SKY-FACING MASONRY JOINTS

By Remo Capolino, RRC, PE

Sky-facing masonry joints have been problematic since at least the time of ancient Egypt and the pyramids. Horizontal joints between masonry units such as brick, cast stone, concrete, terra cotta, marble, granite, etc. have allowed water entry into the most prestigious buildings, not just those built on a budget. Over time, many methods have been attempted to prevent this water entry; and in this article, we will present the current options that are installed, regardless of their viability as solutions to the weatherproofing of these difficult joints.

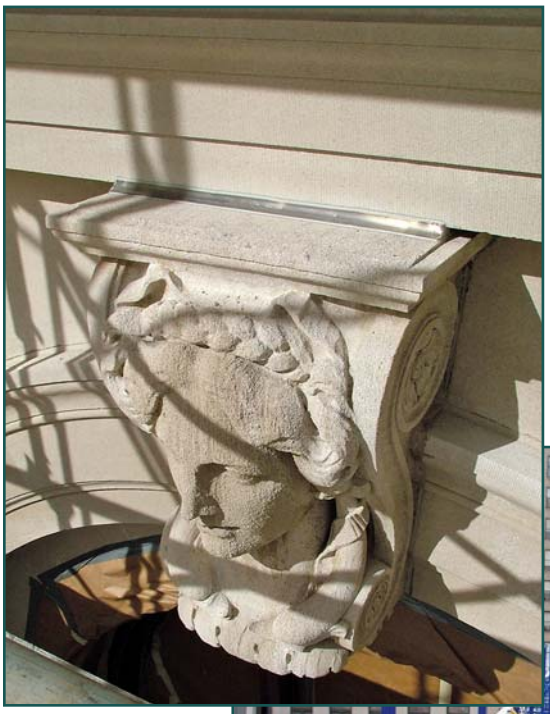

Figure 1 – Small ledge above masonry ornamentation.

Horizontal masonry joints can be small, as in the case of a shelf or water table (*Figure 1*); or extremely large, as when they are the defining elements of buildings' cornices or entry pediments (*Figure 2*). Copings, windowsills, and other locations often contain horizontal masonry joints that need to be detailed to prevent water entry. The most common methods of detailing these joints today include:

1. Sealant
2. Pointing
3. Lead weathercap
4. Hot lead
5. Metal cladding (ledge and coping covers)
6. Liquid membranes

Figure 2 – Large marble shelf at base of batten seam roof.

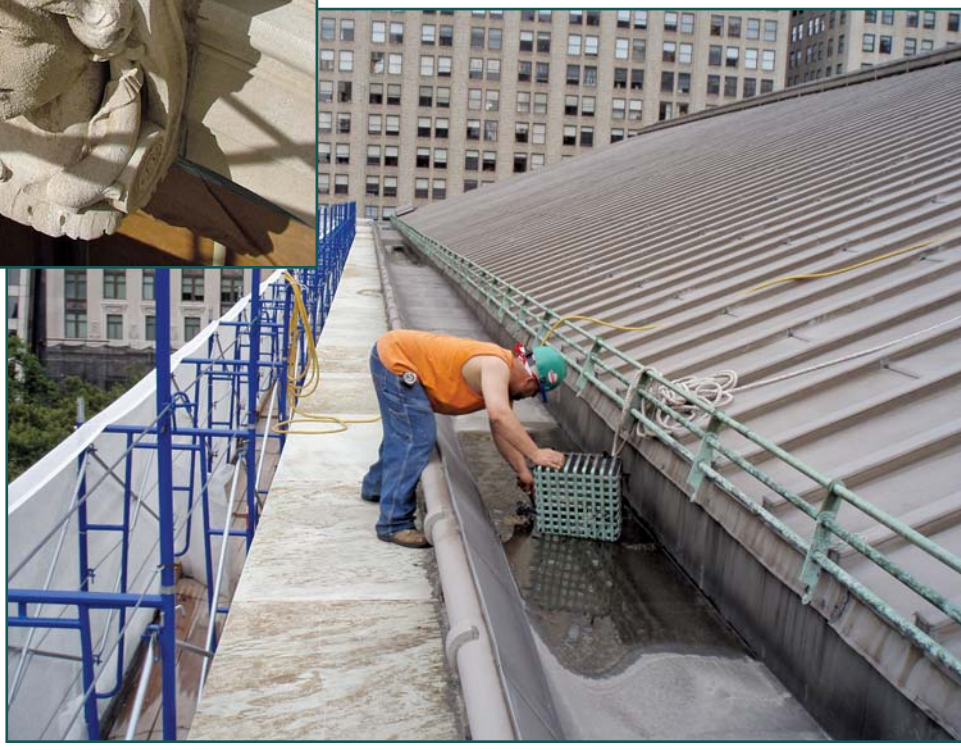

Figure 3 – Self-leveling sealant installed at joints in coping.

SEALANT

With advancements in sealant technology, we are seeing more and more horizontal masonry joints sealed with silicone and urethane sealants. Ease and speed of installation—making costs relatively low—along with warranty claims of 20+ years or more by sealant manufacturers, have spurred this type of detail. Rarely, however, do these types of joints last. In some instances, the use of self-leveling sealants is comically incorrect; however, they are still used (*Figure 3*). Just because a detail is popular does not make it functional or even economically viable. It is strongly recommended that life expectancy, cost of replacement, and consequential damages be considered before using sealant on horizontal masonry joints other than for sidewalks on grade.

POINTING

The most common method of detailing sky-facing masonry joints is with mortar. This joint rarely has a weathertight life expectancy of more than a few years and, as such, should only be used when a continuous metal flashing is installed under the top course of masonry. Many polymeric flashing membranes have been tried in recent years; however, none has a track record as long and successful as metal. Before a polymeric membrane flashing is contemplated, the track record and cost of replacement should be considered. This type of detail is most common with copings when under-coping flashings are installed. Difficulty can arise when a single course of masonry is installed over the metal flashing because the metal acts as a bond breaker and can cause the coping to slide off the wall.

To prevent this, three-way interlocking flashing or dowels are used to provide a positive bond of the coping to the parapet wall. Three-way interlocking flashing is metal that has been bent with corrugations that provide a physical interlock with the mortar above and below the metal to hold all components in place (*Figure 4*). When dowels are used, they serve as shear studs to pre-

Figure 5A - Metal flashing with dowels.

Figure 4 – Three-way interlocking metal under-coping flashing. All seams and fastener heads soldered watertight.

Figure 5B – Close-up of thimbles at dowels.

vent movement of the copings; however, each and every dowel must have a thimble flashing installed to prevent water entry at the dowel (*Figures 5A and 5B*).

LEAD WEATHERCAPS

Lead weathercaps, sometimes referred to as "T" caps, are a more effective method of sealing horizontal masonry joints than sealant but not as effective as when an under-coping metal flashing is installed. In some instances, such as repairs or retrofits, it is the only option, because lifting/resetting the masonry to install under-coping flashing is economically impractical or simply impossible no matter how much money is spent. A lead weathercap is solid lead in the shape of a "T" that is inserted into a horizontal masonry joint (*Figure 6*). Typical recommendations are to rake and repoint the joint, holding the new pointing mortar down approximately 2 in. from the surface

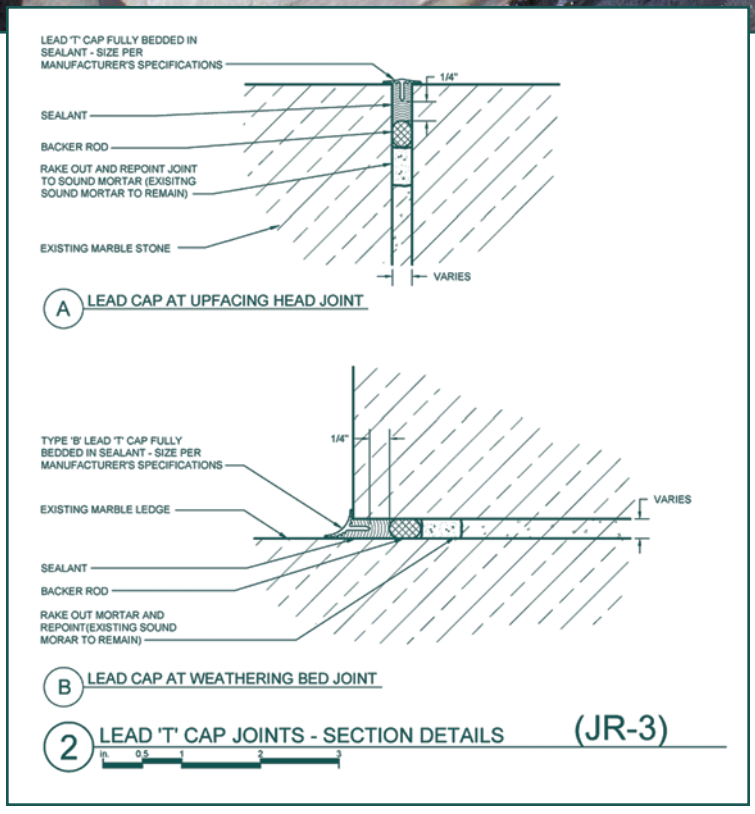

Figure 6 – Detail of lead cap at horizontal and vertical joints.

Figure 7 – Transition between up-facing head joint and weathering bed joint lead T caps.

of the masonry. This offers some weatherproofing function but also provides a sound substrate to install new materials. The lead weathercap is dry-fitted prior to sealant installation; then, backer rod and sealant are installed over the new pointing to completely fill the joint. The weathercap is then "buttered" with sealant on the backside to prevent air pockets from forming and then inserted into the joint until it is flush with the horizontal surface. Masking tape on the face of the masonry keeps the joint looking clean when excess sealant is pushed from the joint (*Figure 7*). The type of sealant used can vary and must be selected so as to be compatible with the masonry. Some types of sealants will cause staining or dirt pick-up on particular types of masonry, so selection should be done with care. Urethane sealant is the most popular, although silicone and nonskinning butyl sealant have been used successfully.

HOT LEAD

A method no longer very common, but relatively effective, is what is often referred to as a leaded joint or hot lead. This type of joint is most commonly used to seal a horizontal reglet but has been used on joints between individual masonry units. To install a leaded joint, the mortar between masonry units must

be sound and solid to within one inch of the masonry surface. Lead wool is then pounded into the joint until it is full, and then the top surface is melted with an acetylene torch (*Figure 8*). This joint is similar to a lead and oakum joint in plumbing and is only used when joint movement is expected to be very small.

Figure 8 – Lead wool being pounded into place prior to heating.

METAL CLADDING

In some instances, it is possible to change the horizontal masonry joints for metal joints. If a sky-facing masonry ledge can be clad with a metal that can be soldered, such as copper or lead-coated copper, the weatherproof life expectancy of the assembly can be in excess of 70 years. In these instances, the metal not only protects the joints between masonry units but can protect the masonry as well (*Figures 9* and *10*).

The most common type of metal cladding is the installation of metal copings over masonry coping stones. There are many factory-manufactured copings that can be used to cover the horizontal masonry joints; however, almost any sheet-metal

Figure 9 – Flat marble ledge covered with lead-coated copper; connections made with "drive cleat" at seams.

Figure 10 – Inclined marble pediment clad with lead-coated copper; all seams loose-locked.

Figure 11 – Coping assembly installed over repointed masonry copings. Note: Concealed splice plate is 12 in. overall, and butyl tape is installed only on horizontal portions.

Figure 12 – In-progress detail of self-terminating liquid membrane terminating 1 in. back from coping edge. Membrane continues up cheek wall where the cut reglet detail is visible.

shop can fabricate a coping that provides a long-term weatherproof solution to a horizontal masonry joint. A well-designed metal coping assembly should require the repointing of the existing coping joints and/or the installation of a weather-resistive barrier under the metal copings. Simply installing metal copings over actively leaking coping stones often results in leaks within five or ten years due to incidental water passing the metal copings and following prior paths of water entry. With most coping systems coming in 8- or 10-ft. lengths, and masonry copings typically 4 or 5 ft., this immediately reduces the number of joints by at least half. To minimize the water passing joints in the metal copings, the joint configuration and size should be well planned. The use of welded miters; properly undersized, concealed splice plates of 12 in. or more with nonskinning butyl sealant; as well as urethane sealants go a long way to prevent water entry (*Figure 11*). Many other metal joint configurations are possible as can be viewed in the *SMACNA Manual* (standing seam, slip joint, exposed splice plate, etc.); however, most of these other types of joint configurations create a detail that is readily perceptible—something that is typically avoided if at all possible.

LIQUID MEMBRANES

With the advancement of chemical/polymer technology, reinforced liquid membranes are becoming more prevalent in many construction details. The use of urethane and polymethylmethacrylate (PMMA) waterproofing systems at exposed horizontal masonry and joinery is a viable option and can solve many of the issues such as joint movement. The self-terminating characteristics of the materials allow

Figure 13 – Mock-ups of different surface preparation for liquid membrane.

Figure 14 – Substrate failure when deteriorated masonry is not prepared properly.

them to be installed on horizontal masonry and stopped just shy of the exterior vertical face (*Figure 12*). As an added measure of precaution, liquid membranes can be let into a horizontal reglet that is cut into the masonry.

As with all liquid membranes, surface preparation is critical to the performance of the material. Surface contamination and deterioration of the masonry being waterproofed often require aggressive substrate prep such as grinding or scarifying. Failure to properly prepare the substrate can result in catastrophic failure (*Figures 13* and *14*).

CONCLUSION

As of this writing, there is no panacea detail that solves all the problems of all horizontal masonry joints one might confront. These situations, similar to many others that are encountered on new and existing structures, are something that consultants must deal with and do their best on a case-by-case basis to provide their clients and their buildings with the most weathertight, longest-lasting, and economically viable details.

Even in the best of situations, the solutions described above have limited life expectancy when compared to that of the base material (stone, marble, granite, etc.). As a result, this work must be considered a "maintenance item," even if the work is expected to last 70-plus years. As a maintenance item, considerable thought should be given to the repair/replacement of the work at the end of its useful service life. Systems and details should be selected that are minimally altering and damaging to the base materials and allow multiple reinstallations without significant reworking of the masonry. The cutting of reglets and use of chemicals and adhesives must be well thought out—not only to prevent water entry but also to allow removal and reinstallation of future maintenance campaigns.

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Remo R. Capolino, RRC, PE, grew up in a family-owned specialty roofing and sheet metal contracting business and graduated from the University of Connecticut with a bachelor's degree in civil engineering. After more than 15 years in contracting and leadership roles with the Association of General Contractors (AGC), Northeast Roofing Contractors Association (NERCA), and the National Roofing Contractors Association (NRCA), he turned to consulting, desiring to have an impact on a greater number of projects. Capolino has lent his expertise in copper, zinc, slate, and other specialty roofing assemblies on a number of internationally recognized projects.

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