PROTECTING THE BUILDING ENVELOPE

BY DEAN LEWIS

This series of images shows a vane axial wind-generating device as described in AAMA 501.1. This is a field dynamic water penetration test. The blades of the fan can be rotated to generate a different wind speed. These types of fans are generally used for hurricane-type testing. Photos courtesy of Architectural Testing.

The American Architectural Manufacturers Association (AAMA) was founded in 1936. The organization has been developing product performance standards for window, door, skylight, curtain wall, and storefront products for over 70 years and has been certifying products for over 50 years. AAMA also engages in product testing, market research projects, and continuing education. While the association's focus is and has always been on fenestration, additional guidelines, standard practices, and specifications have broadened the available information to matters that protect the building envelope from water penetration and air leakage. These specification and guidelines also go a long way toward ensuring the appropriate structural wind resistance of windows, doors, and skylights. And, as anyone in our field knows, protecting a building envelope starts from the top, so we'll start with skylights, the need for proper installation, and why field testing plays a crucial role in this process.

SKYLIGHTS

Unit skylights have been included in the North American Fenestration Standard (NAFS) since the 2002 edition. AAMA 1607, *Voluntary Installation Guidelines for Unit Skylights*, was last updated in 2014. This document has been developed for the purpose of providing a guideline for installing preassembled unit skylights onto a roof. It provides clear illustrations and concise commentary on the principles involved to ensure good installation practice when the unit manufacturer has not provided such detail in its instructions.

Additionally, a skylight specification/selection guide is nearing completion. This will provide another resource to those in the industry for how to best protect the building envelope when it comes to skylights – starting from the top.

INSTALLATION

This brings us to the subject of installing windows and doors in the building envelope. A great product is of little use if it's not properly installed. The quality of installation depends on a number of details, such as the installer's skill and experience, the product type, and the configuration and construction of the building wall.

In addition to local building code requirements, the first stop is always the manufacturer's installation instructions. But they can vary in methods and thoroughness, often omitting detail on how to handle various surrounding wall and job-site conditions. The need to fill in such gaps and provide more consistency among installers propelled AAMA's development of the InstallationMasters™ Program in 2000 to train and certify residential window installers, with over 12,000 individuals certified to date.

AAMA has published and maintains several documents that detail the practice of installation and reinforce the importance of doing so properly. These standards go a long way toward protecting the building envelope, as well. Note that some of these documents have been written in collaboration with the Fenestration Manufacturers Association (FMA) and the Window and Door Manufacturers Association (WDMA).

FMA/AAMA 100-12, *Standard Practice for the Installation of Windows With Flanges or Mounting Fins in Wood Frame Construction for Extreme Wind/Water Conditions* – This standard practice covers the installation of windows in wood-frame new construction for residential and light commercial buildings of not more than three stories above-grade in height, utilizing a membrane/drainage system. This practice applies to windows that employ a mounting flange or fin that is attached to the window perimeter frame and is designed as an installation appendage.

FMA/AAMA 200-12, *Standard Practice for the Installation of Windows With Frontal Flanges for Surface Barrier Masonry Construction for Extreme Wind/Water Conditions* – Here, AAMA covers the installation of frontal-flanged windows into buildings with surface barrier wall construction (masonry/concrete). Frontal-flanged windows employ an integral or applied flange that is attached and sealed to the window perimeter frame and is designed to cover a previously installed buck and/or integrate with a precast sill. This standard practice covers the installation process for windows from pre- to post-installation.

FMA/AAMA/WDMA 300-12, *Standard Practice for the Installation of Exterior Doors in Wood Frame Construction for Extreme Wind/Water Exposure* – The methods within this document cover the installation of exterior doors in new construction—both residential and light commercial buildings—of not more than three stories above grade in height, utilizing a membrane/drainage system. This practice applies to exterior doors that employ a mounting flange, exterior casing/brick mold, or a box frame.

FMA/AAMA/WDMA 400-13, *Standard Practice for the Installation of Exterior Doors in Surface Barrier Masonry Construction for Extreme Wind/Water Exposure* – Similar to the previous listing,

An example of a residential curbmount skylight, courtesy of CrystaLite.

Bonobo Winery in Traverse City, MI.
Photos courtesy of Pella Windows and Doors.

this standard practice covers the installation of exterior doors in new construction for residential and light commercial buildings, but with surface barrier wall construction (masonry/concrete). It is expected that all referenced components meet code requirements in force at the time of the installation.

AAMA 2400-10, *Standard Practice for Installation of Windows With a Mounting Flange in Open Stud Frame Construction for Low Wind/Water Exposure* – The 2400 document addresses recommended methods and sequences used to apply or modify the water-resistive barrier or other flashing and sealing materials to open-framed construction. The techniques demonstrated here have been developed specifically to create a moisture barrier to incidental liquid water penetration at the external interface between the window and the rough opening. Whether through the external interface between the window and rough opening, the window joinery, or the installation joints around the perimeter of the window, water that does manage to penetrate will not have a means to exit to the building exterior. As a result, this standard is recommended for buildings and installations considered at low risk of water intrusion.

AAMA 2410-13, *Standard Practice for Installation of Windows With an Exterior Flush Fin Over an Existing Window Frame* – In some cases, it is not advisable to disturb the seal between a previously existing window's frame and the water-resistive barrier. In such cases, the existing frame may be left in place and a replacement window installed within it. This practice covers just such an application in detached one- and two-family dwellings and townhouses not more than three stories above grade in height.

AAMA IPCB-08, *AAMA Standard Practice for the Installation of Windows and Doors in Commercial Buildings* – Here AAMA moves from residential and light commercial to commercial buildings,

covering windows and both hinged and sliding-glass doors. Information pertains to both new construction and replacement projects. Storefront and curtain wall products, profiles, and systems are frequently used in window and door openings; however, these applications are outside the scope of this standard practice.

FIELD TESTING

AAMA/WDMA/CSA 101/I.S.2/A440-11, the North American Fenestration Standard referred to as NAFS, is based on lab testing for air leakage, water penetration resistance, and structural resistance to wind loading. While there is no AAMA field test for structural qualities of fenestration products, AAMA 502 (*Voluntary Specification for Field Testing of Newly Installed Fenestration Products*), 503 (*Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls, and Sloped Glazing Systems*) and 511 (*Voluntary Guideline for Forensic Water Penetration Testing of Fenestration Products*) define the appropriate air and water test pressures, test durations, and conditions for air and water leakage field testing and for forensic investigation of existing leaks.

Note that both AAMA 502 (for "punched" openings) and 503 (for storefronts and curtain walls) are applied to newly installed products. If field testing is required after the building occupancy permit has been issued or more than six months after product installation, then AAMA 511 (the forensic document) needs to be followed.

The current edition of the industry standard specification for windows and doors is NAFS-11 (published in 2011), although some current building codes still cite NAFS-08. As a standard, NAFS specifies ASTM E283 for air leakage and ASTM E547 and/or E331 for water penetration resistance test methodology, depending on the product's performance class. These tests are performed under controlled environmental conditions. Prototype test samples are mounted plumb, level, and square per NAFS-11 tolerance in a precise test buck opening.

NAFS-11 certification provides a convenient means to determine the field test pressure for water penetration resistance for all classes of certified fenestration products. Most windows and doors will have the ratings posted on them with a permanent label, with pressure designated in Pascals and in psf.

The AAMA 502 specification was originally published in 1990 and was initially used primarily for commercial installations such as schools, hospitals, and government buildings. With increased concern and code requirements for residential construction, the AAMA 502 specification is now widely used on all types of installations. It has since been updated several times, specifying, among other things, that:

- An AAMA-accredited lab must perform testing.
- The field test air and water test pressures are to be reduced from the lab testing figures.
- Field-testing is intended for newly installed products.

Both ASTM E331 and E547 for water apply to laboratory testing per NAFS requirements. Procedure A (uniform static air pressure difference) is used for AW Class (architectural) products, while Procedure B (cyclic static air pressure difference) is used for other performance classes. Test methods for field-

Pella® team members prepare to install energy-efficient two-wide composite Pella windows into the home of Steve and Sue Ralston of Waterloo, Iowa. Photo courtesy of Pella Windows and Doors.

testing referenced in AAMA 502 are ASTM E783 for air and E1105 for water. Note that while the ASTM documents prescribe the methods of test, AAMA 502 defines the test pressures and testing conditions to be used and provides the pass/fail criteria. Both together provide the conditions for the field tests. For ease of compliance with the test methods and acceptable pass/fail criteria, AAMA 502 includes a short form specification; the project specifier need only fill in a few select blanks.

AAMA 503 was originally published in 1992 and is a similar document to 502, but for storefronts, curtain walls, and sloped glazing systems. The current edition is 503-14 and is essentially an editorial update from the 2008 edition, which defined "newly" installed as prior to issuance of the occupancy permit, and not to exceed six months later than that. Any testing performed after six months is considered beyond the scope of AAMA 503, but within the scope of AAMA 511 (the forensic procedure).

AAMA 511 provides a systematic method of investigation and analysis to determine the location and cause of known leaks. Often, improper or inadequate leak investigations result in investigators misidentifying the source of water penetration through the exterior wall. This error can result from observations of water penetration at or near a window, door, or skylight opening that may actually originate from the surrounding construction.

In other cases, the water penetration is from a combination of sources that may be inclusive of the fenestration product assemblies. A systematic forensic investigation of the water penetration is required to determine the actual source of the leak, and diagnostic testing is an integral part of this analytical approach. AAMA 511 is a complementary document to ASTM E2128 (*Standard Guide for Evaluating Water Leakage of Building Walls*).

On April 28 of 2015, AAMA conducted a very popular webinar, which was open to anyone in the industry (most AAMA webcasts are reserved as a benefit of membership). The recorded version, including questions and answers, is available on AAMA's Vimeo page (vimeo.com/126545899).

PROTECTING THE BUILDING ENVELOPE

All of these factors can work together to protect the building envelope. Ensure this is done by implementing proper installation; respecting field testing; and knowing your windows, doors, and skylights inside and out.

Dean Lewis

Since joining the AAMA in 1999, Dean Lewis has managed product certification and has advanced AAMA's FenestrationMasters™ professional certification program and other educational initiatives. He began his career at PPG Industries with positions in project engineering and design, sales, and customer technical support. He has served on committees of ANSI, ASTM, and ASHRAE. Further experience includes teaching in the industrial and military sectors, plus 35 years of managing technical training, publishing, and certification. Lewis holds a BS in physics with graduate work in engineering management.

Affordable Care Act Upheld

The U.S. Supreme Court, for the second time in three years, has affirmed the legality of key provisions of the 2010 Patient Protection and Affordable Care Act. In a 6-3 opinion issued on June 25, the court said that federal tax credits that enable individuals who cannot otherwise afford health insurance to purchase coverage are permissible under the Affordable Care Act and are in line with what Congress intended when it wrote the law.

Contractor groups say that they will continue to push for more construction-industry-friendly changes to the law or outright appeal, claiming that the law has caused health care premiums to rise. Since the measure was enacted, the Republican-controlled House has voted to alter or repeal the law about 50 times, but few changes have been enacted. The constitutionality of the law's "individual mandate" was also the subject of an unsuccessful legal challenge before the Supreme Court in 2012. ***– ENR***