

This is a guidance document with sample specification language intended to be inserted into project specifications on this subject as appropriate to the agency's environmental goals. Certain provisions, where indicated, are required for U.S. federal agency projects. Sample specification language is numbered to clearly distinguish it from advisory or discussion material. Each sample is preceded by identification of the typical location in a specification section where it would appear using the SectionFormat™ of the Construction Specifications Institute; the six digit section number cited is per CSI Masterformat™ 2004 and the five digit section number cited parenthetically is per CSI Masterformat™ 1995.

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SECTION 08 50 00 (SECTION 08500) – WINDOWS

SPECIFIER NOTE:

resource management: Windows can be fabricated from a variety of wood, metal, and plastic. Refer to Divisions 05, 06, and 09 (5,6, and 9) for information on these materials.

toxicity/IEQ: Windows can be fabricated from a variety of wood, metal, and plastic. Refer to Divisions 05, 06, and 09 (5,6, and 9) for information on these materials.

performance: The energy efficiency of the window can vary with glazing selection, window type (casement, double-hung, etc.) and construction (thermal break, aluminum-clad, etc.).

Window properties are critical to energy performance and visual satisfaction. Specify low U value to reduce winter heat loss and summer heat gain. Windows on the west and east sides experience maximum solar gain in summer and should have a low Solar Heat Gain Coefficient (SHGC). Low SHGC is achieved with selective glass, tinted glass, or reflective coating. Specify selective glass for clear appearance or when high visible transmittance is required for daylighting goals. South side glass may be protected from summer sun by an overhang and have a high SHGC if winter heat is useful. Specify a low SHGC for south-side glass if the building is dominated by internal heat gain and solar heat is unwelcome even in winter. North side receives very little sun and requires no special treatment. FEMP maintains a guide on residential window recommendations at http://www.eere.energy.gov/femp/technologies/eep_res_windows.cfm

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. **[Aluminum] [Wood] [xxxx] windows.**

1.2 SUBMITTALS

- A. Product data.** Unless otherwise indicated, submit the following for each type of product provided under work of this Section:

SPECIFIER NOTE:

Green building rating systems often include credit for materials of recycled content. USGBC-LEED™ v3, for example, includes credit for materials with recycled content, calculated on the basis of pre-consumer and post-consumer percentage content, and it includes credit for use of salvaged/recovered materials.

Green Globes US also provides points for reused building materials and components and for building materials with recycled content.

1. **Recycled Content:**

- a. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.

- b. Indicate relative dollar value of recycled content product to total dollar value of product included in project.
- c. If recycled content product is part of an assembly, indicate the percentage of recycled content product in the assembly by weight.
- d. If recycled content product is part of an assembly, indicate relative dollar value of recycled content product to total dollar value of assembly.

SPECIFIER NOTE:

Specifying local materials may help minimize transportation impacts; however it may not have a significant impact on reducing the overall embodied energy of a building material because of efficiencies of scale in some modes of transportation.

Green building rating systems frequently include credit for local materials. Transportation impacts include: fossil fuel consumption, air pollution, and labor.

USGBC-LEED™ v3 includes credits for materials extracted/harvested and manufactured within a 500 mile radius from the project site. Green Globes US also provides points for materials that are locally manufactured.

2. Local/Regional Materials:

- a. Sourcing location(s): Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the project site.
- b. Manufacturing location(s): Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
- c. Product Value: Indicate dollar value of product containing local/regional materials; include materials cost only.
- d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.

SPECIFIER NOTE:

Green building rating systems may include credit for low emitting materials. USGBC-LEED™ v3, for example, includes credits for low-emitting materials, including: adhesives and sealants, paints and coatings, carpets, and composite wood and agrifiber products. Under LEED™ v3, adhesives and sealants are to comply with California's South Coast Air Quality Management District (SCAQMD) #1168; aerosol adhesives are to comply with Green Seal GS-36; interior architectural paints are to comply with Green Seal GS-11; anti-corrosive paints are to comply with Green Seal GS-03 (note – Green Seal has withdrawn GS-03; as of November 2008, anti-corrosive paints are included in a revised GS-11); clear wood finishes are to comply with SCAQMD #1113; carpet with the Carpet and Rug Institute (CRI) Green Label Plus; carpet cushion with CRI Green Label program; and, composite wood and agrifiber products are to contain no added urea-formaldehyde.

As per USGBC published Credit Interpretations, the credits for low-emitting materials are directed towards interior, site-installed (i.e. not prefabricated) products. Verify project requirements for low VOC products.

Both the Adhesive and Sealant Council (ASC) and the SCAQMD have indicated that low VOC adhesives may have performance difficulties in extreme temperature and humidity conditions.

Green Seal, an independent, non-profit organization, certifies low-emitting products using internationally recognized methods and procedures. Green Seal certification meets the criteria of ISO 14020 and 14024, the environmental standards for ecolabeling set by the International Organization for Standardization (ISO); the U.S. Environmental Protection Agency's criteria for third-party certifiers of environmentally preferable products; and the criteria for bona fide ecolabeling bodies of the Global Ecolabeling Network.

ANSI A208.1, the Composite Panel Association's Standard for Particleboard, includes maximum formaldehyde emissions for different grades of particleboard; ANSI A208.2, the Composite Panel Association's Standard for MDF, covers MDF for interior applications and includes maximum formaldehyde emission level for different grades of MDF.

3. VOC data:
 - a. Adhesives for **[site installation] [factory fabrication]:**
 - 1) Submit manufacturer's product data for adhesives. Indicate VOC limits of the product. Submit MSDS highlighting VOC limits.
 - 2) Submit Green Seal Certification to GS-36 and description of the basis for certification.
 - 3) **[Submit manufacturer's certification that products comply with SCAQMD #1168.] [Submit manufacturer's certification that products comply with SCAQMD Rule 1168 in areas where exposure to freeze/thaw conditions and direct exposure to moisture will not occur. In areas where freeze/thaw conditions do exist or direct exposure to moisture can occur, submit manufacturer's certification that products comply with Bay Area AQMD Reg. 8, Rule 51 for containers larger than 16 oz and with California Air Resources Board (CARB) for containers 16 oz or less.]**
 - b. Engineered Wood Products: Provide documentation that composite wood and agrifiber products **[are third-party certified as meeting ANSI standard requirements for formaldehyde emissions] [contain no added urea-formaldehyde resins.]**
 - 1) ANSI A208.1 – 1999, Particleboard
 - 2) ANSI A208.2 – 2002, Medium Density Fiberboard (MDF) for Interior Applications

SPECIFIER NOTE:

The EPA has developed minimum energy efficiency standards for Energy Star labeled products. EPA Energy Star categories include: appliances, HVAC, residential equipment, office equipment, and lighting.

4. Energy Efficiency:
 - a. Submit documentation for Energy Star qualifications for products provided under work of this Section.

SPECIFIER NOTE:

Green building rating systems typically include credit for sustainably harvested wood. USGBC-LEED™ v3, for example, includes credit for use of sustainably harvested wood certified under Forest Stewardship Council Guidelines. Under LEED™ v3, a minimum of 50 percent of wood-based materials and products incorporated into the Project must be certified in accordance with the Forest Stewardship Council Guidelines.

Green Globes US also provides points for wood products that originate from certified sources, such as, Forest Stewardship Council, Sustainable Forestry Initiative, and the CSA Sustainable Forest Management Program.

- B. Letter of Certification(s) for Sustainable Forestry:
 1. Forest Stewardship Council (FSC): Provide letter of certification signed by lumber supplier. Indicate compliance with FSC "Principles for Natural Forest Management" and identify certifying organization.
 - a. Submit FSC certification numbers; identify each certified product on a line-item basis.
 - b. Submit copies of invoices bearing the FSC certification numbers.

2. Sustainable Forestry Board: Provide letter of certification signed by lumber supplier. Indicate compliance with the Sustainable Forestry Board's "Sustainable Forestry Initiative" (SFI) and identify certifying organization.
 - a. Submit SFI certification numbers; identify each certified product on a line-item basis.
 - b. Submit copies of invoices bearing the SFI certification numbers.
 3. Canadian Standards Association (CSA): Provide letter of certification signed by lumber supplier. Indicate compliance with the CSA and identify certifying organization.
 - a. Submit CSA certification numbers; identify each certified product on a line-item basis.
 - b. Submit copies of invoices bearing the CSA certification numbers.
- C. Submit environmental data in accordance with Table 1 of ASTM E2129 for products provided under work of this Section.
- D. Operating And Maintenance Manuals Submittals:

SPECIFIER 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.

Society of Plastic Inc. resin codes are easily recognized by the consumer. These are the numerical designations within chasing arrows. At the present time there is not a separate resin code for PLA (bio-resins). PLA (bio-resins) are classified as #7 (Other). Nor are there specific indications for additives or blends. The Society of Plastics resin code symbols are common for plastic packaging materials; for example:



ASTM D1972 standard specifies a resin code that provides substantially more information regarding the plastic resin, including blends and additives. ASTM D1972 labeling protocols are not common for packaging materials; however, they are recognized and utilized in the construction industry and other industry sectors. Many construction products are labeled according to ASTM D1972. Such detailed information is anticipated to be necessary data for future deconstruction (and recycling) efforts. Therefore, plastic construction products and plastic components of assemblies should be labeled in accordance with ASTM D1972. Example for a polypropylene containing 30 mass percentage of mineral powder use:

>PP-MD30<

- a. Verify that plastic products, including plastic components in assemblies, to be incorporated into the Project are labeled in accordance with ASTM D1972. Where products are not labeled, provide product data indicating polymeric information in Operation and Maintenance Manual.
 - 1) Products made from compositions containing a single filler, reinforcing, or other modifying material in a concentration of more than one percent by mass shall be marked with the abbreviated term for the polymer,

followed by a dash, then the abbreviated term or symbol for the additive, with its percentage by mass, arranged as shown in the example and set off with brackets. For example, a polypropylene containing 30 mass percentage of mineral powder use would be labeled: >PP-MD30<

1.3 QUALITY ASSURANCE

- A. **Sustainably Harvested Wood:** Certification Organizations shall be accredited by the **[Forest Stewardship Council] [Sustainable Forestry Board] [Canadian Standards Association] [xxxxxxx]**.
- B. **VOC emissions:** Provide low VOC products.
 - 1. **Adhesives and sealants:** Comply with California's South Coast Air Quality Management District (SCAQMD) #1168
 - 2. **Aerosol adhesives:** Comply with Green Seal GS-36
 - 3. **Clear wood finishes:** Comply with SCAQMD #1113
 - 4. **Engineered Wood Products:** Provide products with no added urea formaldehyde.
 - a. Determine formaldehyde concentrations in air from wood products under test conditions of temperature and relative humidity in accordance with ASTM D6007 or E1333.
 - b. Determine Volatile Organic Compounds (VOC), excluding formaldehyde, emitted from manufactured wood-based panels in accordance with ASTM D6330.

PART 2 PRODUCTS

SPECIFIER NOTE:

EO 13423 includes requirements for Federal Agencies to use "sustainable environmental practices, including acquisition of biobased, environmentally preferable, energy-efficient, water-efficient, and recycled-content products"

Specifically, under the Sustainable Building requirements per Guiding Principle #5 Reduce Environmental Impact of Materials, EO13423 directs Federal agencies to "use products meeting or exceeding EPA's recycled content recommendations" for EPA-designated products and for other products to "use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes at least 10% (based on cost) of the total value of the materials in the project."

Additionally, for USDA-designated biobased products, Federal agencies must use products meeting or exceeding USDA's biobased content recommendations; and for other products, biobased products made from rapidly renewable resources and certified sustainable wood products.

And, under the Sustainable Building requirements per Guiding Principle #4 Enhance Indoor Environmental Quality, EO13423 directs Federal agencies to use "materials and products with low pollutant emissions, including adhesives, sealants, paints, carpet systems, and furnishings."

EO 13423 includes requirements for Federal Agencies to "... improve energy efficiency and reduce greenhouse gas emissions ... by (i) 3 percent annually through the end of fiscal year 2015, or (ii) 30 percent by the end of fiscal year 2015, relative to the baseline of ... year 2003"

Specifically, under the Sustainable Building requirements per Guiding Principle #2 Optimize Energy Performance, EO 13423 directs Federal agencies to "design to earn the Energy Star

targets for new construction and major renovation” and, for “new construction, reduce the energy cost budget by 30 percent compared to the baseline building performance rating per the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., (ASHRAE) and the Illuminating Engineering Society of North America (IESNA) Standard 90.1-2004, Energy Standard for Buildings Except Low-Rise Residential. For major renovations, reduce the energy cost budget by 20 percent below pre-renovations 2003 baseline.”

Executive Order 13514; *Federal Leadership in Environmental, Energy, and Economic Performance*; was signed on October 5, 2009. <http://www.ofee.gov/execorders.asp> It expands upon the environmental performance requirements of EO 13423. http://www1.eere.energy.gov/femp/regulations/printable_versions/eo13423.html

EO 13514 sets numerous federal requirements in several areas, including sustainable buildings and communities. Federal agencies must implement high performance sustainable federal building design, construction, operation and management, maintenance, and deconstruction, including:

- Ensuring all new Federal buildings, entering the design phase in 2020 or later, are designed to achieve zero net energy by 2030.
- Ensuring all new construction, major renovations, or repair or alteration of Federal buildings comply with the Guiding Principles of Federal Leadership in High Performance and Sustainable Buildings <http://www1.eere.energy.gov/femp/pdfs/mouhighperfsustainfedfacts.pdf>
- Ensuring at least 15% of existing agency buildings and leases (above 5,000 gross square feet) meet the Guiding Principles by fiscal year 2015 and that the agency makes annual progress towards 100% compliance across its building inventory.

2.1 MATERIALS

A. Lumber:

1. Resource Management:

SPECIFIER NOTE:

Disallowing the use of old growth timber may conflict with use of timber recovered and cut from public lands than have been burned in a wildland fire. As of this draft, two examples of viable and on-going timber salvage from past wildland fires on public land are the 500,000 acre (60 mile x 60 Mile) Biscuit Fire in SW Oregon and the 150,000 acre (10 mile x 5 mile) McNally Fire in the South Central Sierra Nevada.

- a. Virgin Lumber: **[Lumber fabricated from old growth timber is not permitted.]** Provide sustainably harvested; certified or labeled in accordance with **[FSC] [SFI] [CSA] [xxxxx]** guidelines.
- b. Salvaged Lumber: Lumber from deconstruction or demolition of existing buildings or structures. Unless otherwise noted, salvaged lumber shall be delivered clean, denailed, and free of paint and finish materials, and other contamination.
- c. Recovered Lumber: Previously harvested lumber pulled from riverbeds or otherwise abandoned. Unless otherwise noted, recovered lumber shall be delivered clean and free of contamination.

B. Engineered Wood Products:

1. Toxicity/IEQ:

- a. Products shall contain no added urea-formaldehyde.

C. **[Metal] [Plastic] [xxxx]:**

SPECIFIER NOTE:

Green building rating systems often include credit for materials of recycled content and may distinguish allowable credit for post-consumer and post-industrial (or pre-consumer) recycled content. USGBC-LEED™ v3, for example, factors 100 percent of post-consumer recycled content but only 50 percent of pre-consumer (post-industrial) recycled content into calculations for its recycled content materials credit. LEED v3 grants one credit to a project for using materials with recycled content such that the sum of post-consumer recycled content plus one-half of the post-industrial content constitutes at least 10 percent of the total value of the materials in the project; 10% (post-consumer + 1/2 post-industrial). It grants an additional point for 20% (post-consumer + 1/2 post-industrial).

Green Globes US also provides points for reused building materials and components and for building materials with recycled content.

Recycled content is typically determined by calculating the weight of the recycled material divided by the total weight of the product and expressed as a percentage by weight. (The recycled content “value” of a product as assessed under LEED is determined by multiplying the recycled content percentage and the cost of the product.)

Verify with manufacturer for product availability and recycled content.

1. Recycled Content: Minimum **[5] [10] [xxxx]** percent post-consumer recycled content, or minimum **[20] [40] [xxxx]** percent pre-consumer recycled content at contractor’s option.

2.2 ACCESSORIES

A. Adhesives for **[site installation] [factory fabrication]:**

1. Toxicity/IEQ: Comply with applicable regulations regarding toxic and hazardous materials, GS-36 for Commercial Adhesive, **[South Coast Air Quality Management District Rule 1168] [Bay Area AQMD Reg. 8, Rule 51 for containers larger than 16 oz and with California Air Resources Board (CARB) for containers 16 oz or less** , and as specified.

B. Fasteners:

1. Recycled Content: Fabricated from 100 percent re-melted steel.

2.3 FABRICATED PRODUCTS

A. Windows:

SPECIFIER NOTE:

Edit below as appropriate to energy code, project goals and location. Coordinate with agencies having jurisdiction. The U-factor represents the rate of heat transfer; a lower U-factor means less heat is transferred. The Solar Heat Gain Coefficient (SHGC) represents how much heat the building gains from the sun. A lower SHGC results in less heat gain from the sun. U-values and SHGC vary with glazing selection, window type (casement, double-hung, etc.) and construction (thermal break, aluminum-clad, etc.). Whole-fenestration-unit U-values are greater than center-of-glass U-values.

AAMA 1503, ASTM E1423, and NFRC 100 provide test procedures for thermal transmittance. However, only NFRC ratings are recognized by DOE and the Energy Star Windows program. Following are examples.

1. Energy Efficiency:
 - a. Thermal Transmittance: Provide windows and curtain walls with a U-factor maximum in accordance with NFRC 100.
 - b. U-Value: **[xxxx]** Btu/sq. ft. x h x deg F (W/sq. m x K).

- c. Solar Heat-Gain Coefficient: Provide windows with a whole-window SHGC maximum of [xxxx] determined according to NFRC 200 procedures.
- d. Visible transmittance:
- e. Exterior reflectivity:
- f. Color of tint:

SPECIFIER NOTE:

According to the EPA Energy Star Standards for residential construction: in southern, cooling-dominated climates, windows must have a U factor of 0.60 or lower and a Solar Heat Gain Coefficient (SHGC) of 0.27 or lower; in south-central climates with slightly higher cooling than heating demand, windows must have a U factor of 0.35 or lower and SHGC of 0.30 or lower; in north-central climates with slightly higher heating than cooling demand, windows must have a U factor of 0.32 or lower and SHGC of 0.40 or lower; and, in northern, heating-dominated climates, windows must have a U factor of 0.30 or lower with any SHGC.

All Energy Star qualified window products also bear a label from the National Fenestration Rating Council (NFRC).

The NFRC rating program addresses a fixed set of environmental conditions and specific product sizes. While the ratings may not be directly applicable for determining seasonal energy performance, they nevertheless indicate general energy efficiency parameters. A NFRC label should include values for U-Factor, Solar Heat Gain Coefficient, and Visible Light Transmittance. It should also indicate the specific product descriptions such as "Model xxx Casement, low-e, argon filled."

Green Seal also has standards for energy efficiency. GS-13 establishes environmental requirements for the residential fenestration products; GS-14 establishes environmental requirements for residential retrofittable window films.

- g. Energy Efficiency: Provide Energy Star labeled products as appropriate to climate zone.

SPECIFIER NOTE:

Edit below as appropriate to project goals and location.

STC levels higher than 35 may require costly design modifications and special glazing. Revise for windows tested for Outside-Inside Transmission Class (OITC). STC addresses construction subject to interior sound frequencies and does not include all typical outdoor frequencies; OITC was developed to evaluate an expanded sound-frequency range generally considered to be more reflective of exterior noise conditions imposed on the building envelope such as road, rail, and airplane traffic.

Following are examples.

- 2. Toxicity/IEQ:
 - a. Sound Transmission Class: Provide glazed windows rated for not less than [26] [30] [35] [xxxx] STC when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E413.

PART 3 - EXECUTION

3.X SITE ENVIRONMENTAL PROCEDURES

- A. Resource Management:
 - 1. Energy Efficiency: Verify products are properly installed, connected, and adjusted. Verify that products are performing as specified.

END OF SECTION