The Total Building Envelope Concept
by Eric J. Seaverson, P.E.

The building envelope consists of all exterior components of a building – roof, walls, below-grade waterproofing, windows, skylights, and so on. When looking at these components from a weatherproofing perspective, why is it so important that each component is taken into consideration? The answer is simple. Any missed detail, big or small, is a potential for moisture or air to migrate into the building.

The envelope is a complicated and integral entity of a building. That said, it is often the most neglected portion of a building. The building envelope must be properly designed, constructed, and maintained to prevent water and air infiltration through the envelope, and prevent moisture condensation within the envelope system(s). Each component of the building envelope must be reliable and also properly integrated with adjacent components to prevent moisture intrusion, such as roofs to walls, and wall systems to windows. Any and all moisture within the building envelope is a potential problem, including dripping water in interior spaces, deterioration of building envelope components, reduced insulation values, deterioration of structural components, and microbial growths.

When designing or maintaining a building envelope, the function of the specific system(s) must be considered to ensure it functions properly and reliably. In general, there are two types of building envelope systems: dual-stage and single-stage. A dual-stage system includes a primary barrier with a secondary waterproofing system. An example of a dual-stage system is a brick masonry veneer wall. The brick veneer is the primary barrier, but because water readily migrates through masonry, a secondary waterproofing membrane and flashing system are provided to capture and divert water back to the exterior. If weep holes (opening in the masonry to allow water to drain) are covered with sealant, water can backup in the cavity behind the brick, potentially causing more problems than are existing.

A single-stage system relies on the exterior “skin” to prevent leakage, without a secondary system to manage water leakage. Examples of single-stage systems are a roof membrane and insulated metal panels. In single stage systems, any water leakage (or condensation) behind the exterior skin typically becomes trapped and prematurely deteriorates the system.

Regardless of the type, flashing systems must be reliably integrated to prevent or capture and manage leakage. For example, because window frame corners are notorious for leakage (at installation or some point during the service-life), metal flashing should be provided under the sill framing to capture and manage water leakage; this is especially important in single-stage systems to keep water out of the wall.

Though it can be an expensive process to construct and/or maintain a comprehensive and reliable building envelope, the consequences of NOT having one are even higher. For new buildings, unreliable building envelopes can allow water leakage from the beginning, requiring significant effort to correct deficient components. For existing buildings, as maintenance is deferred, water infiltration into the wall system can go unnoticed for long periods of time, with building components continuing to deteriorate. With construction costs increasing annually, and the amount and extent of deterioration

multiplying, the cost of a comprehensive building envelope restoration project significantly increases. By implementing a periodic maintenance program, the service-life of the building envelope can be increased and the cost of future restoration/replacement projects decreased.

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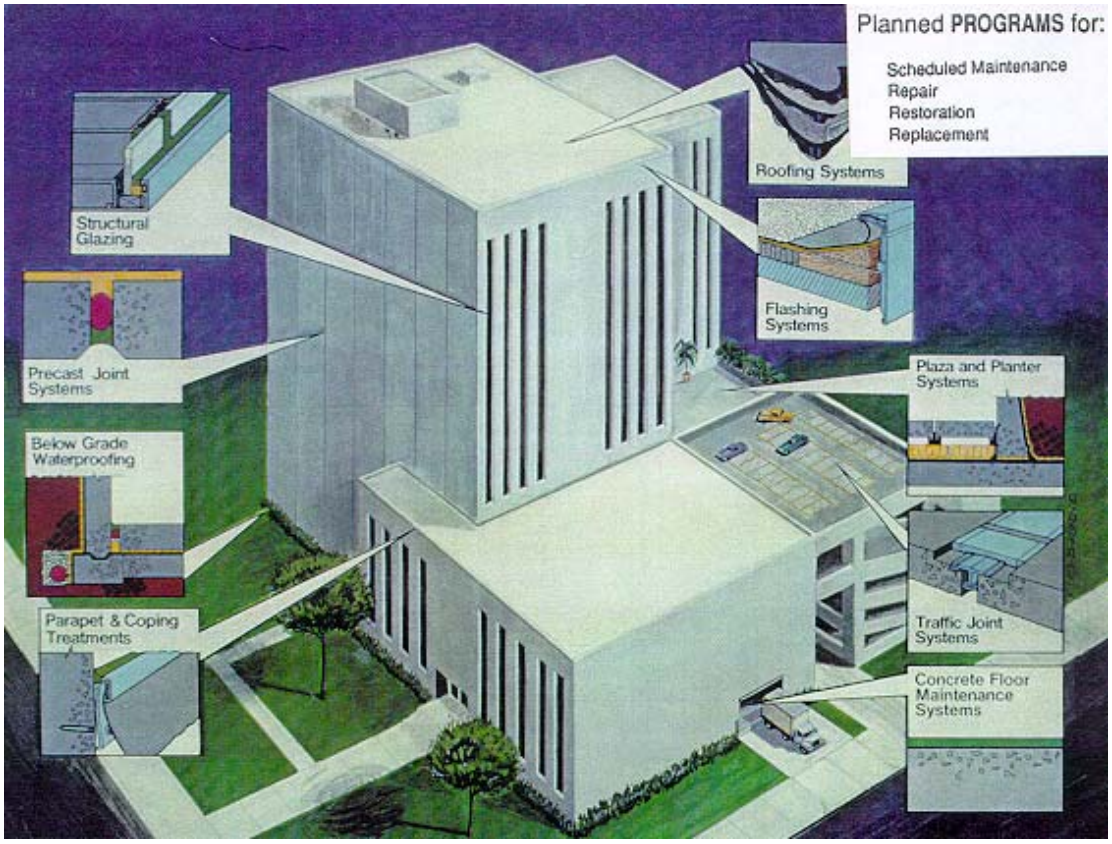
Sidebar:

Building Envelope Maintenance Checklist

1. Perform an interior survey to identify areas of potential water leakage, looking for stained ceiling tiles and stained interior finishes (such as around windows).
2. Review the exterior walls for signs indicative of excessive water infiltration, such as a white effloresence staining (masonry) or rust staining.
3. Review the condition of exterior sealants.
4. Review wall systems for cracks and openings that may allow water infiltration.
5. Review transition flashing, such as metal coping flashing at the top of wall, which may allow water infiltration into both the wall and roof system.
6. Perform an infrared survey of the roof to identify wet insulation (an indication of water leakage).
7. Review the roof membrane and flashing details for obvious holes and defects.
8. Remove leaves/debris from around roof drains.


Planned PROGRAMS for:
Scheduled Maintenance
Repair
Restoration
Replacement
Roofing Systems
Structural Glazing
Flashing Systems
Precast Joint Systems
Plaza and Planter Systems
Below Grade Waterproofing
Traffic Joint Systems
Parapet & Coping Treatments
Concrete Floor Maintenance Systems