

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 07 30 00 (SECTION 07300) – STEEP SLOPE ROOFING

SPECIFIER NOTE:

resource management: Mining raw materials for the manufacture of stabilizers and surfacing granules produces soil erosion, pollutant runoff, and habitat loss. Asphalt, modifiers, and fiber glass mat binders are derived from petrochemicals. Extraction of petroleum and natural gas can generate air and water pollution.

Organic felt with recycled fiber content is available in some asphalt shingles.

Roof tiles may be fabricated from clay, fiber cement, concrete, plastics and polymer-based composites or metal. Refer to Section 03 30 00 (03300) – Cast-in-Place Concrete for information regarding portland cement. Fiber-cement roofing can include recycled content fiber. Felt underlayment can include recycled content. Metal roofing tiles and panels can contain up to 100 percent recycled metal.

toxicity/IEQ: Asphalt base shingles contain petroleum products and will outgas, especially in warm, sunny climates. Clay, concrete, fiber cement, and metal are generally considered inert. Since the material is on the exterior of the structure, there is generally little direct contamination of indoor air quality.

performance: Provide light colored roof surfaces to improve albedo.

Asphalt shingles are recyclable, especially for paving, but the infrastructure necessary to effectively recycle them is not yet developed.

Recycled rubber shingles can have a class A fire rating, pass wind tests up to 110 mph, and be sawed and nailed like wood.

Photovoltaic shingles are available; refer to Section 48 14 00 (13600) - Solar Energy Electrical Power Generation.

Clay, concrete, fiber cement, plastics and polymer-based composites and metal are durable; fire and insect resistant; and, easily disassembled. Clay, concrete, and fiber cement may be crushed and used for sub-base material or fill. Fiber cement products typically do not perform well where freeze-thaw cycles occur.

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Roofing Shingles.
 - a. Asphalt.
 - b. Rubber.
 - c. Wood.
 - d. Plastics and polymer-based composites.
 - 2. Roofing Tiles.

- a. Clay.
- b. Fiber cement.
- c. Metal.
- d. Plastics and polymer-based composites.

B. Related Sections:

1. 07 20 00 (07200) – Thermal Protection: Board insulation.
2. 48 14 00 (13600) – Solar Energy Electrical Power Generation: Photovoltaic roofing shingle system.

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:

On hot summer days, urban air can be 2-10 **degrees** Fahrenheit hotter than the surrounding rural areas. Not to be confused with global warming, scientists call this phenomenon the "urban heat island effect." Heat islands form as vegetation is replaced by asphalt, concrete and other structures. These surfaces absorb – rather than reflect – the sun's heat, causing surface temperatures and overall ambient temperatures to rise. The displacement of trees and shrubs eliminates the natural cooling effects of shading and evapotranspiration (a natural cooling process in which water transpires from a leaf's surface and evaporates into the atmosphere, reducing ambient temperature). Refer to the EPA's Heat Island Reduction Initiative for additional information, <http://www.epa.gov/heatisland/index.htm>

USGBC-LEED™ v3 includes credit for reducing the heat island effect. To qualify, vegetated surfaces and/or high-albedo materials are necessary. USGBC identifies high-albedo materials for non-roof areas as materials with a Solar Reflectance Index (SRI) of at least 29. The SRI is a measure of the constructed surface's ability to reflect solar heat, as shown by a small temperature rise. It is defined so that a standard black (reflectance 0.05, emittance 0.90) is 0 and a standard white (reflectance 0.80, emittance 0.90) is 100. To calculate the SRI for a given material, obtain the reflectance value and emittance value for the material. SRI is calculated according to ASTM E 1980-01. Reflectance is measured according to ASTM E 903, ASTM E 1918, or ASTM C 1549. Emittance is measured according to ASTM E 408 or ASTM C 1371.

For roofing, USGBC provides credit for low-slope roofs with a minimum SRI of 78 and for steep-slope roofs with a minimum SRI of 29.

Green Globes – US also requires measures to reduce heat build-up on the roof (i.e. either high-albedo roofing materials (reflectance of at least 0.65 and emissivity of at least 0.9), OR a green roof, OR a combination of both high-albedo materials and green roof).

To qualify for an Energy Star label:

- Low Slope roofs must have an initial solar reflectance of ≥ 0.65 . After 3 years, the solar reflectance must be ≥ 0.50 .
- Steep Slope roofs must have an initial solar reflectance of ≥ 0.25 . After 3 years, the solar reflectance must be ≥ 0.15 .

3. Albedo data: Provide information identifying the **[SRI] [solar reflectance]** of the following products provided under work of this Section:
 - a. Roofing.
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<

SPECIFIER NOTE:

Identify special maintenance agreements. Maintenance agreements are standard practice in the building industry. Take-back programs refer to programs in which the product manufacturer "takes-back" scrap material and/or packaging associated with its product.

- E. Documentation of manufacturer's **[take-back program]** for roofing materials. Coordinate with construction waste management. Include the following:
 1. Appropriate contact information.
 2. Overview of procedures.
 3. Limitations and conditions, if any, applicable to the project.

1.3 QUALITY ASSURANCE

A. Albedo:

SPECIFIER NOTE:

The EPA Energy Star program recommends Solar Reflectance for low sloped and steep sloped roofs as indicated below. Additional considerations for the procurement official include: Geographic location of building; the amount of insulation; and roof surface to building volume ratio. Refer to http://www.energystar.gov/index.cfm?c=roof_prods.pr_proc_roof_products

1. Low sloped: Initial Solar Reflectance greater than or equal to 0.65. Maintenance of Solar Reflectance greater than or equal to 0.50 three years after installation under normal conditions.
2. Steep sloped: Initial Solar Reflectance greater than or equal to 0.25. Maintenance of Solar Reflectance greater than or equal to 0.15 three years after installation under normal conditions.

B. Energy Efficiency:

SPECIFIER NOTE:

Roof systems that meet or exceed solar reflectance, without compromising product quality and performance, qualify for the Energy Star label. Manufacturers voluntarily sign an agreement with Energy Star called a Partnership Agreement (PA) allowing them to place the Energy Star label on the packaging of qualifying roof products. An Energy Star qualified roof product lowers roof surface temperature by up to 100°F, thereby decreasing the amount of heat transferred into a building's interior. Energy Star roof specifications are not restricted to any particular type of roof product. However, Energy Star expects that, at least initially, metal, single-ply membrane, and roof coating products will be most widely represented. For additional information, refer to http://www.energystar.gov/index.cfm?c=roof_prods.pr_roof_products

1. Provide Energy Star labeled roofing systems.

- C. Sustainably Harvested Wood: Certification Organizations shall be accredited by the **[Forest Stewardship Council] [Sustainable Forestry Board] [Canadian Standards Association] [xxxxxxx]**.

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.

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/mouhighperfsustainfedfac.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. Shingles: **[Asphalt] [Rubber] [Wood] [Plastics and polymer-based composites] [xxxx]:**

SPECIFIER NOTE:

US-EPA Comprehensive Procurement Guidelines (CPG) recommends 50-100 percent post-consumer content for fiber (felt) for fiber composite roofing. US-EPA Comprehensive

Procurement Guidelines (CPG) recommend 12-100 percent post-consumer content for rubber roofing; 100 percent post-consumer content for plastic and plastic/rubber composite roofing; and 100 percent total recycled content for wood/plastic composites.

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 **[12] [50] [xxxx]** percent post-consumer recycled content, or minimum **[50] [xxxx]** percent total recycled content at contractor’s option.

2. 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. Tiles: **[Clay] [Metal] [Plastics and polymer-based composites] [xxxx]:**

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.

- C. Felt Underlayment:

1. Recycled Content: Minimum **[50] [xxxx]** percent post-consumer recycled content, or minimum **[50] [xxxx]** percent pre-consumer recycled content at contractor’s option.

- D. Continuous Ridge Vent: **[Plastic] [Metal] [xxxx]:**

1. Recycled Content: Minimum **[12] [50] [xxxx]** percent post-consumer recycled content, or minimum **[50] [xxxx]** percent total recycled content at contractor's option.

2.2 ACCESSORIES

A. Fasteners:

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

PART 3 - EXECUTION

3.X SITE ENVIRONMENTAL PROCEDURES

A. Waste Management: As specified in Section 01 74 19 (01351) – Construction Waste Management and as follows:

1. Coordinate with manufacturer for **[take-back program]**. Set aside scrap to be returned to manufacturer for recycling into new product.

END OF SECTION