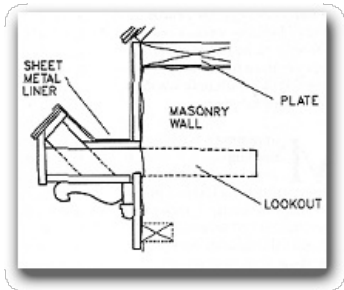


## Focus: Maintaining Built-In Gutters

While often unseen and neglected, built-in gutters are critical design elements found on historic houses of worship throughout New York State. When deteriorated, water can enter through the structure and cause extensive damage.

For years you have looked up at your older church or synagogue in search of the gutter system, unable to see anything from the ground. You know that water is draining away from the building, but you don't see anything that resembles the copper or aluminum gutters that hang from the roofs of contemporary homes. That's because your historic house of worship probably has what are called built-in gutters.



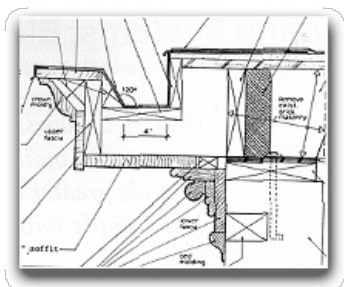
Built-in gutter systems are integrated within the cornice structure, connected to internal or external leaders, and are not readily visible. Traditional Rainwater Conductor Systems of the 18th and 19th Centuries by Karen Dodge of the National Park Service (1999) reports that built-in gutters were first adopted in North America during the 18th century in high-style Georgian and Federal-style buildings, usually public or commercial, where refined architectural qualities were desired. These hidden gutters also served an aesthetic purpose in buildings with grandiose compositions, classical orders, and elaborate cornices. The roof and cornice line are not only extremely important elements of the architectural character of these buildings -- they also play a critical role in the water-shedding function of the exterior.

Historically built-in gutters were constructed of wood boxes with sloped bottoms, lined with metal; the first metal linings were lead. Copper became available in America by the end of the 18th century and soon became popular for its durability. The integrity of the metal lining, flashings below the edge of the roof cladding, and cap flashings are critical to the performance of built-in gutters. A common sub-category of built-in gutter, also called a boxed gutter, eaves trough, or sunk gutter, cuts through the roof itself and is lined with metal.

### How to Maintain and Inspect Gutters

Specifications for General Inspection and Maintenance of Gutters and Downspouts are available from the U.S. General Services Administration's Historic Preservation Technical Procedures website at [www.gsa.gov/pbs/hptp](http://www.gsa.gov/pbs/hptp). Cleaning out leaves and debris from gutters as often as necessary is essential for durability and proper performance. When this type of gutter leaks, water will work its way through the structure.

Since this type of work frequently requires the use of a tall ladder, work safety and proper insurance must be reviewed. In addition to cleaning debris, alertness of building personnel about problems, and careful annual inspection of gutters by a competent roofer can make a big difference in limiting costly, hidden damage. Look for defects such as localized damage due to fallen limbs or other debris; cracks from expansion and contraction at joints or folds; or pinholes from corrosion. The most common sign of water penetration is peeling paint and decay in the wood soffit under the gutter. Other signs are dark stains and mildew, or deterioration of masonry. Water penetration may be visible in attic inspections -- or when it damages interior plaster and decorative finishes. The sooner a leak or area vulnerable to failure is addressed, the smaller the scope and cost of repairs.



Bituminous roofing compound, known as "roofing tar," should not be applied to metal gutter linings in an attempt to stop leaks or prolong their life. It hides the true condition of the gutter, corrodes metal, begins to crack in a year, and cannot be removed without damaging the lining. Preservation architects interviewed for Common Bond report that they routinely find tar on gutter linings, which means that the lining will have to be replaced. Never use sharp tools to chop ice out of gutters, as damage to roofing materials is sure to occur.

"Two major disadvantages of built-in gutters is that leaks are hidden, and repairs are difficult," observes preservation architect Randy Crawford of Crawford & Stearns, Syracuse, NY. "A single loose slate that slides down a steep roof slope can easily perforate the gutter lining and go undetected. With proper detailing, built-in gutters can be watertight, but people usually don't come to us for help

until their gutters are in very poor condition."

### Restoring Built-In Gutter Systems

Restoration of long-neglected built-in gutter systems that leak and have caused decay in the cornice and roof structure is often complicated and can be costly. But once the work is completed, a regularly maintained, well-detailed system can last 60 to 100 years or more, depending on the life of the metal lining. A preservation architect or consultant should inspect the building, propose treatment options, develop working drawings and specifications, and supervise bidding and construction. Temporary protection and permanent repairs should be performed by a roofer experienced in this specialty on historic buildings.

"We encourage restoration of historic built-in gutter systems," says preservation architect Michael Devonshire of Jan Hird Pokorny Associates, New York, NY. "The use of modern building materials as an adjunct to traditional materials boosts longevity." Devonshire explains the principal elements in a typical gutter restoration:

- \* Strip off old gutter lining and two feet of the above roof cladding.
- \* Where rafter ends are rotted, install sisters (new pressure-treated rafter ends adjacent to old ones) or scarf in new wood and sisters.
- \* Replace old wooden gutter bottom with kiln-dried-after-treatment (KDAT) plywood treated for resistance to decay, minimal expansion and contraction, and increased longevity; slope bottom toward outlet.
- \* Install gutter lining: an elastomeric ice-and-water shield on the bottom (not always required); building felt; a slip-sheet of rosin paper; and copper on top (16, 18, or 20 ounce, depending on the dimensions of the gutter).
- \* Install on the roof decking above the gutter two feet of elastomeric ice-and-water shield (or copper flashing) and roof cladding over it.
- \* Repair or replace cornice moldings and interior structural elements as needed.

Architectural copper experts Daniel Sternthal of the Copper Development Association, New York, NY, and David Hunt of Revere Copper Products, Inc., Rome, NY, recommend the use of copper for gutter linings, rather than lead-coated copper. (Lead-coated copper has a thin covering of gray lead over the copper and is sometimes used as a deterrent to theft.) Mr. Sternthal noted that "contrary to the assumptions of many architects, lead coating is strictly aesthetic and does not increase the longevity of copper. Sheet copper can last 100 years or more." Mr. Hunt added that the chief advantage of regular copper is that it is easier to handle and solder. Better soldering increases longevity.

### Covering Over Built-in Gutters

Some congregations and architects opt to cover over the built-in gutter and design alternative drainage systems. The roof sheathing and cladding can be extended to cover the outer lip of the built-in gutter, and proper edge flashing can be installed. Hanging metal gutters and external leaders are often chosen to take over the function of abandoned built-in gutter systems. The advantage is that leaks and other problems that develop in hanging gutters are more visible, and repair or replacement is simpler. However, they are not a panacea -- neglected hanging gutters can overflow or cause ice dams just as neglected built-in gutters can. And hanging gutters tend to need replacement every 20 or 30 years -- a life-cycle cost that over a century can exceed that of built-in gutters.

A major drawback of adding hanging gutters is the alteration of the historic roofline. Where the roofline and cornice profile are significant character-defining features, altering the shape of the roofline and adding projecting gutters may violate the Secretary of the Interior's Standards for Rehabilitation. This can affect possible funding from preservation groups.

Half-round copper or lead-coated copper gutters and leaders are considered by many to be the most attractive type of hanging metal gutter. Disadvantages include their high cost, attractiveness to thieves, and susceptibility to damage from impact. A copper gutter is easily dented by the weight of a ladder leaning against it. Galvanized steel gutters are much less expensive than copper and more resistant to impact. With occasional maintenance, steel gutters can last 50 to 100 years, says Mr. Crawford, but many people dislike their appearance. Enameled steel gutters require repainting about every five years.

### Conclusion

Although restoring long-neglected gutter systems is often a major expense, the long lifespan of a well-detailed and maintained system, and the preservation of the original design of the building, often justify the effort. It is important to evaluate the options on a case-by-case basis with advice from preservation architects and consultants with specific expertise in gutter systems and a holistic view of the building.