



EcoLogo®

Environmental Standard - Certification Criteria Document

CCD 016: Thermal Insulation Materials

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Introduction

The certification criteria documented in this standard are designed to support a continuing effort to improve and/or maintain environmental quality by reducing energy and materials consumption and by minimizing the impacts of pollution generated by the production, use and disposal of goods and services.

Insulation materials that fall under this criteria document include batt and blanket type (fiberglass or mineral wool), rigid board-type (plastic, fiberglass, mineral wool), spray-on / loose-fill type (cellulose, plastic foam, and glass or mineral fibre) and reflective insulation (aluminium foil on various substrates). This document does not have criteria for radiant barriers (e.g., single layers of aluminum foil, or reflective paints) that have no single "R-value."

More attention has been paid to thermal insulation use in buildings in recent times because of economic and environmental concerns such as global warming and excessive use of energy and non-renewable resources. There are a number of areas where insulation producers can reduce environmental impact during extraction, manufacturing, use and disposal of these products. Substituting recycled material for virgin materials will reduce the amount of materials entering the waste stream and reduce total resource consumption. Plastic insulation materials are formed with the aid of blowing agents and these types of chemicals are available with reduced ozone depleting and global warming potentials. Other ingredients with less toxic options include binders/ resins used to stick fibrous batts together and fire retardants.

Based on a review of currently available life cycle information, the product category requirements will produce an environmental benefit through performance; reduced use of virgin resources; restrictions on ingredients contributing to specific impacts (e.g., ozone depletion, global warming, ground level smog formation); and elimination of replaceable toxic materials (e.g., formaldehyde).

Life cycle review is an ongoing process. As information and technology change, the product category requirements will be reviewed and possibly amended.

The growing importance of reducing greenhouse gases underscores the environmental significance of this product group. The purpose of insulation is to reduce the amount of energy used in heating and cooling buildings, and the associated greenhouse gas emissions.

There are two general types of material used for insulating buildings from heat loss or heat gain. Fibrous insulation has been on the market longer, and can be made of fiberglass, mineral wool or cellulose. Plastic insulation is a more recent product based on polymers of different petroleum derivatives such as styrene, isocyanurate, and urethane. A third type of insulation material exists and uses low-emittance surfaces to produce reflective air spaces.

Insulation can be applied in pre-formed batts or (fiberglass or mineral wool), blankets (fiberglass, mineral wool, aluminum reflective insulation) as rigid boards (in the case of plastic, fiberglass, mineral fiber), as loose fill (cellulose, fiberglass, mineral wool) and as a spray-applied material such as blown cellulose or polyurethane.

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In North America most residential insulation used during renovations and to a lesser extent, during construction, fiberglass. Various estimates suggest that approximately 80% of all residential insulation jobs use fiberglass, batts and the remaining jobs are split between mineral wool batts, blown in cellulose, spray foam, loose-fill fiberglass and rigid stock plastic foam.

Commercial buildings are generally insulated with rigid plastic boards and the remainder are insulated with spray foams, and rigid fiberglass or mineral wool boards. Insulating materials are used to reduce heat flow across walls, ceilings, floors, tanks and pipes.

The biggest environmental impacts of insulation exist during the extraction and manufacturing stages. The raw material comes from a variety of sources (e.g. petroleum, silica, basalt, newspaper) with associated extraction impacts. The source of recycled materials varies from post-consumer sources (e.g., glass or paper taken from curbside collection) to post industrial sources (e.g. slag produced as waste during metal ore processing). Other ingredients that are added to the product during manufacturing may be toxic (e.g. formaldehyde, used to bind materials together is a known carcinogen).

Plastics are based on a variety of monomers. Styrene polymers that form rigid board insulation are manufactured in two different processes. Expanded polystyrene (EPS) is formed when beads are expanded together and Extruded polystyrene (XPS) is formed from molten material. Polyisocyanurate board stock and polyurethane spray foams are formed from the same materials; diisocyanate and an alcoholic "polyol".

Blowing agents are used to expand the plastic polymer. Polyurethanes may be of the "open-cell" or "closed cell" type. Open cell foams use water as a blowing agent, but have a lower R-value. Historically, the blowing agents for "XPS", "polyiso" and "PU" plastic foams were CFC molecules that are now obsolete because of regulations restricting ozone depleting chemicals. In 2004, the newer blowing agents e.g., (HCFC 141-B, HCFC 142-B) are either banned or being gradually phased out in North America. The next generation of blowing agents, HFCs, are non-ozone depleting but do have a significant global warming impact (e.g., typically 1000 x greater warming impact than a similar mass of CO₂). Non fluorinated blowing agents (mainly pentane), are also used to produce board stock and are used in on-the-job spray applications with precautions taken for high flammability of the chemical.

Notice

Any reference to a standard means to the latest edition of that standard.

Notice of Intent

The criteria in this standard will be re-evaluated from time to time to maintain the relevance of the requirements in light of changing environmental knowledge, manufacturing advances, regulatory conditions and other changes in the marketplace. Further revisions of this document may introduce:

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- a specific level of required recycled content for EPS; and
- further limitations on materials used as “facings” for plastic foam boards and mineral and glass fibre batts.

Definitions

1) In this standard:

"batt" means a portion of a mat in the form of a rectangular piece generally 1 - 3 metres or 3.3 – 9.8 feet in length and usually supplied flat, folded, or in a roll;

"binder" means a compound that is used to attach fibers together;

"blanket" means a roll of fibrous or reflective insulation material applied around pipes or tanks or facing flat against a wall or ceiling surface;

"blowing agents" means chemicals used to produce cellular structure in plastic insulation. These chemicals include hydrocarbons and halogenated hydrocarbons, which change from liquid to gas when heated and develop cells within plastic material;

"board-type thermal insulation" means material supplied in the form of sheets, which may be unfaced, or incorporate a facing material on one or both surfaces;

"bubble pack reflective insulation" means one or more layers of poly-ethylene bubbles, laminated between two layers of foil;

"cellulose fibre insulation" means fibrous insulation manufactured from paper or paperboard stock and modified with chemical additives. Cellulose fibre insulation is classified as either Type 1 – Loose Fill or Type 2 – Spray Applied depending on how it is applied;

"CFC" means chlorofluorocarbon;

"consumer" means a household, commercial establishment or institutional facility;

"expanded polystyrene (EPS)" means rigid foam plastic insulation manufactured from expandable polystyrene resin containing a blowing agent that is exposed to steam and subsequently moulded into the desired shape resulting in a closed cell structure filled with air;

"extruded polystyrene (XPS)" means rigid foam plastic insulation manufactured by extrusion and expansion of polystyrene monomer, the base polymer, in the presence of a blowing agent resulting in a closed cell structure containing the blowing agent;

"fibrous insulation" means mineral wool, glass fibre and cellulose (wood) fibre insulation material;

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"formaldehyde containing binders" means a polymeric molecule formed from the chemical reaction of formaldehyde and phenol or formaldehyde and urea to form a resin or "resol" used to bind fibrous insulation;

"glass fiber" means all glass wool products;

"glass fiberboard" means a board that must contain more glass fiber than any other fiber types;

"global warming potential" (GWP) means the time-integrated change in radiative forcing due to the instantaneous release of 1 kilogram of a gas expressed relative to the radiative forcing from the release of 1 kilogram of CO₂;

"industrial scrap" means by-products of an industrial process that can be, and regularly are, used in either the same process, or in a different process. Such materials are excluded from the standard definition of recycled material;

"loose fill thermal insulation" means fibre granules, nodules, or similar forms of material designed to be installed by hand pouring or blowing by pneumatic equipment. This includes loose-fill cellulose fibre, loose -fill glass fibre and loose-fill mineral wool;

"low density fiber glass or mineral wool" means insulation products made of glass fiber or mineral wool having a density of 40 kg/m³ or less, and coming in the form of batts or blankets. This includes the R-12 and R-20 batts commonly used in residential home construction.

"mat" means flexible fibrous insulation supplied in the form of a roll or a batt, which may be faced but not enclosed;

"mineral wool" means rock wool or slag wool products or a combination of both;

"newsprint" means paper having a grammage (i.e. weight) of 40 g/m² - 57 g/m² generally used in the publication of newspapers. It includes both post-consumer and pre-consumer materials;

"ozone depleting potential" (ODP) means the ratio of calculated ozone column change for each mass unit of a gas emitted into the atmosphere relative to the calculated depletion for a mass unit of the reference gas CFC-11;

"paper products" means newsprint, fine paper, clay-coated paper, and cardboard;

"plastic foam cellular insulation" means extruded polystyrene (XPS) board, expanded polystyrene (EPS) board, polyurethane (PU) or polyisocyanurate (PIR) board, and polyurethane spray (SPUR) foam;

"polybrominated diphenyl ethers" means chemicals that have the molecular formula C₁₂H_xBr_yO. This includes penta-, octa-, and deca-brominated diphenyl ethers;

"post-consumer material" means a product which has served its end-use at the consumer level, has been discarded by the consumer, and would, unless diverted, enter the waste stream;

"pre-consumer material" means materials generated by an industrial process that would, unless diverted, enter the waste stream. This includes, but is not limited to, damaged or defective materials, overstock or obsolete inventories from manufacturers, distributors, and wholesalers. It does not include industrial scrap;

"R-Value" means thermal resistance, or the measure of an insulating material's resistance to heat flow; i.e., the ability of the insulation to slow the transfer of heat through it. It is expressed in units of ft²F·h/Btu or Km²/W;

"recycled material" means post-consumer material and pre-consumer material. It does not include industrial scrap, except that proportion of the scrap that originated as post-consumer material and pre-consumer material;

"reflective insulation" means one or more low emittance surfaces, such as metallic foil or metallic deposits, unmounted or mounted on substrates. Reflective insulations derive their thermal performance from surfaces with an emittance of 0.1 or less, facing enclosed air spaces. Examples include "bubble pack reflective insulation";

"slag" means a pre-consumer waste material generated from the smelting industry; and

"spray-on thermal insulation" means material supplied in the form of fiber granules, nodules, or similar forms of material designed to be installed in conjunction with a binder material by means of spraying, or thermoplastic insulation materials designed to be installed by means of spraying using a blowing agent;

Category Definition

- 2) This category includes all thermal insulation materials as further defined in the sub-categories in this section. The sub-categories are:
 - (a) board-type thermal insulation;
 - (b) loose-fill and spray-on thermal insulation; and
 - (c) batt-type and blanket-type thermal insulation.

Note: Other subcategories may be added at a later date.

General Requirements

- 3) The thermal insulation must:
 - (a) meet or exceed all applicable governmental and industrial safety and performance standards; and

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- (b) be manufactured and transported in such a manner that all steps of the process, including the disposal of waste products arising therefrom, will meet the requirements of all applicable governmental acts, by laws and regulations.

Product Specific Requirements

- 4) The thermal insulation material must:
 - (a) not require being labelled as toxic, corrosive or flammable under:
 - in the US, the Federal Hazardous Substances Act (16 CFR Part 1500), and/or
 - in Canada, the Consumer Chemicals and Containers Regulations of the Hazardous Products Act;
 - (b) be accompanied by detailed instructions for proper handling and installation so as to minimize health concerns;
 - (c) as demonstrated by due diligence of the manufacturer, be packaged in a material for which efforts have been made to ensure post-consumer recycled content;
 - (d) not be formulated or manufactured with polybrominated diphenyl ether flame retardants;
 - (e) if batt or blanket type insulation made of low density fiberglass or mineral wool, then not be formulated or manufactured with formaldehyde containing binders;
 - (f) if formulated or manufactured with blowing agents then use agents with zero ozone depleting potential;
 - (g) if expanded polystyrene, polyisocyanurate or open-cell polyurethane type insulation then use blowing agents with a global warming potential of less than 15 (see ODP and GWP values for common blowing agents in Appendix 1);
 - (h) not be formulated or manufactured with lead catalysts when spraying / forming plastic foam;
 - (i) if manufactured from expandable polystyrene resin, blowing agent content must be less than 6% by weight;
 - (j) meet the following minimum recycled content requirements, when calculated on a 12-month rolling basis and measured by weight of the final product:

Material	Board type Insulation	Loose-fill / Spray Applied	Batt or Blanket type insulation
Cellulose	-----	80%	-----
Fiberglass	45 %	45%	45%

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Mineral Wool	35 %	50%	35%
Expanded Polystyrene	no minimum content ¹	---	---
Extruded polystyrene	20 %	---	----
Polyisocyanurate (plastic component only e.g., not including facing)	15%	---	---
Closed –cell spray polyurethane foam	---	5%	-----
Aluminum reflective insulation (plastic layer content)	-----	----	15%

¹ Manufacturers must implement a corporate program for recovery of post-consumer and/or pre-consumer waste that can be re-introduced into the manufacturing process.

- (k) comply with the following performance standards (as applicable to material type):
- ASTM C547, Specification for Mineral Fiber Pipe Insulation,
 - ASTM C553, Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications,
 - ASTM C612, Specification for Mineral Fiber Block and Board Thermal Insulation,
 - ASTM C655, Specification Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing ,
 - ASTM C739, Standard Specification for Cellulosic Fiber (wood-base) Loose-Fill Thermal Insulation,
 - ASTM C1149, Standard Specification for Self-Supported Spray Applied Cellulosic Thermal/Acoustical Insulation,
 - ASTM C1224, Standard Specification for Reflective Insulation for Building Applications,
 - ASTM C 1289, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board,
 - ASTM C1497, Specification for Cellulosic Fiber Stabilized Thermal Insulation,
 - CAN/CGSB 92.2, Trowel or Spray Applied Acoustical Material,
 - CAN/ULC-S701, Thermal Insulation, Polystyrene, Boards and Pipe Covering,
 - CAN/ULC-S702, Thermal Insulation, Mineral Fibre for Buildings (proof of compliance to the optional corrosion test is also required),
 - CAN/ULC S703, Standard for Cellulose Fibre Insulation (CFI) for Buildings,
 - CAN/ULC S705.1, Thermal Insulation-Spray Applied Rigid Polyurethane Foam, Medium Density, Material Specifications,

standards that are gradually being replaced but still in use

- CAN/CGSB-51.9, Mineral Fibre Thermal Insulation for Piping and Round Ducting,
- CAN/CGSB-51.10, Mineral Fibre Board Thermal Insulation,
- CAN/CGSB-51.11, Mineral Fibre Thermal Insulation Blanket,

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- CAN/CGSB-51.26, Thermal Insulation, Urethane and Isocyanurate, Boards, Faced,
- CAN/CGSB-51.31, Thermal Insulation, Mineral Fibre Board for Above Roof Decks,
- CGSB-51-GP-21M, Thermal Insulation, Urethane and Isocyanurate, Unfaced, and
- CGSB 51-GP-27M, Thermal Insulation, Polystyrene, Loose Fill.

For additional copies of this criteria document or for more information about the EcoLogo® Program, please contact:

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Appendix 1: Ozone Depleting Potential and Global Warming Potential of Selected Blowing Agents

Substance	ODP ¹	GWP ²
CO ²	0	1
Pentane	0	11 ³
HFC 134a	0	1320
HFC 245fa	0	1020
HFC-365mfc	0	782
HCFC 22	0.05	1780
HCFC 141b	0.12	713
HCFC 142b	0.07	2270

Note: Plastic thermals insulation products that are manufactured using blowing agents not listed above can be certified subject to availability of ODP and GWP data from accredited sources.

¹ Sources: The Scientific Assessment of Ozone Depletion, 2002. World Meteorological Association's Global Ozone Research and Monitoring Project and IPCC Third Assessment Report: Climate Change 2001 Intergovernmental Panel on Climate Change as reproduced by the U.S. Environmental Protection Agency at <http://www.epa.gov/ozone>

² Sources: The Scientific Assessment of Ozone Depletion, 2002. World Meteorological Association's Global Ozone Research and Monitoring Project and IPCC Third Assessment Report: Climate Change 2001 Intergovernmental Panel on Climate Change as reproduced by the U.S. Environmental Protection Agency at <http://www.epa.gov/ozone>

³ Chemistry and Technology of Polyurethanes. Third Edition. 2002. Walter Dias Vilar.