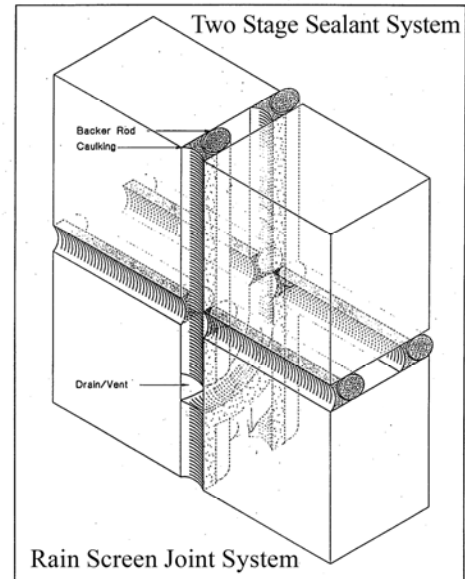


What is a Rain Screen Sealant Joint System?

The importance of good seals in new buildings is noted when walls discolor because of water intrusion; when important papers are soiled, machines get wet and fail, floors and rugs are ruined. Then people think seriously about good sealing practices. Considering the problems and high financial impact that can occur, attention being paid to a good design in sealant joinery is growing.

One of the most reliable ways of eliminating water leakage through the sealant joinery in any building envelope is to apply the rain screen principle within the design, providing pressure equalization, thus preventing the vacuity of water through sealant expansion joints. The basic objective of the Two Staged Sealant System is to provide a major deterrent to water leakage at the outside face of the wall, and seal against air and vapor passage on the interior side of the air space, where the *primary seal* is exposed to little of the destructive elements of weather and sun.



A *Rain Screen Joint Sealant System* or Two Stage Sealant System refers to the function of the two beads of sealant as secondary and primary seals in the same joint; preventing water intrusion to the building through the sealed joinery. This system has proven to be an affective way of preventing the vacuity of destructive moisture into the building and its many components.

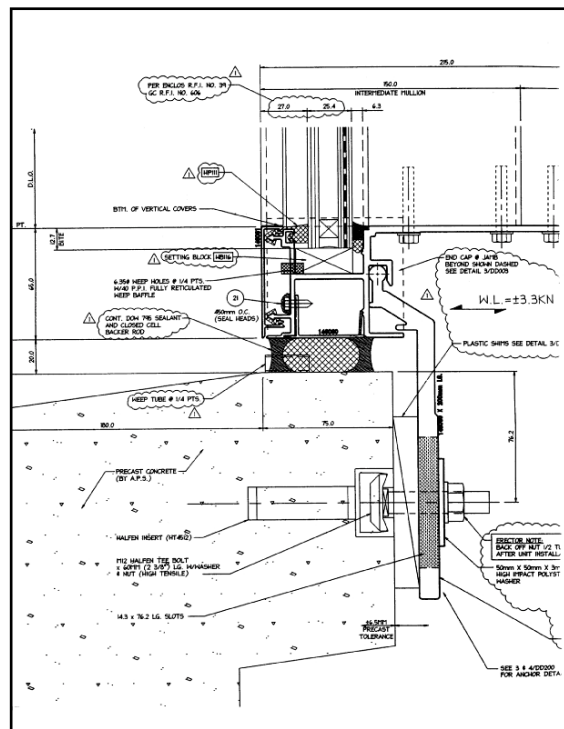
What is referred to as the *Rain Screen Joint* is a combination of the exposed exterior sealant bead, backed by an air space and so designed that it shields the primary (or secondary) interior joint from wetting and

forbids the vacuity of water through pressure equalization beyond the primary sealant bead to the building's interior.

It should be recognized, to begin with, that the term *rain screen joints* and *pressure equalized sealant design*, though closely related and in fact, interdependent, are not strictly synonymous. The term *rain screen* refers to the principle of design which prescribes how penetration of wind driven rain and water may be prevented. Thus the use of the sealant rain screen principle is essential to achieving a pressure-equalized joint method designed to protect the occupants of any building structure against the damaging effects of water alteration and/or intrusion.

It must be understood, too, that the provision of true pressure equalization using two beads of sealant in the same joinery may be difficult, and in some cases impractical. With certain types of windows and glazing systems it is a rather simple matter, requiring little if any additional expense in hardware. In curtainwalls, however, the achievement of pressure equalization sealant systems may become complex, evolving careful detailing and custom extrusions.

Pressure equalization should not be confused, as some may have the tendency to do, with the more conventional and long accepted 'theory of secondary defense', depending on closed cell backer rods to form a seal. Closed cell backer rods will take a compression-set, thus allowing moisture to bypass its installation. Other "expandable foam tapes" can offer a seal against water intrusion forming a mechanical adhesion to the substrates creating the joint system. In some cases, a single sealant bead is installed over the expandable tape to create a double-line of protection against water intrusion.



Action of Rain on a Wall Surface

Before examining what causes water to enter through sealant expansion joints, and how the rain screen principle may be applied to prevent it, it would be well to review briefly how rain-water acts on a wall surface and what can be the most vulnerable parts of a wall, the joint sealants.

A substantial film of water flows down the wall surface and, if wind is present, as is often the case when it is raining, the water flows laterally, and on parts of the building facade it may flow upward as well. The taller the building, the greater will be the accumulated flow over the lower parts of its walls. Lateral flow under wind pressure is greatest near the windward corners of the building, and upward flow is maximum at or near the top of the building facade facing the wind. Therefore, thought to the design of exterior cladding must be given greater attention, as seen in this precast panel design. →→→→→



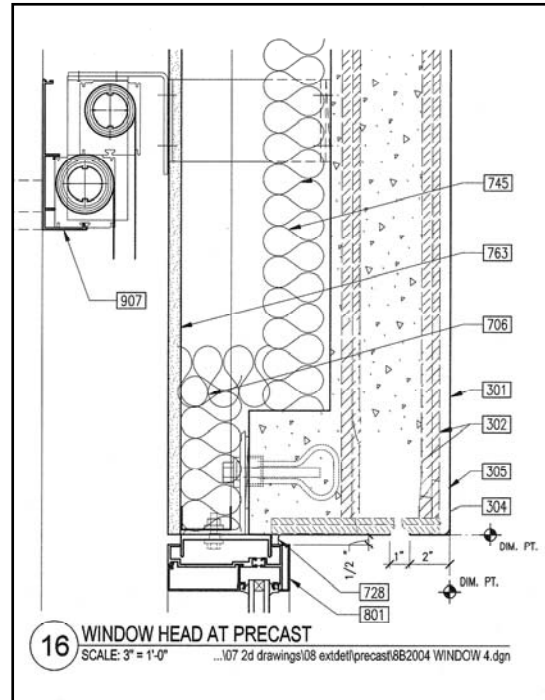
The Nature of Force and Their Control on the Rain Screen Principle

There are various forces which must be considered, and some of them do not result from wind action. Positive and negative forces may be present from the building environmental controls, but in a windy rainstorm various forces are likely be acting to move the surface water through any available opening in failed sealant. The installation of a Two Stage Sealant System or Rain Screen Joint System can be one of the most affective ways in providing an affective barrier against water intrusion.

Two Stage sealant installations in expansion façade joinery (in general) are made more resistant to water penetration, by eliminating the pressure differences, or equalizing the pressures occurring on its inner seal. Therefore, the primary façade or envelope joint seals are removed from the outer skin face and installed to the inner part of the exterior cladding,

where they are kept dry. Thus, instead of a single joint sealant bead working alone against water intrusion, being subjected to both water and wind pressure, the installation of dual sealant beads adds greater protection. Now, the rain screen seal (outer sealant bead) shields against water penetration as the interior joint sealant seals affectively against both air and water penetration. In the illustration on the right the exterior precast the concrete panel has a *Two Stage* sealant system installed, designed to prevent vacuity of water into the building interior with the weep located at the bottom drip edge reveal. The weep is thus placed at the bottom to allow gravity to naturally pull any water bypassing the outer seal. → → → → →

It is important to note that the precast sealant must make contact with the window perimeter sealant as shown for continuity in the façade joinery sealants.



Compartmentalizing the Rain Screen Joinery; Strategic placement of weep tubes and or vents from floor line to floor line in multi-story buildings can prevent intruding water from running aimlessly through the building envelope before it is discovered at some distance from its entry.

The benefits of installing a Rain Screen Joint System help fight against:

- Sealant failure that occurs as a result of faulty sealant installation.
- Kinetic energy force; under the influence of wind, raindrops approach the exterior wall with considerable velocity, and their momentum alone may carry them through openings and sealant failures of insignificant size.

- Capillary action that may occur through a failed single line of sealant allowing unwanted water intrusion. One way to control flow by capillary action is to introduce a discontinuity, or air gap between two lines of sealant, e.g. a Dual Stage Sealant System
- **Convection and Differential Pressure;** These two types of force caused by wind action, are the most critical and most difficult to combat. Air currents may result from differences in pressure over the wall surface, or from convection within wall cavities, and these may carry water through expansion joinery of a single line of sealant. Also, when water is present on one side of the expansion joint, and the air pressure on that side is greater than that on the other side, the water will be moved through any sealant failure, no matter how small, in the direction of the pressure drop. Such pressure differentials may be caused even by gentle winds. It is this latter type of force, differential pressure, which causes most of the leakage at wall joints.

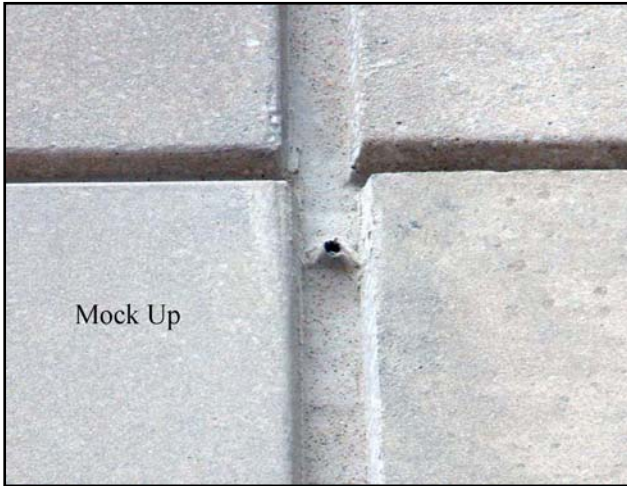
As typically performed, the conventional approach to combating the above types of water intrusion is to install a single sealant bead around curtain wall, window perimeters, and exterior claddings. But the more effective and more reliable approach is to eliminate the pressure differential across the joinery, equalizing the pressures through a primary and secondary sealant installation. It is this approach that is most affective and is known as the rain screen principle.

The ideal leak proof wall employing the Sealant Rain Screen Principle incorporates these essential elements:

- An exterior or rain screen sealant bead barrier to water penetration.
- A confined air space, vented to the exterior compartmentalized to prevent water from wandering aimlessly throughout the building envelope.
- An interior sealant bead, known as the primary defense against water intrusion.

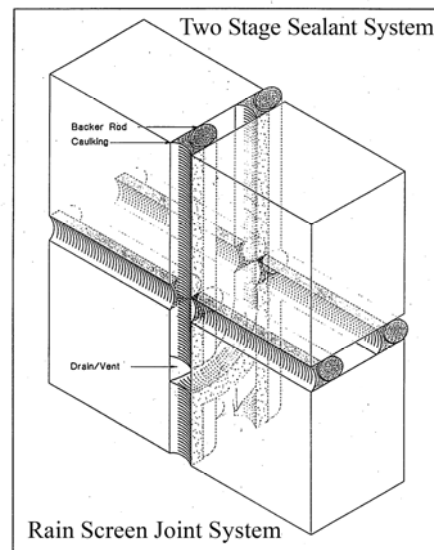
These elements prevent (for the most part) the passage of air and vapor in joint sealants and are capable of withstanding positive and negative pressures.

As it is assumed that most water leaks will occur through the building expansion joinery, the rain screen joint system incorporating the air space should always be vented or weeped to the outside.

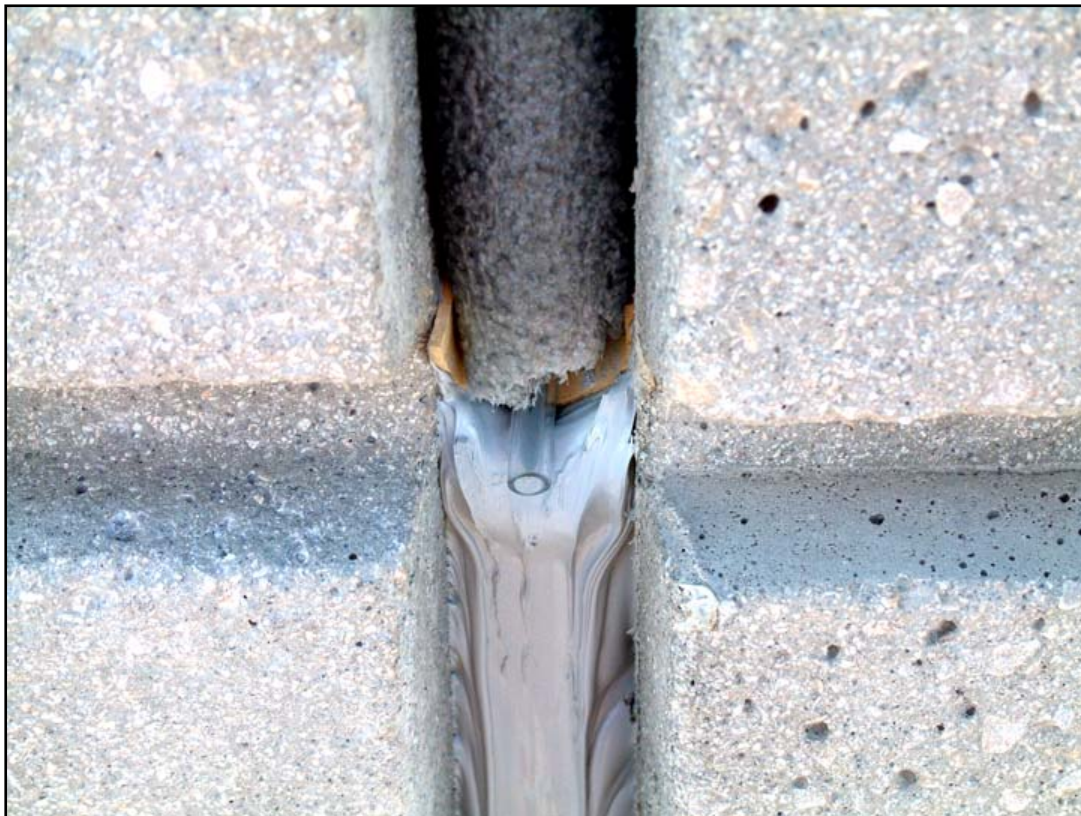


How to Compartmentalize the Rain Screen Joint System

To compartmentalize a Two Stage Joint installation a connecting bead of sealant must be placed between the inner and exterior joint sealant beads, thus allowing any water to exit the cavity created by the two lines of sealant. Before the exterior sealant is completed a weep tube is placed in a predetermined location. As shown in the illustration on the right, the weep or vent is located below a sealant intersection to allow any pooling water in the horizontal surfaces to fall and weep to the exterior. →



Below are some examples of how the two beads of sealant are connected. The connecting bead of sealant acts as a trough directing any water to the weep tube. Finally the exterior weather seal is then extruded and tooled for an aesthetic appearance.



The weep tube is placed before the final sealant bead is installed.