
USACE / NAVFAC / AFCEA / NASA UFGS-08 53 00 (July 2006)

Preparing Activity: NAVFAC Superseding
 UFGS-08 53 00 (April 2006)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 9 October 2006

Revised throughout - latest change not indicated by CHG tags

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07/06

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SECTION 08 53 00

PLASTIC WINDOWS 07/06

NOTE: This guide specification covers the requirements for residential, commercial and heavy commercial grade prime and replacement PVC windows.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

NOTE: Specify the following items of related work under other sections of the specifications:

1. Glass and glazing and the furnishing of glazing clips and gaskets.
2. Calking and sealants.
3. Structural building supports at window mullions.
4. Wood or metal subframes for windows in frame walls.
5. Drilling and tapping for attachment of window shades, drapery rods, and venetian blinds. The drilling and tapping of window frames to receive brackets for shades, venetian blinds, and curtain rods has been omitted from this specification. It

is contemplated that this work will be done after erection of windows by the trade for the item to be installed. On projects where factory drilling for these items is required, revise this specification accordingly.

6. Brackets and supports for window shades, drapery rods, and venetian blinds.

NOTE: On the drawings, show:

1. Sizes and types of windows; subframes, casings, stools, and hardware.

2. Sizes, location, and swing of ventilators; direction of slide for sliding ventilators; location and details of fixed sash.

3. Typical window sections and details. Show glass thickness and air spaces of insulating glass. Show special glazing, if any.

4. Method of anchoring windows to adjoining construction; size and types of clips, anchors, screws, and other fasteners.

5. Details of nonstructural mullions and mullion covers; details of anchoring and reinforcing nonstructural mullions at windows to receive window cleaner anchors. Details of transom bars.

6. Number of window cleaner anchors required and locations.

7. Types and details of accessories to be furnished, such as, trim, screens, grills, and integral venetian blinds.

PART 1 GENERAL

1.1 REFERENCES

NOTE: Issue (date) of references included in project specifications need not be more current than provided by the latest guide specification. Use of SpecsIntact automated reference checking is recommended for projects based on older guide specifications.

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 101 (2002) Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors

AAMA 1503 (1998) Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections

ASME INTERNATIONAL (ASME)

ASME A39.1 (1995; A39.1a; A39.1b) Safety Requirements for Window Cleaning

ASTM INTERNATIONAL (ASTM)

ASTM D 1972 (1991; R 2001) Generic Marking of Plastic Products

ASTM D 3656 (2004) Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns

ASTM D 4099 (1995) Poly(Vinyl Chloride) (PVC) Prime Windows and Sliding Glass Doors

ASTM E 2129 (2001; R 2003) Data Collection for Sustainability Assessment of Building Products

GREEN SEAL (GS)

GS-36 (2000) Commercial Adhesives

NATIONAL FENESTRATION RATING COUNCIL (NFRC)

NFRC 100 (1997; R 2004) Determining Fenestration Product U-factors

NFRC 200 (1997; R 2004) Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule #1168 (1989; R 2005) Adhesive and Sealant Applications

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

Energy Star (1992; R 2006) Energy Star Energy Efficiency Labeling System

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED (2002; R 2005) Leadership in Energy and Environmental Design(tm) Green Building Rating System for New Construction (LEED-NC)

1.2 SUBMITTALS

NOTE: Submittals must be limited to those necessary for adequate quality control. The importance of an item in the project should be one of the primary factors in determining if a submittal for the item should be required.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy projects.

Submittal items not designated with a "G" are considered as being for information only for Army projects and for Contractor Quality Control approval for Navy projects.

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.] [for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Windows; G, [_____]

Indicate elevations of windows, full-size sections, thicknesses of PVC, reinforcing members, fastenings, proposed method of anchoring, size and spacing of anchors, details of construction, method of glazing, details of operating hardware, [mullion details,] [method and materials for weatherstripping,] [method of attaching screens,] [material and method of attaching subframes,] [fins,] [stools,] [casings,] [sills,] [trim,] [window cleaner anchors,] accessories, installation details, window flashings and other related items.

Schedule of windows; G, [_____]

Submit with drawings indicating location of each window unit.

SD-03 Product Data

Windows; G, [_____]; (LEED)

Documentation for Energy Star Qualifications

Fasteners; (LEED)

Submit documentation indicating percentage of post-industrial and post-consumer recycled content per unit of product. Indicate relative dollar value of recycled content products to total dollar value of products included in project.

Hardware

Screens

Weatherstripping

Accessories

[Adhesives; (LEED)

Submit manufacturer's product data, indicating VOC content.]

[Local/Regional Materials; (LEED)

Submit documentation indicating distance between manufacturing facility and the project site. Indicate distance of raw material origin from the project site. Indicate relative dollar value of local/regional materials to total dollar value of products included in project.]

[Environmental Data]

SD-04 Samples

Windows; G, [_____]

Submit one full-size window of each type, complete with certification label indicating conformance to AAMA 101 or ASTM D 4099, glazing, hardware, [fins,] anchors, and other accessories. [Where screens or weatherstripping are required, fit sample windows with such items that are to be provided.] After approval, install each sample in the work, clearly identified, and record its location.

SD-06 Test Reports

Windows; G, [_____]

Submit for each window type attesting that identical or larger windows have been tested and meet the requirements specified herein for conformance to AAMA 101 or ASTM D 4099 and the specified minimum Condensation Resistance Factor (CRF).

SD-07 Certificates

Windows

Submit NFRC Certification documentation.

SD-10 Operation and Maintenance Data

Windows, Data Package 1; G, [_____]

Submit data package in accordance with Section 01 78 23
OPERATION AND MAINTENANCE DATA.

Plastic Identification

When not labeled, identify types in Operation and Maintenance
Manual.

1.3 QUALITY ASSURANCE

1.3.1 Labels

Each window unit shall bear a certification label from an independent, nationally recognized testing organization validating that the product complies with AAMA 101 for the type, grade, and performance class specified or that the product complies with ASTM D 4099 for the grade specified.

1.3.2 Certification

Certified test reports attesting that the window units meet the requirements of AAMA 101 or ASTM D 4099 as specified will be acceptable in lieu of product labeling or marking.

1.4 DELIVERY, STORAGE, AND HANDLING

**NOTE: Include bracketed sentence for cold climate
installations of PVC windows.**

Deliver windows to the project site in an undamaged condition. Use care in handling and hoisting windows during transportation and at the job site. Store windows and components out of contact with the ground, under a weathertight covering, to prevent bending, warping, or otherwise damaging the windows. [Store windows and components so they will not have to be handled at minus 28 degrees C 20 degrees F or colder.] Repair damaged windows to an "as new" condition as approved. Provide new units if windows cannot be repaired.

1.5 PROTECTION

Protect finished surfaces during shipping and handling using the manufacturer's standard method, except do not apply coatings or lacquers on surfaces to receive caulking and glazing compounds.

1.6 SUSTAINABLE DESIGN REQUIREMENTS

1.6.1 Local/Regional Materials

NOTE: Using local materials can help minimize transportation impacts, including fossil fuel consumption, air pollution, and labor. Using materials harvested and manufactured within a 500 mile radius from the project site contributes to the following LEED credit: MR5. Coordinate with Section 01 33 29 LEED(tm) DOCUMENTATION. Use second option if Contractor is choosing local products in accordance with Section 01 33 29 LEED(tm) DOCUMENTATION. First option shall not be used for USACE projects. Army projects shall include second option only if pursuing this LEED credit.

[Use materials or products extracted, harvested, or recovered, as well as manufactured, within a [500][_____] mile [800][_____] kilometer radius from the project site, if available from a minimum of three sources.] [See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total local material requirements. Window materials may be locally available.]

1.6.2 Environmental Data

NOTE: ASTM E 2129 provides for detailed documentation of the sustainability aspects of products used in the project. This level of detail may be useful to the Contractor, Government, building occupants, or the public in assessing the sustainability of these products.

[Submit Table 1 of ASTM E 2129 for the following products: [____].]

1.6.3 Plastic Identification

NOTE: The marking system indicated below is intended to provide assistance in identification of products for making subsequent decisions as to handling, recycling, or disposal.

Verify that plastic products to be incorporated into the project are labeled in accordance with ASTM D 1972. Where products are not labeled, provide product data indicating polymeric information in Operation and Maintenance Manual.

Type 1: Polyethylene Terephthalate (PET, PETE).

Type 2: High Density Polyethylene (HDPE).

Type 3: Vinyl (Polyvinyl Chloride or PVC).

Type 4: Low Density Polyethylene (LDPE).

Type 5: Polypropylene (PP).

Type 6: Polystyrene (PS).

Type 7: Other. Use of this code indicates that the package in question is made with a resin other than the six listed above, or is made of more than

one resin listed above, and used in a multi-layer combination.

PART 2 PRODUCTS

NOTE: This guide specification presents nonproprietary materials. When the guide specification is edited or supplemented to suit project requirements, care shall be exercised to present a project specification section which contains no proprietary materials.

2.1 GENERAL REQUIREMENTS FOR WINDOWS

NOTE: Edit to indicate materials and items required. Consult AAMA 1503, "Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors, and Glazed Wall Sections" and select the minimum Condensation Resistance Factory (CRF) required for the particular project conditions.

NOTE: Window properties are critical to energy performance and visual satisfaction. Specify low U value (rate of heat transfer) to reduce winter heat loss and summer heat gain.

Energy Star labeling is applicable to residential units only. For nonresidential applications, designer shall input SHGC and U values based on ASHRAE 90.1, using either prescriptive envelope option or energy performance modeling as applicable to project design. Coordinate with Section 08 81 00. Designer must verify availability and adequate competition for products meeting bracketed energy performance requirements before specifying and edit as needed.

In southern states, windows shall have a U factor of 0.75 or lower and a SHGC of 0.40 or lower; in the middle states, windows shall have a U factor of 0.40 or lower and SHGC of 0.55 or lower; and in northern states, windows shall have a U factor of 0.35 or lower with any SHGC.

Installing energy efficient windows contributes to the following LEED credits: EA Prerequisite 2; EA1.

Windows shall conform to AAMA 101 or ASTM D 4099 and to requirements specified herein. Provide windows of materials, types, grades, performance classes, combinations and sizes indicated or specified. Each window shall be a unit consisting of [subframe,] frame, sash, glass, hardware, [mullions,] [fins,] [trim,] [casing,] [screen,] [weatherstripping,] anchors and accessories complete. Design windows to accommodate glass, hardware,

[screens,] [weatherstripping,] and accessories to be furnished. Glass shall be factory or field installed. Provide windows with a minimum CRF of [_____] when tested in accordance with AAMA 1503.

[Residential plastic windows (including frames and glass) shall be Energy Star qualified products as appropriate to[Northern][North/Central][South/Central][Southern] climate zone.][Non-residential plastic windows (including frames and glass) shall be certified by the National Fenestration Rating Council with a whole-window Solar Heat Gain Coefficient (SHGC) maximum of [_____] determined according to NFRC 200 procedures and a U-factor maximum of [_____] Btu per square foot x hr x degree F W per square m x K in accordance with NFRC 100.]

2.2 MATERIALS

2.2.1 Windows

NOTE: Use of materials with recycled content, calculated on the basis of post-industrial and post-consumer percentage content, contributes to the following LEED credit: MR4. Coordinate with Section 01 33 29 LEED(tm) DOCUMENTATION. Designer must verify suitability, availability and adequate competition (including verification of bracketed percentages included in this guide specification) before specifying product recycled content requirements. Use second option if Contractor is choosing recycled content products in accordance with Section 01 33 29 LEED(tm) DOCUMENTATION. Army projects shall specify recycled content only if pursuing this LEED(tm) credit.

Provide PVC, reinforcing members, fasteners, hardware, weatherstripping, and anchors conforming to AAMA 101 or ASTM D 4099 and as specified herein. [Plastic [and metal] window components shall contain a minimum of [5][10][_____] percent post-consumer recycled content, or a minimum of [20][40][_____] percent post-industrial recycled content.][See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total recycled content requirements. Metal and plastic materials may contain post-consumer or post-industrial recycled content.]

2.2.2 Sash Insulation

Use hollow PVC or fiberglass profile insulated with foam or fiberglass, or use foamed PVC for good sash insulation performance.

2.2.3 Glass and Glazing

As specified in Section 08 81 00 GLAZING.

2.2.4 Calking and Sealing

As specified in Section 07 92 00 JOINT SEALANTS.

2.2.5 Adhesives

NOTE: Adhesives are potential sources of VOCs in indoor air. Using interior low-VOC products contributes to the following LEED credit: EQ4. Designer must verify suitability, availability and adequate competition (including verification of bracketed requirements included in this guide specification) before specifying product VOC requirements. Coordinate with Section 01 33 29 LEED (tm) DOCUMENTATION. Army projects shall specify bracketed LEED (tm) VOC option only if pursuing LEED (tm) credit.

[Comply with applicable regulations regarding toxic and hazardous materials, GS-36, [SCAQMD Rule #1168,] and as specified in Section 07 92 00 JOINT SEALANTS.][Adhesives must meet the requirements of LEED (tm) low emitting materials credit.]

2.2.6 Insect Screening

ASTM D 3656, Class 2, 18 by 14 mesh, color [charcoal] [grey] [_____].

2.2.7 Accessories

As standard with the manufacturer and as specified herein.

2.3 WINDOW TYPES

NOTE: AAMA 101 includes a window designation system, with a three part product nomenclature representing Product Type, (window) Grade and Performance Class (example DH-C20). The Product Type is an abbreviation for window type (A for awning, C for casement, DH for double hung, etc.). The (window) Grade represents the product's intended use (R for residential, C for commercial, and HC for heavy commercial). The Performance Class represents the design pressure to which the window is constructed.

AAMA 101 establishes a minimum Performance Class for each (window) Grade: 15 for residential (R) windows (corresponding to a design pressure of 72 kg/sq m 15 psf); 20 for commercial (C) windows (corresponding to a design pressure of 96 kg/sq m 20 psf); and 40 for heavy commercial (HC) windows (corresponding to a design pressure of 192 kg/sq m 40 psf).

AAMA 101 also includes criteria for specifying windows required to meet higher design pressures if the minimum design pressure for the particular (window) Grade is determined to be inadequate. These windows are designated as Optional Performance Class windows. The Performance Class for Optional Performance Class windows should be specified in increments of 24 kg/sq m 5 psf above the minimum Performance Class.

ASTM D 4099 classifies window units by Grades based on design pressure. A Grade 15 window is constructed to a design pressure of 72 kg/sq m 15 psf, a Grade 20 window is constructed to a design pressure of 96 kg/sq m 20 psf, etc. Thus, for each window type included, specify an ASTM D 4099 Grade level equivalent to the required AAMA 101 Performance Class.

NOTE: Edit for window types to be included in the project. Consult AAMA/NWDDA 101 and the AAMA "Window Selection Guide" or the Society of the Plastics Industry (SPI) Certified Products Directory for definitions of each type and design consideration. The most commonly used window types have been listed in this specification; windows are available in other types and can be made in various combinations and custom fabrications. Select window types on basis of functional requirements and economic considerations. Functional requirements include operation of window, weather environment, conditions of usage and aesthetic factors. Economic considerations include initial cost as well as maintenance costs over life of the facility.

NOTE: Consult AAMA 101 to calculate design pressure(s) applicable to the project. Adjust "design factors" because naval facilities are typically less than 100 miles from hurricane oceanline.

The Performance Classes listed in brackets represent minimum design pressures to which windows meeting AAMA 101 will be constructed. When design pressure is determined to be less than minimum design pressure for selected (window) Grade, specify minimum Performance Class. When design pressure is determined to be greater than minimum design pressure for selected (window) Grade, an Optional Performance Class window must be specified. Specify Optional Performance Class window with numerical designation to next higher increment of 5 above calculated design pressure.

Specify an ASTM D 4099 Grade equivalent to AAMA 101 Performance Class required.

Windows shall be of the following types, as indicated.

2.3.1 Awning Windows

AAMA 101, Type A- [R 15] [C 20] [[____]] (Optional Performance Class)] or ASTM D 4099, Grade [____]. Provide compression-type weatherstripping.

2.3.2 Casement Windows

AAMA 101, Type C- [R 15] [C 20] [HC 40] [[_____] (Optional Performance Class)] or ASTM D 4099, Grade [_____] . Ventilators shall be [rotary crank] [handle] operated. Provide ventilators over 1675 mm 66 inches high with two separate locking devices or a two-point locking device operated by rods from a single lever handle. Conceal rods where possible. Provide compression-type weatherstripping. [Provide casement windows in combination with [fixed] [projected] windows specified below.]

2.3.3 Double Hung Windows

AAMA 101, Type DH- [R 15] [C 20] [HC 40] [[_____] (Optional Performance Class)] or ASTM D 4099, Grade [_____] .

2.3.4 Horizontal Sliding Windows

AAMA 101, Type HS- [R 15] [C 20] [HC 40] [[_____] (Optional Performance Class)] or ASTM D 4099, Grade [_____] .

2.3.5 Projected Windows

AAMA 101, Type P- [R 15] [C 20] [HC 40] [[_____] (Optional Performance Class)] or ASTM D 4099, Grade [_____] . Provide projected windows with concealed four bar friction hinges only.

2.3.6 Fixed Windows

AAMA 101, Type F- [R 15] [C 20] [HC 40] [[_____] (Optional Performance Class)] or ASTM D 4099, Grade [_____] .

2.3.7 Dual Action (Tilt/Turn) Windows

Dual action windows shall consist of a ventilator which swings into the room from the top for ventilation and swings in from the side for cleaning of the outside surface. When swung from the side, the ventilator shall swing in sufficiently to allow safe access to the outside surface.

2.3.7.1 Construction

Ventilators shall have one or more stabilizing arms attached to the frame when ventilator is opened from top. When ventilator is in the tilt-open position, stabilizing arms shall provide positive positioning of the ventilator.

2.3.7.2 Hardware

Equip each ventilator with one handle to provide both tilt and swing operation. The tilt or swing operation shall be individually selected and rendered operable starting only from the closed sash position. Provide a secondary locking device for each ventilator to prevent accidental swing operation.

2.3.7.3 Performance Requirements

Dual action windows shall meet the primary performance requirements specified in AAMA 101 for Grade and Performance Class [R 15] [C 20] [HC 40] [[_____] (Optional Performance Class)] or the performance requirements specified in ASTM D 4099 for Grade [_____] .

2.4 FABRICATION

Conform to AAMA 101 or ASTM D 4099 and to the requirements specified herein.

2.4.1 Subframes, Mullions and Transom Bars

NOTE: Edit and include this paragraph when PVC subframes, mullions and/or transom bars are included, otherwise delete. Specify the design pressure used to specify the Performance Class or the Optional Performance Class for the adjoining windows. Avoid mullion covers in cold climate installations.

Provide subframes, transom bars and mullions between multiple window units which meet the design pressure of [72] [96] [192] [_____] kilograms per square meter (kg/sq m) [15] [20] [40] [_____] pounds per square foot (psf).

Fabricate mullions and transom bars in such a manner as to permit expansion and contraction between adjoining construction and window units and to form a weathertight joint. [Provide mullion covers on the interior and exterior to completely close exposed joints and recesses between window units and to present a neat appearance.] [Provide special covers over structural support at mullions as indicated.] [Where window cleaner anchors are required, reinforce mullions to provide safe and adequate support.]

2.4.2 Combination Windows

Windows provided in combination shall be the same grade and performance class and shall be factory assembled. Where factory assembly of individual windows into larger units is limited by transportation considerations, prefabricate, match mark, transport, and field assemble.

2.4.3 Frames and Sash

2.4.3.1 Corners and Reinforcement

NOTE: Specify mechanically fixed and sealed or welded corners for most applications. Specify only welded corners for cold climate applications.

Corners of PVC frames and sashes shall be [mechanically fixed and sealed or welded] [welded]. Reinforce frames and sash as necessary to meet the requirements for the performance classes or grades specified herein.

2.4.3.2 Adjustability

Ventilating sash shall be adjustable vertically and horizontally to ensure smooth operation.

2.4.3.3 Drips and Weep Holes

NOTE: Include the first two sentences when operable

windows are included in the project, otherwise delete.

[Provide continuous drips over heads of top ventilators. Where fixed windows adjoin ventilators, provide continuous drips across tops of fixed windows.] Provide drips and weep holes as required to return water to the outside.

2.4.3.4 Provisions for Glazing

NOTE: Specify glass thickness in Section 08800, "Glazing." Inside glazing is preferred, especially for windows above first floor and other locations where access is difficult. Windows designed for inside glazing may not be available in double-hung type. Check manufacturer's literature. Where project requires insulating glass, show sash members, glazing beads, and hardware of sufficient size and weight to receive and support glass of specified thickness. Allow sufficient space between each side of insulating glass and frame for glazing compound or glazing gaskets and expansion as well as sufficient space between edges of glass and frame. Drawings should clearly indicate method for securing insulating glass in place. Specify windows which will require glazing beads if they are indicated as such; specify vinyl, EPDM or silicone rubber gaskets in Section 08800, "Glazing." Do not use glazing compound, vinyl glazing gaskets or exterior glazing beads in cold climates; dry glaze with EPDM or silicone rubber gaskets.

Design windows and rabbets suitable for glass thickness shown [or specified]. Design sash for [inside] [outside] [single] [double] [triple] glazing and for securing glass with [glazing beads,] [glazing clips,] [glazing channels,] [glazing gaskets,] [or glazing compound].

2.4.4 Hardware

The item, type, and functional characteristics shall be the manufacturer's standard for the particular window type. Provide hardware of suitable design and of sufficient strength to perform the function for which it is used. Equip operating ventilators with a lock or latching device which can be secured from the inside.

2.4.5 Weatherstripping

Provide for ventilating sections of windows to ensure a weathertight seal meeting the infiltration requirements specified in [AAMA 101](#) or [ASTM D 4099](#). Provide easily replaceable factory-applied weatherstripping.

2.4.6 Screens

Provide one insect screen for each operable exterior sash or ventilator. Design screens to be rewirable, easily removable from inside the building, and to permit easy access to operating hardware.

2.4.7 Color

NOTE: Standard PVC window color is white and should be specified for most projects. A number of other colors are available, particularly tan (ivory, beige, almond), gray and dark brown (architectural bronze), at additional cost. Colors co-extruded to the exterior of the window are especially designed to prevent heat build-up. Specify premium colors only after verification of availability, cost and aesthetic need.

Window (PVC) color shall be [white] [_____]. Color shall be integral or co-extruded to the PVC to prevent heat build-up.

2.4.8 Fasteners

NOTE: Designer must verify that products meeting the indicated minimum recycled content are available, preferably from at least three sources, to ensure adequate competition. If not, write in suitable recycled content values that reflect availability and competition.

Provide fastener types as standard with the window manufacturer for windows, trim, and accessories. Fabricated from 100 percent re-melted steel.

2.4.9 Accessories

NOTE: Edit for accessories to be included. Check availability of integral venetian blinds before specifying. Indicate windows to receive grills and/or integral venetian blinds on the drawings. If venetian blinds are to be separate from the windows, delete the paragraph entitled "Integral Venetian Blinds" and specify venetian blinds in Section 12490, "Blinds, Venetian (and Audio Visual)."

Provide windows complete with clips, fins, anchors, [grills,] [venetian blinds,] and other appurtenances necessary for complete installation and proper operation.

2.4.9.1 Anchors

Provide concealed anchors of the type recommended by the window manufacturer for the specific type of construction. Anchors and fasteners shall be compatible with the window and the adjoining construction. For each jamb 900 mm 36 inches or longer, provide a minimum of three anchors located approximately 150 mm 6 inches from each end and at midpoint. For jambs less than 900 mm 36 inches long, provide two anchors.

2.4.9.2 Window-Cleaner Anchors

NOTE: Show and specify window-cleaner anchors where sills are more than 1800 mm 6 feet above grade, adjoining balconies, or adjoining roofs, unless window cleaning methods at the activity make use of anchors unnecessary. Coordinate with using activity in making decision as to need for anchors. When requested by activity, removable or tilting-type sash may be provided instead of anchors. Removable or tilting-type sash may be specified as Contractor's option when these units are desired by using activity and when economically competitive with conventional double-hung sash equipped with window cleaner anchors.

Provide double head anchors for windows [indicated] [specified]. Anchors shall be stainless steel of size and design conforming to ASME A39.1. Provide two anchors for each single window [and each adjacent fixed glass window unit]. Fasten anchors 1120 mm 44 inches above the window sill in accordance with ASME A39.1. Reinforce frames to receive anchors. Provide wall anchors on backs of frames at points where anchors are located.

2.4.9.3 Grills

Provide the manufacturer's standard grills for the windows indicated. Grills shall be removable or shall be sealed within insulating glass units. Unless otherwise indicated, grill pattern shall be the manufacturer's standard design or as approved.

2.4.9.4 Integral Venetian Blinds

Provide the manufacturer's standard venetian blinds mounted within the window frame for the windows indicated. Venetian blinds shall be fully adjustable allowing full angle tilting and stops at any position. Color of blinds shall [be white] [match the color of the PVC].

PART 3 EXECUTION

3.1 INSTALLATION

Install in accordance with the window manufacturer's printed instructions and details.[Coordinate installation with commissioning as specified in Section [01 91 00][] COMMISSIONING.] Build in windows as work progresses or install without forcing into prepared window openings. Set windows at proper elevation, location, and reveal; plumb, square, level, and in alignment; and brace, strut, and stay properly to prevent distortion and misalignment. Bed screws or bolts in sill members, joints at mullions, contacts of windows with sills, built-in fins, and subframes in mastic sealant of a type recommended by the window manufacturer. Install and seal windows in a manner that will prevent entrance of water and wind. [Fasten insect screens securely in place.] Fasten hardware to windows.

3.1.1 Anchors and Fastenings

Secure units to each other, to masonry, and to other adjoining construction with clips, fins, screws, or other devices recommended by the window

manufacturer. [Where window cleaner anchors are provided, anchor windows and mullions to provide safe and adequate support for the window cleaner.]

3.2 ADJUSTING

After installation of windows and completion of glazing and field painting, adjust ventilators and hardware to operate smoothly and to provide weathertight sealing when ventilators are closed and locked. Lubricate hardware and operating parts as necessary. Verify products are properly installed, connected, and adjusted.

3.3 CLEANING

Clean interior and exterior surfaces of window units of mortar, plaster, paint spattering spots, and other foreign matter to present a neat appearance, to prevent fouling of weathering surfaces and weatherstripping, and to prevent interference with operation of hardware. Replace stained, discolored, or abraded windows that cannot be restored to their original condition with new windows.

3.4 PROTECTION

Protect ventilators and operating parts against accumulation of dirt and building materials by keeping ventilators tightly closed and locked to frame.

3.5 WASTE MANAGEMENT

NOTE: Diverting waste from the landfill contributes to the following LEED credit: MR2. Coordinate with Section 01572 CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT. Designer shall verify that items are able to be disposed of as specified. Army projects include bracketed text only if pursuing this LEED (tm) credit.

Separate plastic materials, corrugated cardboard, and protective materials in accordance with the Waste Management Plan and reuse or recycle. Place materials defined as hazardous or toxic waste in designated containers and dispose of properly. Close and seal tightly all partly used sealant containers and store protected in well ventilated fire-safe area at moderate temperature. Place used sealant tubes and containers in areas designated for hazardous materials and dispose of properly.

-- End of Section --