Eurovent Recommendation on complementary Product Category Rules for commercial refrigeration equipment

First Edition

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Preface

In a nutshell

This document outlines Eurovent's recommendations for Product Category Rules complementary to EN 15804 or EN 50693 for the development of EPD's for commercial refrigeration equipment. It is intended as input for the development of a future harmonised cPCR standard for commercial refrigeration equipment, and to serve as a useful reference until the publication of said standard. The focus of this Recommendation is on aspects specific to commercial refrigeration equipment, including:

- **Product description, scope and performance characteristics**
- **Functional unit and declared unit**
- **Reference Service Life**
- **Aspects, rules and assumptions in the product stage (A1-A3), construction process stage (A4-A5), use stage (B1-B7), and end of life stage C1-C4**

Authors

This document is published by Eurovent. It was prepared under the project leadership of Charlotte B. Merlin (chme@forcetechnology.com) from FORCE Technology, coordinating a joint effort by the participants of a dedicated Eurovent working group, representing the vast majority of all manufacturers of these products active on the EMEA market.

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Abbreviations and definitions

CEN: European Committee for Standardization

EPD: Environmental Product Declaration

EOL: End-of-life

LCA: Life Cycle Assessment

PEF: Product Environmental Footprint

PEFCR: Product Environmental Footprint Category Rules

cPCR: Complementary Product Category Rules according to EN 15804 or EN 50693 – Product group specific or horizontal PCR, which provide additional compliant and non-contradictory requirements to EN 15804 or EN 50693. cPCR shall be used together with the core PCR or standard.

PCR: Product Category Rules according to ISO14025 – set of specific rules, requirements and guidelines for developing Type III environmental declarations for one or more product categories

RSL: Reference Service Life

1. Introduction

This document outlines Eurovent's recommendations for complementary Product Category Rules for commercial refrigeration equipment. Such complementary rules facilitate the development of EPD's, which can be carried out in accordance with the core rules specified in the following standards:

- EN 50693:2019 "Product category rules for life cycle assessment of electronic and electrical products and systems".
- EN 15804+A2:2019 "Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products"

This document is intended to serve as input to, and support for, the work to develop a harmonised cPCR standard for commercial refrigeration equipment. A harmonised cPCR is needed to complement core rules, reduce room for creative interpretation, simplify the production of EPDs, and level the playing field. It should enable the selection sustainable solutions considered over the life cycle of the system, according to a unified approach, with minimal burdens, complexity, costs, and other barriers to scalability.

The focus of this Recommendation is on LCA aspects specific to commercial refrigeration equipment. More general aspects common across product categories, and issues in the overarching standards and general programme rules, are not considered. These issues are important and may also result in differences and inconsistencies related to the products in scope, but it is not likely that a cPCR can solve such inconsistences, which should be addressed at a more overall level, such as for example, within the work carried out by ECO Platform, various standardisation organisations, and by the European Commission. All this said, the creation of a harmonised cPCR for commercial refrigeration equipment, applied uniformly, would already be a helpful step in the right direction.

2. Scope

2.1. Product scope

This Recommendation applies to commercial refrigeration equipment covered by CEN/TC 44 - Commercial and professional refrigerating appliances.

The main purpose of commercial refrigeration equipment is to display and sell, with or without assisted serving, foodstuffs and other items at specified temperatures below the ambient temperature to customers, accessible directly through open sides or through one or more doors, or drawers or both, including refrigerating appliances with a direct sales function with areas used for storage of foodstuffs, according to Regulation (EU) 2019/2024.

The products can be of the following types:

- Supermarket cabinets
  - Plug-in units, which integrate the condenser and compressor
  - Remote units, which need to be connected additionally to remote components (condensing unit and/or compressor and/or water condensed unit) which are not an integral part of the cabinet
- Saladettes
- Serve-over counters
- Ice cream freezers

– Commercial beverage coolers

Relevant standards that characterise the products in scope include the following:

– EN ISO 23953-1:2023; EN ISO 23953-2:2023 for supermarket applications
– EN ISO 22043:2020 for ice cream freezers
– EN ISO 22044:2022 for commercial beverage coolers
– EN 16838:2024 for gelato scooping cabinets
– IEC 63252:2020 for refrigerated vending machines

2.2. Modules

The Recommendation addresses the whole life cycle from cradle to grave, which includes all modules shown in Figure 1 below.

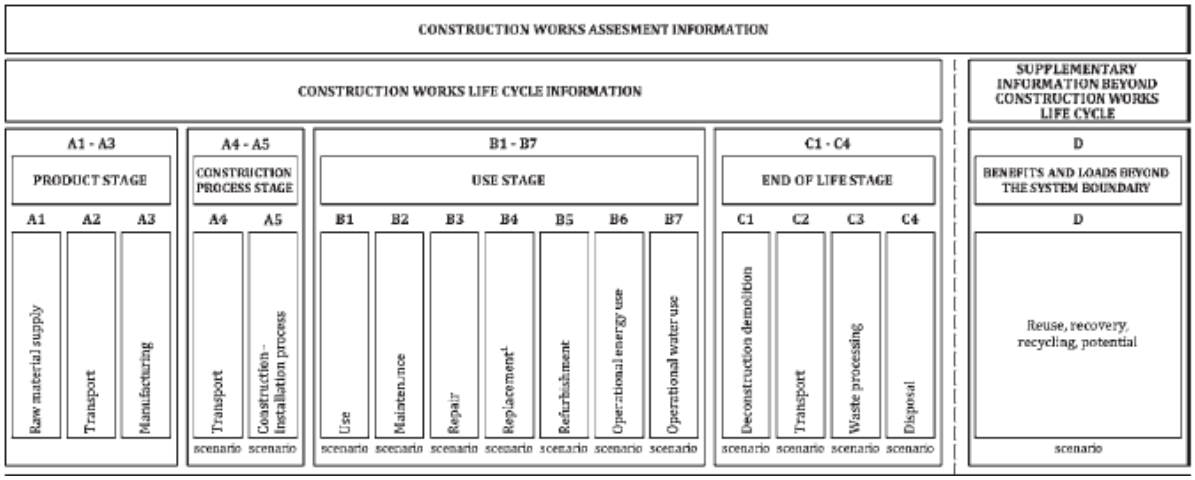

Figure 1: Modular structure in EN 15804 for construction products

It is noted that LCA studies based on this Recommendation may not apply the above modular structure. For a correlation with the terms used in EN 50693, refer to Annex D of said standard.

3. Development process

All Eurovent members were invited to participate in the development of this Recommendation in a dedicated technical working group, and to provide inputs throughout the development process. 8 companies participated, as did several independent experts and knowledge partners.

A recorded training seminar was made available to the members of the working group, to ensure a sufficient level of knowledge about PCR's.

The first step was a mapping of existing (c)PCR's, LCA's and EPD's for commercial refrigeration equipment and similar product categories. For an overview of these, see Table 1 below. The findings were structured in a mapping report. The purpose of this exercise was to:

- Identify inconsistencies across cPCR's, EPD's and LCA practices for the products in scope
- Identify aspects in need of clarification and guidance to ensure a harmonised, fair and cost-efficient LCA practice for the products in scope

During the development process, the issues, inconsistencies and recommendations were discussed in several meetings, while participants also shared relevant information and feedback with the project leaders in between meetings.

This Recommendation is a product of the discussions and consensus achieved in the working group.

The Recommendation was tested, updated and validated based on a pilot study on an OFC Red Bull and SOUND BT/TN refrigerated counter from Epta. Where relevant, scenarios for remote systems were also tested.

4. Existing (c)PCR

In accordance with ISO 14025, existing (c)PCR's for relevant product categories were mapped and the content was considered in this recommendation. The (c)PCR's considered are shown in Table 1 below:

Source	cPCR	Scope
PEP	PSR-0013-ed3.0-EN-2023-06-06	Thermodynamic generator with electric compression (EN 14511-1)
EPD Italy	PCR EPDItaly019 – HVAC Home Appliances	Air-conditioning machines (CPC 43912) Refrigerating and freezing equipment and heat pumps, except household type equipment (CPC 43913)
PEP	PCR-ed4-EN-2021 09 06	Electrical, electronic and HVAC-R
CEN-CENELEC	EN 50693	Electrical and Electronic Equipment
IEC	IEC 63366	Electrical and electronic products and systems

Table 1: cPCR's for commercial refrigeration equipment and other related product categories

More details are available in the corresponding mapping report. The mapping also included a deep dive into existing LCA's and EPD's for the products in scope, some published and some subject to confidentiality. The results of this mapping exercise have been considered in the work developing this recommendation.

5. Recommendations

5.1. Product description, scope and performance characteristics

5.1.1. Unique product identification

Eurovent recommends that LCA's and EPD's shall specify the product trade name(s), number(s), or other identifier(s) that unambiguously identify the products included in the study (e.g. with the use of a GTIN code). This way, the EPD users can know with certainty which product variants are covered by the EPD.

5.2. Functional unit and declared unit

5.2.1. Declared unit

Eurovent recommends that the declared unit (or reference unit according to PEF) shall be defined as *'one piece of commercial refrigeration equipment'*. Having a declared unit is sufficient for LCA studies that do not include the use stage.

5.2.2. Functional unit

A functional unit describes the value delivered by the product and increases the comparability of LCA studies. When the use stage is included, a functional unit must be defined.

In PEF studies, the definition of the functional unit is similar to EN 15804 and must quantify the aspects shown in the table below:

Aspect:	Theoretical example:
What?	Display and sell foodstuffs at temperatures below the ambient temperature
How much?	1 m^3
How well?	At temperature class X and climate conditions X, Y, Z
For how long?	*X* years

Table 2: Functional unit specification in PEF with a theoretical example

Eurovent recommends that functional unit shall be defined as follows:

- For commercial beverage coolers: '*100 L gross volume, during the reference service life of the product and according to the defined use stage scenario*',
- For ice cream freezers: '*100 L net volume, during the reference service life of the product and according to the defined use stage scenario*',
- For all other applications: '*1 m2 of refrigerated total display area (TDA), during the reference service life of the product and according to the defined use stage scenario*'.

With this phrasing, the use stage scenario defined for the EPD is an integral part of the functional unit. The reason for this is that the function(s) delivered by the product depend on the use-conditions.

5.3. Reference Service Life

The RSL is an uncertain and generic value. The actual lifetime is highly sensitive to the use conditions, including for example how well the equipment is serviced or how much it is used. Default values are recommended for comparability, equal terms and to avoid having multiple options for defining an RSL value for a given product.

Eurovent recommends the following default RSL values, which are sourced from the Ecodesign Impact Accounting[1] STOCKBAU tables:

[1] https://op.europa.eu/en/publication-detail/-/publication/392bc471-76ae-11ed-9887-01aa75ed71a1/language-en

Product family	Lifetime (years)
Open vertical chilled multi deck (RVC2)	10
Open horizontal frozen island (RHF4)	10
Other supermarket display (non-BCs)	10
Plug in one door beverage cooler	9
Plug in horizontal ice cream freezer	9
Spiral vending machine	11

Table 3: RSL values for different types of equipment

Eurovent further recommends that no EPD is allowed to specify a higher RSL than the abovementioned default values regardless of the available documentation and justification. It is possible to do sensitivity assessments and LCA's with alternative values, but these are not to be declared in a formal EPD.

Finally, Eurovent recommends that the following sentence shall be stated next to the RSL in a general EPD: *'The RSL is an uncertain and generic value. The actual lifetime is highly sensitive to the actual use conditions of the unit.'*

5.4. Product stage (A1-A3)

5.4.1. Components (A1)

Eurovent recommends that data for purchased components must include the production of the components, with representative or at least conservative data. Data on the raw materials alone is not sufficient.

When excluding the use stage, then module A1 often dominates the results for the product categories in scope. In many LCA's, this stage is modelled with secondary data. The aim of this recommendation is to avoid LCA's that model components such as compressors or electronics simply based on a bill of materials for this component. This is not sufficient – among others, the energy consumption and material loss during production of such components should be included as well.

This is challenging since it can lead to a large number of material flows with unknown processing, and the information is usually either unavailable or lies further upstream in the supply chain. Therefore, in cases where sufficient representativeness of data for modelling components is not possible, it is recommended to use more generic but conservative datasets.

5.4.2. Co-allocation in manufacturing (A3)

It is not recommended to have a standardised, default allocation key for distributing inputs and outputs such as utilities and waste between the co-products. Eurovent recommends that the choice of allocation key must be justified, and the differences between the co-products must be described in the LCA report.

5.5. Construction process stage (A4-A5)

5.5.1. Transport to installation (A4)

The transport in module A4 can be modelled with primary product specific data. No default values for distances in A4 are recommended for a future cPCR.

Eurovent recommends that the transport scenario and the choice of the transportation dataset shall be described in the LCA report.

5.5.2. Installation energy (A5)

The energy for installing the products is typically not a significant contribution to the LCA results. This has been confirmed in the pilot study, assuming a conservative installation scenario. Eurovent therefore recommends to permit leaving out energy consumption for product installation.

5.6. Use stage (B1-B7)

5.6.1. Maintenance (B2)

Commercial refrigeration equipment must be inspected regularly. The inspection frequency shall be specified in the LCA report. If the frequency is dictated by law in the country or region of sales, then this frequency shall be applied. Where relevant, manufacturers shall apply the scenarios of Regulation (EU) 2024/573 to specify the frequency of maintenance operations and leak checks for equipment containing fluorinated refrigerants.

Eurovent further recommends that:

- the default vehicle type for transporting the operator is a van
- the default distance is 50km one way, which is 100 km including the return trip
- the default weight of the operator is 80kg

5.6.2. Replacement (B4)

Eurovent recommends that the replacement of components during the use stage shall be based on the experience and sales documentation of the manufacturer, as well as on any applicable regulations. The replacement of parts due to malfunction does not need to be taken into account. The end-of-life treatment of replaced components shall be modelled according to the scenarios applied in the product end-of-life stage. If a component in the equipment is replaced by the operator when this person inspects the equipment, then the transport of this person is only counted once (see maintenance chapter below for operator transport scenario).

5.6.3. Operational energy use (B6)

For commercial refrigeration equipment, the electricity use in B6 is significant and dominant in some results categories. Operational energy use depends on a wide range of use conditions. That said, a default use stage scenario is needed to harmonise assumptions. Fortunately, a robust methodology exists to assess operational energy consumption at standard conditions, used in the Regulations (EU) 2019/2024 and (EU) 2019/2018.

Default use stage scenario:

Calculations of operational energy consumption shall be based on default use conditions as specified in the following standards and used for energy calculations in the Regulations (EU) 2019/2024 and (EU) 2019/2018:

- EN ISO 23953-1:2023; EN ISO 23953-2:2023 for supermarket applications
- EN ISO 22043:2020 for ice cream freezers
- EN ISO 22044:2022 for commercial beverage coolers
- EN 16838:2024 for gelato scooping cabinets
- IEC 63252:2020 for refrigerated vending machines

The EPD shall specify the internal temperature class of the product, as declared for the EU Energy Label.

The source of electricity shall be average European or national grid mix depending on the geographical boundary of the LCA.

5.7. End of life stage C1-C4

5.7.1. Demolition (C1)

Eurovent recommends that material and energy flows related to dismantling are cut-off, whenever it is reasonable to assume that dismantling is performed with manual tools.

5.7.2. End-of-life (C2-C4)

Eurovent recommends the default end-of-life scenario in Table 6 for LCA's with a European scope. Any LCA's with a different scope may apply a more geographically representative scenario, which shall be justified for example based on national statistical data.

CATEGORY:	MATERIAL:	*R2 (recycling rate) %*	*R3 (energy recovery rate) %*	*Disposal rate (%)*
Metals	Steel	85	0	15
	other ferrous metals	80	0	20
	Aluminium	85	0	15
	Copper	80	0	20
	other non ferrous metals	60	0	40
Plastics	PP	20	40	40
	PS-HiPS	20	40	40
	ABS	20	40	40
	PU foam	0	50	50
	Rubber	0	50	50
	Other plastics	0	50	50
Minerals	Glass	60	0	40
	Other minerals	0	0	100
PCBs and other passive electronic components	PCBs (support)	0	0	100
	PCBs (metals)	50	0	50

Table 4: Default end-of-life scenario for average Europe[2]

The chosen default end-of-life scenario is primarily based on EN 50693. This is because this source has relevant material categories that are deemed to be more representative for electronic products, and is more recent than PEF annex C, which is outdated. The recycling rates from EN 50693 also takes losses in the collection and recycling systems into consideration, which means that data for that will also be harmonised and the LCA practitioners do not need to retrieve such data elsewhere.

The copper R2 value stems from PEF Annex C and applies for copper in electronics.

[2] R2 is the proportion of the material in the product that will be recycled in a subsequent system. R2 shall take into account the inefficiencies in the collection and recycling processes. R2 shall be measured at the output of a recycling plant. R3 is the proportion of the material in the product that is used for energy recovery at end-of-life.

The steel and aluminium values stem from PEF Annex C. The recycling rates from EN 50693 are deemed too low considering that commercial refrigeration equipment typically has large steel and/or aluminium components, which are easy to access and recycle.

The scenario does not include waste treatment rates for passive electronic components (capacitors, resistances, inductors etc.). Eurovent recommends that the same waste treatment rates as for PCBs shall apply to passive electronic components.

In PEF studies, end-of-life is calculated using the so-called Circular Footprint Formula (CFF). This allocates environmental impacts differently than EN 15804. However, the calculation is generally based on the same type of input data, which includes the recycling rate and inefficiencies in the recycling systems (R2) as well as the energy recovery rate (R3). Therefore, a default scenario in a cPCR for EPD's may potentially also be relevant for a future PEFCR.

5.8. Refrigerants across the lifecycle

This chapter concerns the production, refills and disposal of refrigerants, including quantities and treatment methods throughout the product life cycle.

5.8.1. Manufacturing emissions

Refers to direct air emissions of refrigerant during equipment manufacturing and pre-charging in factory. Eurovent recommends applying the following default values:

- For plug-in and semi plug-in units: 0,5% of refrigerant charge,
- For remote units: 0% of refrigerant charge.

Manufacturers may only declare better values if evidenced and justified (for example leakage tests made in compliance with EN 378).

5.8.2. Installation emissions

Refers to direct air emissions of refrigerant during the installation of equipment on site. Eurovent recommends applying the following default values:

- For plug-in and semi plug-in units: 0% of refrigerant charge,
- For remote units: 0,5% of refrigerant charge.

5.8.3. Use stage emissions

Refers to direct air emissions of refrigerant during use of the equipment. Eurovent recommends applying the following default values:

- Central systems*: 9% of refrigerant charge per year
- Condensing units*: 6% of refrigerant charge per year
- Hermetic units: 1% of refrigerant charge per year

*Note that the same cabinet could be connected to a central refrigeration pack or a condensing unit. The sensitivity analysis done during the pilot study has shown this to make little difference to the LCA results.

5.8.4. End-of-life scenario

Eurovent recommends applying the following conservative default scenarios[3]:

Central systems*:

- 8,2% of the refrigerant is recovered at end of life for incineration or cracked to base chemical compounds,
- 73,8% is recovered for reuse or reclamation,
- 18% is assumed accidentally discharged to the atmosphere.

Condensing units*:

- 7,5% of the refrigerant is recovered at end of life for incineration or cracked to base chemical compounds,
- 67,5% is recovered for reuse or reclamation,
- 25% is assumed accidentally discharged to the atmosphere.

Hermetic units:

- 6,5% of the refrigerant is recovered at end of life for incineration or cracked to base chemical compounds,
- 58,5% is recovered for reuse or reclamation,
- 35% is assumed accidentally discharged to the atmosphere.

*Note that the same cabinet could be connected to a central refrigeration pack or a condensing unit. The sensitivity analysis done during the pilot study has shown this to make little difference to the LCA results.

5.8.5. Total production of refrigerant to be modelled

Total production of refrigerant to be modelled = Manufacturing emissions + Equipment refrigerant charge + Refilled refrigerant.

Where 'Refilled refrigerant' ≈ Use emission rate * Equipment refrigerant charge * RSL.

[3] The source of the default values for use stage emissions and disposal emissions is *Commission staff working document, Impact Assessment Report – Accompanying the document "Proposal for a Regulation of the European Parliament and of the Council on fluorinated greenhouse gases, amending Directive (EU) 2019/1937 and repealing Regulation (EU) No 517/2014*

About Eurovent

Eurovent is the voice of the European HVACR industry, representing over 100 companies directly and more than 1.000 indirectly through our 16 national associations. The majority are small and medium-sized companies that manufacture indoor climate, process cooling, and cold chain technologies across more than 350 manufacturing sites in Europe. They generate a combined annual turnover of more than 30 billion EUR and employ over 150.000 Europeans in good quality tech jobs.

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