

## ENVIRONMENTAL PRODUCT DECLARATION

# PRESSED AND COATED METAL ROOFING SYSTEMS

TILCOR ROOFING SYSTEMS



Tilcor and Metrotile roofing systems installed with fasteners, underlayment, strip, and hip and ridge components.



Ross Roof Group has been involved in roofing for over 5 generations since 1942. Its stone-coated and satin-finish Tilcor and Metrotile roofing systems incorporate cutting-edge Zincalume protective steel, giving the panels a significantly longer service life than typical galvanised panels.

They source the purest steel and manufacture to the highest standards at their ISO 9001 accredited factory. Their roofing systems deliver on quality, durability, and ease of installation. Tested and proven in extreme weather events and backed by one of the best warranties in the market, there is no need to compromise between looks and durability.

Ross Roof Group values the environment they live in. They understand the importance of sustainable construction. This EPD demonstrates the role Pressed Metal panels can play in any sustainable project.



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**PRESSED AND COATED METAL ROOFING TILES**  
Product Specific EPD

According to ISO 14025,  
EN 15804:2012 and ISO 21930:2017

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL Environment 333 Pfingsten Road Northbrook, IL 60611	<a href="https://www.ul.com/">https://www.ul.com/</a> <a href="https://spot.ul.com">https://spot.ul.com</a>
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	General Program Instructions v.2.5 March 2020	
MANUFACTURER NAME AND ADDRESS	Ross Roof Group 3 Inlet Road Takanini, Auckland 2112 New Zealand	
DECLARATION NUMBER	4788415833.101.1	
DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT	Pressed and Coated Metal Roofing System Tiles; 100 square meters of roof area covered	
REFERENCE PCR AND VERSION NUMBER	Insulated Metal Panels, Metal Composite Panels, and Metal Cladding: Roof and Wall Panels v2.0, October 2018	
DESCRIPTION OF PRODUCT APPLICATION/USE	Roofing System for application on pitched roofs	
MARKETS OF APPLICABILITY	North America, EU & Global	
DATE OF ISSUE	October 1, 2020	
PERIOD OF VALIDITY	5 Years	
EPD TYPE	Product-Specific	
EPD SCOPE	Cradle to gate with options (A4, C3, C4 and D)	
YEAR(S) OF REPORTED PRIMARY DATA	July 2016 to June 2017	
LCA SOFTWARE & VERSION NUMBER	GaBi 9.2 (Sphera 2020)	
LCI DATABASE(S) & VERSION NUMBER	GaBi LCI Database 2020 (Sphera 2020)	
LCIA METHODOLOGY & VERSION NUMBER	TRACI 2.1 v1.05	

This PCR review was conducted by:	UL Environment
	PCR Review Panel
	<a href="mailto:epd@ulenvironment.com">epd@ulenvironment.com</a>
This declaration was independently verified in accordance with ISO 14025: 2006. <input type="checkbox"/> INTERNAL <input checked="" type="checkbox"/> EXTERNAL	<i>Grant R. Martin</i>
	Grant R. Martin, UL Environment
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	<i>Thomas P. Gloria</i>
	Thomas P. Gloria, Industrial Ecology Consultants

**LIMITATIONS**

Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc.

Accuracy of Results: EPDs regularly rely on estimations of impacts; the level of accuracy in estimation of effect differs for any particular product line and reported impact.

Comparability: EPDs from different programs may not be comparable. Full conformance with a PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible. Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.

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## 1. Product Definition and Information

### 1.0. Description of Company/Organization

Ross Roof Group is a family owned business with a proud history. They have over 75 years of experience in roofing and their focus on innovation and continuous improvement has put them in a strong position for the future. They have a culture where people matter and are treated with respect. As a result, they have strong passionate team, and this flows through into the quality of our products.

Ross Roof Group provide aesthetically pleasing lightweight roofs that stand up to the toughest environmental conditions. Their range of exceptionally crafted stone coated steel roofing profiles are specifically designed to suit specific architectural styles. Their advanced roofing systems lead the way in innovation, tested and proven in over 80 countries around the world.

They take their environmental responsibilities seriously and focus on their operation activities to improve energy efficiency and sustainability in the building industry. They also use the latest technology to ensure they reduce their carbon footprint and deliver environmentally preferable products wherever possible to their customers.

Their products are supported by a passionate team that go out of their way to help business partners achieve success.

Please visit [www.rossroofgroup.com](http://www.rossroofgroup.com) for the most up to date information.

### 1.1. Product Description

#### Product Identification

All products within this EPD are roofing products manufactured by Ross Roof Group for the building and construction industry. All products have been produced at Ross Roof Group's manufacturing facility in Auckland, New Zealand. The following Construction Specifications Institute (CSI) and United Nations Standard Products and Services Code (UNSPSC) codes are applicable for products in this EPD.

Construction Specifications Institute (CSI):

- 074113.13 Formed Metal Roof Panels

United Nations Standard Products and Services Code (UNSPSC) is 4299 with the following section, division, group and class:

- Section: 4 - Metal products, machinery and equipment
- Division: 42 - Fabricated metal products, except machinery and equipment
- Group: 429 - Other fabricated metal products
- Class: 4299 - Other metal goods

United Nations Central Product Classification (UNCPC) is also included for Australasian markets:

- 54530 Roofing and waterproofing services



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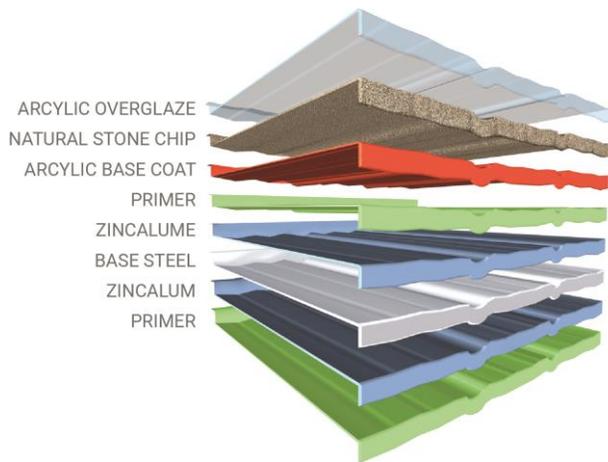
## PRESSED AND COATED METAL ROOFING TILES Product Specific EPD

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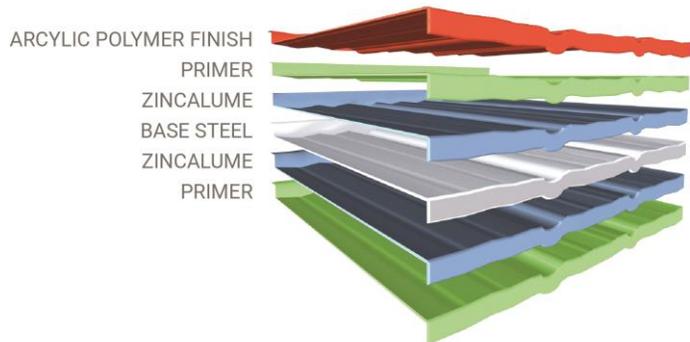
**Table 1: Product specification for the Ross Roof Group products declared in this EPD**

PROFILE	LENGTH (MM)	WIDTH (MM)	HEIGHT (MM)
Antica	1300	428	29
Bond	1330	425	14
Classic	1330	418	18
CF Shake	1335	424	24
CF Shingle	1335	422	20.5
CF Slate	1340	290	12
Roman	1295	420	29
Royal	1350	420	24
Shake	1345	411	10
Tudor	1335	414	18

### Textured Profile Layers



### Satin Profile Layers



### Product Average

Results for a representative product is presented in this EPD, where similarity among the roofing tiles enable them to be grouped into three categories based on the coating material: Natural stone coated tiles; Ceramic stone coated tiles, and Satin coated tiles. The manufacturing process, base metal material and metal thickness is the same for all products. Only the coating materials differ between the three product groups. Rather than a single average product, LCA results have been calculated for a representative product within each group. The Antica tile is the reference tile for each product group. The Antica tile shows the highest impacts over all relevant impact categories due to a) a higher weight per square meter of tile and b) higher cut-offs, both due to Antica's wave like shape. This selection is considered to be a conservative approach.



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## 1.2. Application

The product is intended for use as roofing material - to provide weather proofing via roofing systems. Applications for this study include roofing for Residential, Light Commercial, Religious, Aged Care, Education, Agricultural, Hotels, Resorts, Historic Buildings and re-roofing.

Ross Roof Group products are made from Zinalume® protective steel, giving the tiles a significantly longer service life than typical galvanised steel. They also have Class 4 (highest possible) impact resistance rating and Class A (highest possible) fire rating. As a lightweight roofing system, they often require less structural support than concrete or clay roofs and will not crack or shatter in earthquakes.

Due to Above Sheathing Insulation (ASV) the roofing system is considered a 'cool roof' leading to a more energy efficient home and removing issues like ice damming. The product meets the World Health Organisation's standards for potable water ensuring water run-off can be collected where town supply is not available.

With a range of expertly crafted profiles and colours, there is no need to compromise between looks and durability.



## 1.3. Installation

Roofs are installed as a complete system; the modular nature of the products means that our product requires minimal space on site and very few tools to install. The cuts and bends can be made with hand operated guillotines and benders further reducing noise on site. As our roofs are safe to collect water off, metal off-cuts are collected and removed from site minimising impact on the surrounding environment.

## 1.4. Declaration of Methodological Framework

This EPD is cradle to gate with modules A1-A3, A4, C3, C4 and D included. Other life cycle stages (Modules A5, B1-B7 and C1) are dependent on particular scenarios and best modelled at the building level. While no reference service life is defined for the EPD, Ross Roof Group offers the following warranty for tile products:

### North America:

- Tilcor Lifetime/50 Year Transferable Limited Warranty.

### Rest of the world:

- A 50-year pro-rata weatherproof warranty. This warranty is a full 25-year weatherproof warranty plus a diminishing pro-rata weatherproof warranty for the subsequent 25-years
- Textured Surface Coating Warranty: A 10-year full surface coat warranty plus a diminishing pro-rata warranty for a further 10 years
- Satin Surface Coating Warranty: A 5-year full surface coat warranty plus a diminishing pro-rata warranty for a further 10 years



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## 1.5. Environmental Activities and Certifications

We focus on our operation activities to improve sustainability and energy efficiency in the building industry. Steel is considered by the sustainable building industry to be a sustainable material. It's one of the most infinitely recycled materials in the world, and we recycle our steel scrap, including off-cuts.

We use the latest technology to ensure our carbon footprint is reducing and to deliver environmentally preferable products, wherever possible. We're serious about managing our environmental impact. As part of our Health and Safety Policy, we also manage our wastewater. Our plant and facilities meet all the relevant local and governmental regulations on water discharge and liquid disposal.

This EPD is one of our steps to help establish the environmental credentials of Ross Roof group products.



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## 1.6. Cool roofs

In a batten system, wooden battens are applied either horizontally or in both directions in a grid pattern, known as a counter-batten system. The battens then provide the fixing point for roofing materials, such as metal tile roofing.

Installation of metal tile roofing over a batten system, allows airflow under the tiles and, as a result provides better ventilation. The air space resulting from a batten system works well for a cool roof design and for heat dissipation. By installing a batten system above sheathing ventilation you achieve higher energy efficiency. The air space below the metal tile roof heats up, rises to the ridge and escapes out before it has a chance to enter the attic. This air movement serves to keep the home cooler.

## 1.7. Properties of Declared Product as Delivered

The dimensions of the declared products as delivered to the site of installation/application are given in Table 2.

**Table 2: Dimensions of the Ross Roof Group products declared in this EPD**

NAME	LENGTH (M)	WIDTH (M)	THICKNESS/ HEIGHT (MM)
Antica	1.4	1.1	770
Bond	1.4	1.1	750
Classic	1.4	1.1	760
Craftsman Shake / Shake	1.4	1.1	770
Roman	1.4	1.1	770
Royal	1.4	1.1	770
Tudor	1.4	1.1	900
CF Shake	1.4	1.1	1140
CF Shingle	1.4	1.1	1120
CF Slate	1.4	1.1	830

## 1.8. Material Composition

The average material composition per tile for the three groups is given due to the confidential nature of the product compositions.

**Table 3: Material composition for three product groups**

TILE TYPE	STEEL SUBSTRATE	BASE COAT	GLAZE	NATURAL STONE	CERAMIC STONE	SATIN COAT
Natural stone	65%	8%	1%	26%	-	-
Ceramic coated stone	65%	8%	1%	-	26%	-
Satin	96%	-	-	-	-	4%



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## 1.9. Manufacturing

Ross Roof Group's product system involves purchase of Zinalume® coated steel, from New Zealand Steel. The Zinalume® coated steel coil is unrolled, cut and pressed into the respective tile profiles and sizes. Depending on the tile profile either a satin coat or a stone coat is applied. Satin coated tiles only receive one layer of satin coating. Stone coated tiles require several layers of coating. An acrylic base coat is applied, followed by either natural or ceramic stone granules/chips and a clear acrylic over glaze. The tiles are then dried and baked in a curing oven to harden.

Ross Roof Groups buys the individual paint components, such as acrylics, fillers and pigments and blends them on site with water to produce the required satin coat and base coat. All paints are water-based with no or negligible VOC emissions.

Ross Roof Group's ISO 9001 manufacturing facility has a strong focus on quality. Quality checks are made throughout the manufacturing process and regular weathering and quality tests are performed in accordance with international standards.

## 1.10. Packaging

Ross Roof Group's product are stacked, with cardboard separators added between every 20-40 tiles, and placed on pallets. All pallets are wrapped in a tight plastic film.

## 1.11. Transportation

Transport details for product distribution to markets (A4) in Europe, Japan, New Zealand, United Kingdom and the United States are given in Table 4.

**Table 4: Transport mode, vehicle type, distance and energy carrier for distribution (A4)**

TRANSPORT MODE, FUEL AND VEHICLE TYPE	EUROPE	JAPAN	NEW ZEALAND	UNITED KINGDOM	UNITED STATES
Road transport (km) via diesel driven truck-trailer, Euro 0 – 6 mix, 34 - 40t gross weight / 27t payload capacity	50	50	322	50	50
Sea transport (km) via heavy fuel oil driven ocean-going container ship (5,000 to 200,000 dead weight tonne payload capacity)	20,876	7,740	19	19,383	9,107



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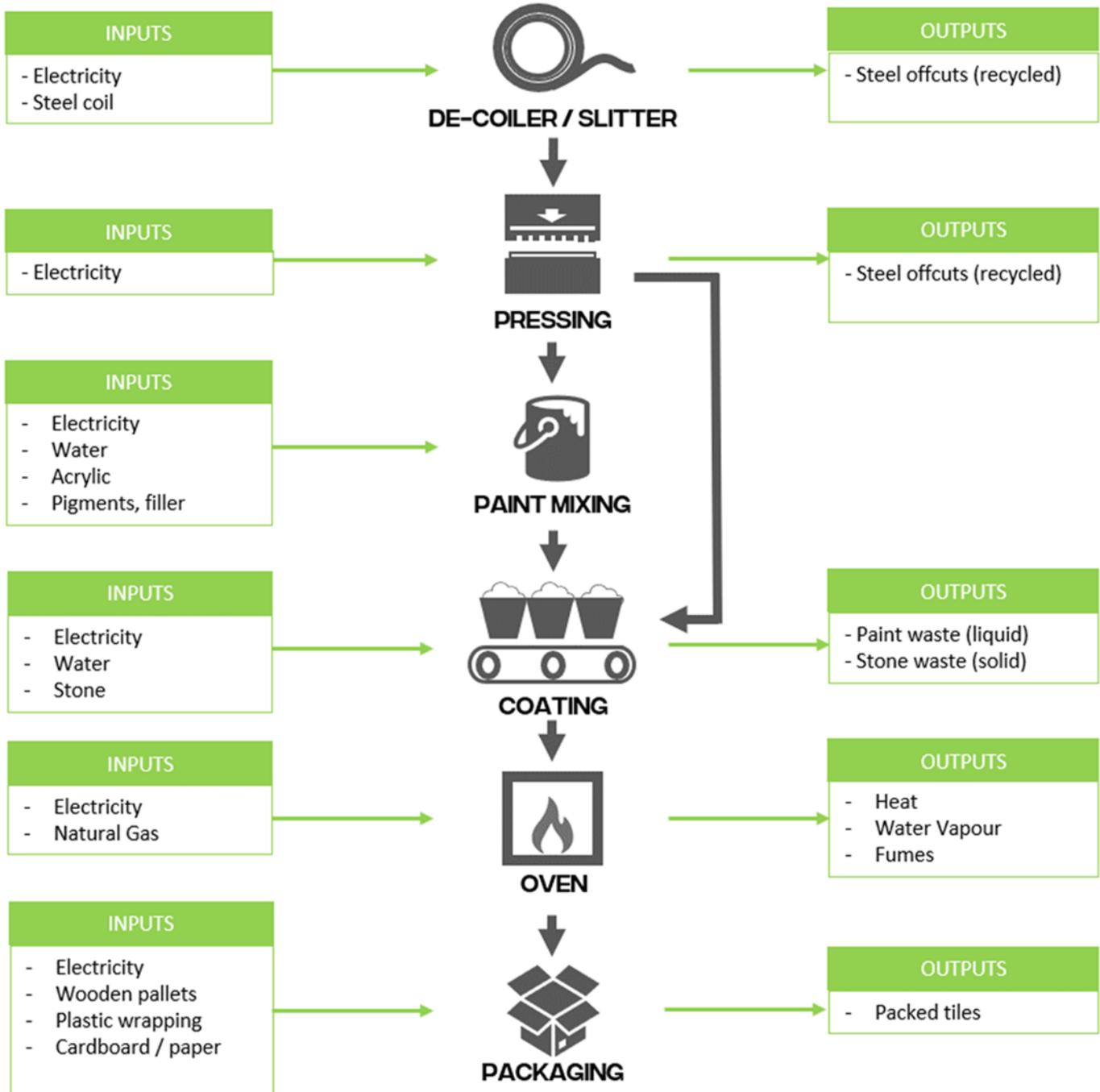


Figure 1: Ross Roof Group roofing tile manufacture process



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## 1.12. End of life: Disposal, recycling and recovery

When a building reaches its end-of-life, most of the steel used in the building is recovered. Module C3 includes the processing of construction waste for recycling. This mainly includes the separation of steel from other building materials and pre-processing to the stage where it becomes suitable to be purchased by a steel manufacturer's steel recycling facility. It does not include the actual recycling process. Results for 100% recycling and 100% landfill are given in each results table. Due to the high recyclability and value of scrap, recycling is a likely scenario for steel products at end of life in many countries.

PCR Part A defines the disposal pathways to be applied per country. The EPD includes waste disposal in landfill for the amount of scrap that is not recycled under the recycling scenario. The disposal pathways applied per market are given in Table 5 and are based on expected end of life scenarios per market. No credits are given for energy recovery.

Table 5: Disposal pathways per market at end of life (C3-C4)

COUNTRY/REGION	RECYCLING RATE (C3)	LANDFILL RATE (C4)	INCINERATION RATE (C4)
Europe	50%	37%	13%
Japan	53%	4%	43%
New Zealand	89%	11%	0
United Kingdom	50%	37%	13%
United States	85%	15%	0

Module D starts at the “end of waste”, when the steel is no longer a product in its first life cycle but starts to be a potential input for its second life cycle. For steel, the end of waste state is generally reached when the steel scrap has been collected and sorted/pre-processed and is available to be purchased by a steel manufacturer's recycling facility. This means that the “end of waste” state is at the point when the scrap would be delivered to a steel producer. Generally, module D would assign a credit for secondary material outputs if the output of secondary material from Module C3 is higher than the input of secondary material needed for the production of steel (A1-A3); alternatively, a burden is assigned if the ratio is the other way around. However, as mentioned earlier, there is no post-consumer steel delivered to Ross Roof Group's steel supplier for recycling. Hence 100% of the recovered steel to Module D is given a credit.

The impacts assigned to the credit or burden that comes from Module D are based on a global average for the difference between 100% primary steel production (BF-BOS) and 100% secondary steel production (EAF). Since steel is an internationally traded product, the global average is seen as the most representative scenario. The global average “Value of Scrap” is provided by worldsteel and integrated as a process into the GaBi LCI Database 2020.

## 2. Life Cycle Assessment Background Information

### 2.0. Declared Unit

The declared unit is 100 m<sup>2</sup> of (roof) area covered. Trim and flashing will be included within the declared unit, i.e. not declared separately. They are manufactured in exactly the same way as the tiles, using the same coatings and are a crucial part of the roof. Roof substructure is not included as part of the declared unit and is outside of the scope of this EPD.



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**Table 6: Declared Unit Information Roofing tiles**

PRODUCT	STEEL BMT	COATING	DECLARED UNIT (M <sup>2</sup> )	MASS (KG)	AREA DENSITY (KG/M <sup>2</sup> )	CONVERSION TO 1 KG (M <sup>2</sup> /KG)
Antica	0.39 mm	Natural stone	100	504	5.04	0.198
		Ceramic-coated stone	100	520	5.20	0.192
		Satin	100	359	3.59	0.279
Bond	0.39 mm	Natural stone	100	480	4.80	0.208
		Ceramic-coated stone	100	490	4.90	0.204
		Satin	100	346	3.46	0.289
Classic	0.39 mm	Natural stone	100	514	5.14	0.195
		Ceramic-coated stone	100	519	5.19	0.193
		Satin	100	361	3.61	0.277
Craftsman Shake	0.39 mm	Natural stone	100	538	5.38	0.186
		Ceramic-coated stone	100	520	5.20	0.192
		Satin	100	376	3.76	0.266
Roman	0.39 mm	Natural stone	100	516	5.16	0.194
		Ceramic-coated stone	100	516	5.16	0.194
Royal	0.39 mm	Natural stone	100	512	5.12	0.195
		Ceramic-coated stone	100	497	4.97	0.201
CF Slate	0.39 mm	Natural stone	100	556	5.56	0.180
Tudor	0.39 mm	Natural stone	100	513	5.13	0.195
		Ceramic-coated stone	100	516	5.16	0.194
		Satin	100	352	3.52	0.284
CF Shingle	0.39 mm	Natural stone	100	564	5.64	0.177
		Ceramic-coated stone	100	559	5.59	0.179
CF Shake	0.39 mm	Natural stone	100	546	5.46	0.183
		Ceramic-coated stone	100	539	5.39	0.186

## 2.1. System Boundary

This EPD has a cradle-to-gate scope with options as shown in Table 7. It includes the environmental impacts associated with raw material extraction and processing (A1), material transport to the manufacturer (A2), manufacturing processes (A3), transport to the construction site (A4), waste processing (C3), waste disposal (C4), and reuse, recovery and recycling potential (D). Impacts and indicators related to waste are considered in the module in which the waste occurs in line with the polluter pays principle specified in EN 15804.

Other life cycle stages concerning the construction process (A5), the use stage (B1-B7), deconstruction and demolition (C1), and end-of-life transport (C2) are not included in this EPD. These life cycle stages vary by end use and are best considered at the building level.



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**Table 7: Modules of the production life cycle included in the EPD (X = declared module; MND = module not declared)**

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE			RECOVERY STAGE	
Raw material supply	Transport	Manufacturing	Transport	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction / demolition	Transport	Waste processing	Disposal	Future reuse, recycling or energy recovery 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

## Capital Goods and Infrastructure

PCR requires infrastructure and production equipment to be included, however, this impact could be excluded if contribution is less than 10%. Capital goods and infrastructure have been excluded since the contribution from Ross Roof Group and steel supplier’s capital goods and infrastructure contribute to less than 10% of module A1-A3 impact.

## 2.2. Estimates and Assumptions

Due to lack of data availability some proxy background data were used, specifically in the context of the geographical scope of the study. For processes within the system boundary, all available energy, water and material flow data have been included in the model. In cases where no matching life cycle inventories were available to represent a flow, proxy data have been applied based on conservative assumptions regarding environmental impacts. All background datasets for modelling stone and paints are from the GaBi Life Cycle Inventory Database 2020 (Sphera, 2020).

Transportation: Transportation is based on primary data. Where the mode of transport is unknown, transport is assumed to be by 34 - 40t gross weight / 27t payload capacity truck-trailer. Where distances are unknown, these are assumed to be 100 km.

Recycling: The end of life scenarios at the different end markets is prescribed by the PCR.

## 2.3. Cut-off Criteria

No specific criteria were set out for excluding the collection of data for minor inputs and outputs. The only input knowingly excluded from the inventory are packaging materials for minor inputs such as lubricants which are used in very small quantities. Other than the above exceptions, no known flows are deliberately excluded from this EPD. All reported data was incorporated and modelled using the best available life cycle inventory data.





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## 2.4. Data Sources

Primary data comprises of a combination of measured and calculated data for the manufacturing stage (gate-to-gate) as well transportation of inputs and final products. All primary data were collected from Ross Roof Group and suppliers for financial year 2017 (July 2016 to June 2017). Primary data is mostly measured data, with a few exceptions such as water vapour, emissions from paint application.

All substrate metal is sourced from New Zealand and is produced by New Zealand Steel Ltd. Background data from New Zealand Steel EPD work is used model impact data for ZINCALUME® (AZ150) steel with a base metal thickness of 0.39mm.

Stone, paints and chemicals: Primary data for stone chip production and transport has been collected from Ross Roof Group's two suppliers from New Zealand and China. Paint is mixed at Ross Roof Groups manufacturing site, the acrylics for the paint have been sourced from Indonesia and Germany. The fillers and pigments are from New Zealand manufacturers. All background datasets for modelling stone and paints are from the GaBi Life Cycle Inventory Database 2020 (Sphera, 2020).

All Ross Roof Group products are manufactured in New Zealand. The New Zealand grid electricity, based on background data from the GaBi Life Cycle Inventory Database 2020, was used in the model.

## 2.5. Data quality

### Temporal Representativeness

Primary data were collected for the financial years 2017 (July 1st, 2016, to June 30th, 2017). All secondary data come from the GaBi 2020 LCI databases. Most data are representative of the years 2016 to 2019.

### Technological Representativeness

All primary and secondary data are modelled to be specific to the technologies or technology mixes under study.

### Geographical Representativeness

Ross Roof Group's manufacturing plant is located in Takanini, Auckland, New Zealand. All primary data collected were specific to New Zealand conditions. Where country / region specific data were unavailable for secondary data, proxy data were used.

### Completeness

All relevant process steps are considered and modelled to represent the specific situations. The process chain is considered complete with regard to the goal and scope of this study.

### Consistency

To ensure consistency, all primary data are collected with the same level of detail, while all background data are sourced from GaBi LCI Database 2020 (Sphera, 2020). Allocation and other methodological choices were made consistently throughout the model.

### Reliability

Data for Ross Roof Group products were collected directly from Ross Roof Group and their suppliers. Cross-checks concerning the plausibility of mass and energy flows were carried out on the raw data as well as within the LCA model developed in the GaBi software (Sphera, 2020).





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## 2.6. Allocation

Allocation rules for foreground processes as well as upstream data used within this project complies with the allocation principles outlined in the PCR, ISO 21930 and EN 15804. Allocation of background data (energy and materials) taken from the GaBi LCI Database 2020 is documented online at <http://www.gabi-software.com/support/gabi/gabi-database-2020-lci-documentation/>

### Multi-output allocation

Impacts due to multi-output processes within the foreground system are allocated to coproducts by economic value, if the difference in the revenue of co-products is high (>25% according to EN 15804). If the difference in the revenue of co-products is low, physical properties such as mass, volume or energy have been applied.

While there is no input of post-consumer scrap into the coating process, Ross Roof Group produces metal scrap during manufacture. All metal scrap from Ross Roof Group's production is sold to a scrap dealer/recycler and are classified as by-products of the production process. The steel scrap for recycling has a relatively small economic value compared to the main product.

### Multi-input allocation

Multi-input allocation is applied for landfill and waste water treatment processes, where mass allocation is applied. No energy credits are claimed for landfill gas recovery.

## 3. Life Cycle Assessment Results

Life cycle impact assessment (LCIA) and life cycle inventory results are presented per 100 square meter (m<sup>2</sup>) of roof coverage for the end markets: United States, Europe, UK, Japan and New Zealand. Results are given for environmental impact using TRACI 2.1 and CML (2001 - 2013) in compliance with EN 15804. Other life cycle impacts such as those associated with resource use, waste categories and output flows are also given. Results are presented per product group (natural stone coated, ceramic stone coated and satin coated) and contain the following:

- A1-A3: raw material extraction/processing, material transport and manufacturing processes
- A4: transport to the construction site
- C3: waste processing (based on disposal pathways from Table 5)
- C4: waste disposal (based on disposal pathways from Table 5)
- D: reuse, recovery, and recycling potential (based on disposal pathways from Table 5)
- C3, C4 and D for the 100% recycle and 100% landfill scenarios.

A1-A3 results are common across global markets. Impact assessment results for product transport (A4), waste processing (C3), waste disposal (C4) and end of life recovery (D) are specific to market. The 100% landfill and 100% recycle results are provided to allow calculation of specific end of life scenarios as required. In the case of the 100% landfill and 100% recycle scenarios, only C4 is relevant for the 100% landfill scenario since there is no recovery at end of life; and only C3 and D are relevant for the 100% recycle scenario since there is no material for disposal.

### 3.0. Life Cycle Assessment Results – A to D for the US market

Impact assessment results including transport and end of life waste treatment for the North American market are given for the three product groups from Table 8 to Table 10. It is possible to calculate specific end of life scenarios using the results for 100% landfill and 100% recycle given in the right-hand side columns.



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**PRESSED AND COATED METAL ROOFING TILES**  
Product Specific EPD

According to ISO 14025,  
EN 15804 and ISO 21930:2017

**Table 8. Impact assessment results (A-D) for natural stone coated metal tile (representative) product sold to North America**

	UNIT	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
<b>Environmental Impact Indicators (TRACI 2.1)</b>	<b>Unit</b>						<b>C4</b>	<b>C3</b>	<b>D</b>
Global warming potential	kg CO <sub>2</sub> -eq.	1.48E+03	6.52E+01	1.29E+01	3.06E+00	-4.01E+02	2.25E+01	1.52E+01	-4.71E+02
Stratospheric ozone layer depletion potential	kg CFC11-eq.	2.82E-09	8.31E-15	6.21E-14	1.05E-14	1.47E-12	7.28E-14	7.31E-14	1.72E-12
Acidification potential	kg SO <sub>2</sub> -eq.	1.33E+01	2.10E+00	1.95E-02	1.43E-02	-8.15E-01	6.77E-02	2.30E-02	-9.67E-01
Eutrophication potentials	kg N-eq.	2.70E-01	7.20E-02	1.49E-03	2.08E-03	-3.07E-02	2.92E-03	1.75E-03	-3.94E-02
Photochemical ozone creation potential	kg O <sub>3</sub> -eq.	1.29E+02	4.01E+01	2.79E-01	2.51E-01	-1.09E+01	1.22E+00	3.28E-01	-1.30E+01
Abiotic depletion potential for fossil resources	MJ, LHV	1.10E+03	1.16E+02	1.34E+01	6.36E+00	9.25E+01	4.51E+01	1.58E+01	1.10E+02
<b>Environmental Impact Indicators (CML 2001)</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A4</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>C4</b>	<b>C3</b>	<b>D</b>
Global warming potential (total)	kg CO <sub>2</sub> -eq.	1.48E+03	6.52E+01	1.29E+01	3.06E+00	-4.01E+02	2.25E+01	1.52E+01	-4.71E+02
Depletion potential of the stratospheric ozone layer	kg CFC11-eq.	2.57E-09	8.31E-15	6.21E-14	1.05E-14	1.47E-12	7.28E-14	7.31E-14	1.72E-12
Acidification potential of land and water	kg SO <sub>2</sub> -eq.	1.30E+01	1.97E+00	1.75E-02	1.30E-02	-8.63E-01	6.35E-02	2.06E-02	-1.02E+00
Eutrophication potential	kg PO <sub>4</sub> <sup>3-</sup> -eq.	6.88E-01	2.10E-01	1.92E-03	2.99E-03	-5.19E-02	6.75E-03	2.26E-03	-6.50E-02
Photochemical ozone creation potential	kg C <sub>2</sub> H <sub>4</sub> -eq.	7.18E-01	1.05E-01	1.37E-03	1.77E-04	-2.20E-01	5.87E-03	1.61E-03	-2.58E-01
Abiotic depletion potential – elements	kg Sb-eq.	1.24E-02	1.69E-06	2.75E-06	6.53E-07	-6.62E-03	1.69E-06	3.24E-06	-7.80E-03
Abiotic depletion potential – fossil fuels	MJ	1.98E+04	8.01E+02	1.65E+02	4.90E+01	-4.17E+03	3.42E+02	1.95E+02	-4.90E+03
<b>Resource use</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A4</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>C4</b>	<b>C3</b>	<b>D</b>
Renewable primary energy as energy carrier	MJ	3.72E+03	1.05E-01	3.39E+01	4.05E+00	3.38E+02	2.47E+01	3.99E+01	3.97E+02
Renewable primary energy resources as material utilization	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
Total use of renewable primary energy resources	MJ	3.72E+03	2.70E+00	3.39E+01	4.05E+00	3.38E+02	2.47E+01	3.99E+01	3.97E+02
Non-renewable primary energy as energy carrier	MJ	1.94E+04	8.01E+02	2.15E+02	5.01E+01	-4.23E+03	3.52E+02	2.52E+02	-4.97E+03
Non-renewable primary energy as material utilization	MJ	7.85E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources	MJ	2.02E+04	8.03E+02	2.15E+02	5.01E+01	-4.23E+03	3.52E+02	2.52E+02	-4.97E+03
Use of secondary material	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
Use of renewable secondary fuels	MJ	3.10E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	3.67E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E-02	9.22E-02	-8.30E-01
Use of net fresh water	m <sup>3</sup>	1.80E+01	4.85E-03	7.83E-02	7.12E-03	-7.05E-01	0.00E+00	0.00E+00	0.00E+00

# ENVIRONMENTAL PRODUCT DECLARATION



## PRESSED AND COATED METAL ROOFING TILES Product Specific EPD

According to ISO 14025,  
EN 15804 and ISO 21930:2017

	UNIT	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
<b>Waste categories and output flows</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A4</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>C4</b>	<b>C3</b>	<b>D</b>
Hazardous waste disposed	kg	1.14E-05	7.81E-08	8.24E-08	3.35E-07	-5.32E-04	1.60E-06	9.70E-08	-6.26E-04
Non-hazardous waste disposed	kg	1.18E+02	8.01E-02	6.65E-02	7.50E+01	1.81E+02	5.00E+02	7.83E-02	2.13E+02
Radioactive waste disposed	kg	1.41E-01	8.70E-04	1.91E-02	4.24E-04	1.87E-03	4.17E-03	2.25E-02	2.60E-03
High-level radioactive waste	kg	1.37E-01	8.46E-04	1.85E-02	4.11E-04	1.82E-03	4.06E-03	2.17E-02	2.52E-03
Intermediate and low-level radioactive waste	kg	1.41E-01	8.69E-04	1.91E-02	4.24E-04	1.87E-03	4.17E-03	2.24E-02	2.60E-03
Components for re-use	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
Materials for recycling	kg	2.03E-02	0.00E+00	4.24E+02	0.00E+00	0.00E+00	0.00E+00	4.99E+02	0.00E+00
Materials for energy recovery	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
Exported electrical energy	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
Exported thermal energy	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

Table 9. Impact assessment results (A-D) for ceramic stone coated metal tile products sold to North America

	Unit	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
<b>Environmental Impact Indicators (TRACI 2.1)</b>	<b>Unit</b>						<b>C4</b>	<b>C3</b>	<b>D</b>
Global warming potential	kg CO <sub>2</sub> -eq.	1.56E+03	6.69E+01	1.32E+01	3.15E+00	-4.12E+02	2.31E+01	1.56E+01	-4.84E+02
Stratospheric ozone layer depletion potential	kg CFC11-eq.	2.90E-09	8.52E-15	6.37E-14	1.08E-14	1.51E-12	7.47E-14	7.50E-14	1.77E-12
Acidification potential	kg SO <sub>2</sub> -eq.	1.43E+01	2.16E+00	2.00E-02	1.47E-02	-8.38E-01	6.95E-02	2.36E-02	-9.94E-01
Eutrophication potentials	kg N-eq.	3.02E-01	7.39E-02	1.53E-03	2.14E-03	-3.16E-02	3.00E-03	1.79E-03	-4.04E-02
Photochemical ozone creation potential	kg O <sub>3</sub> -eq.	1.45E+02	4.12E+01	2.86E-01	2.58E-01	-1.13E+01	1.26E+00	3.37E-01	-1.34E+01
Abiotic depletion potential for fossil resources	MJ, LHV	1.22E+03	1.18E+02	1.37E+01	6.52E+00	9.51E+01	4.63E+01	1.62E+01	1.13E+02
<b>Environmental Impact Indicators (CML 2001)</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A4</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>C4</b>	<b>C3</b>	<b>D</b>
Global warming potential (total)	kg CO <sub>2</sub> -eq.	1.56E+03	6.69E+01	1.32E+01	3.15E+00	-4.12E+02	2.31E+01	1.56E+01	-4.84E+02
Depletion potential of the stratospheric ozone layer	kg CFC11-eq.	2.64E-09	8.52E-15	6.37E-14	1.08E-14	1.51E-12	7.47E-14	7.50E-14	1.77E-12
Acidification potential of land and water	kg SO <sub>2</sub> -eq.	1.40E+01	2.03E+00	1.80E-02	1.34E-02	-8.86E-01	6.52E-02	2.11E-02	-1.05E+00
Eutrophication potential	kg PO <sub>4</sub> <sup>3-</sup> -eq.	7.78E-01	2.15E-01	1.97E-03	3.06E-03	-5.34E-02	6.93E-03	2.32E-03	-6.68E-02
Photochemical ozone creation potential	kg C <sub>2</sub> H <sub>4</sub> -eq.	7.74E-01	1.07E-01	1.40E-03	1.82E-04	-2.26E-01	6.02E-03	1.65E-03	-2.65E-01

# ENVIRONMENTAL PRODUCT DECLARATION



## PRESSED AND COATED METAL ROOFING TILES Product Specific EPD

According to ISO 14025,  
EN 15804 and ISO 21930:2017

	Unit	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
Abiotic depletion potential – elements	kg Sb-eq.	1.28E-02	1.73E-06	2.83E-06	6.71E-07	-6.80E-03	1.73E-06	3.32E-06	-8.01E-03
Abiotic depletion potential – fossil fuels	MJ	2.11E+04	8.22E+02	1.70E+02	5.03E+01	-4.29E+03	3.51E+02	2.00E+02	-5.04E+03
<b>Resource use</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A4</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>C4</b>	<b>C3</b>	<b>D</b>
Renewable primary energy as energy carrier	MJ	3.86E+03	1.07E-01	3.47E+01	4.15E+00	3.47E+02	2.53E+01	4.09E+01	4.08E+02
Renewable primary energy resources as material utilization	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
Total use of renewable primary energy resources	MJ	3.86E+03	2.77E+00	3.47E+01	4.15E+00	3.47E+02	2.53E+01	4.09E+01	4.08E+02
Non-renewable primary energy as energy carrier	MJ	2.06E+04	8.22E+02	2.20E+02	5.14E+01	-4.35E+03	3.62E+02	2.59E+02	-5.10E+03
Non-renewable primary energy as material utilization	MJ	8.07E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources	MJ	2.14E+04	8.24E+02	2.20E+02	5.14E+01	-4.35E+03	3.62E+02	2.59E+02	-5.10E+03
Use of secondary material	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
Use of renewable secondary fuels	MJ	3.18E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	3.77E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.39E-02	9.46E-02	-8.53E-01
Use of net fresh water	m <sup>3</sup>	1.84E+01	4.98E-03	8.04E-02	7.30E-03	-7.24E-01	0.00E+00	0.00E+00	0.00E+00
<b>Waste categories and output flows</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A4</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>C4</b>	<b>C3</b>	<b>D</b>
Hazardous waste disposed	kg	1.21E-05	8.02E-08	8.46E-08	3.44E-07	-5.46E-04	1.64E-06	9.95E-08	-6.43E-04
Non-hazardous waste disposed	kg	1.24E+02	8.22E-02	6.83E-02	7.69E+01	1.85E+02	5.13E+02	8.03E-02	2.18E+02
Radioactive waste disposed	kg	1.47E-01	8.93E-04	1.96E-02	4.35E-04	1.92E-03	4.28E-03	2.30E-02	2.67E-03
High-level radioactive waste	kg	1.43E-01	8.68E-04	1.89E-02	4.22E-04	1.86E-03	4.16E-03	2.23E-02	2.59E-03
Intermediate and low-level radioactive waste	kg	1.47E-01	8.92E-04	1.96E-02	4.35E-04	1.92E-03	4.28E-03	2.30E-02	2.66E-03
Components for re-use	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
Materials for recycling	kg	2.09E-02	0.00E+00	4.35E+02	0.00E+00	0.00E+00	0.00E+00	5.12E+02	0.00E+00
Materials for energy recovery	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
Exported electrical energy	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
Exported thermal energy	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

# ENVIRONMENTAL PRODUCT DECLARATION



**PRESSED AND COATED METAL ROOFING TILES**  
Product Specific EPD

According to ISO 14025,  
EN 15804 and ISO 21930:2017

**Table 10. Impact assessment results (A-D) for satin coated metal tile products sold to North America**

	Unit	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
<b>Environmental Impact Indicators (TRACI 2.1)</b>							<b>C4</b>	<b>C3</b>	<b>D</b>
Global warming potential	kg CO <sub>2</sub> -eq.	1.39E+03	4.68E+01	9.17E+00	2.17E+00	-4.49E+02	1.60E+01	1.08E+01	-5.28E+02
Stratospheric ozone layer depletion potential	kg CFC11-eq.	2.84E-09	5.97E-15	4.42E-14	7.47E-15	1.43E-12	5.17E-14	5.19E-14	1.68E-12
Acidification potential	kg SO <sub>2</sub> -eq.	1.31E+01	1.51E+00	1.39E-02	1.02E-02	-8.60E-01	4.81E-02	1.63E-02	-1.01E+00
Eutrophication potentials	kg N-eq.	2.57E-01	5.17E-02	1.05E-03	1.49E-03	-3.51E-02	2.07E-03	1.24E-03	-4.16E-02
Photochemical ozone creation potential	kg O <sub>3</sub> -eq.	1.25E+02	2.88E+01	1.99E-01	1.79E-01	-1.17E+01	8.69E-01	2.33E-01	-1.37E+01
Abiotic depletion potential for fossil resources	MJ, LHV	8.28E+02	8.27E+01	9.51E+00	4.52E+00	8.01E+01	3.21E+01	1.12E+01	9.43E+01
<b>Environmental Impact Indicators (CML 2001)</b>							<b>C4</b>	<b>C3</b>	<b>D</b>
Global warming potential (total)	kg CO <sub>2</sub> -eq.	1.39E+03	4.68E+01	9.17E+00	2.17E+00	-4.49E+02	1.60E+01	1.08E+01	-5.28E+02
Depletion potential of the stratospheric ozone layer	kg CFC11-eq.	2.59E-09	5.97E-15	4.42E-14	7.47E-15	1.43E-12	5.17E-14	5.19E-14	1.68E-12
Acidification potential of land and water	kg SO <sub>2</sub> -eq.	1.29E+01	1.42E+00	1.24E-02	9.22E-03	-8.97E-01	4.51E-02	1.46E-02	-1.06E+00
Eutrophication potential	kg PO <sub>4</sub> <sup>3-</sup> - eq.	6.69E-01	1.51E-01	1.36E-03	2.12E-03	-5.88E-02	4.80E-03	1.60E-03	-6.97E-02
Photochemical ozone creation potential	kg C <sub>2</sub> H <sub>4</sub> -eq.	6.66E-01	7.51E-02	9.72E-04	1.26E-04	-2.21E-01	4.17E-03	1.14E-03	-2.60E-01
Abiotic depletion potential – elements	kg Sb-eq.	1.25E-02	1.21E-06	1.95E-06	4.65E-07	-6.68E-03	1.20E-06	2.30E-06	-7.85E-03
Abiotic depletion potential – fossil fuels	MJ	1.79E+04	5.75E+02	1.18E+02	3.48E+01	-4.31E+03	2.43E+02	1.38E+02	-5.07E+03
<b>Resource use</b>							<b>C4</b>	<b>C3</b>	<b>D</b>
Renewable primary energy as energy carrier	MJ	3.64E+03	7.51E-02	2.41E+01	2.87E+00	3.28E+02	1.75E+01	2.83E+01	3.87E+02
Renewable primary energy resources as material utilization	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
Total use of renewable primary energy resources	MJ	3.64E+03	1.94E+00	2.41E+01	2.87E+00	3.28E+02	1.75E+01	2.83E+01	3.87E+02
Non-renewable primary energy as energy carrier	MJ	1.80E+04	5.75E+02	1.52E+02	3.56E+01	-4.37E+03	2.50E+02	1.79E+02	-5.14E+03
Non-renewable primary energy as material utilization	MJ	2.05E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources	MJ	1.82E+04	5.77E+02	1.52E+02	3.56E+01	-4.37E+03	2.50E+02	1.79E+02	-5.14E+03
Use of secondary material	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
Use of renewable secondary fuels	MJ	3.12E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	3.69E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.04E-02	6.55E-02	-9.64E-01
Use of net fresh water	m <sup>3</sup>	1.76E+01	3.48E-03	5.57E-02	5.05E-03	-8.20E-01	0.00E+00	0.00E+00	0.00E+00

# ENVIRONMENTAL PRODUCT DECLARATION



**PRESSED AND COATED METAL ROOFING TILES**  
Product Specific EPD

According to ISO 14025,  
EN 15804 and ISO 21930:2017

	Unit	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
<b>Waste categories and output flows</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A4</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>C4</b>	<b>C3</b>	<b>D</b>
Hazardous waste disposed	kg	1.10E-05	5.61E-08	5.86E-08	2.38E-07	-5.36E-04	1.13E-06	6.89E-08	-6.31E-04
Non-hazardous waste disposed	kg	1.08E+02	5.75E-02	4.73E-02	5.33E+01	6.74E+01	3.55E+02	5.56E-02	7.93E+01
Radioactive waste disposed	kg	1.24E-01	6.25E-04	1.36E-02	3.01E-04	5.43E-04	2.96E-03	1.60E-02	6.90E-04
High-level radioactive waste	kg	1.21E-01	6.08E-04	1.31E-02	2.92E-04	5.27E-04	2.88E-03	1.54E-02	6.69E-04
Intermediate and low-level radioactive waste	kg	1.24E-01	6.24E-04	1.35E-02	3.01E-04	5.42E-04	2.96E-03	1.59E-02	6.89E-04
Components for re-use	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
Materials for recycling	kg	2.05E-02	0.00E+00	3.01E+02	0.00E+00	0.00E+00	0.00E+00	3.54E+02	0.00E+00
Materials for energy recovery	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
Exported electrical energy	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
Exported thermal energy	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

## 3.1. Life Cycle Assessment Results – A to D for the European market

EPD results for the three types of metal roofing tiles for the European market are provided from Table 11 to Table 13.

**Table 11. Impact assessment results (A-D) for natural stone coated metal tile (representative) product sold to Europe**

	Unit	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
<b>Environmental Impact Indicators (TRACI 2.1)</b>							<b>C4</b>	<b>C3</b>	<b>D</b>
Global warming potential	kg CO <sub>2</sub> -eq.	1.56E+03	1.51E+02	5.61E+00	1.26E+01	-2.42E+02	2.25E+01	1.52E+01	-4.71E+02
Stratospheric ozone layer depletion potential	kg CFC11-eq.	2.90E-09	1.92E-14	1.68E-13	1.38E-13	8.83E-13	7.28E-14	7.31E-14	1.72E-12
Acidification potential	kg SO <sub>2</sub> -eq.	1.43E+01	4.94E+00	1.22E-02	-1.99E-02	-4.97E-01	6.77E-02	2.30E-02	-9.67E-01
Eutrophication potentials	kg N-eq.	3.02E-01	1.69E-01	1.15E-03	-3.78E-04	-2.03E-02	2.92E-03	1.75E-03	-3.94E-02
Photochemical ozone creation potential	kg O <sub>3</sub> -eq.	1.45E+02	9.44E+01	1.63E-01	-3.92E-01	-6.68E+00	1.22E+00	3.28E-01	-1.30E+01
Abiotic depletion potential for fossil resources	MJ, LHV	1.22E+03	2.66E+02	4.27E+00	2.17E+01	5.64E+01	4.51E+01	1.58E+01	1.10E+02
<b>Environmental Impact Indicators (CML 2001)</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A4</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>C4</b>	<b>C3</b>	<b>D</b>
Global warming potential (total)	kg CO <sub>2</sub> -eq.	1.56E+03	1.51E+02	5.61E+00	1.26E+01	-2.42E+02	2.25E+01	1.52E+01	-4.71E+02
Depletion potential of the stratospheric ozone layer	kg CFC11-eq.	2.64E-09	1.92E-14	1.68E-13	1.38E-13	8.83E-13	7.28E-14	7.31E-14	1.72E-12

# ENVIRONMENTAL PRODUCT DECLARATION



## PRESSED AND COATED METAL ROOFING TILES Product Specific EPD

According to ISO 14025,  
EN 15804 and ISO 21930:2017

	Unit	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
Acidification potential of land and water	kg SO <sub>2</sub> -eq.	1.40E+01	4.64E+00	1.03E-02	-1.99E-02	-5.25E-01	6.35E-02	2.06E-02	-1.02E+00
Eutrophication potential	kg PO <sub>4</sub> <sup>3-</sup> - eq.	7.78E-01	4.94E-01	1.26E-03	-1.87E-03	-3.34E-02	6.75E-03	2.26E-03	-6.50E-02
Photochemical ozone creation potential	kg C <sub>2</sub> H <sub>4</sub> -eq.	7.74E-01	2.47E-01	8.39E-04	9.33E-05	-1.32E-01	5.87E-03	1.61E-03	-2.58E-01
Abiotic depletion potential – elements	kg Sb-eq.	1.28E-02	3.93E-06	1.75E-06	-6.01E-07	-4.01E-03	1.69E-06	3.24E-06	-7.80E-03
Abiotic depletion potential – fossil fuels	MJ	2.11E+04	1.86E+03	6.23E+01	1.79E+02	-2.52E+03	3.42E+02	1.95E+02	-4.90E+03
<b>Resource use</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A4</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>C4</b>	<b>C3</b>	<b>D</b>
Renewable primary energy as energy carrier	MJ	3.86E+03	2.47E-01	4.46E+01	2.57E+01	2.04E+02	2.47E+01	3.99E+01	3.97E+02
Renewable primary energy resources as material utilization	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
Total use of renewable primary energy resources	MJ	3.86E+03	6.16E+00	4.46E+01	2.57E+01	2.04E+02	2.47E+01	3.99E+01	3.97E+02
Non-renewable primary energy as energy carrier	MJ	2.06E+04	1.86E+03	1.01E+02	2.00E+02	-2.55E+03	3.52E+02	2.52E+02	-4.97E+03
Non-renewable primary energy as material utilization	MJ	8.07E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources	MJ	2.14E+04	1.86E+03	1.01E+02	2.00E+02	-2.55E+03	3.52E+02	2.52E+02	-4.97E+03
Use of secondary material	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
Use of renewable secondary fuels	MJ	3.18E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	3.77E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E-02	9.22E-02	-8.30E-01
Use of net fresh water	m <sup>3</sup>	1.84E+01	1.11E-02	5.16E-02	1.81E-01	-4.27E-01	0.00E+00	0.00E+00	0.00E+00
<b>Waste categories and output flows</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A4</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>C4</b>	<b>C3</b>	<b>D</b>
Hazardous waste disposed	kg	1.21E-05	1.82E-07	4.17E-08	6.35E-07	-3.21E-04	1.60E-06	9.70E-08	-6.26E-04
Non-hazardous waste disposed	kg	1.24E+02	1.88E-01	7.14E-02	1.95E+02	1.09E+02	5.00E+02	7.83E-02	2.13E+02
Radioactive waste disposed	kg	1.47E-01	2.05E-03	1.53E-02	8.34E-03	1.33E-03	4.17E-03	2.25E-02	2.60E-03
High-level radioactive waste	kg	1.43E-01	1.99E-03	1.49E-02	8.11E-03	1.29E-03	4.06E-03	2.17E-02	2.52E-03
Intermediate and low-level radioactive waste	kg	1.47E-01	2.04E-03	1.53E-02	8.33E-03	1.33E-03	4.17E-03	2.24E-02	2.60E-03
Components for re-use	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
Materials for recycling	kg	2.09E-02	0.00E+00	2.56E+02	0.00E+00	0.00E+00	0.00E+00	4.99E+02	0.00E+00
Materials for energy recovery	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
Exported electrical energy	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
Exported thermal energy	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

# ENVIRONMENTAL PRODUCT DECLARATION



PRESSED AND COATED METAL ROOFING TILES  
Product Specific EPD

According to ISO 14025,  
EN 15804 and ISO 21930:2017

**Table 12. Impact assessment results (A-D) for ceramic stone coated metal tile products sold to Europe**

	Unit	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
<b>Environmental Impact Indicators (TRACI 2.1)</b>							<b>C4</b>	<b>C3</b>	<b>D</b>
Global warming potential	kg CO <sub>2</sub> -eq.	1.39E+03	1.06E+02	3.88E+00	8.68E+00	-2.64E+02	2.31E+01	1.56E+01	-4.84E+02
Stratospheric ozone layer depletion potential	kg CFC11-eq.	2.84E-09	1.34E-14	1.17E-13	9.55E-14	8.41E-13	7.47E-14	7.50E-14	1.77E-12
Acidification potential	kg SO <sub>2</sub> -eq.	1.31E+01	3.45E+00	8.49E-03	-1.38E-02	-5.06E-01	6.95E-02	2.36E-02	-9.94E-01
Eutrophication potentials	kg N-eq.	2.57E-01	1.19E-01	7.96E-04	-2.62E-04	-2.09E-02	3.00E-03	1.79E-03	-4.04E-02
Photochemical ozone creation potential	kg O <sub>3</sub> -eq.	1.25E+02	6.60E+01	1.13E-01	-2.72E-01	-6.85E+00	1.26E+00	3.37E-01	-1.34E+01
Abiotic depletion potential for fossil resources	MJ, LHV	8.28E+02	1.86E+02	2.95E+00	1.51E+01	4.72E+01	4.63E+01	1.62E+01	1.13E+02
<b>Environmental Impact Indicators (CML 2001)</b>							<b>C4</b>	<b>C3</b>	<b>D</b>
Global warming potential (total)	kg CO <sub>2</sub> -eq.	1.39E+03	1.06E+02	3.88E+00	8.68E+00	-2.64E+02	2.31E+01	1.56E+01	-4.84E+02
Depletion potential of the stratospheric ozone layer	kg CFC11-eq.	2.59E-09	1.34E-14	1.17E-13	9.55E-14	8.41E-13	7.47E-14	7.50E-14	1.77E-12
Acidification potential of land and water	kg SO <sub>2</sub> -eq.	1.29E+01	3.24E+00	7.11E-03	-1.38E-02	-5.28E-01	6.52E-02	2.11E-02	-1.05E+00
Eutrophication potential	kg PO <sub>4</sub> <sup>3-</sup> - eq.	6.69E-01	3.45E-01	8.70E-04	-1.29E-03	-3.48E-02	6.93E-03	2.32E-03	-6.68E-02
Photochemical ozone creation potential	kg C <sub>2</sub> H <sub>4</sub> -eq.	6.66E-01	1.73E-01	5.81E-04	6.46E-05	-1.30E-01	6.02E-03	1.65E-03	-2.65E-01
Abiotic depletion potential – elements	kg Sb-eq.	1.25E-02	2.75E-06	1.21E-06	-4.16E-07	-3.93E-03	1.73E-06	3.32E-06	-8.01E-03
Abiotic depletion potential – fossil fuels	MJ	1.79E+04	1.30E+03	4.31E+01	1.24E+02	-2.53E+03	3.51E+02	2.00E+02	-5.04E+03
<b>Resource use</b>							<b>C4</b>	<b>C3</b>	<b>D</b>
Renewable primary energy as energy carrier	MJ	3.64E+03	1.73E-01	3.08E+01	1.78E+01	1.93E+02	2.53E+01	4.09E+01	4.08E+02
Renewable primary energy resources as material utilization	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
Total use of renewable primary energy resources	MJ	3.64E+03	4.31E+00	3.08E+01	1.78E+01	1.93E+02	2.53E+01	4.09E+01	4.08E+02
Non-renewable primary energy as energy carrier	MJ	1.80E+04	1.30E+03	6.97E+01	1.39E+02	-2.57E+03	3.62E+02	2.59E+02	-5.10E+03
Non-renewable primary energy as material utilization	MJ	2.05E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources	MJ	1.82E+04	1.30E+03	6.97E+01	1.39E+02	-2.57E+03	3.62E+02	2.59E+02	-5.10E+03
Use of secondary material	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
Use of renewable secondary fuels	MJ	3.12E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	3.69E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.39E-02	9.46E-02	-8.53E-01
Use of net fresh water	m <sup>3</sup>	1.76E+01	7.79E-03	3.57E-02	1.25E-01	-4.83E-01	0.00E+00	0.00E+00	0.00E+00

# ENVIRONMENTAL PRODUCT DECLARATION



**PRESSED AND COATED METAL ROOFING TILES**  
Product Specific EPD

According to ISO 14025,  
EN 15804 and ISO 21930:2017

	Unit	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
<b>Waste categories and output flows</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A4</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>C4</b>	<b>C3</b>	<b>D</b>
Hazardous waste disposed	kg	1.10E-05	1.27E-07	2.88E-08	4.39E-07	-3.16E-04	1.64E-06	9.95E-08	-6.43E-04
Non-hazardous waste disposed	kg	1.08E+02	1.32E-01	4.94E-02	1.35E+02	3.97E+01	5.13E+02	8.03E-02	2.18E+02
Radioactive waste disposed	kg	1.24E-01	1.43E-03	1.06E-02	5.77E-03	3.45E-04	4.28E-03	2.30E-02	2.67E-03
High-level radioactive waste	kg	1.21E-01	1.39E-03	1.03E-02	5.61E-03	3.35E-04	4.16E-03	2.23E-02	2.59E-03
Intermediate and low-level radioactive waste	kg	1.24E-01	1.43E-03	1.06E-02	5.77E-03	3.44E-04	4.28E-03	2.30E-02	2.66E-03
Components for re-use	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
Materials for recycling	kg	2.05E-02	0.00E+00	1.77E+02	0.00E+00	0.00E+00	0.00E+00	5.12E+02	0.00E+00
Materials for energy recovery	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
Exported electrical energy	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
Exported thermal energy	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

**Table 13. Impact assessment results (A-D) for satin coated metal tile products sold to Europe**

	Unit	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
<b>Environmental Impact Indicators (TRACI 2.1)</b>							<b>C4</b>	<b>C3</b>	<b>D</b>
Global warming potential	kg CO <sub>2</sub> -eq.	1.39E+03	4.68E+01	9.17E+00	2.17E+00	-4.49E+02	1.60E+01	1.08E+01	-5.28E+02
Stratospheric ozone layer depletion potential	kg CFC11-eq.	2.84E-09	5.97E-15	4.42E-14	7.47E-15	1.43E-12	5.17E-14	5.19E-14	1.68E-12
Acidification potential	kg SO <sub>2</sub> -eq.	1.31E+01	1.51E+00	1.39E-02	1.02E-02	-8.60E-01	4.81E-02	1.63E-02	-1.01E+00
Eutrophication potentials	kg N-eq.	2.57E-01	5.17E-02	1.05E-03	1.49E-03	-3.51E-02	2.07E-03	1.24E-03	-4.16E-02
Photochemical ozone creation potential	kg O <sub>3</sub> -eq.	1.25E+02	2.88E+01	1.99E-01	1.79E-01	-1.17E+01	8.69E-01	2.33E-01	-1.37E+01
Abiotic depletion potential for fossil resources	MJ, LHV	8.28E+02	8.27E+01	9.51E+00	4.52E+00	8.01E+01	3.21E+01	1.12E+01	9.43E+01
<b>Environmental Impact Indicators (CML 2001)</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A4</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>C4</b>	<b>C3</b>	<b>D</b>
Global warming potential (total)	kg CO <sub>2</sub> -eq.	1.39E+03	4.68E+01	9.17E+00	2.17E+00	-4.49E+02	1.60E+01	1.08E+01	-5.28E+02
Depletion potential of the stratospheric ozone layer	kg CFC11-eq.	2.59E-09	5.97E-15	4.42E-14	7.47E-15	1.43E-12	5.17E-14	5.19E-14	1.68E-12
Acidification potential of land and water	kg SO <sub>2</sub> -eq.	1.29E+01	1.42E+00	1.24E-02	9.22E-03	-8.97E-01	4.51E-02	1.46E-02	-1.06E+00
Eutrophication potential	kg PO <sub>4</sub> <sup>3-</sup> -eq.	6.69E-01	1.51E-01	1.36E-03	2.12E-03	-5.88E-02	4.80E-03	1.60E-03	-6.97E-02
Photochemical ozone creation potential	kg C <sub>2</sub> H <sub>4</sub> -eq.	6.66E-01	7.51E-02	9.72E-04	1.26E-04	-2.21E-01	4.17E-03	1.14E-03	-2.60E-01

# ENVIRONMENTAL PRODUCT DECLARATION



## PRESSED AND COATED METAL ROOFING TILES Product Specific EPD

According to ISO 14025,  
EN 15804 and ISO 21930:2017

	Unit	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
Abiotic depletion potential – elements	kg Sb-eq.	1.25E-02	1.21E-06	1.95E-06	4.65E-07	-6.68E-03	1.20E-06	2.30E-06	-7.85E-03
Abiotic depletion potential – fossil fuels	MJ	1.79E+04	5.75E+02	1.18E+02	3.48E+01	-4.31E+03	2.43E+02	1.38E+02	-5.07E+03
<b>Resource use</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A4</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>C4</b>	<b>C3</b>	<b>D</b>
Renewable primary energy as energy carrier	MJ	3.64E+03	7.51E-02	2.41E+01	2.87E+00	3.28E+02	1.75E+01	2.83E+01	3.87E+02
Renewable primary energy resources as material utilization	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
Total use of renewable primary energy resources	MJ	3.64E+03	1.94E+00	2.41E+01	2.87E+00	3.28E+02	1.75E+01	2.83E+01	3.87E+02
Non-renewable primary energy as energy carrier	MJ	1.80E+04	5.75E+02	1.52E+02	3.56E+01	-4.37E+03	2.50E+02	1.79E+02	-5.14E+03
Non-renewable primary energy as material utilization	MJ	2.05E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources	MJ	1.82E+04	5.77E+02	1.52E+02	3.56E+01	-4.37E+03	2.50E+02	1.79E+02	-5.14E+03
Use of secondary material	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
Use of renewable secondary fuels	MJ	3.12E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	3.69E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.04E-02	6.55E-02	-9.64E-01
Use of net fresh water	m <sup>3</sup>	1.76E+01	3.48E-03	5.57E-02	5.05E-03	-8.20E-01	0.00E+00	0.00E+00	0.00E+00
<b>Waste categories and output flows</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A4</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>C4</b>	<b>C3</b>	<b>D</b>
Hazardous waste disposed	kg	1.10E-05	5.61E-08	5.86E-08	2.38E-07	-5.36E-04	1.13E-06	6.89E-08	-6.31E-04
Non-hazardous waste disposed	kg	1.08E+02	5.75E-02	4.73E-02	5.33E+01	6.74E+01	3.55E+02	5.56E-02	7.93E+01
Radioactive waste disposed	kg	1.24E-01	6.25E-04	1.36E-02	3.01E-04	5.43E-04	2.96E-03	1.60E-02	6.90E-04
High-level radioactive waste	kg	1.21E-01	6.08E-04	1.31E-02	2.92E-04	5.27E-04	2.88E-03	1.54E-02	6.69E-04
Intermediate and low-level radioactive waste	kg	1.24E-01	6.24E-04	1.35E-02	3.01E-04	5.42E-04	2.96E-03	1.59E-02	6.89E-04
Components for re-use	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
Materials for recycling	kg	2.05E-02	0.00E+00	3.01E+02	0.00E+00	0.00E+00	0.00E+00	3.54E+02	0.00E+00
Materials for energy recovery	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
Exported electrical energy	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
Exported thermal energy	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

# ENVIRONMENTAL PRODUCT DECLARATION



PRESSED AND COATED METAL ROOFING TILES  
Product Specific EPD

According to ISO 14025,  
EN 15804 and ISO 21930:2017

## 3.2. Life Cycle Assessment Results – A to D for the UK market

EPD results for the three types of metal roofing tiles for the UK market are provided from Table 14 to Table 16.

**Table 14. Impact assessment results (A-D) for natural stone coated metal tile (representative) product sold to the UK**

	Unit	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
<b>Environmental Impact Indicators (TRACI 2.1)</b>							<b>C4</b>	<b>C3</b>	<b>D</b>
Global warming potential	kg CO <sub>2</sub> -eq.	1.48E+03	1.37E+02	4.67E+00	1.18E+01	-2.36E+02	2.25E+01	1.52E+01	-4.71E+02
Stratospheric ozone layer depletion potential	kg CFC11-eq.	2.82E-09	1.74E-14	1.76E-13	1.40E-13	8.59E-13	7.28E-14	7.31E-14	1.72E-12
Acidification potential	kg SO <sub>2</sub> -eq.	1.33E+01	4.47E+00	1.34E-02	-1.87E-02	-4.84E-01	6.77E-02	2.30E-02	-9.67E-01
Eutrophication potentials	kg N-eq.	2.70E-01	1.53E-01	4.74E-04	-6.44E-04	-1.97E-02	2.92E-03	1.75E-03	-3.94E-02
Photochemical ozone creation potential	kg O <sub>3</sub> -eq.	1.29E+02	8.54E+01	1.67E-01	-3.78E-01	-6.50E+00	1.22E+00	3.28E-01	-1.30E+01
Abiotic depletion potential for fossil resources	MJ, LHV	1.10E+03	2.41E+02	7.57E+00	2.24E+01	5.49E+01	4.51E+01	1.58E+01	1.10E+02
<b>Environmental Impact Indicators (CML 2001)</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A4</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>C4</b>	<b>C3</b>	<b>D</b>
Global warming potential (total)	kg CO <sub>2</sub> -eq.	1.48E+03	1.37E+02	4.67E+00	1.18E+01	-2.36E+02	2.25E+01	1.52E+01	-4.71E+02
Depletion potential of the stratospheric ozone layer	kg CFC11-eq.	2.57E-09	1.74E-14	1.76E-13	1.40E-13	8.59E-13	7.28E-14	7.31E-14	1.72E-12
Acidification potential of land and water	kg SO <sub>2</sub> -eq.	1.30E+01	4.20E+00	7.40E-03	-2.05E-02	-5.11E-01	6.35E-02	2.06E-02	-1.02E+00
Eutrophication potential	kg PO <sub>4</sub> <sup>3-</sup> - eq.	6.88E-01	4.46E-01	9.59E-04	-1.93E-03	-3.25E-02	6.75E-03	2.26E-03	-6.50E-02
Photochemical ozone creation potential	kg C <sub>2</sub> H <sub>4</sub> -eq.	7.18E-01	2.24E-01	7.01E-04	-8.65E-06	-1.29E-01	5.87E-03	1.61E-03	-2.58E-01
Abiotic depletion potential – elements	kg Sb-eq.	1.24E-02	3.56E-06	1.49E-06	-7.40E-07	-3.90E-03	1.69E-06	3.24E-06	-7.80E-03
Abiotic depletion potential – fossil fuels	MJ	1.98E+04	1.67E+03	6.46E+01	1.74E+02	-2.46E+03	3.42E+02	1.95E+02	-4.90E+03
<b>Resource use</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A4</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>C4</b>	<b>C3</b>	<b>D</b>
Renewable primary energy as energy carrier	MJ	3.72E+03	2.24E-01	4.49E+01	2.57E+01	1.98E+02	2.47E+01	3.99E+01	3.97E+02
Renewable primary energy resources as material utilization	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
Total use of renewable primary energy resources	MJ	3.72E+03	5.58E+00	4.49E+01	2.57E+01	1.98E+02	2.47E+01	3.99E+01	3.97E+02
Non-renewable primary energy as energy carrier	MJ	1.94E+04	1.67E+03	9.84E+01	1.94E+02	-2.48E+03	3.52E+02	2.52E+02	-4.97E+03
Non-renewable primary energy as material utilization	MJ	7.85E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources	MJ	2.02E+04	1.69E+03	9.84E+01	1.94E+02	-2.48E+03	3.52E+02	2.52E+02	-4.97E+03
Use of secondary material	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
Use of renewable secondary fuels	MJ	3.10E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

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## PRESSED AND COATED METAL ROOFING TILES Product Specific EPD

According to ISO 14025,  
EN 15804 and ISO 21930:2017

	Unit	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
Use of non-renewable secondary fuels	MJ	3.67E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E-02	9.22E-02	-8.30E-01
Use of net fresh water	m <sup>3</sup>	1.80E+01	1.01E-02	3.05E-02	1.69E-01	-4.15E-01	0.00E+00	0.00E+00	0.00E+00
Waste categories and output flows	Unit	A1-A3	A4	C3	C4	D	C4	C3	D
Hazardous waste disposed	kg	1.14E-05	1.65E-07	3.36E-08	6.11E-07	-3.13E-04	1.60E-06	9.70E-08	-6.26E-04
Non-hazardous waste disposed	kg	1.18E+02	1.70E-01	9.35E-02	1.90E+02	1.06E+02	5.00E+02	7.83E-02	2.13E+02
Radioactive waste disposed	kg	1.41E-01	1.85E-03	1.38E-02	7.69E-03	1.30E-03	4.17E-03	2.25E-02	2.60E-03
High-level radioactive waste	kg	1.37E-01	1.80E-03	1.35E-02	7.49E-03	1.26E-03	4.06E-03	2.17E-02	2.52E-03
Intermediate and low-level radioactive waste	kg	1.41E-01	1.85E-03	1.38E-02	7.68E-03	1.30E-03	4.17E-03	2.24E-02	2.60E-03
Components for re-use	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
Materials for recycling	kg	2.03E-02	0.00E+00	2.49E+02	0.00E+00	0.00E+00	0.00E+00	4.99E+02	0.00E+00
Materials for energy recovery	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
Exported electrical energy	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
Exported thermal energy	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

Table 15. Impact assessment results (A-D) for ceramic stone coated metal tile products sold to the UK

	Unit	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
Environmental Impact Indicators (TRACI 2.1)							C4	C3	D
Global warming potential	kg CO <sub>2</sub> -eq.	1.56E+03	1.40E+02	4.80E+00	1.20E+01	-2.42E+02	2.31E+01	1.56E+01	-4.84E+02
Stratospheric ozone layer depletion potential	kg CFC11-eq.	2.90E-09	1.79E-14	1.81E-13	1.44E-13	8.83E-13	7.47E-14	7.50E-14	1.77E-12
Acidification potential	kg SO <sub>2</sub> -eq.	1.43E+01	4.58E+00	1.38E-02	-1.92E-02	-4.97E-01	6.95E-02	2.36E-02	-9.94E-01
Eutrophication potentials	kg N-eq.	3.02E-01	1.57E-01	4.87E-04	-6.61E-04	-2.03E-02	3.00E-03	1.79E-03	-4.04E-02
Photochemical ozone creation potential	kg O <sub>3</sub> -eq.	1.45E+02	8.76E+01	1.71E-01	-3.88E-01	-6.68E+00	1.26E+00	3.37E-01	-1.34E+01
Abiotic depletion potential for fossil resources	MJ, LHV	1.22E+03	2.48E+02	7.76E+00	2.30E+01	5.64E+01	4.63E+01	1.62E+01	1.13E+02
Environmental Impact Indicators (CML 2001)	Unit	A1-A3	A4	C3	C4	D	C4	C3	D
Global warming potential (total)	kg CO <sub>2</sub> -eq.	1.56E+03	1.40E+02	4.80E+00	1.20E+01	-2.42E+02	2.31E+01	1.56E+01	-4.84E+02
Depletion potential of the stratospheric ozone layer	kg CFC11-eq.	2.64E-09	1.79E-14	1.81E-13	1.44E-13	8.83E-13	7.47E-14	7.50E-14	1.77E-12

# ENVIRONMENTAL PRODUCT DECLARATION



## PRESSED AND COATED METAL ROOFING TILES Product Specific EPD

According to ISO 14025,  
EN 15804 and ISO 21930:2017

	Unit	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
Acidification potential of land and water	kg SO <sub>2</sub> -eq.	1.40E+01	4.30E+00	7.61E-03	-2.11E-02	-5.25E-01	6.52E-02	2.11E-02	-1.05E+00
Eutrophication potential	kg PO <sub>4</sub> <sup>3-</sup> - eq.	7.78E-01	4.58E-01	9.85E-04	-1.98E-03	-3.34E-02	6.93E-03	2.32E-03	-6.68E-02
Photochemical ozone creation potential	kg C <sub>2</sub> H <sub>4</sub> -eq.	7.74E-01	2.30E-01	7.19E-04	-8.87E-06	-1.32E-01	6.02E-03	1.65E-03	-2.65E-01
Abiotic depletion potential – elements	kg Sb-eq.	1.28E-02	3.64E-06	1.53E-06	-7.60E-07	-4.01E-03	1.73E-06	3.32E-06	-8.01E-03
Abiotic depletion potential – fossil fuels	MJ	2.11E+04	1.72E+03	6.62E+01	1.79E+02	-2.52E+03	3.51E+02	2.00E+02	-5.04E+03
<b>Resource use</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A4</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>C4</b>	<b>C3</b>	<b>D</b>
Renewable primary energy as energy carrier	MJ	3.86E+03	2.30E-01	4.61E+01	2.64E+01	2.04E+02	2.53E+01	4.09E+01	4.08E+02
Renewable primary energy resources as material utilization	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
Total use of renewable primary energy resources	MJ	3.86E+03	5.73E+00	4.61E+01	2.64E+01	2.04E+02	2.53E+01	4.09E+01	4.08E+02
Non-renewable primary energy as energy carrier	MJ	2.06E+04	1.72E+03	1.01E+02	1.98E+02	-2.55E+03	3.62E+02	2.59E+02	-5.10E+03
Non-renewable primary energy as material utilization	MJ	8.07E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources	MJ	2.14E+04	1.73E+03	1.01E+02	1.98E+02	-2.55E+03	3.62E+02	2.59E+02	-5.10E+03
Use of secondary material	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
Use of renewable secondary fuels	MJ	3.18E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	3.77E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.39E-02	9.46E-02	-8.53E-01
Use of net fresh water	m <sup>3</sup>	1.84E+01	1.04E-02	3.14E-02	1.72E-01	-4.27E-01	0.00E+00	0.00E+00	0.00E+00
<b>Waste categories and output flows</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A4</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>C4</b>	<b>C3</b>	<b>D</b>
Hazardous waste disposed	kg	1.21E-05	1.69E-07	3.45E-08	6.27E-07	-3.21E-04	1.64E-06	9.95E-08	-6.43E-04
Non-hazardous waste disposed	kg	1.24E+02	1.75E-01	9.59E-02	1.95E+02	1.09E+02	5.13E+02	8.03E-02	2.18E+02
Radioactive waste disposed	kg	1.47E-01	1.90E-03	1.42E-02	7.89E-03	1.33E-03	4.28E-03	2.30E-02	2.67E-03
High-level radioactive waste	kg	1.43E-01	1.85E-03	1.38E-02	7.69E-03	1.29E-03	4.16E-03	2.23E-02	2.59E-03
Intermediate and low-level radioactive waste	kg	1.47E-01	1.90E-03	1.42E-02	7.88E-03	1.33E-03	4.28E-03	2.30E-02	2.66E-03
Components for re-use	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
Materials for recycling	kg	2.09E-02	0.00E+00	2.56E+02	0.00E+00	0.00E+00	0.00E+00	5.12E+02	0.00E+00
Materials for energy recovery	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
Exported electrical energy	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
Exported thermal energy	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

# ENVIRONMENTAL PRODUCT DECLARATION



**PRESSED AND COATED METAL ROOFING TILES**  
Product Specific EPD

According to ISO 14025,  
EN 15804 and ISO 21930:2017

**Table 16. Impact assessment results (A-D) for satin coated metal tile products sold to the UK**

	Unit	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
<b>Environmental Impact Indicators (TRACI 2.1)</b>							<b>C4</b>	<b>C3</b>	<b>D</b>
Global warming potential	kg CO <sub>2</sub> -eq.	1.39E+03	9.82E+01	3.32E+00	8.34E+00	-2.64E+02	1.60E+01	1.08E+01	-5.28E+02
Stratospheric ozone layer depletion potential	kg CFC11-eq.	2.84E-09	1.25E-14	1.25E-13	9.95E-14	8.41E-13	5.17E-14	5.19E-14	1.68E-12
Acidification potential	kg SO <sub>2</sub> -eq.	1.31E+01	3.21E+00	9.58E-03	-1.33E-02	-5.06E-01	4.81E-02	1.63E-02	-1.01E+00
Eutrophication potentials	kg N-eq.	2.57E-01	1.10E-01	3.37E-04	-4.57E-04	-2.09E-02	2.07E-03	1.24E-03	-4.16E-02
Photochemical ozone creation potential	kg O <sub>3</sub> -eq.	1.25E+02	6.12E+01	1.19E-01	-2.69E-01	-6.85E+00	8.69E-01	2.33E-01	-1.37E+01
Abiotic depletion potential for fossil resources	MJ, LHV	8.28E+02	1.73E+02	5.38E+00	1.59E+01	4.72E+01	3.21E+01	1.12E+01	9.43E+01
<b>Environmental Impact Indicators (CML 2001)</b>							<b>C4</b>	<b>C3</b>	<b>D</b>
Global warming potential (total)	kg CO <sub>2</sub> -eq.	1.39E+03	9.82E+01	3.32E+00	8.34E+00	-2.64E+02	1.60E+01	1.08E+01	-5.28E+02
Depletion potential of the stratospheric ozone layer	kg CFC11-eq.	2.59E-09	1.25E-14	1.25E-13	9.95E-14	8.41E-13	5.17E-14	5.19E-14	1.68E-12
Acidification potential of land and water	kg SO <sub>2</sub> -eq.	1.29E+01	3.01E+00	5.26E-03	-1.45E-02	-5.28E-01	4.51E-02	1.46E-02	-1.06E+00
Eutrophication potential	kg PO <sub>4</sub> <sup>3-</sup> - eq.	6.69E-01	3.21E-01	6.82E-04	-1.36E-03	-3.48E-02	4.80E-03	1.60E-03	-6.97E-02
Photochemical ozone creation potential	kg C <sub>2</sub> H <sub>4</sub> -eq.	6.66E-01	1.61E-01	4.98E-04	-6.15E-06	-1.30E-01	4.17E-03	1.14E-03	-2.60E-01
Abiotic depletion potential – elements	kg Sb-eq.	1.25E-02	2.55E-06	1.06E-06	-5.26E-07	-3.93E-03	1.20E-06	2.30E-06	-7.85E-03
Abiotic depletion potential – fossil fuels	MJ	1.79E+04	1.21E+03	4.58E+01	1.24E+02	-2.53E+03	2.43E+02	1.38E+02	-5.07E+03
<b>Resource use</b>							<b>C4</b>	<b>C3</b>	<b>D</b>
Renewable primary energy as energy carrier	MJ	3.64E+03	1.61E-01	3.20E+01	1.83E+01	1.93E+02	1.75E+01	2.83E+01	3.87E+02
Renewable primary energy resources as material utilization	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
Total use of renewable primary energy resources	MJ	3.64E+03	4.01E+00	3.20E+01	1.83E+01	1.93E+02	1.75E+01	2.83E+01	3.87E+02
Non-renewable primary energy as energy carrier	MJ	1.80E+04	1.21E+03	6.99E+01	1.38E+02	-2.57E+03	2.50E+02	1.79E+02	-5.14E+03
Non-renewable primary energy as material utilization	MJ	2.05E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources	MJ	1.82E+04	1.21E+03	6.99E+01	1.38E+02	-2.57E+03	2.50E+02	1.79E+02	-5.14E+03
Use of secondary material	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
Use of renewable secondary fuels	MJ	3.12E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	3.69E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.04E-02	6.55E-02	-9.64E-01
Use of net fresh water	m <sup>3</sup>	1.76E+01	7.25E-03	2.17E-02	1.20E-01	-4.83E-01	0.00E+00	0.00E+00	0.00E+00

# ENVIRONMENTAL PRODUCT DECLARATION



**PRESSED AND COATED METAL ROOFING TILES**  
Product Specific EPD

According to ISO 14025,  
EN 15804 and ISO 21930:2017

	Unit	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
<b>Waste categories and output flows</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A4</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>C4</b>	<b>C3</b>	<b>D</b>
Hazardous waste disposed	kg	1.10E-05	1.18E-07	2.39E-08	4.34E-07	-3.16E-04	1.13E-06	6.89E-08	-6.31E-04
Non-hazardous waste disposed	kg	1.08E+02	1.22E-01	6.64E-02	1.35E+02	3.97E+01	3.55E+02	5.56E-02	7.93E+01
Radioactive waste disposed	kg	1.24E-01	1.33E-03	9.83E-03	5.46E-03	3.45E-04	2.96E-03	1.60E-02	6.90E-04
High-level radioactive waste	kg	1.21E-01	1.29E-03	9.59E-03	5.32E-03	3.35E-04	2.88E-03	1.54E-02	6.69E-04
Intermediate and low-level radioactive waste	kg	1.24E-01	1.33E-03	9.82E-03	5.46E-03	3.44E-04	2.96E-03	1.59E-02	6.89E-04
Components for re-use	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
Materials for recycling	kg	2.05E-02	0.00E+00	1.77E+02	0.00E+00	0.00E+00	0.00E+00	3.54E+02	0.00E+00
Materials for energy recovery	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
Exported electrical energy	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
Exported thermal energy	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

### 3.3. Life Cycle Assessment Results – A to D for the Japanese market

EPD results for the Japanese market are given from Table 17 to Table 19.

**Table 17. Impact assessment results (A-D) for natural stone coated metal tile (representative) product sold to Japan**

	Unit	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
<b>Environmental Impact Indicators (TRACI 2.1)</b>							<b>C4</b>	<b>C3</b>	<b>D</b>
Global warming potential	kg CO <sub>2</sub> -eq.	1.48E+03	5.56E+01	9.66E+00	1.58E+01	-2.50E+02	2.25E+01	1.52E+01	-4.71E+02
Stratospheric ozone layer depletion potential	kg CFC11-eq.	2.82E-09	7.09E-15	2.29E-13	2.60E-13	9.11E-13	7.28E-14	7.31E-14	1.72E-12
Acidification potential	kg SO <sub>2</sub> -eq.	1.33E+01	1.78E+00	1.32E-02	-6.53E-02	-5.12E-01	6.77E-02	2.30E-02	-9.67E-01
Eutrophication potentials	kg N-eq.	2.70E-01	6.12E-02	6.95E-04	-2.32E-03	-2.08E-02	2.92E-03	1.75E-03	-3.94E-02
Photochemical ozone creation potential	kg O <sub>3</sub> -eq.	1.29E+02	3.41E+01	2.84E-01	-1.15E+00	-6.90E+00	1.22E+00	3.28E-01	-1.30E+01
Abiotic depletion potential for fossil resources	MJ, LHV	1.10E+03	9.84E+01	1.16E+01	2.46E+01	5.82E+01	4.51E+01	1.58E+01	1.10E+02
<b>Environmental Impact Indicators (CML 2001)</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A4</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>C4</b>	<b>C3</b>	<b>D</b>
Global warming potential (total)	kg CO <sub>2</sub> -eq.	1.48E+03	5.56E+01	9.66E+00	1.58E+01	-2.50E+02	2.25E+01	1.52E+01	-4.71E+02
Depletion potential of the stratospheric ozone layer	kg CFC11-eq.	2.57E-09	7.09E-15	2.29E-13	2.60E-13	9.11E-13	7.28E-14	7.31E-14	1.72E-12

# ENVIRONMENTAL PRODUCT DECLARATION



## PRESSED AND COATED METAL ROOFING TILES Product Specific EPD

According to ISO 14025,  
EN 15804 and ISO 21930:2017

	Unit	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
Acidification potential of land and water	kg SO <sub>2</sub> -eq.	1.30E+01	1.67E+00	1.11E-02	-6.37E-02	-5.42E-01	6.35E-02	2.06E-02	-1.02E+00
Eutrophication potential	kg PO <sub>4</sub> <sup>3-</sup> - eq.	6.88E-01	1.78E-01	1.59E-03	-6.06E-03	-3.45E-02	6.75E-03	2.26E-03	-6.50E-02
Photochemical ozone creation potential	kg C <sub>2</sub> H <sub>4</sub> -eq.	7.18E-01	8.88E-02	1.02E-03	-2.31E-03	-1.37E-01	5.87E-03	1.61E-03	-2.58E-01
Abiotic depletion potential – elements	kg Sb-eq.	1.24E-02	1.43E-06	1.74E-06	-1.95E-06	-4.13E-03	1.69E-06	3.24E-06	-7.80E-03
Abiotic depletion potential – fossil fuels	MJ	1.98E+04	6.84E+02	1.21E+02	2.15E+02	-2.60E+03	3.42E+02	1.95E+02	-4.90E+03
<b>Resource use</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A4</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>C4</b>	<b>C3</b>	<b>D</b>
Renewable primary energy as energy carrier	MJ	3.72E+03	8.88E-02	2.62E+01	2.05E+01	2.10E+02	2.47E+01	3.99E+01	3.97E+02
Renewable primary energy resources as material utilization	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
Total use of renewable primary energy resources	MJ	3.72E+03	2.31E+00	2.62E+01	2.05E+01	2.10E+02	2.47E+01	3.99E+01	3.97E+02
Non-renewable primary energy as energy carrier	MJ	1.94E+04	6.84E+02	1.24E+02	2.20E+02	-2.63E+03	3.52E+02	2.52E+02	-4.97E+03
Non-renewable primary energy as material utilization	MJ	7.85E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources	MJ	2.02E+04	6.86E+02	1.24E+02	2.20E+02	-2.63E+03	3.52E+02	2.52E+02	-4.97E+03
Use of secondary material	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
Use of renewable secondary fuels	MJ	3.10E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	3.67E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E-02	9.22E-02	-8.30E-01
Use of net fresh water	m <sup>3</sup>	1.80E+01	4.15E-03	3.92E-02	3.00E-01	-4.41E-01	0.00E+00	0.00E+00	0.00E+00
<b>Waste categories and output flows</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A4</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>C4</b>	<b>C3</b>	<b>D</b>
Hazardous waste disposed	kg	1.14E-05	6.66E-08	4.23E-08	4.07E-07	-3.32E-04	1.60E-06	9.70E-08	-6.26E-04
Non-hazardous waste disposed	kg	1.18E+02	6.81E-02	1.49E-01	1.23E+02	1.13E+02	5.00E+02	7.83E-02	2.13E+02
Radioactive waste disposed	kg	1.41E-01	7.39E-04	1.16E-03	2.30E-03	1.38E-03	4.17E-03	2.25E-02	2.60E-03
High-level radioactive waste	kg	1.37E-01	7.19E-04	1.11E-03	2.23E-03	1.34E-03	4.06E-03	2.17E-02	2.52E-03
Intermediate and low-level radioactive waste	kg	1.41E-01	7.39E-04	1.16E-03	2.30E-03	1.38E-03	4.17E-03	2.24E-02	2.60E-03
Components for re-use	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
Materials for recycling	kg	2.03E-02	0.00E+00	2.64E+02	0.00E+00	0.00E+00	0.00E+00	4.99E+02	0.00E+00
Materials for energy recovery	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
Exported electrical energy	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
Exported thermal energy	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

# ENVIRONMENTAL PRODUCT DECLARATION



**PRESSED AND COATED METAL ROOFING TILES**  
Product Specific EPD

According to ISO 14025,  
EN 15804 and ISO 21930:2017

**Table 18. Impact assessment results (A-D) for ceramic stone coated metal tile products sold to Japan**

	Unit	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
<b>Environmental Impact Indicators (TRACI 2.1)</b>							<b>C4</b>	<b>C3</b>	<b>D</b>
Global warming potential	kg CO <sub>2</sub> -eq.	1.56E+03	5.72E+01	9.92E+00	1.62E+01	-2.57E+02	2.31E+01	1.56E+01	-4.84E+02
Stratospheric ozone layer depletion potential	kg CFC11-eq.	2.90E-09	7.28E-15	2.35E-13	2.66E-13	9.36E-13	7.47E-14	7.50E-14	1.77E-12
Acidification potential	kg SO <sub>2</sub> -eq.	1.43E+01	1.83E+00	1.36E-02	-6.70E-02	-5.26E-01	6.95E-02	2.36E-02	-9.94E-01
Eutrophication potentials	kg N-eq.	3.02E-01	6.28E-02	7.13E-04	-2.39E-03	-2.14E-02	3.00E-03	1.79E-03	-4.04E-02
Photochemical ozone creation potential	kg O <sub>3</sub> -eq.	1.45E+02	3.50E+01	2.92E-01	-1.18E+00	-7.09E+00	1.26E+00	3.37E-01	-1.34E+01
Abiotic depletion potential for fossil resources	MJ, LHV	1.22E+03	1.01E+02	1.19E+01	2.52E+01	5.98E+01	4.63E+01	1.62E+01	1.13E+02
<b>Environmental Impact Indicators (CML 2001)</b>							<b>C4</b>	<b>C3</b>	<b>D</b>
Global warming potential (total)	kg CO <sub>2</sub> -eq.	1.56E+03	5.72E+01	9.92E+00	1.62E+01	-2.57E+02	2.31E+01	1.56E+01	-4.84E+02
Depletion potential of the stratospheric ozone layer	kg CFC11-eq.	2.64E-09	7.28E-15	2.35E-13	2.66E-13	9.36E-13	7.47E-14	7.50E-14	1.77E-12
Acidification potential of land and water	kg SO <sub>2</sub> -eq.	1.40E+01	1.72E+00	1.13E-02	-6.53E-02	-5.57E-01	6.52E-02	2.11E-02	-1.05E+00
Eutrophication potential	kg PO <sub>4</sub> <sup>3-</sup> - eq.	7.78E-01	1.83E-01	1.63E-03	-6.21E-03	-3.54E-02	6.93E-03	2.32E-03	-6.68E-02
Photochemical ozone creation potential	kg C <sub>2</sub> H <sub>4</sub> -eq.	7.74E-01	9.11E-02	1.05E-03	-2.38E-03	-1.40E-01	6.02E-03	1.65E-03	-2.65E-01
Abiotic depletion potential – elements	kg Sb-eq.	1.28E-02	1.47E-06	1.78E-06	-2.00E-06	-4.24E-03	1.73E-06	3.32E-06	-8.01E-03
Abiotic depletion potential – fossil fuels	MJ	2.11E+04	7.02E+02	1.25E+02	2.20E+02	-2.67E+03	3.51E+02	2.00E+02	-5.04E+03
<b>Resource use</b>							<b>C4</b>	<b>C3</b>	<b>D</b>
Renewable primary energy as energy carrier	MJ	3.86E+03	9.11E-02	2.69E+01	2.11E+01	2.16E+02	2.53E+01	4.09E+01	4.08E+02
Renewable primary energy resources as material utilization	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
Total use of renewable primary energy resources	MJ	3.86E+03	2.38E+00	2.69E+01	2.11E+01	2.16E+02	2.53E+01	4.09E+01	4.08E+02
Non-renewable primary energy as energy carrier	MJ	2.06E+04	7.02E+02	1.28E+02	2.26E+02	-2.71E+03	3.62E+02	2.59E+02	-5.10E+03
Non-renewable primary energy as material utilization	MJ	8.07E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources	MJ	2.14E+04	7.04E+02	1.28E+02	2.26E+02	-2.71E+03	3.62E+02	2.59E+02	-5.10E+03
Use of secondary material	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
Use of renewable secondary fuels	MJ	3.18E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	3.77E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.39E-02	9.46E-02	-8.53E-01
Use of net fresh water	m <sup>3</sup>	1.84E+01	4.26E-03	4.03E-02	3.08E-01	-4.53E-01	0.00E+00	0.00E+00	0.00E+00

# ENVIRONMENTAL PRODUCT DECLARATION



**PRESSED AND COATED METAL ROOFING TILES**  
Product Specific EPD

According to ISO 14025,  
EN 15804 and ISO 21930:2017

	Unit	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
<b>Waste categories and output flows</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A4</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>C4</b>	<b>C3</b>	<b>D</b>
Hazardous waste disposed	kg	1.21E-05	6.84E-08	4.34E-08	4.17E-07	-3.41E-04	1.64E-06	9.95E-08	-6.43E-04
Non-hazardous waste disposed	kg	1.24E+02	6.99E-02	1.53E-01	1.26E+02	1.16E+02	5.13E+02	8.03E-02	2.18E+02
Radioactive waste disposed	kg	1.47E-01	7.59E-04	1.19E-03	2.36E-03	1.41E-03	4.28E-03	2.30E-02	2.67E-03
High-level radioactive waste	kg	1.43E-01	7.38E-04	1.14E-03	2.28E-03	1.37E-03	4.16E-03	2.23E-02	2.59E-03
Intermediate and low-level radioactive waste	kg	1.47E-01	7.58E-04	1.19E-03	2.36E-03	1.41E-03	4.28E-03	2.30E-02	2.66E-03
Components for re-use	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
Materials for recycling	kg	2.09E-02	0.00E+00	2.71E+02	0.00E+00	0.00E+00	0.00E+00	5.12E+02	0.00E+00
Materials for energy recovery	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
Exported electrical energy	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
Exported thermal energy	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

**Table 19. Impact assessment results (A-D) for satin coated metal tile products sold to Japan**

	Unit	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
<b>Environmental Impact Indicators (TRACI 2.1)</b>							<b>C4</b>	<b>C3</b>	<b>D</b>
Global warming potential	kg CO <sub>2</sub> -eq.	1.39E+03	3.99E+01	6.87E+00	1.12E+01	-2.80E+02	1.60E+01	1.08E+01	-5.28E+02
Stratospheric ozone layer depletion potential	kg CFC11-eq.	2.84E-09	5.09E-15	1.63E-13	1.84E-13	8.91E-13	5.17E-14	5.19E-14	1.68E-12
Acidification potential	kg SO <sub>2</sub> -eq.	1.31E+01	1.29E+00	9.36E-03	-4.64E-02	-5.37E-01	4.81E-02	1.63E-02	-1.01E+00
Eutrophication potentials	kg N-eq.	2.57E-01	4.39E-02	4.94E-04	-1.65E-03	-2.21E-02	2.07E-03	1.24E-03	-4.16E-02
Photochemical ozone creation potential	kg O <sub>3</sub> -eq.	1.25E+02	2.45E+01	2.02E-01	-8.13E-01	-7.26E+00	8.69E-01	2.33E-01	-1.37E+01
Abiotic depletion potential for fossil resources	MJ, LHV	8.28E+02	7.06E+01	8.19E+00	1.74E+01	5.00E+01	3.21E+01	1.12E+01	9.43E+01
<b>Environmental Impact Indicators (CML 2001)</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A4</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>C4</b>	<b>C3</b>	<b>D</b>
Global warming potential (total)	kg CO <sub>2</sub> -eq.	1.39E+03	3.99E+01	6.87E+00	1.12E+01	-2.80E+02	1.60E+01	1.08E+01	-5.28E+02
Depletion potential of the stratospheric ozone layer	kg CFC11-eq.	2.59E-09	5.09E-15	1.63E-13	1.84E-13	8.91E-13	5.17E-14	5.19E-14	1.68E-12
Acidification potential of land and water	kg SO <sub>2</sub> -eq.	1.29E+01	1.21E+00	7.87E-03	-4.53E-02	-5.59E-01	4.51E-02	1.46E-02	-1.06E+00
Eutrophication potential	kg PO <sub>4</sub> <sup>3-</sup> -eq.	6.69E-01	1.29E-01	1.12E-03	-4.31E-03	-3.69E-02	4.80E-03	1.60E-03	-6.97E-02
Photochemical ozone creation potential	kg C <sub>2</sub> H <sub>4</sub> -eq.	6.66E-01	6.38E-02	7.28E-04	-1.64E-03	-1.38E-01	4.17E-03	1.14E-03	-2.60E-01

# ENVIRONMENTAL PRODUCT DECLARATION



## PRESSED AND COATED METAL ROOFING TILES Product Specific EPD

According to ISO 14025,  
EN 15804 and ISO 21930:2017

	Unit	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
Abiotic depletion potential – elements	kg Sb-eq.	1.25E-02	1.03E-06	1.23E-06	-1.39E-06	-4.16E-03	1.20E-06	2.30E-06	-7.85E-03
Abiotic depletion potential – fossil fuels	MJ	1.79E+04	4.92E+02	8.62E+01	1.52E+02	-2.69E+03	2.43E+02	1.38E+02	-5.07E+03
<b>Resource use</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A4</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>C4</b>	<b>C3</b>	<b>D</b>
Renewable primary energy as energy carrier	MJ	3.64E+03	6.38E-02	1.86E+01	1.45E+01	2.05E+02	1.75E+01	2.83E+01	3.87E+02
Renewable primary energy resources as material utilization	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
Total use of renewable primary energy resources	MJ	3.64E+03	1.66E+00	1.86E+01	1.45E+01	2.05E+02	1.75E+01	2.83E+01	3.87E+02
Non-renewable primary energy as energy carrier	MJ	1.80E+04	4.92E+02	8.83E+01	1.56E+02	-2.72E+03	2.50E+02	1.79E+02	-5.14E+03
Non-renewable primary energy as material utilization	MJ	2.05E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources	MJ	1.82E+04	4.93E+02	8.83E+01	1.56E+02	-2.72E+03	2.50E+02	1.79E+02	-5.14E+03
Use of secondary material	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
Use of renewable secondary fuels	MJ	3.12E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	3.69E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.04E-02	6.55E-02	-9.64E-01
Use of net fresh water	m <sup>3</sup>	1.76E+01	2.98E-03	2.79E-02	2.13E-01	-5.12E-01	0.00E+00	0.00E+00	0.00E+00
<b>Waste categories and output flows</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A4</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>C4</b>	<b>C3</b>	<b>D</b>
Hazardous waste disposed	kg	1.10E-05	4.78E-08	3.01E-08	2.89E-07	-3.34E-04	1.13E-06	6.89E-08	-6.31E-04
Non-hazardous waste disposed	kg	1.08E+02	4.89E-02	1.06E-01	8.76E+01	4.21E+01	3.55E+02	5.56E-02	7.93E+01
Radioactive waste disposed	kg	1.24E-01	5.31E-04	8.22E-04	1.63E-03	3.66E-04	2.96E-03	1.60E-02	6.90E-04
High-level radioactive waste	kg	1.21E-01	5.16E-04	7.92E-04	1.58E-03	3.55E-04	2.88E-03	1.54E-02	6.69E-04
Intermediate and low-level radioactive waste	kg	1.24E-01	5.30E-04	8.21E-04	1.63E-03	3.65E-04	2.96E-03	1.59E-02	6.89E-04
Components for re-use	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
Materials for recycling	kg	2.05E-02	0.00E+00	1.88E+02	0.00E+00	0.00E+00	0.00E+00	3.54E+02	0.00E+00
Materials for energy recovery	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
Exported electrical energy	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
Exported thermal energy	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

# ENVIRONMENTAL PRODUCT DECLARATION



PRESSED AND COATED METAL ROOFING TILES  
Product Specific EPD

According to ISO 14025,  
EN 15804 and ISO 21930:2017

## 3.4. Life Cycle Assessment Results – A to D for the New Zealand market

EPD results for the New Zealand market are provided from Table 20 to Table 22.

**Table 20. Impact assessment results (A-D) for natural stone coated metal tile (representative) product sold to New Zealand**

	Unit	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
<b>Environmental Impact Indicators (TRACI 2.1)</b>							<b>C4</b>	<b>C3</b>	<b>D</b>
Global warming potential	kg CO <sub>2</sub> -eq.	1.48E+03	1.15E+01	3.30E+00	2.48E+00	-3.57E+02	2.25E+01	1.52E+01	-4.71E+02
Stratospheric ozone layer depletion potential	kg CFC11-eq.	2.82E-09	1.37E-15	1.85E-14	8.01E-15	1.53E-12	7.28E-14	7.31E-14	1.72E-12
Acidification potential	kg SO <sub>2</sub> -eq.	1.33E+01	2.37E-02	5.56E-02	7.45E-03	1.13E+00	6.77E-02	2.30E-02	-9.67E-01
Eutrophication potentials	kg N-eq.	2.70E-01	1.26E-03	8.55E-04	3.21E-04	3.39E-02	2.92E-03	1.75E-03	-3.94E-02
Photochemical ozone creation potential	kg O <sub>3</sub> -eq.	1.29E+02	4.96E-01	2.10E-01	1.34E-01	2.68E+01	1.22E+00	3.28E-01	-1.30E+01
Abiotic depletion potential for fossil resources	MJ, LHV	1.10E+03	2.19E+01	4.96E+00	4.97E+00	2.06E+02	4.51E+01	1.58E+01	1.10E+02
<b>Environmental Impact Indicators (CML 2001)</b>							<b>C4</b>	<b>C3</b>	<b>D</b>
Global warming potential (total)	kg CO <sub>2</sub> -eq.	1.48E+03	1.15E+01	3.30E+00	2.48E+00	-3.57E+02	2.25E+01	1.52E+01	-4.71E+02
Depletion potential of the stratospheric ozone layer	kg CFC11-eq.	2.57E-09	1.37E-15	1.85E-14	8.01E-15	1.53E-12	7.28E-14	7.31E-14	1.72E-12
Acidification potential of land and water	kg SO <sub>2</sub> -eq.	1.30E+01	1.91E-02	6.28E-03	6.98E-03	9.63E-01	6.35E-02	2.06E-02	-1.02E+00
Eutrophication potential	kg PO <sub>4</sub> <sup>3-</sup> - eq.	6.88E-01	3.55E-03	1.32E-03	7.42E-04	1.42E-01	6.75E-03	2.26E-03	-6.50E-02
Photochemical ozone creation potential	kg C <sub>2</sub> H <sub>4</sub> -eq.	7.18E-01	-4.12E-03	5.35E-04	6.46E-04	-1.29E-01	5.87E-03	1.61E-03	-2.58E-01
Abiotic depletion potential – elements	kg Sb-eq.	1.24E-02	1.50E-07	9.62E-07	1.86E-07	-6.93E-03	1.69E-06	3.24E-06	-7.80E-03
Abiotic depletion potential – fossil fuels	MJ	1.98E+04	1.54E+02	4.03E+01	3.76E+01	-3.56E+03	3.42E+02	1.95E+02	-4.90E+03
<b>Resource use</b>							<b>C4</b>	<b>C3</b>	<b>D</b>
Renewable primary energy as energy carrier	MJ	3.72E+03	-4.12E-03	1.63E+02	2.71E+00	3.57E+02	2.47E+01	3.99E+01	3.97E+02
Renewable primary energy resources as material utilization	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
Total use of renewable primary energy resources	MJ	3.72E+03	9.23E-01	1.63E+02	2.71E+00	3.57E+02	2.47E+01	3.99E+01	3.97E+02
Non-renewable primary energy as energy carrier	MJ	1.94E+04	1.54E+02	4.03E+01	3.88E+01	-3.61E+03	3.52E+02	2.52E+02	-4.97E+03
Non-renewable primary energy as material utilization	MJ	7.85E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources	MJ	2.02E+04	1.54E+02	4.03E+01	3.88E+01	-3.61E+03	3.52E+02	2.52E+02	-4.97E+03
Use of secondary material	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
Use of renewable secondary fuels	MJ	3.10E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

# ENVIRONMENTAL PRODUCT DECLARATION



## PRESSED AND COATED METAL ROOFING TILES Product Specific EPD

According to ISO 14025,  
EN 15804 and ISO 21930:2017

	Unit	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
Use of non-renewable secondary fuels	MJ	3.67E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E-02	9.22E-02	-8.30E-01
Use of net fresh water	m <sup>3</sup>	1.80E+01	1.32E-03	4.22E-01	4.71E-03	-7.27E-01	0.00E+00	0.00E+00	0.00E+00
Waste categories and output flows	Unit	A1-A3	A4	C3	C4	D	C4	C3	D
Hazardous waste disposed	kg	1.14E-05	9.56E-09	2.48E-08	1.76E-07	-5.56E-04	1.60E-06	9.70E-08	-6.26E-04
Non-hazardous waste disposed	kg	1.18E+02	2.04E-03	2.59E-02	5.50E+01	1.89E+02	5.00E+02	7.83E-02	2.13E+02
Radioactive waste disposed	kg	1.41E-01	3.80E-06	2.05E-05	4.59E-04	3.91E-03	4.17E-03	2.25E-02	2.60E-03
High-level radioactive waste	kg	1.37E-01	3.69E-06	1.99E-05	4.46E-04	3.79E-03	4.06E-03	2.17E-02	2.52E-03
Intermediate and low-level radioactive waste	kg	1.41E-01	3.79E-06	2.04E-05	4.58E-04	3.91E-03	4.17E-03	2.24E-02	2.60E-03
Components for re-use	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
Materials for recycling	kg	2.03E-02	0.00E+00	4.44E+02	0.00E+00	0.00E+00	0.00E+00	4.99E+02	0.00E+00
Materials for energy recovery	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
Exported electrical energy	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
Exported thermal energy	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

Table 21. Impact assessment results (A-D) for ceramic stone coated metal tile products sold to New Zealand

	Unit	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
Environmental Impact Indicators (TRACI 2.1)							C4	C3	D
Global warming potential	kg CO <sub>2</sub> -eq.	1.56E+03	1.18E+01	3.40E+00	2.54E+00	-3.67E+02	2.31E+01	1.56E+01	-4.84E+02
Stratospheric ozone layer depletion potential	kg CFC11-eq.	2.90E-09	1.40E-15	1.89E-14	8.22E-15	1.57E-12	7.47E-14	7.50E-14	1.77E-12
Acidification potential	kg SO <sub>2</sub> -eq.	1.43E+01	2.42E-02	5.72E-02	7.64E-03	1.17E+00	6.95E-02	2.36E-02	-9.94E-01
Eutrophication potentials	kg N-eq.	3.02E-01	1.28E-03	8.77E-04	3.29E-04	3.47E-02	3.00E-03	1.79E-03	-4.04E-02
Photochemical ozone creation potential	kg O <sub>3</sub> -eq.	1.45E+02	5.09E-01	2.16E-01	1.38E-01	2.74E+01	1.26E+00	3.37E-01	-1.34E+01
Abiotic depletion potential for fossil resources	MJ, LHV	1.22E+03	2.25E+01	5.08E+00	5.09E+00	2.12E+02	4.63E+01	1.62E+01	1.13E+02
Environmental Impact Indicators (CML 2001)	Unit	A1-A3	A4	C3	C4	D	C4	C3	D
Global warming potential (total)	kg CO <sub>2</sub> -eq.	1.56E+03	1.18E+01	3.40E+00	2.54E+00	-3.67E+02	2.31E+01	1.56E+01	-4.84E+02
Depletion potential of the stratospheric ozone layer	kg CFC11-eq.	2.64E-09	1.40E-15	1.89E-14	8.22E-15	1.57E-12	7.47E-14	7.50E-14	1.77E-12

# ENVIRONMENTAL PRODUCT DECLARATION



## PRESSED AND COATED METAL ROOFING TILES Product Specific EPD

According to ISO 14025,  
EN 15804 and ISO 21930:2017

	Unit	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
Acidification potential of land and water	kg SO <sub>2</sub> -eq.	1.40E+01	1.96E-02	6.44E-03	7.16E-03	9.87E-01	6.52E-02	2.11E-02	-1.05E+00
Eutrophication potential	kg PO <sub>4</sub> <sup>3-</sup> - eq.	7.78E-01	3.64E-03	1.36E-03	7.63E-04	1.46E-01	6.93E-03	2.32E-03	-6.68E-02
Photochemical ozone creation potential	kg C <sub>2</sub> H <sub>4</sub> -eq.	7.74E-01	-4.22E-03	5.49E-04	6.62E-04	-1.32E-01	6.02E-03	1.65E-03	-2.65E-01
Abiotic depletion potential – elements	kg Sb-eq.	1.28E-02	1.54E-07	9.87E-07	1.91E-07	-7.12E-03	1.73E-06	3.32E-06	-8.01E-03
Abiotic depletion potential – fossil fuels	MJ	2.11E+04	1.57E+02	4.13E+01	3.86E+01	-3.66E+03	3.51E+02	2.00E+02	-5.04E+03
<b>Resource use</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A4</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>C4</b>	<b>C3</b>	<b>D</b>
Renewable primary energy as energy carrier	MJ	3.86E+03	-4.22E-03	1.68E+02	2.78E+00	3.67E+02	2.53E+01	4.09E+01	4.08E+02
Renewable primary energy resources as material utilization	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
Total use of renewable primary energy resources	MJ	3.86E+03	9.47E-01	1.68E+02	2.78E+00	3.67E+02	2.53E+01	4.09E+01	4.08E+02
Non-renewable primary energy as energy carrier	MJ	2.06E+04	1.57E+02	4.14E+01	3.97E+01	-3.71E+03	3.62E+02	2.59E+02	-5.10E+03
Non-renewable primary energy as material utilization	MJ	8.07E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources	MJ	2.14E+04	1.57E+02	4.14E+01	3.97E+01	-3.71E+03	3.62E+02	2.59E+02	-5.10E+03
Use of secondary material	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
Use of renewable secondary fuels	MJ	3.18E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	3.77E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.39E-02	9.46E-02	-8.53E-01
Use of net fresh water	m <sup>3</sup>	1.84E+01	1.36E-03	4.34E-01	4.83E-03	-7.47E-01	0.00E+00	0.00E+00	0.00E+00
<b>Waste categories and output flows</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A4</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>C4</b>	<b>C3</b>	<b>D</b>
Hazardous waste disposed	kg	1.21E-05	9.81E-09	2.55E-08	1.80E-07	-5.72E-04	1.64E-06	9.95E-08	-6.43E-04
Non-hazardous waste disposed	kg	1.24E+02	2.09E-03	2.66E-02	5.64E+01	1.94E+02	5.13E+02	8.03E-02	2.18E+02
Radioactive waste disposed	kg	1.47E-01	3.90E-06	2.10E-05	4.71E-04	4.01E-03	4.28E-03	2.30E-02	2.67E-03
High-level radioactive waste	kg	1.43E-01	3.79E-06	2.04E-05	4.58E-04	3.89E-03	4.16E-03	2.23E-02	2.59E-03
Intermediate and low-level radioactive waste	kg	1.47E-01	3.89E-06	2.10E-05	4.71E-04	4.01E-03	4.28E-03	2.30E-02	2.66E-03
Components for re-use	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
Materials for recycling	kg	2.09E-02	0.00E+00	4.56E+02	0.00E+00	0.00E+00	0.00E+00	5.12E+02	0.00E+00
Materials for energy recovery	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
Exported electrical energy	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
Exported thermal energy	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

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**Table 22. Impact assessment results (A-D) for satin coated metal tile products sold to New Zealand**

	Unit	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
<b>Environmental Impact Indicators (TRACI 2.1)</b>							<b>C4</b>	<b>C3</b>	<b>D</b>
Global warming potential	kg CO <sub>2</sub> -eq.	1.39E+03	8.24E+00	2.35E+00	1.76E+00	-4.26E+02	1.60E+01	1.08E+01	-5.28E+02
Stratospheric ozone layer depletion potential	kg CFC11-eq.	2.84E-09	9.79E-16	1.31E-14	5.69E-15	1.50E-12	5.17E-14	5.19E-14	1.68E-12
Acidification potential	kg SO <sub>2</sub> -eq.	1.31E+01	1.70E-02	3.95E-02	5.29E-03	5.17E-01	4.81E-02	1.63E-02	-1.01E+00
Eutrophication potentials	kg N-eq.	2.57E-01	8.98E-04	6.07E-04	2.29E-04	1.20E-02	2.07E-03	1.24E-03	-4.16E-02
Photochemical ozone creation potential	kg O <sub>3</sub> -eq.	1.25E+02	3.56E-01	1.50E-01	9.56E-02	1.50E+01	8.69E-01	2.33E-01	-1.37E+01
Abiotic depletion potential for fossil resources	MJ, LHV	8.28E+02	1.58E+01	3.52E+00	3.53E+00	1.61E+02	3.21E+01	1.12E+01	9.43E+01
<b>Environmental Impact Indicators (CML 2001)</b>							<b>C4</b>	<b>C3</b>	<b>D</b>
Global warming potential (total)	kg CO <sub>2</sub> -eq.	1.39E+03	8.24E+00	2.35E+00	1.76E+00	-4.26E+02	1.60E+01	1.08E+01	-5.28E+02
Depletion potential of the stratospheric ozone layer	kg CFC11-eq.	2.59E-09	9.79E-16	1.31E-14	5.69E-15	1.50E-12	5.17E-14	5.19E-14	1.68E-12
Acidification potential of land and water	kg SO <sub>2</sub> -eq.	1.29E+01	1.38E-02	4.46E-03	4.96E-03	3.91E-01	4.51E-02	1.46E-02	-1.06E+00
Eutrophication potential	kg PO <sub>4</sub> <sup>3-</sup> - eq.	6.69E-01	2.55E-03	9.42E-04	5.28E-04	8.03E-02	4.80E-03	1.60E-03	-6.97E-02
Photochemical ozone creation potential	kg C <sub>2</sub> H <sub>4</sub> -eq.	6.66E-01	-2.95E-03	3.81E-04	4.58E-04	-1.60E-01	4.17E-03	1.14E-03	-2.60E-01
Abiotic depletion potential – elements	kg Sb-eq.	1.25E-02	1.08E-07	6.84E-07	1.32E-07	-6.98E-03	1.20E-06	2.30E-06	-7.85E-03
Abiotic depletion potential – fossil fuels	MJ	1.79E+04	1.10E+02	2.86E+01	2.67E+01	-3.94E+03	2.43E+02	1.38E+02	-5.07E+03
<b>Resource use</b>							<b>C4</b>	<b>C3</b>	<b>D</b>
Renewable primary energy as energy carrier	MJ	3.64E+03	-2.95E-03	1.15E+02	1.93E+00	3.47E+02	1.75E+01	2.83E+01	3.87E+02
Renewable primary energy resources as material utilization	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
Total use of renewable primary energy resources	MJ	3.64E+03	6.62E-01	1.15E+02	1.93E+00	3.47E+02	1.75E+01	2.83E+01	3.87E+02
Non-renewable primary energy as energy carrier	MJ	1.80E+04	1.10E+02	2.86E+01	2.75E+01	-3.99E+03	2.50E+02	1.79E+02	-5.14E+03
Non-renewable primary energy as material utilization	MJ	2.05E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources	MJ	1.82E+04	1.10E+02	2.86E+01	2.75E+01	-3.99E+03	2.50E+02	1.79E+02	-5.14E+03
Use of secondary material	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
Use of renewable secondary fuels	MJ	3.12E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	3.69E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.04E-02	6.55E-02	-9.64E-01
Use of net fresh water	m <sup>3</sup>	1.76E+01	9.51E-04	3.00E-01	3.35E-03	-8.50E-01	0.00E+00	0.00E+00	0.00E+00

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	Unit	A1-A3	A4	C3	C4	D	100% Landfill	100% Recycle	
<b>Waste categories and output flows</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A4</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>C4</b>	<b>C3</b>	<b>D</b>
Hazardous waste disposed	kg	1.10E-05	6.87E-09	1.76E-08	1.25E-07	-5.61E-04	1.13E-06	6.89E-08	-6.31E-04
Non-hazardous waste disposed	kg	1.08E+02	1.46E-03	1.84E-02	3.90E+01	7.06E+01	3.55E+02	5.56E-02	7.93E+01
Radioactive waste disposed	kg	1.24E-01	2.73E-06	1.45E-05	3.26E-04	1.75E-03	2.96E-03	1.60E-02	6.90E-04
High-level radioactive waste	kg	1.21E-01	2.65E-06	1.41E-05	3.17E-04	1.69E-03	2.88E-03	1.54E-02	6.69E-04
Intermediate and low-level radioactive waste	kg	1.24E-01	2.72E-06	1.45E-05	3.26E-04	1.75E-03	2.96E-03	1.59E-02	6.89E-04
Components for re-use	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
Materials for recycling	kg	2.05E-02	0.00E+00	3.15E+02	0.00E+00	0.00E+00	0.00E+00	3.54E+02	0.00E+00
Materials for energy recovery	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
Exported electrical energy	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
Exported thermal energy	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



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#### 4. LCA Interpretation

Figure 2 illustrates the life cycle impacts of the three types of tiles in different markets for global warming potential. The end of life treatment applied for all markets is the 100% recycle scenario. The production stage (module A1-A3) is the dominant stage, with significant impact recovered at end of life (module D). The 100% recycle scenario at end of life provides the largest possible credit at module D. Impact of transport (module A4) is dependent on distance from manufacturing facility to end market.

Steel input is the most significant contributor to the main environmental impact indicators for all three product groups. The manufacture of resin and pigments in the base coat contribute to impact (less than 5%) for the natural stone tile type and the ceramic stone tiles. The ceramic coated tiles tend to have slightly greater impact compared to the natural stone coated tile and this is attributed to the ceramic stone production and transport to Ross Roof Group facilities. Application of coatings where non-methane volatile organic compounds (NMVOC) are released impact on indicators such as formation potential of tropospheric ozone (POCP). The satin coated tile has the least impact overall for all impact indicators where manufacturing impact for the steel input dominate, with minor contributions from the resin in the satin coating.

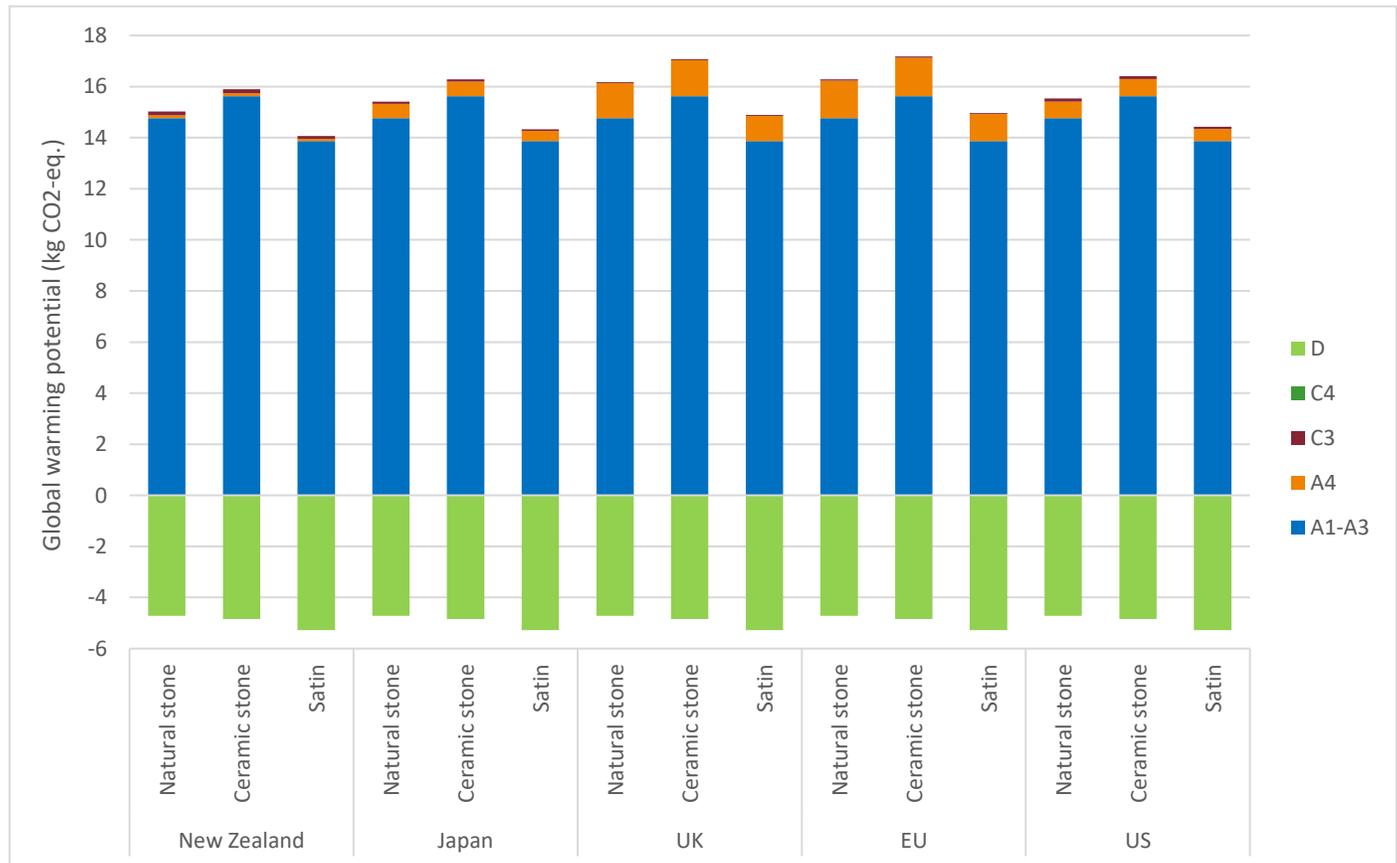


Figure 2: Global warming potential per 1m2 of roof tiles with 100% recycling at end of life



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## 5. Additional Environmental Information

### 5.0. Environment and Health During Manufacturing

Safety Data Sheets are held on file for chemicals used in manufacturing and staff members receive thorough training. In addition, regular monitoring of the manufacturing environment is performed by an independent contractor. We monitor Air Quality, Noise and VOC levels. Wastewater quality is routinely tested by an independent body and provided to the local environmental authority.

#### 5.1. Environment and Health During Installation

Correct Personal Protective Equipment (PPE) is to be worn during installation. Local legislation should be followed in terms of scaffolding, harness, or edge protection requirements. All metal off-cuts are to be collected by the roofing contractor.

#### 5.2. Market Placement/ Application Rules

Ross Roof Group products declared in this document comply with the following codes or regulations.

##### American National Standards Institute (ANSI)

- ANSI/UL 580/1897, Wind Uplift Resistance: Ross Roof Groups metal roofing panels covered under this report have been tested for wind uplift resistance in accordance with ANSI/UL 580/1897
- ANSI/UL790 (ASTM E108), Standard Test Methods for Fire Tests of Roof Coverings. Ross Roof Group tiles have been tested for fire classifications Class A, B, and C in accordance with ANSI/UL790 (ASTM E108) and qualify for use under Section 1505.1 of the 2012, 2009

##### American Society for Testing and Materials (ASTM)

- ASTM G53-93 Standard practice for operating light- and water- exposure apparatus (Fluorescent UV-condensation type) for exposure to non-metallic materials
- ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings
- ASTM B117 – Standard Practice for Operating Salt Spray (Fog) Apparatus
- ASTM E72 – Standard Test Methods of Conducting Strength Test of Panels for Building Constructions.
- ASTM G155 – Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials
- ASTM E 8 – Standard Test Methods for Tension Testing of Metallic Materials
- ASTM A653 – Standard Specification for STEEL Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

##### British Standard (BS)

- BS EN ISO 3231: 1998 Paints and varnishes – Determination of resistance to humid atmospheres containing sulphur dioxide.

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According to ISO 14025,  
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- BS AU 148 -15 1969 Methods of test for motor vehicle paints – Resistance to chipping.
- BS EN 13523 Coil coated metals – Test methods Part 7: Resistance to cracking on bending (T-bend test). A cylindrical mandrel bending device was used.
- BS 3900 Part D9 :1986 Determination of colour difference: measurement, (ISO 7724 Part 2)

## Certificates / Appraisals

- BBA – Certificate 17/5463
- LABC – EW679 A-G
- Miami Dade – 16-0208.09
- Florida Building Code - FL20888
- BRANZ - 1096

## European Organisation for Technical Approvals

- ETAG 006:2000 Guideline for European Approval of Systems of Mechanical Fastened Flexible Roof Waterproofing Membranes, Section 6.1.4.1 Resistance to wind uplift.
- PREN 15601 Hygrothermal performance of buildings – Resistance to wind-driven rain of roof coverings with discontinuously laid small elements – Test method.

## International Building Code (IBC)

- Accelerated Weathering: Tilcor North America's metal roofing panels covered under this report have passed the criteria for accelerated weathering in accordance with Section 1504.6 of the IBC.
- Wind Resistance: Roofing assemblies shall be designed to resist the design wind load pressures for components and cladding in accordance with Section 1609.5 and Section 1504.3 of the 2012, 2009 and 2006 IBC and Section R905.1 of the 2012, 2009 and 2006 IRC.
- Section 1504.3.2 of the 2012, 2009, and 2006 IBC.
- Section R905.1 of the 2012, 2009 and 2006 IRC.
- Section 1609.5 and Section 1504.3 of the 2012, 2009 and 2006 IBC
- Section 1505.1 of the 2012, 2009 2006 IBC
- R902.1 of the 2012, 2009 and 2006 IRC.
- International Residential Code (IRC)
- MOAT No.34: 1986 Precoated metal sheet roofing and cladding, Section 6.3.4.1

## ICC-ES

- ICC-ES Acceptance Criteria for Quality Documentation (AC10), dated June 2014
- ICC-ES Acceptance Criteria for Metal Roof Coverings (AC166), dated October 2012

## Japanese Standards Association

- JIS A 6909:2003 Coating Materials for Textured Finishes of Buildings
- JIS A 1453:1973 Method of abrasion test for building materials and part of building construction (abrasive-paper method)



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- JIS A 1415:1999 Methods of Exposure to Laboratory Light Sources for Polymeric Material of Buildings
- JIS D 0202:1988 General rules of coating films for automobile parts
- JIS K 5600-5-3:1999 Testing methods for paints Part 5: Mechanical property of film - Section 3: Falling-weight test
- JIS K 5600-6-2:1999 Testing Methods for Paints - Part 6: Chemical Property of Film - Section 2: Resistance to Liquids (water Immersion Method)
- JIS K 5600-6-3:1999 Testing methods for paints Part 6: Chemical property of film - Section 3: The effect of heat
- JIS A 1414:2007 Methods of performance test of panels for building construction
- JASS12 Japanese Architectural Standard Specification
- JIS K 5600-8-2:2008 Designation of degree of blistering
- JIS K 5600-8-4:1999 Designation of degree of cracking without preferential direction
- JIS K 5600-8-5:1999 Designation of degree of flaking without preferential direction
- JIS K 5600-8-6:1999 Rating of degree of chalking
- JIS K 5600-4-3:1999 Visual comparison of the colour paints
- JSTM J 6403:2019 Water leak test method for metal sheet roofs (blast water sprinkling test method)
- SSR 2007 Typhoon Testing

### Polish Committee for Standardization

- PN EN 14782:2008 Self-supporting metal sheet for roofing, external cladding, and internal lining – Product specification and requirements.
- PN EN 13501-5:2010 Fire classification of construction products and building elements – Part 5: Classification using data from external fire exposure to roofs tests.
- ENV 1187:2004 Test methods for external fire exposure to roofs

### Standards Australia

- AS1562:1992 Design and installation of sheet roof and wall cladding metal.

### Testing Application Standard (TAS)

- TAS No. 100: Test Procedure for Wind and Wind Driven Rain Resistance of Discontinuous Roof Systems
- TAS No. 125: Standard Requirements for Metal Roofing Systems, Section 8

### Underwriters Laboratories (UL)

- UL 580: Test for Uplift Resistance of Roof Assemblies
- UL 1897: Uplift Tests for Roof Covering Systems
- UL 790: Standard Test Methods for Fire Tests of Roof Coverings
- UL 2218: Standard for Impact Resistance of Prepared Roof Covering Materials





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## 6. Supporting Documentation

For further information and copies of certifications and appraisals please visit [www.RossRoofGroup.com](http://www.RossRoofGroup.com)

## 7. References

- ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and Procedures.
- ISO 14044: 2006 Environmental Management – Life cycle assessment – Requirements and Guidelines.
- ISO 21930: 2017 Sustainability in building construction – Environmental declaration of building products
- EN 15804:2012+A1:2013. Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products. 2013.
- Sphera. (2020). GaBi Life Cycle Inventory Database 2020, Chicago, USA. Retrieved from GaBi life cycle inventory database documentation: <http://www.gabi-software.com/support/gabi/gabi-database-2020-lci-documentation/>
- TRACI Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts, EPA <https://www.epa.gov/chemical-research/tool-reduction-and-assessment-chemicals-and-other-environmental-impacts-traci>
- UL Environment General Program Instructions Version 2.5, March 2020
- UL Environment PCR 10010 Part A: Life Cycle Assessment Calculation Rules and Report Requirements (v3.2; December 2018).
- UL Environment PCR 10010-5 Part B: Insulated Metal Panels, Metal Composite Panels, and Metal Cladding: Roof and Wall Panels (v2.0 October 2018)

