L'ENVELOPPE MÉTALLIQUE DU BÂTIMENT

ASSOCIATION DES FABRICANTS DE PANNEAUX, PROFILS ET SYSTÈMS

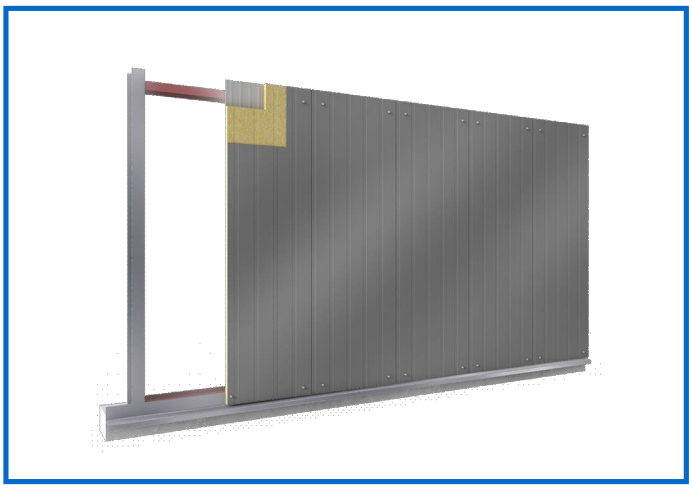
ENVIRONMENTAL AND HEALTH DECLARATION FORM

Cladding sandwich panel with rock wool core of a thickness of between 100mm and 300mm and two steel facings

May 2017

In compliance with ISO 14025, standard NF EN 15804+A1, complementary standard NF EN 15804/CN, June 2016, decree N° 2013-1264 and the decree of 23 December 2013

FDES VÉRIFIÉE inies



Disclaimer

The information contained in this declaration is provided under the responsibility of L'Enveloppe Métallique du Bâtiment (producer of the EHDF) in accordance with the ISO 14025 standard, the NF EN 15804+A1 standard, complementary standard NF EN 15804/CN, June 2016, decree N° 2013-1264 and the decree of 23 December 2013. L'Enveloppe Métallique du Bâtiment asked PwC to assist it in producing its EHDFs. The framework of validity was produced by L'Enveloppe Métallique du Bâtiment only.

PwC and L'Enveloppe Métallique du Bâtiment do not accept any liability with regard to any third party to whom the findings of the study may have been communicated or into whose possession they may have come, since such parties are responsible for their own use of the findings in question.

Any use of all or part of the information provided in this document must at least be accompanied by full references to the original EHDF and its producer. The latter will be able to provide a full copy on request.

We would remind you that the findings of the study are based solely on the facts, circumstances and hypotheses submitted to us during the course of the study. Should any of these facts, circumstances or hypotheses differ, the findings are subject to change.

Moreover, the findings of the study should be considered as a whole, in light of the hypotheses, and not taken in isolation.

NOTE: The literal French translation of EPD (Environmental Product Declaration) is DEP (Déclaration Environnementale de Produit). However, the term FDES (Fiche de Déclaration Environnementale et Sanitaire) is commonly used in France and includes both the Environmental Declaration and Health Information relating to the product to which this EHDF applies. The EHDF is therefore an 'EPD' supplemented with health information.

Reading guide

Clarification regarding the data display format

Some values are displayed in scientific format as shown in the following example:

-4.2 E-06 = -4.2 x 10-6

Display rules

The following display rules apply:

- when the result of an indicator calculation is zero, the zero value is displayed and greyed out;
- all non-zero values are expressed to 3 significant figures.

Abbreviation used

RSL: Reference Service Life

FU: Functional Unit

EHDF: Environmental and Health Declaration Form

EPD: Environmental Product Declaration

CPR: Construction Products Regulation

DoP: Declaration of Performance

NA: Not applicable

Warning regarding the use of the EHDF to compare products

EHDFs pertaining to construction products may not be comparable if they do not comply with the NF EN 15804+A1 standard, complementary standard NF EN 15804/CN, June 2016, decree N° 2013-1264 and the decree of 23 December 2013.

§ 5.3 Comparability of EPDs for construction products of standard NF EN 15804+A1, complementary standard NF EN 15804/CN, June 2016, decree N° 2013-1264 and the decree of 23 December 2013 outlines the conditions under which construction products can be compared, on the basis of the information provided in the EHDF:
" Any comparison of the environmental performance of construction products using the information in the EPDs must be based on the use of the products and their impacts on the building and must take into account the entire life cycle (all information modules)."

General Information

1. Producer of the EHDF

The information contained in this declaration is provided under the responsibility of L'Enveloppe Métallique du Bâtiment.

L'Enveloppe Métallique du Bâtiment
6, 14 rue La Pérouse, 75784 Paris Cedex 16
David Izabel – d.izabel@enveloppe-metallique.fr
Anna Palisson – annapalisson@enveloppe-metallique.fr

2. Representativeness of the EHDF

The manufacturers and sites represented by the EHDF are as follows:

- AMCF ArcelorMittal Construction France ds.arcelormittal.com/construction/France
  - Rue de Berlaimont, 21B – ZI Mar tinrou, 6220 Fleurus - Belgium
- JORIS IDE www.joriside.be
  - ISOMETALL ZI de la Baraque Frai ture - Route de la Roche - 6960 Manhay - Belgium
- Tata Steel France Batiments et Systèmes – Monopanel www.monopanel.fr
  - Rue G. Lufbery, 02300 Chauny

3. Type of EHDF

The EHDF corresponds to the 'cradle-to-grave' life cycle.

4. Validity of the EHDF

The present EHDF is collective. It is only valid for the above-mentioned manufacturers, as members of L'Enveloppe Métallique du Bâtiment who participated in the data collection process. The data collected is combined and averages calculated on a pro rata basis in terms of cladding sandwich panel production. These members represent the majority of manufacturers of this product on the domestic market (80%).

Given the framework of validity, the present EHDF is only valid for cladding sandwich panels with steel facings and a rock wool core of a thickness of between 100mm and 300mm.

"The producers belonging to L'Enveloppe Métallique du Bâtiment listed above must comply with the following conditions in order to benefit from the L'Enveloppe Métallique du Bâtiment EHDF for "Cladding sandwich panel with a rock wool core of a thickness of between 100mm and 300mm":
=> The amount of steel consumed onsite must be less than 15.4kg/m² of sandwich panel, i.e.:
- the manufacturing scrap rate must account for less than 9% of production and
- the mass per unit area of steel must be less than 13.5kg/m² of sandwich panel.

=> The quantity of rock wool consumed onsite must be less than 34.2kg/m² of sandwich panel, i.e.:
- the manufacturing scrap rate must account for less than 9% of production and
- the mass per unit area of the rock wool must be less than 30kg/m² of sandwich panel."

The present EHDF has been produced within the framework of the environmental and health declaration programme for construction products, or 'FDES Programme', run by the INIES www.inies.fr

5. Auditing of the EHDF

The EHDF has been audited by Henry Lecouls (independent auditor authorised by the Afnor).

6. Date of publication

The present EHDF was published on 15/05/2017.

7. Reference documents

- NF EN 14509 *Panneaux sandwiches autoportants, isolants, double peau à parements métalliques – Produits manufacturés – Spécifications et son Complément national* ('Self-supporting double skin metal-faced insulating sandwich panels - Manufactured products - Specifications and domestic supplement').
- Cahier CSTB 3731, March 2012, *Les méthodes de dimensionnement aux états limites des ouvrages de bardage et de couverture en panneaux sandwiches faisant l'objet d'un Document Technique d'Application* ('Limit state sizing methods for sandwich panel cladding and roofing structures covered by a Technical Application Document')
- Cahier 3501 March 2004, *Panneaux sandwiches isolants à parements métalliques – conditions générales de conceptions et fabrications* ('Metal-faced insulating sandwich panels - General conditions of design and manufacture')
- Technical Application Documents (CSTB) for L'Enveloppe Métallique du Bâtiment members

• Description of the functional unit (or declared unit) and the product

8. Functional Unit (FU)

Constitute 1m² of vertical wall, based on a reference service life of 50 years, ensuring the performance of the building envelope in terms of both thermal performance (for a bulk density of 100kg/m³ Up between 0.50 and 0.15 W/(K.m²)) and fire protection (reaction to fire, A2-s1,d0).

9. Product description

The product in question is the cladding sandwich panel with two steel facings and a rock wool core of a thickness of between 100mm and 300mm, with a median mass per unit area of 28.67kg/m².

The manufacturers' trade products are as follows:

- AMCF ArcelorMittal Construction France ds.arcelormittal.com/construction/France
  - PROMISTYL S 900
  - PROMISTYL S 1000
  - PROMISTYL V 900
  - PROMISTYL V 1000
  - PROMISTYL V 1200
  - PROMISTYL VA 1000
  - PROMISTYL VA 1200
- JORIS IDE www.joriside.be
  - VULCASTEEL WALL FC
  - VULCASTEEL WALL FC ALPHA
  - VULCASTEEL WALL FT
  - VULCASTEEL WALL FT ALPHA
- Tata Steel France Batiments et Systèmes – Monopanel www.monopanel.fr
  - MONOLAINE B

The thicknesses of the trade products can be found on the manufacturers' websites.

10. Description of product use

The product is used as a vertical wall in the building envelope. Regarding the fixation of the product at the site, the number of fixing screws on the main body is equal to 0.62 screws/m², in accordance with the applicable Technical Application Documents. A common screw weighs 30g. The mass of the fixing screws is therefore equal to 1.86 E-02kg/m².

11. Other technical characteristics not included in the functional unit

Reaction to fire classification according to the classification report (generally A2-s1,d0).

12. Description of the main materials used in the product

The product consists mainly of rock wool (54% of the total mass) and steel sheet (45%), the remainder being glue and polyethylene foam gasket.

13. REACH Regulation

The product does not contain any substances from the REACH Regulation candidate list.

14. Description of the reference service life

The reference service life is 50 years. Indeed, according to the AIMCC's opinion n°6-15 of 8 July 2015, the conventional lifespan of industrial or tertiary buildings is generally estimated to be 50 years.

Parameter	Value/description
Reference service life (RSL)	50 years
Declared properties of the product (on leaving the factory) and finishes, etc.	Cf. (*1), (*2), (*3)
Theoretical application parameters (if imposed by the manufacturer), including references to appropriate practices	Cf. (*1) and (*2)
Presumed quality of the work, when installed in accordance with the manufacturer's instructions	The rate of steel and rock wool scrap generated during implementation is taken to be 5%.
Outdoor environment (for outdoor applications), e.g. bad weather, pollutants, exposure to UV rays and wind, building orientation, shading, temperature, etc.	Cf. (*1) and (*2)
Indoor environment (for indoor applications), e.g. temperature, humidity, exposure to chemicals, etc.	Cf. (*1) and (*2)
Conditions of use, e.g. frequency of use, mechanical exposure, etc.	Cf. (*1) and (*2)
Maintenance, e.g. required frequency, type and quality and replacement of replaceable components	Identical maintenance for cladding and roofing: every year to ensure the sustainability of the product. The quantity of cleaning water is estimated at 1L/m^2/year. Water consumption over the life time of the product therefore amounts to 50 litres.

(*1) NF EN 14509 *Panneaux sandwiches autoportants, isolants, double peau à parements métalliques – Produits manufacturés – Spécifications et son Complément nationale* ('Self-supporting double skin metal-faced insulating sandwich panels - Manufactured products - Specifications and domestic supplement')
(*2) Valid Technical Application Documents issued by the CCFTA's GS2 specialist group (*3)
CPR DoP

- ## Life cycle stages

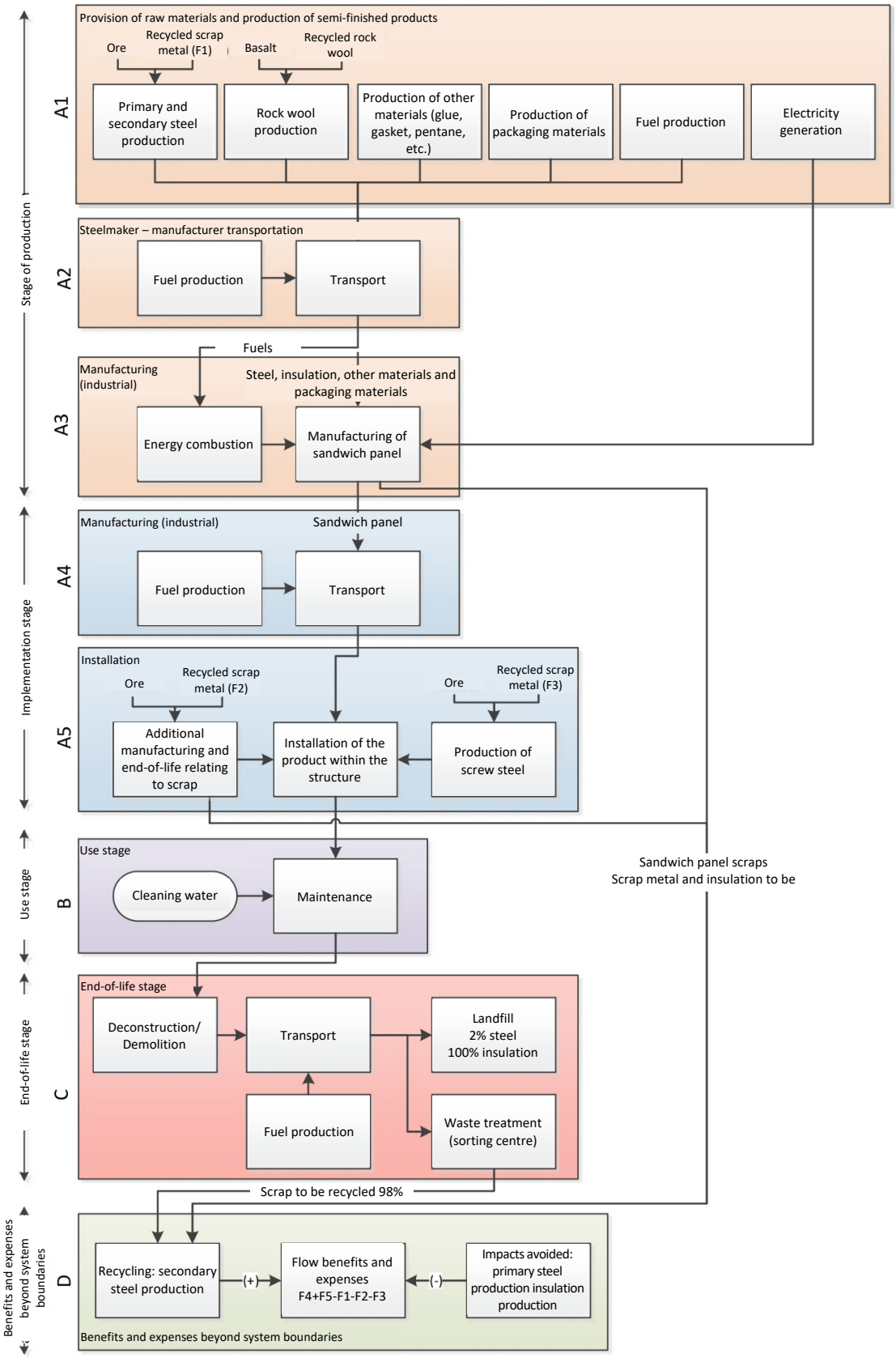


Figure 1 - Product life cycle

- **Production stage, A1-A3**
  - The A1 production stage concerns the supply of raw materials and the production of steel sheet, rock wool and other materials that make up the product, fuels (fuel oil, propane and natural gas), packaging materials (steel and plastic strapping, plastic film and wood) and electricity used in the manufacturing of the product in question.

    The packaging used for finished products leaving the manufacturers' workshops consists, on average, of the following:

- Polystyrene:	1.79 E-01kg/m²	- Cardboard boxes:	5.68 E-02kg/m²
- Plastic film:	4.45 E-02kg/m²	- Packaging wood:	5.11 E-01kg/m²

  - The A2 transport module concerns the transportation of steel, rock wool, fuels and packaging materials to the manufacturer. The means of transport, distances, quantities transported and payloads for road transport have been provided by the manufacturers participating in the data collection process. In the absence of the relevant data, the payload is taken to be 24 tonnes and the distance is taken to be equivalent to 500km by road transport. Truck mileage is considered to be equal to 0.38L/km.
  - The A3 manufacturing module corresponds to the manufacturing of the product in question in manufacturers' workshops and includes energy combustion and waste production. 2/3 of rock wool waste are recycled. The sending to landfill of non-repurposed production waste is not taken into account. Furthermore, manufacturing does not release any emissions into the air other than those relating to energy combustion.

- **Implementation stage, A4-A5**
  - The A4 transport module concerns the transportation of the product from the manufacturing site to the construction site. The modelling takes into account the production and combustion of diesel for transport. No product scrap is generated during transport.

    Transportation to the construction site:

Parameter	Value/description
Type of fuel and vehicle consumption or type of vehicle used for transportation	Average truck fleet in Europe in 2005 for the fuel type
Distance to the construction site	570km (average calculated based on the quantities of product transported).
Capacity utilisation (including empty returns)	Member data 30% by default.
Bulk density of the transported products	NA
Coefficient of volume capacity utilisation	NA

  - The A5 installation module takes into account the installation of the product within the structure, the production of steel for the cap screws and the additional production required to compensate for any loss incurred during installation. The end-of-life of these steel and rock wool scraps is also taken into account. This one is 2/3 recycled. Since the consumption of crane energy resources is less than 0.01% of A1-A3, it is negligible and is not taken into account in the calculations.

    Installation in the building:

Parameter	Value/description
Auxiliary inputs for installation Water usage	Steel screw: 1.86 E-02kg/m²
	0m³
Use of other resources	0kg
Quantitative description of the energy type (regional mix) and consumption during the installation process	0kWh
Waste generated on the construction site prior to the treatment of waste generated by installing the product	5% of the total weight of the product (including screws).
Materials produced as a result of treating waste on the construction site	The waste produced is considered to be landfill and 2/3 of the rock wool is recycled.
Direct emissions into the surrounding air, soil and water	0kg

  - The end-of-life of impact packaging and the end-of-life treatment of scrap are also negligible and are not taken into account in the calculations.

- **Use stage (excluding potential savings), B1-B7**

Maintenance:

Parameter	Value/description
Maintenance process	Exterior maintenance of metal facades must be carried out at least once a year. Rinsing must be performed using clear water.
Maintenance cycle	Once a year
Auxiliary inputs for maintenance	0kg/cycle
Waste generated during maintenance	0kg
Net fresh water consumption during maintenance	1L/m²
Energy input during maintenance	0kWh

- **C1-C4 end-of-life stage**
  - The C1 deconstruction/demolition module concerns the dismantling or demolition of the product in the structure. This module corresponds here to the use of a crane. Since the crane's energy consumption is less than 1kJ, it is negligible and is therefore not taken into account in the calculations.
  - The C2 transport module concerns the transportation of deconstruction products from their place of use to the treatment centre. It also includes the transportation of the share of scrap metal and rock wool going to landfill. The modelling takes into account the production and combustion of diesel for transport.
  - The C3 processing module for deconstruction products concerns the potential processing of products at sorting centres with a view to reusing or recycling them or sending them to landfill. In terms of recycling, this module takes into account by default the shredding of sandwich panel scrap metal. The average energy consumption of this separation process is 40kWh of diesel per tonne of deconstruction product, cf. (*).
  - The C4 landfill module includes the physical pretreatment of waste, as well as its storage, and site management. The share of steel and rock wool disposed of at this stage constitutes waste and is stored at a landfill site.

End of life:

Parameter	Value/description
Collection process specified by type	Deconstruction products are sorted onsite or at a sorting centre.
Recovery system specified by type	98% of the steel mass of the product (screw included) is recovered.
Disposal specified by type	2% of the steel mass of the product (screw included) and 100% of the rock wool are sent to landfill (*).
Hypotheses for scenario development	Transportation distance to the repurposing centre: 250km Transportation distance to landfill: 50km

(*) Syndicat des Recycleurs du BTP (Building and Public Works Recyclers' Union)

- **Repurposing potential, module D**
  - Steel recycling potential includes the impact of secondary steel production and the avoided impact of primary steel production. It refers to the net scrap flow leaving the system, i.e. scrap metal produced during production/installation scrap and end-of-life scrap, minus the scrap used for upstream steel production for both the product in question and the corresponding assembly accessories. In the absence of accurate data on reuse, all of the steel part of the product recovered (recycled + reused) at the end of its life is considered, in terms of environmental impact, to have been recycled (conservative assumption).
  - Rock wool recovery potential covers the impact avoided by the repurposing of rock wool losses in A3 (around 1%) and A5 (5%). Two-thirds of these losses are considered to be repurposed and the associated environmental benefits are accounted for in module D.
  - The repurposing potential of packaging waste is not taken into account.

• Information for performing a life cycle analysis

RCP used	The ISO 14025 standard Standard NF EN 15804+A1 and domestic supplement XP P01-064/CN Decree N° 2013-1264 and the decree of 23 December 2013
System boundaries	The system boundaries cover everything from the production of raw materials and energy to the sending to landfill of some of the product and the creation of a stock of scrap metal and rock wool for repurposing. Benefits and expenses relating to the following are referred to in module D: - the recycling of production/installation steel scrap and end-of-life steel waste, minus the amount of recycled steel consumed by the system, - the reuse of rock wool from modules A1 and A5. The following flows are excluded from the system boundaries: - The lighting, heating and cleaning of workshops, - The administrative department, - Employee transportation, - The manufacturing of production equipment and transportation systems (machines, trucks, etc.).
Allocations	Energy consumption has been allocated to the product in question, at its manufacturing site, economically. The quantities of steel, rock wool and packaging materials are directly related to the product in question, without allocation.
Geographical and temporal representativeness of primary data	The primary data correspond to the data collected from the manufacturing sites. **Production stage - Modules A1-A3** - Year: 2014 for sandwich panel production, 2013 for steel sheets - Geographical representativeness: France (+ Belgium for two member sites) - Technological representativeness: the data correspond to the standard technologies used for the production of cladding sandwich panels - Source: industrial members of L'Enveloppe Métallique du Bâtiment who participated in the data collection process, cf. General information **Implementation stage - A4 transport module** - Year: 2014 - Geographical representativeness: France (+ Belgium for two member sites) - Source: industrial members of L'Enveloppe Métallique du Bâtiment who participated in the data collection process, cf. General information (transportation distance) **Implementation stage - A5 installation module** - Year: 2014 - Geographical representativeness: France - Source: L'Enveloppe Métallique du Bâtiment **End of life stage - C2 transport module** - Year: 2014 - Geographical representativeness: France - Source: L'Enveloppe Métallique du Bâtiment (transportation distance) - **Potential for reuse/recovery/recycling - Module D** The data correspond to the net quantities of steel, based on data from manufacturers and the portion that is repurposed (see production stage and end-of-life stage).
Secondary data sources	Secondary data are data other than those collected from manufacturing sites. **Use stage - B2 maintenance module** Applicable Technical Application Documents **End-of-life stage - C2 transport and C4 landfill modules** - Breakdown of the product by end-of-life channel: Syndicat des Recycleurs du BTP (Building and Public Works Recyclers' Union)

	- Impacts of landfill: Appendix III of the decree of 9 September 1997 relating to storage facilities for household and similar waste, amended by the decrees of 31 December 1997 and 31 December 1998
	December 2001 and 3 April 2002, France **Secondary database: DEAM** And use of the following sources in particular: - *Steel:* World Steel Association 2008 - *Rock wool:* Rockwool 2015 - *Plastic:* PlasticsEurope 2005 - *Electricity:* The power generation mix used in this study is that of France (2011). Power generation was modelled based on data provided by the International Energy Agency (IEA Statistics 2011, International Energy Agency). - *Fuels:* PlasticsEurope 2005, AFNOR instalment FD P 01-015, EMEP/EEA 2010, IPCC 2006 - *Road transport:* EU-15 truck fleet, Emisia/Copert 4 2005 - *Rail transport:* Railenergy/Ecotransit 2005-2010
Variability of results	The variability (uncertainty) of the results is 20 to 30%, depending on the indicator. - .
Traceability	The life cycle inventory and impact calculations were performed by PwC using TEAM™ version 5.1 software. The data in NF EN 15804+A1 format, taking into account the scope of validity, has been combined based on calculations produced by an Excel tool developed by PwC. The framework of validity was produced by L'Enveloppe Métallique du Bâtiment only.

• Life cycle analysis results

Table 1 below shows the modules reported and not reported in the EHDF. All modules are declared in this EHDF ('cradle-to-grave' life cycle).

Table 2 shows the results of the environmental indicators for all modules considered in the life cycle. The results are shown for 1m² of sandwich panel and based on an RSL of 50 years.

SYSTEM BOUNDARY REMINDER (X = module included in the LCA)																	
PRODUCTION STAGE			IMPLEMENTATION STAGE		USE STAGE							END-OF-LIFE STAGE				ENTIRE LIFE CYCLE	INCOME AND COSTS BEYOND THE SYSTEM'S BOUNDARIES
Supply of raw materials	Transport	Manufacturing	Transport	Installation	Usage	Maintenance	Repair	Replacement	Rehabilitation	Energy use	Water use	Deconstruction / Demolition	Transport	Waste treatment	Landfill		Possibility of reuse, recovery or recycling
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**Total A-B-C**	**D**
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Table 1

		LCA RESULTS - Indicator values for the entire RSL: PS of core cladding LR - 1m² - 50 years														
		PRODUCTION STAGE				IMPLEMENTATION STAGE			USE STAGE	END-OF-LIFE STAGE					ENTIRE LIFE CYCLE	INCOME AND EXPENSES BEYOND THE SYSTEM BOUNDARIES
Indicators describing the environmental impacts	**Units**	**A1**	**A2**	**A3**	**A1-A3**	**A4**	**A5**	**A4-A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**C1-C4**	**Total**	**D**
Global warming	kg CO2 eq.	41.4	2.46	9.1E-01	44.8	5.8E-02	2.32	2.38	0	0	2.2E-01	3.4E-01	0	5.7E-01	47.7	-13.2
Depletion of the ozone layer	kg CFC 11 eq.	2.3E-06	1.8E-06	0	4.1E-06	4.2E-08	2.1E-07	2.6E-07	0	0	1.6E-07	2.5E-07	0	4.1E-07	4.8E-06	-3.4E-08
Soil and water acidification	kg SO2 eq.	1.9E-01	1.1E-02	1.8E-03	2.0E-01	2.7E-04	1.0E-02	1.1E-02	0	0	1.0E-03	2.6E-03	0	3.6E-03	2.2E-01	-3.1E-02
Eutrophication	kg PO_4^{3-} eq.	1.9E-02	2.6E-03	2.0E-04	2.2E-02	6.3E-05	1.1E-03	1.2E-03	0	0	2.4E-04	5.5E-04	2.1E-04	1.0E-03	2.4E-02	-2.7E-03
Photochemical ozone formation	kg C2H4 eq.	2.2E-02	1.8E-03	1.1E-04	2.4E-02	4.2E-05	1.3E-03	1.3E-03	0	0	1.6E-04	2.0E-04	0	3.6E-04	2.6E-02	-9.1E-03
Abiotic resource depletion - elements	kg Sb eq.	9.4E-06	2.3E-09	0	9.4E-06	5.4E-11	1.9E-09	2.0E-09	0	0	2.1E-10	4.6E-10	0	6.7E-10	9.4E-06	-8.2E-07
Abiotic resource depletion - fossil fuels	MJ LHV	610	31.4	0	641	7.4E-01	33.0	33.7	0	0	2.86	4.44	0	7.30	682	-165
Air pollution	m^3	4,750	158	14.3	4,922	3.74	256	260	0	0	14.3	54.0	0	68.3	5,250	-3,414
Water pollution	m^3	3.16	7.0E-01	0	3.86	1.7E-02	2.7E-01	2.8E-01	0	0	6.4E-02	9.9E-02	1.4E+00	1.6E+00	5.70	4.3E-02

Indicators describing resource use	**Units**	**A1**	**A2**	**A3**	**A1-A3**	**A4**	**A5**	**A4-A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**C1-C4**	**Total**	**D**
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ LHV	59.7	1.5E-02	0	59.7	3.6E-04	2.98	2.98	0	0	1.4E-03	1.7E-03	0	3.1E-03	62.7	-1.5E+00
Use of renewable primary energy resources as raw materials	MJ LHV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total use of renewable primary energy resources	MJ LHV	59.7	1.5E-02	0	59.7	3.6E-04	2.98	2.98	0	0	1.4E-03	1.7E-03	0	3.1E-03	62.7	-1.5E+00
Use of non-renewable primary energy, excluding non-renewable primary energy resources used as raw materials	MJ LHV	765	31.6	0	797	7.5E-01	41.5	42.2	0	0	2.88	4.50	0	7.37	847	-153
Use of non-renewable primary energy resources as raw materials	MJ LHV	108.3	0	0	108.3	0	4.65	4.65	0	0	0	4.3E-06	0	4.3E-06	112.9	-2.28
Total use of non-renewable primary energy resources	MJ LHV	874	31.6	0	905	7.5E-01	46.1	46.9	0	0	2.88	4.50	0	7.37	959	-155
Use of secondary material	kg	8.2E-01	0	0	8.2E-01	0	4.3E-02	4.3E-02	0	0	0	6.7E-08	0	6.7E-08	8.7E-01	0
Use of renewable secondary fuels	MJ LHV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Use of non-renewable secondary fuels	MJ LHV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net freshwater use	m^3	4.7E-01	3.0E-03	1.7E-04	4.7E-01	7.1E-05	2.4E-02	2.4E-02	5.0E-02	0	2.7E-04	4.4E-04	0	7.1E-04	5.5E-01	-1.4E-01

Indicators describing waste categories	**Units**	**A1**	**A2**	**A3**	**A1-A3**	**A4**	**A5**	**A4-A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**C1-C4**	**Total**	**D**
Hazardous waste disposed of	kg	1.0E-02	7.3E-04	1.9E-02	3.0E-02	1.7E-05	1.5E-03	1.5E-03	0	0	6.6E-05	1.0E-04	0	1.7E-04	3.2E-02	-5.7E-05
Non-hazardous waste disposed of	kg	4.94	5.5E-07	1.91	6.85	1.3E-08	1.3E+00	1.3E+00	0	0	5.0E-08	4.7E-04	18.2	18.2	26.3	-1.8E-01
Radioactive waste disposed of	kg	2.6E-03	5.1E-04	0	3.1E-03	1.2E-05	1.6E-04	1.7E-04	0	0	4.6E-05	7.2E-05	0	1.2E-04	3.4E-03	-5.9E-05

Indicators describing outgoing flows	**Units**	**A1**	**A2**	**A3**	**A1-A3**	**A4**	**A5**	**A4-A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**C1-C4**	**Total**	**D**
Components for reuse	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Materials for recycling	kg	8.6E-01	1.3E-05	4.3E-01	1.3E+00	3.1E-07	1.4E+00	1.4E+00	0	0	1.2E-06	12.62	0	12.62	15.3	-10.34
Materials for energy recovery	kg	3.0E-02	0	0	3.0E-02	0	1.5E-03	1.5E-03	0	0	0	0	0	0	3.1E-02	0
Energy supplied externally	MJ LHV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2

• Additional information on the release of hazardous substances into indoor air, soil and water during the use stage

Indoor air

The potential health effects of substances are taken into account at the product implementation and use stages and are assessed according to the types of substances used in or emitted by the construction product and their classification in the applicable regulations regarding hazardous substances. The health data for the sandwich panel with two steel facings are expressed independently of the functional unit (FU). The information provided below is based on the data available, notably from the Technical Application Documents for sandwich panels with two steel facings manufactured by members of L'Enveloppe Métallique du Bâtiment and the applicable standards.

Galvanised pre-lacquered steel coil:

Steel is not a radioactive substance and is not classified according to Directive 93-32/EEC. It does not represent a health hazard during the usable life of the product.

The lacquer used, which is generally polyester of a nominal thickness of 25µm, is produced in factories* and generates VOC emissions that fall below analytical detection limits. Pre-lacquered steel facings** have undergone a health assessment with regard to the VOC emissions generated. They also fall below analytical detection limits under test conditions.

The Technical Application Documents for the pre-lacquered galvanised steel coils used to make the facings for sandwich panels comply with the NF EN 10169+A1 series of standards, the scope of use of which is defined by a number of categories according to the AFNOR NF P 34-301 standard. Tests notably include corrosion protection and moisture resistance. The AFNOR NF P 34-301 standard defines the categories of use of coatings depending on the indoor and outdoor atmosphere, the humidity of the premises and the positioning of the buildings.

Coils may be coated with zinc magnesium in accordance with the preliminary technical study on the product material.

Guides for using the coatings can be found in the Technical Application Documents. Sources:
* The strip immediately enters an oven which allows the solvents required to spread the product to evaporate and the resin to cure. Book entitled 'De A à Z : Les profilés Minces en acier', SNPPA, 2007
** Test report n° SB-08-080, CSTB, November 2008 - "Evaluation of VOC and formaldehyde emissions from 25 µm polyester pre-coated galvanized steel products according to the ECA, AgBB and AFSSET schemes",
AFNOR NF P 34-301 standard of April 2017
Standard NF EN 10169 + A1 November 2013

Insulators - rock wool:

Sandwich panels assembled to a professional standard will be airtight. The seals are incorporated in the factory.

In view of these provisions governing the assembly and containment of the insulation between the steel facings, the product does not, to the best of current knowledge, present any danger during the implementation or use stages.

Sources:
e-Cahier CSTB - Cahier 3501, March 2004, Art. 2.5, *Panneaux sandwiches isolants à parements métalliques – conditions générales de conceptions et fabrications* ('Metal-faced insulating sandwich panels - General conditions of design and manufacture')
Cahier CSTB 3731, March 2012, Les méthodes de dimensionnement aux états limites des ouvrages de bardage et de couverture en panneaux sandwiches faisant l'objet d'un Document Technique d'Application ('Limit state sizing methods for sandwich panel cladding and roofing structures covered by a Technical Application Document')
FFB/Ademe guide, 'Construction métalliques – réglementation thermique des bâtiments neufs de juin 2008'

Soil and water

Product not in contact with drinking water. No tests performed to date.

• Contribution of the product to improving quality of life inside buildings

Product characteristics contributing to the creation of comfortable hygrothermal conditions inside the building

Impermeability is guaranteed when it is favourably referred to in the Notice section of each Technical Application Document for sandwich panels with two steel facings.

This is due to the fact that classing sandwich panels act as a building envelope and ensure impermeability through their composition and assembly instructions: the panels themselves are entirely watertight and airtight and the peripheral fastening devices and sockets are fitted with watertight joints adapted to the configuration and architecture of the building.

Sources:
Range of Technical Application Documents for members of L'Enveloppe Métallique du Bâtiment - Cf. Chapter 2: Notice section of each Technical Application Document
"En savoir plus sur le panneau sandwich", SNPPA

Regarding the thermal performance of the wall:

Thermal insulation for different thickness, as applicable to the main body, is covered in the Technical Application Document for the panel in question.

The thermal insulation of the product will depend on the thickness and nature of the insulation material that forms its core and the way in which it interlocks. All cladding sandwich panels are likely to meet the minimum requirements of the regulations applicable to new constructions. The justification for such performance must be calculated on a case-by-case basis.

Each Technical Application Document for sandwich panels states the thermal transmission coefficient for the main body of the wall (U_c) and the linear (corresponding to the interlocking of panels) and punctual thermal bridge (corresponding to fixation) coefficients. The U_p coefficient is calculated based on the surface coefficient for the main body U_c (excluding integrated thermal bridges) and the linear and punctual coefficients of the thermal bridges inside the wall.

On average, industrial cladding sandwich panels with two steel facings and rock wool insulation can now achieve U_p levels of 0.50 to 0.15W/ (m^2.K) when used for cladding.

Sources:
'En savoir plus sur le panneau sandwich', SNPPA
FFB/Ademe guide, 'Construction métallique – réglementation thermique des bâtiments neufs de juin 2008'
Range of Technical Application Documents for members of the L'Enveloppe Métallique du Bâtiment

Regarding the air permeability of the wall:

Reference values are defined in the current thermal regulations (Article 20). Furthermore, test reports may be available from L'Enveloppe Métallique du Bâtiment members.

Source:
Applicable TRs
Member test reports
Range of Technical Application Documents for L'Enveloppe Métallique du Bâtiment members

Conclusion:

All of these parameters are used to evaluate the level of hygrothermal comfort within the building.

Source: Range of Technical Application Documents for L'Enveloppe Métallique du Bâtiment members

Product characteristics contributing to the creation of comfortable acoustic conditions inside the building

Acoustic insulation for different thickness is referred to in the Technical Application Document for the panel in question.

Cladding sandwich panels can be used to provide sound and acoustic insulation for a room in addition to their role as a building envelope. The nature of the insulating core contributes to acoustic insulation.

Regarding sound reduction: sandwich panels with two steel facings and a rock wool core have a sound reduction index (R_w) of around 30dB.

There is a range of sandwich facings designed to absorb sound.

Source:
Range of Technical Application Documents for L'Enveloppe Métallique du Bâtiment members SNPPA
Info Profile June 2008
Acoustic range of SNPPA members CSTB
acoustic REEF
Test reports are available from L'Enveloppe Métallique du Bâtiment members.

Product characteristics contributing to the creation of comfortable visual conditions inside the building

The metal facings of the sandwich panels are available in a wide range of colours offering specific technical performance levels.

The nominal gloss of cladding with an organic coating is around 35% according to standard EN13523 - 2.

The degrees of intense reflection in relation to magnesium oxide are as follows:

- very light colours: 75% - 90%
- light colours: 40% - 74%
- dark colours: 8% - 39%

Furthermore, tests performed in accordance with standard NF EN 10169 + A1, November 2013, make it possible to characterise the gloss and colour of the coating.

Sources:
Standards NF EN 10169 + A1, November 2013
L'Enveloppe Métallique du Bâtiment members' coating range French
standard NF EN-1991-1-5 of May 2004, Table 5.2

Product characteristics contributing to the creation of comfortable olfactory conditions inside the building

Steel is a metal that has no particular smell. The coating used does not emit any odour as a result of the manufacturing process *. No odour emission tests have been performed to date.

* The strip immediately enters an oven which allows the solvents required to spread the product to evaporate and the resin to cure. Book entitled 'De A à Z : Les profilés Minces en acier', SNPPA, 2007

• Positive environmental contribution

Energy management

Thanks to their high thermal performance, sandwich panels help meet the requirements of the Grenelle de l'Environnement, namely for the building to achieve an average energy consumption of around 50kWh/m²/year.

The table below shows orders of magnitude of the surface transmission coefficient U_p of a cladding sandwich panel with rock wool:

	Nature of the insulating core	U_P W/(K.m^2)
Industrial cladding	Mineral wool	0.50 to 0.15

Source:
FFB/Ademe guide, 'Construction métallique – réglementation thermique des bâtiments neufs de juin 2008' Range of Technical Application Documents for members of the L'Enveloppe Métallique du Bâtiment

Waste

Due to its magnetic properties, steel can be recovered and sorted easily, regardless of the way in which the structure is deconstructed.

At the end of their life, the waste from the steel facings that make up sandwich panels can be recycled either via the integrated (primary) steel industry or, more commonly, via the electrical industry. Recycling does not alter the physical properties of the steel, meaning that it can be recycled indefinitely in proportion to collection and recycling rates. This being the case, recycling the steel panel helps save natural iron ore resources.

• Participating companies

The present EHDF applies to rock wool core sandwich panels produced by the following manufacturers: