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Steel Sector Carbon Offset Programme

Programme Instructions v2.0

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1. Introduction

1.1. Programme and Branding

This document forms the Programme Instructions for the Steel Sector Carbon Offset Programme (the Programme). The Programme is supported by an online calculator, to enable calculation and offsetting of CO₂-equivalent emissions generated in the production, transport, fabrication and installation of steel products in New Zealand.

HERA is grateful to have been gifted a Te Reo name to use for the Steel Sector Carbon Offset Programme's calculator. Tātaītai Puhanga Waro (mo te Hua Rino) translates as Carbon Emissions Calculator (for Steel/Iron Products). The name was gifted by Joseph (Joe) Te Rito [PhD, Māori Interpreters Licence], Rongomaiwahine/Ngāti Kahungunu.

1.2. Motivation

HERA and its member organisations are mindful of the impact of metal products and services on climate change, and the rising public awareness of the issue.

Globally, the iron and steel Industry is responsible for around 7 % of CO₂-equivalent emissions (International Energy Agency, 2020), while New Zealand's steel industry accounts for 2.2 % of New Zealand's carbon emissions (Forsyth Barr, 2019). There are also significant volumes of steel imported for use in manufacturing, construction and infrastructure.

With New Zealand's commitment to a Carbon Zero target by 2050, reducing the Industry's emissions is important, but that this is only part of the challenge. Carbon is primarily used in the steel making process as a reductant (rather than an energy source). Although there is research into alternative reductants (e.g. hydrogen), currently no commercially viable alternative exists for coal. Therefore, until such an alternative is developed, it is important for the industry to utilise carbon offsetting as a mechanism to reduce net emissions. The Programme has been developed to enable certified carbon offsetting for the steel sector within New Zealand, with a preference for the offsets to be focused on the domestic planting of native New Zealand trees (*i.e.* to provide additional biodiversity and human capital benefits to New Zealand society). HERA is the facilitator of the offsetting process and has partnered with Ekos to administer the Programme. Given the diverse membership of HERA, with a range of product types using a mix of local and imported steel, a staged approach to implementation will be undertaken. An overlying Programme has been created, with instructions and specific rules for each product category as outlined in this document. The rules are intended to apply to both carbon and stainless steel products, as identified within each product category.

1.3. Transparency and Independence

These rules have been developed by thinkstep-anz in consultation with HERA. thinkstep-anz is an independent, New Zealand-based company that assesses and advises on sustainability. thinkstep-anz is a member of the New Zealand Green Building Council, Life Cycle Association of NZ, and has extensive experience conducting LCAs and creating EPDs in the steel sector in Australasia. HERA is an independent research association and has no vested interest in supporting one steel product, supplier or manufacturer above another. The rules will be maintained by HERA and hosted on the HERA website to ensure public access and transparency.

1.4. A Robust Basis: LCA and EPDs

The offsetting calculations in this programme are based on life cycle assessment (LCA) and environmental product declarations (EPDs). This is a cornerstone of the programme, because:

- EPDs provide a **consistent and comparable** way to quantify a product's carbon footprint, along with other environmental footprints.
- EPDs are **independently verified**.
- EPDs are recognised by offsetting programmes, such as Australia's Climate Active carbon neutral certification (Climate Active), as one of the key ways to calculate a carbon footprint, providing a **path towards carbon neutrality**.
- **EPDs provide additional benefits** to a company, being used for marketing and recognised by green building schemes such as Green Star and ISCA.
- LCA results, including carbon footprint, provide a **comprehensive, science-based assessment** of the environmental performance of products.

1.5. Programme Scope

The Programme is designed to support calculation and offsetting of the emissions associated with the production, transport and installation of steel products.

Steel production is energy intensive and is has the most significant emissions across these three steps, therefore requiring detailed LCA data to support these calculations, such as available through an EPD or industry LCA study.

The emissions associated with the transport of steel will depend on the transport distances and modes, and so are best calculated specifically for each project and this is allowed for in the Programme.

Installation emissions are best captured specifically for a project where possible, but the data is often not easily available to support this. As such, these Programme Instructions and Calculator provide average installation emission factors for some products, where installation emissions are expected. These emission factors cover only the emissions resulting from energy used in the installation (such as for running a crane), and do not cover the production of auxillary materials used for installation (e.g. nails, screws, etc).

1.6. Offsetting with Ekos

- Ekos is a New Zealand social enterprise that **grows and protects indigenous forests**, developing sustainable development outcomes in rural communities (thus contributing to the natural, social and human capital categories of Treasury's Living Standards Framework).
- Ekos's carbon credits arise from establishing new forests and protecting existing forests indefinitely from logging. These conservation activities create **measured, reported and verified carbon benefits**.
- The forests provide environmental benefits from **sustainable land management, waterways protection, and biodiversity conservation**.
- They also provide **self-sustaining income for landowning communities**, by covering the lost income that would have come from farming or logging the same land.
- Ekos is recognised as a credible carbon offsetting scheme by ConsumerNZ¹.
- Ekos are in the process of becoming certified under ISO 14065 (Requirements for greenhouse gas validation and verification bodies for use in accreditation or other forms of recognition) and are aiming to achieve verification in 2021.

¹ <https://www.consumer.org.nz/articles/carbon-offset-schemes>

2. General Programme Rules

2.1. Roles in Steel Sector Carbon Offset Programme

The roles in the Programme are outlined in Table 2-1 below.

Table 2-1: Roles in the Steel Product Carbon Offset Programme

Organisation(s)	Role
HERA	<p>Organiser and main overseer of the programme. HERA is responsible for:</p> <ul style="list-style-type: none"> • Reviewing and adjusting Programme Instructions. • Authorising organisations to use this Programme. • Designating the product category rules, LCAs, EPDs, and other data that can be used for calculations in this Programme. • Authorising guidance documents and communications related to this Programme, and maintaining access to these through the HERA website.
thinkstep-anz	<p>Creating Programme Instructions and advising on implementation of the Programme in conjunction with HERA and Ekos. Identification and selection of appropriate data sources to support emissions calculation, including EPD and LCA data, and confirmation that data adopted for use in the calculator meets the requirements of the Programme.</p>
Ekos	<p>Management and provision of offsets and certification under this Programme, and ensuring that the web calculator, purchase process and receipts/certification are correctly and reliably carried out.</p>
Primary steel manufacturers	<p>Communication of Programme to clients and downstream manufacturers, and ensuring calculations are correct (using HERA-approved information) for all primary products.</p>
Steel product distributors	<p>Communication of Programme to fabricators and installers (and consumers, where appropriate), and ensuring calculations are correct (using HERA-approved information) for all primary products.</p>
Fabricators and installers	<p>Communication of Programme to consumers, (and end-users if appropriate) and ensuring calculations are correct (using HERA-approved information) for all primary products.</p>
Consumers	<p>Purchaser of offsets – the consumers will have the option to purchase offsets for their particular projects.</p>

2.2. Use of Ekos General Programme Instructions

These Programme Instructions are to be used alongside the Ekos 'General Programme Instructions – Ekos Carbon Management for Products Programme' (Ekos GPI – Products), currently in draft format (Ekos Kāmahī Limited, 2020). The Ekos GPI – Products should be referred to for specific details on the operator of the programme, the standards to which it conforms, and details on complying with the EPD and LCA data requirements that also apply to this Programme. Once published, the Ekos GPI – Products will be available on the Ekos website (www.ekos.co.nz).

Note that the Ekos GPI – Products are intended for those manufacturers that choose to measure, reduce, offset and report their emissions, and relate to production of a product over an entire year. **The Steel Sector Carbon Offset Programme relates only to the calculation and offsetting of emissions related to the volume of product purchased, and therefore only specific sections of the Ekos GPI – Products are relevant to this Programme.**

The Steel Sector Carbon Offset Programme Instructions provide calculation methodology, industry-specific guidance, and training and communication guidelines. Please read this Programme Instructions document first, and refer to the Ekos GPI – Products for technical details as needed.

The relevant sections of the current version of the Ekos GPI – Products are:

- 2.10 – Process for Programme Administration
- 3 – Carbon Emissions Inventory (introduction)
- 3.4 – Two Methodological Tracks: EPD & LCA
- 6 – Carbon Offsetting (introduction)
- 6.1 – Cancellation of Consumed Carbon Credits
- 8 – Communications
 - Public Reporting is not relevant to the Steel Sector Carbon Offset Programme

2.3. Data Collection

Data must be collected and recorded for every instance of carbon offsetting. This data must be kept by the organisation selling the product (to either another business or to the consumer). At a minimum, the following data points must be recorded for every offsetting instance:

- The specific type of product (manufacturer/brand and specification)
- The quantity of product (in the appropriate functional unit for the product category, e.g. profiled m² of rollformed product for metal roofing, tonnes structural steel, *etc*)
- Transport distances and methods used for transport calculations
- The LCA data or EPD(s) that the calculations were based on, in addition to the data contained in these Programme Instructions.

2.4. Calculations

Carbon calculations must follow these Programme Instructions, as well as the applicable sections of the Ekos GPI – Products. The category-specific guidance, calculation methodology and emission factors in this document shall be used wherever applicable.

2.5. Addition of new Products

The Steel Sector Carbon Offset Programme has been developed by HERA with interested industry bodies to reflect the information currently available in New Zealand. It is anticipated that the Programme may need to expand over time to accommodate new information and/or product sectors.

The Programme covers the following product groups:

- Roll-formed roofing and cladding
- Heavy structural steel (beams, columns)
- Light steel framing
- Steel reinforcing (rebar, wire and mesh)
- Semi-finished or intermediate steel feedstock products
- Stainless steel products

2.5.1. Additional Product Groups

Guidelines for new or additional steel products may be developed and added to the Programme through discussion with HERA and at the cost of the requestor. Interested parties should contact carbon@hera.org.nz.

2.5.2. Additional EPDs and LCAs

Additional EPD and LCA results may be incorporated into the Steel Sector Carbon Offset Programme and Calculator when:

- a new EPD or LCA is developed for the New Zealand market, or
- an EPD or LCA becomes available for a product imported into New Zealand.

The interested party (EPD developer, or user of the imported product) should send the EPD and a request for inclusion to carbon@hera.org.nz.

2.6. Calculation and Offsetting Process

Emissions for most steel products used in New Zealand will be calculated via a web portal at <https://www.hera.org.nz/sustainability/tataitai-puhanga/> using the Steel Sector Carbon Offset Programme's calculator: Tātaitai Puhanga Waro (mo te Hua Rino).

Emissions can then be offset via Ekos through the calculator itself. The offsets provided by Ekos are focused on the planting and protection of native forests which in turn provides additional biodiversity and human capital benefits.

Ekos will send a receipt and certificate via email to show that emissions for a particular project/product have been offset.

Consumers can be referred to Tātaitai Puhanga Waro (mo te Hua Rino) with the knowledge of their purchase quantity and transport distance. Alternatively, the manufacturer, fabricator, or installer may choose to calculate and offset the emissions on the consumer's behalf.

In some cases, and with approval from HERA, emissions may be calculated offline, using the instructions and emission factors provided in these Programme Instructions. The calculations and background information must then be submitted to Ekos to verify that these Programme Instructions have been followed correctly and to complete the offsetting. This method is expected to be used only for extremely large or complex projects with many different steel products.

2.7. Certification

The methodology and emission factors in this document have been reviewed by Ekos, and thus any offsetting that has followed the calculation methodology and instructions in this document may use the Ekos Zero Carbon Steel label on reports and receipts. Zero Carbon Steel indicates that the footprint used for offsetting is based on an estimated measurement.

3. Calculation Methodology

3.1. General Principles

This section provides the general principles and calculation methodology used for the Steel Sector Offset Programme. Product-specific guidelines are provided in the next section.

3.2. Definitions

Before reading the remainder of this document, it is important to understand the following three definitions, which form the basis for all calculations:

CO₂e or carbon dioxide equivalent, is the unit of measure for greenhouse gas emissions (aka carbon footprint). Some gases have a higher contribution to climate change than carbon dioxide (for example 1 kg of methane can contribute as much impact as 28 kg of CO₂ over 100 years), so units are standardised into carbon dioxide equivalents.

Environmental life cycle assessments (LCAs) are studies that systematically look at the environmental impacts of a product throughout its life cycle – *i.e.* all the way upstream to resource extraction, and all the way downstream to reuse, recycling and disposal practices. A full LCA is a *precursor* to an EPD (see below) and can be used for calculations in this programme. The only environmental indicator considered in a carbon footprint is global warming potential, measured in kg of CO₂ equivalent. LCA studies must be conducted according to the requirements in section 3.4.3.

Environmental Product Declarations (EPDs) are a standardised and transparent way of communicating a range of environmental impacts for a particular product or product range. They perform a similar function to a nutrition label, but for environmental criteria. They are often published as a small booklet to provide context. These are usually published by the product manufacturer. The global warming potential (GWP) reported in the EPD is used for carbon footprint calculations. EPDs must confirm to the requirements of section 3.4.2.

Global Warming Potential (GWP) is the only impact category used in this programme. This is an indicator of potential contribution to climate change, and is measured in kilograms (or tonnes) of CO₂ equivalent.

Product Category Rule(s) (PCRs) are documents providing rules, requirements and guidelines for developing an EPD for a specific product category (*e.g.* building materials). They are used as complements to the programme instructions, *e.g.*, in terms of calculation rules, scenarios, and content required the EPD. The goal of a PCR is to enable consistent system boundaries and assumptions when developing EPDs for products in the same product category. In this way, comparisons can be made between products that serve similar functions.

3.3. System Boundary and Data Requirements

3.3.1. System Boundary

The Steel Sector Carbon Offset Programme is based on a "cradle to installation" life cycle. This means that modules A1-A5 in Table 3-1 (shown in green) are included. These modules cover the supply chain from raw material extraction, to manufacturing, and installation, with transport between each step also included. The system boundary for installation includes only the steel product(s) purchased and the energy required to install them; auxiliary materials used for installation are excluded. The impacts associated with producing any offcuts from the installation are included in the system boundary, due to the use of purchased steel as the raw data.

The Programme excludes later life cycle modules, such as the maintenance, repair or replacement throughout the life of the product, or end of life impacts, as these vary greatly between products and add significant complexity to the calculations. The use and end of life stages are also generally of minor impact compared to the production of steel.

Table 3-1: Life cycle stages included in the Steel Sector Carbon Offset Programme (green)

Production			Installation		Use stage							End-of-Life				Next product system
Raw material supply	Transport of raw materials	Manufacturing	Transport to customer	Construction / Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction / demolition	Transport to waste processing	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D

3.3.2. Data Requirements

The Steel Sector Carbon Offset Programme sets different levels of data requirements for each life cycle stage. These requirements are outlined below and expanded on in the following sections:

- The dominant source of emissions for steel products is the primary production of the steel (*i.e.* Modules A1-A3). The emissions for primary production shall be sourced from an EPD or substantive LCA.
- Further production emissions may occur from fabrication steps following primary steel production, which are expected to be relatively small compared to primary production. The emissions for fabrication shall be based on data collected from fabricators in New Zealand, although EPD or LCA data is preferred where available.
- The transport of products to the installation site is specific to each project and shall be calculated using project-specific distances and modes of transport.
 - Transport distances shall include all transport steps from production of the primary steel product to site. See section 3.6 for more detail.
- Installation emissions are expected to be relatively small compared to primary production. The emissions for installation shall be based on data collected from installers in New Zealand.
 - Where project-specific data is available, this may be used in preference to the generic installation emissions provided.

3.4. Production Emissions (A1-A3) and use of LCA and EPD

Emissions for primary production of steel must be based on one of the following options in order of preference:

- An environmental product declaration (EPD) published under a recognised programme and based on an appropriate product category rule (PCR)
- A life cycle assessment (LCA), based on an appropriate PCR (if available)
- EPD for a similar product where both are produced in the Australasian market

3.4.1. Product Category Rules

PCRs define the requirements for a specific category of products for conducting an LCA and declaring the results in an EPD, where EPDs can only be considered comparable if they follow the same PCR. PCRs specify requirements such as the life cycle stages that must be included, the declared unit or functional unit, and the indicators and methodologies that must be used.

The PCRs currently applicable to this programme are shown in Table 3-2. Note that some EPDs may have been produced using previous versions of or precursors to these PCRs. The most recently available version of a PCR should always be used when undertaking a new study, and may be found at <https://www.environdec.com/>.

Table 3-2: Current product category rules applicable to this programme

Reference	Title	Products Covered
EN 15804:2012 +A2:2019	Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.	All construction products; sub-PCRs offer additional guidance <i>[EN 15804:2012+A1:2013 may be used for EPDs published before 31-12-2021]</i>
PCR 2019:14	Construction Products	All construction products (additional guidance to EN 15804+A2); c-PCRs offer additional category specific guidance and should be used if available <i>[PCR 2012:01 may be used for EPDs published before 31-12-2021]</i>
PCR 2015:03	Basic iron or steel products & special steels, except construction steel products.	Semi-finished steels or intermediate special steels that will be further processed to become a finished consumer product
PCR 2014:10	Fabricated steel products, except construction products, machinery and equipment	Finished steel products that will not be further processed. Examples of products in this (e.g. chains, bearing steels, tools, shafts, tubes, pipes)

3.4.2. EPD Requirements

The Steel Sector Carbon Offset Programme recognises EPDs under the Australasian EPD Programme and the International EPD® System to be consistent with the greenhouse gas calculations and requirements of the Ekos GPI – Products. These EPDs are publicly available online at:

- www.epd-australasia.com (Australasia)
- www.environdec.com (International, includes Australasian EPDs)

EPDs from other international EPD programmes recognised by the International EPD System under mutual recognition agreements may also be used. EPDs must be developed in accordance with ISO 14040, ISO 14044, and ISO 14025.

EPDs for steel products manufactured in New Zealand and existing at the time this document version was prepared are listed in Table 3-3. The EPD Australasia website will always have the most recent EPDs available.

Table 3-3: EPDs for steel products manufactured in New Zealand

Product	Company
AlumiGard™, MagnaFlow™ and ZinaCore™ pre-painted roofing and cladding (New Zealand)	Fletcher Steel Ltd and its subsidiary Pacific Coilcoaters
COLORSTEEL® ENDURA® and COLORSTEEL® MAXX®	New Zealand Steel Limited
SEISMIC® Steel Reinforcing Bar, Coil, Rod and Wire	Pacific Steel (NZ) Limited

Other EPDs exist for products manufactured elsewhere, and it is possible to combine upstream LCA or EPD information with LCA data for processes occurring in New Zealand (e.g. fabrication), to get to the final carbon footprint for a particular product or project.

EPD and LCA emission factors that have been identified as relevant to the New Zealand market are provided in Annex A.

Industry Sector EPDs

Where a product-specific EPD is not available, but an industry sector EPD has been published, the industry average EPD data may be used *providing the company supplying the steel is listed as a contributor* to the EPD. However, industry average EPDs usually state the variation in results across the LCA study and results must fall within $\pm 10\%$, therefore additional impact must be added to account for this uncertainty, as follows:

- Where the EPD states the variability, **the upper end of the stated variability for the global warming potential impact must be added** to account for uncertainty.
- Where **variability is not stated, an additional 10% global warming impact must be added** to account for uncertainty.

Note: This factor is automatically incorporated into the online calculator where industry average EPDs are selected. It is the user’s responsibility to ensure that the steel is sourced from a company that has contributed to the LCA study and is listed in the EPD.

Addition of new EPDs

Additional EPDs may be incorporated into the Steel Product Carbon Offset Programme and Calculator when:

- a new EPD is developed for the New Zealand market, or
- an EPD becomes available for a product imported into New Zealand.

The interested party (EPD developer, or user of the product) should send the EPD and a request for inclusion to carbon@hera.org.nz.

3.4.3. LCA Requirements

An LCA study undertaken to achieve compliance in this programme must:

- comply with international accepted principles for LCA according to ISO 14040 and ISO 14044;
- follow the principles, requirements, and guidelines of ISO 14067 (Greenhouse gases—Carbon footprint of products—Requirements and guidelines for quantification);
- follow the general purpose of environmental declarations, the collection of data, and the methods and assumptions used as advocated in the ISO standard 14025; and
- undergo independent review by a suitably qualified person (e.g. a Life Cycle Assessment Certified Practitioner, or a Verifier for EPD Australasia or the International EPD system).

If a PCR document for the product category exists in the International EPD System (or another programme under mutual recognition agreements) the PCR must be used to guide the LCA study assumptions and development. The only impact category required to achieve compliance in this programme is GWP₁₀₀ (global warming potential over 100 years), measured in kg CO₂e.

Further guidance on what must be included in LCAs can be found in the Ekos GPI – Products.

Published Industry LCA data

Where a product-specific LCA is not available, but LCA data has been published by a reputable industry body (e.g. worldsteel, International Stainless Steel Forum), the industry average LCA data may be used *providing the company supplying the steel is listed as a contributor to the LCA study* (see Annex C). An **additional 15% global warming potential impact must be added**, to account for uncertainty.

While these LCA studies are robust, they have not been through the same verification process as an EPD and do not have the same requirement for results to fall within $\pm 10\%$ of the published figure. Industry LCA studies cover a large range of producers and geographies, and the individual impacts are expected to be much more variable than for an Industry EPD, which is generally limited to one geographical area.

Note: This factor is automatically incorporated into the online calculator when 'other' or 'average' products are selected. It is the user's responsibility to ensure that the steel is sourced from a company that is explicitly listed as having contributed to the LCA study.

3.4.4. Products without final EPD/LCA but that use the same input steel and are interchangeable with a product with a published EPD from the same country

The production of iron and steel is carbon intensive and the emissions associated with these initial production steps significantly outweigh the emissions of finishing processes. As such, the overall impacts of two similar/interchangeable steel products using the same input steel and produced in the same country are likely to be very similar.

The definition of similar/interchangeable steel products in this instance includes:

- the same primary input steel from the same producer, and
- the final manufacturing steps are conducted in the same country, and
- the two products have the same purpose (e.g. profiled painted longrun roofing steel).

Where an EPD or substantive LCA is not available for the final product used in a project, an alternative calculation method is applicable in certain circumstances, where:

- an EPD exists for a similar/interchangeable product, based on the same primary steel and produced in the same country, *and*
- the producer is able to confirm their primary steel is from the same source or country.

If this data exists, it may be used, but **an additional 5% global warming potential impact must be added**, to account for uncertainty.

Note: This factor is automatically incorporated into the online calculator when 'other' or 'average' products are selected. It is the user's responsibility to ensure that the product they are purchasing uses primary steel from the selected country.

There are a limited number of primary steel producers in Australasia: New Zealand Steel, BlueScope Steel Australia, and InfraBuild / Liberty / OneSteel in Australia. These producers sell some products direct to market but also sell primary steel products to other companies for further manufacturing (e.g. rollforming, metal coating, painting). This method is intended to enable offsetting for these products, since the impacts from the further processing steps are expected to be less variable than for primary steel production.

3.5. Fabrication Emissions (Additional A3 emissions)

Primary production of steel is the dominant source of emissions for steel products, however further emissions occur from fabrication (e.g. welding, plasma cutting, bending). Fabrication is not included in most EPDs or LCAs as these are for primary steel products, not finished products delivered to site. In order to ensure fabrication emissions are included, emission factors have been estimated based on consultation with fabricators in New Zealand. Specific emission calculation guidance on fabrication and installation for each product group is given within the product-specific guidelines below.

3.6. Transportation Emissions (A4)

While some EPDs include transportation emissions, these are based on averages and are not appropriate for use at a project level. The calculation of transport emissions for specific products is therefore included in this guidance and in the calculator.

Transport emissions should be calculated for each product used on the project, based on the mass of product and the distance it is transported by road, rail and sea freight from the producer to the project.

Where transport distances are not available from the supplier, it is recommended to calculate these using [Google Maps](#) for road and rail transport, and [Sea-Distances.org](#) for sea freight.

It is the users' responsibility to ensure that transport distances include all transport steps, for example:

- Road transport:
 - From production plant to port in country of origin – 100 km
 - From port in New Zealand to fabrication site – 50 km
 - From fabrication site to project site – 30 km
 - **Total – 180 km**
- Rail freight in country of origin and in New Zealand – **0 km**
- Sea freight from port in country of origin to port in New Zealand – **10,000 km**

The transport emission factors are taken from 2020 Ministry for the Environment guidance (MfE, 2021). Note that the unit is "kg-km", *i.e.* one kilogram of material transported one kilometre. This factor needs to be multiplied by the distance transported as well as the mass of material transported.

Table 3-4: Transport emission factors used in this programme

Process	Emission Factor (kg CO ₂ e/kg-km)	Source
Road freight	0.000135	MfE 2020; 'Road freighting goods in New Zealand – All trucks'
Rail freight	0.0000280	MfE 2020; 'Rail Freight'
Sea freight	0.0000121	MfE 2020; 'International shipping – General cargo, 10,000+ DWT'

Note: For metal roofing which is commonly given in profiled m², the area densities of the rollformed products (in kg/profiled m²) must be gathered from the manufacturer. For metal roofing products covered by EPDs at the time this document was published, area densities are included within the product-specific guidelines and calculator.

3.7. Installation Emissions (A5)

Installation emissions are not commonly included in EPDs due to the difficulty of collecting data from downstream installers. HERA has gathered installation data from its members to calculate estimated installation emissions by product group. These estimated factors are provided in this guidance and the calculator.

Installation emissions must be included wherever available, and are automatically added in the calculator.

Where a project captures installation data, this may be used in place of the estimations, provided the data is captured in sufficient detail and is independently reviewed by a suitably qualified person (e.g. a Life Cycle Assessment Certified Practitioner, or a Verifier for EPD Australasia or the International EPD system). Please contact carbon@hera.org.nz to discuss if this is appropriate for your project.

3.8. Calculation Steps

The generic calculation steps are provided below. Product-specific calculation steps are given in the next section.

The total carbon footprint for each product used shall be calculated by:

- 1) Identifying the appropriate product-specific guideline for the product, and sub-product type if necessary.
- 2) Identify the most appropriate LCA or EPD data to calculate the **primary production impacts** per unit of each product and multiplying by the quantity of product used.
 - A 5% uplift shall be added where the final product is not specific to the product and manufacturer, but the underlying steel input is specific to the steel producer.
 - A 15% uplift shall be added where the data is not specific to the product and manufacturer.
- 3) Add **Fabrication** emissions for the quantity of product used (where this is identified as appropriate for the product type), using the methodology and emission factors in these Programme Instructions.
- 4) Add **Transportation** emissions for the mass of product used (convert to mass if necessary, using the conversions provided), by working out the total distance the product is transported by road, rail and sea, including all transport steps from the producer to the project and using the methodology and emission factors in these Programme Instructions.
- 5) Add **Installation** emissions for the quantity of product used (where this is identified as appropriate for the product type), using the methodology and emission factors in these Programme Instructions.
- 6) Sum the results of steps 2-5 to arrive at a total footprint for the product.

The total carbon footprint for the steel used in the project shall be calculated as the sum of all individual product emissions as calculated using the steps above.

4. Product-Specific Guidelines

This section provides product-specific guidelines for each type of steel product included in this programme:

- Roll-formed roofing and cladding
- Heavy structural steel (beams, columns)
- Light steel framing
- Steel reinforcing (rebar, wire and mesh)
- Semi-finished or intermediate steel feedstock
- Stainless steel

Guidelines for new or additional steel products may be developed and added to the Programme through discussion with HERA and at the cost of the requestor. Interested parties should contact carbon@hera.org.nz.

4.1. Roll-Formed Roofing and Cladding

4.1.1. Product Category Rules

EN 15804:2012+A2:2019 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.

[EN 15804:2012+A1:2013 may be used for EPDs published before 31-12-2021]

PCR 2019:14 Construction Products *[PCR 2012:01 for EPDs registered before 31-12-2021]*

4.1.2. Production Emissions (A1-A3)

Environmental Product Declarations

The following EPDs are available to calculate production and roll-forming emissions.

Table 4-1: EPDs for roll-formed steel products

Product	Company	Region	EPD Reg #
AlumiGard™, MagnaFlow™ and ZinaCore™ pre-painted roofing and cladding (ColorCote®®)	Fletcher Steel Ltd and its subsidiary Pacific Coilcoaters	New Zealand	S-P-01539
COLORSTEEL® ENDURA® and COLORSTEEL® MAXX®	New Zealand Steel Limited (BlueScope)	New Zealand	S-P-01001
COLORSTEEL® Addendum – Roll-forming Data	New Zealand Steel Limited (BlueScope)	New Zealand	Rollforming Addendum
COLORBOND® steel	BlueScope Steel Australia	Australia	S-P-00999

Note: The updated COLORBOND® steel EPD v2.0 now includes rollforming, which no longer needs to be added separately (as per v1.0 of this document).

Life Cycle Inventory Data

No life cycle inventory data is provided for rollformed products. Given the relatively low impact of the rollforming stage, the impacts provided in the New Zealand Steel rollforming addendum may be applied to other similar feedstock if required.

Production Emission Factors

Roll-Formed Roofing and Cladding has been split into four product types to enable separate inclusion of each type of element and measurement units appropriate to each use type. The production emission factors are provided in Annex A for each product type and measurement unit as shown in Table 4-2.

Table 4-2: Production emission factor location for each product type and measurement unit

Product Type	Profiled square metres (profiled m ²)	Lineal metres (ℓm)
Roofing	Table A-2	Table A-3
Cladding	Table A-2	Table A-3
Flashings	N/A	Table A-4
Rainwater products (Downpipes & Guttering)	N/A	Table A-5

The selection of products available for each product type is limited based on standard use scenarios.

It should be noted that the lineal metre values are provided based on industry information of average profiled product widths, for products that are typically sold per lineal metre, and to support end users who do not have square metre data. Projects using products with profile widths significantly different to the average are advised to instead calculate the emissions of these products using the profiled square metre emission factors, which are available for the Roofing and Cladding product types. The average profiled product widths used for these calculations are given in Table 4-3.

Table 4-3: Average profiled product widths used to calculate lineal metre emission factors

Product Type	Average profiled product width of Lineal metre product (m)
Roofing	0.962
Cladding	0.962
Flashings	0.350
Rainwater products (Downpipes & Guttering)	0.277

4.1.3. Fabrication Emissions (Additional A3)

No additional fabrication emissions required. Rollforming impacts are included in the production emission factors provided.

4.1.4. Transport Emissions (A4)

Emissions must be calculated and offset for the transport of product from manufacturer to site, including the transport between any intermediate processes such as cutting or shaping the product.

These emissions are calculated using emission factors in Table A-1.

Note that the emission factor gives emissions per kg-km of product. You therefore must first calculate the mass of the product. The area density and lineal density for all rollformed products are provided in the same tables as the production emission factors, as outlined in Table 4-2, above.

Example

If you are transporting 100 profiled m² of COLORSTEEL® ENDURA® 0.55mm (which weighs 4.52 kg/profiled m²) 350 km by truck in New Zealand, the total emissions will be calculated as:

$$\begin{aligned}
 & \textit{Transport emissions} \\
 & = \textit{area of product (m}^2\text{)} \times \textit{area density of product} \left(\frac{\textit{kg}}{\textit{m}^2} \right) \\
 & \quad \times \textit{distance transported by truck (km)} \times \textit{road transport emission factor} \left(\frac{\textit{kgCO}_2\textit{e}}{\textit{kg.km}} \right) \\
 & \textit{Transport emissions} = 100 \times 4.52 \times 350 \times 0.000136 = 21.5 \textit{ kgCO}_2\textit{e}
 \end{aligned}$$

4.1.5. Installation Emissions (A5)

For projects *using less than 200 m² of product* (i.e. residential and small commercial projects), the impact of fabrication and installation is expected to be immaterial (<0.5% of total emissions), based on discussion with manufacturers.

For projects *above 200 m² of product*, there is a higher likelihood that machinery is used for installation, such as a crane truck, generator, forklift or scissor lift, as this represents larger commercial and industrial installations.

Modelling fuel use for installation, a Franna MAC 25 crane truck with Hino H07C-T engine was used as a representative vehicle². This machine uses 21.7 litres of fuel per hour on average. Using Ministry for the Environment emission factors for stationary combustion, the emission factor would be 2.66 kg CO₂e per litre of diesel combusted. Therefore the emissions per hour would be: 21.7 x 2.66 = 57.72 kg CO₂e per hour

Based on discussion with manufacturers, it is estimated that one hour of crane usage would be a suitable conservative estimate per 200 m² of roofing installed.

Therefore, for installation, the additional emissions for projects greater than 200m² are: 57.72 / 200 = 0.29 kg CO₂e per profiled m² roofing installed. This emission factor is included per product type in Annex A section A.2. below the production emission factors.

² <https://www.terex.com/docs/librariesprovider22/fuel-consumption/fuel-consumption-site-mac-25-hino-engine.pdf>

4.1.6. Calculation Steps

The total carbon footprint for each product shall be calculated by:

- 1) Identify the most appropriate LCA or EPD data to calculate the **primary production impacts** per unit of each product and multiplying by the quantity of product used.
 - A 5% uplift shall be added where the data is not specific to the product.
 - Use emission factors provided in section A.2. if appropriate.
 - Ensure that roll-forming is included; for COLORSTEEL products it is provided in an addendum (and has been included in the emission factors provided).
- 2) Calculate **Transportation** emissions for the mass of product used (convert to mass using the conversions provided), by working out the total distance the product is transported by road, rail and sea, including all transport steps from the producer to the project and the emission factors in Table A-1.
- 3) For projects over 200 profiled m² only: calculate **Installation** emissions for the quantity of product used based on the emission factor provided in Table A-6.
- 4) Sum the results of steps 1-3 to arrive at a total footprint for the product.

4.2. Heavy Structural Steel

4.2.1. Product Category Rules

EN 15804:2012+A2:2019 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.

PCR 2019:14 Construction Products [*PCR 2012:01 for EPDs registered before 31-12-2021*]

4.2.2. Production Emissions (A1-A3)

Environmental Product Declarations

EPDs are available for a number of welded and hot rolled heavy structural steel products from Australia, and separately for hot dip galvanizing.

Table 4-4: EPDs for heavy structural steel

Product	Company	Region	EPD Reg #
Welded Beams and Columns	BlueScope Steel	Australia	S-P-00559 v2.0
Hot Rolled Structural Sections and Merchant Bar	InfraBuild Steel	Australia	S-P-00854 v1.2
Hot Rolled Structural Products	InfraBuild Steel	Australia	S-P-00856 v1.2
Hot Rolled Structural and Rail	InfraBuild Steel	Australia	S-P-01547 v1.2
Hot Dip Galvanizing in Australia	Galvanizers Association of Australia	Australia	S-P-01166
Hot rolled structural steel sections	Tung Ho Steel Enterprise Corp.	Taiwan	4789597922.102.1
Section Shape Steel	Hyundai Steel	South Korea	4789119110.101.1
Steel plate for construction	Nippon Steel	Japan	JR-AJ-22001E
Picked Steel Sheets and Coils	Nippon Steel	Japan	JR-AJ-22003E
Cold-rolled Steel Square and Rectangular Tubes	Nippon Steel	Japan	JR-AX-23003E
Cold-pressed Steel Square and Rectangular Tubes	Nippon Steel	Japan	JR-AX-23002E

Life Cycle Inventory Data

For product imported from Asia, emission factors are available from WorldSteel's latest database.

Note that industry LCA factors may only be used where the steel producer is listed as a contributor to the LCA study and must have an additional 15% global warming potential impact added to account for uncertainty. The contributors to the WorldSteel LCA study are listed in Annex C, section C.1.

Table 4-5: Life Cycle Data for heavy structural steel

WorldSteel Product	Source	Region
Sections	WorldSteel 2021 Dataset	Asia (Regional average)
Hot Rolled Coil (HRC)	WorldSteel 2021 Dataset	Asia (Regional average)
Cold Rolled Coil (CRC)	WorldSteel 2021 Dataset	Asia (Regional average)
Engineering Steel	WorldSteel 2021 Dataset	Asia (Regional average)
Finished Cold Rolled Coil	WorldSteel 2021 Dataset	Asia (Regional average)
Hot-dip Galvanised Coil	WorldSteel 2021 Dataset	Asia (Regional average)

Proxy Products

Following requests from the construction industry, proxies have been included for commonly used products that are not directly included in either the EPDs or LCA data. These products are created by rollforming of structural (heavyweight) steel, which uses more energy compared to rollforming of lightweight steel.

The heavy rollforming emissions have been calculated using data provided by three New Zealand-based structural steel rollformers, with the average electricity consumption per tonne combined with the NZ electricity grid emission factor. An average Asian electricity factor has also been used to estimate heavy rollforming emissions in Asia.

Additionally, a proxy product has been created for 'nuts and bolts' which includes galvanizing. These products are assumed to be sourced from Asia. The galvanising impacts are calculated as the difference between the WorldSteel 'Hot-dip Galvanised Coil' and 'Finished Cold Rolled Coil'.

The list of proxy products and the methodology used for calculating their emission factors is provided in Table 4-6, including the 15% uplift for uncertainty.

Table 4-6: Proxy Products & Emission Factor Calculation Methodology

Product	Emission Factor Calculation Methodology
Purlins & Girts	WorldSteel Cold Rolled Coil Coil x 1.15 + NZ Heavy Rollforming
Nuts & Bolts	(WorldSteel Engineering Steel + Asian Heavy Rollforming + Galvanizing) x 1.15
Other Asian Merchant Bar Product	WorldSteel Sections x 1.15
Other Asian Structural Section	(WorldSteel HRC + Asian Heavy Rollforming) x 1.15

Production Emission Factors

Production emission factors for all EPD and proxy products are provided in Table A-7. All emission factors for structural products are provided per tonne, since significant quantities of structural steel are used in each product.

4.2.3. Fabrication Emissions (Additional A3)

Fabrication of heavy steel involves processes such as sawing, drilling, thermal cutting, plasma cutting, and preheating. The amount of energy required depends on many factors, including if the sections are classed as light, medium or heavy. The range of weights per metre for each class and associated emission factors are given in Table A-8.

Emissions for painting and abrasive blasting have not been included as project-average data was not available. If these processes are important for a given project, consideration should be given to capturing and including the associated emissions for the materials and energy use.

4.2.4. Transport Emissions (A4)

Emissions must be calculated and offset for the transport of product from manufacturer to site, including the transport between any intermediate processes such as cutting or shaping the product.

These emissions are calculated using emission factors in Table A-9, which are given in t-km. *Note that these are different emission factors to those used for other product categories, due to heavy structural steel data being captured in tonnes rather than kilogrammes.*

4.2.5. Installation Emissions (A5)

Installation typically involves a crane or crane truck to lift sections into place.

Modelling fuel use for installation, a Franna MAC 25 crane truck with Hino H07C-T engine was used as a representative vehicle³. This machine uses 21.7 litres of fuel per hour on average. Ministry for the Environment emission factors for stationary combustion give an emission factor of 2.66 kg CO₂e per litre of diesel combusted.

Note that emissions for on-site welding have not been included as project-average data was not available – and the need for welding varies between projects. Projects involving significant amounts of welding should consider capturing and including the associated emissions.

Crane usage is estimated (through consultation with industry) as 0.56 hours per tonne of steel installed.

Therefore the installation emissions are: $21.7 \times 2.66 \times 0.56 = 32.5$ kg CO₂e per tonne of steel installed. This emission factor is also included in Table A-10.

³ <https://www.terex.com/docs/librariesprovider22/fuel-consumption/fuel-consumption-site-mac-25-hino-engine.pdf>

4.2.6. Calculation Steps

The total carbon footprint for each product shall be calculated by:

- 1) Identify the most appropriate LCA or EPD data to calculate the **primary Production impacts** per tonne of each product and multiplying by the quantity of product used.
 - A 15% uplift shall be added where the data is not specific to the product.
 - Use emission factors provided in Table A-7 if appropriate.
- 2) Calculate **Fabrication** emissions based on the weight class of the product, using the emission factors given in Table A-8.
- 3) Calculate **Transportation** emissions for the mass of product used (in tonnes), by working out the total distance the product is transported by road, rail and sea, including all transport steps from the producer to the project and the emission factors in Table A-9.
- 4) Calculate **Installation** emissions for the quantity of product used based on the emission factor in Table A-10.
- 5) Sum the results of steps 1-4 to arrive at a total footprint for the product.

4.3. Light Steel Framing

This category includes light steel framing for residential applications.

4.3.1. Product Category Rules

EN 15804:2012+A2:2019 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.

PCR 2019:14 Construction Products [PCR 2012:01 for EPDs registered before 31-12-2021]

4.3.2. Production Emissions (A1-A3)

Environmental Product Declarations

An EPD for light steel framing produced in New Zealand has not been published at the time of publication of this document. Until this exists, proxies must be used.

Proxy Products

Industry information suggests that light steel framing is produced in New Zealand using one of three metal-coated steel options:

- Galvanised steel Z275 produced by New Zealand Steel,
- AM100 ZINCALUME® imported from BlueScope Steel Australia, or
- Galfan ZA275 from Alrite Taiwan

EPDs for the specific metal-coated steel products are not available. EPDs are available for painted metal-coated steel products from New Zealand Steel and BlueScope Steel Australia, along with WorldSteel LCA data for painted metal-coated steel products. These are used as conservative proxies for the desired metal-coated steel products. The light steel framing impacts are calculated by adding rollforming emissions and an uplift for uncertainty.

The EPDs for the proxy products from Australia and New Zealand are shown in Table 4-7. For product imported from Asia, emission factors are available from WorldSteel’s latest database as shown in Table 4-8.

Table 4-7: EPDs for painted metal-coated steel proxy products and rollforming for light steel framing

Product	Manufacturer	Region	EPD Reg #
COLORSTEEL® ENDURA® and COLORSTEEL® MAXX®	New Zealand Steel Limited (Bluescope)	New Zealand	S-P-01001
COLORSTEEL Addendum - Rollforming Data	New Zealand Steel Limited (Bluescope)	New Zealand	Rollforming Addendum
COLORBOND® steel	BlueScope Steel Australia	Australia	S-P-00999 v2.0

Table 4-8: Life Cycle Data for painted metal-coated steel proxy products for light steel framing

WorldSteel Product	Source	Region
Organic coated steel	WorldSteel 2021 Dataset	Asia (Regional average)

The methodology used to calculate the light steel framing emission factor is provided in Table 4-9 including the uplift for uncertainty.

Table 4-9: Proxy Products & Emission Factor Calculation Methodology

Product	Emission Factor Calculation Methodology
Other New Zealand light framing product	((Average COLORSTEEL® ENDURA and COLOURSTEEL® MAXX per kg) + Average Rollforming per kg) x 1.05
Other Australian light framing product	((Average COLORBOND® steel per kg) + Average Rollforming per kg) x 1.05
Other Asian light framing product	(WorldSteel Organic Coated Steel + Rollforming) x 1.15

Production Emission Factors

Production emission factors for the proxies are provided in Table A-11.

4.3.3. Fabrication Emissions (Additional A3)

Fabrication of light steel framing products are expected to be immaterial, based on discussions with industry professionals. As such, no additional emissions need be added.

4.3.4. Transport Emissions (A4)

Emissions must be calculated and offset for the transport of product from manufacturer to site, including the transport between any intermediate processes such as cutting or shaping the product.

These emissions are calculated using emission factors in Table A-1.

4.3.5. Installation Emissions (A5)

Installation of light steel framing products are expected to be immaterial, based on discussions with industry professionals. As such, no additional emissions need be added.

4.3.6. Calculation Steps

The total carbon footprint for each product shall be calculated by:

- 1) Identify the most appropriate LCA or EPD data to calculate the **primary Production impacts** per kg of each product and multiplying by the quantity of product used.
 - A 15% uplift shall be added where the data is not specific to the product.
 - Use emission factors provided in Table A-11 if appropriate.
- 2) Calculate **Transportation** emissions for the mass of product used, by working out the total distance the product is transported by road, rail and sea, including all transport steps from the producer to the project and the emission factors in Table A-1.
- 3) Sum the results of steps 1-2 to arrive at a total footprint for the product.

4.4. Steel Reinforcing

4.4.1. Product Category Rules

EN 15804:2012+A2:2019 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.

PCR 2019:14 Construction Products [PCR 2012:01 for EPDs registered before 31-12-2021]

4.4.2. Production Emissions (A1-A3)

Environmental Product Declarations

The following EPDs are available to calculate production of steel reinforcing.

Table 4-10: EPDs for reinforcing products

Product	Company	Region	EPD Reg #
Pacific Steel SEISMIC® reinforcing products	Pacific Steel	New Zealand	S-P-01002
Steel reinforcing bar and mesh	Australian Reinforcing Company	Australia	S-P-00858 v1.2
Reinforcing bar and mesh	InfraBuild Construction Solutions	Australia	S-P-00857 v1.2
Reinforcing rod, bar & wire	InfraBuild Steel	Australia	S-P-00855 v1.2

Life Cycle Inventory Data

For product imported from Asia, emission factors are available from WorldSteel's latest database.

Note that industry LCA factors may only be used where the steel producer is listed as a contributor to the LCA study and must have an additional 15% global warming potential impact added to account for uncertainty. The contributors to the WorldSteel LCA study are listed in Annex C, section C.1.

Table 4-11: Life Cycle Data for reinforcing products

WorldSteel Product	Source	Region
Rebar	WorldSteel 2021 Dataset	Asia (Regional average)

Production Emission Factors

The currently available production emission factors are provided in Table A-12.

4.4.3. Fabrication Emissions (Additional A3)

Fabrication of reinforcing involves heating, bending and welding product to specification. Because Fletcher Reinforcing track carbon emissions across all sites, the total emissions for fabrication per kg of product was able to be calculated. This emission factor is 0.011 kg CO₂e per kg of finished reinforcing product and is also provided in Table A-13.

4.4.4. Transport Emissions (A4)

Transport emissions must be calculated and offset for the transport of product from manufacturer to site, including the transport between any intermediate processes such as cutting or shaping the product. These emissions are calculated using emission factors in Table 3-4 in the Calculation Methodology section.

4.4.5. Installation Emissions (A5)

Installation of reinforcing products are expected to be immaterial, based on discussions with industry professionals. As such, no additional emissions need be added.

4.4.6. Calculation Steps

The total carbon footprint for each product shall be calculated by:

- 1) Identify the most appropriate LCA or EPD data to calculate the **primary production impacts** per kg of each product and multiplying by the quantity of product used.
 - A 15% uplift shall be added where the data is not specific to the product.
 - Use emission factors provided in Table A-12 if appropriate.
- 2) Calculate **Fabrication** emissions based on the weight class of the product, using the emission factors given in Table A-13.
- 3) Calculate **Transportation** emissions for the mass of product used, by working out the total distance the product is transported by road, rail and sea, including all transport steps from the producer to the project and the emission factors in Table A-1.
- 4) Sum the results of steps 1-3 to arrive at a total footprint for the product.

4.5. Semi-Finished or Intermediate Steel Feedstock

This category applies to UN CPC codes 412, 421, 422, 423 and 429 (semi-finished steels or intermediate special steels that will be further processed to become a finished consumer product). Examples of products in this category are ingots, blooms, slabs, plates, rolled products (wire rods, bars, flats, billets), cold finished (cold-drawn, peeling/turning and straightening) and basic forged products (bars and flats) in carbon steels, free cutting steels, alloyed steels, spring steels, microalloyed steels, cold forming steels, bearing steels, etc.

Note that EPDs for some semi-finished products may be produced using the construction products PCRs, since they may also be relevant to that market. These are the primary focus of this category for the purposes of this Programme.

4.5.1. Product Category Rules

PCR 2015:03 – Basic iron or steel products & special steels, except construction steel products. v2.0.

EN 15804:2012+A2:2019 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.

PCR 2019:14 Construction Products [*PCR 2012:01 for EPDs registered before 31-12-2021*]

4.5.2. Production Emissions (A1-A3)

Environmental Product Declarations

Table 4-12: EPDs for semi-finished or intermediate products

Product	Company	Region	EPD Reg #
Steel – Hot Rolled Coil	BlueScope Steel	Australia	S-P-00557 v2.0
XLERPLATE® Steel	BlueScope Steel	Australia	S-P-00558 v2.0
Hot rolled steel coil	Hyundai Steel	South Korea	S-P-02215 v1.1

Life Cycle Inventory Data

For product imported from Asia, emission factors are available from WorldSteel's latest database.

Note that industry LCA factors may only be used where the steel producer is listed as a contributor to the LCA study and must have an additional 15% global warming potential impact added to account for uncertainty. The contributors to the WorldSteel LCA study are listed in Annex C, section C.1. .

Table 4-13: Life Cycle Data for semi-finished or intermediate steel products

Product	Source	Region
Hot rolled coil	worldsteel	Asia (Average)
Hot-dip galvanised coil	worldsteel	Asia (Average)
Electrogalvanised coil	worldsteel	Asia (Average)
Engineering Steel	worldsteel	Asia (Average)
Plate Steel	worldsteel	Asia (Average)

Production Emission Factors

The currently available production emission factors are provided in Table A-14.

4.5.3. Fabrication Emissions (Additional A3)

In this category, fabrication is highly dependent on the product, and emission factors cannot be included here. It is recommended that for fabrication, actual electricity and fuel use is estimated, and emissions calculated using emission factors from the Ministry for the Environment publication 'Measuring Emissions: A Guide for Organisations. 2019 Detailed Guide', available publicly online.

4.5.4. Transport Emissions (A4)

Emissions must be calculated and offset for the transport of product from manufacturer to site, including the transport between any intermediate processes such as cutting or shaping the product.

These emissions are calculated using emission factors in Table A-1.

4.5.5. Installation Emissions (A5)

In this category, installation is highly dependent on the product, and emission factors cannot be included here. It is recommended that for installation, actual electricity and fuel use is estimated, and emissions calculated using emission factors from the Ministry for the Environment publication 'Measuring Emissions: A Guide for Organisations. 2019 Detailed Guide', available publicly online.

4.5.6. Calculation Steps

The total carbon footprint for each product shall be calculated by:

- 1) Identify the most appropriate LCA or EPD data to calculate the **primary Production impacts** per kg of each product and multiplying by the quantity of product used.
 - A 15% uplift shall be added where the data is not specific to the product.
 - Use emission factors provided in Table A-14 if appropriate.
- 2) Calculate **Fabrication** emissions for the specific use scenario, as appropriate.
- 3) Calculate **Transportation** emissions for the mass of product used, by working out the total distance the product is transported by road, rail and sea, including all transport steps from the producer to the project and the emission factors in Table A-1.
- 4) Calculate **Installation** emissions for the specific use scenario, as appropriate.
- 5) Sum the results of steps 1-4 to arrive at a total footprint for the product.

4.6. Stainless Steel

This product category corresponds to UN CPC codes 412 (for finished products), 422 (Tanks, reservoirs and containers of iron, steel or aluminium) and UN CPC 429 (Other fabricated metal products). These products should be **stainless steel products** that will not be further processed.

Some of the EPDs and LCA information will have been prepared with construction uses in mind; this should not affect outcomes provided there are no significant calculation differences between the EPDs and LCAs. These are the primary focus of this category for the purposes of this Programme. The EPDs and LCA data below has been checked to ensure the same life cycle stages are included.

4.6.1. Product Category Rules

PCR 2014:10 Fabricated steel products, except construction products, machinery and equipment v2.11.

Institut Bauen und Umwelt e.V., Berlin (pub.): PCR Guidance Texts for Building Related Products and Services, Part B: Requirements on the EPD for Structural Steels. 2017

EN 15804:2012+A2:2019 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.

4.6.2. Production Emissions (A1-A3)

Environmental Product Declarations

Table 4-14: EPDs for stainless steel products

Product	Company	Region	EPD Reg #
Cold Rolled Stainless Steel			EPD-OTO-20190002-IBD1-EN
Hot Rolled Stainless Steel	Outokumpu Oyj	International (based on data from plants in Germany, Sweden, Finland, USA and Mexico)	EPD-OTO-20190003-IBD1-EN
Stainless Steel Long Product			EPD-OTO-20190107-IBD1-EN

Life Cycle Inventory Data

For imported stainless products, global averages can be used from the International Stainless Steel Forum (ISSF).

Note that industry LCA factors may only be used where the steel producer is listed as a contributor to the LCA study and must have an additional 15% global warming potential impact added to account for uncertainty. The contributors to the ISSF LCA study are listed in section C.2. .

Table 4-15: Life Cycle Data for upstream inputs for finished fabricated steel products

Product	Source	Region
Stainless Steel Product	International Stainless Steel Forum LCA Data	Global

Production Emission Factors

The currently available production emission factors are provided in Table A-15.

4.6.3. Fabrication Emissions (Additional A3)

In this category, fabrication is highly dependent on the product, however average emission factors have been provided for common product types in New Zealand, based on data provided by a number of New Zealand fabricators and provided in Table A-16.

Where possible, actual electricity and fuel use should be measured or estimated, and emissions calculated using emission factors from the Ministry for the Environment publication 'Measuring Emissions: A Guide for Organisations. 2019 Detailed Guide', available publicly online.

4.6.4. Transport Emissions (A4)

Emissions must be calculated and offset for the transport of product from manufacturer to site, including the transport between any intermediate processes such as cutting or shaping the product.

These emissions are calculated using emission factors in Table A-1.

4.6.5. Installation Emissions (A5)

Installation emission data was unavailable for most products at the time of publication, with the exception of Onsite Fabrication & Installation, where the installation is included in the Fabrication figures provided. Installation is not expected to be material.

Where possible, actual electricity and fuel use should be measured or estimated, and emissions calculated using emission factors from the Ministry for the Environment publication 'Measuring Emissions: A Guide for Organisations. 2019 Detailed Guide', available publicly online.

4.6.6. Calculation Steps

The total carbon footprint for each product shall be calculated by:

- 1) Identify the most appropriate LCA or EPD data to calculate the **primary Production impacts** per kg of each product and multiplying by the quantity of product used.
 - A 15% uplift shall be added where the data is not specific to the product.
 - Use emission factors provided in Table A-15 if appropriate.
- 2) Calculate **Fabrication** emissions for the specific use scenario, as appropriate.
 - Use emission factors provided in Table A-16 if appropriate.
- 3) Calculate **Transportation** emissions for the mass of product used, by working out the total distance the product is transported by road, rail and sea, including all transport steps from the producer to the project and the emission factors in Table A-1.
- 4) Calculate **Installation** emissions for the specific use scenario, if appropriate.
- 5) Sum the results of steps 1-4 to arrive at a total footprint for the product.

5. Training and Communication

5.1. Roles for Communication

HERA's role in communication related to this programme is to provide communication material for its members to ensure there is consistent messaging around the programme.

Examples of material can include:

- General statements about the programme
- How an independently developed and verified programme increases trust and transparency
- Guidance for manufacturers and fabricators on how they can communicate the benefits of offsetting their carbon emissions to consumers

HERA may also choose to publish offsetting statistics based on this programme.

5.2. Making Public Statements about Carbon Offsetting

Using the correct language when referring to carbon emissions and carbon offsetting is crucial to remain compliant with this programme and with Commerce Commission requirements relating to factual and evidence-based product claims.

Some examples of suggested language for communication of this programme are below:

The Programme: *The Steel Sector Carbon Offset Programme was developed by HERA, an independent research association providing support to the metals industry in New Zealand, in consultation with thinkstep-anz, a company with over 15 years of local sustainability expertise. Calculations are based on rigorous scientific data and follow international standards. Find out more at www.hera.org.nz/resources/carbon-offsetting*

Purchased Offset Communication: *The carbon emissions from the production, transportation and installation of [amount] of [Steel product name] have been offset. The offsets are certified carbon credits from Ekos' projects to grow and protect forests in Aotearoa and the Pacific Islands, and will be retired on the appropriate third party register. This material is now Zero Carbon Steel.*

Certified Product Communication: *(Business name) is proud to have certified (Product XXXX) as a Zero Carbon Steel product with Ekos. We have measured and offset the carbon footprint of (product XXX) which included the following activities (XYZ). These certified carbon credits are sourced from projects that grow and protect forests in Aotearoa and the Pacific Islands and help to deliver climate resilience, waterways protection, erosion control, biodiversity conservation and community economic development.*

Certified Product Communication (short version): *(Product X) is certified as Zero Carbon Steel with Ekos.*

Please refer to the 'Definitions' section of these Programme Instructions for clarification on any of the terms used.

5.3. Where to Find Further Information:

Further information about this programme can be found on the HERA website at:

www.hera.org.nz/resources/carbon-offsetting

For questions about having your products included in this programme, please contact HERA at carbon@hera.org.nz

For further information about conducting a life cycle assessment or publishing an environmental product declaration for your product, please visit www.thinkstep-anz.com.

For further information about the offsets used in this programme, please visit www.ekos.org.nz.

6. References

- Ekos Kāmahī Limited. (2020). *General Programme Instructions – Ekos Carbon Management for Products Programme (DRAFT)*. Ekos Kāmahī Limited.
- Forsyth Barr. (2019). *The Carbon Report - Counting Carbon Costs: Climate Change and NZX Companies*. New Zealand Equity Research.
- International Energy Agency. (2020). *Iron and Steel Technology Roadmap: Towards more sustainable steelmaking*. IEA Publications.
- MfE. (2021). *MfE Guidance for Voluntary Greenhouse Gas Reporting - 2020; Emission Factor Workbook*. Retrieved from Measuring Emissions: Detailed Guide 2020: <https://environment.govt.nz/publications/measuring-emissions-detailed-guide-2020/>

Applicability and Limitations

Restrictions and Intended Purpose

This report has been prepared by thinkstep-anz with all reasonable skill and diligence within the agreed scope, time and budget available for the work. thinkstep-anz does not accept responsibility of any kind to any third parties who make use of its contents. Any such party relies on the report at its own risk. Interpretations, analyses, or statements of any kind made by a third party and based on this report are beyond thinkstep-anz's responsibility.

If you have any suggestions, complaints, or any other feedback, please contact us at: feedback@thinkstep-anz.com.

Legal interpretation

Opinions and judgements expressed herein are based on our understanding and interpretation of current regulatory standards and should not be construed as legal opinions. Where opinions or judgements are to be relied on, they should be independently verified with appropriate legal advice.

Annex A Emission Factors

A.1. Transportation

The transport emission factors are taken from 2019 Ministry for the Environment guidance (Table 3-4). Note that the unit is "kg-km", *i.e.* one kilogram of material transported one kilometre. This factor needs to be multiplied by the distance transported as well as the mass of material transported.

These emission factors are common to all products except Heavy Structural Steel (which uses emission factors per tonne-km, provided in Table A-9), although product mass may need to be calculated before use.

Table A-1: Transport emission factors

Process	Emission Factor (kg CO ₂ e/kg-km)	Source
Road freight	0.000135	MfE 2022; 'Road freighting goods in New Zealand – All trucks'
Rail freight	0.0000280	MfE 2022; 'Rail Freight'
Sea freight	0.0000132	MfE 2022; 'International shipping – General cargo, 10,000+ DWT'

A.2. Roll-Formed Roofing and Cladding

Table A-2: Production (A1-A3) emission factors for roll-formed steel roofing and cladding sheeting per profiled square metre (profiled m²)

Product	Region	Manufacturer	Production Emission Factor (kg CO ₂ e/profiled m ²)	Area Density (kg/profiled m ²)	Source	EPD Valid Until
COLORSTEEL® ENDURA® 0.4mm	New Zealand	New Zealand Steel	13.8	3.36	S-P-01001, and rollforming addendum	2023
COLORSTEEL® ENDURA® 0.55mm	New Zealand	New Zealand Steel	17.9	4.52		
COLORSTEEL® MAXX® 0.4mm	New Zealand	New Zealand Steel	14.1	3.40		
COLORSTEEL® MAXX® 0.55mm	New Zealand	New Zealand Steel	18.3	4.57		
ColorCote® AlumiGard™ 0.7mm	New Zealand	Pacific Coilcoaters	33.0	5.95	S-P-01539	2024
ColorCote® AlumiGard™ 0.9mm	New Zealand	Pacific Coilcoaters	42.6	7.65		
ColorCote® MagnaFlow™ 0.4mm	New Zealand	Pacific Coilcoaters	11.2	3.40		
ColorCote® MagnaFlow™ 0.55mm	New Zealand	Pacific Coilcoaters	14.6	4.57		
ColorCote® ZinaCore™ 0.4mm	New Zealand	Pacific Coilcoaters	13.9	3.40		
ColorCote® ZinaCore™ 0.55mm	New Zealand	Pacific Coilcoaters	18.1	4.57		
COLORBOND® AM100 0.42mm	Australia	BlueScope Steel	12.0	3.46	S-P-00999 v2.0	2028
COLORBOND® AM100 0.48mm	Australia	BlueScope Steel	13.2	3.93		
Other Australian rollformed product (0.41 - 0.45mm)	Australia	Generic	12.6	3.46	COLORBOND® emission factors used with 5% uncertainty added	N/A
Other Australian rollformed product (0.46 - 0.50mm)	Australia	Generic	13.9	3.93		

Table A-3: Production (A1-A3) emission factors for roll-formed steel roofing and cladding sheeting per lineal metre

Product	Region	Manufacturer	Production Emission Factor (kg CO ₂ e/lm)	Lineal Density (kg/ lm)	Source (converted to lm based on industry average widths)	EPD Valid Until
COLORSTEEL® ENDURA® 0.4mm	New Zealand	New Zealand Steel	13.3	3.23	S-P-01001, and rollforming addendum	2023
COLORSTEEL® ENDURA® 0.55mm	New Zealand	New Zealand Steel	17.2	4.35		
COLORSTEEL® MAXX® 0.4mm	New Zealand	New Zealand Steel	13.6	3.27		
COLORSTEEL® MAXX® 0.55mm	New Zealand	New Zealand Steel	17.6	4.40		
ColorCote® AlumiGard™ 0.7mm	New Zealand	Pacific Coilcoaters	31.7	5.72	S-P-01539	2024
ColorCote® AlumiGard™ 0.9mm	New Zealand	Pacific Coilcoaters	41.0	7.36		
ColorCote® MagnaFlow™ 0.4mm	New Zealand	Pacific Coilcoaters	10.8	3.27		
ColorCote® MagnaFlow™ 0.55mm	New Zealand	Pacific Coilcoaters	14.0	4.40		
ColorCote® ZinaCore™ 0.4mm	New Zealand	Pacific Coilcoaters	13.4	3.27		
ColorCote® ZinaCore™ 0.55mm	New Zealand	Pacific Coilcoaters	17.4	4.40		
COLORBOND® AM100 0.42mm	Australia	BlueScope Steel	11.5	3.33	S-P-00999 v2.0	2028
COLORBOND® AM100 0.48mm	Australia	BlueScope Steel	12.7	3.78		
Other Australian rollformed product (0.41 - 0.45mm)	Australia	Generic	12.1	3.33	COLORBOND® emission factors used with 5% uncertainty added	N/A
Other Australian rollformed product (0.46 - 0.50mm)	Australia	Generic	13.3	3.78		

Table A-4: Production (A1-A3) emission factors for roll-formed steel flashing per lineal metre

Product	Region	Manufacturer	Production Emission Factor (kg CO ₂ e/ℓm)	Lineal Density (kg/ℓm)	Source (converted to ℓm based on industry average widths)	EPD Valid Until		
COLORSTEEL® ENDURA® 0.4mm	New Zealand	New Zealand Steel	4.83	1.18	S-P-01001, and rollforming addendum	2023		
COLORSTEEL® ENDURA® 0.55mm	New Zealand	New Zealand Steel	6.27	1.58				
COLORSTEEL® MAXX® 0.4mm	New Zealand	New Zealand Steel	4.94	1.19				
COLORSTEEL® MAXX® 0.55mm	New Zealand	New Zealand Steel	6.41	1.60				
ColorCote® AlumiGard™ 0.7mm	New Zealand	Pacific Coilcoaters	11.6	2.08	S-P-01539	2024		
ColorCote® AlumiGard™ 0.9mm	New Zealand	Pacific Coilcoaters	14.9	2.68				
ColorCote® MagnaFlow™ 0.4mm	New Zealand	Pacific Coilcoaters	3.92	1.19				
ColorCote® MagnaFlow™ 0.55mm	New Zealand	Pacific Coilcoaters	5.11	1.60				
ColorCote® ZinaCore™ 0.4mm	New Zealand	Pacific Coilcoaters	4.87	1.19				
ColorCote® ZinaCore™ 0.55mm	New Zealand	Pacific Coilcoaters	6.34	1.60				
COLORBOND® AM100 0.42mm	Australia	BlueScope Steel	4.20	1.21			S-P-00999 v2.0	2028
COLORBOND® AM100 0.48mm	Australia	BlueScope Steel	4.62	1.38				
Other Australian rollformed product (0.41 - 0.45mm)	Australia	Generic	4.41	1.21	COLORBOND® emission factors used with 5% uncertainty added	N/A		
Other Australian rollformed product (0.46 - 0.50mm)	Australia	Generic	4.85	1.38				

Table A-5: Production (A1-A3) emission factors for roll-formed steel rainwater products (downpipes & guttering) per lineal metre

Product	Region	Manufacturer	Production Emission Factor (kg CO ₂ e/ℓm)	Lineal Density (kg/ℓm)	Source (converted to ℓm based on industry average widths)	EPD Valid Until
COLORSTEEL® ENDURA® 0.4mm	New Zealand	New Zealand Steel	N/A	N/A	S-P-01001	2023
COLORSTEEL® ENDURA® 0.55mm	New Zealand	New Zealand Steel	4.96	1.25		
COLORSTEEL® MAXX® 0.4mm	New Zealand	New Zealand Steel	N/A	N/A		
COLORSTEEL® MAXX® 0.55mm	New Zealand	New Zealand Steel	5.07	1.27		
ColorCote® AlumiGard™ 0.7mm	New Zealand	Pacific Coilcoaters	N/A	N/A	S-P-01539	2024
ColorCote® AlumiGard™ 0.9mm	New Zealand	Pacific Coilcoaters	11.8	2.12		
ColorCote® MagnaFlow™ 0.4mm	New Zealand	Pacific Coilcoaters	N/A	N/A		
ColorCote® MagnaFlow™ 0.55mm	New Zealand	Pacific Coilcoaters	4.04	1.27		
ColorCote® ZinaCore™ 0.4mm	New Zealand	Pacific Coilcoaters	N/A	N/A		
ColorCote® ZinaCore™ 0.55mm	New Zealand	Pacific Coilcoaters	5.01	1.27		
COLORBOND® AM100 0.42mm	Australia	BlueScope Steel	3.32	0.958	S-P-00999 v2.0	2028
COLORBOND® AM100 0.48mm	Australia	BlueScope Steel	N/A	N/A		
Other Australian rollformed product (0.41 - 0.45mm)	Australia	Generic	3.49	0.958	COLORBOND® emission factors used	N/A
Other Australian rollformed product (0.46 - 0.50mm)	Australia	Generic	N/A	N/A	with 5% uncertainty added	

Table A-6: Installation emission factors for roll-formed steel roofing and cladding products

Process	Product type	Installation Emission Factor per profiled square metre (kg CO ₂ e/profiled m ²)	Installation Emission Factor per lineal metre (kgCO ₂ e/ℓm)	Source
Commercial installation using crane truck	Sheeting (roofing & cladding products)	0.410	0.394	Estimate based on industry consultation. See product-specific guidelines for details.
	Flashing	N/A	0.144	
	Rainwater (gutter & downpipe products)	N/A	0.114	

A.3. Heavy Structural Steel

Table A-7: Production (A1-A3) emission factors for heavy steel products

Product	Region	Manufacturer	Production Emission Factor (kg CO ₂ e/t)	Source	EPD Valid Until
Welded Beams and Columns	Australia	BlueScope Steel	2,750	S-P-00559 v2.0	2025
Hot Rolled Merchant Bar	Australia	InfraBuild Steel	1,240	S-P-00854 v1.2	2025
Hot rolled Structural Section	Australia	InfraBuild Steel Centre	3,720	S-P-00856 V1.2	2025
Hot rolled Merchant Bar	Australia	InfraBuild Steel Centre	1,520		
Hot Rolled Structural Section	Australia	Liberty	3,320	S-P-01547 V1.2	2025
Hot rolled structural steel sections	Taiwan	Tung Ho Steel Enterprise Corp.	934	4789597922.102.1	2025
Section Shape Steel	South Korea	Hyundai Steel	460	4789119110.101.1	2024
Cold-rolled Steel Square and Rectangular Tubes	Japan	Nippon Steel	1,900	JR-AX-23003E	2028
Cold-pressed Steel Square and Rectangular Tubes	Japan	Nippon Steel	2,400	JR-AX-23002E	2028
Purlins & Girts	New Zealand	Generic	2,988	Calculated as per Table 4-6	N/A
Nuts & Bolts	Asia	Generic	2,328	Calculated as per Table 4-6	N/A
Other Asian Merchant Bar	Asia	Generic	2,277	Calculated as per Table 4-6	N/A
Other Asian Structural Section	Asia	Generic	2,707	Calculated as per Table 4-6	N/A
Other Australian Welded Section	Australia	Generic	2,888	Results for average production in Australia plus 5% uncertainty	N/A
Other Australian Hot Rolled Merchant Bar	Australia	Generic	1,449		
Other Australian Hot Rolled Structural Section	Australia	Generic	3,696		

Table A-8: Fabrication emission factors for heavy steel products

Process	Lineal Density (kg/m)	Fabrication Emission Factor (kg CO ₂ e/t)	Source
Fabrication - Light (14-37 kg/m)	14-37	13.2	Estimates of electricity and fuel use from Grayson Engineering. See product-specific guidelines for details.
Fabrication - Medium (37-67 kg/m)	37-67	9.72	
Fabrication - Heavy (>67 kg/m)	>67	6.16	

Table A-9: Transport emission factors for heavy structural steel products

Process	Emission Factor (kg CO ₂ e/t-km)	Source
Road freight	0.135	MfE 2022; 'Road freighting goods in New Zealand – All trucks'
Rail freight	0.0280	MfE 2022; 'Rail Freight'
Sea freight	0.0132	MfE 2022; 'International shipping – General cargo, 10,000+ DWT'

Table A-10: Installation emission factors for heavy steel products

Process	Installation Emission Factor (kg CO ₂ e/t)	Source
Installation of heavy steel members with crane truck	32.9	Estimates of crane use from Grayson Engineering. See product-specific guidelines for details.

A.4. Light Steel Framing

Table A-11: Production (A1-A3) emission factors for light steel framing (proxy information used)

Product	Region	Manufacturer	Production Emission Factor (kg CO ₂ e/kg)	Source	EPD Valid Until
Other New Zealand light framing product	New Zealand	Generic (Proxy data)	4.34	Calculated as per Table 4-9.	N/A
Other Australian light framing product	Australia	Generic (Proxy data)	3.67	Calculated as per Table 4-9.	N/A
Other Asian light framing product	Asia	Generic (Proxy data)	3.86	Calculated as per Table 4-9.	N/A

No material fabrication or installation emissions are expected for light steel framing.

A.5. Reinforcing Steel

Table A-12: Production (A1-A3) emission factors for reinforcing steel products

Product	Region	Manufacturer	Production Emission Factor (kg CO ₂ e/kg)	Source	EPD Valid Until
SEISMIC® Reinforcing bar	New Zealand	Pacific Steel	3.97	S-P-01002	2023
SEISMIC® Reinforcing - coil	New Zealand	Pacific Steel	3.75		
SEISMIC® Reinforcing - rod	New Zealand	Pacific Steel	3.78		
SEISMIC® Reinforcing - wire (galvanised)	New Zealand	Pacific Steel	3.90		
Reinforcing - bar (basic product)	Australia	InfraBuild Construction Solutions	1.58	S-P-00855 v1.1	2025
Reinforcing - rod and wire	Australia	InfraBuild Construction Solutions	1.98		
Reinforcing - bar (pre-fabricated assemblies)	Australia	InfraBuild Steel	1.67	S-P-00857 v1.1	2025
Reinforcing - mesh	Australia	InfraBuild Steel	2.06		
Reinforcing - bar (basic product)	Australia	Australian Reinforcing Company (ARC)	1.67	S-P-00858	2021
Reinforcing - mesh	Australia	Australian Reinforcing Company (ARC)	2.06		
Other NZ reinforcing product	New Zealand	Generic	4.04	Average of Pacific Steel products + 5%	N/A
Other Australian reinforcing product	Australia	Generic	1.93	Average of InfraBuild and ARC products + 5%	N/A
Other Asian reinforcing product	Asia	Generic	2.47	Rebar - WorldSteel 2019 Data + 15%	N/A

Table A-13: Fabrication emission factors for reinforcing steel products

Process	Fabrication Emission Factor (kg CO ₂ e/kg)	Source
Fabrication	0.011	Fletcher Reinforcing average data – see product-specific guidelines for details

A.6. Semi-Finished and Intermediate Steel Feedstock

Table A-14: Production (A1-A3) emission factors for semi-finished and intermediate steel feedstock products

Product	Region	Manufacturer	Production Emission Factor (kg CO ₂ e/kg)	Source	EPD Valid Until
Hot Rolled Coil – Low Carbon Steel	Australia	BlueScope Steel	2.33	S-P-00557 v2.0	2025
Hot Rolled Coil – Medium Carbon Steel	Australia	BlueScope Steel	2.38	S-P-00557 v2.0	2025
Hot Rolled Coil – Alloyed Steel	Australia	BlueScope Steel	2.49	S-P-00557 v2.0	2025
XLERPLATE® steel – Low Carbon Steel	Australia	BlueScope Steel	2.49	S-P-00558 v2.0	2025
XLERPLATE® steel – Medium Carbon Steel	Australia	BlueScope Steel	2.54	S-P-00558 v2.0	2025
XLERPLATE® steel – Alloyed Steel	Australia	BlueScope Steel	2.65	S-P-00558 v2.0	2025
Hyundai Hot rolled steel coil	South Korea	Hyundai	1.77	S-P-02215 v1.1	2025
Steel plate for construction	Japan	Nippon Steel	1.90	JR-AJ-22001E	2027
Nippon Pickled Steel Sheets and Coils	Japan	Nippon Steel	1.70	JR-AJ-22003E	2027
Other Australian hot rolled coil	Australia	Generic	2.52	BlueScope EPD + 5% uncertainty	N/A (2025)
Other Australian plate steel	Australia	Generic	2.69	BlueScope EPD + 5% uncertainty	N/A (2025)
Other Asian Hot rolled coil	Asia	Generic	2.63	WorldSteel data + 15% uncertainty	N/A
Other Asian Hot-dip galvanised coil	Asia	Generic	3.29	WorldSteel data + 15% uncertainty	N/A
Other Asian Electrogalvanised coil	Asia	Generic	2.98	WorldSteel data + 15% uncertainty	N/A
Other Asian Engineering Steel	Asia	Generic	2.07	WorldSteel data + 15% uncertainty	N/A
Other Asian Plate Steel	Asia	Generic	2.66	WorldSteel data + 15% uncertainty	N/A

No fabrication or installation emissions are required for semi-finished and intermediate steel feedstock products.

A.7. Stainless Steel

Table A-15: Production (A1-A3) emission factors for stainless steel products

Product	Region	Manufacturer	Production Emission Factor (kg CO ₂ e/kg)	Source	EPD Valid Until
Cold Rolled Stainless Steel	Global	Outokumpu Oyj	3.39	EPD-OTO-20190002-IBD1-EN	2024
Hot Rolled Stainless Steel	Global	Outokumpu Oyj	2.74	EPD-OTO-20190003-IBD1-EN	2024
Stainless steel long product	Global	Outokumpu Oyj	2.89	EPD-OTO-20190107-IBD1-EN	2024
Other International Stainless steel	Global	Generic	3.80	International Stainless Steel Forum LCA data + 15%	N/A

Table A-16: Fabrication emission factors for stainless steel products

Process	Fabrication Emission Factor (kg CO ₂ e/kg)	Source
Fabrication - Stainless Tube	0.0913	Industry average data
Fabrication - Stainless Tanks	0.0756	Industry average data
Fabrication - Cut & Polished Stainless	0.410	Industry average data
Fabrication - Onsite Fabrication & Installation	0.0687	Industry average data

Annex B Links to referenced EPDs

The EPDs referenced in the Programme Instructions are available at the links in Table B-1.

Table B-1: Links to EPDs referenced in Programme Instructions

EPD Ref #	EPD Title	Link
S-P-01001	COLORSTEEL® ENDURA® and COLORSTEEL® MAXX®	https://epd-australasia.com/epd/colorsteel-endura-and-colorsteel-maxx/
Rollforming Addendum	Rollforming Addendum	Rollforming Addendum on COLORSTEEL® website
S-P-01539	AlumiGard™, MagnaFlow™ and ZinaCore™ pre-painted roofing and cladding (New Zealand)	https://epd-australasia.com/epd/alumigard-magnaflow-and-zinacore-pre-painted-roofing-and-cladding-australia/
S-P-00999 v2.0	COLORBOND® steel	https://epd-australasia.com/epd/colorbond-steel/
S-P-00559 v2.0	Steel – Welded Beams and Columns	https://epd-australasia.com/epd/steel-welded-beams-and-columns/
S-P-00854 v1.2	Hot Rolled Structural and Merchant Bar	https://epd-australasia.com/epd/hot-rolled-structural-and-merchant-bar/
S-P-00856 v1.2	Hot Rolled Structural Products	https://epd-australasia.com/epd/hot-rolled-structural-products/
S-P-01547 v1.2	Hot Rolled Structural and Rail	https://epd-australasia.com/epd/hot-rolled-structural-and-rail-2/
S-P-01166	Hot Dip Galvanizing in Australia	https://epd-australasia.com/epd/hot-dip-galvanizing-in-australia/
S-P-01002	SEISMIC® Steel Reinforcing Bar, Coil, Rod and Wire	https://epd-australasia.com/epd/seismic-steel-reinforcing-bar-coil-rod-and-wire/
S-P-00855 v1.2	Reinforcing Rod, Bar & Wire	https://epd-australasia.com/epd/reinforcing-rod-bar-wire/
S-P-00857 v1.2	Reinforcing Bar and Mesh	https://epd-australasia.com/epd/reinforcing-bar-and-mesh/
S-P-00858 v1.2	Steel reinforcing bar and mesh	https://epd-australasia.com/epd/steel-reinforcing-bar-and-mesh/
S-P-00557 v2.0	Steel - Hot Rolled Coil	https://epd-australasia.com/epd/steel-hot-rolled-coil/
S-P-00558 v2.0	XLERPLATE® steel	https://epd-australasia.com/epd/xlerplate-steel/
EPD-OTO-20190002-IBD1-EN	Cold Rolled Stainless Steel	https://epd-online.com/EmbeddedEpdList/Download/10910
EPD-OTO-20190003-IBD1-EN	Hot Rolled Stainless Steel	https://epd-online.com/EmbeddedEpdList/Download/10911
EPD-OTO-20190107-IBD1-EN	Stainless Steel Long Product	https://epd-online.com/EmbeddedEpdList/Download/12188

Annex C Industry LCA Data Providers

C.1. WorldSteel LCA – Participating Companies 2019 – Asian Data

The following companies provided data to the WorldSteel LCA 2019 study and have steel production facilities based in Asia. The WorldSteel product emission factors may be used where steel is sourced from one of the following companies:

- Aichi Steel
- ArcelorMittal
- China Steel Corporation (Baowu group)
- Daido Steel
- Godo Steel
- HBIS
- Itoh Ironworks Corp
- JFE Steel
- JSW
- Kobe Steel
- Kyoei Steel
- Nippon Steel
- Osaka Steel (part of Nippon Steel)
- Sahaviriya Steel Industries (SSI)
- Sanyo Special Steel
- Shimizu Steel Tomakomai
- Tata Steel India
- Tokyo Kohtetsu
- Tokyotekko
- Topy Industries

The buyer may also wish to ask the supplying mill if they have WorldSteel Climate Action Programme membership and request a certificate proving data was provided to the study.

C.2. International Stainless Steel Federation – Participating Companies

The following companies provided data to the International Stainless Steel Federation LCA study. The ISSF product emission factors may be used where steel is sourced from one of the following companies:

- Aperam
- Acerinox Group
- Outokumpu Group
- Nippon Steel Stainless Steel Corporation
- Nisshin Steel
- POSCO
- Baowu Steel Group
- Swiss Steel Group
- Nippon Yakin Kogyo

Annex D Programme Setup

Approach

The approach used to develop the programme comprised the following steps, described in more detail below:

1. Develop programme implementation process
 - a. Assign roles
 - b. Develop Programme Instructions
 - c. Determine the practical implementation steps
2. Develop calculation methodology
3. Work with Ekos to implement web-based offset calculator
4. Training and communication for those using the calculator

Roles

The roles of thinkstep, HERA, Ekos, and other parties in the development of this programme and the ongoing programme usage/administration are defined in these Programme Instructions.

Develop Programme Instructions (this document)

The Programme Instructions for the Steel Sector Carbon Offset Programme are based on existing documents where applicable, including the General Programme Instructions for the Ekos Carbon Management for Products Programme (currently in draft) and published product category rules.

These Programme Instructions clearly define:

- The roles of HERA, Ekos, and HERA members, as well as any committees or consultants who may review/approve data or reports used for calculations or public communication
- The types of data that may be used as a basis for carbon calculations
- How additional carbon is calculated where an EPD exists for an interim product
- How data is collected and what reporting and documentation is required for the programme
- How small manufacturers/fabricators can offset the emissions for their processes or products (if a full LCA is not required or possible)
- Communication guidance to allow manufacturers to remain compliant with all standards and laws

A sub-set of guidance has been developed for each product type (e.g. roll-formed roofing/cladding, light steel framing, stainless steel *etc*), to clearly define any further requirements specific to the Industry. This includes:

- Industry-specific rules for data collection and carbon calculation
- A functional unit appropriate to the product and accessible all stakeholders (e.g. kg or m²)
- Estimated average emission factors for processes not included in EPDs or LCA data (e.g. fabrication)

Practical implementation steps

The practical implementation steps were discussed between HERA, Ekos and thinkstep-anz, and comprised of:

- Data collection (EPD and LCA research, and engagement with industry)
- Completion of draft programme rules and calculator
- Consultation with industry to review draft rules and calculator
- Final changes and creation of online training resources
- Release of working calculator and final programme rules

Calculation Methodology (Included in this document)

The standardised calculation methodology ensures clear guidance for all stakeholders in the supply chain across all products covered in this programme. An industry-specific calculation methodology has been created for each product category as required, and draws upon existing product category rules where appropriate. The product categories covered in these Programme Instructions are:

- Steel roofing and cladding (roll-formed products)
- Heavy Structural steel products (beams, columns)
- Light Structural Steel Products (light steel framing)
- Steel reinforcing products (rebar, wire and mesh)
- Semi-finished or intermediate steel feedstock
- Stainless steel

A transportation emission calculation methodology is also included.

Offsetting

Ekos enables offsetting through their website. The practical implementation of this is discussed in these programme rules.

Training and Communication

Online training has been prepared by HERA for those who wish to use the calculator. HERA will continue to develop general tools and communications to ensure stakeholders know how to use the calculator, can explain the programme to customers, and know how to correctly refer to the programme. This is crucial to ensure compliance with Commerce Commission requirements⁴ for making accurate claims and to ensure the programme is used responsibly. However, HERA will not be responsible for developing tools and communications that specifically promote a particular product. It will be up to individual suppliers, manufacturers and distributors to develop their own material to promote their own products.

⁴ <https://comcom.govt.nz/business/dealing-with-typical-situations/making-accurate-claims>

Annex E Version History

E.1. Version 2.0, June 2023

Changes in this update relate to the following:

- Update of COLORBOND® steel EPD to v2.0, including roll forming impacts, used in:
 - Roll-Formed Roofing and Cladding
 - Light Steel Framing
- Update of InfraBuild EPDs to v1.2, mostly no change to impacts except
 - Hot Rolled Merchant Bar from InfraBuild Steel Centres
- Update of WorldSteel LCA dataset to 2021, with changes to all products, used in:
 - Heavy Structural Steel
 - Light Steel Framing
 - Reinforcing Steel
 - Semi-Finished and Intermediate Steel Feedstock
- Update of MfE emission factors for transport, electricity, and fuel combustion
- Addition of new EPDs to Structural section, including:
 - Hot Rolled Structural Steel Sections from Tung Ho Steel Enterprise Corp.
 - Section Shape Steel from Hyundai Steel
 - Cold-rolled Steel Square and Rectangular Tubes from Nippon Steel
 - Cold-pressed Steel Square and Rectangular Tubes from Nippon Steel
- Addition of new EPDs to Semi-finished section, including:
 - Hyundai Hot Rolled Steel Coil from Hyundai Steel
 - Steel plate for construction from Nippon Steel
 - Pickled Steel Sheets and Coils from Nippon Steel
- Corrections to calculated values for 'Other' New Zealand and Australian Proxy products for:
 - Roll-Formed Roofing and Cladding
 - Heavy Structural Steel
 - Light Steel Framing
 - Reinforcing Steel
 - Semi-Finished and Intermediate Steel Feedstock
- Update of WorldSteel LCA data contributors in Annex C

About thinkstep-anz



Our mission is to enable organisations to succeed sustainably. We develop strategies, deliver roadmaps, and implement leading software solutions. Whether you're starting out or want to advance your leadership position, we can help no matter your sector or size.

Why us? Because we are fluent in both languages of sustainability and business. We are translators.

We've been building business value from sustainability for 15 years, for small or large businesses, family-owned and listed companies, or government agencies.

Our approach is science-based, pragmatic, and flexible.

Our work helps all industries in Australia and New Zealand, including manufacturing, building and construction, FMCG, packaging, energy, apparel, tourism, and agriculture.

Our services range from ready-to-go packages to solutions tailored to your needs.

As a certified B Corp with an approved science-based target, we make sure we are walking the talk.

Our services cover:



Product

- Life Cycle Assessment (LCA)
- Environmental Product Declarations (EPD)
- Carbon footprint
- Circular Economy (CE)
- Cradle to Cradle (C2C)
- Water footprint
- Packaging
- Independent reviews



Carbon

- Carbon Footprint
- Scope 3 emissions
- Reduction strategy
- Carbon targets
- Science-based targets (SBT)
- Offsetting strategies
- Inventory verification



Strategy

- Materiality assessment
- Green Star
- Sustainable Development Goals (SDGs)
- Foresighting & regenerative futures
- Roadmaps & action plans
- Responsible procurement & supply chain engagement



Software & tools

- GaBi LCA software
- GaBi Envision
- Material Circularity Indicator (MCI)
- OpenLCA
- eTool
- Packaging calculator
- SoFi sustainability reporting



Reporting & disclosures

- Task Force on Climate-related Financial Disclosures (TCFD)
- Global Reporting Initiative (GRI) & Integrated reporting (<IR>)
- B Corp
- Voluntary & compliance reporting
- CDP



Communications

- Short form reports
- Case studies
- Infographics
- Workshops
- Storytelling
- Stakeholder engagement
- Sustainability reports



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Doing our part:

