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GUIDANCE FOR THE PROVISION OF ENVIRONMENTAL INFORMATION ON CONSTRUCTION PRODUCTS

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GUIDANCE FOR THE PROVISION OF ENVIRONMENTAL INFORMATION ON CONSTRUCTION PRODUCTS

A - INTRODUCTION

This document has been produced to satisfy a growing international need for guidance on the provision of environmental information in a uniform way for construction products. The document is a voluntary tool that has been produced by representatives of the producers of construction products in Europe.

CEPMC considers that this document will serve to reduce the diversity of ways to provide environmental information throughout Europe and that it could be valuable to authorities and manufacturers who wish to see environmental information collected, recorded and managed in a systematic and comparable way.

The document makes reference to the environmental standards of ISO. For published standards and for further information on the work currently underway in ISO, reference should be made to the ISO 14000 series of standards.

The environmental inventory referred to in this guidance document is only part of the data needed for the rational assessment of a product. No attempt has been made to assess the environmental impacts associated with the data. EN ISO 14041: 2000 points out that “the interpretation of LCI results alone cannot be the basis for reaching conclusions about relative environmental impacts”.

The environmental information referred to in this document is only one aspect of the total technical and social considerations now facing authorities, architects and specifiers. If the intention is to minimise the impact of the construction works as a whole then it will be necessary to look also at aspects other than the environmental impacts of the products from which it is made.

Of greater importance, for example, is the use of the construction works. Other factors of importance are its design and location and the efficiency of, for example, the water heating and ventilation.
For example, during a house’s life-time of 50 years, 90 % of the total energy use, and hence most of the environmental impacts, result from the use phase of the house (heating, hot water, cooking and ventilation). Less than 10 % is used in the manufacture of the products used to build the house.

GUIDANCE FOR THE PROVISION OF ENVIRONMENTAL INFORMATION ON CONSTRUCTION PRODUCTS

B - INFORMATION REQUIREMENTS

1 GENERAL

Manufacturers or the (trade) association of individual manufacturers, who have pooled their data, are asked to provide the following information where relevant, for all characteristics. Where appropriate the range of values should be provided.

1.1 Product generic name :

1.2 Name of producer or trade association :

1.3 Product description :

1.4 Description of the product function :

2 PRODUCTION

2.1 Density and range (if applicable) :

2.2 Relevant environmental standards :

2.3 Functional unit:

The Life Cycle Inventory data (LCI data) in Table 1 (see separate attachment) is the information recorded by the compiler based on a functional unit. relevant to the application.

The derivation of the functional units for product applications should be defined and agreed by the producers and their industry sector and appended as an annex to this document. (e.g. producers of bricks, cement, insulation materials).

The functional unit describes the function to be fulfilled /achieved by the product and the period during which the function is carried out. Comparisons between products in the same application may only be carried out after the products have been subjected to a review in accordance with ISO 14040 (Environmental management - Life cycle assessment - Principles and framework).

The requirements for transparency, required by ISO, shall be borne in mind and the environmental burdens shall be expressed **per functional unit.** The functional unit takes into account the amount of product needed to fulfil the functional unit (this means that aspects like duration, maintenance, supplementary or ancillary products, renewal and recycling should be taken into account).

(NOTE: Some materials used for a number of applications may have several functional units.)

2.4 Life Cycle Inventory (LCI) on the product
The intention behind this document is to provide information on the product over its life cycle "cradle to grave" (see: EN ISO 14041: 2000).

It should be noted that (in accordance with EN ISO 14040: 1997) if the results of the LCI are to be communicated to any interested party other than the commissioner or the practitioner of the study, regardless of the form of the communication, a third-party report shall be prepared.

Reference should be made to the LCA methodology: goal, scope, boundaries, data quality.

Reference should be made to the database used for LCI calculations such as Boustead, Ecobilan or Simapro (including reference to the database used for the calculations concerning pre-production and disposal burdens)

The reference to the author and the date of the publication must be provided.

Table 1 provides a format for the producer of the product to record his own data. The trade association data should give the industry average values and the range of variation within the data. The data is expressed per functional unit of product.

3. SITE CONSTRUCTION

3.1 Packaging :

3.2 Transport :

3.3 Installations requirements and precautions :

3.4 Waste :

4. USE AND MAINTENANCE

4.1 Product expected life time :

4.2 Maintenance frequency :

4.3 Maintenance requirements and precautions :

5. END OF LIFE

5.1 Waste category :

5.2 Reuse (possible Y/N and precautions) :

5.3 Recycle (possible Y/N and precautions) :

5.4 Energy recovery (possible Y/N, precautions, calorific value) :

5.6 Landfill (possible Y/N and precautions) :

FOR FURTHER INFORMATION REFER TO:
- Guide for the compiler
- Guide for the reader

GUIDANCE FOR THE PROVISION OF ENVIRONMENTAL INFORMATION ON CONSTRUCTION PRODUCTS

C - GUIDE FOR THE COMPILER

1. GENERAL

1.1 Product generic name :

1.2 Name of producer or trade association :
Provide information on the type of material and the company producing the product. Give also information on the producer associations (if relevant) and provide an address or telephone number in case additional information is required.

1.3 Product description :
Describe the delivery form: liquid, solid (powder, film, board...), shape, quantity or dimensions, colours. For products transformed on the job site, also give the final use form.

1.4 Description of the product function :
Describe the function of the product, e.g." thermal insulation". The product should conform to European (EN) standards but if none exist then to ISO or national standards.
Major properties should be given with their performance value, units and standard used in their determination. The value(s) should be able to be used in the definition of the functional unit.

2. PRODUCTION

2.1 Density and range
Density or density range should always be quoted. It is not always useful as an indicator of the product performance but it is necessary for functional unit calculations.

If relevant, give an average with a range. If the association represents products of very different chemical compositions then give the different values. If the values are very different (more than 20%) depending on the end use applications, then provide as many as necessary. If values are very different by country, then provide typical national values.

2.2 Relevant environmental standards
If relevant, report compliance with environmental standards such as ISO 14000 or EU EMAS (1836/93 CEE).

2.3 Functional unit: definitions and examples
The environmental data in Table 1 are based on a functional unit.

According to ISO 14040:1997 "the functional unit is the quantified performance of a product system for use as a reference unit in a life cycle assessment study"

For the purpose of this document, the functional unit is defined as that amount of product which on its own or which in combination with other products, achieves a required level of performance or enables the combination to achieve a required level of performance.

The derivation of the functional unit for generic material groups should be agreed by the producers and their industry sector (e.g. producers of bricks, cement, insulation materials). The industry annex should contain typical examples of functional units.

The functional unit depends upon the function to be fulfilled and the period during which the function is carried out. Comparisons between products can only be carried out when the environmental impacts are expressed per functional unit. The functional unit takes into account the quantity of product needed to fulfil the required level of performance including aspects like duration, maintenance, supplementary or ancillary products, renewal and recycling.

2.4 Life Cycle Inventory (LCI) on the product

Provide an extract from the product Life Cycle Inventory data (from raw materials in the earth to spent product and waste materials returned to the earth). Include reference to the LCA methodology used: goal, scope, boundaries, data quality, and to the database used for the LCI calculation of the pre-production and disposal burdens, such as Boustead, Ecobilan and Simapro.
Include reference to the author and the date of publication.

If the data does not cover the full period described above, this must be stated and the reasons given for any omissions.

Energy data, including mix and types of fuels and other factors, shall be treated as for all other material inputs and outputs (EN ISO 14041).
(NOTE: When converting the energy from electricity to primary units, for the tables, the relationship 1 kWh = 3.6 MJ should be used together with the national local efficiency value for energy production.)

3. SITE CONSTRUCTION

3.1 Packaging

State the nature of the packaging material used: wood, aluminium, plastic (LDPE, ...). The correct identification of the material should help the customer with the re-use or recovery of the packaging in the appropriate national schemes.
Optional: describe the shape (bulk, pallets, bags, pots etc.) and give the weight of packaging per kg of building product.

3.2 Transport

If detailed information is available it should be given in table 1. Otherwise give the location of the manufacturing plant and state the mode of transport, e.g. ship, train, truck.

3.3 Requirements and precautions for installation

Requirements: specify whether ancillary products and additional raw materials, water or energy are necessary for any final products that still require "in-situ production".
Precautions: specify any precautions necessary to avoid environmental pollution in air, soil or water.

3.4 Waste
If waste management is similar on the construction site and the demolition site, then refer to the last paragraph. If not, then give the information here following the approach in the last paragraph.

4. USE AND MAINTENANCE

4.1 Expected product life-time
Give the average expected product life- time for each of the major applications in years

4.2 Maintenance frequency
To be identified if different from product expected life-time. Give the major reasons for maintenance.

4.3 Maintenance requirements and precautions
Describe the maintenance process (does it require a new product or is it only cleaning?) and quantify its impact on the additional use of raw materials and energy.

5. END OF LIFE

5.1 Waste category:
Give the name and number of any applicable waste category, whether European or national.

5.2 Re-use (possible Y/N and precautions):
Describe the various re-use options for the product. State pre-requisites, if any, e.g. full pieces, properties, maximum transport distance.

5.3 Recycling (possible Y/N and precautions):
Describe the various recycling options for the product. State pre-requisites, if any, e.g. cleanliness, single material, pre-treatment, maximum transport distance etc.

5.4 Energy recovery (possible Y/N, precautions, calorific value):
State pre-requisites to incineration, if any. Give the potential calorific value of 1 kg of material and the energy recovery achieved in practice.

5.5 Landfill (possible Y/N and precautions):
Is the product allowed on a landfill? Are there national restrictions? Necessary precautions (e.g. no mixing with organic products)? To which type of waste does it belong (e.g. inert)? To which type of landfill should it go (disposal category)?

GUIDANCE FOR THE PROVISION OF ENVIRONMENTAL INFORMATION ON CONSTRUCTION PRODUCTS

D - GUIDE FOR THE READER

1. GENERAL

When attempting comparisons between building products using LCI data the reader is advised to consider that they are only elements of **the complete building**.
The use of energy, mainly derived from fossil fuels, contributes most to the majority of environmental impacts. During a building life-time of 50 years, 90 % of the total energy use, hence most of the environmental impacts, result from the use phase of the house heating hot water, cooking and ventilation. Less than 10 % is used for the manufacture of the products used to build the house.

1.4 Description of the product function :
The major properties of a product give important information and provide a basis for both technical and environmental comparisons. It is essential to know that the product fulfils its primary purpose. The main characteristic(s) will form the basis for the functional unit calculation.

2. PRODUCTION

2.1 Density and range :
It is not always useful as an indicator of the product performance but it is necessary for functional unit calculations and comparisons.

2.2 Relevant environmental standards
Relevant standards are ISO 14001 (international) and EMAS 1836/93/EC (European / EC). These are voluntary schemes established since 1993. A third party certification body awards certification after an Eco-audit of the environmental management system of the organisation and its manufacturing site. Unlike ISO 14001, EMAS requires the communication of the company's environmental policy and results to the public. The EU regulation also asks for the reduction of the impacts using Best Available Techniques Not Entailing Excessive Costs (BATNEEC).

2.3 Functional unit: definitions and examples
Table 1 gives environmental data on an individual product, based upon the functional unit.

According to ISO 14040:1997 "the functional unit is the quantified performance of a product system for use as a reference unit in a life cycle assessment study"

For the purpose of this document the functional unit is defined as that amount of product which, on its own or which in combination with other products, achieves a required level of performance or enables the combination to achieve a required level of performance.

The derivation of the functional unit for generic material groups should be agreed by the producers and their industry sector (e.g. producers of bricks, cement, insulation materials). The industry annex should contain typical examples of functional units.

The functional unit depends upon the function to be fulfilled and the period during which the function is carried out. Comparisons between products can only be carried out when the environmental impacts are expressed **per functional unit**. The functional unit takes into account the quantity of product needed to fulfil the functional unit (this means that aspects like duration, maintenance, supplementary or ancillary products, renewal, and recycling should be taken into account).

2.4 Life Cycle Inventory (LCI) on the product

The extract from the product Life Cycle Inventory data should include reference to the author and the date of publication.

If the data provided by the practitioner does not cover the full period described above, this should be stated and the reasons given for any omissions. Data reference and date are important in order to provide a check on the quality of the information.

NOTES:

- CFCs and HCFCs are classified as contributors to ozone depletion.
- CO_2, CFCs, HCFCs and methane are among the largest contributors to global warming /greenhouse effect.
- Hydrocarbons (VOCs) are among the largest contributors to photo-oxidant formation (summer smog).
- SO_x and NO_x are among the largest contributors to acidification (acid rain).
- COD and BOD are indicators of eutrophication / nutrification (phosphates are among the largest contributors).

3. SITE CONSTRUCTION

3.1 Packaging

The identification of the material used in packaging products should help to identify the appropriate re-use or recovery schemes in each country.

3.2 Transport

Data for transport is included in the LCI unless specifically excluded by its scope. For the same transported quantity, over the same distance, the transport by train has less impact on the environment than the transport by truck.
In general, the proximity principle should be applied. Long transport distances are likely to have significant environmental impacts. This applies to delivery of materials to site, and to waste management (see 3.4 below). Factors affecting waste transport include the availability of recycling facilities, incineration facilities and landfill sites.

3.3 Installation requirements and precautions

Products are only comparable in the ‘ready for use condition’. For products that still require some "production" on the construction site the raw materials (including water) and energy used at the production site should be added to the LCI data.

3.4 Waste

The owner of the waste deciding the destination of the waste can have a strong influence on environmental impacts, therefore all potential recovery or disposal operations available should be discussed with competitive waste management companies.

4. USE AND MAINTENANCE

4.1 Product expected life-time

This is absolutely critical when comparing the environmental impacts of products: if one product has half of the environmental impacts of the other one, but also half of the expected life time, then they can be considered as equivalent from an environmental point of view.
It should also be pointed out that the expected life-time of a product can only be estimated roughly due to end-user behaviour. Normally, renovation is not necessarily due to technical necessity of renewing the construction works and its components, but is due to changes in fashion, to improvement in comfort or to new ownership.

4.2 Maintenance frequency

If a product requires more frequent maintenance, the effect on its overall impact on the environment may be very significant.

4.3 Maintenance requirements and precautions

These data should help evaluate the **magnitude** of the impacts of the maintenance operations on the environment.

5. END OF LIFE

5.1 Hazardous waste category (if relevant)

A product may use “hazardous” raw materials during its production. If this hazardous substance is chemically or physically bound in the product and cannot be released in the disposal phase then the product itself should not be considered as “hazardous”.

For assessing the following categories

- Re-use: potential and requirements
- Recycle: potential and requirements
- Incineration with energy recovery: potential and requirements (calorific value)
- Incineration without energy recovery: potential and requirements
- Landfill: potential and requirements

always apply the proximity principle (see 3.2 above).

REFERENCES

EN ISO 14040: 1997: Environmental management - Life cycle assessment - Principles and framework.

EN ISO 14041: 2000: Life cycle assessment - Goal and scope definition and inventory analysis.

GUIDANCE FOR THE PROVISION OF ENVIRONMENTAL INFORMATION ON CONSTRUCTION PRODUCTS

E - EXPERIENCE OF THE EUROPEAN THERMAL INSULATION PRODUCTS INDUSTRY USING CEPMC'S DOCUMENT "GUIDANCE FOR THE PROVISION OF ENVIRONMENTAL INFORMATION ON CONSTRUCTION PRODUCTS".

With a view to achieving European harmonisation in the provision of environmental data for construction products, CEPMC has prepared a document "Guidance for the provision of environmental information on construction products".

This document is in four parts:
- Introduction
- Information Requirements
- Guide for the Compiler
- Guide for the Reader

The document has been prepared by a task group of CEPMC's Environment Working Group. This document is intended for use by the relevant construction products industry associations at European level. However, its use by individual companies is not excluded.

In order to validate the document, it was agreed that the European thermal insulation products industry, made up of associate members of CEPMC, would be the best candidate to test the approach since some of the products concerned had already produced LCI data.

A European thermal insulation products experts' group was thus set up with the following membership:
- BING (Federation of European Rigid Polyurethane Foam Associations)
- EUPEFA (European Polyethylene Foam Association)
- EUMEPS (European Manufacturers of Expanded Polystyrene)
- EXIBA (European Extruded Polystyrene Insulation Board Association)
- ROCKWOOL UK, member of EURIMA (European Insulation Manufacturers Association)

The group met 5 times during 1998 and 1999.

First, it was necessary, as recommended in section 2.3 Functional Unit of the Guide for the Compiler, to prepare an Annex (see Annex A attached: Functional Units for Thermal Insulation Products for Use in Buildings).

This document contains the agreed definitions and boundaries specific to a particular industry:
- precise definition of the functional unit(s) for the major product types
- expected life time of the products
- basis for waste management at the end of the useful life
- handling of products comparisons
- examples.

The documents then need to be completed.
The various participants had very different types of environmental and LCI data for this purpose:

- EUMEPS, EUPEFA and BING possessed European LCA studies done by consultants.
- ROCKWOOL UK had company data (EURIMA's position is not to supply environmental or LCA data at association level).
- EXIBA had data drawn from various literature sources (APME Eco-profiles, EU environmental labelling, …)

The main conclusions of the work of the European thermal insulation products expert's group were as follows:

- an Annex specific to a particular sector of industry is absolutely necessary for there to be agreement on major boundaries
- it was possible to fill in the document's qualitative part without major difficulty
- it was still possible to fill in the quantitative part, the LCI table, due to the flexible presentation which allows either detailed or aggregated data to be used.
- some boundaries were, however, still difficult to define precisely (waste management options) and to implement: a third party or an independent expert would be needed to guarantee data consistency.

Annex A

Functional Units for Thermal Insulation Products for Use in Buildings

Introduction

The purpose of the functional unit is to facilitate the conversion of the basic Life Cycle Inventory data for a product (table 1) to the real situation where the product is used in its chosen application at the selected thickness (table 2); it is the multiplying factor needed to create the link.

According to ISO 14040:1997 "the functional unit is the quantified performance of a product system for use as a reference unit in a life cycle assessment study". For insulation products, the functional unit has the units of mass/m^2, or mass/m (for pipe sections) normalised to produce equivalent benefit over the life of a building.

1. Calculation of the functional unit

1.1 Flat products where the service life is equal to the building life

If the service life of an insulation product is the same as the building life the functional unit **(F)** in (**kg/m^2**) of an insulation product providing an additional thermal performance to 1 m^2 is:

$$\mathbf{F} = \boldsymbol{m} \qquad \text{----------(1)}$$

Where ***m*** is the mass of product, **kg/m^2,** which has its area perpendicular to the direction of heat flow

The functional unit (**F**) in **(kg/m^2)** may also be calculated from the product thickness and the product density. In this case :

$$\mathbf{F = t \times r} \qquad \text{——————————(2)}$$

Where **t** is the thickness of the product, **m**

r is the density of the material, **kg/m^2**

as in (1) the area of the product is perpendicular to the direction of heat flow

In addition the functional unit (**F**) in **(kg/m^2)** may also be calculated from the thickness of the product expressed as (**R** x λ_{10}):

$$\mathbf{F = R} \times \lambda_{10} \times \mathbf{r} \qquad \text{——————————(3)}$$

Where **R** is the thermal resistance of the insulation, m^2K/W

λ_{10} (lambda) is the thermal conductivity of the material measured at 10^{o}C, W/mK

r is the density of the material, kg/m^3

as in (1) the area of the product is perpendicular to the direction of heat flow

The functional unit for an insulation product, defined using (3), can be seen to be equal to the mass per unit area of product which will result in a defined level of thermal performance.

1.2 For pipe section insulation where the service life is equal to the building life

If the service life of a pipe insulation product, of specified dimensions, is the same as the building life the functional unit **(F)** in (**kg/m**) of an insulation product is:

F = *m* ----------(4)

Where **m** is the mass in **kg** of one metre length of the insulation providing an additional thermal performance to 1m of a pipe with a given diameter.

2. The effects of service life

The majority of insulation products used in buildings have service lives which are equal to the life of the building. Their replacement will only be necessary if they are damaged during the maintenance of the building component in which they are incorporated. In order to calculate the functional unit of a product, it is necessary to make a number of assumptions:

- no product can have a life exceeding the building life
- products are not recoverable at the completion of the building life
- a product is always replaced by the same product at the end of its service life

3. Composite or faced / coated products and multi-layer products

Composite or faced / coated products should be dealt with as if the facings or coatings were entirely independent of one another. Unless the facing or coating has some thermal performance, its functional unit is simply given by its mass per unit area, corrected as above, for service life.

For multi-layer products, the environmental data (table 1) for each layer of the insulation products should be added to produce an overall data set which can then be treated as if it originated from a single product with a unique R value.

4. Comparisons between products

Comparison between products may be carried out at any pre-determined R value. When a particular R value is selected, then the products are compared under the condition that they give identical insulation benefit to the environment over their service life.

For the sake of simplicity and transparency in any comparison of environmental data, the insulation industry has agreed that R should be declared only at a value of R = 1

In real situations, where an R value is known for a particular product in its chosen application, environmental data relevant to that application can be obtained by multiplication.

5. Examples

In the following fictitious examples, the functional units are calculated using the above principles for six unfaced / uncoated insulation products used in different applications in buildings, all of which, except one, have a lifetime equal to that of the building i.e. 50 years. No particular insulation level has been identified, so pre-determined values of R have been chosen at random:

Product	R value m^2K / W	lambda (l) W/mK	density (r) kg/m^3	Service life years	Initial Plus No. of times replaced	Functional unit, kg/m^2
1	3	0.045	60	50	1	8.1
2	3	0.035	20	17	3	6.3
3	3	0.040	30	25	2	7.2
4	4	0.039	40	35	2	12.48
5	2	0.033	100	30	2	13.2

6. Use of the functional unit

When comparing the environmental information of products, the environmental data in table 1 (data per kilogram of unfaced product) are multiplied by the functional unit to produce Table 2 (data per functional unit of unfaced product).

Table 2, together with the other environmental information, provides a basis for environmental comparisons between products, building elements or even between complete buildings.

For composite or faced /coated products the values of Table 2 for the individual components of a product (unfaced product + facing) should be added to produce environmental data for the product as a whole.