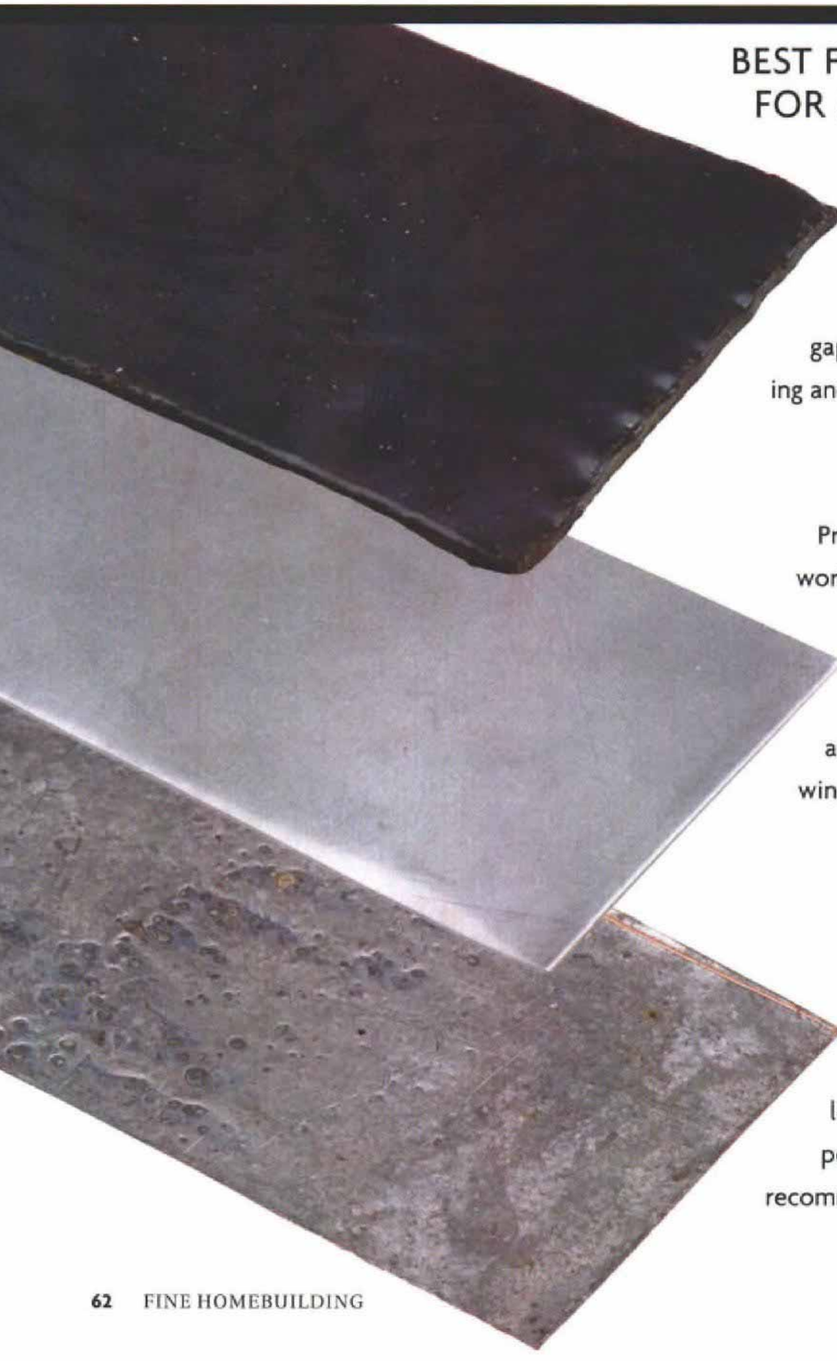
Flashing Brick-Veneer Walls

Good masonry work blocks most rainwater, and proper flashing details expel what does get through

BY DOUGLAS R. STIEVE



BEST FLASHINGS FOR MASONRY

Flexible membranes wrap all openings and bridge the gap between framing and metal flashing.

Pricey and hard to work, stainless-steel flashing resists galvanic corrosion around aluminum windows and doors.

Durable, nonstaining and easily worked, lead-coated copper is the author's recommended flashing in most cases.

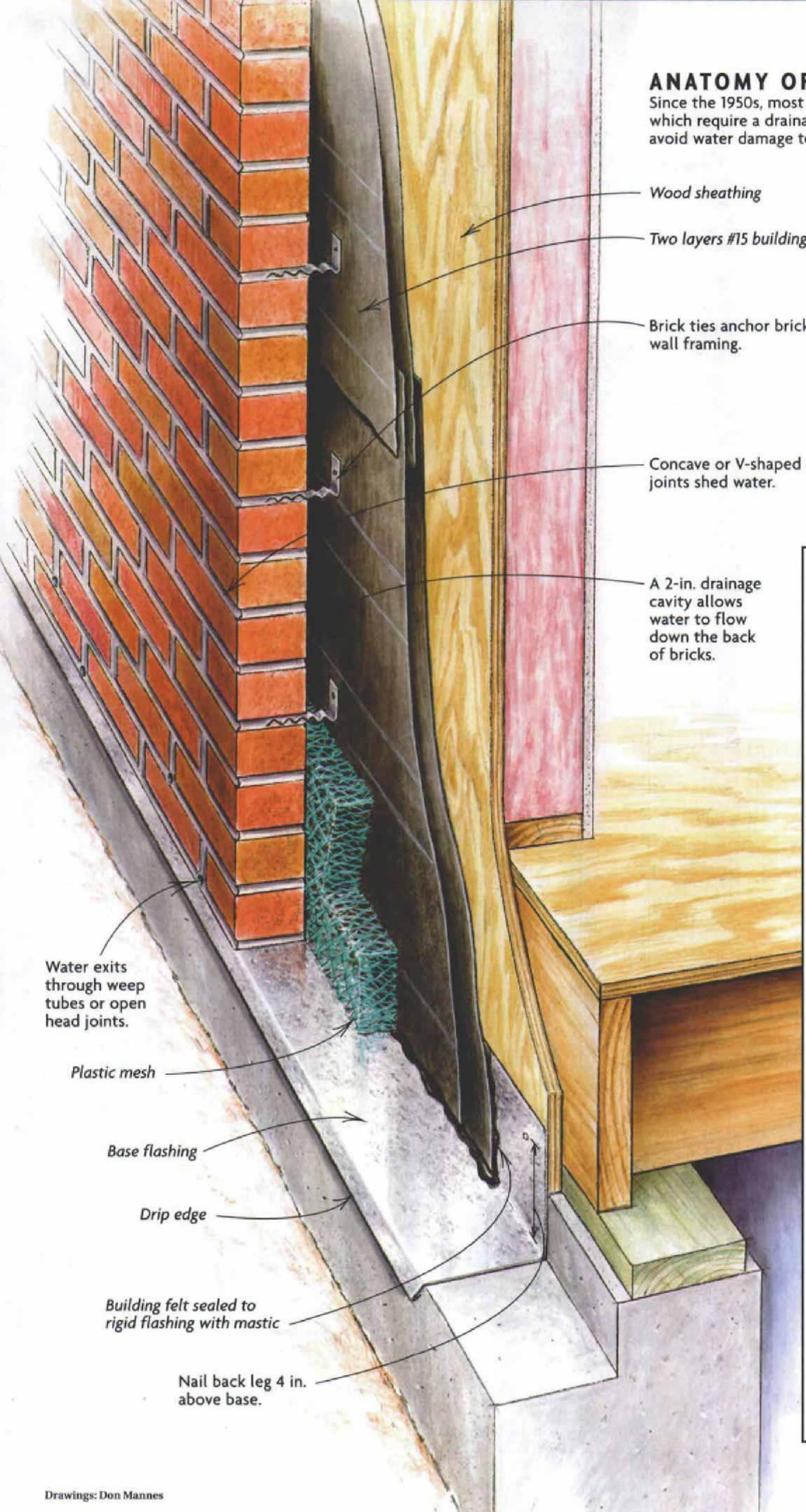
Bricks and mortar may seem impervious to water infiltration, but they are not. Bricks and mortar themselves absorb water. Gaps between bricks and mortar can channel water into the wall of a house. Window and door openings invite in even more water. Most water infiltration can be prevented, but not all of it. So the real key to keeping house interiors dry is the way water flow is managed after it gets behind the brick.

Prior to the 1950s, most brick walls were thick, load-bearing walls consisting of at least two wythes of brick (a wythe is one thickness of brick). The bricks and mortar absorbed water, but usually not enough that it seeped inside. Since the '50s, most residential masonry walls have been brick veneers, not load-bearing walls. Starting on the outside, modern walls usually consist of a single wythe of brick, a 2-in. drainage cavity, tar paper, wood sheathing and then a standard wood stud wall (drawing facing page). Some people use housewrap in place of tar paper; but I don't because housewrap is not waterproof. Similarly, some people use only a 1-in. drainage cavity, but a 2-in. cavity helps to prevent water from bridging across to the sheathing. The drainage cavity allows water to flow down the back of the brick onto flashings that direct the water back to the exterior.

At least that's the plan. Inadequate flashing details allow water to enter the framing, where it can rot the wood, soak the insulation and stain the ceiling or walls. Brick-veneer walls directly above occupied sections of the home (where brick runs over a bay window, for example) are especially susceptible to problems. Any breakdown in the design or installation of the flashing and/or

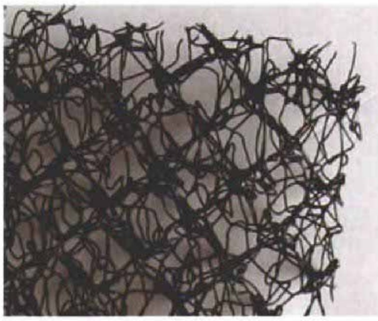
ANATOMY OF A BRICK-VENEER WALL

Since the 1950s, most brick walls have been veneer walls, which require a drainage cavity and careful flashing to avoid water damage to the wood framing behind.



CATCH MORTAR DROPPINGS TO KEEP WEEP HOLES CLEAN

Several manufacturers sell plastic mesh to break up and deflect mortar droppings before they reach the bottom of the cavity and block weep holes. The meshes come in different heights and thicknesses, and are dropped into the cavity as the first bricks go up.



Mortar Break by Advanced Building Products (800-252-2306; advancedbuildingproducts.com).

Mortar Net by Hohmann & Barnard Inc. (h-b.com; 631-234-0600).

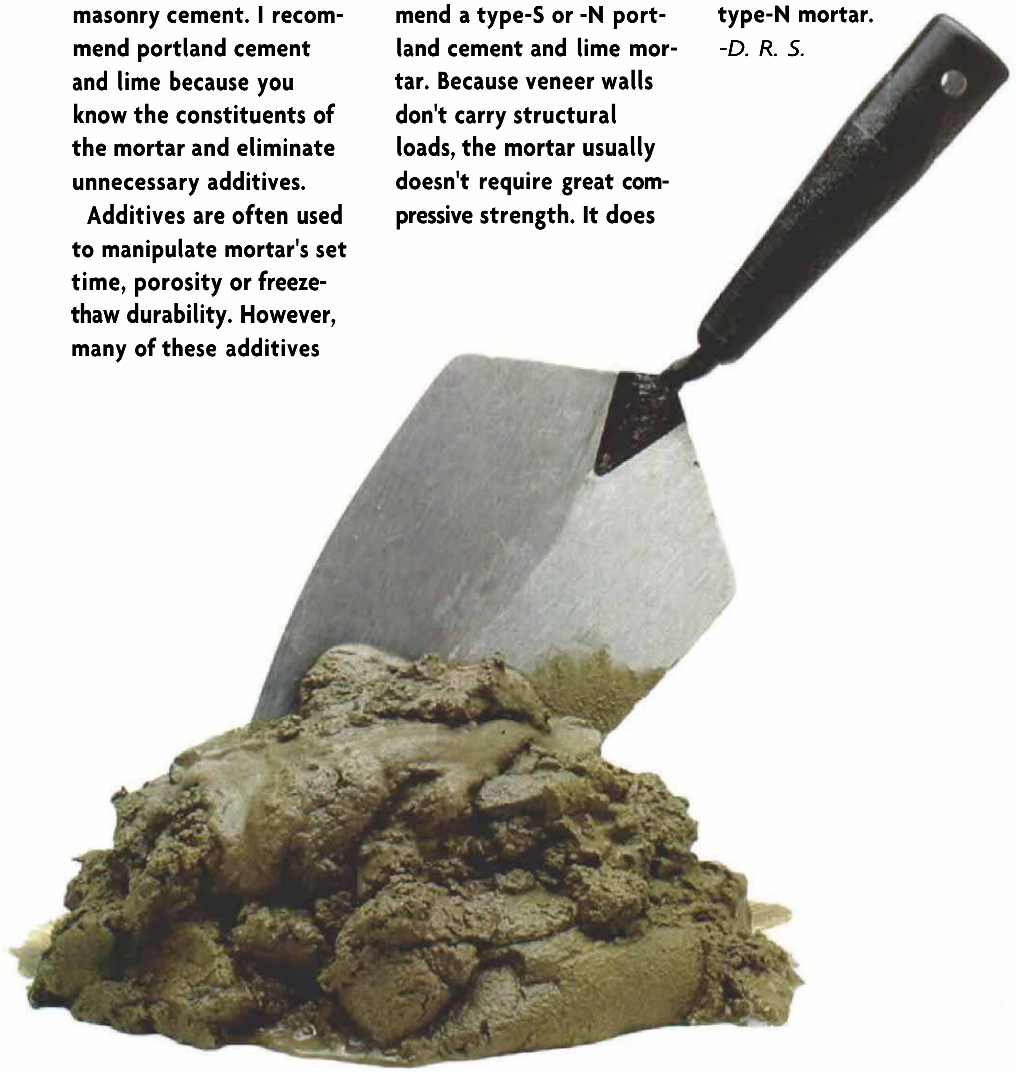
Drawings: Don Mannes

Match the mortar to the brick

The right kind of mortar for the bricks is crucial. The two most popular forms of mortar are portland cement and lime; and masonry cement. I recommend portland cement and lime because you know the constituents of the mortar and eliminate unnecessary additives.

Additives are often used to manipulate mortar's set time, porosity or freeze-thaw durability. However, many of these additives are unnecessary, and using them improperly or in the wrong combination may damage the wall. To keep it simple, I usually recommend a type-S or -N portland cement and lime mortar. Because veneer walls don't carry structural loads, the mortar usually doesn't require great compressive strength. It does need the flexibility that types S and N provide. However, check local building codes before using the weaker type-N mortar.

-D. R. S.



weep provisions of the exterior wall at these locations can cause disaster.

Tar paper and flexible membranes protect the sheathing and openings

As an architect who specializes in fixing failing buildings, I've seen a slew of details that don't work. Here are some details I specify to ensure the longevity of these buildings.

I begin with two layers of #15 tar paper on the sheathing, lapped to shed water downward (drawing p. 63). The second layer provides redundancy in case of a tear that's not repaired before the masonry veneer goes up. Peace of mind and fewer callbacks are worth the cost of a second layer of tar paper.

Tar paper alone, however, isn't enough around windows, doors and mechanical penetrations. Metal flashing and flexible waterproofing membranes are needed to seal these vulnerable openings. These flexible membranes are composite materials, usually containing rubberized asphalt with a cross-laminated polyethylene-film reinforcement. One such product is Bituthene 3000 by W. R. Grace (www.graceconstruction.com; 800-444-6459). Some people use Grace's roofing underlayment, Ice & Water Shield, for flashing, but Bituthene 3000 is a little thicker and stronger (photo p. 62). Some manufacturers offer flexible through-wall flashing to take the place of rigid metal. I don't recommend this because metal is more durable and more easily formed into a drip edge.

Rigid flashings channel water out

Combining rigid-metal flashings with flexible waterproofing membrane is the best way to divert water from wall penetrations (drawing facing page). Metal stands up well to the installation of the window or door and provides a clear exit drain.

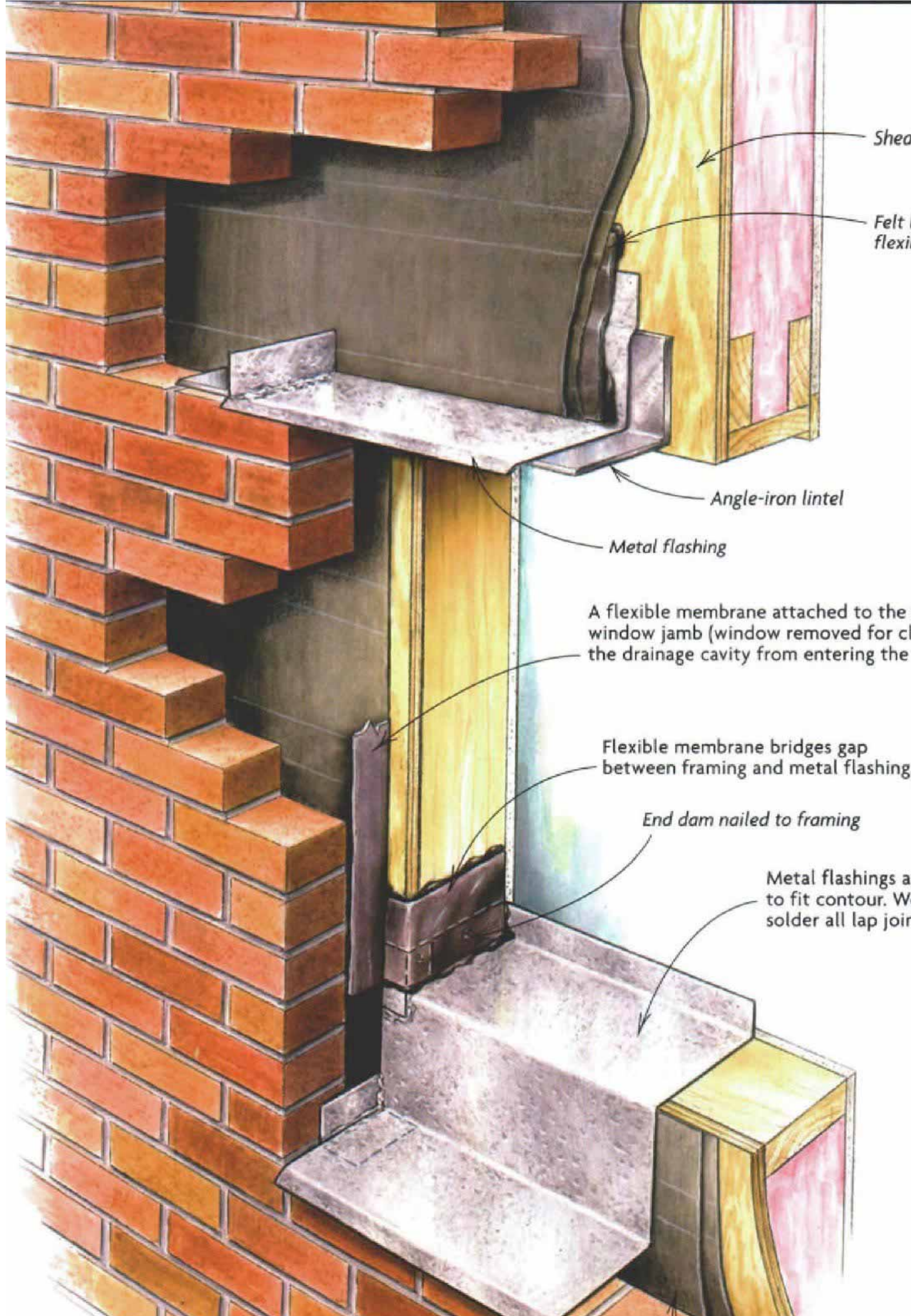
Metal flashings come in a variety of forms. I prefer 16-oz. lead-coated copper because it won't corrode. Lead-coated copper is easily formed with a metal brake either in a shop or in the field, and watertight seams are easily soldered in the field. The lead coating prevents the copper base material from staining the masonry. Other rigid flashings include kraft paper-laminated copper, type 304 stainless steel (photo p. 62), aluminum and polyvinyl chloride (PVC). The latter two require a caution. Prepainted aluminum is common, but unpainted aluminum will corrode if set in wet mortar. PVC tends to turn brittle and break down over time.

Bending up the backs and sides of the metal flashings to form vertical back legs and end dams prevents water from spilling off the ends of the flashing and down under the windowsill or into the space between the window frame and the adjacent studs. All seams should be soldered or welded watertight. The angle-iron lintel that's typical above a door or window (drawing facing page) should not be relied on to serve as the rigid flashing. The lintels have no end dams to keep water from flowing over the sides, and they tend to corrode.

Because metal flashing can be difficult to install tight to adjacent wood studs and sheathing, flexible waterproofing membrane should be adhered to the studs and sheathing, underneath the tar paper, and lapped into the metal pan. The window or door should be shimmed slightly off the bottom flashing to allow water to exit between the bottom of the window or door and the flashing.

Water that gets behind the brick must exit at the base of the wall

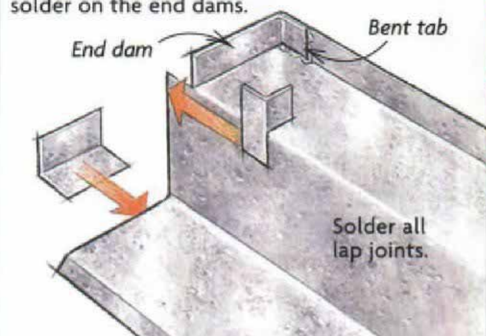
At the bottom of each wall section, the tar paper should lap onto a metal flashing, just as at the windows, adhering to the flashing with the same waterproofing mastic used for flexible membranes and touching the horizontal leg of the metal. The vertical back leg should be nailed directly to the sheathing at least 4 in. above the horizontal leg so that the nail penetration is well above the level of any collecting rainwater. The horizontal leg extends completely to the exterior of the wall



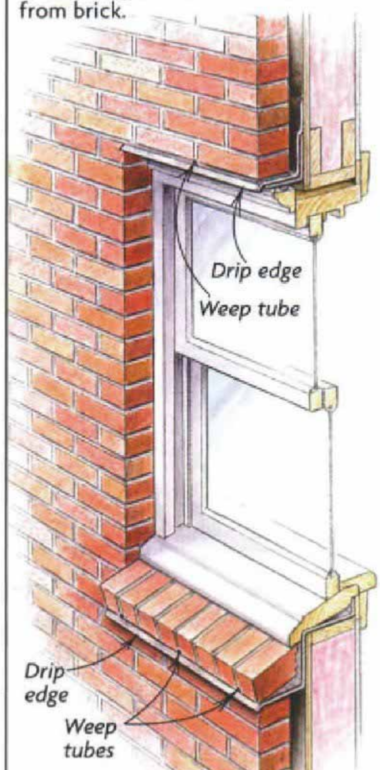
WINDOW AND DOORS

Any penetration in the wall, such as a window, door or air vent, requires careful detailing. Combining the strength of metal and the flexibility of waterproofing membranes adds the most security.

End dams keep water contained
One way to build up windowsill flashing is to bend the main piece on a brake and then solder on the end dams.

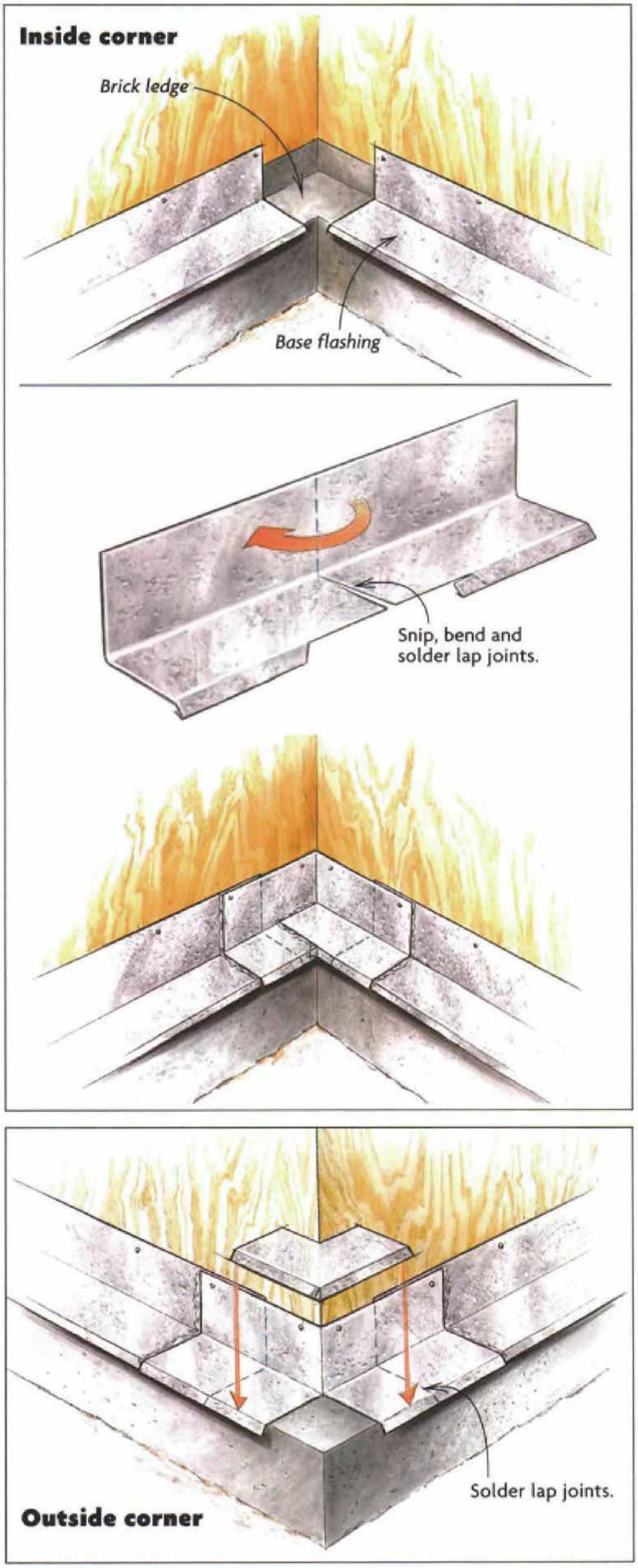


Weep tubes go over as well as under windows
Water drains from weep tubes to drip edges, which lead water from brick.



Base-flashing corner details

Corner flashings can be formed in the field from lead-coated copper. The flashings should be nailed to the sheathing at least 4 in. up the back leg, and building felt or flexible waterproofing membrane should overlap and be adhered to the metal base flashing.



and forms a drip edge to prevent water from traveling around the edge of the flashing and back into the wall cavity.

Metal flashing should wrap continuously around all inside and outside corners (drawing left). Corner flashings can be prefabricated in a shop, but because no building corners are ever perfect, I prefer making the corner flashings in the field so that adjustments can be made for construction tolerances.

To allow water to drain, weep holes should be made in the brick veneer at the level of the rigid flashing, both at the base of the wall and above windows and doors (drawing right, p. 65). Open head joints (the vertical joints between two bricks in the same course) provide an effective weep system, but they also create a wide-open path for wind-driven rain to blow into the wall. Oiled rods that are laid in with the mortar and then removed after the mortar cures form weep holes that don't present such a big target for rain.

Plastic weep tubes spaced at 16 in. o. c. (or every other head joint) also work well. Installing two rows of weep tubes, with the second row a single course above the first, provides some redundancy in case the lower section of the wall fills with mortar droppings. Plastic weep tubes should be laid in the head joints before the brick is pressed into place. Shoving weep tubes into an already formed joint fills them with the mortar.

Properly laid brick sheds the bulk of the water

Because the mortar in the head joints isn't compressed as much as that in the horizontal bed joints, head joints are not always completely filled with mortar and thus can invite water infiltration. To be as watertight as possible, joints between bricks should be completely filled with mortar. Mortar should be packed into the head joints without spilling into the drainage cavity.

Mortar droppings at the bottom of the drainage cavity often block weep holes. There are a few techniques to limit mortar droppings. Mesh materials inserted into the drainage cavity catch the droppings before they get to the bottom (photos p. 63). If enough mortar accumulates, however, it covers these products and block the drainage cavity. Back-beveling the mortar for bed joints (striking it so that it angles away from the cavity before stacking on the next course) makes for a smaller amount of mortar droppings in the first place. □

Douglas R. Stieve is an architect with Wiss, Janney, Elstner Associates in New York City. Photos by Roe A. Osborn.

Some types of brick call for wetter or drier mortar

All bricks absorb water through microscopic pores, and do so at different rates. Knowing the rate at which bricks absorb water from mortar, their initial rate of absorption (IRA), can reduce the amount of cracking and separation that occurs later.

If the brick absorbs water too quickly from the fresh mortar, little water will be left to hydrate the portland cement in the mortar properly, and subsequent cracking within the mortar may occur. If the brick absorbs too little water, however, a weak bond forms, causing the mortar to separate from the brick.

Mortar recipes can be adjusted, if necessary, to accommodate the brick's IRA, which can be obtained directly from the brick manufacturer. A brick with an IRA above 25g per minute per 30 sq. in. is considered very absorptive, and an IRA below 5g per minute per 30 sq. in. is considered low. For a very absorptive brick, make one of the following adjustments:

- Add a little more water to the mortar and wet the bricks before installation (except in cold weather).
- Add more hydrated lime within the limits of ASTMC270.
- Use a workability-enhancing admixture that conforms to ASTM C1384.

For a low IRA, the brick manufacturer's recommendations may include one or all of the following adjustments:

- Reduce the amount of water in the mortar.
- Keep the brick dry before installation.

For more details on bricks, mortars and techniques, contact the Brick Industry Association (703-620-0010; www.bia.org) and the American Society for Testing and Materials (610-832-9585; www.astm.org).

-D. R. S.