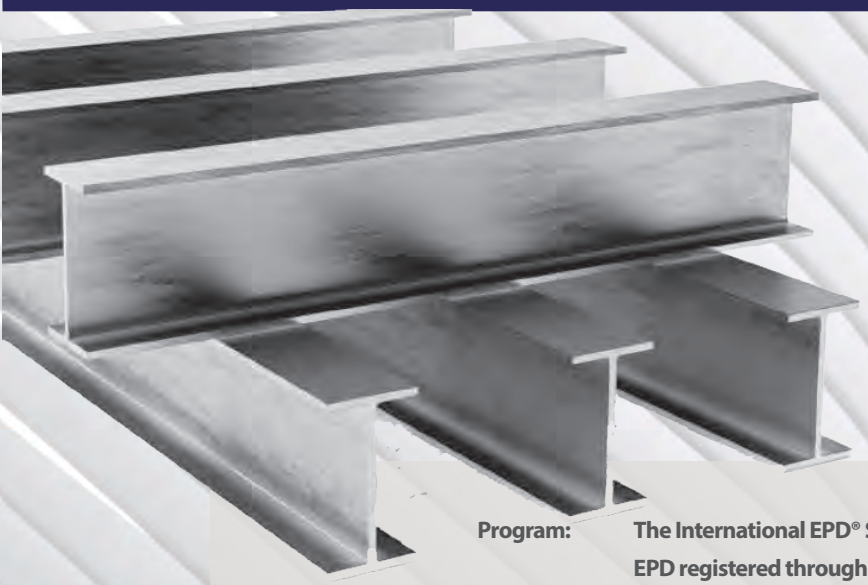
GERDAU CORSA

LATIN AMERICA EPD®

Environmental Product Declaration

Hot rolled structural shapes manufactured from steel scrap.

Environmental Product Declaration
In accordance with ISO 14025:2006 and EN 15804:2012



Program:	**The International EPD® System** **EPD registered through the fully aligned regional programme/hub:** **EPD Latin America**
Program operator:	**EPD International AB**
Regional Hub:	**EPD Latin America**
EPD registration number:	**S-P-01662**
Issue date:	**2020/07/27**
Validity date:	**2025/03/22** **An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com**
Revision date:	**2020/03/23**
Geographical scope:	**Mexico**

Content

1. GERDAU

Gerdau is a major producer of long steel in the Americas, and one of the world's largest suppliers of special steel. We operate in 10 countries and employ 30,000 individuals.

The trajectory of GERDAU began in 1901 with a factory in Porto Alegre, Brazil. Today, GERDAU products are present in the daily lives of millions of people.

We are also one of the largest recyclers in the world. Each year, we transform millions of tons of scrap into steel that is used to shape the future. Gerdau is a publicly traded company listed on the New York, São Paulo and Madrid stock exchanges.

Gerdau Arrived in Mexico in 2007 with the acquisition of a rebar plant, in 2008 Gerdau and Aceros Corsa create a joint venture with Aceros Corsa's merchant bar plant, and in 2012, Gerdau and Aceros Corsa unify the brand in Mexico under Gerdau Corsa name.
In 2015, Gerdau Corsa starts production in the new structural shapes plant located in Sahagun city, Hidalgo, Mexico.

GERDAU CORSA provides quality products and offers value-added services such as custom length cuts for optimized building structure fabrication.

Our network of steel mills covers the United States, Venezuela, Colombia, Argentina, Perú, Uruguay, Brasil, Republica Dominicana, Canada, and Mexico. We offer made to order Steel grades and lengths.

We have a technical team focused on the customer needs and able to offer the right solution for your building steel structure.

We believe in the strength of Steel transformation, and from the beginning of our history, the Main goal has always been to transform the lives of the people around us. Steel can turn projects into reality and boost the development of a better society and a better place to live.

Our Purpose is to: Empower people who build the future

The men and women in the steel industry make a transformative impact on society. They create and build with steel. They connect the world through bridges and cars, move people on elevators and across railroads, construct homes that protect families, and erect structures that revitalize landscapes. At Gerdau Corsa, we empower people who build the future.

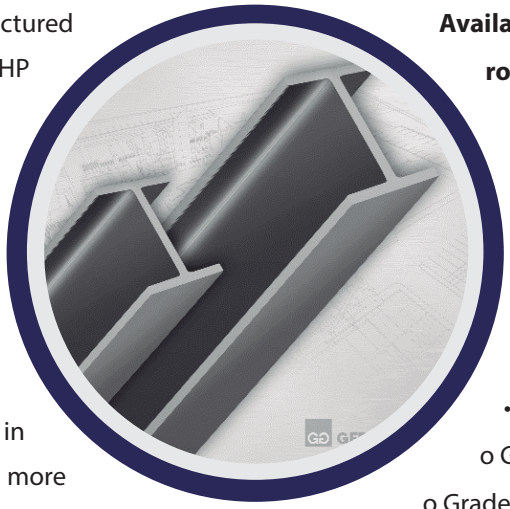
This Environmental Product Declaration (EPD) is in accordance with ISO 14025, for structural beams hot-rolled manufactured from steel scrap. The EPD owner has the sole ownership, liability, and responsibility for the EPD. EPD of construction products may not be comparable if they do not comply with EN 15804 Sustainability of Construction Works – Environmental Product Declarations – Core rules for Central Product Classification: UN CPC 4124 Bars and rods, hot rolled, of iron or steel; Environmental product declarations within the same product category but from different programs may not be comparable.

2. General information

Product:	Hot rolled structural shapes manufactured from steel scrap
Declaration owner:	Gerdau Corsa, SAPI. Km 3 Carretera México, Ciudad Sahagún, Zona industrial Tepeapulco, Hidalgo, CP 43990, México. Contact person: Itzia Nallely Santillán Fierro Itzia.santillan@gerdau.com Cel: 5515039744 Tel: 52627335 Marketing y relaciones publicas
Description of the construction product:	Hot rolled structural shapes manufactured from Steel scrap. Are also known as W, HP and C Shapes, their application is generally in the construction of steel structures using them in structural elements such as columns, beams, trusses, deep foundations, etc.
Declared Unit:	One metric ton of hot rolled structural shapes manufactured from steel scrap by GERDAU CORSA at the Ciudad Sahagún plant.
Main product components:	100% Steel manufactured using scrap steel as source of iron.
Life cycle stages not considered:	Downstream (A4, A5, B1, B2, B3, B4, B5, B6, B7, C1, C2, C3, C4), other environmental information (D), and inclusion of reference service life (RSL).
Content of the declaration:	This EPD is based on information modules that do not cover the aspects of use and end of life of the product. It contains in detail, for Module A1, A2 and A3: • Product definition and physical data. • Information about raw materials and origin. • Specifications on manufacturing the product. • Notes on product processing. • LCA based on a declared unit, cradle-to-gate. • LCA results. • Evidence and verifications.
For more information consult:	https://www.gerdaucorsa.com.mx/
Site for which this EPD is representative:	Manufacturing Plant:Gerdau Corsa, SAPI. Km 3 Carretera México, Ciudad Sahagún, Zona industrial, Tepeapulco, Hidalgo, CP 43990, México.
Intended Public:	B2B (Business to Business)

3. Product description

Hot rolled structural shapes manufactured form steel scrap, are also known as W, HP and C Shapes, their application is generally in the construction of steel structures in elements such as columns, beams, trusses, Deep foundations, etc.



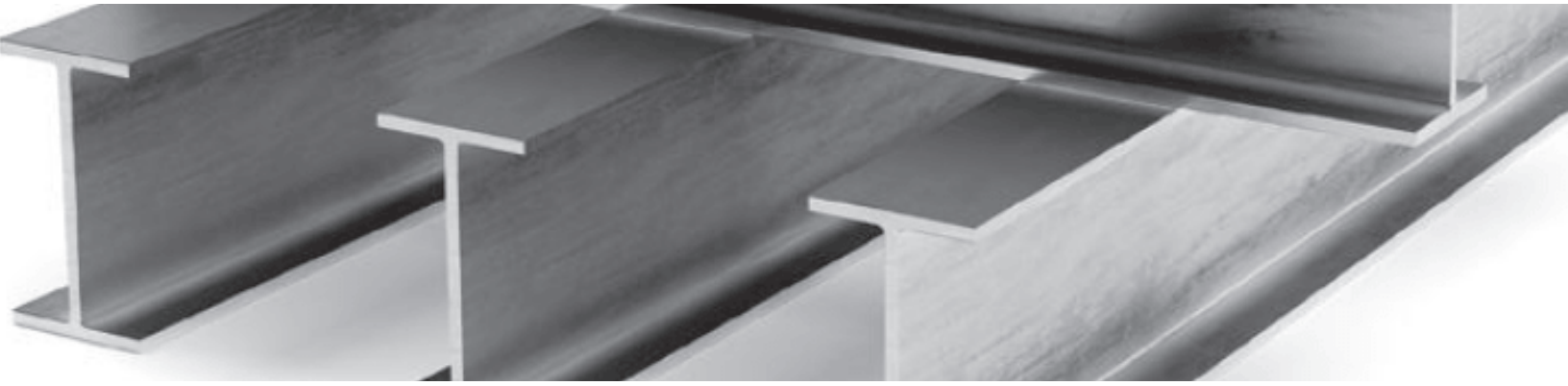
GERDAU CORSA as a leader in the production of this type of product in Mexico has the ability to manufacture more than 110 different shapes, manufactured under national and international norms, such as ASTM A6 / A6M (Standard specification for general requirements for rolled structural steel bars, plates, shapes, and sheet piling), also their products are subjected to chemical and mechanical properties tests to ensure product quality.

Uses

- In the construction industry as columns, beams, trusses and Deep foundations.
- Metallic barriers and structural support.
- Industrial buildings.

Available Steel Norms and Grades for hot rolled structural shapes:

- ASTM A992/A992M
- ASTM A572/572M
  - o Grade 50
  - o Grade 55
  - o Grade 60
- ASTM A36/A36M
- ASTM A529/A529M
  - o Grade 50
  - o Grade 55
- ASTM A588/A588M
  - o Grade A
  - o Grade B
  - o Grade K
- ASTM A709/A709M
  - o Grade 36
  - o Grade 50
    - · A
    - · B
  - o Grade 50W
- CSA G40-20 / G40-21
  - o Grade 345WM
- NMX-B-284
  - o Class C, Grade A99



3.1 Available geometries

According to ASTM A6/AM:

Table 1. Technical specification

Designation		Area (in^2)	Depth d (in)	Flange		Web
Depth (Des)	Weigth (lb/ft)			Width bf (in)	Thickness tf (in)	Thickness tw (in)
W24 X 103	103	30.3	24.53	9	0.98	0.55
W24 X 94	94	27.7	24.31	9.065	0.875	0.515
W24 X 84	84	24.7	24.1	9.02	0.77	0.47
W24 X 76	76	22.4	23.92	8.99	0.68	0.44
W24 X 68	68	20.1	23.73	8.965	0.585	0.415
W24 X 62	62	18.2	23.74	7.04	0.59	0.43
W24 X 55	55	16.2	23.57	7.005	0.505	0.395
W21 X 93	93	27.3	21.62	8.42	0.93	0.58
W21 X 83	83	24.3	21.43	8.355	0.835	0.515
W21 X 73	73	21.5	21.24	8.295	0.74	0.455
W21 X 68	68	20	21.13	8.27	0.685	0.43
W21 X 62	62	18.3	20.99	8.24	0.615	0.4
W21 X 55	55	16.2	20.8	8.22	0.522	0.375
W21 X 48	48	14.1	20.62	8.14	0.43	0.35
W21 X 57	57	16.7	21.06	6.555	0.65	0.405
W21 X 50	50	14.7	20.83	6.53	0.535	0.38
W21 X 44	44	13	20.66	6.5	0.45	0.35
W18 X 119	119	35.1	18.97	11.265	1.06	0.655
W18 X 106	106	31.1	18.73	11.2	0.94	0.59
W18 X 97	97	28.5	18.59	11.145	0.87	0.535
W18 X 86	86	25.3	18.39	11.09	0.77	0.48
W18 X 76	76	22.3	18.21	11.035	0.68	0.425
W18 X 71	71	20.8	18.47	7.635	0.81	0.495
W18 X 65	65	19.1	18.35	7.59	0.75	0.45
W18 X 60	60	17.6	18.24	7.555	0.695	0.415
W18 X 55	55	16.2	18.11	7.53	0.63	0.39
W18 X 50	50	14.7	17.99	7.495	0.57	0.355
W18 X 46	46	13.5	18.06	6.06	0.605	0.36
W18 X 40	40	11.8	17.9	6.015	0.525	0.315
W18 X 35	35	10.3	17.7	6	0.425	0.3
W16 X 100	100	29.4	16.97	10.425	0.985	0.585
W16 X 89	89	26.2	16.75	10.365	0.875	0.525
W16 X 77	77	22.6	16.52	10.295	0.76	0.455
W16 X 67	67	19.7	16.33	10.235	0.665	0.395
W16 X 57	57	16.8	16.43	7.12	0.715	0.43
W16 X 50	50	14.7	16.26	7.07	0.63	0.38
W16 X 45	45	13.3	16.13	7.035	0.565	0.345
W16 X 40	40	11.8	16.01	6.995	0.505	0.305
W16 X 36	36	10.6	15.86	6.985	0.43	0.295
W16 X 31	31	9.12	15.88	5.525	0.44	0.275
W16 X 26	26	7.68	75.69	5.5	0.345	0.25
W14 X 82	82	24.1	14.31	10.13	0.855	0.51
W14 X 74	74	21.8	14.17	10.07	0.785	0.45
W14 X 68	68	20	14.04	10.035	0.72	0.415
W14 X 61	61	17.9	13.89	9.995	0.645	0.375
W14 X 53	53	15.6	13.92	8.06	0.66	0.37
W14 X 48	48	14.1	13.79	8.03	0.595	0.34
W14 X 43	43	12.6	13.66	7.995	0.53	0.305
W14 X 38	38	11.2	14.1	6.77	0.515	0.31
W14 X 34	34	10	13.98	6.745	0.455	0.285
W14 X 30	30	8.85	13.84	6.73	0.385	0.27
W14 X 26	26	7.69	13.91	5.025	0.42	0.255
W14 X 22	22	6.49	13.74	5	0.335	0.23
W12 X 120	120	35.3	13.12	12.32	1.105	0.71
W12 X 106	106	31.2	12.89	12.22	0.99	0.61
W12 X 96	96	28.2	12.71	12.16	0.9	0.55
W12 X 87	87	25.6	12.53	12.125	0.81	0.515
W12 X 79	79	23.2	12.38	12.08	0.735	0.47
W12 X 72	72	21.1	12.25	12.04	0.67	0.43
W12 X 65	65	19.1	12.12	12	0.605	0.39
W12 X 58	58	17	12.19	10.01	0.64	0.36
W12 X 53	53	15.6	12.06	9.995	0.575	0.345
W12 X 50	50	14.7	12.19	8.08	0.64	0.37
W12 X 45	45	13.2	12.06	8.045	0.575	0.335
W12 X 40	40	11.8	11.94	8.005	0.515	0.295
W12 X 35	35	10.3	12.5	6.56	0.52	0.3
W12 X 30	30	8.79	12.34	6.52	0.44	0.26
W12 X 26	26	7.65	12.22	6.49	0.38	0.23
W12 X 22	22	6.48	12.31	4.03	0.425	0.26
W12 X 19	19	5.57	12.16	4.005	0.35	0.235
W12 X 16	16	4.71	11.99	3.99	0.265	0.22
W12 X 14	14	4.16	11.91	3.97	0.225	0.2
W10 X 112	112	32.9	11.36	10.415	1.25	0.755
W10 X 100	100	29.4	11.1	10.34	1.12	0.68
W10 X 88	88	25.9	10.84	10.265	0.99	0.605
W10 X 77	77	22.6	10.6	10.19	0.87	0.53
W10 X 68	68	20	10.4	10.13	0.77	0.47
W10 X 60	60	17.6	10.22	10.08	0.68	0.42
W10 X 54	54	15.8	10.09	10.03	0.615	0.37
W10 X 49	49	14.4	9.98	10	0.56	0.34
W10 X 45	45	13.3	10.1	8.02	0.62	0.35
W10 X 39	39	11.5	9.92	7.985	0.53	0.315
W10 X 33	33	9.71	9.73	7.96	0.435	0.29
W10 X 30	30	8.84	10.47	5.81	0.51	0.3
W10 X 26	26	7.61	10.33	5.77	0.44	0.26
W10 X 22	22	6.49	10.17	5.75	0.36	0.24
W10 X 19	19	5.62	10.24	4.02	0.395	0.25
W10 X 17	17	4.99	10.11	4.01	0.33	0.24
W10 X 15	15	4.41	9.99	4	0.27	0.23
W10 X 12	12	3.54	9.87	3.96	0.21	0.19

Designation		Area (mm^2)	Depth d (mm)	Flange		Web
Depth (Des)	Weigth (kg/m)			Width bf (mm)	Thickness tf (mm)	Thickness tw (mm)
W610 X 153	153	19600	623	229	24.9	14
W610 X 140	140	17900	617	230	22.2	13.1
W610 X 125	125	15900	612	229	19.6	11.9
W610 X 113	113	14500	608	228	17.3	11.2
W610 X 101	101	13000	603	228	14.9	10.5
W610 X 92	92	11700	603	179	15	10.9
W610 X 82	82	10500	599	178	12.8	10
W530 X 138	138	17,600	549	214	23.6	14.7
W530 X 123	123	15,700	544	212	21.2	13.1
W530 X 109	109	13,900	539	211	18.8	11.6
W530 X 101	101	12,900	537	210	17.4	10.9
W530 X 92	92	11,800	533	209	15.6	10.2
W530 X 82	82	10,500	528	209	13.3	9.5
W530 X 72	72	9,180	524	207	10.9	9
W530 X 85	85	10,800	535	166	16.5	10.3
W530 X 74	74	9,480	529	166	13.6	9.7
W530 X 66	66	8,390	525	165	11.4	8.9
W460 X 177	177	22,600	482	286	26.9	16.6
W460 X 158	158	20,100	476	284	23.9	15
W460 X 144	144	18,400	472	283	22.1	13.6
W460 X 128	128	16,300	467	282	19.6	12.2
W460 X 113	113	14,400	463	280	17.3	10.8
W460 X 106	106	13,400	469	194	20.6	12.6
W460 X 97	97	12,300	466	193	19	11.4
W460 X 89	89	11,400	463	192	17.7	10.5
W460 X 82	82	10,500	460	191	16	9.9
W460 X 74	74	9,480	457	190	14.5	9
W460 X 68	68	8,710	459	154	15.4	9.1
W460 X 60	60	7,610	455	153	13.3	8
W460 X 52	52	6,650	450	152	10.8	7.6
W410 X 149	149	19,000	431	265	25	14.9
W410 X 132	132	16,900	425	263	22.2	13.3
W410 X 114	114	14,600	420	261	19.3	11.6
W410 X 100	100	12,700	415	260	16.9	10
W410 X 85	85	10,800	417	181	18.2	10.9
W410 X 75	75	9,480	413	180	16	9.7
W410 X 67	67	8,580	410	179	14.4	8.8
W410 X 60	60	7,610	407	178	12.8	7.7
W410 X 53	53	6,840	403	177	10.9	7.5
W410 X 46.1	46.1	5,880	403	140	11.2	7
X 38.8	38.8	4,950	399	140	8.8	6.4
W360 X 122	122	15,500	363	257	21.7	13
W360 X 110	110	14,100	360	256	19.9	11.4
W360 X 101	101	12,900	357	255	18.3	10.5
W360 X 91	91	11,500	353	254	16.4	9.5
W360 X 79	79	10,100	354	205	16.8	9.4
W360 X 72	72	9,100	350	204	15.1	8.6
W360 X 64	64	8,130	347	203	13.5	7.7
W360 X 58	58	7,230	358	172	13.1	7.9
W360 X 51	51	6,450	355	171	11.6	7.2
W360 X 44.6	44.6	5,710	352	171	9.8	6.9
W360 X 39	39	4,960	353	128	10.7	6.5
W360 X 32.9	32.9	4,190	349	127	8.5	5.8
W310 X 179	179	22,800	333	313	28.1	18
W310 X 158	158	20,100	327	310	25.1	15.5
W310 X 143	143	18,200	323	309	22.9	14
W310 X 129	129	16,500	318	308	20.6	13.1
W310 X 117	117	15,000	314	307	18.7	11.9
W310 X 107	107	13,600	311	306	17	10.9
W310 X 97	97	12,300	308	305	15.4	9.9
W310 X 86	86	11,000	310	254	16.3	9.1
W310 X 79	79	10,100	306	254	14.6	8.8
W310 X 74	74	9,480	310	205	16.3	9.4
W310 X 67	67	8,520	306	204	14.6	8.5
W310 X 60	60	7,610	303	203	13.1	7.5
W310 X 52	52	6,650	317	167	13.2	7.6
W310 X 44.5	44.5	5,670	313	166	11.2	6.6
W310 X 38.7	38.7	4,940	310	165	9.7	5.8
W310 X 32.7	32.7	4,180	313	102	10.8	6.6
W310 X 28.3	28.3	3,590	309	102	8.9	6
W310 X 23.8	23.8	3,040	305	101	6.7	5.6
W310 X 21	21	2,680	303	101	5.7	5.1
W250 X 167	167	21,200	289	265	31.8	19.2
W250 X 149	149	19,000	282	263	28.4	17.3
W250 X 131	131	16,700	275	261	25.1	15.4
W250 X 115	115	14,600	269	259	22.1	13.5
W250 X 101	101	12,900	264	257	19.6	11.9
W250 X 89	89	11,400	260	256	17.3	10.7
W250 X 80	80	10,200	256	255	15.6	9.4
W250 X 73	73	9,290	253	254	14.2	8.6
W250 X 67	67	8,580	257	204	15.7	8.9
W250 X 58	58	7,420	252	203	13.5	8
W250 X 49.1	49.1	6,260	247	202	11	7.4
W250 X 44.8	44.8	5,700	266	148	13	7.6
W250 X 38.5	38.5	4,910	262	147	11.2	6.6
W250 X 32.7	32.7	4,190	258	146	9.1	6.1
W250 X 28.4	28.4	3,630	260	102	10	6.4
W250 X 25.3	25.3	3,220	257	102	8.4	6.1
W250 X 22.3	22.3	2,850	254	102	6.9	5.8
W250 X 17.9	17.9	2,280	251	101	5.3	4.8

Table 1. Technical specification

Designation		Area (in^2)	Depth d (in)	Flange		Web
Depth (Des)	Weigth (lb/ft)			Width bf (in)	Thickness tf (in)	Thickness tw (in)
W8 X 67	67	19.7	9	8.28	0.935	0.57
W8 X 58	58	17.1	8.75	8.22	0.81	0.51
W8 X 48	48	14.1	8.5	8.11	0.685	0.4
W8 X 40	40	11.7	8.25	8.07	0.56	0.36
W8 X 35	35	10.3	8.12	8.02	0.495	0.31
W8 X 31	31	9.13	8	7.995	0.435	0.285
W8 X 28	28	8.25	8.06	6.535	0.465	0.285
W8 X 24	24	7.08	7.93	6.495	0.4	0.245
W8 X 21	21	6.16	8.28	5.27	0.4	0.25
W8 X 18	18	5.26	8.14	5.25	0.33	0.23
W8 X 15	15	4.44	8.11	4.015	0.315	0.245
W8 X 13	13	3.84	7.99	4	0.255	0.23
W8 X 10	10	2.96	7.89	3.94	0.205	0.17
W6 X 25	25	7.34	6.38	6.08	0.455	0.32
W6 X 20	20	5.87	6.2	6.02	0.365	0.26
W6 X 15	15	4.43	5.99	5.99	0.26	0.23
W6 X 16	16	4.74	6.28	4.03	0.405	0.26
W6 X 12	12	3.55	6.03	4	0.28	0.23
W6 X 9	9	2.68	5.9	3.94	0.215	0.17
W6 X 8.5	8.5	2.52	5.83	3.94	0.195	0.17

Designation		Area (mm^2)	Depth d (mm)	Flange		Web
Depth (Des)	Weigth (kg/m)			Width bf (mm)	Thickness tf (mm)	Thickness tw (mm)
W200 X 100	100	12,700	229	210	23.7	14.5
W200 X 86	86	11,000	222	209	20.6	13
W200 X 71	71	9,100	216	206	17.4	10.2
W200 X 59	59	7,550	210	205	14.2	9.1
W200 X 52	52	6,650	206	204	12.6	7.9
W200 X 46.1	46.1	5,890	203	203	11	7.2
W200 X 41.7	41.7	5,320	205	166	11.8	7.2
W200 X 35.9	35.9	4,570	201	165	10.2	6.2
W200 X 31.3	31.3	3,970	210	134	10.2	6.4
W200 X 26.6	26.6	3,390	207	133	8.4	5.8
W200 X 22.5	22.5	2,860	206	102	8	6.2
W200 X 19.3	19.3	2,480	203	102	6.5	5.8
W200 X 15	15	1,910	200	100	5.2	4.3
W150 X 37.1	37.1	4,740	162	154	11.6	8.1
W150 X 29.8	29.8	3,790	157	153	9.3	6.6
W150 X 22.5	22.5	2,860	152	152	6.6	5.8
W150 X 24	24	3,060	160	102	10.3	6.6
W150 X 18	18	2,290	153	102	7.1	5.8
W150 X 13.5	13.5	1,730	150	100	5.5	4.3
W150 X 13	13	1,630	148	100	4.9	4.3

Illustration 1. W Shapes

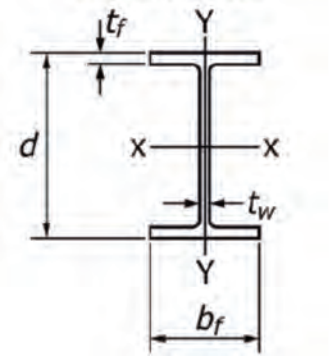


Illustration 2. HP Shapes

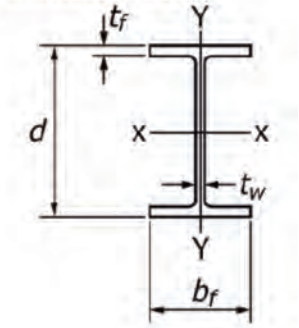


Illustration 3. Shapes C

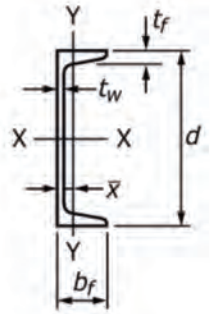


Table 2. Technical specification

Designation		Area (in^2)	Depth d (in)	Flange		Web
Depth (Des)	Weigth (lb/ft)			Width bf (in)	Thickness tf (in)	Thickness tw (in)
HP12 X 84	84	24.6	12.28	12.295	0.685	0.685
HP12 X 53	53	15.5	11.78	12.045	0.435	0.435

Designation		Area (mm^2)	Depth d (mm)	Flange		Web
Depth (Des)	Weigth (kg/m)			Width bf (mm)	Thickness tf (mm)	Thickness tw (mm)
HP310 X 125	125	15,900	312	312	17.4	17.4
HP310 X 79	79	10,000	299	306	11	11

Table 3. Technical specification

Designation		Area (in^2)	Depth d (in)	Flange		Web
Depth (Des)	Weigth (lb/ft)			Width bf (in)	Thickness tf (in)	Thickness tw (in)
C15 X 50	50	14.7	15	3.716	0.65	0.716
C15 X 40	40	11.8	15	3.52	0.65	0.52
C15 X 33.9	33.9	9.96	15	3.4	0.65	0.4
C 12 X 30	30	8.82	12	3.17	0.501	0.51
C12 X 25	25	7.35	12	3.047	0.501	0.387
C12 X 20.7	20.7	6.09	12	2.942	0.501	0.282

Designation		Area (mm^2)	Depth d (mm)	Flange		Web
Depth (Des)	Weigth (kg/m)			Width bf (mm)	Thickness tf (mm)	Thickness tw (mm)
C380 X 74	74	9,480	381	94	16.5	18.2
C380 X 60	60	7,610	381	89	16.5	13.2
C380 X 50.4	50.4	6,430	381	86	16.5	10.2
C310 X 45	45	5,690	305	80	12.7	13
C310 X 37	37	4,740	305	77	12.7	9.8
C310 X 30.8	30.8	3,930	305	74	12.7	7.2

3.2 Mechanical and chemical properties

Chemical and mechanical properties are obtained based on ASTM reference, the grades produced in Gerdau Corsa and the applicable chemical and mechanical properties are listed below:

Table 4. Mechanical and chemical properties

	ASTM A992/A992M		ASTM A572/A572M					
	Grade 50		Grade 50 A		Grade 55 A		Grade 60 A	
Carbon (max.) %	0.23		0.23		0.25		0.26	
Manganese %	0.5 -1.6 A		1.35 max. B,C		1.35 max. B,C		1.35 max. B,C	
Silicon (max.) %	0.4		0.4		0.4		0.4	
Vanadium (max.) %	0.15 B		Table A		Table A		Table A	
Columbium (max.) %	0.05 B		Table A		Table A		Table A	
Phosphorus (max) %	0.035		0.04		0.04		0.04	
Sulfur (max.) %	0.045		0.05		0.05		0.05	
Copper %	0.6 max.		A		A		A	
Nickel (max.) %	0.45		-		-		-	
Chromium %	0.35 max.		-		-		-	
Molybdenum (max.) %	0.15		-		-		-	
Carbon equivalent (max.) %	0.45 F		-		-		-	
Mechanical properties	Ksi	MPa	Ksi D	MPa D	Ksi D	MPa D	Ksi D	MPa D
Tensile strength min. (Ksi MPa)	65	450	65	450	70	485	75	520
Yield point min. (Ksi MPa)	50 - 65 C	345 - 450 C	50	345	55	380	60	415
Yeil to tensile ratio max.	0.85D		-		-		-	
Elongation 8 in (200 mm) min. %	18 E		18 E		17 E		16 E	
Elongation 2 in (50 mm) min %	21 E		21 E		20 E		18 E	

[A] Provided that the ratio of manganese to sulfur is not less than 20 to 1, the minimum limit for manganese for shapes with flange or leg thickness not exceeding 1 in. (25 mm) shall be 0.30%.

[B] The sum of columbium and vanadium shall not exceed 0.15%

[C] A maximum yield strength of 70 ksi (480 MPa) is permitted for structural shapes that are required to be tested from the web location.

[D] A maximum ratio of 0.87 is permitted for structural shapes that are tested from the web location.

[E] See elongation requirement adjustments under the tension tests section of ASTM A6/A6M Specification A6/A6M.

[F] The maximum permissible carbon equivalent value shall be 0.47% for shapes with flange thickness over 2 in. (50 mm), and 0.45% in other shapes. The carbon equivalent value shall be based on heat analysis.The required chemical analysis as well as the carbon equivalent shall be reported.The carbon equivalent shall be calculated using the following formula:
CE=C+Mn/6+(Cr+Mo+V)/S+(Ni+Cu)/15

[A] Copper when specified shall have a minimum content of 0.20 % by heat analysis (0.18 % by product analysis).

[B] Manganese, minimum, by heat analysis of 0.80 % (0.75 % by product analysis) shall be required for all plates over 3/8 in. [10 mm] in thickness; a minimum of 0.50 % (0.45 % by product analysis)shall be required for plates 3/8 in. [10 mm] and less in thickness, and for all other products. The manganese to carbon ratio shall not be less than 2 to 1.

[C] For each reduction of 0.01 percentage point below the specified carbon maximum, an increase of 0.06 percentage point manganese above the specified maximum is permitted, up to a maximum of 1.60 %.

[D] See specimen Orientation under the Tension Tests section of Specification A6/A6M.

[E] See elongation requirement adjustments underthe tension Tests section of ASTM A6/A6M Specification A6/A6M.

Table 5. Mechanical and chemical properties

	ASTM A36/A36M		ASTM A529/A529M			
	Grade 36		Grade 50		Grade 55	
Carbon (max.) %	0.26		0.27		0.27	
Manganese %	A		1.35 B		1.35 B	
Silicon (max.) %	0.4		0.4		0.4	
Vanadium (max.) %	-		-		-	
Columbium (max.) %	-		-		-	
Phosphorus (max) %	0.04		0.04		0.04	
Sulfur (max.) %	0.05		0.05		0.05	
Copper %	D		D		D	
Nickel (max.) %	-		-		-	
Chromium %	-		-		-	
Molybdenum (max.) %	-		-		-	
Carbon equivalent (max.) %	-		0.55 C		0.55 C	
Mechanical properties	Ksi B	MPa B	Ksi A	MPa A	Ksi A	MPa A
Tensile strength min. (Ksi MPa)	50 - 80 C	400 - 500 C	65 - 100	450 - 690	70 - 100	485 - 690
Yield point min. (Ksi MPa)	36	250	50	380	55	380
Yeil to tensile ratio max.	-		-		-	
Elongation 8 in (200 mm) min. %	20		18		17	
Elongation 2 in (50 mm) min %	21 C		21		20	

[A] Manganese content of 0.85-1.35% and silicon content of 0.15-0.40% is required for shapes with flange thickness over 3 in. [75 mm], otherwise there is no requirement.

[B] See specimen orientation under the tension test section of specification A6/A6M.

[C] For wide flange shapes with flange thickness over 3 in. [75 mm] the 80 ksi [550 MPa] maximum tensile strength does not apple and a minimum elongation in 2 in. [50 mm] of 19 % applies.

[D] 0.20% Copper,min, when copper is specified.

[A] See specimen orientation under the tension test section of specification A6/A6M.

[B] A maximum of 1.50% manganese is permissible, with an associated reduction of the carbon maximum of 0.01 percentage point for each 0.05 percentage point increase in manganese.

[C] The carbon equivalent equivalent shall be calculated using the following formula: CE= C + (Mn+Si)/6 + (Cu+Ni)/15 + (Cr +Mo + V + Cb)/5

[D] 0.20% Copper , min, when copper is specified.

Table 6. Mechanical and chemical properties

	ASTM A588/A588M						CSA G40-20 / G40-21	
	Grade 50 / A		Grade 50 / B		Grade 50 / K		Grade 345WM	
Carbon (max.) %	0.19		0.2		0.17		0.23	
Manganese %	0.8 - 1.25 A		0.75 - 1.35 A		0.50 - 1.20 A		0.50 - 1.60	
Silicon (max.) %	0.30 - 0.65		0.15 - 0.50		0.25 - 0.50		0.10 - 0.40	
Vanadium (max.) %	0.02 - 0.1		0.01 - 0.1		-		0.15	
Columbium (max.) %	-		-		0.005 - 0.05		0.15	
Phosphorus (max) %	0.03 B		0.03 B		0.03 B		0.035	
Sulfur (max.) %	0.03 B		0.03 B		0.03 B		0.045	
Copper %	0.25 - 0.40		0.20 - 0.40		0.30 - 0.50		0.6 B	
Nickel (max.) %	0.4		0.5		0.4		0.45	
Chromium %	0.40 - 0.65		0.40 - 0.70		0.40 - 0.70		0.35 max.	
Molybdenum (max.) %	-		-		0.1		0.15	
Carbon equivalent (max.) %							0.45 A	
Mechanical properties	Ksi C	MPa C	Ksi C	MPa C	Ksi C	MPa C	Ksi	MPa
Tensile strength min. (Ksi MPa)	70	485	70	485	70	485	65	450
Yield point min. (Ksi MPa)	50	345	50	345	50	345	60 - 65 C	345 - 450 C
Yeil to tensile ratio max.	-		-		-		0.85 C	
Elongation 8 in (200 mm) min. %	18		18		18		18	
Elongation 2 in (50 mm) min %	21 D		21 D		21 D		21	

[A] For each reduction of 0.01 percentage point below the specified maximum for carbon, an increase of 0.06 percentage point above the specified maximum for manganese is permitted, up to a maximum of 1.50 %.

[B] A maximum phosphorus content of 0.04 % and a maximum sulfur content of 0.05 % are permitted for the following materials: • Structural shapes / • Bars • Plates with widths up to and including 15 in. [380 mm]

[C] See specimen Orientation under the Tension Tests section of Specification A6/A6M.

[D] For wide flange shapes with flange thickness over 3 in. [75 mm], elongation in 2 in. [50 mm] of 18 % minimum applies.

[A] The maximum permitted carbon equivalent value shall be 0.47% for shapes with flange thickness over 50 mm [2 in] and 0.45% in other shapes. The carbon equivalent value shall be based on heat analysis. The carbon equivalent value shall be calculated as follows: CE = C+(Mn)/6+(Cr+Mo+V)/5+(Ni+Cu)/15

[B] 0.20% Copper, min, when copper is specified

[C] The maximum yield strength is 450 MPa and the maximum yield to tensile strength ratio is 0.85. For structural shapes that are required to be tested from the web location, a maximum yield strength of 480 MPa and a maximum yield to tensile strength ratio of 0.87 is permitted.

Table 7. Mechanical and chemical properties

	ASTM A588/A588M									
	Grade 36		Grade 50		Grade 50W AG		Grade 50W BG		Grade 50S	
Carbon (max.) %	0.26		0.23		0.19		0.2		0.23	
Manganese %	A, B		1.35 D		0.8 - 1.25 H		0.75 - 1.35 H		0.5 -1.6 J	
Silicon (max.) %	0.4		0.4 F		0.30 - 0.65		0.15 - 0.50		0.4	
Vanadium (max.) %	-		Table 1		0.02 - 0.1		0.01 - 0.10		0.15 K	
Columbium (max.) %	-		Table 1		-		-		0.05 K	
Phosphorus (max) %	0.04		0.04 E		0.03 I		0.03 I		0.035	
Sulfur (max.) %	0.05		0.05 E		0.03 I		0.03 I		0.045	
Copper %	C		C		0.25 - 0.40		0.20 - 0.40		0.6 max.	
Nickel (max.) %	-		-		0.4		0.5		0.45	
Chromium %	-		-		0.4 - 0.65		0.40 - 0.70		0.35 max.	
Molybdenum (max.) %	-		-		-		-		0.15	
Carbon equivalent (max.) %	-		-		-		-		0.45 L	
Mechanical properties	Ksi M	MPa M	Ksi M	MPa M	Ksi M	MPa M	Ksi M	MPa M	Ksi M	MPa M
Tensile strength min. (Ksi MPa)	58-80 N	400 - 550 N	65 N	450 N	70 N	485 N	70 N	485 N	65 N	450 N
Yield point min. (Ksi MPa)	36	250	50	345	50	345	50	345	50 - 65 Q	345 - 450 Q
Yeil to tensile ratio max.	-		-		-		-		0.85 P	
Elongation 8 in (200 mm) min. %	20		18		18		18		18	
Elongation 2 in (50 mm) min %	21		21 O		21 R		21 R		21	

[A] Manganese content of 0.85 to 1.35 % and silicon content of 0.15 to 0.40 % is required for shapes with flange thickness over 3 in. [75 mm].

[B] For each reduction of 0.01 below the specified carbon maximum, an increase of 0.06 % manganese above the specified maximum will be permitted up to a maximum of 1.35 %.

[C] Copper when specified shall have a minimum content of 0.20 % by heat analysis (0.18 % by product analysis).

[D] Manganese, minimum by heat analysis of 0.80 % (0.75 % by product analysis) shall be required for all plates over 3/8 in. [10 mm]
in thickness; a minimum of 0.50 % (0.45 % by product analysis) shall be required for plates 3/8 in. [10 mm] and less in thickness, and for all other products. The manganese to carbon ratio shall not be less than 2 to 1. For each reduction of 0.01 percentage point below the specified carbon maximum, an increase of 0.06 percentage point manganese above the specified maximum is permitted, up to a maximum of 1.60 %.

[E] A maximum phosphorus content of 0.04 % and a maximum sulfur content of 0.05 % are permitted for the following materials:
• Structural shapes
• Bars
• Plates with widths up to and including 15 in. [380 mm]

[F] Silicon content in excess of 0.40 % by heat analysis must be negotiated.

[G] Weldability data for these types have been qualified by FHWA for use in bridge construction.

[H] For each reduction of 0.01 percentage point below the specified maximum forcarbon, an increase of 0.06 percentage point above the specified maximum for manganese is permitted, up to a maximum of 1.50 %.

[I] A maximum phosphorus content of 0.04 % and a maximum sulfur content of 0.05 % are permitted for the following materials:
• Structural shapes
• Bars
• Plates with widths up to and including 15 in. [380 mm]

[J] Provided that the ratio of manganese to sulfur is not less than 20 to 1, the minimum limit for manganese for shapes with flange or leg thickness not exceeding 1 in. [25 mm] shall be 0.30 %.

[K] The sum of columbium and vanadium shall not exceed 0.15 %.

[L] The maximum permissible carbon equivalent value shall be 0.47 % for shapes with flange thickness over 2 in. [50 mm], and 0.45 % in other shapes. The carbon equivalent value shall be based on heat analysis. The required chemical analysis as well as the carbon equivalent shall be reported. The carbon equivalent shall be calculated using the following formula:

[M] See specimen Orientation under the Tension Tests section of Specification A6/A6M.

[N] Measured at 0.2 % offset or0.5 % extension under load as described in Section 13 of Test Methods A370.

[O] Elongation in 2 in. or 50 mm: 19 % for shapes with flange thickness over 3 in. [75 mm].

[P] The yield to tensile ratio shall be 0.87 or less for shapes that are tested from the web location; for all other shapes, the requirement is 0.85.

[Q] A maximum yield strength of 70 ksi [480 MPa] is permitted for structural shapes that are required to be tested from the web location.

[R] For wide flange shapes with flange thickness over 3 in. [75 mm], elongation in 2 in. or 50 mm of 18 % minimum applies.

Table 8. Mechanical and chemical properties

	NMX-B-284	
	Class C Grade 345 C	
Carbon (max.) %	0.23	
Manganese %	0.5 - 1.6 A	
Silicon (max.) %	0.4	
Vanadium (max.) %	0.15 B	
Columbium (max.) %	0.05 B	
Phosphorus (max) %	0.03	
Sulfur (max.) %	0.035 A	
Copper %	0.6	
Nickel (max.) %	0.45	
Chromium %	0.35 max.	
Molybdenum (max.) %	0.15	
Carbon equivalent (max.) %	0.45	
Mechanical properties	Ksi G	MPa G
Tensile strength min. (Ksi MPa)	65	450
Yield point min. (Ksi MPa)	50 - 65 E	345 - 450 E
Yeil to tensile ratio max.	0.85 F	
Elongation 8 in (200 mm) min. %	18	
Elongation 2 in (50 mm) min %	21	

[A] The ratio of manganese to sulfur must not be less than 20 to 1

[B] The sum of columbium and vanadium shall not exceed 0.15 %.

[C] The test result certificate must report tin (Sn) content, whenever the amount of tin (Sn) is less than 0.02%, <0.02% value is allowed to be reported.

[D] The maximum permissible carbon equivalent value shall be 0.45 % The carbon equivalent value shall be based on heat analysis. The required chemical analysis as well as the carbon equivalent shall be reported. The carbon equivalent shall be calculated using the following formula: CE= C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15

[E] maximum yield strength of 70 ksi [480 MPa] is permitted for structural shapes that are required to be tested from the web location.

[F] A maximum ratio of 0.87 is permitted for structural shapes that are tested from the web location.

[G] The longitudinal axis of the test specimen must be the same as the rolled direction of the shape.

	Alloy content	
Type A	Elements	Heat analysis (%)
1	Columbium	0.005 - 0.05 B
2	Vanadium	0.01 - 0.15 C
3	Columbium	0.005 - 0.05 B
	Vanadium	0.01 - 0.15 C
	Columbium plus	0.02 - 0.15 D
	Titanium	0.006 - 0.04
5	Nitrogen	0.003 - 0.015
	Vanadium	0.06 max.

[A] Alloy content shall be in accordance with Type 1, 2, 3, or 5 and the contents of the applicable elements shall be reported on the test report.

[B] Product analysis limits =0.004 to 0.06 %.

[C] Product analysis limits =0.005 to 0.17%

[D] Product analysis limits =0.01 to 0.16 %.

4. Content declaration

Hot rolled structural shapes manufactured from steel scrap by GERDAU CORSA are produced in an electric arc furnace using 94% of recycled material. The typical composition is in Table 9.

Table 9. Content structural hot rolled structural shapes manufactured from steel scrap

Homogeneous Material or Chemical Substances	Chemical Substances	Weight (%)	CAS Number	Function of Chemical Substance	Health class[1]
Steel scrap	Not applicable	94 %	Not applicable	Iron content in steel	Not listed
Insufflated coal	Anthracite	2 %	8029-10-5	Carbon content in steel	Not listed
Anthracite	Anthracite	<1 %	8029-10-5	Carbon content in steel	Not listed
Setting coal	Anthracite	<1 %	8029-10-5	Carbon content in steel	Not listed
Lime dolomite	Calcium carbonate magnesium	3 %	16389-88-1	Iron ore sintering agent steel foundry	Not listed
Lime C5-12	Calcium carbonate	<1 %	471-34-1	Iron ore sintering agent steel foundry	Not listed
Lime C1-2172	Calcium carbonate	<1 %	471-34-1	Iron ore sintering agent steel foundry	Not listed

1 According to EN15804 declaration of material content of the product shall List of Substances of Very High Concern (SVHC) that are listed by European Chemicals Agency.

5. LCA Rules

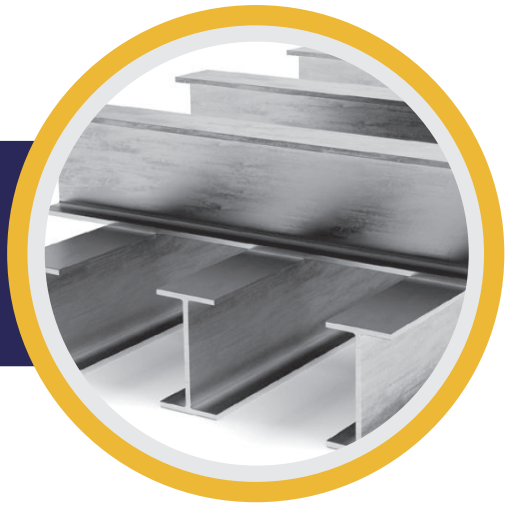
Environmental potential impacts were calculated according to EN 15804:2012 and PCR 2012:01 Construction products and construction services Version 2.3 (2018-11-15). This EPD is in accordance with ISO 14025:2006.

Environmental potential impacts were calculated through Life Cycle Assessment (LCA) methodology according to ISO 14040:2006 and ISO 14044:2006.

An external third-party veri¬fication process of the EPD was conducted according to General Programme Instructions for the International EPD® System Version 3.0. Verifi¬cation includes a documental review and a validation of both the underlying LCA study and documents describing additional environmental information that justify data provided in the EPD.

5.1. Declared unit

One metric ton of hot rolled structural shapes manufactured from steel scrap by GERDAU CORSA at the Ciudad Sahagún plant.



5.2. System boundary

The potential environmental impacts were calculated through Life Cycle Assessment (LCA) methodology of hot rolled structural shapes manufactured from steel scrap according to ISO 14040:2006 and ISO 14044:2006.

This study went through a critical review process in accordance with ISO / TS 14071: 2014. For a "cradle-to-gate " EPD is be based on information modules A1 to A3. (see table 10).

Table 10. System boundary hot rolled structural shapes manufactured from steel scrap

Life cycle information of the hot rolled structural shapes manufactured from steel scrap			EPD type	
Life cycle stages in the international EPD- System	Asset life cycle stages (EN 15804)	Information modulo (EN 15804)	Declared unit: Cradle-Gate Cradle-Gate with options	Function of Chemical Substance
Upstream	A1) Raw material supply	A1-A3) Product stage	Mandatory	Mandatory
Core	A2) Transport A3) Manufacturing			
Downstream	A4) Transport A5) Construction installation	A4-A5) Construction process stage	Optional for a product, mandatory for a service	Mandatory
	B1) Use B2) Maintenance B3) Repair B4) Replacement B5) Refurbishment	B1-B5) Use stage	Optional	Mandatory
	B6) Operational energy use B7) Operational water use	---------- ----------	---------- ----------	---------- ----------
	C1) Deconstruction, demolition C2) Transport C3) Waste processing C4) Disposal	C1-C4) End of life stage	Optional	Mandatory
Other environmental information	D) Future, reuse, recycling or energy recovery potentials	D) Recovery stage	Optional	Optional
Inclusion of reference service life (RSL)	----------	----------	Mandatory if any module in Bis included	Mandatory

Description of information modules is included in Table 11.

A1) Raw material supply

- Pre-processing of steel scrap.
- Production of raw materials: ferroalloys, lime, carbon, graphite electrodes, etc.
- Production of packaging materials for raw materials.
- Generation and distribution of the electricity consumed in manufacturing.
- Generation and distribution of the natural gas consumed in manufacturing.

A2) Transportation

- Transportation of scrap steel.
- Transportation of other raw materials.
- Transportation of auxiliary materials.
- Internal transportation requirements.

A3) Manufacturing

- Consumption of fresh water.
- Production and consumption of auxiliary materials: oxygen, nitrogen, chemicals for water treatment.
- Waste generation and waste management processes.
- Emissions to air.
- Transport of waste to the treatment and final disposal site.

Table 11. Description of information modules included in this EPD.

5.3. Description of the manufacturing process

The manufacturing process is described in Figure 1:

Figure. 1. Flow diagram of hot rolled structural shapes manufactured from steel scrap.

5.4. Assumptions

The following are the assumptions related to the industrialization process of scrap metal:

•The steel scrap from Hidalgo, Queretaro, State of Mexico and Guanajuato, is treated in the los Reyes scrap collection center State of Mexico, grouping the raw material sources by geographical area.

• The steel scrap of Veracruz, Puebla, Tlaxcala and Tabasco own are collected and treated in the Veracruz collection center.

• The Sahagún plant collection center receives steel from the other collection centers the treated of collection Centre others, the untreated material that arrives directly and GERDAU CORSA production returns steel exclusively.

• The steel scrap from Jalisco is being collected and treated in the yard Guadalajara collection center.

• The steel scrap of Morelos is being collected and treated in the San Juan collection center.

• The steel scrap data from Nuevo Leon was ruled out since it is not a constant supplier and the quantities that I handle are not representative.

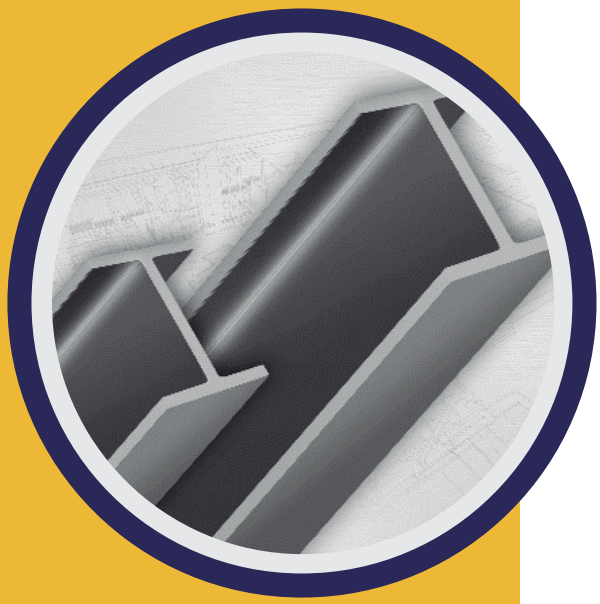
• Gerdau Corsa provided the scrap consumption data from January to August, and the total amount of scrap consumption in 2018. With this information a correlation for the missing months data was created.

• The distance from the collection center to the plant consumption was done using an average of the distances covered regarding each geographical area.

The following assumptions regard the life cycle inventory for the structural shapes:

• The shipment of non-hazardous waste take place at 34 km from the plant.

• The direct emissions were calculated using the factors for natural gas emissions.



5.5. Cut-off criteria

All flows of fuel, energy, materials and supplies necessary for the production of the Structural shapes have considered; materials that could use in preventive or corrective maintenance of machinery and equipment were disregarded,

as well as the use of uniforms and personal protective equipment or other auxiliary materials, leaving out textile impregnated with oils or plastics and the final disposal of these as hazardous waste.

5.6. Allocation

Allocation of inputs and outputs of the system between product and coproducts was based on a mass relation, considering the quantity produced per year of each product and coproduct at the level of the process unit.

The assignment amount of resource of the life cycle inventory is for 99.8% scrap, and the 0.21% to waste of usable ferrous material.

In table 12, shows the coproducts generated during the processing of steel scrap.

Product	Quantity	Unit	Assignment
Waste of usable ferrous material	2.14	kg	0.21%
Steel scrap	1000	kg	99.8%
Total	1002.14	kg	100%

Table 12. Coproduct generated the processing of steel scrap.

The assignment amount of resource of the life cycle inventory is for 89.8% hot rolled structural shapes manufactured from steel scrap, and the 10.2% to waste of usable ferrous material, called slag. Below are the assignments related to the manufacturing process of the hot rolled structural shapes manufactured from steel scrap.

Co-product	Quantity	Unit	Assignment
Slag	113.61	kg	10.2%
Structural beams hot-rolled manufactured from steel scrap	1000	kg	89.8%
Total	1113.60	kg	100%

Table 13. Coproduct generated in the manufacturing

The polluter pays principle was applied for the allocation procedure during recycling. In this way, in each case when there was an input of secondary material to hot rolled structural shapes system, recycling process and transportation to the site were included in life cycle inventory (for example, steel scrap).

In those cases, in which output of material to recycling were presented, material transportation to recycling plant was included. This principle was applied to plastic and metal containers recycled by a third party.

For generic data Mexicaniuh and Ecoinvent 3.3 (Allocation - Recycled Content version) databases were used.

5.7. Time representativeness

Direct data obtained from GESRDAU CORSA is representative for 2018.

5.8. Data quality assessment

Data quality assessment per information module is provided in tables 14, 15 and 16.

Table 14. Raw material supply module data quality assessment

Data	Time related coverage	Geographic coverage	Technological coverag	Data source	Measured or estimated
Consumption steel scrap	2018	Mexico	Modern	GERDAU CORSA	M
Transport distance of Steel scrap to pre-processing plants	2018	Mexico	Modern	GERDAU CORSA	M
Energy and materials consumption, coproduct and emissions generation from pre-processing steel scrap	2018	Mexico	Modern	GERDAU CORSA	M
Raw material consumption for steel billet manufactured from steel scrap	2018	Mexico	Modern	GERDAU CORSA	M
Production of raw materials packaging	2018	Mexico	Modern	GERDAU CORSA	M
Raw material consumption for steel rebar manufactured from steel scrap	2018	Mexico	Modern	GERDAU CORSA	M
Consumption of energy, emissions, waste and materials for the manufacture of steelmaking raw materials	1980-2016	Mix european	European production	Ecoinvent 3.3	M&E
Consumption of fuels and emissions related to electricity production in Mexico at country level	2017	Mexico	Mix technological Mexico	Mexicaniuh	M&E
Energy and materials consumption and emissions related to natural gas production in Mexico	2017	Mexico	Mix technological Mexico	Mexicaniuh	M&E

M&E: Measured and Estimated, M: Measured, E: Estimated

Table 15. Transportation module data quality assessment

Data	Time related coverage	Geographic coverage	Technological coverag	Data source	Measured or estimated
Transport distance of scrap and other raw materials	2018	Mexico	N/A	GERDAU CORSA	M
Transport distance of auxiliary supplies	2018	Mexico	N/A	GERDAU CORSA	M
Consumption of materials and energy and emissions related to the transport requirements of raw materials and auxiliary inputs.	1992-2014	Mix european	European production	Ecoinvent 3.3	M&E

M&E: Measured and Estimated, M: Measured, E: Estimated

Table 16. Manufacture module data quality assessment

Data	Time related coverage	Geographic coverage	Technological coverag	Data source	Measured or estimated
Water consumption	2017	Mexico	Modern	GERDAU CORSA	M
Consumption of auxiliary materials during manufacturing	1990 - 2016	Worldwide average based on Europe	Worldwide average based on Europe	Ecoinvent 3.3	M&E
Consumption of energy and materials for the manufacture of auxiliary materials	1990 - 2016	Worldwide average based on Europe	Worldwide average based on Europe	Ecoinvent 3.3	M&E
Consumption of energy and materials for the manufacture of the packaging of auxiliary materials used during manufacturing	2018	Mexico	Modern	GERDAU CORSA	M
Emissions to air and water during the manufacturing process	2018	Mexico	Modern	GERDAU CORSA	M
Emissions to waste during the manufacturing process	2018	Mexico	Modern	GERDAU CORSA	M
Waste treatment processes	1992-2014	Worldwide average based on Europe	Worldwide average based on Europe	Ecoinvent 3.3	M&E
Distance and consumption of materials, energy and emissions related to waste transport requirements	2018/ 1992-2014	Mexico/ Worldwide average based on Europe	Mexico/ Worldwide average based on Europe	GUERDAU CORSA/ Ecoinvent 3.3	M&E

M&E: Measured and Estimated, M: Measured, E: Estimated

6. Environmental performance

SimaPro 8.4 was used for Life Cycle Impact Assessment

6.1. Use of resources

Parameters describing resource use were evaluated with the Cumulated Energy Demand method version 1.09 (Frischknecht et al. 2007) except for the indicator of use of net fresh water that was evaluated with Recipe 2016 Midpoint (H) version 1.00 (Huijbregts et al. 2017). The detailed description of the use of resources is provided in table 17.

Table 17. Resource Indicators per metric ton of hot rolled structural shapes manufactured from steel scrap

Parameter	Unit	Total	A1) Raw materials supply	A2) Transportation	A3) Manufacturing
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	3.07E+02	2.20E+02	1.02E+01	7.67E+01
Use of renewable primary energy as raw materials	MJ	0	0	0	0
Total use of renewable primary energy resources	MJ	3.07E+02	2.20E+02	1.02E+01	7.67E+01
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	9.50E+03	7.82E+03	9.10E+02	7.66E+02
Use of non-renewable primary energy used as raw materials	MJ	0	0	0	0
Total use of non-renewable primary energy resources	MJ	9.50E+03	7.82E+03	9.10E+02	7.66E+02
Use of secondary material	kg	9.40E+02	0	0	9.40E+02
Use of renewable secondary fuels	MJ	0	0	0	0
Use of non-renewable secondary fuels	MJ	0	0	0	0
Use of net fresh water	m^3	3.81E+00	3.10E-01	1.60E-01	3.32E+00

M&E: Measured and Estimated, M: Measured, E: Estimated

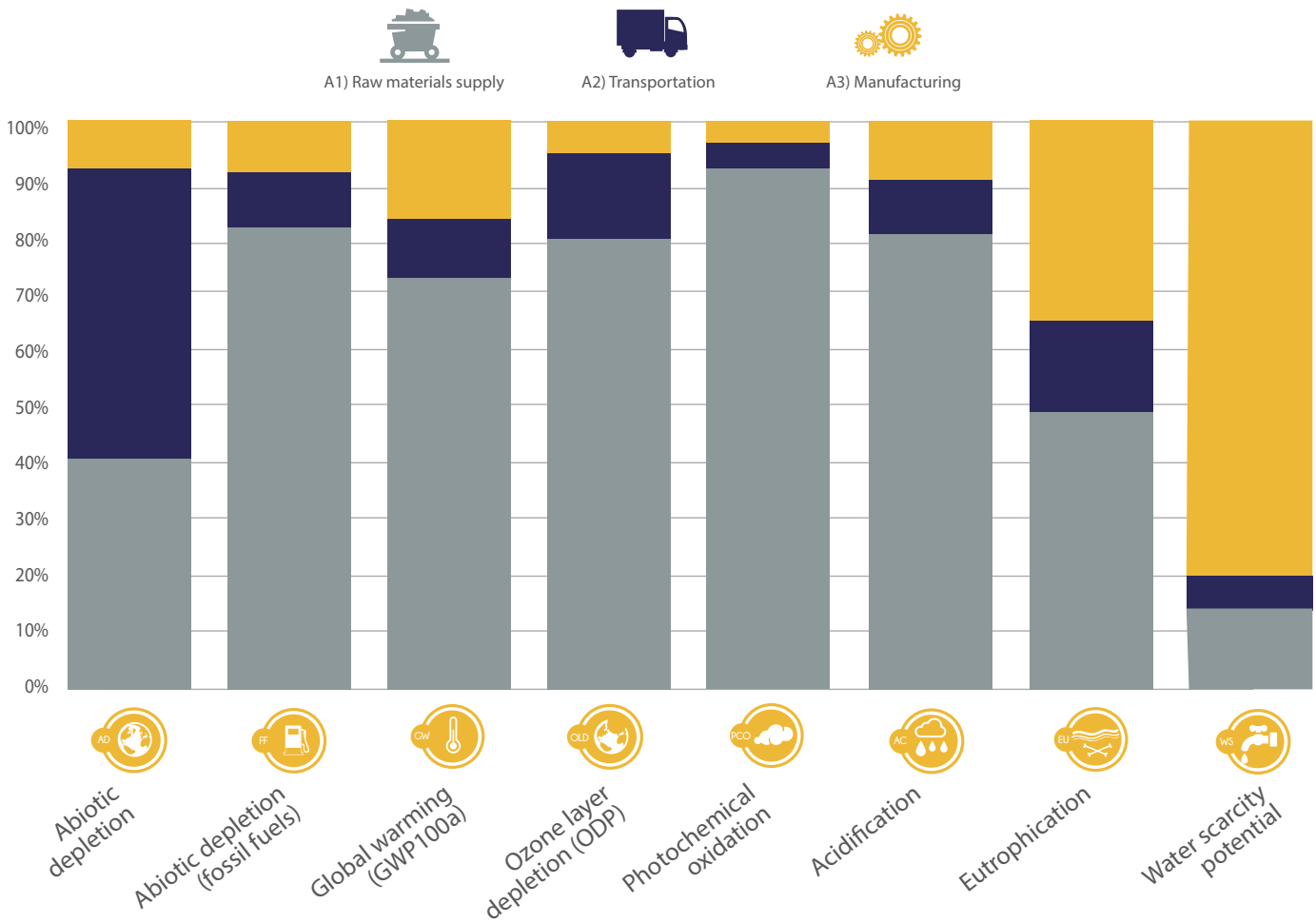
6.2. Potential environmental impact

All information modules are reported and value separately. However, in the present EPD presents itself the total impact across all stage. Parameters describing environmental potential impacts were calculated using CML-IA method version 3.04 (Guinee et al. 2001; Huijbregts et al. 2003; Wegener et al. 2008) as implemented in SimaPro 8.4. Water scarcity potential was calculated using AWARE method (Boulay et al. 2018).

Table 18. Potential environmental impact indicators per metric ton of hot rolled structural shapes manufactured from steel scrap

Impact Category	Unit	A1) Raw materials supply	A2) Transportation	A3) Manufacture	Total A1 - A3	A4 - A5, B1-B7, C1-C4, D
Abiotic depletion	kg Sb eq	1.1E-04	1.4E-04	1.9E-05	2.6E-04	Modules not declared
	%	41%	52%	7%	100%	
Abiotic depletion (fossil fuels)	MJ	7.6E+03	9.0E+02	6.8E+02	9.1E+03	
	%	83%	10%	7%	100%	
Global warming (GWP100a)	kg CO_2 eq	2.9E+02	5.4E+01	6.5E+01	4.1E+02	
	%	71%	13%	16%	100%	
Ozone layer depletion (ODP)	kg CFC-11 eq	5.4E-05	1.0E-05	2.8E-06	6.7E-05	
	%	81%	15%	4%	100%	
Photochemical oxidation	kg C_2H_4 eq	3.4E-01	1.2E-02	1.3E-02	3.6E-01	
	%	93%	3%	4%	100%	
Acidification	kg SO_2 eq	2.8E+00	3.1E-01	3.2E-01	3.5E+00	
	%	82%	9%	9%	100%	
Eutrophication	kg PO_4^{3-}--- eq	1.6E-01	6.0E-02	1.1E-01	3.4E-01	
	%	49%	18%	33%	100%	
Water scarcity potential	m^3	1.87E+01	9.97E+00	1.14E+02	1.43E+02	
	%	13%	7%	80%	100%	

Figure. 2 Potential environmental impact contribution per metric ton hot rolled structural shapes manufactured from steel scrap



6.3. Waste production

Environmental indicators describing waste generation were obtained from LCI except for background information which has been calculated using EDIP 2003 method (Hauschild and Potting, 2005). Table 19 shows waste and other outputs generated during each information module.

Table 19. Waste and other outputs per metric ton of steel rebar manufactured from steel scrap

Output parameter	Unit	Total	1) Raw materials supply	A2) Transportation	A3) Manufacturing
Hazardous waste	kg	5.29E-03	3.73E-03	5.02E-04	1.06E-03
Non hazardous waste	kg	5.61E+01	2.23E+01	3.22E+01	1.60E+00
Radioactive waste*	kg	1.62E-02	8.45E-03	5.79E-03	1.94E-03
Components for reuse	kg	0	0	0	0
Materials for recycling	kg	1.05E+03	0	1.90E+01	1.07E+03
Materials for energy recovery	kg	0	0	0	0
Exported electricity	MJ	0	0	0	0
Exported heat	MJ	0	0	0	0

**No radioactive waste is produced during GERDAU CORSA operation.*

6.4 Additional environmental information

Our Purpose in Gerdau Corsa is to Empower people who build the future.

The men and women in the steel industry make a transformative impact on society. They create and build with steel.

They connect the world through bridges and cars, move people on elevators and across railroads, construct homes that protect families, and erect structures that revitalize landscapes. At Gerdau Corsa, we empower people who build the future.

We believe that thorough empowering people we can achieve continuous improvement in our processes and communities, this is key in order to make a better workplace, society and planet; our philosophy is based first of all on people, the environment and the quality of our products, this is why all our plants are ISO certified in management systems regarding health and safety, environment, and quality (ISO 45001:2018, ISO 14001:2015, ISO 9001:20115 accordingly).

Our passion comes from the people we employ and collaborate within the industry; while investing in the latest technologies that take care of our environment.

All of our mills have modern dust removal systems that capture particles generated in the steel production process. This filtered material is a co-product used by other industries.

Our co-products - which are the secondary materials produced during steel production - can be used in numerous industrial applications, such as road paving, railway ballasts, foundries, cement manufacturing and ceramics. Gerdau reuses 73% of its co-products globally and donate the remaining co-products to help municipalities improve the roads in areas near our operations.

We also rely on water to cool production equipment and steel products. To conserve this water, Gerdau Corsa uses a closed-loop system that allows this valuable resource to be treated and reused. This process optimizes and substantially reduces water consumption.

Through new technology and awareness, our water intake is decreasing. Today, the company reuses almost 97% of its industrial process water.

We are truly committed to our planet and all of us living in it and that is what makes us special.

(EPD) Hot rolled structural shapes manufactured from steel scrap

7. Verification and registration

CEN standard EN 15804 served as the core PCR	
Program:	International EPD® System www.environdec.com EPD registered through the fully aligned regional program/hub: EPD Latin America www.epdlatinamerica.com
Program operator:	EPD International AB Box 210 60 SE-100 31 Stockholm, Sweden EPD Latin America Chile: Alonso de Ercilla 2996, Ñuñoa, Santiago Chile. Mexico: Av. Convento de Actopan 24 Int. 7A, Colonia Jardines de Santa Mónica, Tlalnepantla de Baz, Estado de México, México, C.P. 54050
EPD registration number:	S-P-01662
Issue date:	2020/07/27
Validity date:	2025/03/22
Revision date:	2020/03/23
Reference year of data:	2018
Geographical scope:	Mexico
Central product classification:	UN CPC 4124 Bars and rods, hot rolled, of iron or steel
PCR:	PCR 2012:01 construction products and construction services, Version 2.3 (2018-11-15)
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 data, according to ISO 14025:2006.	EPD process certification (Internal) ☐ EPD verification (External) ☑
Third-party verifier: Accredited or approved by:	Rubén Carnerero Acosta, approved EPD verifier r.carnerero@ik-ingenieria.com The International EPD® System
Procedure for follow-up of data during EPD validity involves third-party verifier:	Yes ☐ No ☑

8.Certifications

PLANTA ISO 45001 2018 CERTIFICADA
SEGURIDAD Y SALUD

PLANTA ISO 9001 2015 CERTIFICADA
CALIDAD

PLANTA ISO 14001 2015 CERTIFICADA
MEDIO AMBIENTE

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