

FLASHING AND SHIELDING

If generous overhangs and peripheral protection are not adequate or possible, shielding or flashing protection may be used. Portions of structural wood members will be visually obscured, but by proper design, these independent shields will offer important protection to exposed members. Many materials can effectively shield wood. Buildings were inspected that had metal, wood, polyethylene, and impregnated felt shielding. Protection for the top, sides, and ends of beams and columns is discussed here.

Metal Flashing

Many architects prefer to flash beam ends with metal, especially copper, because of its sharp lines and decorative effect. Usually, any exposed top and end surface is flashed as a cap unit. Figure 9-6 shows a common approach, the nailing of the metal cap directly to the beam. This causes an uneven expansion-contraction problem, and if moisture gets under the metal, it remains. Corrosion also may occur. Air circulation is always necessary because unusual occurrences such as snow pileup or heavy rains can force moisture into normally protected areas, and only airflow can effectively evaporate this moisture. The insulating effect of airspaces also might provide additional protection by reducing heat transfer. Figure 10-12 shows the best metal flashing solution examined, but even here, air circulation was not allowed. At least 1/2-inch blocking should be used to separate the cap from the beam, and side nailing is preferred to reduce waterflow through nail holes.

Metal flashing is also used to protect wood beams from the concrete decks they support. No blocking is used in this case and a thick polyethylene plastic sheet often separates the metal from the wood. This prevents chemical action between the metal and the wood. Allowance for water leakage through cracks in the concrete must be made by providing ample metal edge drips

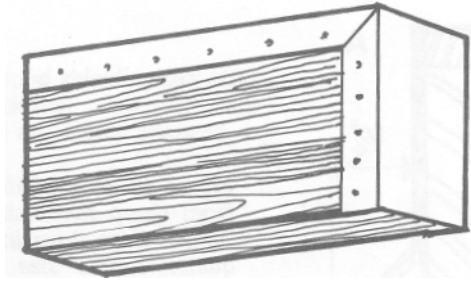


Figure 9-6.--A common metal flashing cap solution.

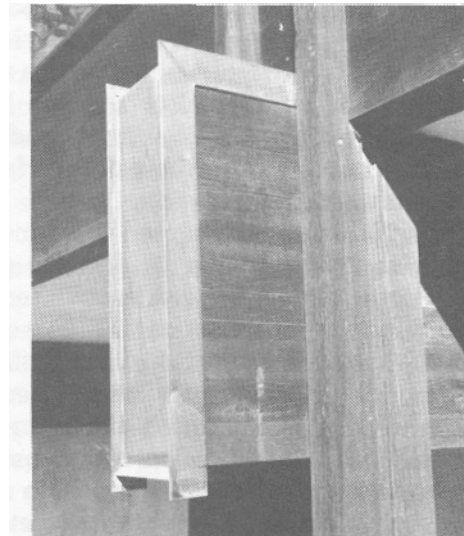


Figure 10-12.--A good metal flashing cap design. This cap channels water runoff away from the sides of the beam. Air space, as shown in (A), could further improve the design.



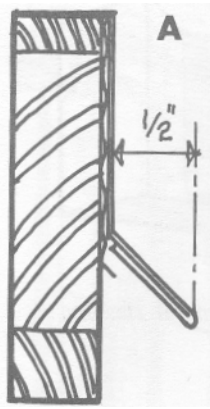
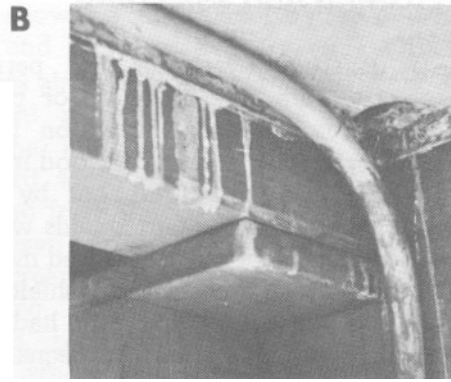


Figure 11-25.--Flashing protects wood from damp materials if properly designed. Edge drips in (B) were inadequate. Ample size of drip (A) is important to prevent retention of water.



bent away from the side of the beam. Some flashing caps were observed that held a layer of water between the metal edge and the beam surface long after the rain had stopped. In figure 11-25, lime, washed from the concrete onto the wood surface, clearly shows the path of water.

Metal flashing has been used as a remedy to prevent further decay of A-frame glulams exposed to the weather. Covering exposed beams or arches on the tops and sides, with an airspace between the flashing and the wood, keeps water from entering existing checks (probably the initial cause of decay). In most cases, proper preservative treatment and periodic inspection and maintenance would be adequate protection under these existing conditions without resorting to this extra covering.

Wood Shields

Wood is often used to cap the exposed end of a beam. Figure 12-7A shows a common method of shielding in which 1-inch stock or 3/4-inch plywood is nailed and/or glued to the end surface. Unsatisfactory protection results because the shield piece warps and the anchorage works loose due to uneven exposure and consequent differential shrinkage. The crack between the pieces then allows moisture to remain for a long period of time. The wood

shield often looks as bad as unprotected beam ends after several years of weathering. Figure 12-7B illustrates a design for wood caps to provide maximum protection and prevent occurrence of these problems. This solution must utilize the independent protection principle literally to be successful: the wood cap must be as independent of the beam end as possible.

Exposed wood decks always pose potential problems for the structural support after several years. Two attempts to solve this problem, by using a wood cap on top of the beam, were observed (fig. 13-16A) : a cap directs the water away from the sides of the beam and also protects the beam from moisture held between the decking and the beam. This is the area where serious decay first occurs. If the edges of the cap were "drip kerfed," if it were pressure treated with a preservative, and if it were either glued or kerfed on the bottom side and nailed to prevent cupping, the possibility of decay in the beam would be further reduced (fig. 13-16B). The U.S. Forest Products Laboratory has recently been testing the effectiveness of felt pads saturated with preservative for protecting critical joints in highway bridges. This may be the practical answer for protection of wood deck members if the tests prove successful.

Structural wood columns can also be protected. In a residence colonnade,

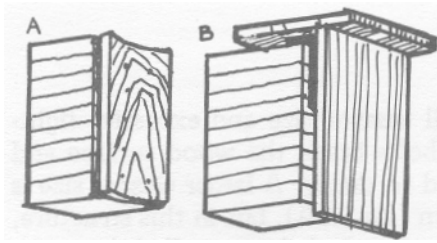


Figure 12-7.--Wood shielding can offer beam-end protection. Cap (A) traps water. Cap (B) eliminates intersurface contact.

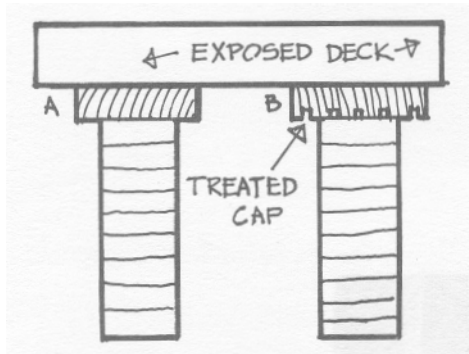


Figure 13-16, 27.--Wood cap shields top of exposed beam. Solution (A) was observed. Solution (B) suggested further protection.

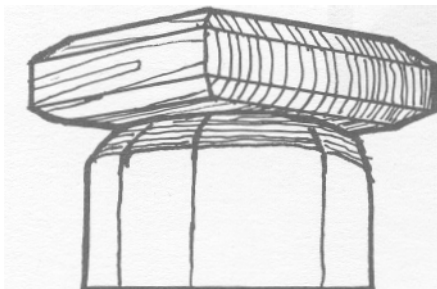


Figure 14-11.--Column wood cap protects end grain.

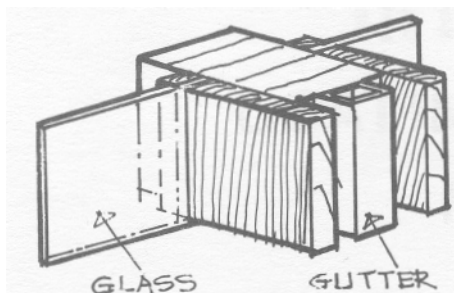


Figure 15-13.--Treated millwork can protect wood columns.

columns made from cedar poles have a wood-block capital to protect the end grain from direct moisture (fig. 14-11). On a church, the sides of laminated columns with a southern exposure have been covered by window millwork which, because of smaller dimensions, is less likely to check and is also easier to treat with preservatives (fig. 15-13). The bases of columns may also be protected with impregnated felt.

Since shielding and flashing provide close protection of structural wood members, they offer a definite advantage over other independent protection methods. However, the close proximity of the metal and the wood requires sophisticated approaches to design, as has been illustrated, and the visual force that an uncovered structural wood member expresses is sacrificed.

FASTENING AND ERECTION PROTECTION

An important, though often neglected, aspect of independent protection of a structure relates to the fastenings. It is extremely important to specify accurately the sizes of fastenings and the erection procedures to be used. Figure 16B shows

how small washer size and excessive tightening of bolts break the wood surface and might lead to decay. A larger washer size is also shown (fig. 16A), but in this structure, even this size had been pulled into the glulam arch in some places.

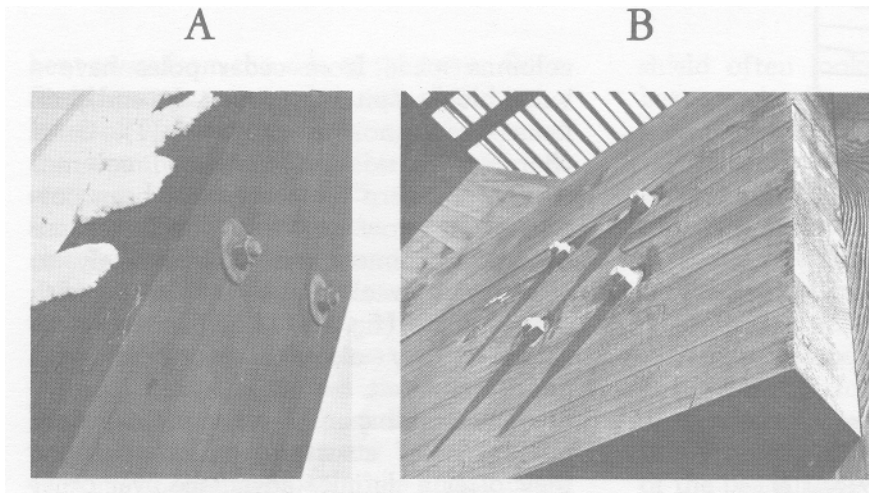
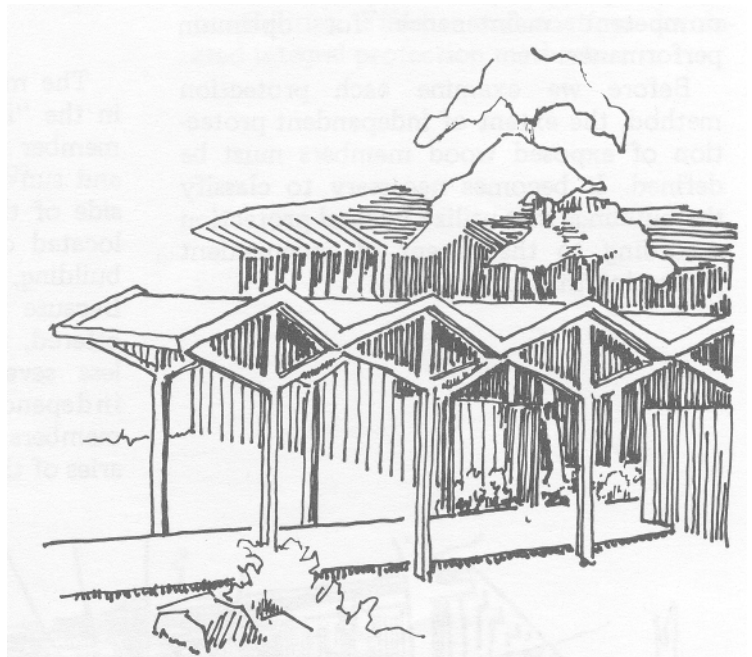


Figure 16.--Large-size washers (A) and careful tightening of bolts reduce crushing (B) of wood.



INTEGRAL PROTECTION

COATINGS AND TREATMENTS

MECHANICAL METHODS

OTHER METHODS

In contrast to independent protection, which involves a minimum of contact between the protecting elements and the wood surface, integral protection provides a more intimate protection by treating, coating, or altering the exposed surface.

Improved appearance is the primary function of integral protection in today's structures. Other structural performance factors are important in some specific instances, but visual satisfaction is foremost. Integral protection in the near future will play a more decisive role in wood protection under all exposure conditions. In today's wood structures, however, integral protection must be complemented by suitable independent protection and competent maintenance for optimum performance.

Before we examine each protection method, the extent of independent protection of exposed wood members must be defined. It becomes necessary to classify the buildings that utilize integral protection according to the extent of independent protection that exists.

Maximum Exposure

Integral protection is given its greatest test under conditions of maximum exposure. Any member whose exterior portion is totally exposed to rain and sun and is located on the southern or western side of a building falls into this category. This condition offers no independent protection to the exposed members and necessitates optimum integral protection and maintenance. Weathering and decay are most noticeable in structures under extreme exposure conditions. Severe surface checking, noticeable decay, and breakdown of surface finishes often occur.

Intermediate Exposure

The majority of buildings examined fall in the "intermediate exposure" class. Any member that is partly exposed to the rain and sun and located on the west or south side of the building, or fully exposed and located on the north or east side of the building, fits this classification (fig. 17-25). Because partial independent protection is offered, weathering and possible decay are less severe; many times the extent of independent protection on individual members can be determined by the boundaries of these visible defects.

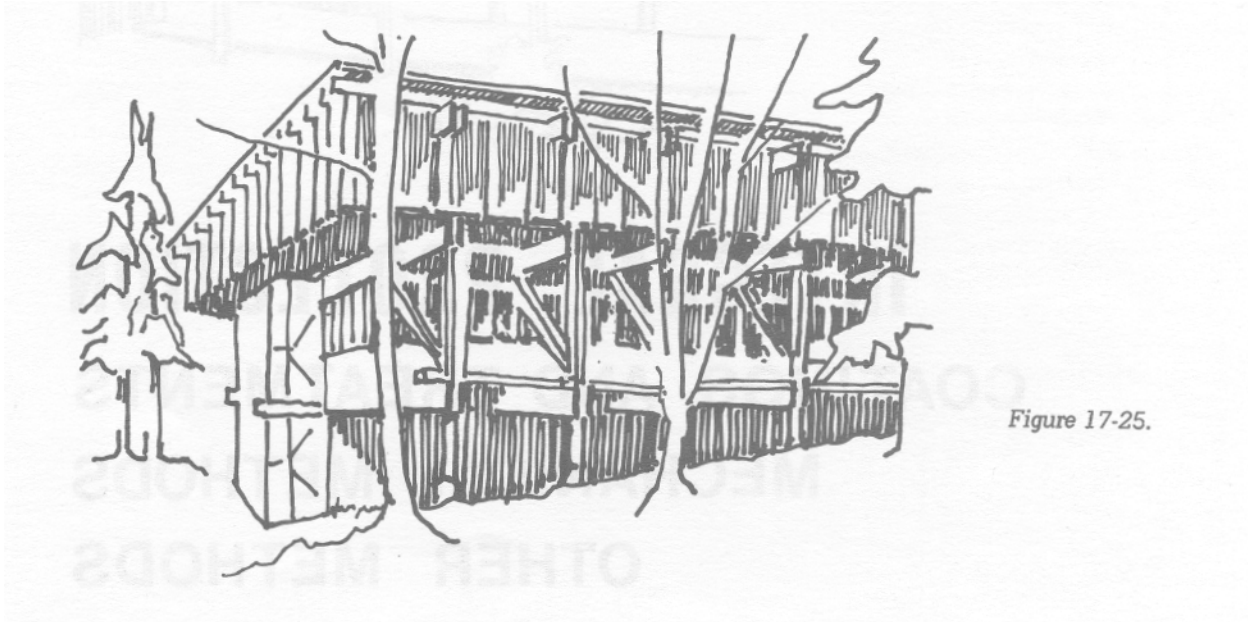


Figure 17-25.

Minimum Exposure

Any exposed structural wood member that is substantially protected from the rain and sun falls into this final group (fig. 18-1). Integral methods of protection under this exposure are least affected by weathering and decay, so optimum performance usually occurs.

Integral protection may be provided in three ways: by coating or impregnating the wood, by mechanically altering the member, or by providing other safeguards both before and after the structure is built.

Tabulated below are types of integral protection:

Coatings and treatments

- Paints and stains
- Natural finishes
- Preservatives
- Polyester resin-fiber glass coatings
- Polysulfide polymer coatings

Mechanical methods

- Saw kerfing and shaping

Other methods

- Specification and fabrication
- Caulking and bulking
- Maintenance

It was not possible to observe all of the methods listed; some treatments observed lacked in-service testing, but they give a total cross section of integral protection possibilities. Finishes and coatings dominated integral protection

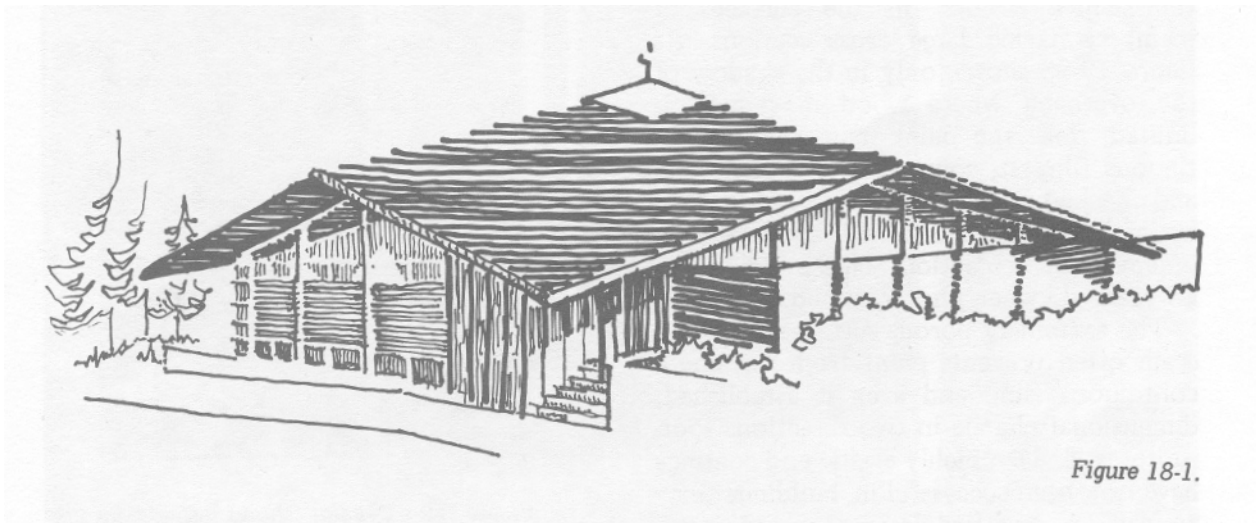


Figure 18-1.

COATINGS AND TREATMENTS

Paints

The use of paint on the exposed structure of buildings examined was second only to stains as a method of integral protection. Various surface conditions of paint film were examined, their condition almost always relating to the extent of exposure and the amount of maintenance.

Paint does not always prolong the life of wood. Its durability depends upon the quality of the resinous vehicle and the quality of the formulation. Since the finish coat forms a continuous skin over the wood, water (except in vapor form) is excluded, if there are no checks. This barrier works both ways so that sometimes large amounts of moisture, once it has entered, cannot get out, and blistering and/or decay may result. Deterioration often begins at a paint-wood interface where the film adhesion has been destroyed. Some paint films are also susceptible to molds and must contain a preservative. Because of these characteristics, paint requires attention to keep its film intact.

Maximum Exposure.--When painted wood structures undergo maximum exposure, the paint film usually cannot withstand the continual expansion and contraction which occurs on the surfaces of members having large cross sections. As figure 19-23 shows, only in the shadow of the overhang where wood movement is limited, does the paint maintain its continuous film. In contrast, the broken film and checked surface of the exposed portion again illustrates the added advantage of independent protection. This building was 13 years old when photographed.

The extremely porous surface of the end grain often prevents paint from forming a continuous film, and even if established, dimensional change in two directions soon ruptures it. Even highly elastic end coatings have not been successful in buildings examined. A modified latex-base end sealer was not sufficiently flexible in the beam

ends exposed to sun and rain (fig. 6-25B). Paint needs additional help from independent protection to do a satisfactory job. Unfortunately, wood species, like Douglas-fir, that are superior for structural purposes are not the best in terms of paintability. Thus, cedar and redwood are often used as the exposed sidewall surfaces in buildings that are structurally framed with Douglas fir (3, p.6). More frequent renewal of the finish on the structural members than on the nonstructural siding should be anticipated.

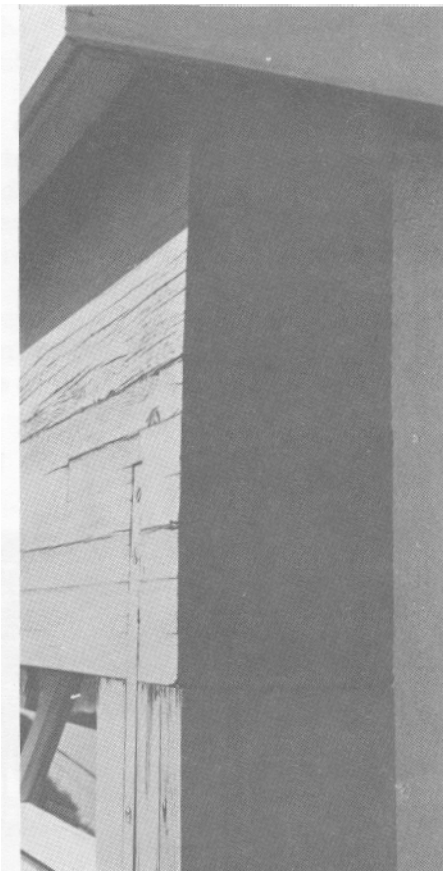


Figure 19-23.--Paint shows effects in protected and in unprotected areas.

Intermediate Exposure.--Partial protection helps painted structural surfaces considerably. With proper care and correct application, paint can be maintained in the condition seen in figure 20-21. Surface preparation and paint quality are important; this suggests proper specification prior to construction and certain maintenance standards after the building is in service.

Minimum Exposure.--Complete protection from exposure assures longer, maintenance-free life of painted members. Independent protection cannot be overemphasized in increasing paint life. This is vividly illustrated in a U.S. Department of Agriculture booklet, "Building Decay Associated With Rain Seepage," where paint failure on window trim was 83 percent with 2 to 4-inch overhangs, 53 percent with 22-inch overhangs, and zero with 72-inch overhangs (8, p. 13).

Figure 20-21.

