

# EXPANSION JOINTS

## IN BUILT-IN GUTTERS

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Once upon a time, everyone's eyes glossed over with boredom when expansion joints were mentioned. But the lack of knowledge about expansion joints became a common reason built-in gutters (often called "box gutters") failed. As a slate roof consultant, I have the dubious pleasure of examining many failed box gutter installations, almost all of which show broken, leaking solder joints, and, guess what — no expansion joints! If you have to install, replace or repair a built-in gutter, you better expand your expansion joint knowledge.

Let's start with SMACNA. The Sheet Metal and Air Conditioning Contractors National Association emphasizes the importance of expansion joints, which, in their words, are "essential in all gutter installations." When no allowances for expansion are incorporated into a metal gutter design, the stress and strain of expansion and contraction will work on the weakest parts of the system, which happen to be the solder joints — eventually breaking them. On older box gutters the solder joints are often sealed with mastic, indicating leakage. If you look around, you will also notice that there are no expansion joints to be seen. Following SMACNA guidelines, a 20 ounce copper built-in gutter with a 12" bottom dimension should have a maximum distance to a fixed point, such as a downspout, ranging from 17' to 20', then there would be an expansion joint. The spacing of the expansion joints depends on the size of the gutter and thickness of the metal, but a general rule is that an expansion joint should be included about every thirty feet.

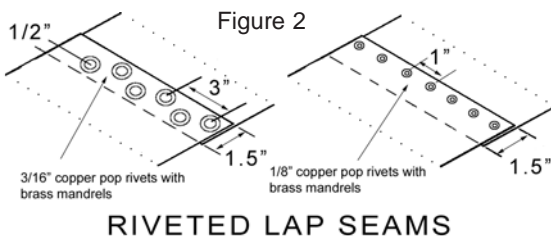
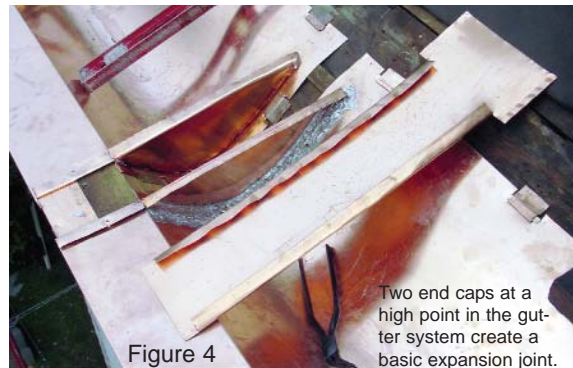
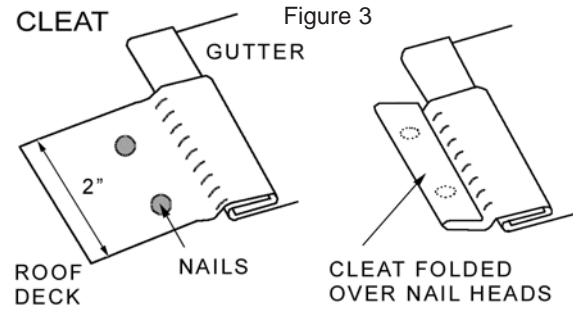
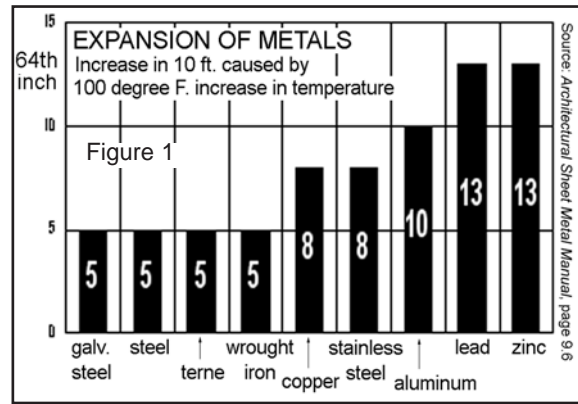
Most new box gutters these days are made of either copper or stainless steel, although many old box gutters were made of terne-coated steel. These metals expand and contract with temperature changes and this must be accounted for when designing gutter systems (Figure 1). If not, something will break from strain, which could happen sooner rather than later. Although the solder joints are most likely to crack and leak, the metal itself can split due to expansion and contraction. This is why box gutters are not nailed into place — they're set into place, clamped over an outside drip edge (see flat-lock article, page 6) and cleated to the roof deck (Figure 3). This allows the metal to move without undue stress. The expansion joints add an additional, necessary measure of protection.

What exactly is an expansion joint? Simply stated, a box gutter is terminated with an end cap as if the gutter has ended. Then, a space of an inch or two separates that section of gutter from the next, which begins with another end cap. The space between the pair of end caps is covered with a clamped cap to prevent water entry and to allow the separate sections of gutter to move back and forth with temperature changes (Figure 4). Because an expansion joint consists of two terminations in the gutter system, it creates a dam in the system, preventing the flow of water across the joint. An expansion joint, therefore, should be located at a high point in the gutter, as water will then flow away from the expansion joint rather than try to flow through it. When a high point is not available, a drain outlet must be included or added to the gutter system on the uphill side of the expansion joint.

Incidentally, when soldering a built-in gutter, care must be taken to not use an open-flame torch. Open flame torches are notorious for igniting buildings underneath the metal flashing because of the extreme heat of the open flame. Instead, only closed flame or electric soldering torches should be used. Furthermore, if the joints on the gutter system are lap joints (where the metal simply overlaps), the overlap should be approximately 1.5" and riveted every inch when using 1/8" pop rivets, and every 1.5" when using 3/16" pop rivets (Figure 2). The rivets should be made of a metal that is compatible with the metal of the gutter lining. For a copper gutter, copper rivets with brass mandrels should be used. Copper rivets with steel mandrels should be avoided. Check your rivets with a magnet — if they stick, they're no good! On the other hand, if the joints on the gutter are lock joints (joints folded together), no rivets are needed (see related articles on pages 6 and 26).

If a built-in gutter system happens to be installed without expansion joints, the joints *can* be added later, although it's quite a bit more difficult than adding them at the time of installation. To add a retrofit expansion joint, a section of the gutter lining approximately 1.5" wide must be removed. This can be done using a metal blade on a high-speed grinding tool, for example. Once the section is removed, the gutter is in separate segments. Each segment is then fitted with a custom fabricated "end-cap" termination. The two terminations are then soldered into place and a top cap is fitted over them. A drop outlet may then need to be added.

Remember, when installing built-in gutters, don't nail the gutter sections to the roof — use a clamping and cleating system. Also, either a) lock-seam or b) lap seam and rivet the joints, then fully sweat them with solder, using a safe soldering device. Include an appropriate number of expansion joints as recommended by SMACNA, and everyone will live happily ever after. ☐



RIVETED LAP SEAMS

Source: Architectural Sheet Metal Manual, page 96

Photos by Joe Jenkins