WET SEALING

By Karl Schaack, RRC, PE

What is a wet seal? An Australian-based clothing company or a drenched sea mammal? A "wet seal" as it relates to the building envelope industry is generally referred to as the application of an elastomeric, gun-grade joint sealant at the interface of a glass unit and the adjoining frame and/or gasket of an existing window unit. "Wet seal" is not officially defined in ASTM C 717, "Standard Terminology of Building Seals and Sealants." According to the Sealant and Waterproofing Restoration Institute (SWRI), a wet seal is commonly referred to as a cap bead application.

The primary function of a wet seal is to alleviate water infiltration occurring within a window assembly. The window assembly subject to receiving wet sealing can be an individual punched opening, a storefront system, a structural skylight, or the multitude of window wall/curtain wall systems.

Water infiltration can occur within window assemblies for a variety of reasons, including but not limited to the following:

- Improper installation of the assembly,
- A lack of or inadequate/improper end dams,
- Loose, missing, or unsealed fasteners within the assembly,
- Unsealed joints, and
- Deteriorated or improperly installed gaskets.

Leaks can also appear to be associated with window assemblies, but the actual source of water penetration through the building envelope and the manifestation at the windows are the result of a nonfunctioning through-wall flashing system located directly above the top or head of the assembly. Since the components of a window are typically concealed or restrained within the frame, disassembling of the units (or portions thereof) is often required to perform corrective procedures to alleviate the water infiltration problems that are directly related to issues associated with the window unit. While this can be accomplished, the work is meticulous, time-consuming, relatively costly, and can be disruptive to building operations. Some units that utilize snap-on covers can be disassembled to perform remedial work without glass removal. However, this removal process could distort the covers and result in improper fit during the reinstallation process. Other assemblies, such as lockstrip gasketed systems, typically cannot be disassembled without the removal of the glass. So, with the need to resolve water

Figure 1 – Short gasket at corner of frame.

Figure 2 – Deteriorated lockstrip gasket.

Figure 3 – Loose gasket.

Figure 4 – Loose gasket.

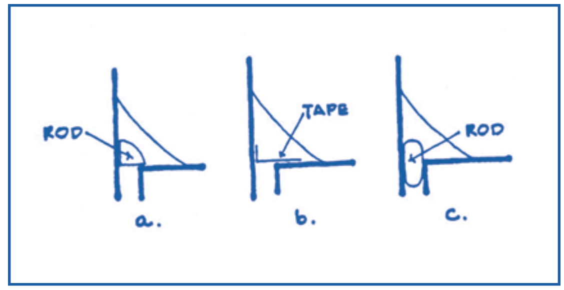

Figure 5 – Fillet joint backing options.

infiltration problems, together with the desire to minimize disruptions to building occupants and operations, as well as restrictions from budgetary constraints, wet sealing is commonly utilized to solve water infiltration problems.

When water infiltration is experienced in window/wall systems, it is often believed that the internal gutters and weep system (collection and extrication system) are not functioning properly. Therefore, the intent of a wet seal is to "seal" all of the possible/potential sources on the exterior surfaces of the window assembly that may be sources of water infiltration. These potential sources could include the following:

- Intersection of the glass and the preformed gasket,
- Intersection of the frame and the preformed gasket,
- Exposed fasteners in the frames, and
- Exposed joints (butt or lap joints) in the frames or caps/covers that are not utilized as a weep system.

Consequently, the sealant (in a wet-seal application) becomes the primary seal, and the backup system within the assembly is basically abandoned.

Water infiltration typically occurs at preformed gaskets, due to either shrinkage (resulting from weathering/aging) or improper installation. Improper installation can result in gaps and/or openings between adjoining gaskets that occur at the corners of the sill and jamb intersections. During installation of the gaskets, adjoining gaskets might not be properly mitered at the adjoining corner, or the two adjoining gaskets might be "pulled/stretched" into their original end-to-end positions then shrink back "recoil/relax" to their original length. Refer to Tremco's *Technical Service Bulletin No. S-05-06* for further information regarding proper installation of gaskets.

As a result of these actions, a relatively large gap (¼ in to ½ in) can occur at the corners of the sill and jamb intersections, which can allow water to migrate into the internal network of the assembly (*Figure 1*). The gaskets are traditionally composed of EPDM rubber that, upon exposure and aging, will begin to shrink and develop crazing/cracking of the gasket surface (*Figure 2*). This shrinkage and development of cracks (particularly along the outer, thinner edges of the gasket) can result in a loss of compression between the gasket and the glass, which can then allow moisture migration into the assembly (*Figures 3* and *4*). Therefore, the purpose of the wet seal is to completely conceal the gasket with the new sealant.

This can be achieved by placing either bond-breaker tape or a ¼-round backer rod over the exposed top edge of the gasket and then applying the new sealant in a fillet-shaped joint configuration (*Figure 5*). After the sealant is "gunned" in place, the sealant is tooled to achieve bond interfaces ("bite") with both the glass and the frame (*Figures 6* and *7*).

The bond breaker tape (typically a polyethylene strip/ribbon) or the backer rod serves two purposes:

Figure 6 – Wet sealing window frame.

Figure 7 – Tooling sealant.

1. Results in an unbonded portion of the bottom of the sealant to achieve a profile similar to the desired "hourglass" shape for optimum sealant performance, and
2. Protects/separates the sealant from the gasket to alleviate potential compatibility issues between the sealant and the gasket (*Figure 8*).

Since the existing gaskets in window systems are predominantly black, a black-colored sealant is commonly used for this application. A silicone-based sealant is typically used for wet sealing due to its propensity for achieving long-term bonds with both glass and metal substrates. At exposed fasteners in the assembly, sealant is applied in a cap-bead configuration that conceals the fastener in its entirety. A cap-bead profile, or bridge-sealant joint, is also applied over exposed joints in the metal frames and/or covers of the assembly.

The cap bead is centered over the joint and can be applied directly to the metal frame. If movement is expected at this joint, a thin strip of bond-breaker tape (polyethylene) may be loose-laid over the joint prior to the sealant application, again attempting to mimic or achieve parallel bonded ends of the sealant. Silicone sealant is also typically used for this application. Sealant applied over joints in the frames will commonly intersect or abut sealant that is applied between the metal frame and the exterior façade finish. Therefore, sealant compatibility between various sealants that occur in these joints should be confirmed. However, when wet sealing is performed, the sealants located around perimeters of the frame are also typically replaced, as these sealants are commonly the same age as the gaskets and are weathered and deteriorated. This

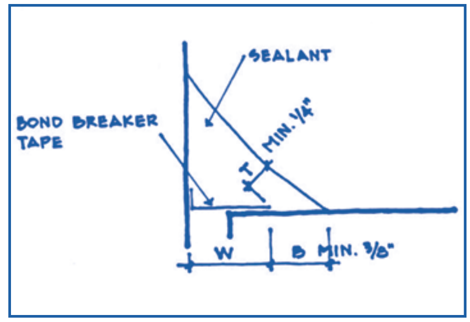

Figure 8 – Fillet joint diagram.

also allows the proper sealant selection for all of the affected joints. Surface prepara-

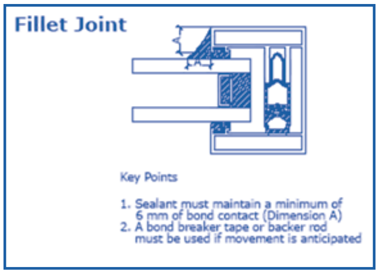

Figure 9 (above) – Sealant fillet bead at window frame.

Figure 11 – Wet-sealed lockstrip.

Figure 10 (below) – Wet seal applied along edge of gasket.

tion, cleaning, and priming are essential in achieving proper sealant performance with this application (*Figure 9*).

Similar to other preformed gasket systems, lockstrip gasketed systems become vulnerable as the outer edge of the gasket or lip of the gasket loses pressure on the glass, resulting in avenues for moisture migration into the glazing pocket and manifesting as leakage in the interior at joints in the gaskets. Wet-sealing of these assemblies can include injecting sealant behind the lip of the gasket and allowing the sealant to exude out to be tooled flush. Sealant is then applied in a cap bead centered over the lip or outer edge of the gasket and adhered to the gasket and the glass (*Figures 10* and *11*). Sealant is also applied over the gasket intersections at the corners of the four glass units and at any gasket joint that may occur in vertical or horizontal runs of the assembly (*Figures 12* and *13*). Mock-ups using the proposed sealant should be performed to test for compatibility issues and adhesion properties. In the past, polyurethane sealants were commonly used for this application, due to their ability to bond readily to the gaskets. However, due to their organic-based compound, this type of sealant weathered and became hardened in a relatively short timeframe (i.e., 5-7 years) and made future sealant remedial work (removal) more exhaustive. Additionally, polyurethane sealants

Figure 12 – Lock-strip gasket corner.

Figure 13 – Wet seal of lock-strip gasket.

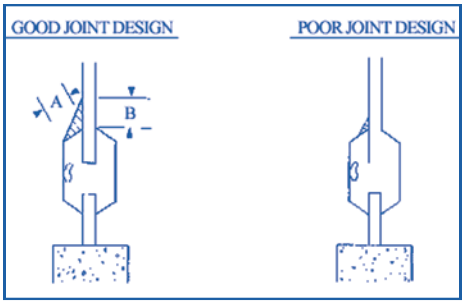

Figure 14 – Lockstrip wet seal diagram.

are typically not designed for achieving high performance when adhered to glass substrates. Improvements in silicone sealant technology in achieving good adhesion to rubber gasket, combined with its recognized ability to bond to glass have allowed silicone sealants to be used effectively for this purpose. Silicone sealants now have a proven track record for long-term performance, and in certain cases, a warranty (material and installation) can be issued by the manufacturer for the sealant application (*Figure 14*).

In summary, wet sealing can be a valid and cost-effective method for alleviating certain water infiltration problems associated with window systems and assemblies. However, as with most sealant applications, assembling mock-ups and performing prejob adhesion testing are essential in achieving optimum results. In addition, it is recommended that the sealant manufacturer be involved in the planning phase of the project and validate or approve of the application.

REFERENCES

1. ASTM C 717, Standard Terminology of Building Seals and Sealants.
2. ASTM C 920, Standard Specification for Elastomeric Joint Sealants.

Figure 15 – Installed wet seal at window frame.

3. ASTM C 1193, Standard Guide for Use of Joint Sealants.
4. *Joint Sealers*, CSI Monograph Series, December 1991.
5. Sandberg, L. Bogue, "Comparison of Silicone and Urethane Sealant Durabilities," *Journal of Materials in Civil Engineering*, Vol. 3, No. 4, November 1991.
6. *Weatherproofing Sealant Guide*, Dow Corning, October 1994.

Karl A. Schaack, RRC, PE

Karl A. Schaack, RRC, PE, is president of Price Consulting, Inc., a roofing and waterproofing consulting firm in Houston, Texas. Schaack has a bachelor's degree in civil engineering from Clemson University. He is a registered professional engineer in Texas, South Carolina, and North Carolina. Karl is a member of RCI, the Roofing Contractors Association of Texas, and the Gulf Coast Chapter of RCI. He is an RRC and a former director of RCI's original Region IV. In 2007, he won the Horowitz Award for best technical article in *Interface* for 2006.

RCI Director of Technical Services Receives D08 Highest Award

Walter Rossiter, RCI's director of technical services, was granted ASTM Technical Committee D08 on Roofing and Waterproofing's highest honor at the American Society for Testing and Materials' June 23 meeting. The William C. Cullen Award was given to Rossiter "in recognition of his distinguished contributions and personal commitment to Committee D08 and to the field of roofing and waterproofing through his extensive research, prolific publications, and exemplary leadership."

Walt noted, "I am particularly honored because this award is named after a long-term friend and mentor who hired me into the building research industry and the roofing program so many years ago at NIBS/NIST."


Walt Rossiter with William C. Cullen Award. (Photo courtesy of Dick Fricklas, 2006 recipient of the same award.)

The William C. Cullen Award was established to recognize outstanding contributions and personal commitment by Committee D08 members to the field of roofing and waterproofing as exemplified by the distinguished accomplishments in this field by William C. Cullen.

A research chemist with over 35 years of experience with the National Institute of Standards and Technology (NIST), Walt Rossiter's research has supported the technical basis on which several ASTM standards are based. He has published and presented scores of papers throughout the industry, served as a past chairman of the ASTM D08 Committee, and received both an Award of Merit and the Walter A. Voss Award from ASTM for his contributions. He has co-chaired five ASTM symposia on roofing research, served as a faculty member for the now-defunct Roofing Industry Educational Institute (RIEI), participated in the Roofing Industry Committee on Weather Issues (RICOWI)'s field reconnaissance missions following wind events, and represented NIST with the international community. Retiring from NIST in 2006, Rossiter took his current position with RCI in 2007. He also serves as a member of the RCI Foundation board of directors.