



ENVIRONMENTAL PRODUCT DECLARATION

Warm roof decking by Delft Profielen

DELFT 160R/750

Approval date: 04.09.2023 Valid to: 03.09.2028

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DIT PRODUCT IS OPGENOMEN IN
DE NATIONALE MILIEUDATABASE

General information

COMPANY NAME	Delft Profielen
ADDRESS	Havenweg 4, 5145 NJ Waalwijk, Netherlands
DECLARATION OWNER	Delft Profielen
WEBSITE	https://www.delftprofielen.nl/



Overview	
Product type	Warm roof decking
Product name	DELFT 160R/750
Product description	Steel warm roof decking, type DELFT 160R/750
Declared unit	1 m ² of steel warm roof decking, type DELFT 160R/750, produced by Delft Profielen in Waalwijk, the Netherlands
Reference service life (RSL)	50 years
Reference LCA study	EPD Delft Profielen, D.B. van Nunen MSc., B.M. Vermaas MSc., ing. J. Levels-Vermeer
Product category rules (PCR)	In accordance with - NEN-EN 15804:2012+A1+A2 (2019), NMD Bepalingsmethode Milieuprestatie Bouwwerken, version 1.1, March 2022. - ISO 14025 and EN 15804 EPD's of construction products may not be comparable if they do not comply with these standards.
Application	Warm roof decking
Scope of application of the EPD	Steel warm roof decking, produced by Delft Profielen
Used background databases	Ecoinvent 3.6 and NMD 3.6
LCIA method used	NMD 3.6, based on EN 15804:A2 (2019)
Program operator	This environmental declaration is included in the Nationale Milieudatabase, Visseringlaan 22b, 2288 ER Rijswijk, The Netherlands. ProductID: 94010
Third party reviewer	SGS INTRON, Ulbert Hofstra/Angnes Schuurmans
Data collection period	09/2021 – 08/2022

About Delft Profielen

Delft Profielen has been producing profiled sheeting for roofs and facades for over 35 years. We know our customers and we understand their wishes. All products are customer or project specific with almost endless possibilities in material, color and length.

Quality

We are a member of MDG, the Dutch trade association. The MDG membership comes with a binding quality directive which applies to the products we deliver. On top of that we have a FM4451 and NEN-EN 1090 certificate for multiple products and our management system is ISO 9001 certified. We are continuously looking to improve our product quality.

Sustainability

Our mission is to build a sustainable future. Our management systems is certified conform ISO 14001 and our company is BES6001 certified. We perform life cycle analysis for multiple products, and we are always looking for opportunities to reduce our impact on the environment.

Product information

Steel warm roof decking from Delft Profielen

The Delft Profielen warm roof decks are profiled steel plates that are used for the realisation of warm roof structures. The span, load capacity and appearance of the warm roof decking from Delft Profielen differ between the various types of decking that are produced. The decking is manufactured from cold-rolled hot dip galvanized coils, either coated or non-coated.

DELFT 160R/750

The DELFT 160R/750 has a 250 mm profile pitch, a profile depth of 160 mm and covers a width of 750 mm. This decking comes in various galvanization and coating types and thicknesses of the steel plates. The decking is produced with a thickness of the steel plates between 0,75 – 1,50 mm.

Reference product

The reference product has a steel plate thickness of 0,75 mm and has the galvanization and coating as represented by the weighted average of the production in the reference year (between 09-2021 and 08-2022). The transport distance to the construction site (A4) is representative for sites located in the Netherlands. The environmental impact in A4 can be calculated for specific construction sites with the calculation method presented in section *Custom transport distances (A4)*.

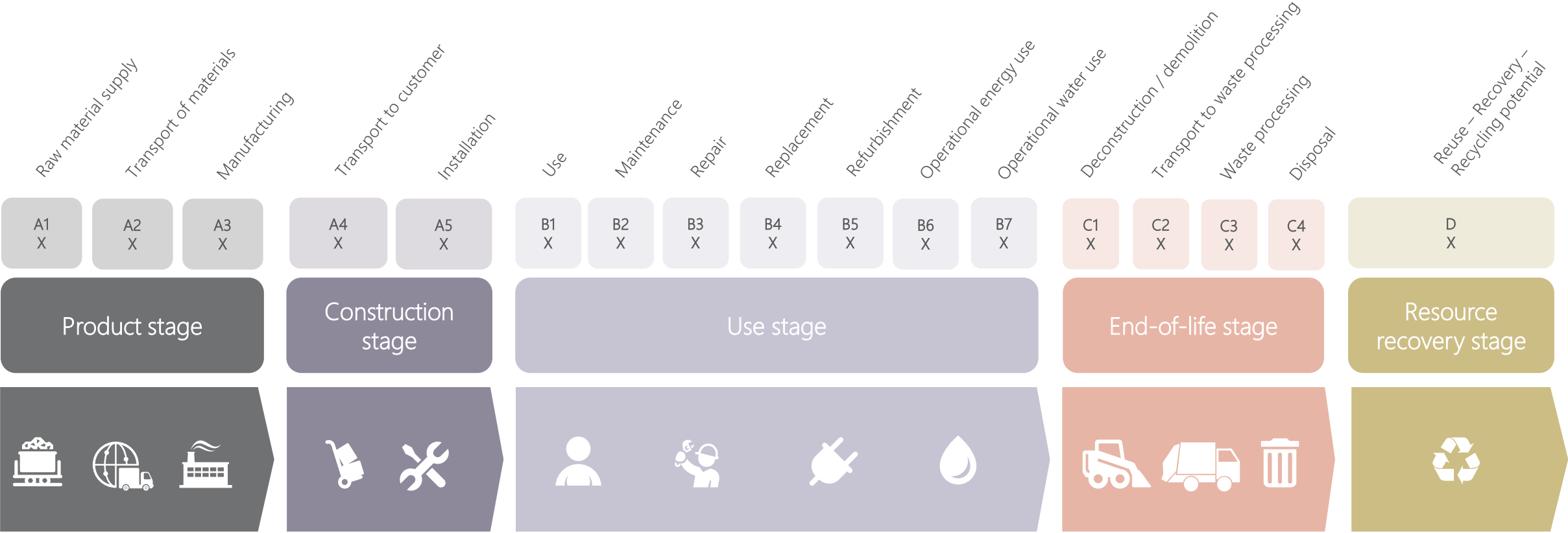
Galvanization	Coating	Production share reference year (%)
ZM120	None	6
ZM100	Interior coating (12-18 µm) and back coating (5-7 µm)	23
Z275	None	42
AZ100	Interior coating (12-18 µm) and back coating (5-7 µm)	29

Declaration of material content of SVHC

The steel warm roof decking by Delft Profielen does not contain any substances from the Candidate List of Substances of Very High Concern for authorization.

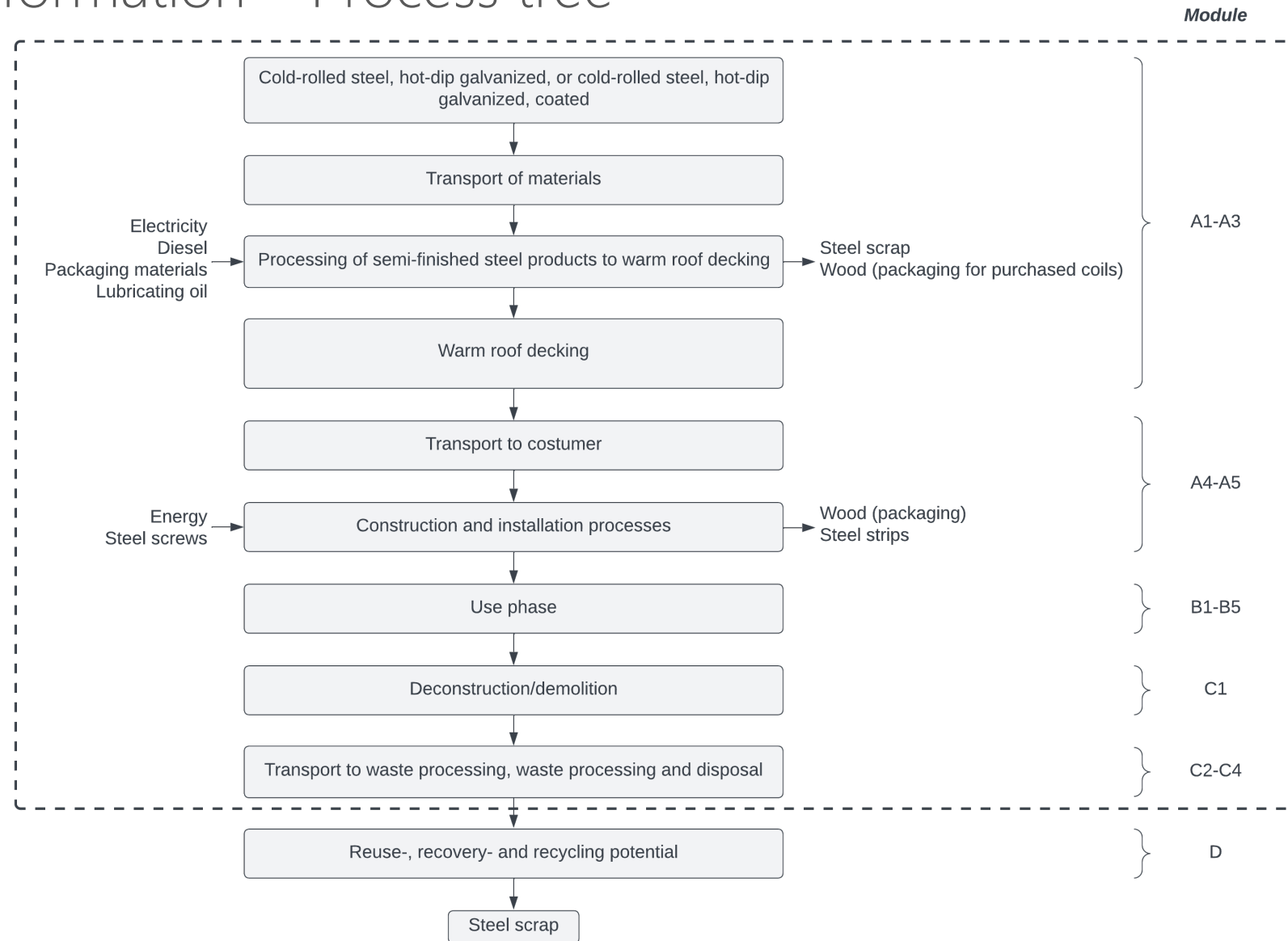
System boundary

This LCA considers a cradle to grave system with module D (full life cycle).
 The figure below shows which phases are considered in this analysis.





Life cycle information – Process tree



System boundary

Production stage, A1-A3

Originating from several suppliers, steel galvanized coils and steel galvanized and coated coils are delivered to Delft Profielen by freight lorry, and/or freight ship (barge and containership). A differentiation is made between steel originating from within or outside of Europe. The pre-finished steel undergoes a process of cold-rolling, profiling, and cutting into appropriate lengths at Delft Profielen. This process involves the use of lubricating oil and electricity. Internal transport is provided by diesel driven machines. The final products are packaged using wood-based supports and steel strips to ensure their protection during transportation.

Transport and construction process stage, A4-A5

A4: In line with the Bepalingsmethode, the warm roof decking is transported by freight lorry and covers a distance of 150 km.

A5: The warm roof decking is secured to the concrete, steel or wooden structures of the building using screws. The installation of the decks is modelled with a ratio of 30% electrical and 70% diesel-driven construction cranes. In accordance with the Bepalingsmethode, there is a material loss of 3% during this stage. The packaging materials are processed as waste in this stage in accordance with the prescribed set of scenario values for the end-of-life stage by the Bepalingsmethode, as given in the table displayed to the right.

Use stage, B

There are no emissions or environmental impacts during the use stage. The use stage is declared as '0'.

End-of-life-stage, C1-C4

C1: Deinstallation/demolition of the warm roof decking requires equal to the usage of the electrical/diesel driven construction cranes during the installation stage.

C2-C4: C2-C4: The waste in this stage is also processed by the set of scenario values for the end-of-life-stage, as prescribed by the Bepalingsmethode and displayed in the table below. The processes related to European steel products, including galvanization and coating, are modeled using the NMD processes of the Staalfederatie¹.

Resource and energy recovery stage, D

Through the EAF and BOF route, secondary steel can replace primary steel 1 to 1.

The galvanization and coating are included in the recycling process. The share of zinc on the steel plates can be partially recovered through the EAF route. However, the shares of aluminium, magnesium, and silicon cannot be recovered. The emissions that are released during these processes are also included.

The recycling loads and benefits, after reaching end-of-waste, of the losses during construction and that of the packaging materials (A5) are included in module D.

End-of-life stage, in line with the Bepalingsmethode			
	Landfill	Incineration	Recycling
Transport distance (km)	100	150	50
Wood	10%	85%	5%
Steel strips	5%	0%	95%
Cold-rolled steel, including galvanization and coating	5%	0%	95%
Screws	5%	0%	95%

¹ From Staalfederatie, 2019. *LCA Staalfederatie, Basis Profielen Staalproducten*.

Allocation

Closed loop recycling

Production scrap is allocated with the 'closed loop recycling' calculation method. With closed loop recycling a correction is applied to the secondary content of the material based on the production scrap. The corrected secondary content is used for calculating module D.



Cut off

In line with paragraph 6.3.6 of the EN15804:A2, all significant input and output streams must be included in the calculations.

- A cut-off process may not contribute to more than 1% of the energy usage and may not exceed 1% of the mass. Processes excluded from the calculations may not contribute to more than 5% of the total energy usage or total mass.
- The sum of the processes excluded from the calculations, may not contribute to more than 5% of the total energy usage or total mass.

In line with EN 15804 the following processes are not considered within the system boundaries of this LCA.

- Overhead processes, like office departments, personal transportation, etc.
- Production, maintenance and the end-of-life stage of capital goods like buildings, machinery, etc.

It is not to be expected for the above-mentioned processes to contribute significantly to the environmental profile of warm roof decking.

Life cycle assessment results

Set 1, for product unit: 1 m² of warm roof decking of the type DELFT 160R/750, produced by Delft Profielen in Waalwijk, steel plate thickness of 0,75 mm

Environmental indicator	Unit	A1-A3	A4	A5	B1-B5	C1	C2	C3	C4	D
001. Abiotic depletion, non fuel (AD)	kg Sb eq.	1,26E-02	6,04E-06	4,31E-04	0,00E+00	2,87E-08	2,31E-07	5,16E-06	3,59E-09	-1,48E-03
002. Abiotic depletion, fuel (AD)	kg Sb eq.	2,07E-01	1,74E-03	6,64E-03	0,00E+00	1,27E-04	6,01E-04	1,94E-03	4,28E-05	-1,01E-01
004. Global warming (GWP)	kg CO ₂ eq.	3,28E+01	2,36E-01	1,05E+00	0,00E+00	1,80E-02	8,14E-02	2,96E-01	3,14E-03	-1,75E+01
005. Ozone layer depletion (ODP)	kg CFK-11 eq.	1,54E-06	4,19E-08	5,38E-08	0,00E+00	2,84E-09	1,50E-08	3,51E-08	1,04E-09	-3,80E-07
006. Photochemical oxidation (POCP)	kg ethyleen eq.	2,83E-02	1,43E-04	9,09E-04	0,00E+00	1,56E-05	4,80E-05	2,32E-04	3,33E-06	-1,88E-02
007. Acidification (AP)	kg SO ₂ eq.	1,69E-01	1,04E-03	5,55E-03	0,00E+00	1,15E-04	3,53E-04	2,56E-03	2,32E-05	-4,74E-02
008. Eutrophication (EP)	kg PO ₄ - eq.	2,72E-02	2,04E-04	9,18E-04	0,00E+00	2,58E-05	7,03E-05	5,49E-04	4,37E-06	-6,90E-03
009. Human toxicity (HT)	kg 1,4-DCB eq.	1,22E+01	9,95E-02	4,57E-01	0,00E+00	5,82E-03	3,26E-02	2,83E-01	1,28E-03	-5,63E+00
010. Ecotoxicity, fresh water (FAETP)	kg 1,4-DCB eq.	1,95E-01	2,90E-03	6,97E-03	0,00E+00	8,33E-05	9,55E-04	3,96E-03	3,19E-05	1,74E-02
012. Ecotoxicity, marine water (MAETP)	kg 1,4-DCB eq.	5,77E+02	1,04E+01	1,99E+01	0,00E+00	2,92E-01	3,45E+00	2,38E+01	1,10E-01	-6,01E+01
014. Ecotoxicity, terrestrial (TETP)	kg 1,4-DCB eq.	6,69E-02	3,52E-04	2,64E-03	0,00E+00	2,42E-05	1,15E-04	9,24E-04	3,80E-06	4,30E-01
MKI	€	€ 3,81	€ 0,03	€ 0,13	€ 0,00	€ 0,00	€ 0,01	€ 0,06	€ 0,00	-€ 1,67

Life cycle assessment results

Set 2, for product unit: 1 m² of warm roof decking of the type DELFT 160R/750, produced by Delft Profielen in Waalwijk, steel plate thickness of 0,75 mm

Environmental indicator	Unit	A1-A3	A4	A5	B1-B5	C1	C2	C3	C4	D
051. Climate change	kg CO ₂ eq.	3,39E+01	2,38E-01	1,08E+00	0,00E+00	1,83E-02	8,22E-02	3,19E-01	5,10E-03	-1,83E+01
052. Climate change – Fossil	kg CO ₂ eq.	3,39E+01	2,38E-01	1,08E+00	0,00E+00	1,83E-02	8,21E-02	3,01E-01	3,21E-03	-1,83E+01
053. Climate change – Biogenic	kg CO ₂ eq.	-1,89E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,71E-02	1,89E-03	0,00E+00
054. Climate change - Land use and LU change	kg CO ₂ eq.	2,72E-02	8,73E-05	9,52E-04	0,00E+00	1,41E-06	2,57E-05	3,43E-04	1,41E-06	4,39E-03
055. Ozone depletion	kg CFC11 eq.	1,39E-06	5,26E-08	5,07E-08	0,00E+00	3,52E-09	1,88E-08	4,08E-08	1,31E-09	-2,46E-07
056. Acidification	mol H ⁺ eq.	2,45E-01	1,38E-03	8,06E-03	0,00E+00	1,60E-04	4,68E-04	3,21E-03	3,05E-05	-6,16E-02
057. Eutrophication, freshwater	kg P eq.	1,65E-03	2,40E-06	5,46E-05	0,00E+00	1,21E-07	1,20E-06	8,79E-05	5,74E-08	-8,37E-04
058. Eutrophication, marine	kg N eq.	3,30E-02	4,87E-04	1,15E-03	0,00E+00	6,96E-05	1,63E-04	7,20E-04	1,01E-05	-1,20E-02
059. Eutrophication, terrestrial	mol N eq.	7,49E-01	5,37E-03	2,52E-02	0,00E+00	7,64E-04	1,80E-03	8,44E-03	1,11E-04	-1,24E-01
060. Photochemical ozone formation	kg NMVOC eq.	1,24E-01	1,53E-03	4,21E-03	0,00E+00	2,10E-04	5,13E-04	2,26E-03	3,23E-05	-6,21E-02
061. Resource use, minerals and metals ²	kg Sb eq.	1,26E-02	6,04E-06	4,31E-04	0,00E+00	2,87E-08	2,31E-07	5,15E-06	3,59E-09	-1,48E-03
062. Resource use, fossils ²	MJ	3,19E+02	3,59E+00	1,04E+01	0,00E+00	2,61E-01	1,26E+00	4,09E+00	8,97E-02	-1,22E+02
063. Water use ²	m ³ depriv.	6,88E+00	1,29E-02	2,24E-01	0,00E+00	7,63E-04	7,40E-03	4,75E-02	4,16E-03	-1,86E+00
064. Particulate matter	disease inc.	2,19E-06	2,14E-08	7,61E-08	0,00E+00	4,10E-09	7,36E-09	4,22E-08	5,76E-10	-7,11E-07
065. Ionising radiation ¹	kBq U-235 eq.	6,70E-01	1,51E-02	2,32E-02	0,00E+00	9,57E-04	5,39E-03	1,85E-02	3,67E-04	3,35E-02
066. Ecotoxicity, freshwater ²	CTUe	8,53E+02	3,20E+00	2,77E+01	0,00E+00	1,50E-01	8,12E-01	9,64E+00	5,00E-02	-5,38E+02
067. Human toxicity, cancer ²	CTUh	1,02E-07	1,04E-10	3,30E-09	0,00E+00	5,17E-12	3,44E-11	2,99E-10	1,27E-12	-2,39E-08
068. Human toxicity, non-cancer ²	CTUh	7,78E-07	3,50E-09	2,67E-08	0,00E+00	1,24E-10	1,15E-09	1,30E-08	3,99E-11	1,74E-06
069. Land use ²	Pt	9,18E+01	3,12E+00	3,27E+00	0,00E+00	2,86E-02	1,07E+00	7,61E+00	1,90E-01	-2,46E+01

¹ Disclaimer 1 – This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

² Disclaimer 2 – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

Life cycle assessment results

Material use, waste and outputs for product unit: *1 m² of warm roof decking of the type DELFT 160R/750, produced by Delft Profielen in Waalwijk, steel plate thickness of 0,75 mm*

Environmental indicator	Unit	A1-A3	A4	A5	B1-B5	C1	C2	C3	C4	D
111. Energy, primary, renewable, excluding usage as material	MJ	1,90E+01	4,50E-02	6,19E-01	0,00E+00	1,37E-03	1,71E-02	5,97E-01	2,29E-03	1,72E-01
113. Energy, primary, renewable, used as material	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
101. Energy, primary, renewable (MJ)	MJ	1,90E+01	4,50E-02	6,19E-01	0,00E+00	1,37E-03	1,71E-02	5,97E-01	2,29E-03	1,72E-01
112. Energy, primary, non-renewable, excluding usage as material	MJ	3,59E+02	3,82E+00	1,17E+01	0,00E+00	2,79E-01	1,34E+00	4,35E+00	9,56E-02	-5,42E+01
114. Energy, primary, non-renewable, used as material	MJ	4,94E-01	0,00E+00	1,48E-02	0,00E+00	6,01E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00
102. Energy, primary, non-renewable (MJ)	MJ	3,59E+02	3,82E+00	1,17E+01	0,00E+00	2,79E-01	1,34E+00	4,35E+00	9,56E-02	-5,42E+01
108. Secondary material (kg)	kg	1,26E+00	0,00E+00	3,93E-02	0,00E+00	1,09E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00
109. Secondary fuel, renewable (kg)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
110. Secondary fuel, non-renewable (kg)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
104. Water, fresh water use (m ³)	m ³	2,58E-01	4,38E-04	8,25E-03	0,00E+00	2,67E-05	2,41E-04	1,30E-03	9,63E-05	-8,89E-03
106. Waste, hazardous (kg)	kg	3,66E-03	9,11E-06	1,19E-04	0,00E+00	6,15E-07	7,75E-07	4,94E-06	6,33E-08	-7,66E-04
105. Waste, non hazardous (kg)	kg	4,10E+00	2,28E-01	1,70E-01	0,00E+00	3,23E-04	7,69E-02	1,19E-01	5,88E-01	-6,71E-01
107. Waste, radioactive (kg)	kg	7,19E-04	2,36E-05	2,57E-05	0,00E+00	1,49E-06	8,47E-06	2,36E-05	5,86E-07	4,55E-05
120. Components for re-use (kg)	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
121. Materials for recycling (kg)	kg	2,18E-04	0,00E+00	3,48E-01	0,00E+00	0,00E+00	0,00E+00	1,12E+01	0,00E+00	0,00E+00
122. Materials for energy recovery (kg)	kg	3,71E-03	0,00E+00	4,04E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
123. Exported energy, electric (MJ)	MJ	9,34E-03	0,00E+00	1,02E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
124. Exported energy, thermal (MJ)	MJ	1,61E-02	0,00E+00	1,75E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Contribution analysis of reference product

Contribution analysis

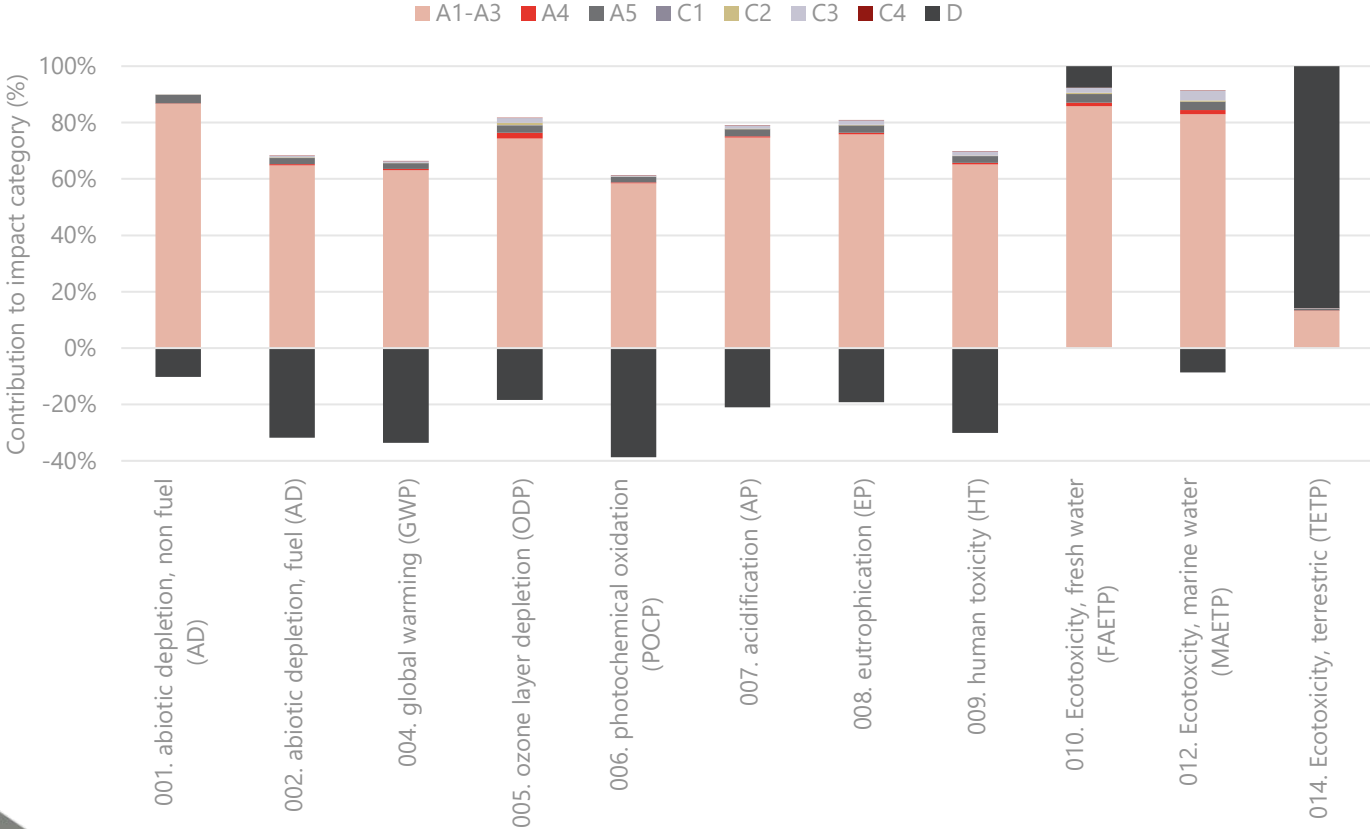
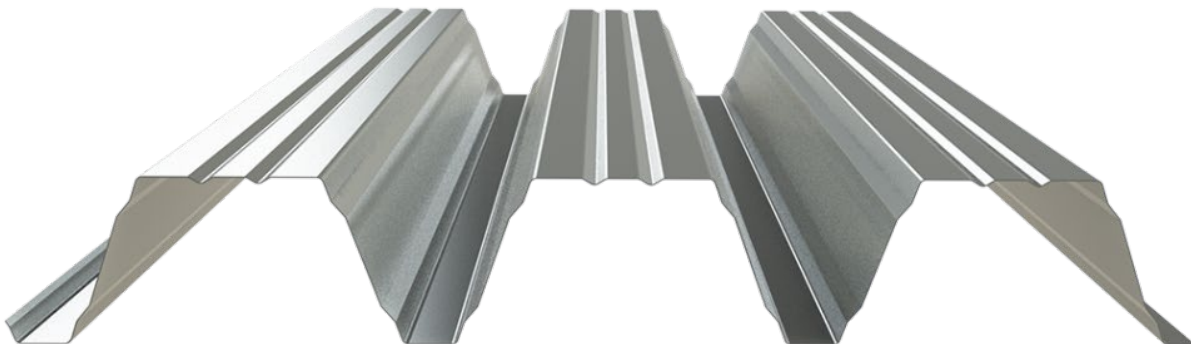
Overall, most of the impact categories are dominated by the production (A1-A3) of the cold-rolled steel and its galvanization.

Another important factor is the high share of steel that is recycled. While the impact during the end-of-life stages is minimal, the benefits in terms of environmental impact reduction, particularly in module D, are substantial.

The use of packaging materials, energy consumption and transport have a low relevance regarding the considered impact categories.

Variability for average declaration

The reference product has the galvanization and coating as represented by the weighted average of the production in the reference year. In accordance with the Bepalingsmethode, all impact categories of set 1 (EN 15804/A1:2013) have a variability below 20% due to the weighted average. For set 2 (EN 15804/A2:2019), only *Climate change – Land use, Acidification, Eutrophication – terrestrial and Resource use, minerals and metals* have a variability of more than 20%.



Biogenic content

The warm roof decking by Delft Profielen itself does not contain biogenic content. The wooden packaging materials do contain biogenic carbon.

Biogenic carbon	Mass per kg billet	Biogenic carbon mass
Biogenic carbon in the product	-	0 kg C
Biogenic carbon in the packaging	0,0039 kg of wooden packaging, equal to 0,0059 kg CO ₂ emissions	0.0016 kg C
NOTE 1 kg biogenic carbon equals to 44/12 kg of CO ₂		



Scaling

The warm roof decking by Delft Profielen is produced with several thicknesses of cold-rolled steel plates, between 0,75 and 1,50 mm. Therefore, a scalable and non-scalable environmental profile has been modelled. These profiles are displayed on the next pages.

Steel plate thickness (mm)	Weight (kg/m ²)
0,75	11,77
0,88	13,81
1,00	15,70
1,13	17,74
1,25	19,63
1,50	23,55

Non-scalable environmental profile

The galvanization, coating, screws and the packaging materials are not dependent on the plate thickness. The non scalable part of the DELFT 160R/750 warm roof decking has a constant mass of 0,38 kg.

Scalable environmental profile

The scaling formula for the total mass of the warm roof decking is corrected for the mass of the non-scalable part.

Warm roof decking	Mass – non scalable part (kg)	Schaling formula – scalable part Y = kg/m ² , x = mm
DELFT 160R/750	0,3830	Y = 15,710x - 0,3952

Environmental profile of 1 m² of DELFT 160R/750

To obtain the environmental profile of 1 m² of DELFT 160R/750, the environmental profile of the non-scalable part must be summed to that of the scalable part for the relevant plate thickness.

Life cycle assessment results – scalable environmental profile

Set 1, for product unit: 1 kg DELFT 160R/750 – scalable profile

Environmental indicator	Unit	A1-A3	A4	A5	B1-B5	C1	C2	C3	C4	D
001. Abiotic depletion, non fuel (AD)	kg Sb eq.	7,03E-06	5,13E-07	2,43E-07	0,00E+00	0,00E+00	1,97E-08	4,38E-07	3,05E-10	-3,80E-07
002. Abiotic depletion, fuel (AD)	kg Sb eq.	1,61E-02	1,48E-04	4,95E-04	0,00E+00	0,00E+00	5,10E-05	1,65E-04	3,64E-06	-8,64E-03
004. Global warming (GWP)	kg CO ₂ eq.	2,60E+00	2,01E-02	7,98E-02	0,00E+00	0,00E+00	6,91E-03	2,52E-02	2,67E-04	-1,50E+00
005. Ozone layer depletion (ODP)	kg CFK-11 eq.	1,11E-07	3,56E-09	3,59E-09	0,00E+00	0,00E+00	1,27E-09	2,98E-09	8,84E-11	-3,19E-08
006. Photochemical oxidation (POCP)	kg ethyleen eq.	2,31E-03	1,21E-05	7,07E-05	0,00E+00	0,00E+00	4,08E-06	1,97E-05	2,83E-07	-1,62E-03
007. Acidification (AP)	kg SO ₂ eq.	9,07E-03	8,83E-05	2,84E-04	0,00E+00	0,00E+00	3,00E-05	2,17E-04	1,97E-06	-3,83E-03
008. Eutrophication (EP)	kg PO ₄ - eq.	1,25E-03	1,73E-05	3,98E-05	0,00E+00	0,00E+00	5,97E-06	4,67E-05	3,71E-07	-4,77E-04
009. Human toxicity (HT)	kg 1,4-DCB eq.	9,43E-01	8,45E-03	2,95E-02	0,00E+00	0,00E+00	2,77E-03	2,41E-02	1,09E-04	-4,80E-01
010. Ecotoxicity, fresh water (FAETP)	kg 1,4-DCB eq.	1,22E-02	2,47E-04	3,89E-04	0,00E+00	0,00E+00	8,11E-05	3,36E-04	2,71E-06	2,01E-03
012. Ecotoxicity, marine water (MAETP)	kg 1,4-DCB eq.	3,77E+01	8,88E-01	1,23E+00	0,00E+00	0,00E+00	2,93E-01	2,02E+00	9,32E-03	-3,40E+00
014. Ecotoxicity, terrestrial (TETP)	kg 1,4-DCB eq.	3,34E-03	2,99E-05	1,04E-04	0,00E+00	0,00E+00	9,80E-06	7,85E-05	3,23E-07	3,81E-02
MKI	€	€ 0,27	€ 0,00	€ 0,01	€ 0,00	€ 0,00	€ 0,00	€ 0,00	€ 0,00	-€ 0,14

Life cycle assessment results - scalable environmental profile

Set 2, for product unit: 1 kg DELFT 160R/750 – scalable profile

Environmental indicator	Unit	A1-A3	A4	A5	B1-B5	C1	C2	C3	C4	D
051. Climate change	kg CO ₂ eq.	2,68E+00	2,03E-02	8,27E-02	0,00E+00	0,00E+00	6,98E-03	3,89E-02	1,75E-03	-1,57E+00
052. Climate change – Fossil	kg CO ₂ eq.	2,70E+00	2,02E-02	8,27E-02	0,00E+00	0,00E+00	6,98E-03	2,56E-02	2,73E-04	-1,57E+00
053. Climate change – Biogenic	kg CO ₂ eq.	-1,48E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,33E-02	1,48E-03	0,00E+00
054. Climate change - Land use and LU change	kg CO ₂ eq.	9,01E-04	7,42E-06	2,83E-05	0,00E+00	0,00E+00	2,18E-06	2,92E-05	1,20E-07	4,39E-04
055. Ozone depletion	kg CFC11 eq.	9,67E-08	4,47E-09	3,22E-09	0,00E+00	0,00E+00	1,60E-09	3,47E-09	1,12E-10	-2,00E-08
056. Acidification	mol H ⁺ eq.	1,17E-02	1,17E-04	3,67E-04	0,00E+00	0,00E+00	3,98E-05	2,73E-04	2,59E-06	-4,96E-03
057. Eutrophication, freshwater	kg P eq.	1,11E-04	2,04E-07	3,57E-06	0,00E+00	0,00E+00	1,02E-07	7,47E-06	4,88E-09	-4,44E-05
058. Eutrophication, marine	kg N eq.	2,34E-03	4,14E-05	7,44E-05	0,00E+00	0,00E+00	1,39E-05	6,12E-05	8,55E-07	-9,62E-04
059. Eutrophication, terrestrial	mol N eq.	2,70E-02	4,56E-04	8,59E-04	0,00E+00	0,00E+00	1,53E-04	7,17E-04	9,42E-06	-9,62E-03
060. Photochemical ozone formation	kg NMVOC eq.	9,78E-03	1,30E-04	3,07E-04	0,00E+00	0,00E+00	4,36E-05	1,92E-04	2,75E-06	-5,17E-03
061. Resource use, minerals and metals ²	kg Sb eq.	7,03E-06	5,13E-07	2,43E-07	0,00E+00	0,00E+00	1,96E-08	4,38E-07	3,05E-10	-3,77E-07
062. Resource use, fossils ²	MJ	2,41E+01	3,05E-01	7,49E-01	0,00E+00	0,00E+00	1,07E-01	3,47E-01	7,62E-03	-1,04E+01
063. Water use ²	m ³ depriv.	5,14E-01	1,09E-03	1,56E-02	0,00E+00	0,00E+00	6,29E-04	4,04E-03	3,53E-04	-1,66E-01
064. Particulate matter	disease inc.	1,23E-07	1,82E-09	3,90E-09	0,00E+00	0,00E+00	6,26E-10	3,58E-09	4,90E-11	-5,93E-08
065. Ionising radiation ¹	kBq U-235 eq.	4,75E-02	1,28E-03	1,53E-03	0,00E+00	0,00E+00	4,58E-04	1,57E-03	3,12E-05	3,52E-03
066. Ecotoxicity, freshwater ²	CTUe	5,37E+01	2,72E-01	1,65E+00	0,00E+00	0,00E+00	6,90E-02	8,19E-01	4,25E-03	-3,62E+01
067. Human toxicity, cancer ²	CTUh	8,50E-09	8,83E-12	2,57E-10	0,00E+00	0,00E+00	2,92E-12	2,54E-11	1,08E-13	-2,04E-09
068. Human toxicity, non-cancer ²	CTUh	4,45E-08	2,98E-10	1,39E-09	0,00E+00	0,00E+00	9,80E-11	1,10E-09	3,39E-12	1,57E-07
069. Land use ²	Pt	7,15E+00	2,65E-01	2,47E-01	0,00E+00	0,00E+00	9,08E-02	6,47E-01	1,61E-02	-2,03E+00

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² Disclaimer 2 – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

Life cycle assessment results - scalable environmental profile

Material use, waste and outputs for product unit: 1 kg DELFT 160R/750 – scalable profile

Environmental indicator	Unit	A1-A3	A4	A5	B1-B5	C1	C2	C3	C4	D
111. Energy, primary, renewable, excluding usage as material	MJ	1,30E+00	3,82E-03	4,07E-02	0,00E+00	0,00E+00	1,46E-03	5,08E-02	1,95E-04	1,69E-02
113. Energy, primary, renewable, used as material	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
101. Energy, primary, renewable (MJ)	MJ	1,30E+00	3,82E-03	4,07E-02	0,00E+00	0,00E+00	1,46E-03	5,08E-02	1,95E-04	1,69E-02
112. Energy, primary, non-renewable, excluding usage as material	MJ	2,73E+01	3,24E-01	8,45E-01	0,00E+00	0,00E+00	1,14E-01	3,70E-01	8,12E-03	-4,76E+00
114. Energy, primary, non-renewable, used as material	MJ	7,36E-06	0,00E+00	2,21E-07	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
102. Energy, primary, non-renewable (MJ)	MJ	2,73E+01	3,24E-01	8,45E-01	0,00E+00	0,00E+00	1,14E-01	3,70E-01	8,12E-03	-4,76E+00
108. Secondary material (kg)	kg	1,11E-01	0,00E+00	3,32E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
109. Secondary fuel, renewable (kg)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
110. Secondary fuel, non-renewable (kg)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
104. Water, freshwater use (m3)	m ³	1,80E-02	3,72E-05	5,46E-04	0,00E+00	0,00E+00	2,05E-05	1,10E-04	8,19E-06	-7,81E-04
106. Waste, hazardous (kg)	kg	1,45E-04	7,74E-07	4,39E-06	0,00E+00	0,00E+00	6,58E-08	4,20E-07	5,38E-09	-6,73E-05
105. Waste, non-hazardous (kg)	kg	3,32E-01	1,94E-02	1,31E-02	0,00E+00	0,00E+00	6,54E-03	1,01E-02	5,00E-02	-5,89E-02
107. Waste, radioactive (kg)	kg	5,27E-05	2,00E-06	1,74E-06	0,00E+00	0,00E+00	7,20E-07	2,00E-06	4,98E-08	3,99E-06
120. Components for re-use (kg)	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
121. Materials for recycling (kg)	kg	1,85E-05	0,00E+00	2,96E-02	0,00E+00	0,00E+00	0,00E+00	9,50E-01	0,00E+00	0,00E+00
122. Materials for energy recovery (kg)	kg	3,15E-04	0,00E+00	3,43E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
123. Exported energy, electric (MJ)	MJ	7,94E-04	0,00E+00	8,64E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
124. Exported energy, thermal (MJ)	MJ	1,37E-03	0,00E+00	1,49E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Life cycle assessment results – non-scalable environmental profile

Set 1, for product unit: 1 m² DELFT 160R/750 – non-scalable profile

Environmental indicator	Unit	A1-A3	A4	A5	B1-B5	C1	C2	C3	C4	D
001. Abiotic depletion, non fuel (AD)	kg Sb eq.	1,25E-02	1,96E-07	4,28E-04	0,00E+00	2,87E-08	7,53E-09	1,68E-07	1,17E-10	-1,47E-03
002. Abiotic depletion, fuel (AD)	kg Sb eq.	2,33E-02	5,65E-05	1,01E-03	0,00E+00	1,27E-04	1,95E-05	6,31E-05	1,39E-06	-2,95E-03
004. Global warming (GWP)	kg CO ₂ eq.	3,17E+00	7,69E-03	1,40E-01	0,00E+00	1,80E-02	2,65E-03	9,64E-03	1,02E-04	-4,29E-01
005. Ozone layer depletion (ODP)	kg CFK-11 eq.	2,75E-07	1,36E-09	1,29E-08	0,00E+00	2,84E-09	4,88E-10	1,14E-09	3,39E-11	-1,71E-08
006. Photochemical oxidation (POCP)	kg ethyleen eq.	2,01E-03	4,64E-06	1,05E-04	0,00E+00	1,56E-05	1,56E-06	7,56E-06	1,08E-07	-3,58E-04
007. Acidification (AP)	kg SO ₂ eq.	6,52E-02	3,38E-05	2,32E-03	0,00E+00	1,15E-04	1,15E-05	8,33E-05	7,56E-07	-3,84E-03
008. Eutrophication (EP)	kg PO ₄ - eq.	1,30E-02	6,64E-06	4,64E-04	0,00E+00	2,58E-05	2,29E-06	1,79E-05	1,42E-07	-1,46E-03
009. Human toxicity (HT)	kg 1,4-DCB eq.	1,44E+00	3,24E-03	1,21E-01	0,00E+00	5,82E-03	1,06E-03	9,22E-03	4,17E-05	-1,60E-01
010. Ecotoxicity, fresh water (FAETP)	kg 1,4-DCB eq.	5,57E-02	9,45E-05	2,54E-03	0,00E+00	8,33E-05	3,11E-05	1,29E-04	1,04E-06	-5,55E-03
012. Ecotoxicity, marine water (MAETP)	kg 1,4-DCB eq.	1,47E+02	3,40E-01	5,81E+00	0,00E+00	2,92E-01	1,12E-01	7,75E-01	3,57E-03	-2,13E+01
014. Ecotoxicity, terrestrial (TETP)	kg 1,4-DCB eq.	2,88E-02	1,14E-05	1,46E-03	0,00E+00	2,42E-05	3,75E-06	3,01E-05	1,24E-07	-3,19E-03
MKI	€	€ 0,69	€ 0,00	€ 0,03	€ 0,00	€ 0,00	€ 0,00	€ 0,00	€ 0,00	-€ 0,07

Life cycle assessment results – non-scalable environmental profile

Set 2, for product unit: 1 m² DELFT 160R/750 – non-scalable profile

Environmental indicator	Unit	A1-A3	A4	A5	B1-B5	C1	C2	C3	C4	D
051. Climate change	kg CO ₂ eq.	3,23E+00	7,76E-03	1,43E-01	0,00E+00	1,83E-02	2,67E-03	1,04E-02	1,66E-04	-4,43E-01
052. Climate change – Fossil	kg CO ₂ eq.	3,22E+00	7,75E-03	1,42E-01	0,00E+00	1,83E-02	2,67E-03	9,80E-03	1,04E-04	-4,43E-01
053. Climate change – Biogenic	kg CO ₂ eq.	-6,17E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,55E-04	6,17E-05	0,00E+00
054. Climate change - Land use and LU change	kg CO ₂ eq.	1,69E-02	2,84E-06	6,30E-04	0,00E+00	1,41E-06	8,36E-07	1,12E-05	4,60E-08	-6,07E-04
055. Ozone depletion	kg CFC11 eq.	2,91E-07	1,71E-09	1,41E-08	0,00E+00	3,52E-09	6,11E-10	1,33E-09	4,27E-11	-1,81E-08
056. Acidification	mol H ⁺ eq.	1,11E-01	4,50E-05	3,88E-03	0,00E+00	1,60E-04	1,52E-05	1,05E-04	9,92E-07	-5,09E-03
057. Eutrophication, freshwater	kg P eq.	3,91E-04	7,82E-08	1,40E-05	0,00E+00	1,21E-07	3,90E-08	2,86E-06	1,87E-09	-3,31E-04
058. Eutrophication, marine	kg N eq.	6,39E-03	1,58E-05	3,00E-04	0,00E+00	6,96E-05	5,31E-06	2,34E-05	3,27E-07	-1,05E-03
059. Eutrophication, terrestrial	mol N eq.	4,41E-01	1,75E-04	1,54E-02	0,00E+00	7,64E-04	5,86E-05	2,75E-04	3,61E-06	-1,46E-02
060. Photochemical ozone formation	kg NMVOC eq.	1,27E-02	4,99E-05	7,19E-04	0,00E+00	2,10E-04	1,67E-05	7,36E-05	1,05E-06	-3,25E-03
061. Resource use, minerals and metals ²	kg Sb eq.	1,25E-02	1,96E-07	4,28E-04	0,00E+00	2,87E-08	7,52E-09	1,68E-07	1,17E-10	-1,47E-03
062. Resource use, fossils ²	MJ	4,44E+01	1,17E-01	1,90E+00	0,00E+00	2,61E-01	4,09E-02	1,33E-01	2,92E-03	-4,46E+00
063. Water use ²	m ³ depriv.	1,03E+00	4,18E-04	4,56E-02	0,00E+00	7,63E-04	2,41E-04	1,55E-03	1,35E-04	2,73E-02
064. Particulate matter	disease inc.	7,90E-07	6,96E-10	3,17E-08	0,00E+00	4,10E-09	2,40E-10	1,37E-09	1,87E-11	-3,56E-08
065. Ionising radiation ¹	kBq U-235 eq.	1,30E-01	4,90E-04	5,74E-03	0,00E+00	9,57E-04	1,75E-04	6,00E-04	1,19E-05	-6,55E-03
066. Ecotoxicity, freshwater ²	CTUe	2,42E+02	1,04E-01	8,90E+00	0,00E+00	1,50E-01	2,64E-02	3,14E-01	1,63E-03	-1,26E+02
067. Human toxicity, cancer ²	CTUh	5,41E-09	3,38E-12	3,73E-10	0,00E+00	5,17E-12	1,12E-12	9,71E-12	4,12E-14	-6,96E-10
068. Human toxicity, non-cancer ²	CTUh	2,71E-07	1,14E-10	1,09E-08	0,00E+00	1,24E-10	3,75E-11	4,22E-10	1,30E-12	-4,55E-08
069. Land use ²	Pt	1,04E+01	1,01E-01	4,59E-01	0,00E+00	2,86E-02	3,48E-02	2,48E-01	6,17E-03	-1,56E+00

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Life cycle assessment results – non-scalable environmental profile

Material use, waste and outputs for product unit: 1 m² DELFT 160R/750 – non-scalable profile

Environmental indicator	Unit	A1-A3	A4	A5	B1-B5	C1	C2	C3	C4	D
111. Energy, primary, renewable, excluding usage as material	MJ	4,17E+00	1,46E-03	1,55E-01	0,00E+00	1,37E-03	5,58E-04	1,94E-02	7,46E-05	-2,05E-02
113. Energy, primary, renewable, used as material	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
101. Energy, primary, renewable (MJ)	MJ	4,17E+00	1,46E-03	1,55E-01	0,00E+00	1,37E-03	5,58E-04	1,94E-02	7,46E-05	-2,05E-02
112. Energy, primary, non-renewable, excluding usage as material	MJ	4,80E+01	1,24E-01	2,04E+00	0,00E+00	2,79E-01	4,36E-02	1,42E-01	3,11E-03	-1,05E-03
114. Energy, primary, non-renewable, used as material	MJ	4,94E-01	0,00E+00	1,48E-02	0,00E+00	6,01E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00
102. Energy, primary, non-renewable (MJ)	MJ	4,85E+01	1,24E-01	2,06E+00	0,00E+00	2,79E-01	4,36E-02	1,42E-01	3,11E-03	-1,05E-03
108. Secondary material (kg)	kg	7,43E-05	0,00E+00	1,50E-03	0,00E+00	1,09E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00
109. Secondary fuel, renewable (kg)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
110. Secondary fuel, non-renewable (kg)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
104. Water, freshwater use (m3)	m ³	5,33E-02	1,42E-05	2,02E-03	0,00E+00	2,67E-05	7,84E-06	4,23E-05	3,13E-06	-2,86E-07
106. Waste, hazardous (kg)	kg	2,01E-03	2,96E-07	6,88E-05	0,00E+00	6,15E-07	2,52E-08	1,61E-07	2,06E-09	-3,48E-09
105. Waste, non-hazardous (kg)	kg	3,15E-01	7,42E-03	2,09E-02	0,00E+00	3,23E-04	2,50E-03	3,87E-03	1,91E-02	-3,69E-05
107. Waste, radioactive (kg)	kg	1,19E-04	7,68E-07	5,87E-06	0,00E+00	1,49E-06	2,76E-07	7,67E-07	1,91E-08	-6,34E-09
120. Components for re-use (kg)	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
121. Materials for recycling (kg)	kg	7,10E-06	0,00E+00	1,13E-02	0,00E+00	0,00E+00	0,00E+00	3,64E-01	0,00E+00	0,00E+00
122. Materials for energy recovery (kg)	kg	1,21E-04	0,00E+00	1,31E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
123. Exported energy, electric (MJ)	MJ	3,04E-04	0,00E+00	3,31E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
124. Exported energy, thermal (MJ)	MJ	5,23E-04	0,00E+00	5,70E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Custom transport distances (A4)

The transport distance from the Delft Profielen production location to the construction site (A4) has been modelled as 150 km, in line with the Bepalingsmethode. This transport distance is representative for construction sites within the Netherlands.

The environmental impact in A4 can be calculated for specific construction sites with the environmental profile of the transport process that has been used: *0001-tra&Transport, vrachtwagen (o.b.v. Transport, freight, lorry, unspecified {GLO} market group for transport, freight, lorry, unspecified | Cut-off, U)(NMD 3.6 database)*. The environmental profile of the process is displayed on the right for 1 tkm driven.

Calculation method

The table below shows the product mass for the DELFT 160R/750 warm roof decks. To calculate the transport in tkm, you need to consider the mass in tons and the distance in km. For example, 1 m² of DELFT 160R/750 with a plate thickness of 0,75 mm, has a mass of 11,77 kg. For a transport distance of 500 km, the transport in tkm would be 0,01177*500 = 5,885. This would be the multiplication factor for the environmental profile of transport within A4.

Steel plate thickness (mm)	Weight (kg/m ²)
0,75	11,77
0,88	13,81
1,00	15,70
1,13	17,74
1,25	19,63
1,50	23,55

Impact category	Unit	0001-tra&Transport, vrachtwagen (1 tkm)
001. Abiotic depletion, non fuel (AD)	kg Sb eq.	3,42E-06
002. Abiotic depletion, fuel (AD)	kg Sb eq.	9,84E-04
004. Global warming (GWP)	kg CO ₂ eq.	1,34E-01
005. Ozone layer depletion (ODP)	kg CFK-11 eq.	2,37E-08
006. Photochemical oxidation (POCP)	kg ethyleen eq.	8,07E-05
007. Acidification (AP)	kg SO ₂ eq.	5,88E-04
008. Eutrophication (EP)	kg PO ₄ - eq.	1,16E-04
009. Human toxicity (HT)	kg 1,4-DCB eq.	5,63E-02
010. Ecotoxicity, freshwater (FAETP)	kg 1,4-DCB eq.	1,64E-03
012. Ecotoxicity, marine water (MAETP)	kg 1,4-DCB eq.	5,92E+00
014. Ecotoxicity, terrestrial (TETP)	kg 1,4-DCB eq.	1,99E-04
051. Climate change	kg CO ₂ eq.	1,35E-01
052. Climate change - Fossil	kg CO ₂ eq.	1,35E-01
053. Climate change - Biogenic	kg CO ₂ eq.	6,23E-05
054. Climate change - Land use and LU ch	kg CO ₂ eq.	4,95E-05
055. Ozone depletion	kg CFC11 eq.	2,98E-08
056. Acidification	mol H ⁺ eq.	7,83E-04
057. Eutrophication, freshwater	kg P eq.	1,36E-06
058. Eutrophication, marine	kg N eq.	2,76E-04
059. Eutrophication, terrestrial	mol N eq.	3,04E-03
060. Photochemical ozone formation	kg NMVOC eq.	8,68E-04
061. Resource use, minerals and metals	kg Sb eq.	3,42E-06
062. Resource use, fossils	MJ	2,04E+00
063. Water use	m ³ depriv.	7,28E-03
064. Particulate matter	disease inc.	1,21E-08
065. Ionising radiation	kBq U-235 eq.	8,53E-03
066. Ecotoxicity, freshwater	CTUe	1,81E+00
067. Human toxicity, cancer	CTUh	5,89E-11
068. Human toxicity, non-cancer	CTUh	1,98E-09
069. Land use	Pt	1,77E+00
111. Energy, primary, renewable, excludi	MJ	0,00E+00
113. Energy, primary, renewable, materia	MJ	0,00E+00
101. Energy, primary, renewable (MJ)	MJ	2,55E-02
112. Energy, primary, non-renewable, exc	MJ	0,00E+00
114. Energy, primary, non-renewable, mat	MJ	0,00E+00
102. Energy, primary, non-renewable (MJ)	MJ	2,16E+00
108. Secondary material (kg)	kg	0,00E+00
109. Secondary fuel, renewable (kg)	MJ	0,00E+00
110. Secondary fuel, non-renewable (kg)	MJ	0,00E+00
104. Water, freshwater use (m3)	m ³	2,48E-04
106. Waste, hazardous (kg)	kg	5,16E-06
105. Waste, non hazardous (kg)	kg	1,29E-01
107. Waste, radioactive (kg)	kg	1,34E-05
120. Components for re-use (kg)	kg	0,00E+00
121. Materials for recycling (kg)	kg	0,00E+00
122. Materials for energy recovery (kg)	kg	0,00E+00
123. Exported energy, electric (MJ)	MJ	0,00E+00
124. Exported energy, thermal (MJ)	MJ	0,00E+00