New York Landmarks Conservancy

Common Bond

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The newsletter of the Sacred Sites Program on maintenance and preservation for caretakers of architecturally significant religious buildings.

The Rev. William Shillady, Pastor of the Mamaroneck United Methodist Church unveils a new roadside marker in front of the church following a special service commemorating the listing of the church on the National Register of Historic Places. *See page A-1 for details.* *Edward T. Mohylowski*

Dear Reader:

Technical concerns are stressed in this issue. The technical feature, **What's So Important About Flashing?,** clarifies the indispensable role flashing plays in keeping buildings watertight. The **Ask the Technical Preservation Services Center** column addresses a Long Island congregation's question about waterproofing a white marble church facade.

Judson Memorial Church, located in New York City's Greenwich Village Historic District, is the subject of this issue's **Preservation Profile.** The congregation, one with a long-standing commitment to social justice, recently completed a major renovation of this historic McKim, Mead & White church overlooking Washington Square.

Rural congregations in upstate New York may benefit from a new grant program administered by the Preservation League of New York State. A number of congregations have already received funding (see page A-4) from the Rural New York Historic Preservation Grant Program. This program provides matching grants of up to $5,000. See **Financial Assistance** on page 9 for information.

The Rev. Thomas F. Pike
Chair, Advisory Committee

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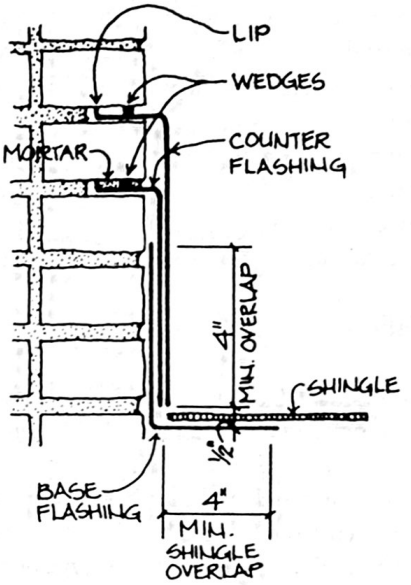
What's So Important About Flashing?

Various exterior building elements, such as roofs, walls, foundations, windows, and doors, collectively form a protective "envelope" that shelters the interior of a building, protecting it from the ravages of the exterior environment. Water, among all the other possibilities, is the element that poses the greatest threat to a building. That is why so many building elements and details function either to direct water away from, or to keep water out of, buildings. A sound roof with an appropriate drainage system unquestionably constitutes the first line of defense against water penetration. But to be effective, a good roof must include items other than just the roofing material. One of them is flashing. The importance of flashing is often minimized, and its installation is sometimes ignored, especially in poor roofing installations. The purpose of this technical article is to explain flashing and clarify its indispensable role in keeping buildings water-tight.

What is Flashing?

Flashing is a construction detail used to seal and protect joints in a building from water penetration. The joints created by the intersection of the roof and roof-mounted structures and projections, such as parapets, hatches, skylights, chimneys, vent stacks, or towers, are among the most vulnerable areas of roofing systems. They constantly expand and contract in response to changes in humidity and temperature. The greater the number of such projections, the greater the potential for serious leaks. Flashing is used at these intersections to keep rainwater from leaking into the building. It makes joints at these junctions watertight, while at the same time allowing the natural expansion and contraction of materials to continue. It operates on the principle that, in order to penetrate a joint, water must work itself upward against the force of gravity, or in the case of wind-driven rain, would have to follow a tortuous path during which the force of the wind would be dissipated.



National Slate Association

Cross-section of a flashing detail showing the intersection of a roof and a wall or chimney. This flashing is unusual in that the cap flashing is doubled.

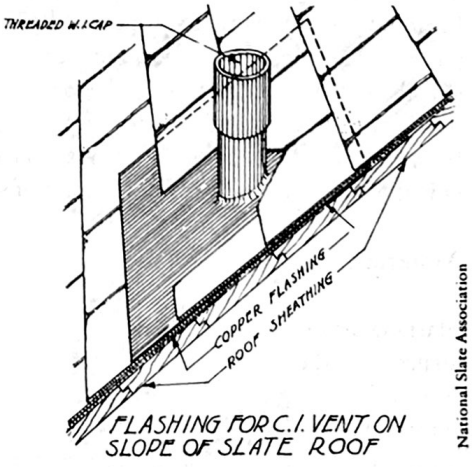
How Flashing Works

Flashing is installed at intersecting roofs and parapets and walls. It typically consists of angled strips of corrosion- resistant metal that overlap in such a way as to discourage water entrapment. Flashing is composed of two parts—the base flashing and cap flashing (which is sometimes referred to as counter flashing).

Base Flashing is the portion of the installation attached to the roof itself. It is "L-shaped" with one leg extended underneath the roofing material at least six inches, preferably more, and the other leg extending up the abutting vertical surface.

In quality flashing installations, cylindrical roof-mounted structures, such as vent stacks, use base flashing composed of special sleeves that are integral to the vent stack. However, since this type of flashing is expensive, a black ring of roofing compound is more often used. Roofing compound is unsightly and deforms easily with changes in temperature. Despite the expense, it is usually best to flash these structures properly with metal base flashing compatible with the rest of the roofing system.

Cap Flashing is attached to the projection or wall with which the roof intersects and overlaps with the base flashing by at least six inches, so that water cannot penetrate this vulnerable joint. In masonry buildings, the cap flashing is imbedded in the "reglet"–the groove formed by the mortar joint in a wall or parapet. In wooden buildings, flashing is usually nailed to the underlayment and its upper edge protected by clapboards, shingles, or whatever wall sheathing is being used on the building. When flashing is installed properly, the bottom edge of the cap flashing is usually turned by about 1/2 inch to stiffen the long strip of metal against the wind.

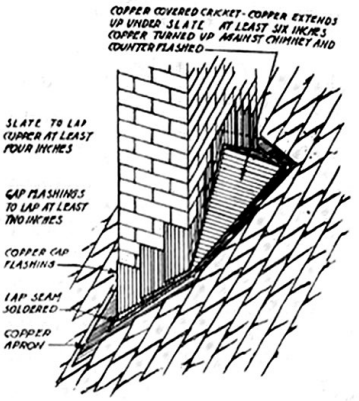


National Slate Association

This drawing illustrates the best way to flash a cylindrical vent.

Where cap flashing follows the slope of the roof, it is arranged in steps--with each step overlapping the one immediately below it. In slate, tile, or asphalt shingle roofs, the base flashing may also be woven into the courses of the roof sheathing in order to make a more effective watertight joint.

The base and cap flashings are, or should be, independent of each other to allow for differential movement between the wall and roof structures. However, due to incorrect installation or damage from ice or vandalism, they occasionally bind. If openings or bends in the joints develop between the base and cap flashings, the joints will not move properly. The joints should be kept flexible, but tight.



National Slate Association

This flashing for a chimney on a sloped roof employs a copper-covered cricket to divert water away from the face of the chimney.

Saddles or Crickets

Flashing at tall structures mounted on pitched roofs, such as chimneys, should employ a "cricket" or a "saddle." A cricket is a ridge installed between the roof slope and the protruding structure that deflects the flow of water around the protruding structure and keeps snow and dirt from collecting. If the cricket is being used in a small area, such as against a chimney, it is usually treated as a modified form of base flashing, extending under the adjacent roof sheathing in the same manner as normal base flashing, and turned up against the vertical surface and counter flashed. If a cricket is abutting a large vertical surface, such as the wall of a tower, and is exposed to view, it is usually treated as part of the roof structure and sheathed in the same manner as the roof.

Valleys

Valleys, which occur where different roof slopes intersect, are problem spots because the geometry of roof intersections often creates low spots, particularly at the eaves. Water can pond and ice can dam at these low spots, get underneath the adjacent roofing material, and cause severe damage. Most valleys are lined with a heavy-gauge, corrosion-resistant metal, forming a type of flashing. This lining may or may not be visible depending on the type of roofing material used and the detailing of the roof intersections. If valley linings are not extended far enough beneath the adjacent roofing materials, leaks may occur when the valleys are backed up by ice dams in the winter. This condition requires the eventual replacement of the valley lining.

"Open valleys" are flashed by laying strips of sheet metal in the valley angle and lapping the adjacent roofing material over it. The width of the valley increases as it approaches the bottom to accommodate the increased flow of water.

"Closed valleys" are only possible with slate, tile, or asphalt shingle roofs. They are far less common than open valleys, and the flashing required is far more complex. In closed valleys, the roof sheathing is brought tight to the valley line, and small pieces of flashing are arranged under each slate or tile. This flashing is invisible, but still absolutely essential to keep the joint watertight. Instead of individual pieces of flashing, long, overlapping strips of flashing are occasionally used in closed valleys. However, this mode of flashing tends to be less effective than using smaller, individual pieces of flashing for each course of slate or tile.

Edward T. Mohylowski

This photograph shows the flashing for an open valley where two roofs meet. The width of the valley increases as it approaches the eaves in order to accommodate the increased flow of water.

Materials

Flashing may be either concealed or exposed. Flashing concealed within the construction of the building may be of either sheet metal or a waterproof membrane. Exposed flashing typically consists of pieces of sheet metal or impervious, flexible membrane material. Metal exposed flashing is usually of the following types: aluminum, copper, galvanized steel (painted), stainless steel, lead, terne-plate, or zinc alloy. Roofing felts are also used occasionally for flashings in certain types of roofs, such as asphalt shingle roofs or flat, built-up roofs.

The choice of the appropriate material to use for flashing depends on several criteria. What is the most cost-effective material in a given situation? What is the most durable? Will the material being considered be visible to the observer? Is it historically appropriate to the building and the type of roof? Are the materials used for the flashing chemically compatible with the materials they will come in contact with? Copper, for instance, is the most traditional material used for flashing. However, it cannot be used with roofs composed of dissimilar metals due to "galvanic action," which sets up a chemical reaction between the copper and the iron in the roof sheathing. By the same token, it cannot be nailed to the roof deck or sheathing with iron nails.

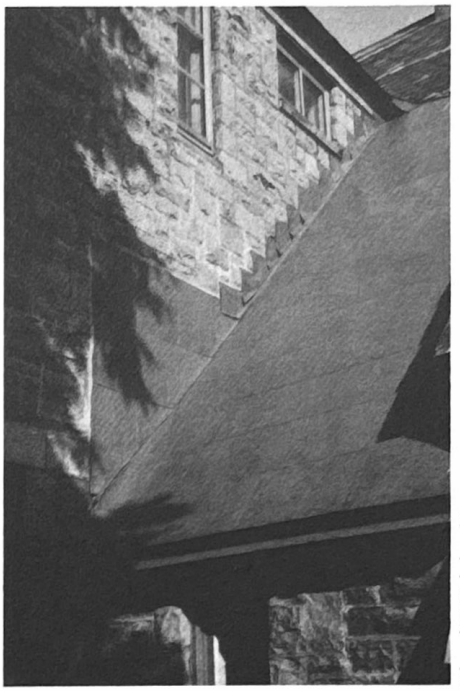
Exposed metal flashing affects the appearance of a building; its color, texture, and pattern should be considered. It should be durable, weather-resistant, and maintenance-free. It must not stain or be stained by adjacent materials or react chemically with them. Expansion joints should be provided to prevent deformation.

Copper is the most popular material used for flashing. It is easily worked and shaped, and adjusts itself to temperature stresses. It requires no painting or other treatment, although it occasionally is painted to hasten the development of a natural green patina. Generally it is considered extremely durable. However, copper is susceptible to deterioration by "acid rain" and therefore deteriorates more rapidly these days than in the past. Coating copper with lead enhances its resistance to deterioration.

Terne-plate (often referred to as "tin" although this is technically inaccurate) is also common. Terne-plate is composed of a base metal of iron or steel, which is coated with a mixture of lead and tin. Terne-plate has traditionally been painted and requires regular painting in order to prevent corrosion.

Zinc, although more rarely used for flashing in this country, is extremely durable and generally requires little maintenance. As zinc oxidizes, it forms a protective coating, dark grey in color, that is extremely resistant to weathering.

Roofing felts are strips of felt impregnated with roofing compound. Although appropriate for certain types of built-up roofing, particularly on flat roofs, this is probably the least desirable material to use for flashing. Roofing compound expands and contracts in response to changes in temperature and deforms easily, often rendering the flashing useless within a year or two. Although usually cheaper to install initially than metal flashing, it constantly has to be renewed in order to remain effective, and thus any initial savings are usually nullified by the subsequent cost of constant replacement. In addition, roofing felts are not usually appropriate for use on historic buildings with visible roofs, particularly slate, tile, or standing seam metal roofs.



Edward T. Mohylowski

This photograph illustrates the stepped pattern made by flashing where the roof meets a vertical surface, such as a wall. In this particular instance, the flashing is painted bright red, making this functional element an important ornamental feature of the building.

Flashing Repairs

Failure of the flashing system is usually a major cause of roof deterioration. Flashing should be carefully inspected for failure caused either by poor workmanship, thermal stress, or metal deterioration (both of the flashing material itself and of the fasteners). With many roofing materials, the replacement of flashing on an existing roof is a major operation--one that may require taking up large sections of the roof surface. Therefore the installation of top quality flashing material on a new or replaced roof should be a primary consideration. Remember, some roofing and flashing materials are not compatible.

When repairing any metal flashing, avoid the temptation to use roofing compound (black "goop") to stop leaks. This often-used treatment is not a long-term repair and usually causes more damage to the basic material. Roofing compound becomes brittle and inflexible within one year of exposure to the weather, and whatever limited effectiveness it may have quickly disappears. More importantly, the chemi-

cal interaction between the compound and the metal often accelerates deterioration and causes extensive corrosion. Coating valleys with roofing compound should also be avoided because roofing compound hides the condition of the valley lining and creates irregular surfaces that inhibit good drainage.

Holes in copper flashing are best repaired with a soldered patch. Aluminum flashing is difficult to solder, so holes have to be covered by a "cold" patching methods. A number of commercial sealing products used for patching metal gutters, such as gutter tape, can be used for a "cold" patch. You can also make a temporary patch with sheet metal and flashing cement. Clean the metal with a wire brush or steel wool. Cut a sheet metal patch that overlaps the hole at least three inches on all sides. Coat the pack of the patch with flashing cement. Press the patch firmly into place--just hard enough so that the cement doesn't ooze onto the roof. Paint the patch to match the rest of the flashing. These patches are strictly temporary and should be inspected at least twice a year to make sure they are still holding. If cap flashing comes loose from the reglet, it should be repaired by re-wedging and sealing the reglet. The reglet can be filled with mortar (preferred) or a high-quality sealant, such as urethane caulk.

Conclusion

Any roofing system should be recognized as a membrane that is designed to be self-sustaining, but that can be easily damaged by intrusions such as pedestrian traffic or fallen tree branches. Generally damage from water or ice is less likely on a roof that has good flashing on the outside.

This article was written by Edward T. Mohylowski, Editor of Common Bond, *and Christopher Jenks, Consulting Editor for* Common Bond.

Ask the Technical Preservation Services Center

We are considering applying a waterproof coating to some or all of the marble facades of our church in order to protect the roof trusses and interior finishes from water damage. Is this a good idea?

The Rev. Monsignor Edmond J. Trench, Pastor
Sacred Hearts of Jesus and Mary R. C. Church
Southampton, New York

Sacred Hearts of Jesus and Mary R.C. Church

Sacred Hearts of Jesus and Mary R.C. Church

Waterproof coatings are chemical solutions that keep water from penetrating the outer skin of a building stone. They are useful in some applications. However, they can also have undesirable side effects, and should only be used with caution.

The marble with which your church was constructed has a sound track record, especially when used in a non-industrial area such as Southampton. It is dense and strong, and is relatively fine-grained and free of silicates–which is to say that it should weather well under normal conditions. These properties of the stone were understood at the time of construction. However, marble is susceptible to deterioration caused by "acid rain," which was not a serious problem when the church was built. In addition, your church does present some unusual design conditions. Since your belfry is open to the weather, its marble walls are exposed to the weather on both the outside and the inside. Given these circumstances, higher-than-normal levels of moisture should be expected within the tower walls.

Nevertheless, given the quality of the stone, I have to question whether a surface waterproofing treatment is necessary, and I suspect it might do more harm than good. Is the recommendation to waterproof based on a comprehensive analysis of the situation? Have you determined without doubt that the source of the moisture rotting the ceiling joists and damaging the interior finishes is dampness