



Product Category Rules for Preparing an Environmental Product Declaration (EPD) for Product Group:

Building Envelope Thermal Insulation

The product group includes all commercially available building envelope thermal insulation products, regardless of material type, including but not limited to: cellular glass, mineral fibre insulation (rock, slag or glass), cellulose-based insulation, textile-based insulation, and polymer-based insulation.

VERSION 1.0 September 23, 2011
VALID THROUGH September 23, 2016

PRODUCT CATEGORY RULE

Product Category
 Product Category Rule Number UL 110116

According to ISO 14025

PCR for Building Envelope Thermal Insulation

Scope of validity of these PCR

The product group “building envelope thermal insulation” includes all commercially available building envelope thermal insulation products, regardless of material type, including but not limited to: cellular glass, mineral fiber insulation (rock, slag or glass), cellulose-based insulation, textile-based insulation, and polymer-based insulation.

Content

These PCR determine the product group specific rules for:

- the creation of the Environmental Product Declaration (EPD)
- the calculation of the Life Cycle Assessment (LCA) and the creation of the project report on the LCA

Further requirements are given in UL Requirements for Product Category Rules and Environmental Product Declarations.

Versions overview

Version	Description	History
1	Version finalized by UL Environment	9/23/2011

Editor’s Notes:

This PCR is based on revisions made to existing PCRs from other countries that address Insulation Materials, including the PCR prepared by Næringslivets Stiftelse for Miljødeklarasjoner. Revisions/discussion points to make this PCR applicable to the U.S. include: units, functional unit, impact assessment methods, testing methods and requirements, use phase options, references, and standards.

The revisions are not modifications to the overall methodology or structure of existing PCRs, but are intended to reflect practices, methods and requirements that are specific to the United States.

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1.0 Goal & Scope

The intended application of this Product Category Rules (PCR) document is to give guidance for carrying out Environmental Product Declarations (EPD) for building envelope thermal insulation materials and to pinpoint the underlying requirements of the LCA pursuant to ISO standards that address appropriate environmental aspects of these materials. The users of this PCR will be manufacturers of building envelope thermal insulation materials and other interested parties. This PCR is valid for all building envelope thermal insulation materials according to the standards or technical approvals shown under Section 3.0 below.

This PCR addresses the cradle-to-grave environmental impacts of building envelope thermal insulation including the following:

1. Raw materials acquisition;
2. Manufacturing;
3. Transportation;
4. Installation and Maintenance; and
5. Disposal/reuse/recycling

This is not intended to be a full building LCA, therefore, the installation phase impacts do not address the energy savings that result from the ongoing building operation due to the installed insulation.

This PCR complies with ISO 14025, Environmental labeling and declarations – Type III environmental declarations – Principles and procedures and ISO 21930, Sustainability in building construction— Environmental declaration of building products. Additional information as shown under Section 9.0 is permitted.

An EPD prepared under this PCR will present data that has been aggregated over the aforementioned life cycle stages:

1. Raw materials acquisition;
2. Manufacturing;
3. Transportation;
4. Installation and Maintenance; and
5. Disposal/reuse/recycling

Comparability of EPD of insulation materials will be in accordance with the requirements for comparability as described in ISO 14025, sections 4 and 5.6.

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2.0 Applicability

This PCR is valid for all building envelope thermal insulation materials according to the standards or technical approvals shown under chapter 11.0. The product group “building envelope thermal insulation” includes all commercially available building envelope thermal insulation products, regardless of material type, including but not limited to: cellular glass, mineral fiber insulation (rock, slag or glass), cellulose-based insulation, textile-based insulation, and polymer-based insulation.

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Program operator: **UL Environment**

The PCR has been prepared by a coalition of insulation trade associations and members led by the American Chemistry Council. UL Environment served as Program Operator in finalizing the PCR:

Coalition: American Chemistry Council (ACC)
 Cellulose Insulation Manufacturers Association (CIMA)
 Center for the Polyurethane Industry (CPI)
 Expanded Polystyrene Molders Association (EPSMA)
 Extruded Polystyrene Foam Association (XPSA)
 North American Insulation Manufacturers Association (NAIMA)
 Polyisocyanurate Insulation Manufacturers Association (PIMA)
 Spray Polyurethane Foam Alliance (SPFA)

Expert interested parties: Paul Bertram – Kingspan Insulated Panels

Coalition Staff Lead: D’Lane Wisner, consultant to the American Chemistry Council
 An earlier draft of the PCR was reviewed by Five Winds International and Athena International.
 PCR/EPD/LCA Expert Advisors: George Z. Pavlovich and Jerry W. Phelan, Bayer MaterialScience

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3.0 Period of Validity

This document is effective for five years from latest date of publication. If relevant changes in LCA methodology for the product category occur, the document will be revised. This PCR will be reviewed bi-annually to determine whether revisions are necessary.

4.0 Definitions

For the purposes of this document, the following definitions apply:

Building Envelope Thermal Insulation A material or assembly of materials used to provide resistance to heat flow.

Declared Unit

Quantity of a building product for use as a reference unit in an EPD, based on LCA, for the expression of environmental information needed in information modules.

Example: mass (kg); volume (m³) [ISO 21930]

Feedstock Energy

Heat of combustion of a raw material input that is not used as an energy source to a product system, expressed in terms of higher heating value or lower heating value [ISO 14044].

Functional Unit

Quantified properties of a building product for use as a reference unit description in an EPD based on LCA [ISO 21930].

Information Module

Compilation of data to be used as a basis for a Type III Environmental Declaration, covering a unit process or a combination of unit processes that are part of the life cycle of a product [ISO 21930].

Life Cycle Assessment (LCA)

Calculation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle [ISO 14040].

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Process Energy

Energy input required for operating the process or equipment within a unit process, excluding energy inputs for production and delivery of the energy itself [ISO 14044].

Product Category

Group of building envelope thermal products that can fulfill equivalent functions [ISO 21930].

Type III Environmental Declaration, Environmental Product Declaration (EPD)

Environmental declaration providing quantified environmental data using predetermined parameters and, where relevant, additional environmental information [ISO 21930].

Unit Process

Smallest portion of a product system for which data are collected when performing a life cycle assessment.

5.0 Description of company/organization and product

5.1 Description of company/organization

The EPD will set forth the name of the manufacturing company/organization as well as the place(s) of production (see section 10.1). The EPD may include general information about the company/organization, such as the existence of quality systems or environmental management systems, according to ISO 14001 or any other environmental management system in place.

5.2 Description of product

The EPD will provide a narrative description of the product in a manner that enables the user to clearly identify the product. This description will include:

- 5.2.1 Product identification by brand name, by material type, by production code (if applicable), and by simple visual representation, which may be by photograph or graphic illustration;
- 5.2.2 The appropriate ASTM or ANSI product specification, including pertinent physical properties and technical information.

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- 5.2.3 A graphical depiction of a flow diagram illustrating main production processes according to the scope of the declaration. (See section 6.2).

In addition to the above, the optional inclusion of the following criteria is encouraged.

- 5.2.4 During its service life, insulation significantly reduces the energy use in a building, thereby reducing the impact on the environment. The exclusion of the building heating and cooling during the insulation material's use phase severely underestimates the benefits that insulation has on the environment. This section may describe the energy savings and environmental benefits during use of the product in a building and only references operational consideration.

6.0 Requirements for the underlying LCA

6.1 Functional unit

The functional unit of a product provides the quantitative normalization for comparing products of equivalent function (functional unit) or equivalent specification (declared unit). For declarations covering the complete life cycle, a functional unit is defined. The functional unit is based on the thermal property (design) as determined by the relevant standards/methods for an insulation type (see Section 11.0). Where there is an applicable ASTM material standard, that standard will be referenced.

For declaration and reporting purposes only, it is acceptable to report the functional and declared units and LCA results in IP units as described in Section 8.0 of this PCR (see discussion on conversions).

The functional unit (cradle to end of life) is:

1 m² of insulation material with a thickness that gives an average thermal resistance R_{SI} = 1 m²K/W and with a building service life of 60 years (packaging included). The R-value is

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the manufacturer's average value for the service life of the material and is determined by ASTM C 518 and/or ASTM C1303, whichever is applicable. The unit for the functional unit mass is kg. The unit for the functional unit service life is years. The defined reference service life of a product shall be verifiable against manufacturer's stated specifications or publically available information.

Functional units can be expressed as: $FU = R_{Si} \cdot \lambda \cdot \rho \cdot A$ [kg] where

- R_{Si} = thermal resistance [m²K/W]
- λ = thermal conductivity [W/mK]
- ρ = density of insulation product [kg/m³]
- A = Area [m²] (here, 1 m²)

The result for any other R_{Si} -values than 1 m²K/W can be found by simple multiplication.

The thermal resistance may also be expressed as: $R_{Si} = d/\lambda$ where d [m] is the thickness of the insulation.

This PCR applies to a wide variety of thermal insulation types, each with its own applicable ASTM standard. Some insulation types are offered in different densities that will directly impact R-value. In turn, other insulation types have R-values that are linear with respect to thickness, while others are non-linear. Therefore, since this PCR is based on an R-value functional unit, adjustments for density and thicknesses are to be provided.

6.2 System boundaries

The life cycle stages for the installed insulation products are shown in figure 1. The system boundaries encompass the following processes:

6.2.1 Raw materials acquisition

The production stage will report:

- Extraction/Production of raw materials
- Average transport of raw materials from extraction/production to manufacturer
- Processing of recycled materials
- Transport of recycled/used materials to manufacturer

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6.2.2 Manufacturing

- Manufacturing of building envelope thermal insulation products
- Packaging
- Releases to environmental media (air, soil, ground and surface water)
- Manufacturing waste

6.2.3 Transportation

The construction stage will report:

- Transport of building envelope thermal insulation products from manufacturer to distributor/building site
- Transport of building envelope thermal insulation products from distributor to building site, if applicable

6.2.4 Installation and Maintenance

The installation of the product is treated as a scenario and will include:

- Installation on the building including any materials specifically required for installation
- Releases to environmental media (air, soil, ground and surface water)
- Construction waste
- The reference service life of the building is defined as 60 years and the number of replacements of the insulation products will be declared accordingly. The number of replacements shall be calculated by dividing the reference service life of the building by the product service life as defined by the manufacturer's specifications.
- Maintenance of the building envelope thermal insulation products that under normal conditions will be necessary to achieve the defined reference service life. Maintenance/replacements will be modeled according to manufacturers' guidelines.
- Releases to environmental media (air, soil, ground and surface water) of the product during installation and life of the product will be declared in accordance with current U.S. national standards and practice.
- Installation waste

6.2.5 Disposal/reuse/recycling

The disposal/reuse/recycling stage is treated as a scenario and will include:

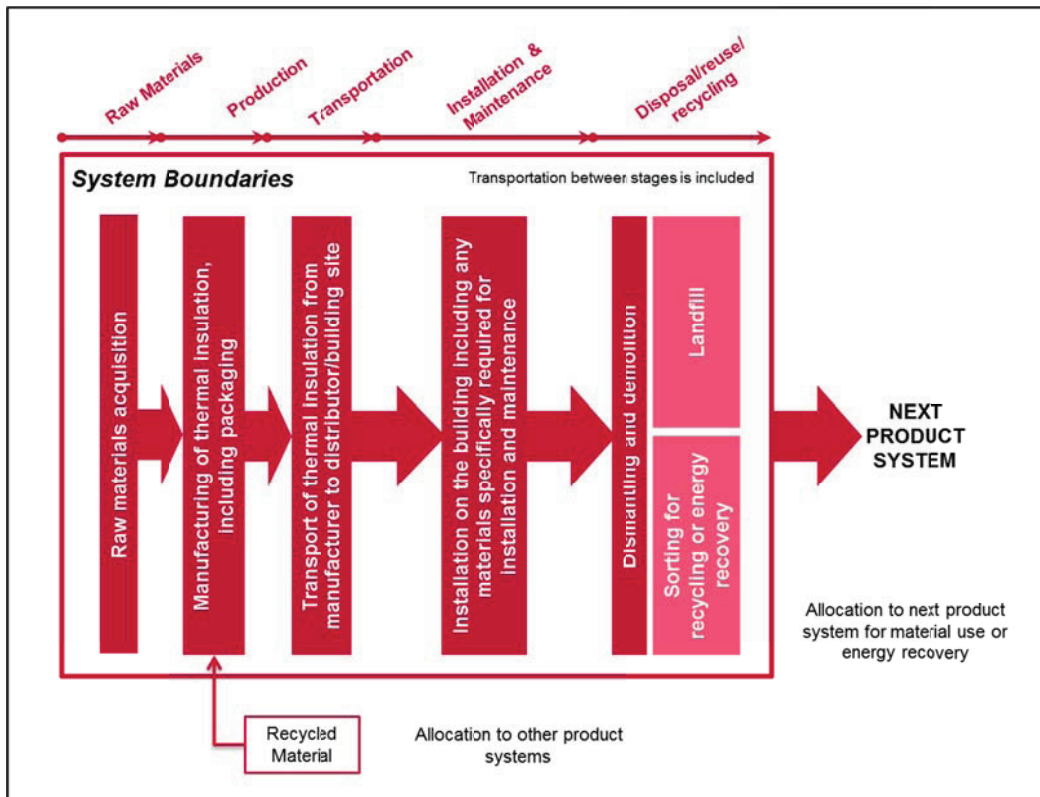
- Dismantling/Demolition

- Transport from building site to final disposition
- Final disposition (e.g., recycling/reuse/landfill/waste incineration/conversion to energy)

The manufacturing and the installation processes will be declared separately from both the use/maintenance processes (building use stage) and from the demolition processes (end of life stage). The building use stage and the end of life stage are both based on typical scenarios for the products. The scenarios will be described in detail.

Any other transportation data than identified above will be indicated. If transportation information is included in other stages than indicated, or if no transportation information exists and assumptions are made, this will be noted.

Figure 1: System boundaries and life cycle of insulation products



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6.3 Cut-off rules

A process or activity that contributes no more than 2% of the total mass and 1% of the total energy use may be omitted from the inventory analysis, except that:

6.3.1 Omissions of any material flows that may have a relevant contribution to the selected impact categories of the products underlying the Environmental Declaration will be justified, if applicable, by a sensitivity analysis.

The sum of the excluded material flows must not exceed 5% of mass, energy or environmental relevance.

6.4 Allocation rules

In a production process where more than one type of product is generated, it is necessary to allocate the environmental impacts (inputs and outputs) from the process to the different products in order to obtain product-based inventory data. Allocation rules should reflect the goal of the production process. For production of building envelope thermal insulation products, the preferred allocation rule is that allocation be carried out according to mass. For additional information, see ISO 14044 Section 4.3.4.

Where applicable, feedstock energy shall be declared and shall be shown separately from process energy.

When allocation is used, aspects such as economic conditions will be considered to determine if other allocation criteria would be more appropriate or lead to deviating results. A sensitivity analysis should be initiated if a deviation of > 20% is foreseen. Different data sets will be documented and reported, if different allocation options are relevant.

6.5 Transportation

Allocation associated with transport will be based on weight or volume, as appropriate for realistic modeling.

Example: In the case of low density finished insulation products, it will be the volume that restricts the amount of cargo on a vehicle, not the weight, and thus volume will be used in allocating material for transport.

7.0 Data Quality requirements

7.1 Data collection

The inventory data collected will be flow-based, complete and follow ISO 14025 and 21930 requirements as relevant regarding data quality, e.g. reproducibility, consistency, precision, uncertainty etc. Data shall be representative according to temporal, geographical and technological requirements.

- **Temporal:** The obtained information from the manufacturing process will be annual approximate values, and will be current (no older than 12 months). Average background (secondary) data will not be older than 10 years.
- **Geographical:** The geographic region of the production sites included in the calculation of representative data will be documented.
- **Technological:** Data will represent technology in use.

7.2 Description of data

The use of specific or average flow-based background data will be documented. The following distribution will be applied:

- Production of raw materials (specific and/or average background)
- Manufacturing of the product (specific or generic)
- The sources for electricity used will be based on published U.S. government sources for regional grids that are either self-sufficient or net exporters, if available. Site-specific data will be used for electricity grid mix averages. If site-specific data are such data is not available, regional averaged grid mix values for major grids that are not connected (e.g. East, West and Texas) shall be used. The sources for electricity (calculation procedure) will be documented.
- Hazardous waste will be defined according to the U.S. Resource Conservation and Recovery Act (RCRA) and applicable regulations.

Generic flow-based data will be used for the U.S. market where specific data are not available. In cases where U.S. data are not available, sources for similar technology adjusted for US boundary conditions (e.g., energy mix) may be used.

All data will be documented with reference to the source database and year of publication. Sources of data for transport models (including transport form, distances and quantities to be transported) and thermal energy production will be documented.

7.3 Product Content

The product content will be described in the declaration. Information protected under U.S. law as confidential does not need to be disclosed; in such cases, a notation that the information is confidential will be made along with a description of the function of the compound.

8.0 Units

The following units will be used for the Life Cycle Calculations:

- SI units
- Preferred basic units:
 - kg (kilograms)
 - MJ (mega Joule) for thermal energy
 - kWh (kilowatt-hour) or MJ (mega Joule) for electrical energy

Table 1 – Mandatory conversion factors to be used if reporting in IP units

Convert from	To	Multiply by
square meter (m ²)	Square foot (ft ²)	10.76391
kilogram (kg)	Pound (lb)	2.204622
Mega joule (MJ)	British Thermal Unit (BTU)	947.8170
degree Celsius (°C)	degree Fahrenheit (°F)	t/°C = (t/°F - 32)/1.8
cubic meter (m ³)	cubic foot (ft ³)	35.31466

Alternative IP Reporting Units

$$\text{Functional Unit FU} = \text{DU} = R \cdot \lambda \cdot \rho \cdot A \text{ [lb]}$$

where; R = thermal resistance [ft²·°F·hr/Btu]

λ = thermal conductivity [Btu-in./hr ft² F]

ρ = density of insulation product [lb/ft³]

A = Area [ft²], here 1 ft²

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Note: Common units for thermal conductivity in the U.S. are Btu-in./hr ft² F. To convert to Btu-in./hr ft² F, divide the value in Btu-in./hr ft² F by 12.

8.1 Characterization factors

The factors employed to calculate the selected environmental impacts will be taken from the following sources:

Table 2a: Units and Method for establishment of characterization factors of environmental attributes for North America

Environmental Attribute	Unit	Method
Global Warming Potential	[kg CO ₂ equiv]	US EPA TRACI (Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts)
Acidification Potential	[mole H ⁺ equiv]	
Eutrophication Potential	[kg N equiv]	
Smog Creation Potential	[kg O ₃ equiv]	
Ozone Depletion Potential	[kg R11 equiv]	

Table 2b: Units and Method for establishment of characterization factors of environmental attributes for jurisdictions other than North America.

Environmental Attribute	Unit	Method
Global Warming Potential	[kg CO ₂ equiv]	CML (Center of Environmental Science – Leiden University)
Acidification Potential	[kg SO ₂ equiv]	
Eutrophication Potential	[kg PO ₄ equiv]	
Photochemical Ozone Creation Potential	kg Ethene-Equiv.	
Ozone Depletion Potential	[kg R11 equiv]	

9.0 EPD Content

All Type III environmental declarations in a product category will include the parameters as identified in this PCR.



9.1 General information to be declared

The following general information will be declared:

- the name and address of the manufacturer(s);
- product identification by name (including production code) and a simple visual representation of the building envelope thermal product to which the EPD is developed;
- the description of the product’s use and the functional or declared unit of the product to which the data relates;
- the description of the application (installation) of the insulation products;
- a general specification for the composition of the products will be given;
- name and contact information of program operator;
- the PCR identification;
- the date the declaration was issued and period of validity;
 - additional environmental information
 - content of the product as identified
- a statement that environmental declarations from different programs (ISO 14025) may not be comparable;
- a statement that this declaration represents an average performance, in such cases where an EPD declares an average performance for a number of products or manufacturing plant locations;
- the site(s), manufacturer or group of manufacturers or those representing them for whom the results of the LCA are representative;
- information on where explanatory material may be obtained;
- a diagram of the life cycle stages included in the LCA; and
- completion and inclusion of Table 3 (below):

Table 3 Demonstration of verification

This EPD review, was conducted by: < name and organization of the chair, and information on how to contact the chair through the Program Operator >
Independent verification of the declaration and data, according to ISO 14025 <input type="checkbox"/> external or <input type="checkbox"/> internal Note: If external, then verifier must not have been connected in any manner with the EPD or LCA.
(Where appropriate ^a) Third party verifier: < name of the third party verifier >



9.2 Declaration of Environmental aspects:

Use of material and energy resources:

- Use of non-renewable material resources
 - Use of renewable material resources
 - Use of non-renewable primary energy (units: megajoules):
 - Fossil oil
 - Natural gas
 - Coal
 - Uranium
 - Use of renewable primary energy (units: megajoules):
 - Hydropower
 - Wind power
 - Solar power
 - Biomass
 - Use of water
-
- Additional environmental information related to environmental aspects
 - Scenarios and technical information, as relevant per ISO 21930

Impact category indicator will include, but not be limited to, results for: (see Table 2a and 2b for units)

- Climate change. Emission of greenhouse gases.
- Destruction/depletion of ozone layer. Emission of ozone-depleting gases.
- Acidification of land and water sources. Emission of acidifying gases.
- Eutrophication. Emission of substances contributing to eutrophication potential.
- Formation of photochemical oxidants. Emission of gases that contribute to the creation of ground-level ozone.

Waste to disposal

- Non-hazardous waste (kg)
- Hazardous waste (kg) according to U.S. EPA RCRA regulations

Waste to energy

10.0 Optional environmental information

10.1 Indoor environment

Materials exposed to the indoor environment may have volatile organic compound (VOC) emissions in the use phase that are not typically accounted for as a part of normal life cycle assessment. However, given the importance, manufacturers have placed on their indoor air quality (IAQ) efforts to reduce impacts, any reporting of test results, certifications or key benefits related to IAQ may be placed within this section of the EPD. Any product declarations in this category shall be declared in accordance with national standards and practice.

10.2 Additional environmental benefits

Other relevant information highlighting additional environmental impacts or benefits of the product may be declared within this section of the EPD (e.g. material sourcing, specific manufacturing processes, occupational health considerations, and environmental impacts prevented or end-of-life options for reuse/recycling).

10.3 Building use-stage environmental benefits

Use-stage environmental benefits of insulation during building operations can be significant as low thermal conductivity and air sealing attributes of insulation limit utility consumption and associated environmental impacts. Information regarding these benefits may be provided as per section 5.2.4.

10.4 Other relevant information

Should relevant information demonstrating other benefits that the product provides other than what is described by the Characterization factors (Section 7.1.1) such as acoustics, fire and moisture protection be disclosed, it shall be declared under this section.

11.0 References

This PCR is based on the following studies (references):

American Conference of Governmental Industrial Hygienists (ACGIH[®]) Threshold Limit Values and Biological Exposure Indices

ASHRAE:

ASHRAE Standard 62.1 Ventilation for Acceptable Indoor Air Quality

ASHRAE Standard 90.1 Energy Standard for Buildings Except Low-Rise Residential Buildings

ASHRAE 90.2 Energy-Efficient Design of Low-Rise Residential Buildings

ASTM Product Specifications:

C208-08a Standard Specification for Cellulosic Fiber Insulating Board

C518 - 10 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

C549-06 Standard Specification for Perlite Loose Fill Insulation

C552-07 Standard Specification for Cellular Glass Thermal Insulation

C578-10 Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation

C665-06 Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing

C726-05e1 Standard Specification for Mineral Fiber Roof Insulation Board

C728-05(2010) Standard Specification for Perlite Thermal Insulation Board

C739-08 Standard Specification for Cellulosic Fiber Loose-Fill Thermal Insulation

C764-07 Standard Specification for Mineral Fiber Loose-Fill Thermal Insulation

C991-08e1 Standard Specification for Flexible Fibrous Glass Insulation for Metal Buildings

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- C1014-08 Standard Specification for Spray-Applied Mineral Fiber Thermal and Sound Absorbing Insulation
- C1029-10 Standard Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation
- C1086-09 Standard Specification for Glass Fiber Mechanically Bonded Felt Thermal Insulation
- C1126-04 Standard Specification for Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation
- C1149-08 Standard Specification for Self-Supported Spray Applied Cellulosic Thermal Insulation
- C1224-09 Standard Specification for Reflective Insulation for Building Applications
- C1289-10 Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
- C1303-11a Standard Test Method for Predicting Long-Term Thermal Resistance of Closed-Cell Foam Insulation
- C1482-09 Standard Specification for Polyimide Flexible Cellular Thermal and Sound Absorbing Insulation
- C1484-09 Standard Specification for Vacuum Insulation Panels
- C1497-04 Standard Specification for Cellulosic Fiber Stabilized Thermal Insulation
- C1594-07 Standard Specification for Polyimide Rigid Cellular Thermal Insulation
- C1631-08 Standard Specification for Cellular Polypropylene Thermal Insulation Emissions Testing
ASTM D6670 - 01(2007) Standard Practice for Full-Scale Chamber Determination of Volatile Organic Emissions from Indoor Materials/Products
- ASTM D7143 - 05 Standard Practice for Emission Cells for the Determination of Volatile Organic Emissions from Indoor Materials/Products
- ASTM E1333 - 96(2002) Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber

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International Standards Organization:

ISO 14001 Environmental management systems –Requirements with guidance for use

ISO 14025 Environmental labels and declarations –Type III environmental declarations – Principles and procedures

ISO 14040 Environmental management -- Life cycle assessment -- Principles and framework

ISO 14044 Environmental management - life cycle assessment - Requirements and Guidelines

ISO 15686-8 Buildings and constructed assets – Service life planning – Part 8: Reference service life.

ISO 21930 Sustainability in building construction - Environmental declaration of building products

US EPA

RCRA regulations, 40 CFR Part 261

TRACI (Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts)

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Appendix I: Project Documentation and Reporting

Project documentation will include information, which can be made available to verifier in order to demonstrate that the relevant requirements of ISO 14025 and ISO 21930 have been met:

- input and output environmental data of the unit processes that are used for the LCA calculations;
- the documentation (measurements, calculations, estimates, sources, correspondence, traceable references to origin, etc) that provides the basis from which the process data for the LCA is formulated;
- documentation demonstrating that the verification and review requirements of ISO 14025/21930 have been followed

This includes documentation for:

- the material specification to which the insulation product conforms;
- energy consumption figures;
- emission data to air, water and soil;
- waste production;
- data that demonstrates that the information is complete. If applicable standards or quality regulations are available, reference should be made to them;
- referenced literature and databases from which data have been extracted;
- demonstrating that the insulation products can meet the desired function(s) and deliver desired performance;
- demonstrating that the chosen processes and scenarios in the flow chart satisfy the requirements set in ISO 21930;
- substantiating the chosen life cycle of the insulation products;
- data used to carry out the sensitivity analyses, in cases where applicable
- substantiating the percentages or figures used for the calculations in the waste scenario;
- substantiating the percentages and figures (e.g., number of cycles) used for the calculations in the allocation procedure;
- information showing how averages of different reporting locations have been calculated in order to obtain generic data;
- substantiating any qualitative information in the additional environmental information;

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- procedures used to carry out the data collection (questionnaires, instructions, informative material, confidentiality agreements, etc.);
- the characterization factors, normalization factors and weighting factors used;
- the criteria and substantiation used to determine the system limits and the selection of input and output flows;
- substantiating the other choices and assumptions; and
- the results, comments and recommendations from a critical review per ISO 14025.

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