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Standard Practice for Installation of Exterior Windows, Doors and Skylights[1]

This standard is issued under the fixed designation E2112; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

This document is intended to provide technical guidance to organizations that are developing training programs for installers of fenestration units in low-rise residential and light commercial structures. The majority of fenestration units selected for installation in these types of structures are certified as meeting specified performance characteristics in standardized laboratory testing. Experience indicates, however, that the performance of fenestration installations is frequently significantly inferior to the performance of the manufactured units in laboratory testing. Installation of fenestration units can significantly influence in-service performance.

The requirements promulgated in this practice have, by consensus, (of individuals with specialized knowledge concerning installation of fenestration units) been identified as necessary to ensure that as-installed performance is roughly equivalent to performance in laboratory testing. The task group responsible for development of this practice recognizes that building owners sometimes, accept as adequate, in-service performance of fenestration installations that are significantly inferior those of the units in laboratory testing. This practice is not intended for use in such circumstances, where owner expectations are modest. The intent of this practice is to provide guidance to those concerned with ensuring that as-installed performance is comparable to the capabilities of the units installed for a solid majority of installations.

A particularly noticeable behavior that indicates deficiencies in installation is rainwater leakage. Rainwater leakage has been the leading reason for dissatisfaction of building owners with performance of fenestration installations. For this reason, this practice places greater emphasis on preventing or limiting rainwater leakage than on any other single performance characteristic.

This practice emphasizes that the water-shedding surfaces of fenestration units must be adequately integrated with adjacent water-shedding surfaces of the building envelope. It does not, however, attempt to promulgate requirements for water-shedding surfaces of building envelopes other than those interfacing with fenestration units. The standard assumes that the basic design of the building's water-shedding system is adequate, that is, that either (*1*) there is a high probability that the outermost building surface will dependably prevent all water entry, or (*2*) the building envelope incorporates an effective concealed barrier that will dependably prevent further intrusion of incidental water that breaches the outermost surface. The practice further assumes that fenestration units can be dependably sealed to, and integrated with, at least one of these surfaces. If the basic design of the building's water-shedding system is inadequate, or does not allow for reliable integration of fenestration units into it, competent installation of the units is unlikely to nullify these deficiencies.

[1] This practice is under the jurisdiction of ASTM Committee E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.51 on Performance of Windows, Doors, Skylights and Curtain Walls.

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1. ~~Scope~~ Scope*

1.1 This practice covers the installation of fenestration products in new and existing construction. For the purpose of this practice, fenestration products shall be limited to windows, sliding patio-type doors, swinging patio type doors, and skylights, as used primarily in residential and light commercial buildings.

1.2 This practice assumes that the installer possesses basic woodworking skills and an understanding of wall and roof construction, sheet metal work, and joint sealant practices.

1.3 This practice attempts to instruct and familiarize the installer with the concepts of both Barrier Systems and Membrane/Drainage Systems, in order to ensure the continuity of the building envelope. This practice attempts to educate the installer, builder, architect, and other users in the identification and understanding of the water shedding system of the building envelope.

1.4 This practice covers the installation process from pre-installation procedures through post-installation procedures, for single units or factory-mulled multiple units in a single opening. It does not cover the fabrication or assembly of multiple units, whether such fabrication takes place in a factory or at the intended installation site. The installer should check with the manufacturer of factory-assembled units for instructions for anchoring. When using field-mulled units, follow manufacturer's recommendations and make certain that they meet applicable codes. This practice does not cover the selection of appropriate fenestration products for a given application, nor the selection of other products or systems for use in the installation.

1.5 This practice provides minimum requirements that will help to accomplish the installation of fenestration products in an effective manner. Actual conditions in buildings vary greatly and, in some cases, substantial additional precautions may be required. In the event that the manufacturer's installation instructions provided with the product conflict with requirements of this practice, the manufacturer's instructions shall prevail. This practice is not intended to limit or exclude other new procedures that may refine or further improve the effectiveness of fenestration installation.

1.5.1 This practice is intended to be used for background information in order to develop training manuals and training programs. Further, this practice attempts to consolidate and unify the various steps of construction, tying together the various trades involved with the continuity between fenestration products and the building envelope.

1.6 The text of this practice references notes and footnotes that provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of this practice.

1.7 This standard has not been created to address all issues related to every possible installation situation one might experience in the field. Furthermore, this practice does not purport to provide fail-safe installation methods, assurance or protection against installation deficiencies, or a standard by which architects can specify or ensure delivered performance.

NOTE 1—There are no ISO standards covering the primary subject matter of this practice.

1.8 *Design Professional*—This practice is not intended to limit the role and authority of a registered design professional to select a method of installation or to change, modify, or develop other methods of installation to meet the specific requirements of a building project for a particular location. A design professional retains the authority to prepare construction documents indicating window/door/skylight installations integrated with the water-resistive barrier (WRB).

1.9 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.10 *This practice does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and to determine the applicability of regulatory limitations prior to use.* For specific precautionary statements, see Section 5, Related Procedures. Where a lead hazard is known or suspected, refer to *ASTM Standards on Lead Hazards Associated with Buildings* and to applicable state and federal regulations. Where an asbestos hazard is known or suspected, refer to the *ASTM Manual on Asbestos Control*, and to applicable state and federal regulations.

1.11 *Table of Contents:*

1.12 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

A123/A123M Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
B456 Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium
B663/B663M Specification for Silver-Tungsten Carbide Electrical Contact Material
B766 Specification for Electrodeposited Coatings of Cadmium
C717 Terminology of Building Seals and Sealants
C755 Practice for Selection of Water Vapor Retarders for Thermal Insulation
C794 Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants
C834 Specification for Latex Sealants
C920 Specification for Elastomeric Joint Sealants
C1085 Specification for Butyl Rubber Based Solvent-Release Sealants (Withdrawn 1997)[3]
C1193 Guide for Use of Joint Sealants
C1281 Specification for Preformed Tape Sealants for Glazing Applications
C1299 Guide for Use in Selection of Liquid-Applied Sealants (Withdrawn 2012)[3]
C1311 Specification for Solvent Release Sealants
C1382 Test Method for Determining Tensile Adhesion Properties of Sealants When Used in Exterior Insulation and Finish Systems (EIFS) Joints
C1397 Practice for Application of Class PB Exterior Insulation and Finish Systems (EIFS) and EIFS with Drainage
C1620 Specification for Aerosol Polyurethane and Aerosol Latex Foam Sealants
C1642 Practice for Determining Air Leakage Rates of Aerosol Foam Sealants and Other Construction Joint Fill and Insulation Materials
D779 Test Method for Determining the Water Vapor Resistance of Sheet Materials in Contact with Liquid Water by the Dry Indicator Method

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.
[3] The last approved version of this historical standard is referenced on www.astm.org.

D1970/D1970M Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
D2822/D2822M Specification for Asphalt Roof Cement, Asbestos-Containing (Withdrawn 2016)[3]
E283 Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
E331 Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
E547 Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference
E621 Practice for Use of Metric (SI) Units in Building Design and Construction(Committee E06 Supplement to E380) (Withdrawn 2008)[3]
E631 Terminology of Building Constructions
E783 Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors
E1105 Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference
E1677 Specification for Air Barrier (AB) Material or Assemblies for Low-Rise Framed Building Walls
E2357 Test Method for Determining Air Leakage Rate of Air Barrier Assemblies

2.2 *AAMA Standards:*[4]
502 Voluntary Specification for Field Testing of Windows and Doors
711 Voluntary Specification for Self Adhering Flashing Used for Installation of Exterior Wall Fenestration Products
712 Voluntary Specification for Mechanically Attached Flexible Flashing
713 Voluntary Test Method to Determine Chemical Compatibility of Sealants and Self-Adhered Flexible Flashings
714 Voluntary Specification for Liquid Applied Flashing Used to Create a Water Resistive Seal around Exterior Wall Openings in Buildings
800 Voluntary Specifications and Test Methods for Sealants
808.3 Voluntary Specifications for Exterior Perimeter Sealing Compounds
809.2 Voluntary Specification for Non Drying Sealant
850 Fenestration Sealants Guide Manual

2.3 *ANSI/AAMA/WDMA Standard:*[4]
101/I.S.2 Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors

2.4 *AAMA/WDMA Standard:*[4]
1600/IS7 Voluntary Specifications for Roof Windows and Skylights

2.5 *ANSI/ASME Standard:*[5]
A39.1 Standard, Safety Requirements for Window Cleaning

2.6 *ANSI/EIMA Standard:*[5]
99-A-200 Exterior Insulation and Finish Systems (EIFS)

2.7 *ANSI/ISDI Standard:*[5]
102 Insulated Steel Door Systems—Installation Standard

2.8 *CSA Standards:*[6]
A440.4 Fenestration Product Installation
A440-M90 Windows—A National Standard of Canada

2.9 *CPSC Standard:*[7]
16 CFR 1201 USA Consumer Product Safety Commission, Code of Federal Regulations; Part 1201, Safety Standard for Architectural Glazing Materials, 1977

2.10 *FMA/AAMA Standards:*[4]
100 Standard Practice for the Installation of Windows with Flanges or Mounting Fins in Wood Frame Construction for Extreme Wind/Water Exposure
200 Standard Practice for the Installation of Windows with Frontal Flanges for Surface Barrier Masonry Construction for Extreme Wind/Water Conditions

2.11 *FMA/AAMA/WDMA Standards:*[4]
300 Standard Practice for the Installation of Exterior Doors in Wood Frame Construction for Extreme Wind/Water Exposure

[4] ~~Available from American Architectural Manufacturers Association (AAMA), 1827 Walden Office Square, Suite 550, Schaumburg, IL 60173-4268, http://www.aamanet.org.~~As of January 2020, AAMA organized with IGMA (Insulated Glass Manufacturers Alliance) with a name change to FGIA (Fenestration & Glazing Industry Alliance). AAMA Standards are now available from FGIA, 1900 E. Golf Rd., Suite 1250, Schaumburg, IL 60173. https://fgiaonline.org
[5] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.
[6] Available from Canadian Standards Association (CSA), 178 Rexdale Blvd., Toronto, ON M9W 1R3, Canada, http://www.csagroup.org.
[7] Available from U.S. Government Publishing Office (GPO), 732 N. Capitol St., NW, Washington, DC 20401, http://www.gpo.gov.

400 Standard Practice for the Installation of Exterior Doors for Surface Barrier Masonry Construction for Extreme Wind/Water Conditions

2.12 *FMA/WDMA Standard:*[8]

250 Standard Practice for the Installation of Non-Frontal Flanged Windows with Mounting Flanges for Surface Barrier Masonry Construction

2.13 *WDMA Standard:*[8]

I.S.4 Industry Standard for Water-Repellent Preservative Treatment for Millwork

2.14 *OSHA Standards:*[9]

29 CFR 1926.62 Lead in Construction Standard

29 CFR 1926.1101 Asbestos Construction Standard

3. Terminology

3.1 *Definitions*—Definitions are in accordance with Terminology E631 and Terminology C717, unless otherwise specified.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *accessory groove, n*—a shape included on a fenestration product frame that is designed to mate with installation accessories.

3.2.2 *air barrier, n*—the assembly of materials used in building construction to reduce or retard the uncontrolled passage of air into and out of the building.

3.2.3 *air barrier foam sealant, n*—an aerosol foam product dispensed as a bead into the air gap area around the fenestration perimeter to reduce the infiltration or exfiltration of air past the fenestration product.

3.2.4 *air leakage, n*—also referred to as *air infiltration*. According to Terminology E631 in buildings, the passage of uncontrolled air through cracks or openings in the building envelope or its components, such as ducts, because of air pressure or temperature difference. See Appendix X5.

3.2.5 *anchor line (or anchor point), n*—a line (or point) of reference on a fenestration product or the building, or both, where attachment is made.

3.2.6 *annealed glass, n*—raw glass used as a glazing product.

3.2.6.1 *Discussion*—

Further processing is required to transform annealed glass into safety glazing material.

3.2.7 *anodic finishes, n*—clear or colored coatings composed of aluminum oxide that are electrolytically deposited and are an integral part of the aluminum substrate.

3.2.7.1 *Discussion*—

Careful control permitted by the electrolytic anodizing process provides substantial improvement over a natural oxide film due to greater thickness, density, and hardness of these factory-produced finishes. Pre-anodic chemical treatments clean and prepare the aluminum for the anodic finish. The Aluminum Association classifies architectural anodic coatings depending on coating thickness and recommended use. Further detailed information and specifications on anodic finishes is available from the Aluminum Association and the American Architectural Manufacturers Association.

3.2.8 *apron, n*—a molding applied horizontally to the wall, directly below the window sill and used to hide the rough edge of the drywall or plaster below the window framing.

3.2.9 *backer rod, n*—a material placed into a joint, primarily to control the depth of the sealant, also serves as a bond breaker.

3.2.10 *barrier wall system, n*—a wall system that is intended to manage all water at the exterior surface.

3.2.10.1 *Discussion*—

These wall systems consist of the exterior surface of the wall and the exterior surface of the fenestration product, usually connected by a sealant joint.

[8] Available from Window & Door Manufacturers Association (WDMA), 330 N. Wabash Ave., Suite 2000, Chicago, IL 60611, http://www.wdma.com.

[9] Available from Occupational Safety and Health Administration (OSHA), 200 Constitution Ave., Washington, DC 20210, http://www.osha.gov.

3.2.11 *bead, n*—sealant applied in a joint, such as sealant bead, glazing bead, and so forth. According to Terminology E631, in glazing, (*1*) a strip of metal or wood used around the periphery of a pane of glass to secure it in place (also referred to as a stop) and (*2*) a strip of sealant, glazing compound, or putty.

3.2.12 *bite, n*—amount of overlap between the stop and the panel or light. According to Terminology E631, the distance that the surround member (rail or stile) overlaps the glazing.

3.2.13 *blind nailing, n*—nailing in such a way that the nail heads are not visible on the face of the finished work.

3.2.14 *blind stop, n*—a rectangular molding attached to the side and head of a window to serve as a stop for storm windows and screens.

3.2.15 *block frame fenestration product (sometimes called box frame), n*—a type of non-finned fenestration product (either window or door) that has no factory-applied moldings and that is installed into the rough opening either by driving fasteners through shimmed side jambs or by use of installation clips or brackets.

3.2.15.1 *Discussion*—

Exterior moldings or casings may be supplied with the fenestration unit (that is, by the manufacturer) for installation after the unit is secured in the rough opening. It is generally easier to ensure effective integration of a block-frame unit's water-shedding surfaces with the water-resistive barrier of a membrane/drainage wall system than it is to accomplish the same task with a non-finned unit to which exterior moldings have been factory-installed.

3.2.15.2 *Discussion*—

Block-frame windows are commonly used in most of the Canadian provinces. They are relatively rare in residential construction in the United States, where nailing flange windows and windows with factory-applied brick moldings are more common.

3.2.16 *bond breaker, n*—a material used to prevent three-sided adhesion in sealant joints.

3.2.17 *brick mold, n*—an exterior trim molding which forms a boundary between bricks or other siding and a fenestration product.

3.2.17.1 *Discussion*—

Brick mold fenestration units are a type of non-finned product (either window or door) with factory-supplied exterior moldings that are brick moldings. The unit may be supplied without the brick moldings attached, and intended for installation as a block-frame unit. More commonly, the brick moldings are factory-applied, and the unit is secured in the rough opening by nailing through the brick moldings into framing members.

3.2.17.2 *Discussion*—

Ensuring that the water shedding surfaces of the fenestration unit are effectively integrated with the WRB of a membrane/drainage wall system can be challenging. This practice does not recognize the brick moldings on fenestration units as being permanently effective water-shedding surfaces; finger joints in wood brick moldings may open over time unless paint maintenance is meticulous, and upper-corner miter joints may open sufficiently to permit some water intrusion. This practice assumes that the water-shedding surfaces of a brick mold fenestration unit are the window sash or door, the top and side jambs of the unit, and the unit's sill. This practice further recognizes, however, that over the service life of the fenestration unit, water leakage may occur between the side jambs and sill, which is why pan flashings are recommended for use with these units (see 8.2).

3.2.18 *buck, n*—a rough wooden framework, built into a window or door opening in a concrete or masonry wall, to which the window or door frame is secured.

3.2.19 *building envelope, n*—the exterior of a building.

3.2.19.1 *Discussion*—

According to Terminology E631, the outer elements of a building, both above and below ground, that divide the external from the internal environments.

3.2.20 *building paper, n*—a membrane material made of cellulose paper impregnated with asphalt (to inhibit passage of liquid water through the material) and which is commonly used as a concealed water-resistive barrier in membrane/drainage walls.

3.2.20.1 *Discussion*—

Typically installed after windows and window flashing. Block or brick-mold windows may be installed after building paper (defer to manufacturer's instructions).

3.2.21 *buttering, n*—application of sealant compound to the flat surface of a member before placing the member in position.

3.2.22 *cap/capping, n*—see *pan/panning*.

3.2.23 *casing, n*—a trim molding used around doors and windows to cover the area between the wall and the edge of the jamb.

3.2.24 *caulk (non-elastomeric), n*—see *sealant*.

3.2.25 *cementitious material, n*—material binding aggregate particles together into a heterogeneous mass.

3.2.26 *channel, n*—a three-sided, U-shaped opening in sash or frame to receive a light or panel.

3.2.26.1 *Discussion*—

In sash or frame units in which the light or panel is retained by a removable stop.

3.2.27 *channel depth, n*—the measurement from the bottom of the channel to the top of the stop, or measurement from sight line to base of channel.

3.2.28 *channel glazing, n*—the sealing of the joints around lights or panels set in a U-shaped channel employing removable stops.

3.2.29 *channel width, n*—the measurement between stationary and removable stops in a U-shaped channel at its widest point.

3.2.30 *cladding system, n*—the aesthetic covering of a building.

3.2.30.1 *Discussion*—

According to Terminology E631, material assembly applied to a building as a non-load-bearing wall, or attached to a wall surface as a protective and ornamental covering.

3.2.31 *cohibition point, n*—a location where movement is restricted between the sash and the frame, such as at a hinge or lock.

3.2.32 *complete window replacement, n*—the installation of a replacement window where the previously-installed window is completely removed.

3.2.33 *composite materials, n*—fenestration members which contain two or more materials, structurally combined or connected so as to perform structurally as a singular material such as poured and de-bridged aluminum shapes, fiberglass and man-made wood products.

3.2.34 *compound, n*—a formulation of ingredients, usually grouped as vehicle or polymer pigment and fillers to produce caulking compounds and elastomeric joint sealants.

3.2.35 *consistency, n*—degree of softness or firmness of a compound as supplied in the container.

3.2.35.1 *Discussion*—

Consistency varies according to method of application, such as gun, knife, trowel, and so forth.

3.2.36 *construction documents, n*—architectural drawings, specifications, shop drawings, manufacturing details, test reports, contracts, building permits, applicable codes.

3.2.37 *counter-flashing, n*—horizontally applied sheet (flashing) material that joins layers of flashings where they join the water-resistive barrier, enhancing drainage by gravity.

3.2.38 *cripple stud, n*—a short stud above or below a window or door opening.

3.2.39 *cross shims, n*—see *shim*.

3.2.40 *curing, n*—a chemical process which over time results in the ultimate properties of a finish or other material.

3.2.41 *curing agent, n*—one part of a two-part sealant which, when added to the base, will cause the base to change its physical state.

3.2.42 *drainage wall system, n*—see *membrane/drainage system*.

3.2.43 *drip, n*—any exterior horizontal course or molding that projects to the weather side of a wall or other surface to throw off water.

3.2.43.1 *Discussion*—

A small drip groove is sometimes used on the underside of a drip cap or window sill to prevent water from running back under the cap or window.

3.2.44 *drip cap, n*—a molding or flashing commonly installed over windows and doors to direct water away from the building in order to prevent seepage; also called a drip molding.

3.2.44.1 *Discussion*—

A rounded or beveled metal strip attached to the bottom of an exterior door to prevent water from draining or blowing under the door.

3.2.45 *drying, n*—the process of removing water from a material; usually accomplished with heated air.

3.2.45.1 *Discussion*—

According to Terminology E631, the process of developing, solely by evaporation of volatile ingredients, ultimate properties of a finish or other material over a specified period of time; compare *curing*.

3.2.46 *durometer, n*—an instrument used to measure hardness of a material.

3.2.46.1 *Discussion*—

Shore hardness is a commonly used hardness measurement scale.

3.2.47 *egress, n*—a means of exiting a room or building in an emergency.

3.2.47.1 *Discussion*—

An egress window is one that is large enough for an adult to exit the room in case of an emergency. The size is defined by national or local building codes.

3.2.48 *EIFS, n*—see *exterior insulation and finish system*.

3.2.49 *elastomer, n*—an elastic, rubber-like substance, such as natural or synthetic rubber.

3.2.50 *elastomeric sealant, n*—a sealant that returns to its initial dimensions and shape after substantial deformation.

3.2.51 *end dam, n*—any means provided to stop the flow of water out of the ends of a sill, panning system or subsill and into the wall cavity, such as sealants, upstands, plates, or gasketing.

3.2.52 *exterior insulation and finish system (EIFS), n*—according to Practice C1397, a non-load-bearing outdoor wall finish system consisting of a thermal insulation board, an attachment system, a reinforcement system, and a compatible finish.

3.2.52.1 *Discussion*—

ANSI/EIMA Standard 99-A-200 further defines EIFS as consisting of ~~5~~five elements: adhesive, foam, reinforcement fiberglass mesh, base coat, and finish coat, which does not include exterior joint sealant per Terminology E631.

3.2.53 *fenestration product, n*—any transparent or translucent glazing material plus associated sash, frame, mullions, and dividers, in the envelope of a building, including but not limited to windows, sliding glass doors, French doors, skylights, curtain walls, and garden windows.

3.2.54 *flashing, n*—sheet material, integrated with the water-resistive barrier, that bridges and protects the joint (gap) between the

window or door frame members and the adjacent construction for the purpose of preventing water penetration by draining water away from the window or door. For further discussion, see Appendix X1—Window/Door Flashing Types. (See also *pan flashing*.)

NOTE 2—Flashing is to be water-resistive and durable for the intended use. Flashing is to be a single component or a series of connected components that provides a mechanism to direct incidental water penetration to the exterior. Flashing is used to direct incidental water to the exterior either directly or via the wall cavity between the water-resistive barrier and cladding to provide a water-shedding system.

3.2.55 *flashing system, n*—integrated system of flashings intended to move incidental water to the building exterior or to the drainage plane.

3.2.56 *frame, n*—the outside perimeter of a window or door consisting of 2 side jamb members, 1 head member, and 1 sill member which holds the glass lites or sash panels.

3.2.56.1 *Discussion*—

According to Terminology E631, an assembly of structural members that surrounds and supports the sash, ventilators, doors, panels, or glazing that is installed into an opening in a building envelope or wall.

3.2.57 *frame liners, n*—covers or track assemblies, typically of vinyl or aluminum, designed to fit into an existing fenestration product frame for the purpose of accepting new sash or glazing. (Also known as *jamb liners*.)

3.2.58 *galvanic corrosion, n*—a form of deterioration of metal resulting from the electrochemical reaction that occurs when certain dissimilar metals are in contact with each other in the presence of moisture.

3.2.59 *glazing, n*—window sash and door panel in-fills that contain glass or glass-like materials.

3.2.59.1 *Discussion*—

According to Terminology E631, a material installed in a sash, ventilator, or panel such as glass, plastic, and so forth.

3.2.60 *head, n*—the top of a fenestration product.

3.2.60.1 *Discussion*—

According to Terminology E631, an upper horizontal member of a window or door frame.

3.2.61 *header, n*—a horizontal structural member (beam) that supports the load over an opening, such as that of a door or window. The header transfers that load to the vertical members at the sides of the opening.

3.2.62 *head expander, n*—an inverted U-channel fenestration installation accessory that may be fitted to the head of a replacement window to accommodate differences between rough opening height and product height.

3.2.63 *head flashing, n*—sheet material, integrated with the water-resistive barrier, that bridges and protects the joint (gap) between the window or door frame members at the head, and the adjacent construction for the purpose of preventing water penetration by draining water away from the window or door. For further discussion, see Appendix X1—Window/Door Flashing Types.

3.2.64 *house wrap, n*—a polymer-based sheet material provided in a variety of dimensions and used as a water-resistive barrier (user of this product should defer to manufacturer's instructions).

3.2.65 *inorganic, n*—designating or composed of materials that are derived from neither living organisms nor hydrocarbon sources.

3.2.65.1 *Discussion*—

Most inorganic compounds do not contain carbon and are derived from mineral sources. Calcium carbonate (that is, limestone) is generally classified as an inorganic material, although it contains carbon. Fossil or non-fossil remnants of dead organisms (for example, mollusks, limestone) are generally classified as inorganic materials provided that they are not composed of hydrocarbon molecules.

3.2.66 *installation accessories, n*—components that are specifically designed to *trim out* the product with various surrounding constructions.

3.2.67 *installation holes, n*—holes in window or door frames that are fabricated by the manufacturer to locate and accommodate installation fasteners.

3.2.68 *installer, n*—for the purpose of this practice the installer, of fenestration products is person or persons who do the installation labor and those who supervise such labor.

3.2.69 *integral fin, n*—a permanent appendage protruding from the body of a window or door, used as either an installation attachment feature or part of the water-resistive barrier interface between the product and the wall, or both. The term "fin" is also known as "flange."

3.2.69.1 *Discussion*—
Some fin designs allow them to be folded against the fenestration frame for shipping and *folded up* for installation.

3.2.70 *isolation coating, n*—a material which separates two adjacent materials to prevent galvanic corrosion of one of the materials by the other material. (See also *galvanic corrosion*.)

3.2.71 *jack stud, n*—a stud that does not extend from floor to ceiling, and which supports a lintel on its (the stud's) upper end.
3.2.71.1 *Discussion*—
Jack studs are used in conjunction with king studs, and form the vertical surfaces of rough openings.

3.2.72 *jamb, n*—a vertical member of a fenestration product frame (side jamb); or the horizontal member across the top of a fenestration product frame (head jamb).

3.2.73 *jamb flashing, n*—sheet material, integrated with the water-resistive barrier, that bridges and protects the joint (gap) between the window or door frame members at the jambs, and the adjacent construction for the purpose of preventing water penetration by draining water away from the window or door. For further discussion, see Appendix X1—Window/Door Flashing Types.

3.2.74 *king stud, n*—the full length stud next to a door or window opening to which the jack stud or trimmer and lintel are nailed.

3.2.75 *level, n*—having a horizontally flat, even surface with no irregularities and no vertical tilt.
3.2.75.1 *Discussion*—
No part of the surface is higher or lower than any other part. The end points of a line drawn on a level surface are equal distances from the center of the earth.

3.2.76 *lintel, n*—a horizontal member above a window or door that supports the exterior wall surface such as brick veneer.

3.2.77 *lite, n*—another term for a pane of glass used in a window; sometimes spelled light.
3.2.77.1 *Discussion*—
According to Terminology E631, lite is one piece of glazing (preferred term); (synonym: *pane*).

3.2.78 *mastic/roofing mastic, n*—water-proofing material used to seal or decorate.
3.2.78.1 *Discussion*—
According to Terminology E631, a material composition that, after application as a thin layer, is converted to a solid protective, or decorative, or functional adherent film.

3.2.79 *membrane/drainage system, n*—a wall system employing a concealed water-resistive barrier in which the exterior building surface is not the sole method of protecting the building from moisture penetration; that is, stucco, brick veneer, siding.
3.2.79.1 *Discussion*—
The waterproofing and weatherability of the fenestration product is integrated into the system and is waterproofed and sealed to a surface that is behind the exterior building surface. The fenestration product is usually integrated (sealed) to an underlayment membrane or flashing system which is a water-resistive barrier that is not exposed directly to the weather. Incidental moisture that is collected at the underlayment membrane or flashing is drained to the exterior at the bottom most locations of each floor/story/level. Fenestration products and other wall penetrations are typically integrated (sealed) to the membrane, underlayment, or flashing system such that the membrane/drainage system provides continuous protection against wall moisture penetration. See also *primary seal*.

3.2.80 *mill finish aluminum, n*—uncoated aluminum that possesses a silvery, natural finish.
3.2.80.1 *Discussion*—
This finish protects aluminum against most atmospheric corrosion. Atmospheric or certain job site conditions may affect the surface appearance of mill finish aluminum.

3.2.81 *modular opening (M.O.), n*—nominal (callout) opening.

3.2.82 *modular size (M.S.), n*—nominal (callout) size.

3.2.83 *molding, n*—a strip of wood or other material having a rounded or otherwise decorative surface used to conceal joints or to accent and highlight other surfaces.

3.2.84 *mullion, n*—a slender bar separating the compartments or apertures in a screen or window.

3.2.85 *multiple units, n*—single fenestration products mulled together to form a larger unit.

3.2.86 *muntin, n*—grids, or grilles

3.2.87 *new installation, n*—installation of a fenestration product in a new building or wall.

3.2.88 *non-fin window, n*—a fenestration product that has no integral appendage (fin) attached to the body of the window or door for the purposes of installation or air/water resistance. (Also called *block frame* or *box frame*.) See discussion under *block frame fenestration product*.

3.2.89 *organic, n*—designating any material derived from hydrocarbon sources (for example, petroleum, coal, or natural gas) or from living organisms (for example, carbohydrates, proteins, or lipids).

3.2.90 *organic finishes, n*—organic coatings such as paints, enamels, and resins having a wide range of colors achieved through the addition of pigments.

3.2.91 *pane, n*—see *lite*.

3.2.92 *pan flashing, n*—a type of flashing used at the base of rough opening to divert incidental water to the exterior or to the exterior surface of a concealed WRB.

NOTE 3—Pan flashings have upturned legs at the interior edge and ends of the rough opening to form a three-sided *pan*. They are intended to collect and drain water toward the exterior, including water that may enter through the window unit (for example, between the jambs and sill) or around the window (between the rough opening and the fenestration). The pan flashing must be integrated with other flashings and the window assembly to capture water that may otherwise penetrate to the sill framing and allow it to freely drain to the exterior. The window, flashings, and pan are to be sealed in a manner that reliably inhibits air and moisture flow to the interior.

3.2.93 *pan or panning, n*—cosmetic covering, usually found on the exterior of the fenestration product to achieve aesthetic sight lines or to integrate the fenestration product system into the building surface or weatherproofing system.

3.2.93.1 *Discussion*—

If panning is being used for weatherability, the panning is not considered cosmetic, but part of the window system.

3.2.94 *partial window replacement, n*—the installation of a replacement window where a component of the previously-installed window frame will remain.

3.2.95 *plumb, n*—to make vertical.

3.2.95.1 *Discussion*—

Aligned with an imaginary line through the center of the earth and the point of measurement.

3.2.96 *primary seal, n*—the seal beyond which no water is intended to pass.

3.2.96.1 *Discussion*—

This is the location included in the building envelope construction which forms a water-resistive barrier that is ultimately responsible for maintaining water impermeability between the interior and exterior of a building envelope.

3.2.97 *prime window (primary window), n*—the first (main) window, completely installed in a rough opening, which is designed to function as the sole fenestration product.

3.2.97.1 *Discussion*—

This is contrasted to a storm window, which serves as a secondary window in conjunction with a primary window.

3.2.98 *pultrusion, n*—fiberglass reinforced polymer (plastic) structural members having a constant cross-section.

3.2.98.1 *Discussion*—

Pultruded fenestration product members are typically polyester polymer reinforced by continuous fiberglass filaments.

3.2.99 *rabbet, n*—a two-sided L-shaped opening used on a face glazed window sash to receive the glass.

3.2.100 *rack, v*—by application of force to adjust the form of a fenestration unit or the sash of a fenestration unit with respect to either: (*1*) squareness within a flat plane or (*2*) deviation from a flat plane (that is, twist).

3.2.100.1 *Discussion*—

The term can be used to indicate adjustment to or from squareness and flatness, but is more commonly used to indicate the latter (that is, adjustment to an out-of-square or out-of-flat condition). The term is also sometimes used to denote unintentional application of force that deforms a unit or sash to an out-of-square or out-of-plane condition.

3.2.101 *R-point, n*—reference anchoring point which has a rigidity (strength) equal to double that of other anchors.

3.2.101.1 *Discussion*—

This may be achieved by using two anchors instead of one or by using an anchor that is twice as rigid as those used at other points.

3.2.102 *R-value (thermal resistance), n*—(*1*) the resistance of a material to the flow of heat from warmer to cooler points. (*2*) a measure of thermal resistance, usually applied to insulation and other homogeneous materials.

3.2.102.1 *Discussion*—

When applied to non-homogeneous combinations of building materials such as wall systems and fenestration products, the *effective R-value* is the inverse of the system U-factor (the sum of the individual component area-weighted thermal transmission values (that is, effective R-value = $1/U_{system}$, where $U_{system} = (U_1A_1 + U_2A_2 + \ldots)/(A_1 + A_2 + \ldots)$), where 1, 2, and so forth represent the specific components of the system or product).

3.2.103 *registered design professional, n*—an individual who is registered or licensed to practice their respective design profession as defined by the statutory requirements of the professional registration laws of the state or jurisdiction in which the project is to be constructed.

3.2.104 *release agent, n*—a petroleum-based liquid chemical, usually spray applied to a wall form or fixture, that prevents cementitious material from adhering to it.

3.2.105 *remodel, n*—to enhance the aesthetics and livability of a building by replacing or reconditioning its components.

3.2.105.1 *Discussion*—

According to Terminology E631, to replace or improve a building or its parts.

3.2.106 *replacement installation, n*—installation of a fenestration product which is designed for replacement of existing similar type product, by either destructive or non-destructive installation methods.

3.2.107 *replacement window, n*—a window that is designed for and subsequently installed after removal of all or part of a previously installed window.

3.2.108 *retrofit, n*—according to Terminology E631, to add new materials or equipment not provided at the time of original construction.

3.2.109 *reveal, n*—the part of the edge of a door or window frame or jamb not covered by the casing.

3.2.110 *roof, n*—the top cover of a building; includes the roofing system.

3.2.110.1 *Discussion*—

According to Terminology E631, roofing system—assembly of interacting components designed to weatherproof, and sometimes to insulate, the roof surface of a building.

3.2.111 *roof window, n*—sloped fenestration product with an operable sash.

3.2.112 *rough opening, n*—an unfinished fenestration opening in the building envelope.

3.2.113 *rough opening gap, n*—the space between the rough opening and the fenestration product frame.

3.2.114 *safety glazing materials, n*—materials that reduce the possibility of severe injury upon accidental impact. These materials shall meet 16 CFR 1201 and ANSI Z97.1.

3.2.115 *sash, n*—the moveable portion of an operable window.

3.2.115.1 *Discussion*—
According to Terminology E631, an assembly of one or more lites of glazing, encompassed by surrounding edge members, which when operable, slides in the plane of the window. In the wood window industry, the term *sash* is used regardless of the mode of operation.

3.2.116 *seal (plug seal), n*—water-resistive barrier installed to prevent entry of water, snow, dust, or insects into a rough opening gap.

3.2.117 *sealant, n*—any of a variety of compounds used to fill and seal joints or openings in wood, metal, masonry, and other materials.

3.2.117.1 *Discussion*—
As contrasted to a sealer, which is a liquid used to seal a porous surface. Some common types of sealants are: acoustical, neoprene, polysulfide rubber, silicone, acrylic latex, butyl rubber, polyurethane.

3.2.118 *setting block, n*—a small piece of neoprene or other suitable material used to position a piece of glass in its sash or frame.

3.2.119 *shim, n*—a thin, flat, or wedge-shaped piece of wood or other suitable material used to level or plumb a fenestration product frame during installation.

3.2.119.1 *Discussion*—
Lateral shims are placed in the rough opening adjacent to the frame jambs. Setting shims are placed in the rough opening beneath the sill.

3.2.120 *shingle-lapped (fashion), n*—lapped in a water-shedding fashion (such as roofing shingles).

3.2.121 *shore hardness, n*—measure of firmness of a material determined by means of a durometer hardness gage.

3.2.121.1 *Discussion*—
the range of 20 to 25 shore hardness is about the firmness of an art gum eraser; 90 is about the firmness of a rubber shoe heel.

3.2.122 *sill, n*—the horizontal bottom part of a window or door.

3.2.122.1 *Discussion*—
According to Terminology E631, a lower horizontal member of a fenestration product frame.

3.2.123 *sill angle, n*—an L-shaped installation accessory that may be employed at the sill of a replacement window to accommodate the slope of the existing sill construction.

3.2.124 *sill horn, n*—the horizontal projection of a wood window sill that forms the base for the brick molding or other exterior casing.

3.2.125 *skylight, n*—sloped or flat application of fenestration products which allows for natural day-lighting and ventilation.

3.2.125.1 *Discussion*—
Usually located on a roof where they are out-of-reach.

3.2.126 *spacer, n*—see *shim.*

3.2.127 *square, n*—two construction members that meet at a right (90°) angle.