

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 20 00 (SECTION 07200) – THERMAL PROTECTION

SPECIFIER NOTE:

resource management: Thermal batt insulation includes: glass fiber, cotton insulation, mineral wool (made from slag wool, an industrial by-product from iron ore blast furnace, and rock wool, natural material such as basalt and diabase). Sprayed insulation includes: mineral wool and cellulose. Loose fill insulation includes: perlite, vermiculite, polystyrene beads, mineral wool, fiber glass, and cellulose. Foamed in place insulation includes: silicate foam (made from inorganic cementitious stabilizer, magnesium oxide, a catalyst, and compressed air) and low density closed cell polyurethane. Rigid board insulation includes: fiber glass, cellular glass foam, expanded polystyrene, extruded polystyrene, polyisocyanurate and polyurethane.

Insulation made from renewable resources such as cellulose is available. Straw, wool, coconut fibers, leaves, and sod are traditional and indigenous insulation materials; refer to Section 06 90 00 (06700) - Alternative Agricultural Products.

Insulation made from recycled materials such as cellulose and textiles and glass are available.

toxicity/IEQ: Adsorptive materials such as batt insulation may act as sinks for VOCs. Thermal- and fireproof-insulation materials do not necessarily need soft, adsorptive surface; consider coating with a smooth and impermeable membrane to reduce the adsorption of VOCs.

Design such that an impermeable layer is not located to create a moisture problem in the exterior envelope. Trapped moisture in insulation may promote growth of mold and mildew.

The International Agency for Research on Cancer (IARC) has removed glass, rock, and slag wool fibers from its list of substances "possibly carcinogenic to humans". A complete report documenting the science behind this change in classification, "IARC Monograph on the Evaluation of Carcinogenic Risks to Humans, Volume 81, Man-Made Vitreous Fibres," was made available in October 2002 through IARC. OSHA requires warning labels and MSDSs for fiber glass material identifying it as a "possible" carcinogen. The long, thin fibers of fibrous minerals are suspected of increasing the risk of cancer. Fibrous glass insulation materials may contain formaldehyde based resin binder materials. OSHA also requires MSDSs for rock and slag wool insulations.

The Consumer Product Safety Commission (CPSC) requires labeling on cellulose insulation to inform individuals that a fire hazard exists where cellulose insulation is improperly installed too close to the sides or over the top of recessed electrical light fixtures, or installed too close to the exhaust flues from heat producing devices or apparatus such as furnaces, water heaters, and space heaters.

The National Toxicology Program (NTP) classifies fiber glass as a "possible" carcinogen. Cellulose is regulated as a hazardous substance (29 CFR 1910.1000 Table Z). Cellulose insulation is required by the Federal Hazard Communication Standard to provide MSDSs regarding adverse health effects. Cellulose insulation can contain chemical additives such as ammonium sulfate, boric acid and sodium borate, for fire retardancy. Borates are generally considered to have low acute toxicity for mammals.

performance: Insulation conserves energy; adding insulation above the minimum requirements set by codes for the health and comfort of the occupants can help protect the environment and

reduce emissions. The thermal resistance of insulation is designated by R-value. R-value is resistance to heat flow. The higher the R-value, the greater the insulating power. Thickness of insulation is only one factor that determines its R-value. In fact, according to the Federal Trade Commission's Home Insulation Rule, insulation should always be specified by R-value, not thickness. 16 CFR Part 460. The R-value per inch of fiber-based insulation can vary depending on density. Optimal thickness of the insulation should be determined through Life Cycle Assessment with a goal of minimizing life cycle costs related to energy use.

Equally important in selecting insulation is that the product's R-value does not deteriorate over time.

Loose fill cellulose insulation materials can settle over time thereby reducing their insulation value; however, loose fill spray insulation can have an added binder to reduce settling. The Insulation Contractors Association of America (ICAA) recommends that an additional 25 percent of thickness for cellulose insulation be added above the labeled settled thickness.

The weight of insulation products may also alter the quality of performance. For example, when installing insulation above ceilings, caution should be taken to ensure that the insulation weight does not alter the integrity of the ceiling structure. Based on U.S. Gypsum weight limit recommendations, the installed density of cellulose insulation can cause ceiling drywall to sag at R-values above R-30 for cellulose insulation when installed above ½ inch thick gypsum board ceilings supported with framing spaced 24 inch on centers.

Building materials that introduce moisture into the building envelope like cellulose insulation should demonstrate an established drying time before enclosing the wet material behind the walls. Moisture can also adversely affect the thermal performance of cellulose insulation products.

And, to reduce thermal loss from air movement in the gaps between insulation board joints, provide two layers of insulation, with staggered board joints. Foil facing can provide some resistance to air infiltration and adds a radiant barrier, if a sealed air space is provided on both sides of the material.

Avoid thermal bridging, especially with highly conductive metal framing systems.

Glass, rock and slag wool are naturally noncombustible and remain so for the life of the product.

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulation.
 - a. Rock Wool.
 - b. Mineral Wool.
 - c. Fiber glass.
 - d. Cellulose.
 - e. Perlite Composite Board.
 - r. Plastic Rigid Foam, Polyisocyanurate/Polyurethane.
 - g. Plastic, Non-Woven Batt.
 - h. Polystyrene, expanded.
 - i. Polystyrene, extruded.
2. Insulation accessories.

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 roofing 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.

3. VOC data:
 - a. Adhesives:
 - 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.]**

SPECIFIER NOTE:

The Food, Conservation, and Energy Act of 2008 (also known as the 2008 U.S. Farm Bill) largely continues programs of the Farm Security and Rural Investment Act of 2002 ([2002 Farm Bill](http://www.usda.gov/farmbill/) <http://www.usda.gov/farmbill/>). Section 9002 requires each Federal Agency to develop a procurement program which will assure that items composed of biobased products will be purchased to the maximum extent practicable and which is consistent with applicable provisions of Federal procurement law. USDA designates biobased products for preferred Federal procurement and recommends biobased content levels for each designated product. USGBC-LEED™ v3 includes credits for use of rapidly renewable materials, which USGBC describes as plants harvested within a ten-year cycle. Green Globes – US, provides credit for integration of materials from renewable sources that have been selected based on life-cycle assessment.

4. Biobased materials:
 - a. Indicate type of biobased material in product.
 - b. Indicate the percentage of biobased content per unit of product.
 - c. Indicate relative dollar value of biobased content product to total dollar value of product included in project.
- B. Submit environmental data in accordance with Table 1 of ASTM E2129 for products provided under work of this Section.
- C. 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. Take-back programs refer to programs in which the product manufacturer “takes-back” scrap material and/or packaging associated with its product. While manufacturers of insulation materials are not typically the ones to coordinate these, an entire industry of recyclers has arisen to fill this need and has a well-developed program for recovering left over materials from job sites. Consider the size of the project and available recycling/reuse services; edit as appropriate to project and location.

- D. Documentation of manufacturer’s **[take-back program]** for insulation 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.

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.”

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/mouhighperfsustainfedfacs.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.

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.”

2.1 INSULATION MATERIALS

A. Rock Wool:

SPECIFIER NOTE:

Rock wool is generally made from basaltic rock, and when the insulation is pure rock wool, the recycled content is low. Often, rock wool insulation mixes rock wool and slag wool together. US-EPA Comprehensive Procurement Guidelines (CPG) recommends 75 percent total recycled content for slag in rock wool insulation. The recommended recycled materials content levels are based on the weight (not volume) of materials in the insulating core only.

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 **[75] [xxxx]** percent total **[slag]** recycled content.

B. Fiber glass:

SPECIFIER NOTE:

US-EPA Comprehensive Procurement Guidelines (CPG) recommends 20-25 percent total recycled content for glass cullet in fiber glass insulation. The recommended recycled materials content levels are based on the weight (not volume) of materials in the insulating core only.

American Society for Testing and Materials (ASTM) International issues a standard for the composition of cullet used in the manufacture of fiber glass insulation, D 5359, "Glass Cullet Recovered from Waste for Use in Manufacture of Glass Fiber." EPA recommends that procuring agencies reference this specification in Invitations for Bid and Requests for Proposals.

1. Recycled content: Minimum **[20] [25] [xxxx]** percent total **[glass cullet]** recycled content. Provide glass cullet recovered from municipal waste in accordance with ASTM D5359.

C. Cellulose:

SPECIFIER NOTE:

US-EPA Comprehensive Procurement Guidelines (CPG) recommends 75 percent post-consumer recycled content for post-consumer paper in cellulose loose-fill and spray-on insulation. The recommended recycled materials content levels are based on the weight (not volume) of materials in the insulating core only.

1. Recycled content: Minimum **[75] [xxxx]** percent post-consumer **[paper]** recycled content.
 - a. Loose-fill Cellulose: Comply with ASTM C739 for the composition and physical requirements of chemically treated, recycled cellulosic fiber loose-fill thermal insulation.

D. Perlite Composite Board:

US-EPA Comprehensive Procurement Guidelines (CPG) recommends 23 percent post-consumer recycled content for post-consumer paper in perlite composite board insulation. The recommended recycled materials content levels are based on the weight (not volume) of materials in the insulating core only.

1. Recycled content: Minimum **[23] [xxxx]** percent post-consumer **[paper]** recycled content.

E. Plastic Rigid Foam, Polyisocyanurate/Polyurethane, Polystyrene foam:

US-EPA Comprehensive Procurement Guidelines (CPG) recommends 9 percent total recycled content for rigid foam insulation; 5 percent for foam-in-place insulation; 6 percent for glass fiber reinforced insulation; and 5 percent for phenolic rigid foam. The recommended recycled materials content levels are based on the weight (not volume) of materials in the insulating core only.

1. Recycled content: Minimum **[5] [6] [9] [xxxx]** percent total recycled content.

F. Plastic, Non-Woven Batt:

US-EPA Comprehensive Procurement Guidelines (CPG) recommends 100 percent total recycled content for plastic, non-woven batt insulation. The recommended recycled materials content levels are based on the weight (not volume) of materials in the insulating core only.

1. Recycled content: Minimum **[100] [xxxx]** percent total recycled content.

SPECIFIER NOTE:

For current designations under the Federal Biobased Products Preferred Procurement Program (FB4P), refer to www.biobased.oce.usda.gov. As of January 4, 2010, the Federal Register includes designations for approximately 60 product types. The requirements for purchasing biobased items apply to those items directly purchased by the federal agency. Under a construction contract, the contractor's use of hydraulic fluid in its bulldozers and backhoes is incidental to the purpose of its contract, so the contractor is not required to use biobased hydraulic fluids. The Office of the Federal Environmental Executive (OFEE) recommends that agencies encourage the use of these items, however.

Currently designated items that affect construction include:

- Roof Coatings
- Water Tank Coatings
- Adhesive and Mastic Removers
- Composite Panels
- Fertilizers
- Plastic Insulating Foam
- Carpet and Upholstery Cleaners
- Carpets
- Dust Suppressants
- Packaging Films
- Glass Cleaners
- Hydraulic Fluids – Stationary Equipment
- Wood and Concrete Sealers
- Cleaners

The USDA currently has identified about 150 items for which it is collecting test data needed for the additional designations of items that will extend preferred procurement status to include all qualifying biobased products.

- G. Spray foam insulation:
 1. Biobased Content:
 - a. Plastic Insulating Foam for Residential and Commercial Construction: Spray-in-place plastic foam products designed to provide a sealed thermal barrier for residential or commercial construction applications. Provide minimum 7% biobased content.

SPECIFIER NOTE:

Spray polyurethane foam (SPF) insulation is a highly effective weatherization product that is playing an important role in national efforts to dramatically increase the energy efficiency of our homes, schools, and buildings. However, SPF foam contains diisocyanates, and dermal or inhalation exposure to these chemicals can cause significant health risks, such as asthma and lung damage, if specific workplace precautions are not followed during product application and clean-up. Risks also may apply to building occupants who may remain on-site during or re-enter shortly after application.

EPA, the National Institute for Occupational Safety and Health, the Occupational Safety and Health Administration, and the Consumer Products Safety Commission are challenging the SPF industry to ensure accurate and comprehensive risk information is well communicated, to enhance and implement safer workplace practices for SPF insulation application and clean-up, to address widespread inaccurate or misleading marketing claims, which often tout the product as

“plant-based” or “environmentally-friendly,” and to identify and address potential exposures that may occur with the growing use of SPF in schools, homes, and other buildings.
<http://www.epa.gov/greenbuilding/pubs/highlights.htm>

2. Toxicity:
 - a. Provide clear hazard communication for all SPF users
 - b. **Restrict** work site to only those wearing appropriate personal protective equipment during SPF installation.
 - c. Provide guidance on re-entry time.

2.2 ACCESSORIES

A. Adhesive

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.

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] [local recycler] [xxxx]** for **[take-back program] [recycling]**. Set aside scrap to be returned to manufacturer for recycling into new product.

END OF SECTION