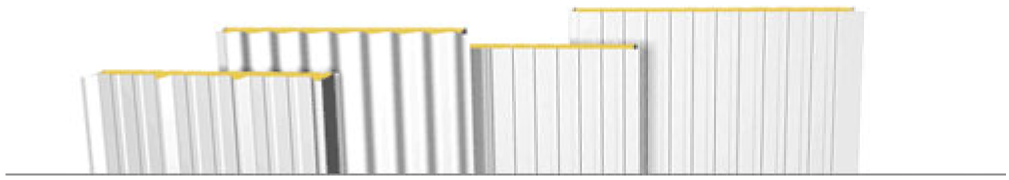
ArcelorMittal

ENVIRONMENTAL PRODUCT DECLARATION
According to EN 15804

ArcelorMittal Construction
Mineral wool sandwich panels



Promistyl/Ondafibre (Induswall - Archwall - Indusroof)

Taranos/Pflaum FO - Vulcanos/Pflaum FOM - Agnios/Pflaum FI - Effistos/Pflaum module4 - Pflaum FR

Declaration Holder	ArcelorMittal Construction
LCA Practitioner	ArcelorMittal Global R&D – Sustainability
Date of issue	06 – 2015
Validity	06 – 2020

General information

ArcelorMittal Construction

Mineral wool sandwich panels

Programme operator
N/A

Declaration Holder
ArcelorMittal Construction
www.arcelormittal.com/construction

Declaration number
N/A

Declared Product / Declared Unit
1m² prefabricated cladding system, consisting of two corrugated steel sheets containing an insulation core made of mineral wool

This Declaration is based on the PCR document:
EN 15804 - Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

Scope of validity:
This document applies to continuously produced sandwich panels with steel skin manufactured by 2 ArcelorMittal Construction sites.
These sites represent 100% of ArcelorMittal Construction mineral wool sandwich panels.

Validity date
2020

Date of issue
2015

CEN standard EN 15804 serves as core PCR
The Life Cycle Assessment which supports this declaration has been peer reviewed by an independent external party and was declared compliant with ISO 14040, ISO 14044 and EN 15804 standards.

Verifier: PE International

Date: June 2015

Product

Product description

ArcelorMittal's steel panels insulated with mineral wool are an insulating cladding system.

The panels are made of two skins of steel sheet and an insulating core made of mineral wool.

Application

The sandwich panels covered by this EPD are used as envelop elements in roofs and walls. They perform several functions: load baring, air tightness, acoustic. The panels are used for industrial, commercial, office, farming or sports buildings.

Panels description

The following table describes the range of sandwich panels covered by the present EPD:

Name	Range or values	Unit
Thickness of the insulation layer	35 – 300	mm
Density of the insulation	85 – 145	kg/m³
Thickness of the external layer	0,50 – 0,75	mm
Thickness of the internal layer	0,50 – 0,75	mm
Thermal conductivity of the insulation	0,041 – 0,047	W/(mK)
Heat transfert coefficient (U)	0,13 – 0,96	W/(m²K)
Panels weight	12,5 – 44,2	kg/m²

*U value calculated for a 1m² panel with 1 fastening / m² (χ fastening= 0,01 W/m.K)

Base materials / Ancillary materials

Average composition of the sandwich panels:

Material	Quantity (%w)
Steel sheet	44%
Insulation core	54%
Adhesive	2%

The minimum steel grade is S280 GD.

The steel sheets are made of metallic coated coils with additional organic coatings, compliant with EN 10 169 and EN 10346.

The thermal insulating core is a mineral wool product compliant with EN 13162, linked to the steel sheets with an organic adhesive.

Reference service life

Sandwich steel panels used in lightweight metal constructions withstand a term of protection of at least 15 years.

The service life is estimated at up to 50 years depending on the use conditions, when respecting the installation and maintenance recommendations.

Panels specifications described in this EPD

Alternative	1	2	3	4
Panel thickness (mm)	80	80	150	150
Mineral wool density (kg/m3)	85	145	85	145
Thickness of the external layer (mm)	0.6	0.6	0.6	0.6
Thickness of the internal layer(mm)	0.5	0.5	0.5	0.5

For other specifications, a specific EPD may be created on demand.

LCA: Calculation rules, scenarios and additional technical Information

Declared unit

1m² of steel mineral wool sandwich panel

System limit

Type of EPD: cradle to gate - with options

Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to EN 15804 and the building context, respectively the product-specific characteristics of performance, are taken into account.

Data collection

Data was collected on an annual base for the year 2011 in two ArcelorMittal production sites located in Belgium and Austria.

Modules considered in the declaration:

- A1: raw material supply
- A2: transportation to the production site
- A3: manufacturing
- A4: transportation to the construction site
- C3: waste processing
- C4: disposal
- D: recycling

A1-A3: From raw materials supply to manufacturing

The materials entering the manufacturing process are mainly of organic coated steel sheets, mineral wool and glue. These materials are produced and transported to the two ArcelorMittal production sites. The European dataset developed by the Worldsteel Association is used for the production of organic coated steel coil. The data for the mineral wool production originates from PE International.

Other processes regarding A1-A3 modules originate from the PE international database (GaBi 5)

A4: transportation to the construction site

The panels are transported by standard truck to customers all over Europe. The weighted average distance is 740km.

Data from the European Life Cycle Database (ELCD) is used to assess transportation.

C3: waste processing

End-of-life panels are shredded to separate the mineral wool and the steel parts.

C4: disposal

The mineral wool is landfilled in an inert material landfill facility.

D: Benefits and loads of Reuse-Recovery-Recycling-potential recycling

In this study, the module D consists in the recycling of steel sheets. The reuse of the panels or the potential recycling of the mineral wool to produce new wool is not considered.

There are two sources of steel scrap for recycling: the production losses occurring during production, and the end-of-life panels after deconstruction.

Steel sheets are recovered with a 90% rate which is entirely recycled to produce new steel. The avoided impact methodology used is described in the methodology report from worldsteel association.

Modules not assessed

For this first EPD of ArcelorMittal steel panels with mineral wool, the modules A5 (installation of the panels on site), C1 (deconstruction), C2 (transport to separation facility) and C3 (shedding of the panels to separate the steel sheet from the wool) are not evaluated because of a lack of information.

The modules B1 to B6 are not relevant for the product (except if maintenance, e.g. cleaning, repainting etc, is considered during the life of the panels)

LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)																
PRODUCT STAGE			CONSTRUCTION PROCESS		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X
For clarity reasons, the modules not accounted for have been deleted in the following tables.																

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1m² sandwich panel [Thickness (mm) – Insulation density (kg/m3) – External layer (mm) – Internal layer (mm)]																					
		[80 – 85 -0.6 – 0.5]					[80 – 145 – 0.6 – 0.5]					[150 – 85 – 0.6 – 0.5]					[150 – 145 – 0.6 – 0.5}				
Parameter	**Unit**	**A1-3**	**A4**	**C3**	**C4**	**D**	**A1-3**	**A4**	**C3**	**C4**	**D**	**A1-3**	**A4**	**C3**	**C4**	**D**	**A1-3**	**A4**	**C3**	**C4**	**D**
GWP	[kg CO2-Eq.]	47,1	0,483	0,0357	0,122	-10,5	52,6	0,633	0,0357	0,199	-10,5	53,9	0,669	0,0357	0,217	-10,5	64,3	0,951	0,0357	0,362	-10,5
ODP	[kg CFC11-Eq.]	4,28E-007	9,66E-010	2,54E-011	1,35E-012	3,35E-007	4,28E-007	1,27E-009	2,54E-011	2,2E-012	3,35E-007	4,29E-007	1,34E-009	2,54E-011	2,41E-012	3,35E-007	4,3E-007	1,9E-009	2,54E-011	4,01E-012	3,35E-007
AP	[kg SO2-Eq.]	0,156	0,00207	9,95E-005	0,000729	-0,025	0,192	0,00272	9,95E-005	0,00119	-0,025	0,201	0,00287	9,95E-005	0,0013	-0,025	0,268	0,00408	9,95E-005	0,00217	-0,025
EP	[kg PO_4^{3-}- Eq.]	0,0148	0,000481	8,9E-006	9,91E-005	-0,000691	0,0192	0,00063	8,9E-006	0,000162	-0,000691	0,0203	0,000666	8,9E-006	0,000177	-0,000691	0,0285	0,000946	8,9E-006	0,000295	-0,000691
POCP	[kg Ethen Eq.]	0,019	0,000228	6,86E-006	7,01E-005	-0,00559	0,0215	0,000299	6,86E-006	0,000115	-0,00559	0,022	0,000316	6,86E-006	0,000125	-0,00559	0,0265	0,000449	6,86E-006	0,000208	-0,00559
ADPE	[kg Sb Eq.]	0,000917	1,03E-008	1,17E-008	4,2E-008	-0,000107	0,000919	1,35E-008	1,17E-008	6,86E-008	-0,000107	0,000919	1,43E-008	1,17E-008	7,5E-008	-0,000107	0,000921	2,02E-008	1,17E-008	1,25E-007	-0,000107
ADPF	[MJ]	524	6,8	0,387	1,58	-111	584	8,91	0,387	2,58	-111	598	9,42	0,387	2,82	-111	711	13,4	0,387	4,7	-111
Caption:	GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non fossil resources; ADPF = Abiotic depletion potential for fossil resources																				

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RESULTS OF THE LCA - RESOURCE USE: 1m² sandwich panel [Thickness (mm) – Insulation density (kg/m3) – External layer (mm) – Internal layer (mm)]																					
		[80 – 85 -0.6 – 0.5]					[80 – 145 – 0.6 – 0.5]					[150 – 85 – 0.6 – 0.5]					[150 – 145 – 0.6 – 0.5}				
Parameter	**Unit**	**A1-3**	**A4**	**C3**	**C4**	**D**	**A1-3**	**A4**	**C3**	**C4**	**D**	**A1-3**	**A4**	**C3**	**C4**	**D**	**A1-3**	**A4**	**C3**	**C4**	**D**
PERE	[MJ]	54,5	-	-	-	-	61,9	-	-	-	-	63,7	-	-	-	-	77,5	-	-	-	-
PERM	[MJ]	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
PERT	[MJ]	54,5	0,00903	0,174	0,186	5,7	61,9	0,0118	0,174	0,304	5,7	63,7	0,0125	0,174	0,332	5,7	77,5	0,0178	0,174	0,553	5,7
PENRE	[MJ]	556	-	-	-	-	622	-	-	-	-	638	-	-	-	-	761	-	-	-	-
PENRM	[MJ]	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
PENRT	[MJ]	556	6,85	0,623	1,64	-98,6	622	8,98	0,623	2,68	-98,6	638	9,49	0,623	2,92	-98,6	761	13,5	0,623	4,87	-98,6
SM	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RSF	[MJ]	0,0708	0	7,27E-006	0,00304	0	0,12	0	7,27E-006	0,00496	0	0,132	0	7,27E-006	0,00542	0	0,225	0	7,27E-006	0,00903	0
NRSF	[MJ]	1,07	0	0,00011	0,00619	0	1,81	0	0,00011	0,0101	0	1,99	0	0,00011	0,0111	0	3,39	0	0,00011	0,0184	0
FW	[m³]	0,712	-7,42E-005	0,000269	0,000334	0,00329	0,725	-9,73E-005	0,000269	0,000546	0,00329	0,728	-0,000103	0,000269	0,000597	0,00329	0,753	-0,000146	0,000269	0,000994	0,00329
Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non renewable primary energy excluding non renewable primary energy resources used as raw materials; PENRM = Use of non renewable primary energy resources used as raw materials; PENRT = Total use of non renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non renewable secondary fuels; FW = Use of net fresh water																				

RESULTS OF THE LCA - OUTPUT FLOWS AND WASTE CATEGORIES: 1m² sandwich panel [Thickness (mm) – Insulation density (kg/m3) – External layer (mm) – Internal layer (mm)]																					
		[80 – 85 -0.6 – 0.5]					[80 – 145 – 0.6 – 0.5]					[150 – 85 – 0.6 – 0.5]					[150 – 145 – 0.6 – 0.5}				
Parameter	**Unit**	**A1-3**	**A4**	**C3**	**C4**	**D**	**A1-3**	**A4**	**C3**	**C4**	**D**	**A1-3**	**A4**	**C3**	**C4**	**D**	**A1-3**	**A4**	**C3**	**C4**	**D**
HWD	[kg]	1,48E-006	0	3,96E-010	3,74E-008	0	2,11E-006	0	3,96E-010	6,11E-008	0	2,26E-006	0	3,96E-010	6,68E-008	0	3,44E-006	0	3,96E-010	1,11E-007	0
NHWD	[kg]	4,08	0	0,000376	7,58	0	6,9	0	0,000376	12,4	0	7,57	0	0,000376	13,5	0	12,9	0	0,000376	22,6	0
RWD	[kg]	0,0112	1,21E-005	9,4E-005	2,29E-005	0,00359	0,0135	1,58E-005	9,4E-005	3,74E-005	0,00359	0,014	1,67E-005	9,4E-005	4,08E-005	0,00359	0,0184	2,37E-005	9,4E-005	6,8E-005	0,00359
CRU	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MFR	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MER	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EE	[MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caption	HWD = Hazardous waste disposed; NHWD = Non hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EE = Exported energy																				

Complementary information

Environmental indicators

Global warming potential – GWP

The global warming potential indicator is dominated by the production of steel (~60%) because of the CO2 emissions at the Blast Furnace. The production of mineral wool is the second largest contributor (~30%).

Depletion potential of the stratospheric ozone layer – ODP

The ozone layer depletion indicator value is almost entirely linked to steel production, mainly due to electricity production for high grade zinc refining. This could be reduced by half using the new ArcelorMittal coating solution named Optigal®. ArcelorMittal Construction already uses this new solution for 90% of his production; however, the data used in this study is not updated yet.

Acidification potential of land and water – AP

Half of the acidification impact originates from mineral wool production, while the steel production contributes to less than 40%.

Eutrophication potential – EP

The production of mineral wool is the largest contributor to this impact (~50%). The second contributor is the production of steel (~20%), while transportation has a non negligible contribution (~16%).

Formation potential of tropospheric ozone photochemical oxidants – POCP

The steel production generates the largest part of the impact (~60%) while the rest is mainly linked to mineral wool production (~40%).

Abiotic depletion potential for non fossil resources – ADPE

The indicator of abiotic depletion of elements is nearly 100% related to the production of steel coils, which is dominated by zinc as a non-renewable resource. Again, this could be reduced by half if the new ArcelorMittal Optigal® solution is considered.

Abiotic depletion potential for fossil resources – ADPF

This indicator is mainly linked to steel production (50%), where the use of hard coal at the BF and natural gas at the hot dip galvanising line contribute to the largest share of fossil fuel consumption. 30% are related to the production of mineral wool.

Total primary energy demand (renewable and non renewable primary energy resources)

Half of the primary energy demand comes from steel production, related to hard coal consumption (80%) and natural gas (9,5%). A large share is also related to mineral wool production (~30%), the rest coming from electricity production and transportation.

Module D considerations

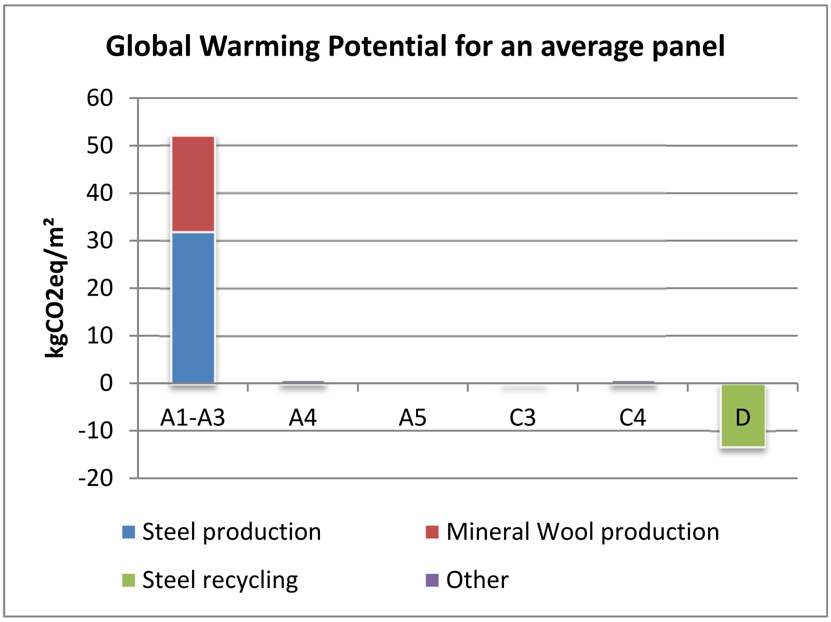
Module D calculates the credits or burdens associated with steel recycling at end of life of the MiWo sandwich panels. When steel is recycled at the electric arc furnace, energy consumption decreases considerably. Recycling avoids the primary route production of new steel by the BF/BOF route and, for example, a credit of 98 MJ can be subtracted from the 560 MJ of total primary energy used for the production of 1 m² of OCS, in order to value the energy footprint of the product according to a whole life cycle perspective. However, in this case, whereas the total primary energy demand decreases, the primary energy from renewable sources increases because the power mix used by the EAF has recourse to more renewable energy resources. Credits are also important for GWP.

Results analysis: focus on Global Warming Potential (GWP)

The distribution of greenhouse gases emissions along the life of the panel are displayed in the following figure. In addition, the contribution of production of steel and mineral wool, as well as the benefit brought by the recycling of steel are detailed.

A first outcome is the importance of modules A1 to A3 to the GWP of the panel. However, the contribution of insulated panels to the reduction of GWP is not represented here. Indeed, insulated panels are an efficient mean for the reduction of energy consumption during the use stage of a building, which represent up to 90% of the life cycle GWP of a building. In this document, the focus is made on the panel as a generic component, without knowing its future usage. Hence, its role in the operational phase of the building (module B6) cannot be calculated.

The figure also shows that the production of the materials constituting the panels is the largest contributor to the panels GWP. Other modules have a very low contribution compared to A1-A3, except for module D, which demonstrate the impacts avoided through the recycling of steel at the end-of-life of the panel.



ArcelorMittal	**Declaration Holder** **ArcelorMittal Construction**

References

EN 10169 EN 10169:2010+A1:2012: Continuously organic coated (coil coated) steel flat products. Technical delivery conditions **EN 10346** EN 10346:2009: Continuously hot-dip coated steel flat products. Technical delivery conditions **EN 13162** EN 13162:2012: Thermal insulation products for buildings. Factory made mineral wool (MW) products. Specification	**ISO 14025** EN ISO 14025:2009-11: Environmental labels and declarations — Type III environmental declarations — Principles and procedures **EN 15804** EN 15804: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products **Steel production** Life Cycle Assessment Methodology report - Worldsteel association **ELCD data** http://eplca.jrc.ec.europa.eu/