

BY ROSS J. SMITH, PE,  
LEED AP BD+C, CDT  
Wiss, Janney, Elstner Associates, Inc.

When that dubious “leak” occurs, instead of a rushed response, stepping back to review on a more macro level can help to identify and understand the best solution.

**Location:**  
WJE DETROIT  
41 Washington Avenue  
Suite 315  
Grand Haven, MI 49417

**Contact:**  
T: 616.401.2228  
E: rsmith@wje.com

www.wje.com

**WJE** ENGINEERS  
ARCHITECTS  
MATERIALS SCIENTISTS

Wiss, Janney, Elstner Associates, Inc.

## “The Window is Leaking!” 5 Steps to Diagnosing Water Infiltration into Your Building

Most building owners, managers, and facilities personnel have a vast array of experience receiving calls from distraught building occupants complaining of window leaks. While some such laments turn out to be isolated plumbing mishaps, and others undetectable, unrepeatable issues, the truth is: water infiltration issues plague many building envelope systems.

Some experienced facilities personnel are exceptionally in-tune with their facility’s system capabilities, controls, and tendencies, and can rapidly diagnose problems. However, even the most proactive owners and sophisticated operators are subject to the limitations of the system, as well as other unforeseen circumstances, and can be left scratching their heads. When that dubious “leak” occurs, instead of a rushed response, stepping back to review on a more macro level can help to identify and understand the best solution. Here we examine some initial items to understand, questions to ask, corresponding conditions to check, and steps to take when responding to “leak” reports:

### 1. Secondary Components of the Window System

The word “window” actually covers a broad assembly of components. As the investigation narrows on specific contributing deficiencies, it is important to isolate and evaluate critical features which represent the most common failure points.

**a. Weep/drainage avenues**—Windows and curtainwall systems often have a designed drainage pathway fortified by internal glazing seals, and culminating in a



Severe frost/ice development on cold window frames due to condensation and thermal bridging issues (not a leak!)

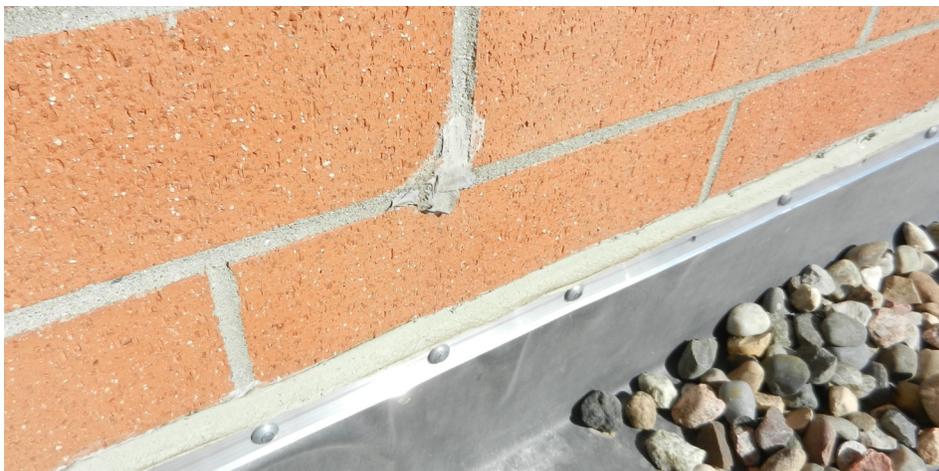
## Water Infiltration (CONTINUED)

purposeful opening called a “weep”. To an unsuspecting observer, such holes can be misinterpreted as potential leak sources. Enter the frustrated owner, the rogue maintenance person, or the overpromising contractor, armed with the quintessential solution for any and all water problems: the large tube of caulk. Resist the urge to solve everything with caulk/sealant and recognize that misapplied sealant can be the **cause** for infiltration problems. Weep avenues are critical and must remain open. Re-opening an improperly blocked or covered weep (or many weeps), may be your entire leak solution.



*Small plastic weep tube in masonry wall assembly above a window opening*

**b. Flashings**—Like weep accessories, flashing materials can be critical for proper performance of a window drainage system. Flashing materials are typically metal, or membrane, and should be layered in an overlapping shingle-like fashion to allow water to flow down and out. When maintenance occurs around flashings, take care not to cut, damage, or displace the flashings. All too often flashings are sealed where they shouldn't be, trapping water within the wall or window system, eventually forcing it inside, and again, becoming the **cause** of infiltration.



*Sealant improperly applied over plastic weep tube in brick masonry wall*

**c. Sealant**—Though we don't want unchecked application of caulk to cure all perceived ills, properly applied and maintained perimeter sealant often acts as the first primary barrier of any window water management system. Surface preparation, product selection, and installation method are all important factors contributing to long-term joint sealant success. Once the sealant is breached, infiltration can occur.

Deficiencies to watch for include: adhesive bond failure (sealant pulled away from window frame), cohesive failure (sealant splitting within the joint) and “crazing” (extensive series of interrelated cracks). Any one or any combination of these items may indicate that careful sealant replacement is warranted in the near future.

## 2. Seasonal/Situational Conditions

Recalling/reviewing trends of when the leak happens can be critical to diagnosing the cause of the problem. Often, such “when” questions are best answered by the facility staff themselves, but building staff/occupants/users adjacent to the leak area may be most familiar with daily changes and repeat problems. Whomever the best

## Water Infiltration (CONTINUED)

source of information, consider the details of when the leak occurs and ask questions, as pertinent.

- Does the leak happen every day, regardless of rain?
- Does the leak only occur during heavy directional rain?
- Does the leak only happen in winter (in northern climates)?

If the leak is happening every day, check the path of your irrigation fixtures, you may be inadvertently sprinkling your building and causing unintended consequences. Infiltration limited to directional rain events may be a clogged weep or a problem with internal seals which are exacerbated/overwhelmed when a large volume of precipitation builds up.

A winter only condition could be indicative of snow on a sill, or an interior relative humidity/condensation problem (see item 5). If the situation isn't an emergency, in addition to asking good questions, consider tracking the incident(s) with written leak logs/reports including notes and photos describing the situational conditions. Over time, the accumulated documentation may provide detail and better data to evaluate the problem.

### 3. Location Specifics

Paying attention to the location of the leak may also give insight on what is happening and what solutions to try first. When first viewing the problem area(s) from inside the building, start with simple observations; then, specific follow-up questions about the location may lead you to a more precise understanding of source of the problem.

- Where is the evidence of water? Where does it start and where is it ending?



*Sealant improperly applied over flashing at the lintel spanning over a window opening*

- Is evidence of water limited to only the sill of the window?
- Is water limited to vertical streaking down the window jambs (Not showing up on the intermediate horizontal mullions)?
- Is water pooling on one or more horizontal mullion surfaces?
- Are there water droplets on some or all of the metal frame surfaces?

If interior leak evidence is found only at the bottom of the window, look more closely at the sill flashing and the weep holes on the exterior (see Items 1a and 4). Clogged weeps and/or failures in the sill flashing may be allowing water to bypass the drainage system and enter the building. If water seems to be on the vertical window elements only, water may be infiltrating into the head of the window from the facade above due to poorly installed flashing or lack of flashing all together. After bypassing the head flashing, water often pools on top of the window frame, seeps through interior frame joints, and streaks down the vertical jambs. When

there are no vertical jamb streaks, but water pools on one or more horizontal mullion surfaces, it may be indicative of a breach in the exterior gaskets/glazing on the glass lites above the surface(s) in question. Water droplets on all of the frame surfaces likely suggests a condensation problem, which may not be an actual leak at all.

### 4. Surrounding Construction

Windows and doors and their respective installation contractors often shoulder the initial blame for any reported wall system leaks. In reality, the surrounding exterior materials and conditions are often solely to blame or at least are key co-contributors. If signs of infiltration are limited to window corners and jambs only, if safely accessible, look at the window from the outside and review the surrounding adjacent finishes. Whether the adjacent construction material is a metal siding, brick masonry, stucco, EIFS, or something else, properly designed and installed systems should include integral hidden layers of materials which serve as a drainage

## Water Infiltration (CONTINUED)

plane and pathway for water to exit the assembly. Successful implementation and maintenance of these layers, including flashings and weep pathways are critical to envelope performance. Failures in these hidden layers can sometimes be evident from localized deterioration of sealants, staining, or other indications of water movement. In many cases, a more extensive investigation involving select cladding removal is required.

### 5. HVAC Impact

Improper design and or mismanagement of the building heating, ventilation and air conditioning system (HVAC) can lead to problems related to the actual placement of supply and return vents as well as issues with sustained interior relative humidity. These complications can lead to systemic or isolated condensation situations which are often misidentified as a leaks. In northern climates, supplying warm air directly on the windows is a critical feature used to assist in warming the window frames. Directly reducing the amount of moisture in the air further limits the possibility of condensation on cooled surfaces. While there may be an insulation, vapor barrier, or window system positioning problem as well, adjusting pressure to net positive and reducing relative humidity can make a marked difference and may solve your "leak".

### Summary

Wherever you are in the investigation process, taking time to carefully review the specifics of this issue, understanding the surrounding construction, inquiring about the trends of distress, and eliminating (or proving) various potential HVAC factors can provide valuable insight, reduce wasted time and money, and move you closer to the eventual solution. Make consistent, careful observations, and fill out a detailed leak reports. If you need to hire an expert who may investigate, make openings, and conduct water and air tests, the data you've already gathered will be of great use to them as well.

### About the Author

Ross J. Smith, PE, LEED AP BD+C, CDT, an associate principal with Wiss, Janney, Elstner Associates, Inc., is experienced in building enclosure commissioning, unique failure investigations, structural evaluation, repair design, and construction quality control. His work also includes structural and architectural failures related to water infiltration, fire, wind, snow, condensation and material failures.