Advanced Housing Research Center

Forest Products Laboratory
Madison, Wisconsin

Tips and Techniques

The Ins and Outs of Caulking

In maintaining wood or wood-based siding and wood-trimmed windows and doors, the question of whether or not to caulk frequently arises. (The term wood-based siding in this article refers to both wood and wood-based siding, such as hardboard and plywood; shingle siding refers to both shake and shingle siding.) Proponents of caulking argue that caulk prevents rainwater from leaking into the siding system. Critics argue that caulk can trap water by inhibiting evaporation and drainage. Both views can be correct, depending on the circumstances.

Rainwater Management With Wood-Based Siding

Wood-based siding is expected to shed water, but it is usually not expected to act as a perfect barrier. Individual pieces of siding in good condition resist water penetration, but water can potentially enter between pieces, where siding meets trim or window or door casing, at penetrations through walls, and at intersections of walls with roofs and decks. In addition, when horizontal lap or shingle siding is exposed to rain, water can be expected to rise up the back of siding as a result of capillary flow and wind-driven rain. Water that is sorbed into siding or that wets the back of siding through capillary rise or minor leaks will eventually evaporate. However, evaporation is not immediate—the siding will retain the water temporarily

A continuous water-resistant material such as building felt or synthetic fiber membrane is often used as a secondary barrier to prevent liquid water that gets past the siding from moving further into the wall. The water stays on the barrier material until it evaporates or drains off. Water drainage can occur at the laps of horizontal lap siding. It can also occur if "weepage" paths are designed into the siding system. Finally, water can drain off the secondary barrier to the base of the wall, especially if the siding is installed over furring strips or a synthetic drainage mat.

Large-panel wood-based siding is sometimes installed without a secondary barrier. This practice is controversial; it appears to be effective where exposure to rain is limited (e.g., a single-story building with roof overhang) and if special precautions are taken at panel edges and joints. These installations are intended to function primarily as face-sealed systems, although some degree of water retention by the siding followed by evaporation also occurs. Successful dissipation of water by evaporation depends, in part, on the finish system used.

Siding finished with a film-forming finish generally dries more slowly than siding finished with a penetrating finish. The extent to which water management relies on temporary retention and evaporation depends on the system used to finish the wood.

Caulk can be beneficial in preventing water entry, but only if the caulk seals remain intact. Applying caulk to areas that would otherwise permit water to drain from behind siding to the exterior is definitely counter-productive.

Caulk and Paint Performance

The performance of film-forming finishes such as paint on wood is influenced by the moisture content of the wood. Water absorption through the end grain is a common cause of finish failure. Sealing the end grain with a water repellent is a proven method of extending the service life of a film-forming finish. Sealing joints with caulk can also limit water absorption and thereby improve performance of the paint. This strategy depends on the caulk seal remaining intact, in part because caulk can slow drying. If a leak occurs at a failed caulk seal, the caulk then

etards drying. Therefore, when caulk seals are used to protect siding, trim, or casing from water absorption, they must be installed carefully and maintained properly.

Potential Locations for Leaks

Fenestration units—As indicated, the interface of wood-based siding with window or door (fenestration) casing is a potential entry point for water. This is particularly true at window and door heads. Head casing should slope to the exterior, extend beyond the siding and fenestration unit, and have a drip edge. In lap siding installations (horizontal lap and shingle), incorporation of metal head flashing, which is integrated shingle-fashion with the secondary barrier (building felt or synthetic fiber membrane), is a common and often effective method. Metal head flashing should not be caulked. Any failure between the caulk and the siding above will serve as a water entry point, and the caulk will then serve as a dam, preventing water drainage. The dammed water may then spill off the ends of the head flashing, along (and perhaps behind) the vertical casing. Improperly detailed or nonfunctioning head flashing can result in substantial water leakage.

Window units may leak water and are sometimes designed to accommodate leakage. These "draining" windows must be installed to allow a drainage pathway, and caulk must not block this pathway. Blocking drainage pathways with caulk will cause leakage into the wall.

Vertical trim and siding interface—Water entry through the interface between vertical trim and siding is not likely to be significant, except when siding is installed diagonally (see Siding orientation). Nevertheless, water entry at this interface is possible. Provided these joints do not function as drainage paths, caulk seals at these locations will most likely be beneficial. However, they will not be beneficial if they fail. If the caulk seals fail, they may admit water and are likely to impede drying, possibly enough to cause problems at ends of siding, in sheathing and in window units. Manufacturers of wood composition siding usually prescribe caulking of these interfaces. Caulk should always be applied carefully and maintained properly, as described later.

Other locations—Penetration through walls and intersections of walls with roofs and decks can be leakage points. These areas require well-designed and installed flashing. Penetration of exterior walls by framing members (e.g., cantilevered decks) is particularly troublesome. Such a design, if attempted, requires use of complicated soldered metal flashing (caulk by itself is inadequate). Small penetrations, such as hose spigots, are an exception. It is appropriate to caulk such areas, although they rarely leak significantly even if not caulked.

Special Considerations

Siding orientation—Special problems arise with diagonally installed board (lumber) siding. For such siding, the potential for water leakage at vertical trim is substantial. Lumber trade associations recommend that if siding is to be installed diagonally, then the project must be designed to accommodate the direction of runoff (water can be expected to follow board edges). Caulk seals at vertical trim cannot prevent this runoff from wetting board ends or leaking into the wall. This situation requires the use of flashing and a provision for drainage at vertical trim.

Large-panel siding—Large-panel siding poses its own set of questions in regard to the management of rainwater. This kind of siding is frequently installed before the window and door units are installed; that is, fenestration units are installed over the siding. When this is the case, metal flashing cannot be used at window and door heads. Water management in this situation depends on the use of sloped drip caps and high quality caulk joints (Fig. 1). An advantage of this type of window installation is that "draining" windows are less likely to be installed improperly than when siding is installed after windows are in place. Providing for window drainage outside the panel face is fairly easy, although it may still be possible to block drainage paths if caulk is used carelessly.

Large-panel siding is most often intended for vertical application, with vertical grooving, ship-lapped vertical edges, and square-cut ends.

Sheets of this kind of siding are

typically 8 or 9 ft long. On buildings with higher exterior walls, siding installation needs to incorporate a horizontal joint. This may be done by shimming out the upper panels to allow a shingle-style overlap, or more commonly, by

using Z-shaped metal flashing. Caulking should **not** be attempted at the Z-shaped flashing. Any failure in caulk adhesion to

Figure 1—Site-fabricated sloped drip cap above window with pine brick molding installed over plywood panel siding. Seal at top of drip cap is urethane caulk. Seal has remained functional, but it is beginning to show surface cracking. Drip cap and caulk seal were installed in September 1983; photo was taken in June 1997. the bottom edge of the upper panel will cause the caulk to act as a dam, thereby preventing drainage off the surface of the flashing. The upper panel must **not** rest directly on the Z-flashing (Fig. 2).

Wood composition siding—Wood composition siding (hardboard and oriented strandboard) is subject to irreversible thickness swelling if the edges are exposed to liquid water. Installation instructions from the manufacturer usually specify that all joints in the siding or between the siding and trim be made waterproof (caulked) and may further specify that all cut edges be painted. The Forest Products Laboratory recommends painting all edges and following manufacturer's caulking recommendations, except where a caulk joint would be likely to prevent water shedding or drainage from behind siding.

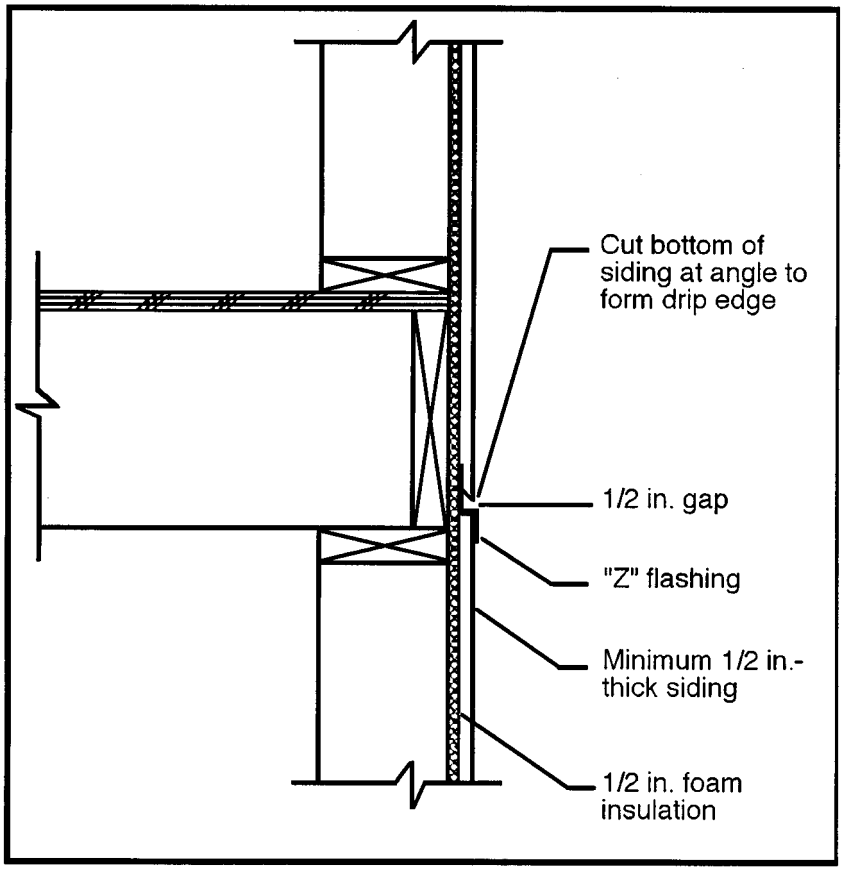

Figure 2—Positioning of sheet siding above Z-flashing. 1 in. = 25.4 mm.

Making Dependable Caulk Seals

Designing and sealing joints has become a well-developed science in the construction of exterior walls of high-rise buildings. This is logical considering that exposure to wind-driven rain can be severe for such buildings and accessibility for inspecting or repairing failed caulk seals is usually difficult. In contrast, designing and sealing joints of wood-based substrates in low-rise construction has not become a "science." Nevertheless, some principles that apply to the design of dependable sealant joints with other materials probably apply to wood-based substrates as well.

Care is needed for the design and application of caulk seals in difficult to reach areas. On single-story buildings, where caulk seals are easily accessible for inspection and repair, a good quality acrylic–latex caulk can be used for caulking vertical trim to siding joints. For joints that are less accessible or where water sealing is critical (such as joints at window heads in large-panel siding installations), the use of a better quality caulk (such as urethane or silicone) is warranted.

The dependability of caulk seals is ensured by five general practices:

1. The caulk should adhere well to the surfaces on both sides of the joint. Clean away dirt or loose materials. Caulk may not adhere well to material that has been treated with a water repellent. Test the caulk on a piece of scrap wood that has been treated with a water repellent to ensure that it will adhere. Caulk adhesion can be enhanced by a priming material; information from the caulk vendor will indicate whether priming is necessary.
2. Wherever possible, avoid three-sided adhesion. Caulk should adhere to only the two surfaces that make the crack in the surface plane, not to a rigid substrate behind the crack. Caulk backer rod is a flexible closed-cell foam material that is formed into long, narrow

lengths, generally of circular cross section. Backer rod is inserted into gaps where caulk seals are to be made; then the rod is caulked over. Backer rod limits the depth of the seal. Depth of caulk seals should not exceed their width. Backer rod can also prevent three-sided adhesion. Where depth of a crack is shallow and backer rod cannot be used, bond-breaker tape is sometimes used to prevent three-sided adhesion.

3. Use flexible caulk that will remain flexible throughout its service life. The surfaces that are being bridged by the caulk can be expected to move somewhat in service. Such movement can be accommodated by a flexible caulk. Conformance with ASTM C920 Class 25 indicates that a caulk has high flexibility and is resistant to weathering. Conformance with C920 Class 12-1/2 indicates lower flexibility, but the caulk is still resistant to weathering.

4. Do not use caulk that has been stored for excessive periods. The caulk manufacturer may indicate shelf life. If it is difficult to force the caulk from the tube, the shelf life has probably been exceeded. However, the ease of dispensing caulk from the tube does not necessarily indicate freshness. Some caulks that have exceeded their shelf life may be pumped easily from the tube but fail to cure. Latex caulk that has been frozen in storage should be discarded.

5. Apply caulk at the proper temperature. A range of acceptable application temperatures will be indicated by the manufacturer. In some cases, the choice of caulk will be determined by temperature at application.

Summary

There is no one answer to the question of whether or not to caulk joints between siding and trim in wood-based siding systems. Dependable caulk seals are essential in some instances, such as at drip caps above windows in large-panel siding without metal flashing or at joints between wood composition siding and vertical trim. Caulk seals are definitely counterproductive in places where they interfere with drainage from behind siding to the exterior. Caulk seals are usually beneficial at junctions of siding with vertical trim, but only if the seals remain intact.

A reasonable approach to maintaining a building is to consider its service history. If the siding/trim system has been performing adequately (either with or without caulk seals), it is logical to continue the maintenance protocol. If leakage or problems with paint performance (with or without caulk seals) occur, it is unwise to immediately assume that caulk seals are either the cause or the cure for poor performance.

Understanding the role of siding, trim, fenestration units, flashing, and caulk seals (where appropriate) in water management is an important step in determining why there are performance problems.