PACIFIC STEEL
CERTAIN STRENGTH

ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH ISO 14025 AND EN 15804

Approval Date: 25/10/2018 | Valid Until: 25/10/2023

AUSTRALASIA EPD®
ENVIRONMENTAL PRODUCT DECLARATION

SEISMIC®
A PACIFIC STEEL PRODUCT

KEY INSIGHTS

Rating Tool EPD Compliance

- As per EN 15804
- Independently verified
- Cradle to gate with options
- Product specific

Pacific Steel Facts:

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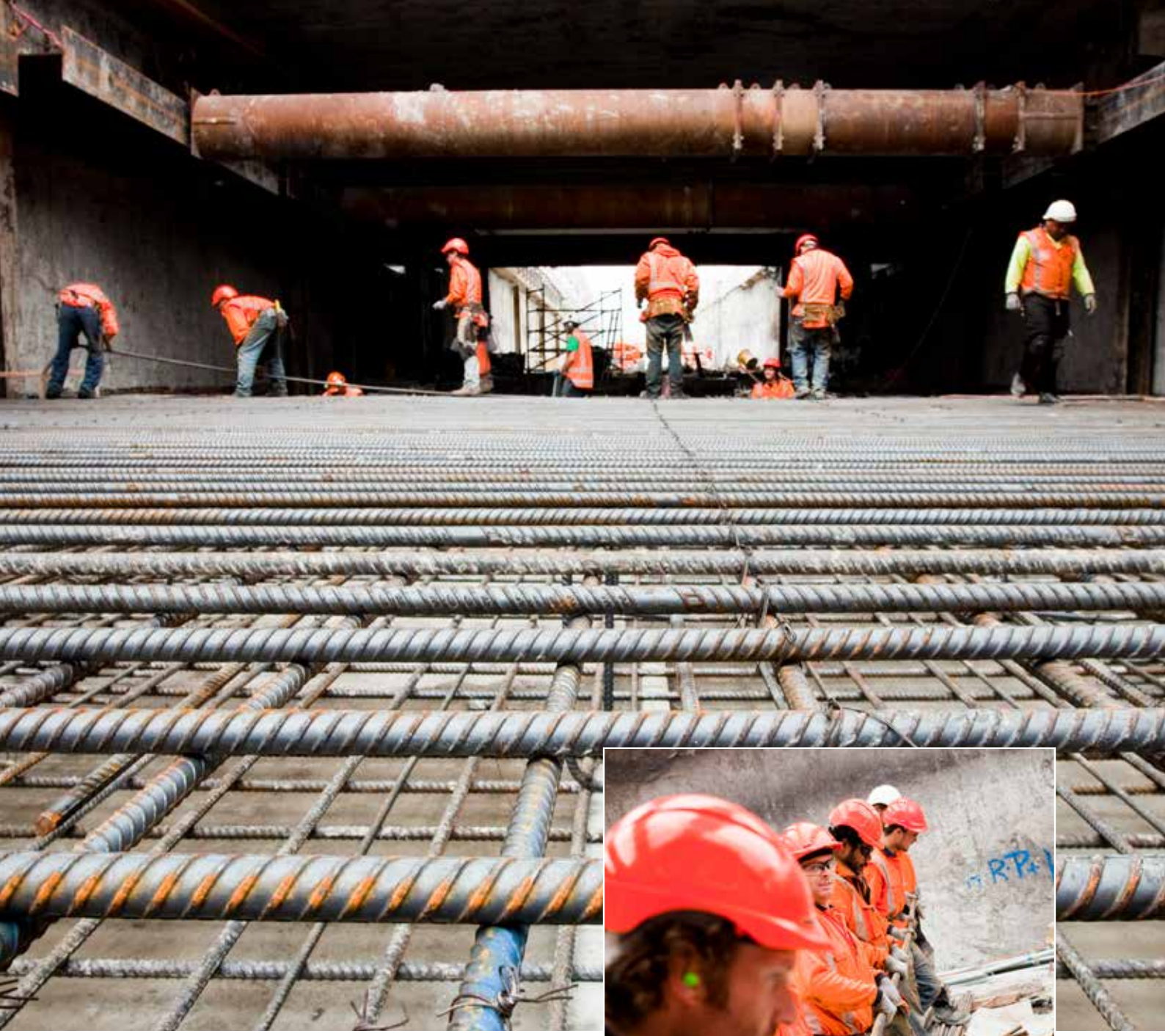
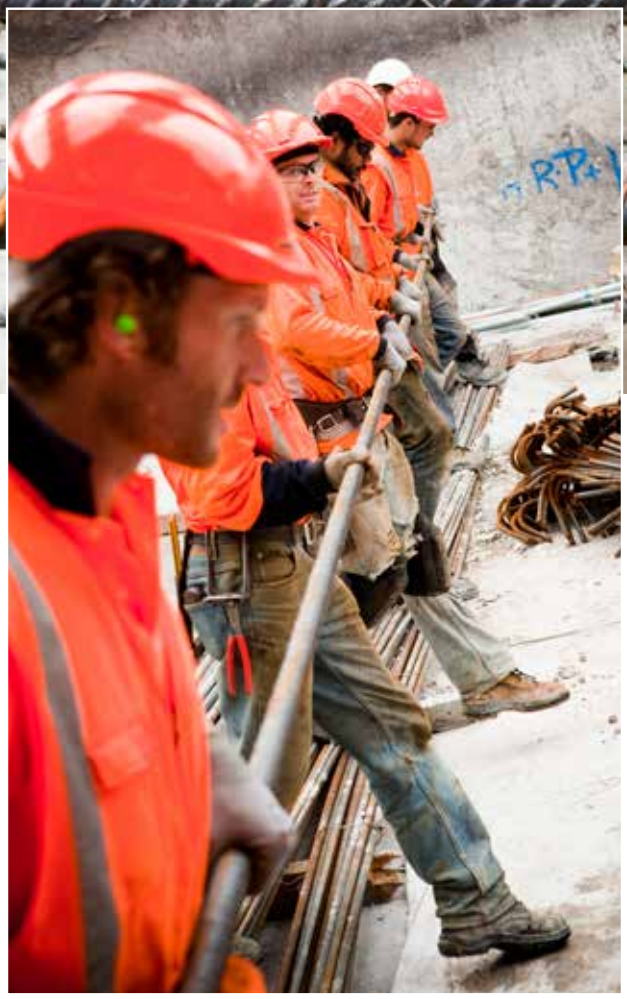




Case Study 1

New Lynn Rail Trench

The New Lynn Rail Trench was designed to improve the efficiency of the Western Auckland transport services. The aim was to allow for more frequent rail journeys, and to enhance the safety of road and pedestrian traffic as it moved around the rail network. The project took place between October 2008 and December 2009 and involved 50,000m^3 of concrete trenches requiring 7,500 tonnes of reinforcement and 100,000 cubic metres of bulk excavation.

The History of Pacific Steel

NEW ZEALAND MADE FOR OVER 50 YEARS

Pacific Steel is New Zealand's only manufacturer of wire rod, reinforcing bar and coil products, having produced high quality products for more than 50 years. Our Auckland based manufacturing facility has a capacity to produce 250,000 tonnes of manufactured steel per year, with much of this volume destined for foundations and structures around New Zealand.

We are committed to providing our customers with outstanding service and exceptional products. Our Australasian Certification Authority for Reinforcing and Structural Steels, or 'ACRS' third party certification, is a reflection of the emphasis we place on quality. ACRS certification reduces the risk to our customers and end users by providing assurances that our products consistently meet the industry recognised highest standards and specifications.

We're committed to working in the most efficient, environmentally-friendly manner possible, with our reinforcing products manufactured to Environmental Choice eco-label standards.

Case Study 2

Lion Nathan's Project Century

When your vision extends 100 years into the future, there's no leaving things to chance.

Lion Nathan's new brewing and beverage facility in South Auckland is ideally positioned to brew, bottle and distribute a high-quality product within the framework of Lion's clear 'reduce, recycle, reuse' principles.

Everything about the plant is centred around sustainability, and with Pacific Steel at its heart, it's destined to become an enduring model of environmentally-responsible commerce in action.

Case Study 3

Auckland City Rail Link

Being tasked to be part of the first stage of what will be the largest infrastructure project ever commissioned in Auckland calls for the right people, the right materials and the kind of can-do attitude that gets the job done.

Project Overview:
The City Rail Link (CRL) project consists of an electrified, double-track rail tunnel underneath Auckland's city center. It runs for approximately 3.5 km between Britomart Transport Centre and the Western Line, connecting to the west of Mount Eden Railway Station with an estimated cost of $3.6 billion.

Pacific Steel's role in the key first stage of the City Rail Link (Britomart Station) centered around the production of 50mm G500E rebar for the diaphragm walls (D-Walls) of the tunnel system. A D-Wall is a continuous wall constructed in the ground, usually to form an underground barrier or structure. In the case of the CRL Britomart project, the purpose of the D-Wall is to allow the rail tunnels to be constructed by supporting the existing foundations of the Chief Post Office. This will provide ground retention during excavation for the rail tunnels and prevent groundwater ingress into the excavations.

Product Development:
Up until the CRL project, 50mm rebar had never been used in New Zealand, so the first obstacle involved finding a production solution that met the requisite AS/NZS 4671 Standard for Reinforcing Steel.

In January 2017 Pacific Steel began trialling the 50mm bar, and by mid April the first commercial production run was completed in accordance with the timeline.

From there, further rollings were completed in July, September and early October, with the final run being completed in November, finalising the delivery of 400 tonnes of 50mm rebar.

For the team at Pacific Steel, this was an incredibly satisfying achievement that involved pulling together the full weight of the company's internal expertise across its manufacturing, technical, sales and supply chain resources. It took flexibility and a nimble approach to problem solving, as well as the determination to foster strong and productive working relationships with joint venture partners like Downer and Soletanche Bashy JV.

The delivery of a truly local solution and the pride created by stepping up to and meeting the challenge directly from our Auckland-based factory has already had a profound effect on the wider Pacific Steel team.

As for the future, in addition to enjoying the benefits that a more efficient CBD transport system will bring to Auckland, Pacific Steel looks forward to more opportunities to display its reliability, agility and sustainability at home and around New Zealand.

The Versatility of Pacific Steel

As New Zealand's only local manufacturer of reinforcing rod, bar, coil, and galvanised wire, our products have been tried, tested and proven time after time, from one end of the country to the other.

Our SEISMIC® branded bar and coil products are made to meet New Zealand's specific seismic conditions, as well as the demanding requirements of the seismic structural design methods required by local authorities around the country. They can be found in commercial, industrial, infrastructure and residential buildings nationwide.

Environmental Product Declaration – Pacific Steel

This EPD sets out information on SEISMIC® reinforcing bar, coil, rod and wire at the outbound gate of the manufacturing site. All products are manufactured by Pacific Steel at its facility in Otahuhu, Auckland. The declared unit presented is one kilogram of SEISMIC® product.

This EPD is of the type "cradle-to-gate with options", where the options include recycling and landfill at end-of-life. Other life cycle stages are dependent on how the product is used, and should be developed and included as part of holistic assessment of specific construction works.

Pacific Steel Product Content

The typical composition of SEISMIC® is:

Element	Typical Content
Iron	>97%
Manganese	<1.5%
Silicon	<0.35%
Chromium	<0.1%
Carbon	<0.23%
Other	<0.1% each

Steel by Pacific Steel – Recycled Content
Pre-consumer recycled content: 5%

The above data complies with the ISO14021 definitions of recycled content.

For safe use, refer to the product Safety Data Sheet (SDS) which is available from Pacific Steel.

What is an SDS?

A Safety Data Sheet (SDS) is a document that describes the chemical and physical properties of a product or material and provides safe handling and use information.

> "Declared Unit — This EPD is valid for a declared unit of 1 kg of SEISMIC® reinforcing bar, coil, rod and wire"

Pacific Steel Manufacturing

Pacific Steel manufactures its products using steel billets supplied by New Zealand Steel.

Those billets are reheated in a furnace at Pacific Steel, before being compressed and elongated through rolls to reduce thickness and increase strength.

The bar markings and diameters pressed into the bars determine which rolls are required, with the line rolls changing accordingly. The end product is then cooled and shipped out to customers around the country.

Scope of Declaration

The scope of this declaration is for 1 kilogram of SEISMIC® steel (bar, coil, rod and wire) from cradle to the mill gate, including end-of-life processing and recycling: Modules A1-A3, C3-C4 and D (according to EN 15804). Modules A4-A5, B1-B7 and C1-C2 have not been included due to the inability to predict how the material will be used following manufacture.

The system boundary applied in this study extends from mining of raw materials such as ironsand and coal; transport to and within the manufacturing site; iron and steel manufacture; ancillary service operations; rolling of steel billet to produce bar, rod and coil; drawing to produce wire; and packaging for dispatch to customers at the exit gate of the manufacturing site.

The system boundary also includes: manufacture of other required input materials; transport between processing operations; the production of external services such as electricity, natural gas and water; and wastes and emissions to air, land and water. Co-products from the steelmaking process have been removed through the use of allocation.

Table 1. Scope of Declaration in EPD

Product stage			Construction process stage		Use stage							End of life stage				Benefits and loads beyond the system boundary
Raw materials	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse – recovery – recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X

X = Module Declared; MND = Module Not Declared (such a declaration shall not be regarded as an indicator result of zero).

Results of Assessment

Table 2. Life Cycle Impact Assessment Indicators (Declared Unit = 1 kg)

Product		Bar	Coil	Rod	Wire	All		
Indicator	**units**	**A1-A3**	**A1-A3**	**A1-A3**	**A1-A3**	**C3**	**C4**	**D**
Global warming potential	kg CO_2-eq.	3.97	3.75	3.78	3.90	0.00777	0.00526	-1.29
Depletion potential of the stratospheric ozone layer	kg CFC11-eq.	2.53E-12	2.44E-12	2.44E-12	2.49E-12	1.91E-17	1.39E-15	7.98E-09
Acidification potential of land and water	kg SO_2-eq.	0.0410	0.0387	0.0388	0.0399	2.48E-05	1.46E-05	0.00101
Eutrophication potential	kg PO_4^{3-}-eq.	0.00202	0.00191	0.00192	0.00198	3.19E-06	1.84E-06	1.82E-04
Formation potential of tropospheric ozone photochemical oxidants	kg C_2H_4-eq.	0.00198	0.00186	0.00187	0.00193	1.76E-06	1.32E-06	-4.59E-04
Abiotic depletion potential for non fossil resources	kg Sb-eq.	3.87E-07	3.65E-07	3.79E-07	3.97E-07	4.21E-09	5.69E-10	-3.82E-07
Abiotic depletion potential for fossil resources	MJ	49.9	47.1	47.5	49.1	0.0960	0.0763	-12.2

Table 3. Resource Indicators (Declared Unit = 1 kg)

Product		Bar	Coil	Rod	Wire	All		
Indicator	**units**	**A1-A3**	**A1-A3**	**A1-A3**	**A1-A3**	**C3**	**C4**	**D**
Renewable primary energy as energy carrier	MJ	5.68	5.25	6.25	6.83	0.292	0.00585	0.930
Renewable primary energy as material utilization	MJ	0	0	0	0	0	0	0
Total use of renewable primary energy resources	MJ	5.68	5.25	6.25	6.83	0.292	0.00585	0.930
Non-renewable primary energy as energy carrier	MJ	50.2	47.4	47.7	49.4	0.0961	0.0791	-11.4
Non-renewable primary energy as material utilization	MJ	0	0	0	0	0	0	0
Total use of non-renewable primary energy resources	MJ	50.2	47.4	47.7	49.4	0.0961	0.0791	-11.4
Use of secondary material	kg	0	0	0	0	0	0	0
Use of renewable secondary fuels	MJ	4.35E-12	4.10E-12	4.10E-12	4.22E-12	0	0	0
Use of non-renewable secondary fuels	MJ	5.15E-11	4.86E-11	4.86E-11	5.00E-11	0	0	0
Use of net fresh water	m^3	0.0430	0.0405	0.0436	0.0454	7.59E-04	8.37E-06	0.00193

Results of Assessment continued

Table 4. Wastes and Other Outputs (Declared Unit = 1 kg)

Product		Bar	Coil	Rod	Wire	All		
Indicator	**units**	**A1-A3**	**A1-A3**	**A1-A3**	**A1-A3**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	2.39E-08	2.26E-08	2.28E-08	2.38E-08	8.21E-11	4.23E-10	-9.35E-07
Non-hazardous waste disposed	kg	0.279	0.264	0.264	0.272	5.64E-05	0.110	0.154
Radioactive waste disposed	kg	1.15E-04	1.08E-04	1.08E-04	1.14E-04	2.95E-08	1.10E-06	2.32E-06
Components for re-use	kg	0	0	0	0	0	0	0
Materials for recycling	kg	0	0	0	0	0.890	0	0
Materials for energy recovery	kg	0	0	0	0	0	0	0
Exported electrical energy	MJ	0	0	0	0	0	0	0
Exported thermal energy	MJ	0	0	0	0	0	0	0

Table 6. End of Life for 1 kg SEISMIC® steel

End of life		
Parameter	**unit**	**All**
Steel collected separately	kg	0
Steel collected with mixed construction waste	kg	0.89
Recovery for re-use	kg	0
Recovery for recycling	kg	0.89
Recovery for energy recovery	kg	0
Disposal to landfill	kg	0.11
Assumptions for scenario	N/A	N/A

Take Care When Comparing

This EPD complies with PCR 2012:01 Construction Products and Construction Services, Version 2.2, 2017-05-30.

Please note that:

- EPDs of construction products may not be comparable if they do not comply with EN 15804.
- EPDs within the same product category from different programmes may not be comparable.
- LCA provides high-level scientific guidance and differences in data should be substantial to be material.
- Understanding the detail is important in comparisons. Expert analysis is required to ensure data is truly comparable, to avoid unintended distortions.
- The best way to compare products and materiality of differences is to place them into the context of a structure across the whole life cycle.

Recycling

All Pacific Steel products are recyclable into equivalent or higher quality products – no losses are necessary due to downgrading of recyclable material. Steel's magnetic properties mean that it can be easily separated for recycling. The intrinsic economic value of steel results in a high recovery rate of all steel waste.

The actual recycling rate of steel at end-of-life has a significant impact on the cradle-to-grave results. The recycling scenario in this EPD was based on Hyder Consulting Reports (see page 13) which indicate that the average metals recycling rate in Australia is 89%. Due to a lack of reliable data for New Zealand, this same rate has been applied, with the remaining 11% assumed to go to landfill.

> "A focus on design to maximise recycling is important to minimise the whole of life impact of any construction project."

Life Cycle Assessment (LCA) Methodology

This EPD has been produced in conformance with the requirements of the International EPD® System General Programme Instructions v3.0 (GPI) and PCR 2012:01 Construction Products and Construction Services v2.2.

All data for primary iron- and steel-making come from New Zealand Steel. New Zealand Steel's Life Cycle Inventory (LCI) was originally based on the time period from 1st July 2011 to 30th June 2012 but has since been updated to reflect changes in manufacturing up to 31st October 2016.

The secondary data used were from GaBi Databases 2018. Most datasets have a reference year from 2014 to 2017, and all fall within the 10-year limit for secondary data specified in EN 15804. Electricity for primary iron- and steel-making was based on New Zealand Steel's cogeneration plants, while all other electricity was based on the average New Zealand electricity grid mix from GaBi Databases 2018.

Allocation follows EN 15804 section 6.4.3.2 and was performed based on economic value for all saleable scrap.

The cut-off criteria applied allowed items constituting less than 1% by mass, energy and environmental relevance to be excluded from the study. However, data which fell within the cut-off criteria were included in the data set where available.

Key assumptions made during the study were:

- Non-carbon emissions from the combustion of coal gases at New Zealand Steel have been based on secondary data from the GaBi Databases as a conservative approach as not all emissions to air are tracked. This approach may lead to overestimation of acidification potential, eutrophication potential and POCP.
- Measured data was always used where it was available, but there were some cases where flows were unmetered and had to be calculated. This was particularly true for water consumption during iron- and steel-making, where calculated flows were used to achieve a water balance.
- Accuracy of data measurement falls within normal industrial weighing systems accuracy limits of ±5%.

Our Safety Beliefs

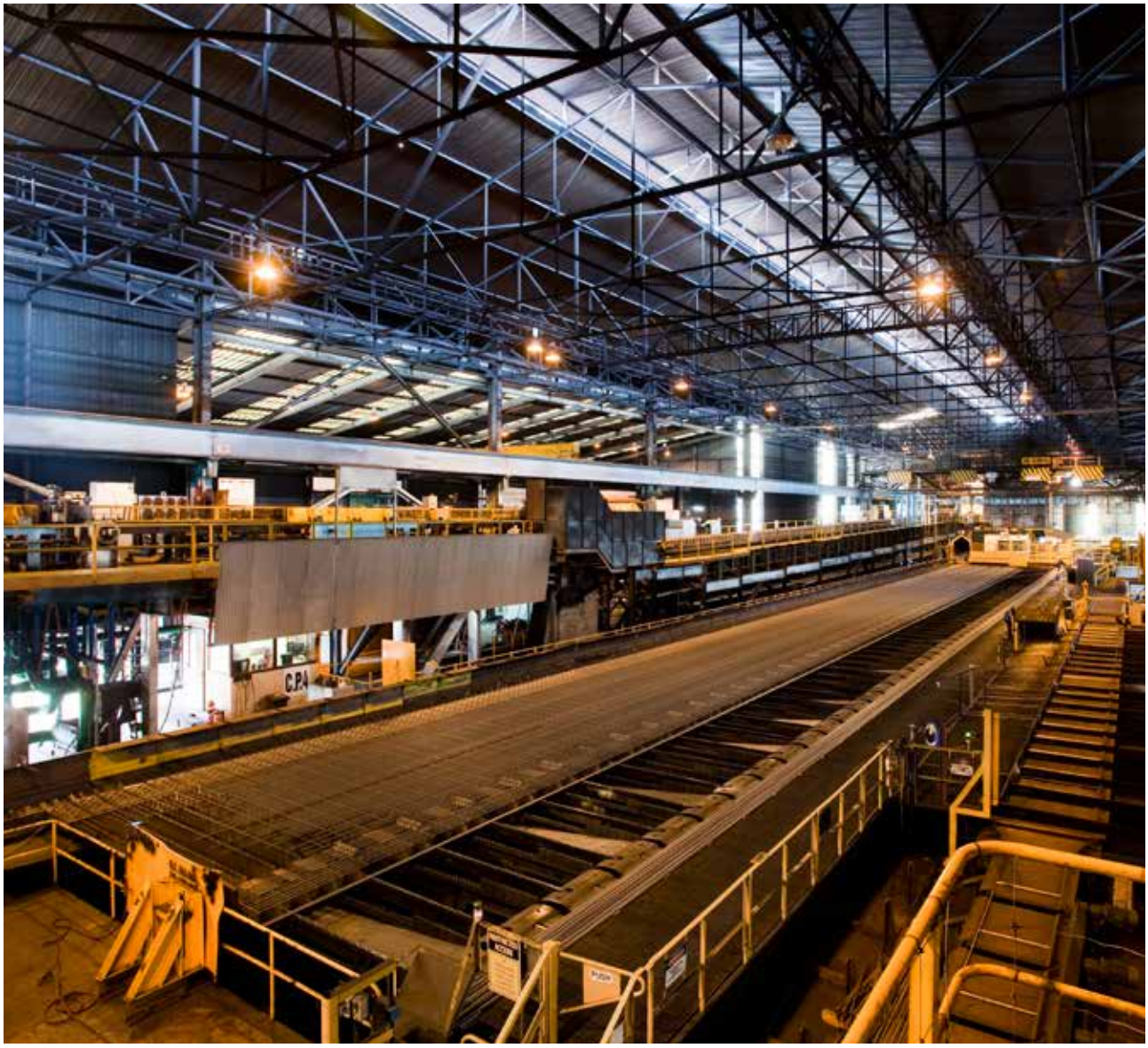
At Pacific Steel, a healthy, safe workplace is our top priority. Accordingly, our safety practices are managed through the internationally recognised Smart Site system and further supported by our Zero Harm culture.

'Zero Harm' has been in existence for over 10 years with the aim of using education, the most up-to-date resources, effective communication and staff engagement strategies to bring about continual improvement in general safety standards.

Safety awareness is achieved via initiatives that encourage the wider team to look out for each other and always seek new and improved ways to integrate safety-led thinking into their working lives.

The programme has been immensely effective and, shortly after its inception, it was recognised with the Australian Steel Institute's 'Best Site Improvement Award'.

One more positive example of behavioural change that has come about through this initiative has been a significant lift in the commitment to teamwork across the business, with measurable and meaningful work efficiencies flowing from this.



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Recycling References

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EPD Registration Information

EPD information:	
EPD registration number:	S-P-01002
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Valid until:	2023-10-25
Product group classification:	UN CPC 4124 – Bars and rods, hot-rolled, of iron or steel ANZSIC C2210 – Iron Smelting and Steel Manufacturing
Reference year for data:	Pacific Steel rolling and wire mills: 1 July 2013 to 30 June 2014. New Zealand Steel billet: 1 July 2011 to 30 June 2012, updated to reflect process changes up to 31 October 2016.
Geographical scope:	New Zealand
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CEN standard EN 15804 served as the core PCR:	
PCR:	PCR 2012:01 Construction Products and Construction Services, Version 2.2, 2017-05-30
PCR review was conducted by:	The Technical Committee of the International EPD® System. Chair: Massimo Marino. Contact via info@environdec.com
Independent verification of the declaration and data, according to ISO 14025:	☐ EPD process certification (Internal) ☒ EPD verification (External)
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Accredited or approved by:	The Australasian EPD® Programme

For more information about
Pacific Steel products call
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