New Developments in Sections and Merchant Bars from ArcelorMittal

Danish Steel Day, Nov. 24th, 2011

www.arcelormittal.com/sections

CE-mark for steel vs. CE mark for steel structures

EN10025 applies to hot-rolled products of structural steel, thus to (unfinished) products like sections and merchant bars leaving steel mills for being shipped to warehouses of distributors or to shops of steel fabricators.

EN1090-2 standard applies to execution of steel structures, thus this standard applies to structural steel members supplied by the steel fabricators to the construction jobsite.

→ **Conclusion: steel mills (of constituent products) certify their deliveries to EN10025, but not to EN1090-2.**

CE-mark for steel vs. CE mark for steel structures

EN1090-2, chapter 5 : Concerning constituent products, execution classes (EXC) of EN1090-2 require customers to order specific certificates (EN10204) and options of EN10025 as appropriate.

Steel Grade (EN10025)	Execution class of component (EN1090-2)	Certificate (EN 10204)
S235 JR / J0, S275 JR / J0	EXC1-EXC2-EXC3-EXC4	→ 2.2
S235 J2, S275 J2	EXC1-EXC2-EXC3-EXC4	→ 3.1
S355 JR / J0	EXC1 EXC2 - EXC3 - EXC4	→ 2.2 → 3.1
S355 J2 / K2 / M / ML, Histar 355 / 355L	EXC1-EXC2-EXC3-EXC4	→ 3.1
S460 all, S450 all, Histar 460 / 460L	EXC1-EXC2-EXC3-EXC4	→ 3.1

Summary of EN10025-2 Annex B (Table B.1), EN1090-2 (Table 1) and EN1993 Annex 10

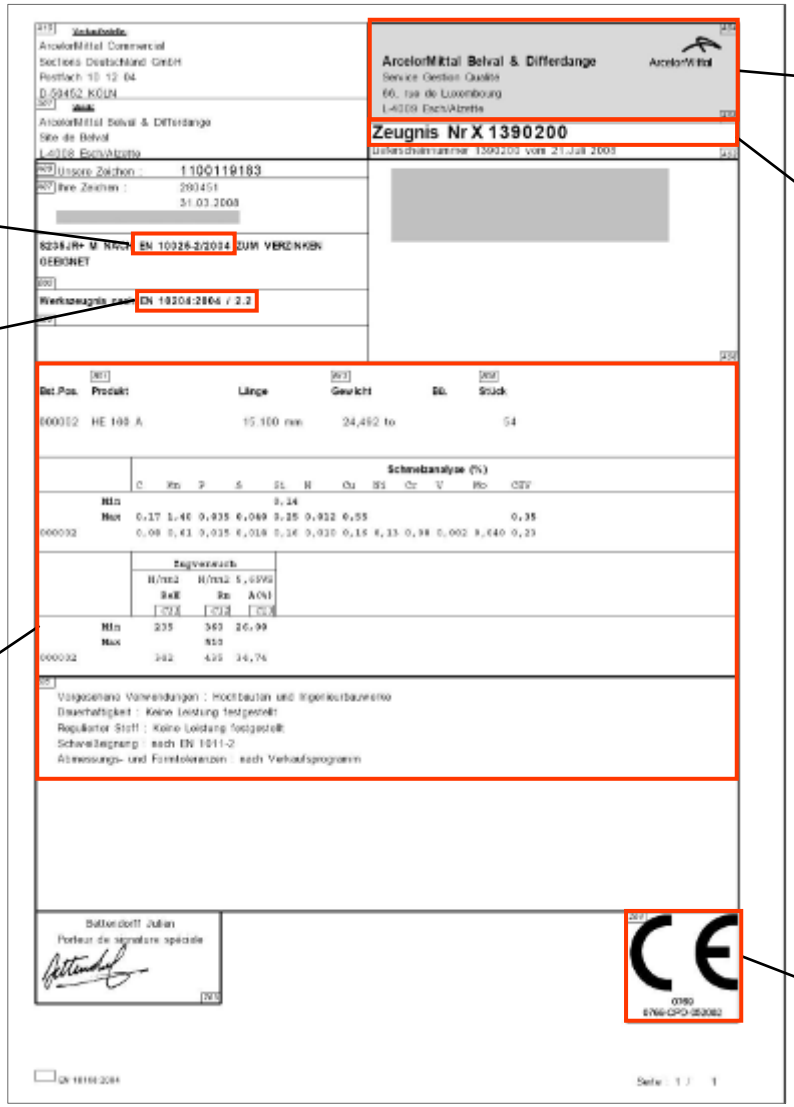
Certification
EN 10204: 2004

AM standard

Table A.1 — Summary of inspection documents

EN 10204 Reference	Designation of the document type			Document content	Document validated by
	English version	German version	French version		
Type 2.1	Declaration of compliance with the order	Werksbescheinigung	Attestation de conformité à la commande	Statement of compliance with the order	The manufacturer
Type 2.2	Test report	Werkszeugnis	Relevé de contrôle	Statement of compliance with the order, with indication of results of non-specific inspection	The manufacturer
Type 3.1	Inspection certificate 3.1	Abnahmeprüfzeugnis 3.1	Certificat de réception 3.1	Statement of compliance with the order, with indication of results of specific inspection	The manufacturer's authorized inspection representative independent of the manufacturing department
Type 3.2	Inspection certificate 3.2	Abnahmeprüfzeugnis 3.2	Certificat de réception 3.2	Statement of compliance with the order, with indication of results of specific inspection	The manufacturer's authorized inspection representative independent of the manufacturing department and either the purchaser's authorized inspection representative or the inspector designated by the official regulations

Certificate acc. to EN 10025-1:2004



Product standard

Type of certificate

Description of product and propertiers according to legal regulations

Name or Logo and legal adress of fabricator

Certificate-Nr.

CE-Mark and Registration-Nr. of certification body

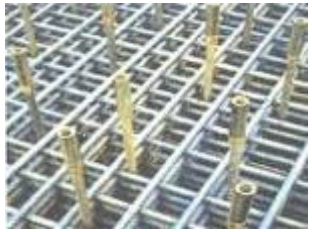
ArcelorMittal

- ***Company***
- ***Products***
- ***Applications***

Global production range of ArcelorMittal Long Carbon Europe

Sheet piles

Special rebars

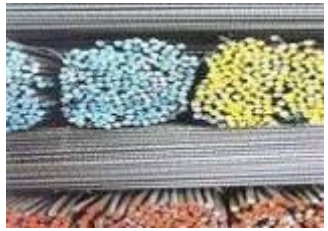


Transport and crane rails

Sections

Mesh

Standard rebars and coiled rebars

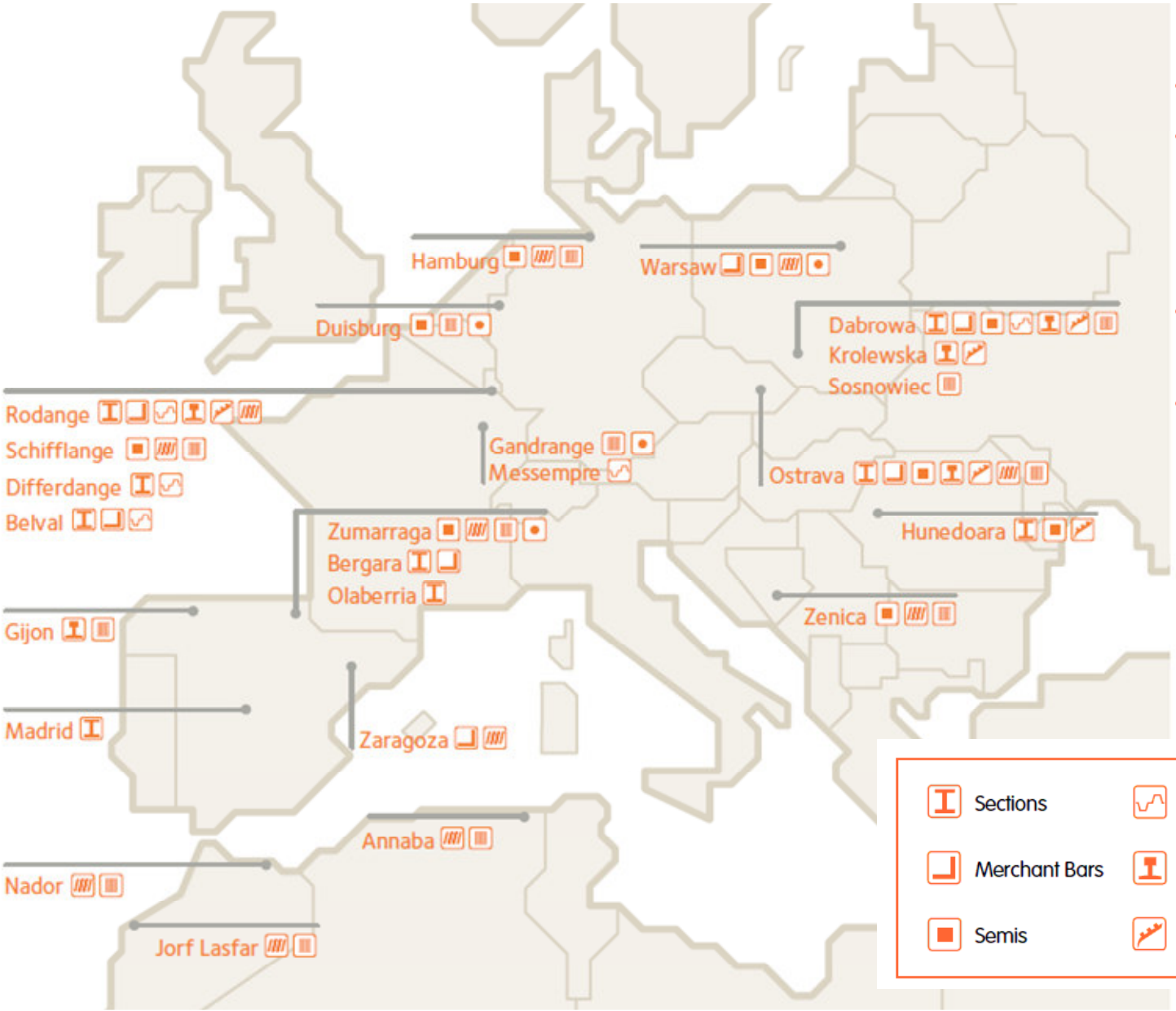


Merchant bars

Wire

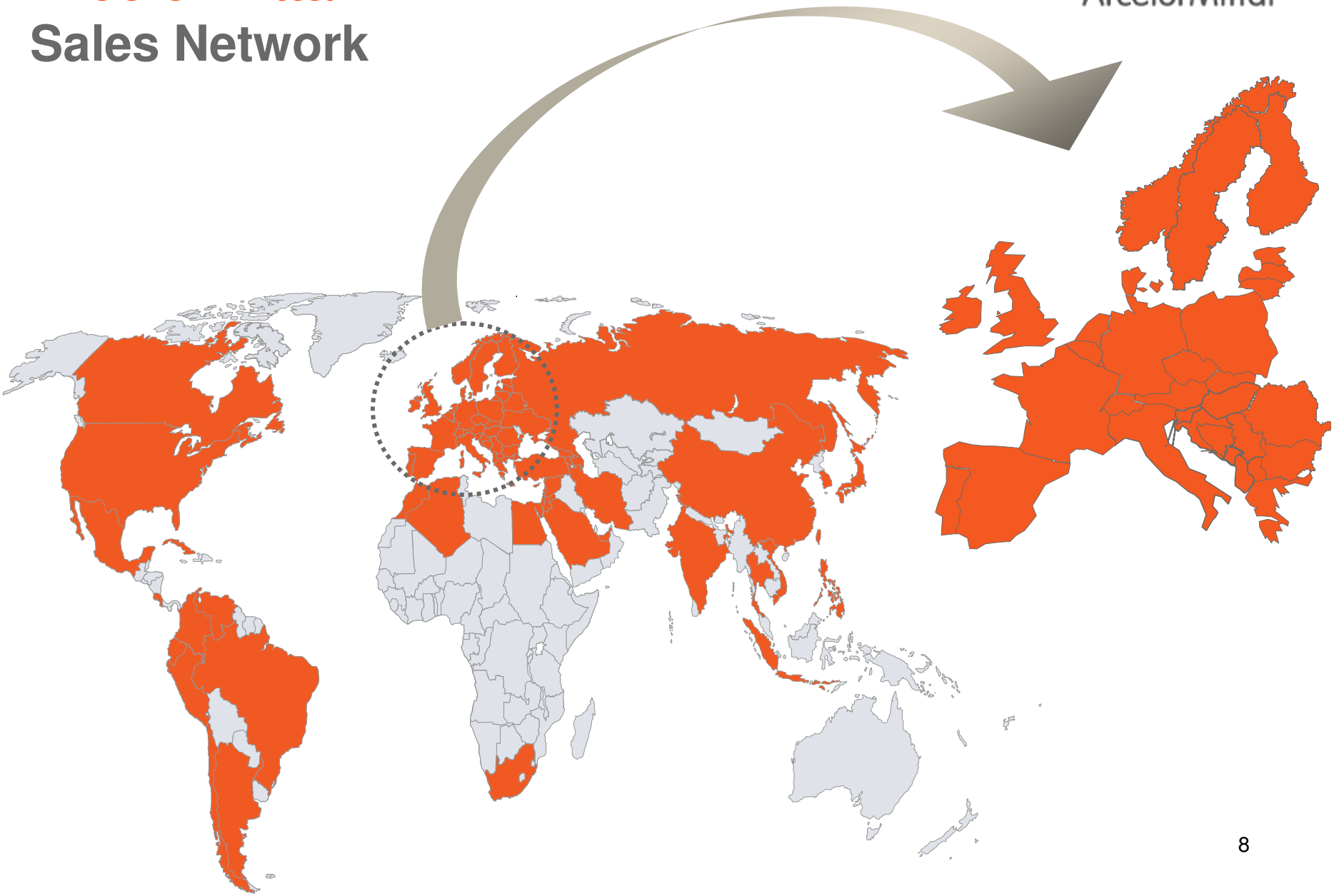
Beams

Long Carbon Europe production sites



- More than 20 mills
- 2/3 based on scrap route
  1/3 based on iron ore route
- Located in 10 countries
- 13 rolling mills of sections and merchant bars

ArcelorMittal
Sales Network



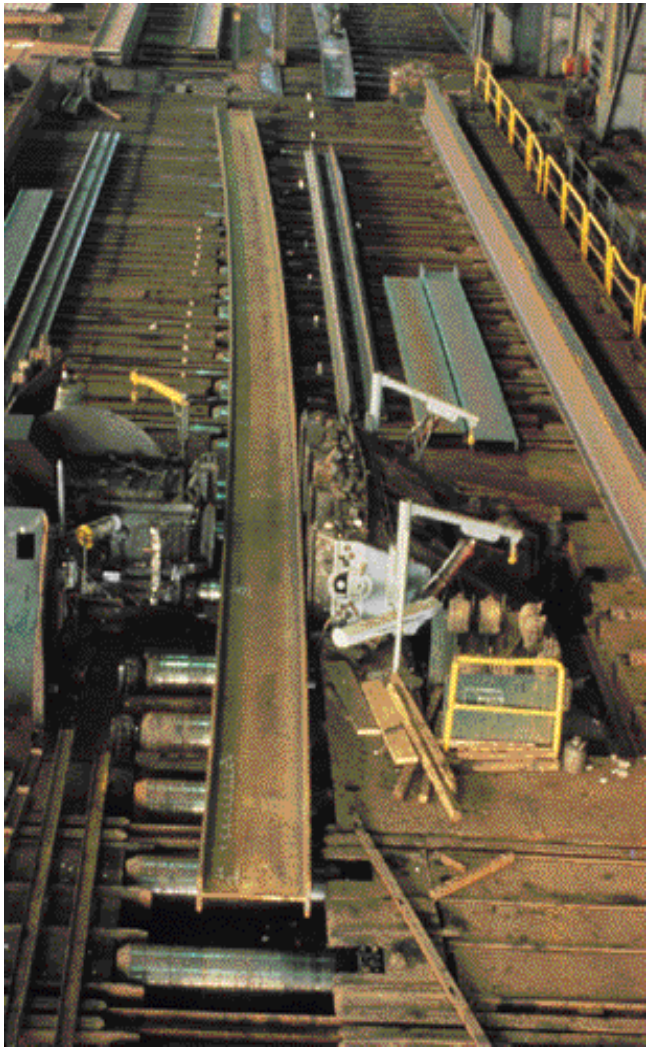
ArcelorMittal

Beam finishing

A range of quality finishing operations is available:

- drilling,
- oxyacetylene cutting,
- cambering and straightening,
- cold sawing,
- bending,
- welding and stud-welding,
- surface treatment:

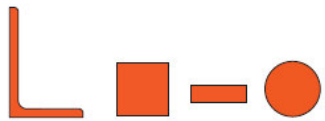
– shot blasting,
– hot metal spraying,
– protective coating,
– hot-dip galvanization.



ArcelorMittal Long Carbon Europe
Product Range

Sections and Merchant Bars

Sections

Beams	Columns	Bearing Piles	Channels	Merchant Bars
				
HE 100 - 1100 HL 920 - 1100 IPE 80 - 750 UB 127x76 - 1016x305 W 6x4 - 44x16 GOST 10B1 -50B2 JIS 150x75 - 900x300 IPN 80 - 600 J 40 - 65 S 3x5.7 - 24x121	HD 260 - 400 UC 152x152 - 356x406 W 4x4 .. 14x16 GOST 20K1 - 40K5 JIS 100x100 - 400x400	HP 200 - 400 UBP203x203-356x368 HP 8x29 - 14x117 JIS200x200-400x400	UPE 80 - 400 PFC 100x50 - 380x100 UPN 50 - 400 U 40 - 65 CH 76x38 - 381x102 C 3x4.1 - 15x50 MC 6x12 - 18x58 GOST 8Y - 20Y	L 20x20 - 300x300 L 100x65 - 200x100 L 2x2 - 12x12 FL 20 - 200 SQ 30x30 - 160x160 R 10 - 110

Sheet Piles

Z-Section	U-Section	Combi-wall HZM/AZ	Flat Sheet Pile AS500
			
AZ 12-770 - AZ 40-700N AZ 12 - AZ 50	AU 14 - AU 26 PU 12 - PU 32 PU 6R - PU 15R GU 6N - GU18-400	HZ 880M HZ 1080M HZ 1180M	AS500 9.5-12.7 I.S. max = 6000 kN/m

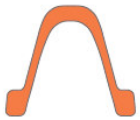
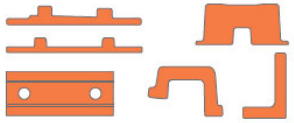
ArcelorMittal Long Carbon Europe
Product Range

ArcelorMittal

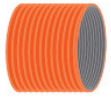
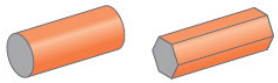
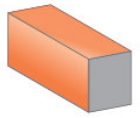
Rails

Transport Rails and Rails for Crossovers			Crane Rails	
Vignole Type	Groove Type & U-Type	Rails for Crossovers	Normal Sizes	Special Sizes
				
EN 13674-1, EN 13674-2, DBS 918 254-1, AS 1085. 1, BS 11, GOST P51685, AREMA, NF A 45-310	EN 14811, PT-W-411/1a/98	ILK4-4510/02/08, EN 13674-2, EN 13674-3	DIN 536, ASTM, MRS, AS, CR	GCRD, GCR

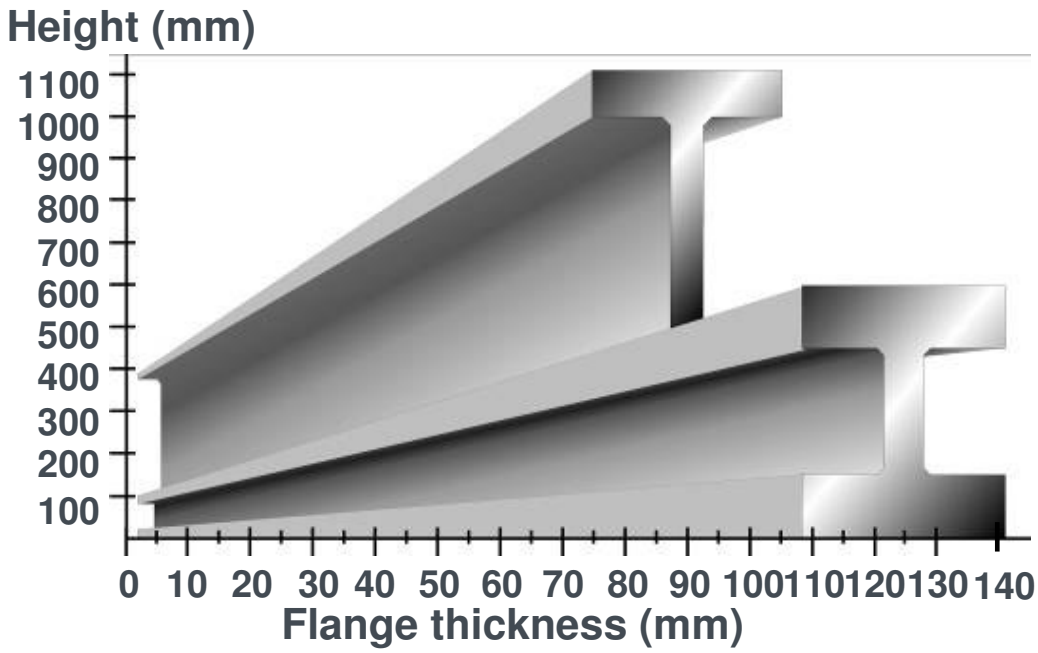
Special Sections

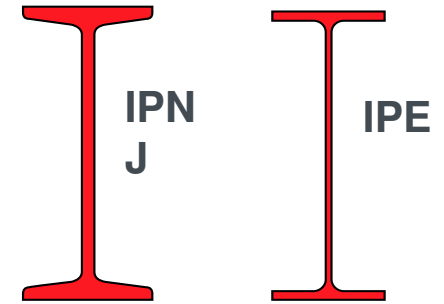
	Mining			
Track Shoes	Support Sections (K&TH)	Mining Accessories	Rail Accessories	Other Special Sections
				
TS1-31 - TS1-73, TS2-49 - TS2-104, TS3-27 - TS3-60, MR 0 - MR 6	TH 16.5 - TH 44, P 28, SV 29, K 21 - K 44, V 25 - V 36	GTHN 29, J21 - J36, A 36 CLAMP, E 74 V.S	Ribbed baseplates, Tie plates (standard-inclined), Tie plates type PANDROL, Metro guide bar 150 X 100 X 25 Clamps, Fishplates, T Rails, Frog profile	Special car building sections, Hot rolled cathode collector bars

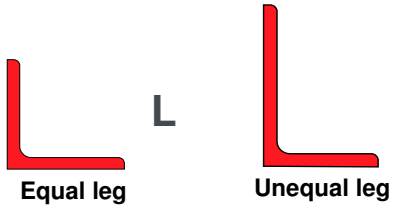
Bars and Rods

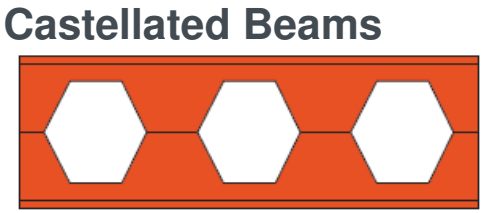
Rebars	Wire Rod	SBQ	Semis
			
Bars : ø 8 - 63.5 mm, Coils : ø 6 - 20 mm	ø 5.5 - 52 mm Mesh, Low and High carbon steels, Cold heading, Welding, Free-cutting, Spring, Steel cord, Bearing	Round : ø 15 - 170 mm Hexagon : ø 27 - 52.5 mm	Rolled billets : ø 120 | 42-60 - 200x200 Continuously cast billets : ø 160 and 210 | 105x105 - 220x130 Blooms : 190x220 - 280x400

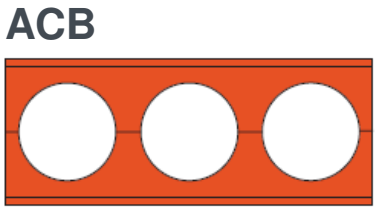
ArcelorMittal Long Carbon Europe:
Overview of Product Range

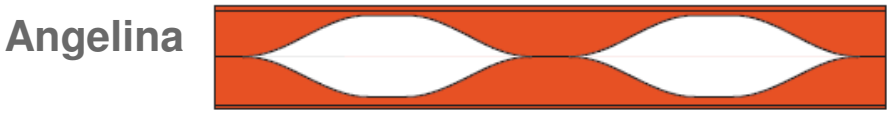












Sections available in accordance with European, Russian, American, British and Japanese standards

INNOVATIONS
in Sections and Merchant Bars

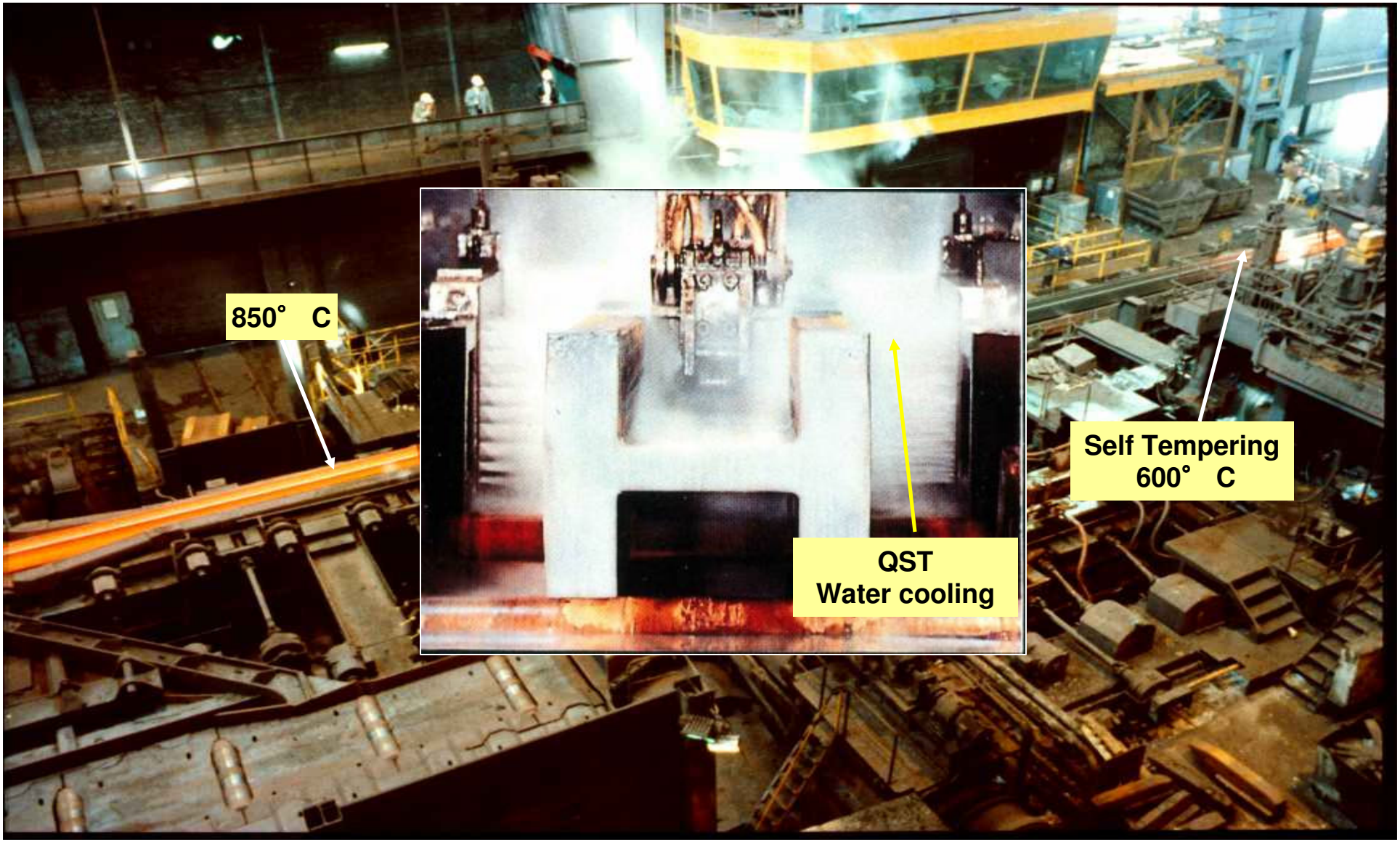
NEW Histar 355 and 460 with CE-mark
NEW Heavier Sections
NEW Angelina / cell beams
NEW Larger Angle Sizes
NEW Composite slim-floors
NEW Precobeam bridge girders
NEW Arcorox: S355J0W in sections
NEW 16Mo3 in sections
NEW EPD for sections and merchant bars
NEW Carbon footprint calculator: AMECO

ArcelorMittal

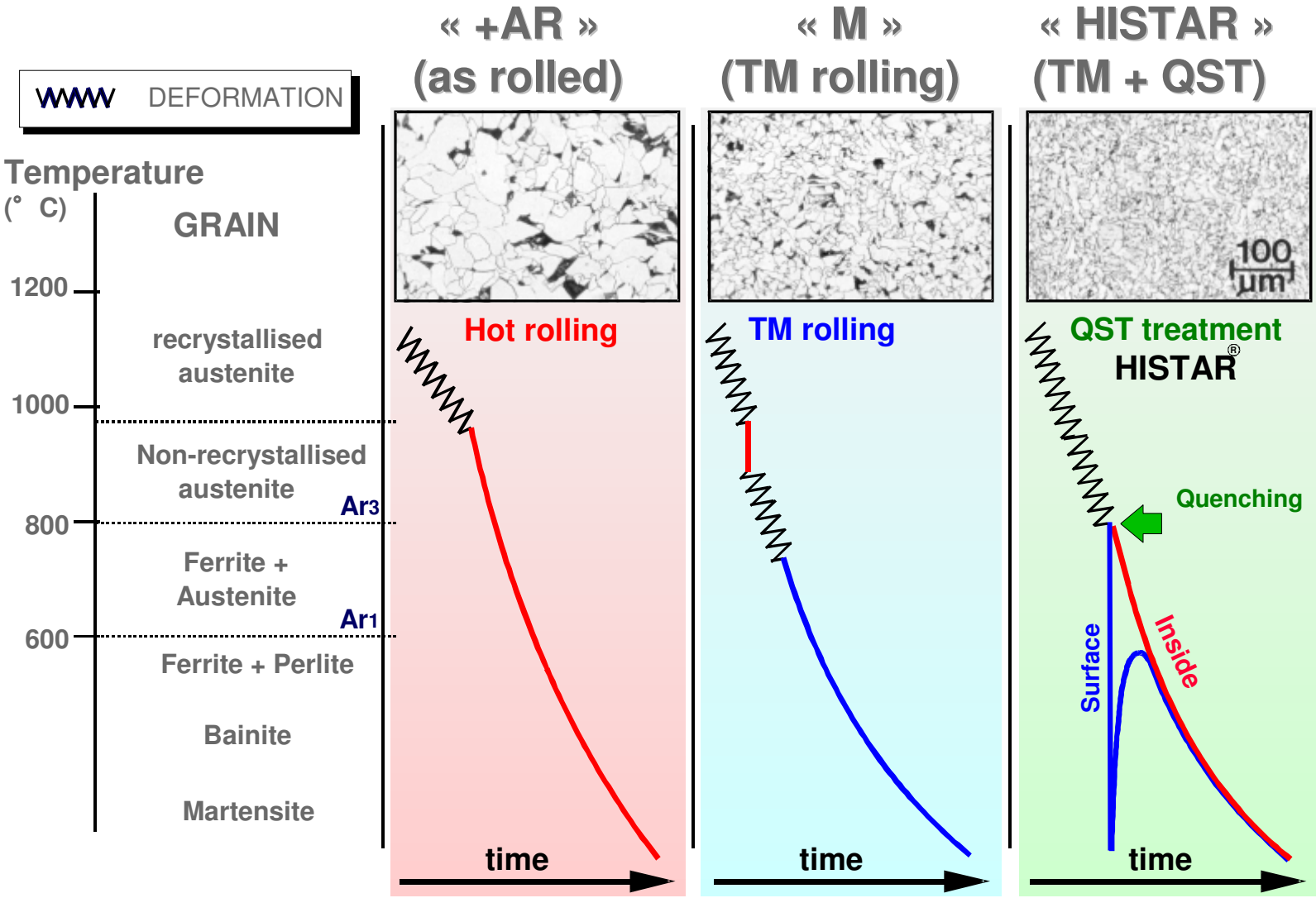
HISTAR

HIgh STrength Steels from ARcelorMittal

Quenching and Self-Tempering (QST)



Comparison of rolling processes



Comparison of rolling processes

Chemical composition of S355 K2 / S355 M / HISTAR355

(Minimum value of impact energy: 40J @ -20° C)

	« +M » (TM rolling)	« M » (TM rolling)	« HISTAR » (TM + QST)
80 mm < t ≤ 100mm	**S355 K2** EN 10025-2 [%]	**S355 M** EN 10025-4 [%]	**HISTAR355** ETA-10/0156 [%]
R_{eH} [MPa]	315	325	355
C	< 0,22	< 0,16	< 0,12
Si	< 0,55	< 0,50	< 0,50
Mn	< 1,60	< 1,60	< 1,60
P	< 0,025	< 0,035	< 0,035
S	< 0,025	< 0,03	< 0,03
Nb	-	< 0,05	< 0,05
V	-	< 0,10	< 0,10
CEV (1)	< 0,47	< 0,45	< 0,39
Minimum elongation [%] (2)	20	22	22
Grade extra [€/t] (3)	60	60	60

(1) CEV = C + Mn/6 + (Cr + Mo + V)/5 + (Ni+Cu)/15

(2) $L_0 = 5.65 * \sqrt{S_0}$

(3) Price list ArcelorMittal LCE,

ArcelorMittal

Advantages of HISTAR steels

ETA: Full compliance with EN10025-4 (-> CE-mark) and EN1993 / EN1994

ArcelorMittal

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Authorised and notified according to Article 10 of the Council Directive of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products (89/106/EEC)

DIBt

Mitglied der EOTA
Member of EOTA

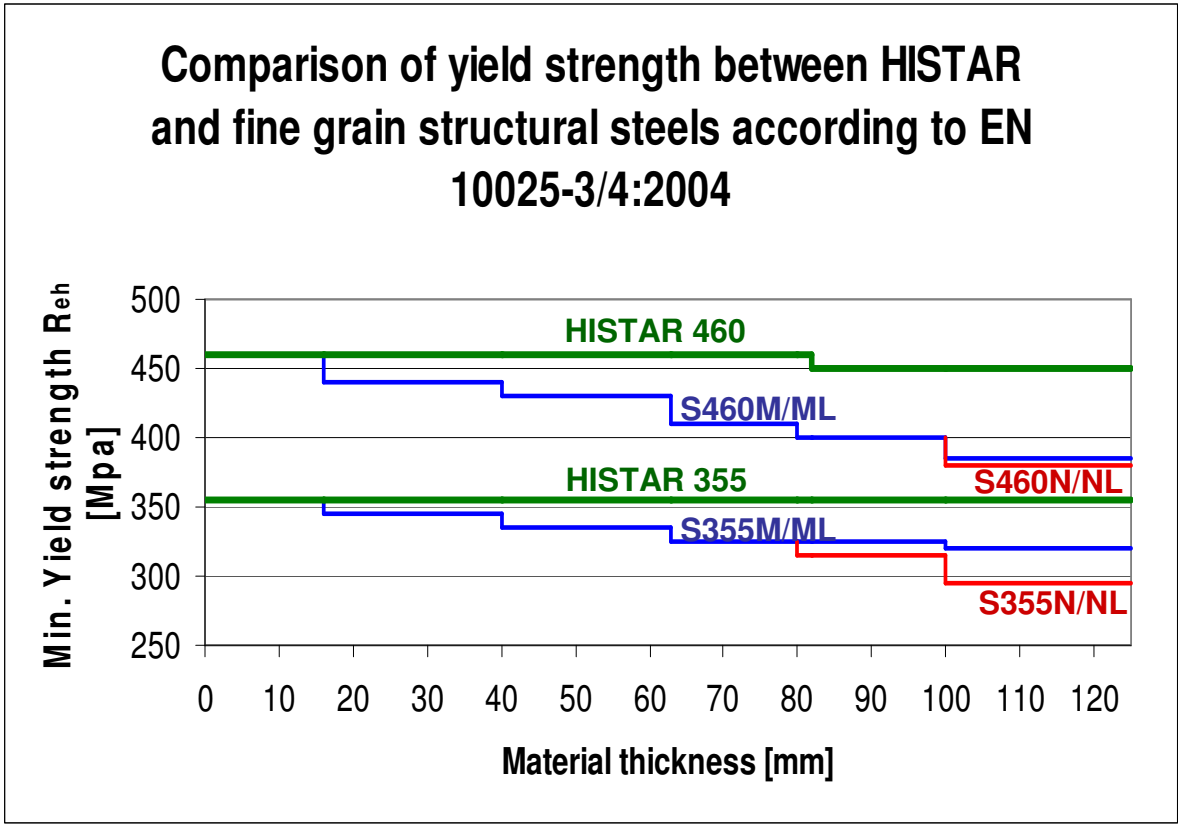
European Technical Approval ETA-10/0156

English translation prepared by DIBt - Original version in German language

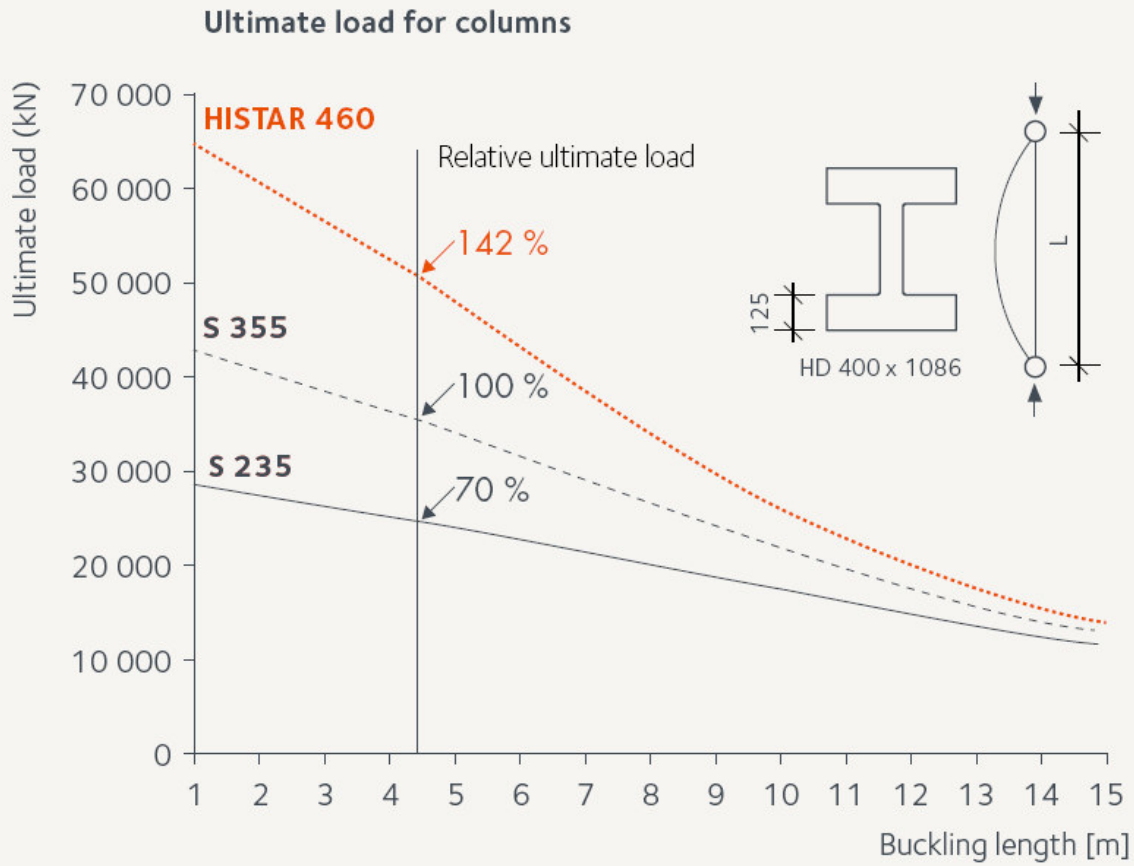
Handelsbezeichnung *Trade name*	Langerzeugnisse aus HISTAR 355 / 355L und HISTAR 460 / 460L *Long products made of HISTAR 355 / 355L and HISTAR 460 / 460L*
Zulassungsinhaber *Holder of approval*	ArcelorMittal Belval&Differdange ArcelorMittal Commercial Sections S.A. 66, rue de Luxembourg 4221 ESCH/ALZETTE LUXEMBURG
Zulassungsgegenstand und Verwendungszweck *Generic type and use of construction product*	Thermomechanisch gewalzte Langerzeugnisse aus Stahl *Thermomechanically hot-rolled long steel products*
Geltungsdauer: vom *Validity: from* bis *to*	7 July 2010 7 July 2015
Herstellwerk *Manufacturing plant*	ArcelorMittal Belval&Differdange ArcelorMittal Commercial Sections S.A. 66, rue de Luxembourg 4221 ESCH/ALZETTE LUXEMBURG

Diese Zulassung umfasst *This Approval contains*	9 Seiten einschließlich 3 Anhänge *9 pages including 3 annexes*

EOTA
Europäische Organisation für Technische Zulassungen
European Organisation for Technical Approvals



Advantages of HISTAR steels



Influence on the slenderness of load carrying capacity of columns in HISTAR and conventional steels

Design according to Eurocode

ArcelorMittal

EN 1993-1-1: 2005 (E)

Table 6.2: Selection of buckling curve for a cross-section

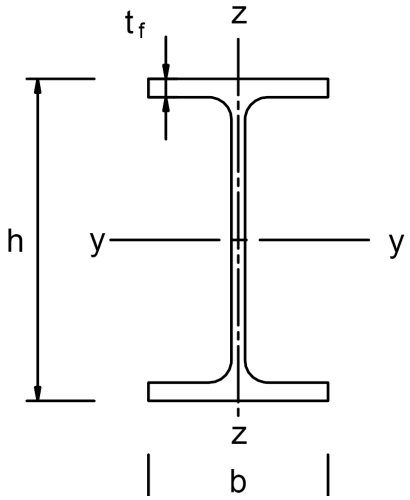
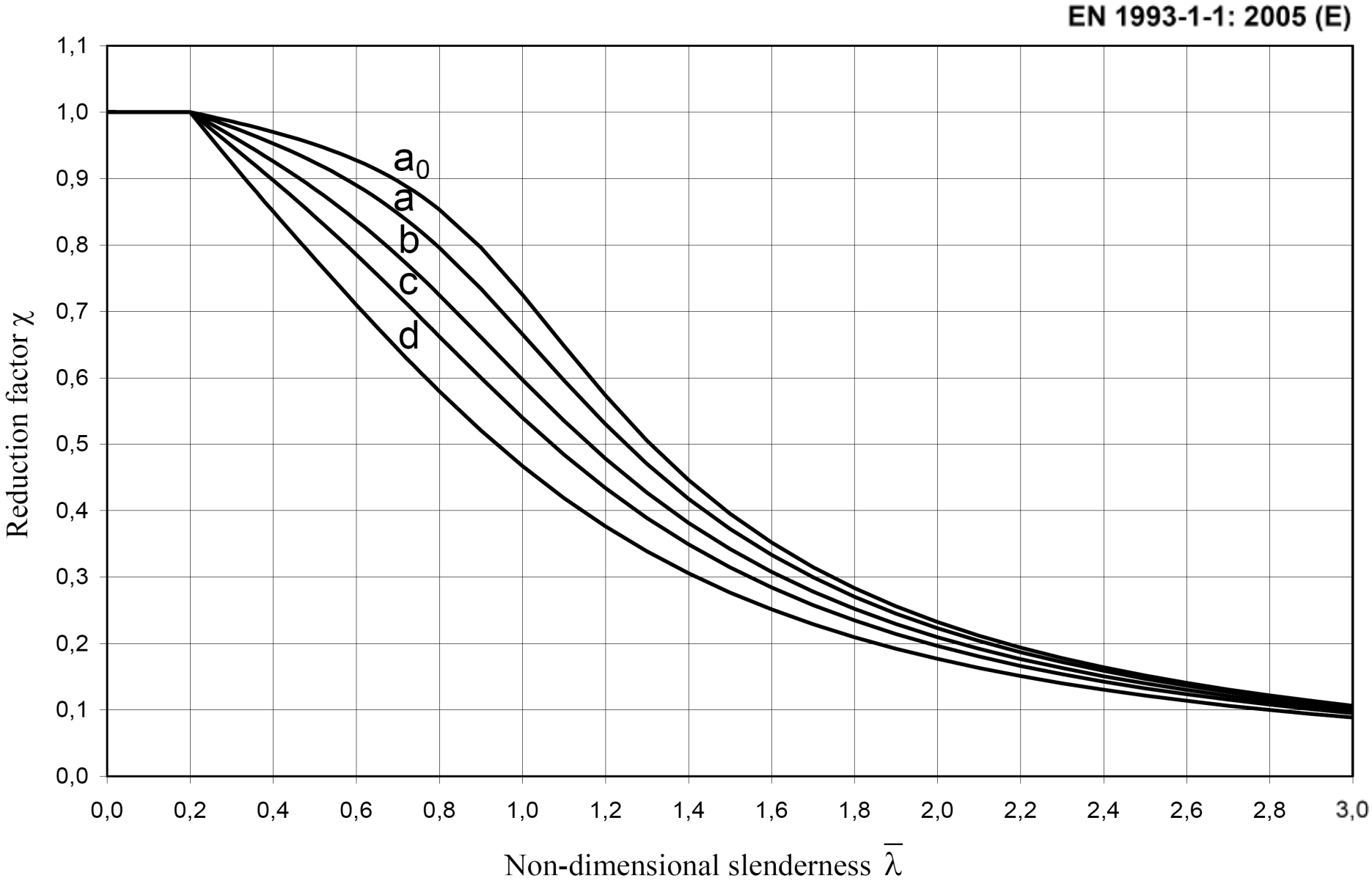
Cross section		Limits		Buckling about axis	Buckling curve: S 235, S 275, S 355, S 420	Buckling curve: S 460
Rolled sections		h/b > 1,2	$t_f \le 40$ mm	y – y	a	a_0
				z – z	b	a_0
			40 mm < $t_f \le 100$	y – y	b	a
				z – z	c	a
		h/b ≤ 1,2	$t_f \le 100$ mm	y – y	b	a
				z – z	c	a
			$t_f > 100$ mm	y – y	d	c
				z – z	d	c
Welded I sections			$t_f \le 40$ mm	y – y	b	b
				z – z	c	c
			$t_f > 40$ mm	y – y	c	c
				z – z	d	d

Table 6.1: Imperfection factors for buckling curves

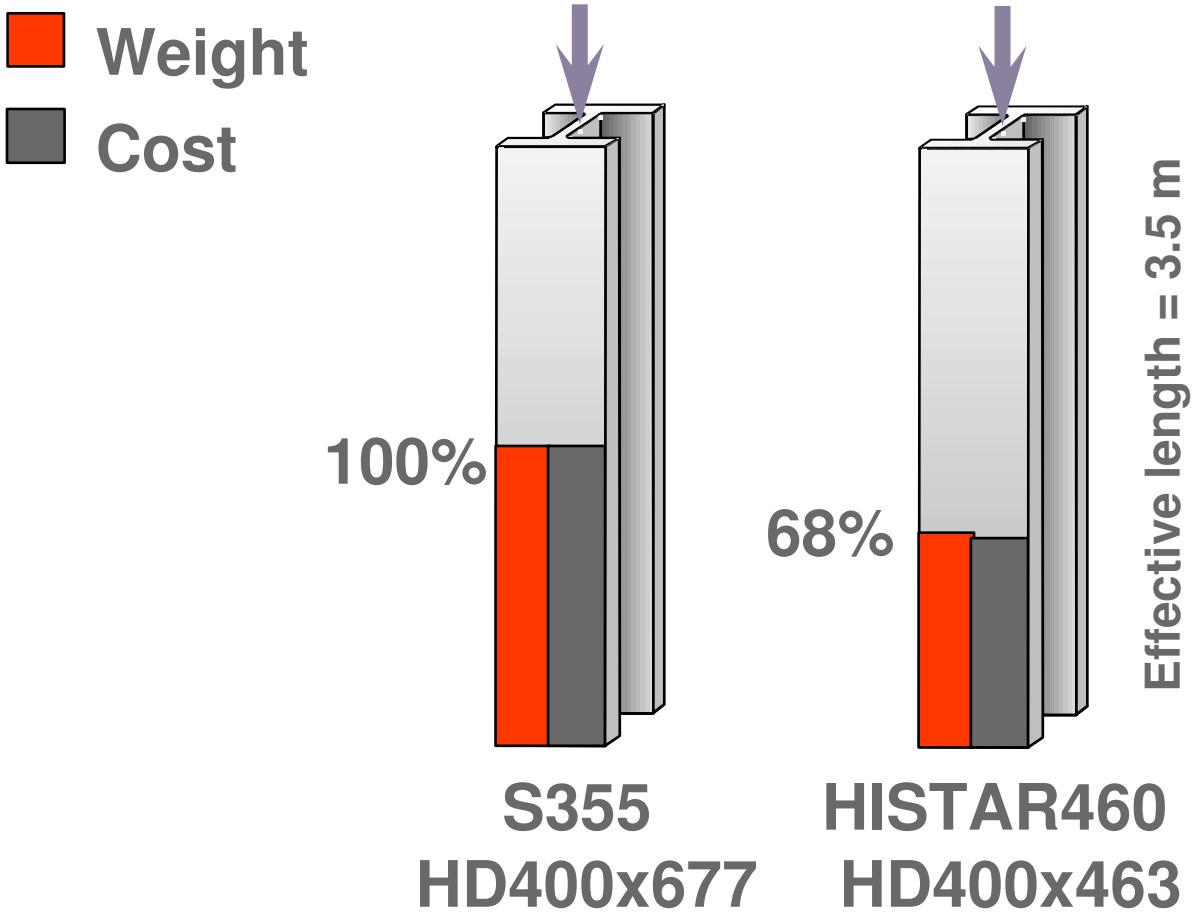
Buckling curve	a_0	a	b	c	d
Imperfection factor α	0,13	0,21	0,34	0,49	0,76

Design according to Eurocode



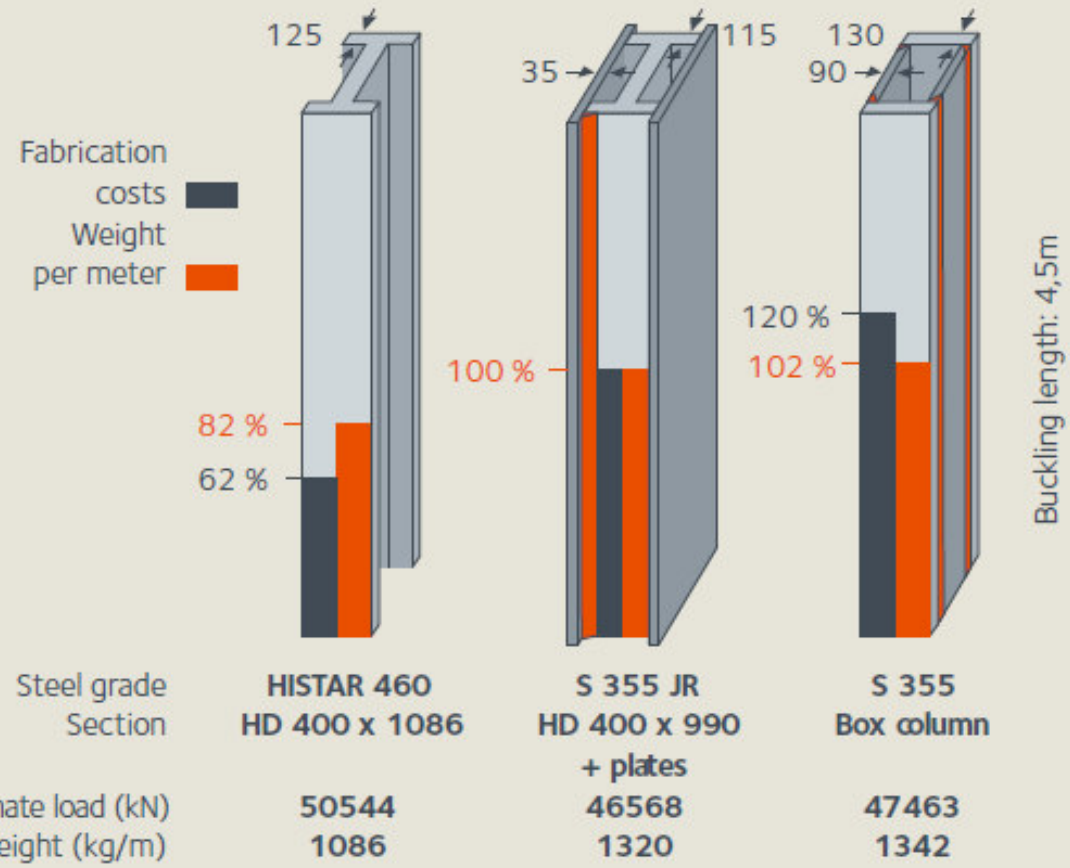
Advantages of HISTAR steels

Weight Savings Using HISTAR460



- 32% Weight and Cost Savings

Advantages of HISTAR steels

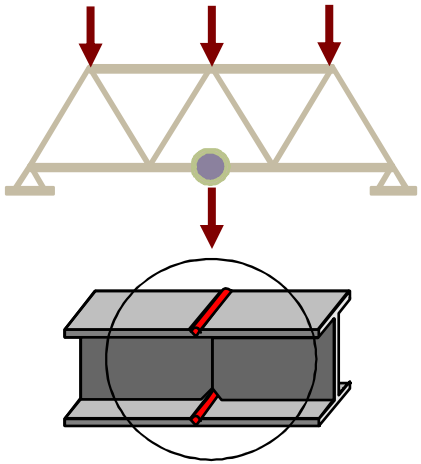


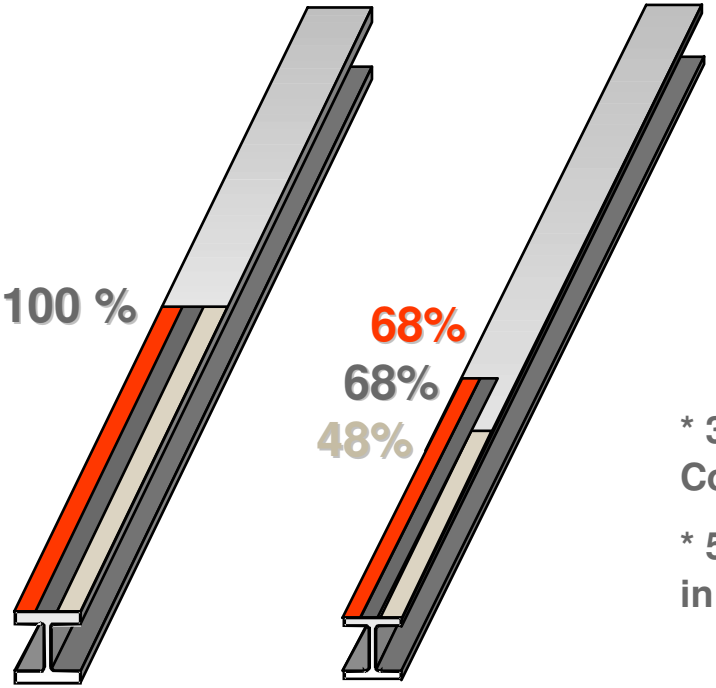
Economical use of HISTAR steels compared to built up sections

Economical advantages of HISTAR steels

Economical Use of HISTAR460 for Tension Members in Trusses

Weight
Cost
Weld volume





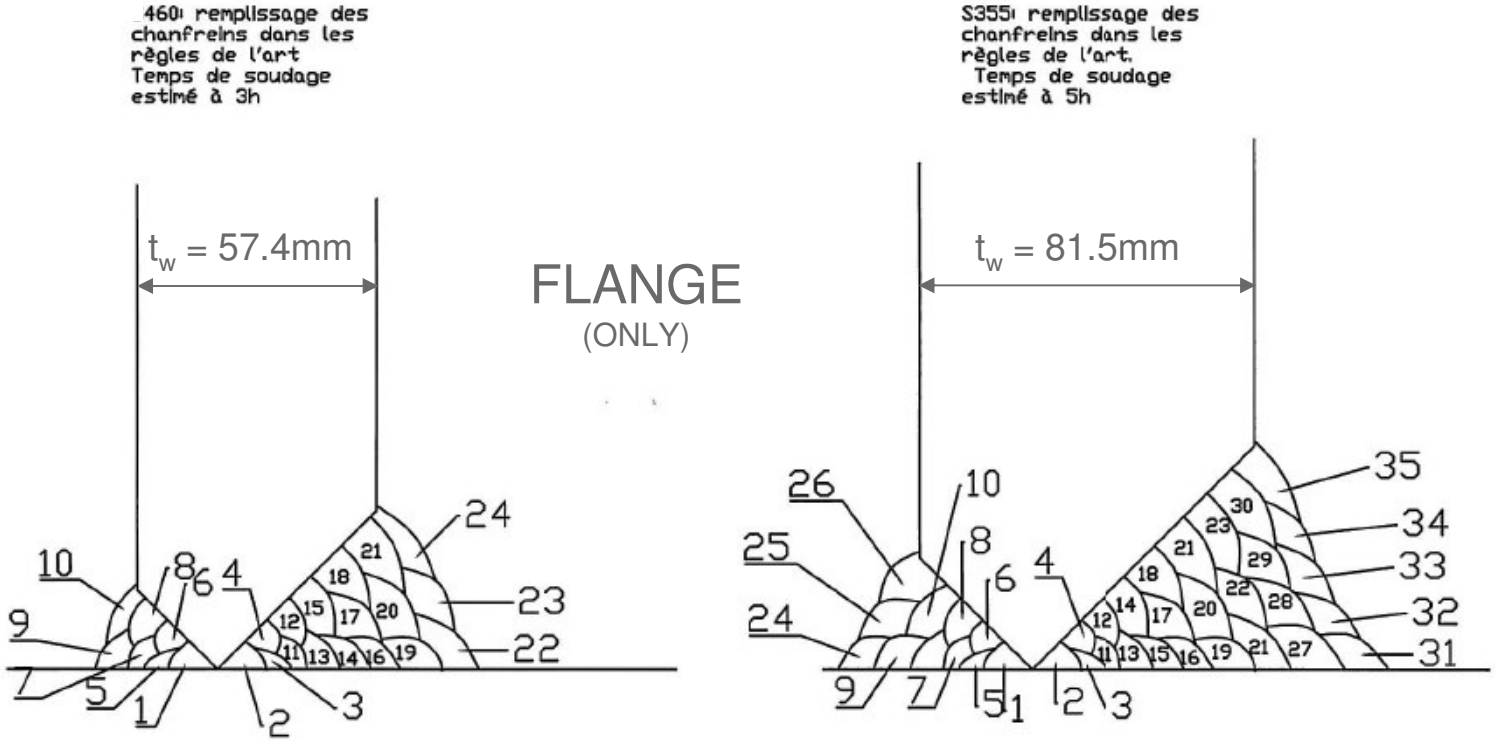
S355
HD400x677

HISTAR460
HD400x463

* 32% Weight & Cost Savings

* 52% Savings in Weld Material

Economical advantages in fabrication

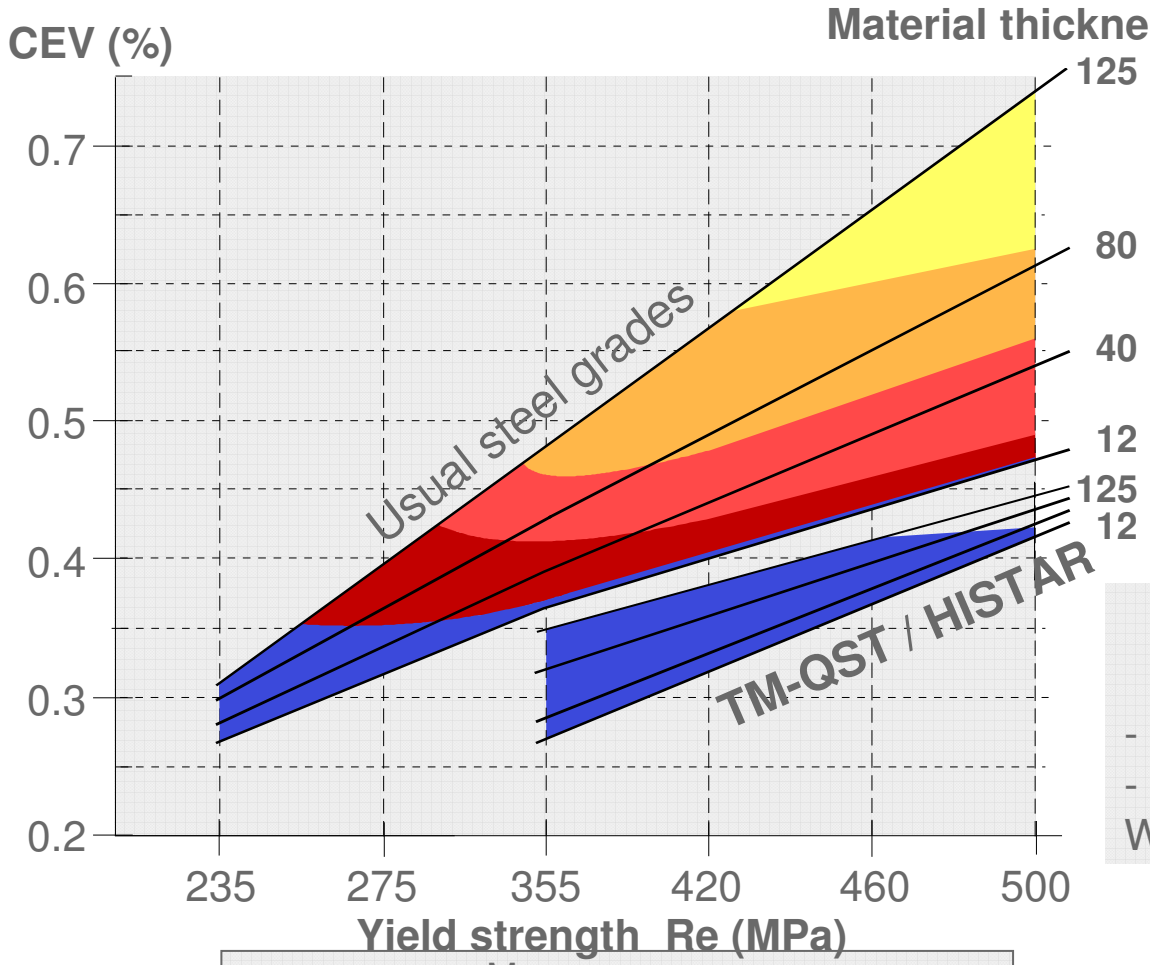


ADVANTAGE OF HISTAR460 -> S355

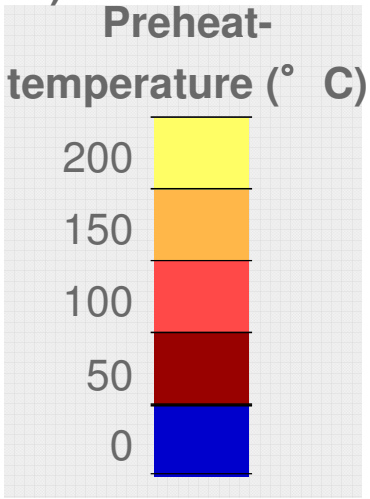
HD 400x463 (HISTAR460) [8h] -> HD 400x677 (S355) [13h]

Economical advantages in fabrication

Weldability and preheat temperatures (EN 1011-2)



$$CE\ (\%) = C + \frac{Mn}{6} + \frac{(Cr + Mo + V)}{5} + \frac{(Cu + Ni)}{15}$$



No preheating for HISTAR steels if:

- Re < 460 MPa: $H_2 \leq$ 10 ml/100g
- Re $\geq$ 460 MPa: $H_2 \leq$ 5 ml/100g

Welding energy: E $\geq$ 10 kJ/cm

Preheating Temperature before Welding

Structural Welding Code AWS D1.1 (Table 3.2)

Thickness	A913 Gr. 450 & Gr. 345	A992/A572 (Gr. 345)
3-20 mm	0° C	0° C
21-38 mm	0° C	10° C
39-65 mm	0° C	65° C
> 66mm	0° C	110° C

Applicable for low hydrogen weld metal (H8)

Welding
of 125 mm thick
shape HD400x1086 kg
(W14x730 lbs)
HISTAR460
(A913/Gr.65)
without preheating

Summary HISTAR460

ArcelorMittal

ArcelorMittal offers HISTAR460 at the same price as S355

- Weight savings (material) 10 to 30% with associated cost savings of 10 to 50%
- Fabrication savings 5 to 30%
- Miscellaneous savings: erection, transportation, foundations, … 0 to 20%

Total Savings = 15% to 35%

HISTAR grades are approved and comply to:

- CE-mark, European Technical Approval ETA-10/0156
- EN 10025-4 (fine grain high strength structural grades)
- EN 10225 (offshore grades)
- ASTM A913 / up to grade 70
- AISC : ASD, LRFD, Seismic Provisions
- UBC, IBC 2000
- FEMA 350 and 353 (Seismic Recommendations)
- Welding Code AWS D1.1
- China: Acceptance by Seismic Committee in Shanghai
- Australia
- Russia

Availability for sections and grades

ArcelorMittal

Poteaux universels britanniques

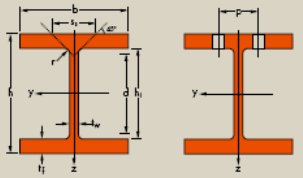
Dimensions: BS 4-1: 2005
Tolérances: EN 10034: 1993
Etat de surface: conforme à EN 10163-3: 2004, classe C, sous-classe 1

British universal columns

Dimensions: BS 4-1: 2005
Tolerances: EN 10034: 1993
Surface condition: according to EN 10163-3: 2004, class C, subclass 1

Britische Universalstützen

Abmessungen: BS 4-1: 2005
Toleranzen: EN 10034: 1993
Oberflächenbeschaffenheit: Gemäß EN 10163-3: 2004, Klasse C, Untergruppe 1



UC

Notations pages 205-209 / Bezeichnungen Seiten 205-209

Désignation Designation Bezeichnung	Dimensions Abmessungen						Dimensions de construction Dimensions for detailing Konstruktionsmaße					Surface Oberfläche	
	G	h	b	t_w	t_f	r	A	h_i	d	Ø	p_{mm}	p_{ms}	A_L	A_G
	kg/m	mm	mm	mm	mm	mm	mm² x10²	mm	mm		mm	mm	m²/m	m²/t
UC 152 x 152 x 23*	23,0	152,4	152,2	5,8	6,8	7,6	29,25	138,8	123,6	M20	72	76	0,889	38,72
UC 152 x 152 x 30*	30,0	157,6	152,9	6,5	9,4	7,6	38,26	138,8	123,6	M20	72	76	0,901	29,99
UC 152 x 152 x 37*	37,0	161,8	154,4	8,0	11,5	7,6	47,11	138,8	123,6	M20	74	78	0,912	24,66
UC 203 x 203 x 46*	46,1	203,2	203,6	7,2	11,0	10,2	58,73	181,2	160,8	M27	90	104	1,189	25,79
UC 203 x 203 x 52*	52,0	206,2	204,3	7,9	12,5	10,2	66,28	181,2	160,8	M27	90	104	1,196	22,99
UC 203 x 203 x 60*	60,0	209,6	205,8	9,4	14,2	10,2	76,37	181,2	160,8	M27	90	106	1,206	20,12
UC 203 x 203 x 71*	71,0	215,8	206,4	10,0	17,3	10,2	90,43	181,2	160,8	M27	92	106	1,220	17,18
UC 203 x 203 x 86*	86,1	222,2	209,1	12,7	20,5	10,2	109,6	181,2	160,8	M27	94	110	1,238	14,38
UC 254 x 254 x 73*	73,1	254,1	254,6	8,6	14,2	12,7	93,10	225,7	200,3	M27	100	152	1,498	20,35
UC 254 x 254 x 89*	88,9	260,3	256,3	10,3	17,3	12,7	113,3	225,7	200,3	M27	102	154	1,503	16,90
UC 254 x 254 x 107*	107,1	266,7	258,8	12,8	20,5	12,7	136,4	225,7	200,3	M27	104	156	1,521	14,21
UC 254 x 254 x 132*	132,0	276,3	261,3	15,3	25,3	12,7	168,1	225,7	200,3	M27	108	160	1,545	11,71
UC 254 x 254 x 167*	167,1	289,1	265,2	19,2	31,7	12,7	212,9	225,7	200,3	M27	112	164	1,579	9,449
UC 305 x 305 x 97*	96,9	307,9	305,3	9,9	15,4	15,2	123,4	277,1	246,7	M27	102	204	1,791	18,48
UC 305 x 305 x 118*	117,9	314,5	307,4	12,0	18,7	15,2	150,2	277,1	246,7	M27	104	206	1,809	15,34
UC 305 x 305 x 137*	136,9	320,5	309,2	13,8	21,7	15,2	174,4	277,1	246,7	M27	106	208	1,824	13,32
UC 305 x 305 x 158*	158,1	327,1	311,2	15,8	25,0	15,2	201,4	277,1	246,7	M27	108	210	1,841	11,65
UC 305 x 305 x 198*	198,1	339,9	314,5	19,1	31,4	15,2	252,4	277,1	246,7	M27	112	212	1,874	9,455
UC 305 x 305 x 240*	240,0	352,5	318,4	23,0	37,7	15,2	305,8	277,1	246,7	M27	116	216	1,907	7,942
UC 305 x 305 x 283*	282,9	365,3	322,2	26,8	44,1	15,2	360,4	277,1	246,7	M27	120	218	1,940	6,856
UC 356 x 368 x 129*	129,0	355,6	368,6	10,4	17,5	15,2	164,3	320,6	290,2	M27	98	262	2,130	16,58
UC 356 x 368 x 153*	152,9	362,0	370,5	12,3	20,7	15,2	194,8	320,6	290,2	M27	100	264	2,155	14,09
UC 356 x 368 x 177*	177,0	368,2	372,6	14,4	23,8	15,2	225,5	320,6	290,2	M27	102	266	2,172	12,27
UC 356 x 368 x 202*	201,9	374,6	374,7	16,5	27,0	15,2	257,2	320,6	290,2	M27	104	268	2,189	10,84
UC 356 x 406 x 235*	235,1	381,0	394,8	18,4	30,2	15,2	299,0	320,6	290,2	M27	106	288	2,278	9,693
UC 356 x 406 x 287*	287,1	393,6	399,0	22,6	36,5	15,2	365,7	320,6	290,2	M27	112	294	2,312	8,053
UC 356 x 406 x 340*	339,9	406,4	403,0	26,6	42,9	15,2	433,0	320,6	290,2	M27	118	292	2,346	6,900
UC 356 x 406 x 393*	393,0	419,0	407,0	30,6	49,2	15,2	500,6	320,6	290,2	M27	122	296	2,379	6,053
UC 356 x 406 x 467*	467,0	436,6	412,2	35,8	58,0	15,2	594,9	320,6	290,2	M27	128	300	2,424	5,191
UC 356 x 406 x 551*	551,0	455,6	418,5	42,1	67,5	15,2	701,9	320,6	290,2	M27	134	306	2,475	4,492
UC 356 x 406 x 634*	633,9	474,6	424,0	47,6	77,0	15,2	807,5	320,6	290,2	M27	140	312	2,524	3,981

Désignation Designation Bezeichnung	Valeurs statiques / Section properties / Statische Kennwerte													Classification EN 1993-1-1: 2005								
	axe fort y-y strong axis y-y starke Achse y-y					axe faible z-z weak axis z-z schwache Achse z-z								Pure bending-y-y				Pure compression				
	G	I_y	$W_{el,y}$	$W_{pl,y}$	i_y	A_{vz}	I_z	$W_{el,z}$	$W_{pl,z}$	i_z	s_z	I_t	I_w	S235	S355	S460	S235	S355	S460	EN 10025-2: 2004	EN 10025-4: 2004	EN 10225: 2001
	kg/m	mm⁴ x10⁴	mm³ x10³	mm³ x10³	mm x10	mm² x10²	mm⁴ x10⁴	mm³ x10³	mm³ x10³	mm x10	mm	mm⁴ x10⁴	mm⁶ x10⁶									
UC 152 x 152 x 23	23,0	1250	164,0	182,0	6,54	9,97	399,9	52,55	80,16	3,70	28,3	4,86	21,18	2	3	3	2	3	3	✓	✓	✓
UC 152 x 152 x 30	30,0	1748	221,8	247,7	6,76	11,56	560,5	73,31	111,6	3,83	34,2	10,67	30,75	1	1	2	1	1	2	✓	✓	✓
UC 152 x 152 x 37	37,0	2210	273,2	308,8	6,85	14,27	706,2	91,48	139,6	3,87	39,9	19,49	39,84	1	1	1	1	1	1	✓	✓	✓
UC 203 x 203 x 46	46,1	4568	449,6	497,4	8,82	16,98	1549	152,1	230,9	5,13	41,2	22,34	142,9	1	2	3	1	2	3	✓	✓	✓
UC 203 x 203 x 52	52,0	5259	510,1	567,4	8,91	18,75	1778	174,0	264,2	5,18	44,9	31,97	166,6	1	1	2	1	1	2	✓	✓	✓
UC 203 x 203 x 60	60,0	6125	584,4	656,1	8,96	22,16	2065	200,6	305,3	5,20	49,8	47,78	196,9	1	1	1	1	1	1	✓	✓	✓
UC 203 x 203 x 71	71,0	7618	706,0	798,8	9,18	24,27	2537	245,9	373,7	5,30	56,6	80,63	249,7	1	1	1	1	1	1	✓	✓	✓
UC 203 x 203 x 86	86,1	9449	850,5	976,7	9,28	30,69	3127	299,1	456,2	5,34	65,7	138,3	317,7	1	1	1	1	1	1	✓	✓	✓
UC 254 x 254 x 73	73,1	11410	897,9	992,1	11,07	25,62	3908	307,0	465,4	6,48	51,9	57,74	562,0	1	2	3	1	2	3	✓	HI	HI
UC 254 x 254 x 89	88,9	14270	1096	1224	11,22	30,81	4857	379,0	575,3	6,55	59,8	102,7	716,6	1	1	1	1	1	1	✓	HI	HI
UC 254 x 254 x 107	107,1	17510	1313	1484	11,33	38,11	5928	458,1	697,0	6,59	68,7	173,9	897,5	1	1	1	1	1	1	✓	HI	HI
UC 254 x 254 x 132	132,0	22530	1631	1860	11,58	46,21	7531	576,4	878,4	6,69	80,8	321,5	1185	1	1	1	1	1	1	✓	HI	HI
UC 254 x 254 x 167	167,1	30000	2075	2424	11,87	58,86	9870	744,3	1137	6,81	97,5	633,8	1632	1	1	1	1	1	1	✓	HI	HI
UC 305 x 305 x 97	96,9	22250	1445	1592	13,42	35,62	7308	478,7	726,1	7,69	58,5	91,80	1562	1	3	3	1	3	3	✓	HI	HI
UC 305 x 305 x 118	117,9	27670	1760	1958	13,57	43,16	9059	589,4	895,4	7,77	67,2	162,3	1980	1	1	2	1	1	2	✓	HI	HI
UC 305 x 305 x 137	136,9	32810	2048	2297	13,72	49,81	10700	692,1	1053	7,83	75,0	251,1	2386	1	1	1	1	1	1	✓	HI	HI
UC 305 x 305 x 158	158,1	38750	2369	2680	13,87	57,32	12570	807,8	1230	7,90	83,6	381,6	2865	1	1	1	1	1	1	✓	HI	HI
UC 305 x 305 x 198	198,1	50000	2995	3440	14,20	70,45	16300	1037	1581	8,04	99,7	741,2	3873	1	1	1	1	1	1	✓	HI	HI
UC 305 x 305 x 240	240,0	64200	3643	4247	14,49	85,85	20310	1276	1951	8,15	116,2	1287	5025	1	1	1	1	1	1	✓	HI	HI
UC 305 x 305 x 283	282,9	78870	4318	5105	14,79	101,5	24630	1529	2342	8,27	132,8	2062	6341	1	1	1	1	1	1	✓	HI	
UC 356 x 368 x 129	129,0	40250	2264	2479	15,65	42,47	14610	792,8	1190	9,43	63,2	152,7	4174	2	3	3	2	3	3	✓	HI	HI
UC 356 x 368 x 153	152,9	48590	2684	2965	15,79	50,26	17550	947,5	1435	9,49	71,5	251,2	5110	1	2	3	1	2	3	✓	HI	HI
UC 356 x 368 x 177	177,0	57120	3103	3455	15,91	58,81	20530	1102	1671	9,54	79,8	383,5	6084	1	1	2	1	1	2	✓	HI	HI
UC 356 x 368 x 202	201,9	66260	3538	3972	16,05	67,55	23690	1264	1920	9,60	88,3	561,4	7151	1	1	1	1	1	1	✓	HI	HI
UC 356 x 406 x 235	235,1	79080	4151	4687	16,25	75,71	30990	1570	2383	10,20	96,6	817,7	9529	1	1	1	1	1	1	✓	HI	HI
UC 356 x 406 x 287	287,1	99880	5075	5812	16,53	93,78	38680	1939	2949	10,28	113,4	1455	12320	1	1	1	1	1	1	✓	HI	HI
UC 356 x 406 x 340	339,9	122500	6031	6999	16,82	111,7	46850	2325	3544	10,40	130,2	2370	15460	1	1	1	1	1	1	✓	HI	
UC 356 x 406 x 393	393,0	146600	6998	8222	17,11	130,1	55370	2721	4154	10,52	146,8	3592	18900	1	1	1	1	1	1	✓	HI	
UC 356 x 406 x 467	467,0	183000	8383	10000	17,54	155,2	67830	3291	5034	10,68	169,6	5896	24260	1	1	1	1	1	1	✓	HI	
UC 356 x 406 x 551	551,0	226900	9962	12080	17,98	185,9	82670	3951	6058	10,85	194,9	9402	31050	1	1	1	1	1	1	✓	HI	
UC 356 x 406 x 634	633,9	274800	11580	14240	18,45	214,6	98130	4629	7108	11,02	219,4	13990	38660	1	1	1	1	1	1	✓	HI	

HI = HISTAR®

* Commande minimale: 40t par profilé et qualité ou suivant accord.
Tonnage minimum et conditions de livraison nécessitant un accord préalable.

* Minimum order: 40t per section and grade or upon agreement.
Minimum tonnage and delivery conditions upon agreement.

* Mindestbestellmenge: 40t pro Profil und Güte oder nach Vereinbarung.
Mindestbestellmenge und Lieferbedingungen nach Vereinbarung.

* $W_{pl,y}$: pour un dimensionnement plastique, la section doit appartenir à la classe 1 ou 2 suivant la capacité de rotation requise. Voir page 209.
* $W_{pl,y}$: for plastic design, the shape must belong to class 1 or 2 according to the required rotation capacity. See page 209.
* $W_{pl,y}$: bei einer plastischen Berechnung muss das Profil je nach erforderlicher Rotationskapazität der Klasse 1 oder 2 angehören. Siehe Seite 209.

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Summary steel grades

Recommended steel specification for sections – Best Practice

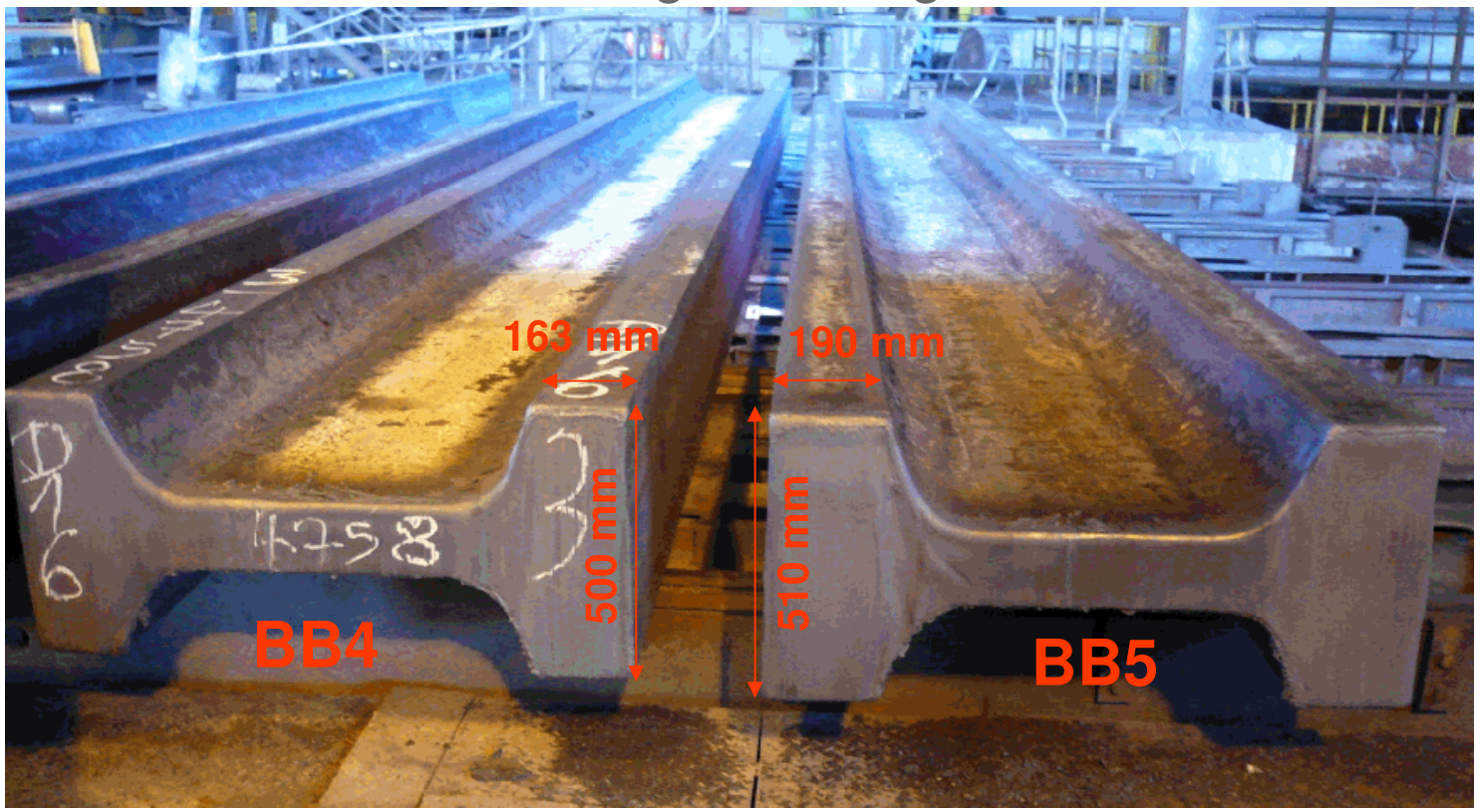
Member type	Steel grade	Member weight	Section
Beam	S275J0+M (EN10025-2) or equivalent ASTM grades	< 100 kg/m	< IPE 500 < HE 200 or equivalent sizes (ASTM, BS…)
Beam or column	S355J2+M (EN10025-2) or S355M (EN10025-4) or equivalent ASTM grades	50 kg/m – 150 kg/m	IPE 330 – IPE 600 HE 160 – HE 320 or equivalent sizes (ASTM, BS…)
Beam or column	HISTAR355 or HISTAR460 (ETA-10/0156) or equivalent ASTM grades	> 100 kg/m	> IPE 550 > HE 300 > HL 920 > HD 260 or equivalent sizes (ASTM, BS…)

ArcelorMittal

NEW Heavier Sections

New Beam Blank BB5 :

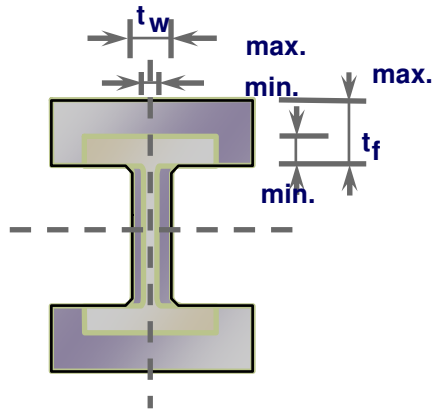
- Increased thickness and height of flange



⇨ the heaviest Beam-blank worldwide

Strengthening the leadership in Heavy Sections and Jumbos

ArcelorMittal



The SUPER JUMBO

		G	h	b	t_w	t_f
		kg/m	mm	mm	mm	mm
W 14 x 16 x 808	HD 400 x 1202	1202	580	471	95	130
W 14 x 16 x 873	HD 400 x 1299	1299	600	476	100	140
W 36 x 16.5 x 723	HL 920 x 1077	1077	1061	451	55,0	99,1
W 36 x 16.5 x 802	HL 920 x 1194	1194	1081	457	60,5	109
W 36 x 16.5 x 853	HL 920 x 1269	1269	1093	461	64,0	115,1
W 36 x 16.5 x 925	HL 920 x 1377	1377	1093	473	76,7	115,1
W 40 x 16 x 655	HL 1000 x 976	976	1108	428	50	89,9

ArcelorMittal

Economical aspects of high strength steels

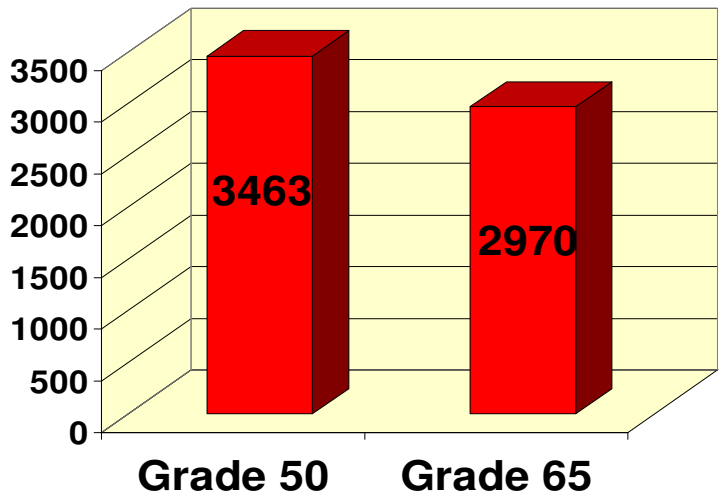
Advantages of HISTAR steels

77 Hudson at Colgate Center, Jersey City

- 32 floors
- Area = 100 000 m²
- Floor height = 4,4 m
- Temporary loads = 15,7 kPa
- Frame: 9 x 9m and 9 x 15m

Columns in ASTM A913 Grade 65 (HISTAR460) instead of Grade 50 (S355)

Total weight of columns



Weight saving: 17 %

Gr. 50 → A913 Gr. 65

W 14 x 730	W 14 x 665
W 14 x 665	W 14 x 605
W 14 x 605	W 14 x 500
W 14 x 550	W 14 x 426
W 14 x 500	W 14 x 398
W 14 x 455	W 14 x 398
W 14 x 426	W 14 x 370
W 14 x 398	W 14 x 342
W 14 x 370	W 14 x 342
W 14 x 342	W 14 x 283
W 14 x 311	W 14 x 257
W 14 x 283	W 14 x 233
W 14 x 257	W 14 x 211
W 14 x 233	W 14 x 193
W 14 x 211	W 14 x 176
W 14 x 193	W 14 x 159
W 14 x 176	W 14 x 145
W 14 x 159	W 14 x 132
W 14 x 145	W 14 x 120
W 14 x 132	W 14 x 109
W 14 x 120	W 14 x 99
W 14 x 109	-

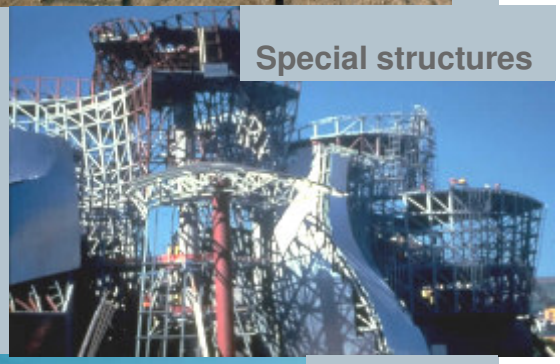
Applications

Typical applications

Skyscrapers

Offshore

Deep foundations



Special structures

Industrial structures

Bridges

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Reference projects: High-rise buildings

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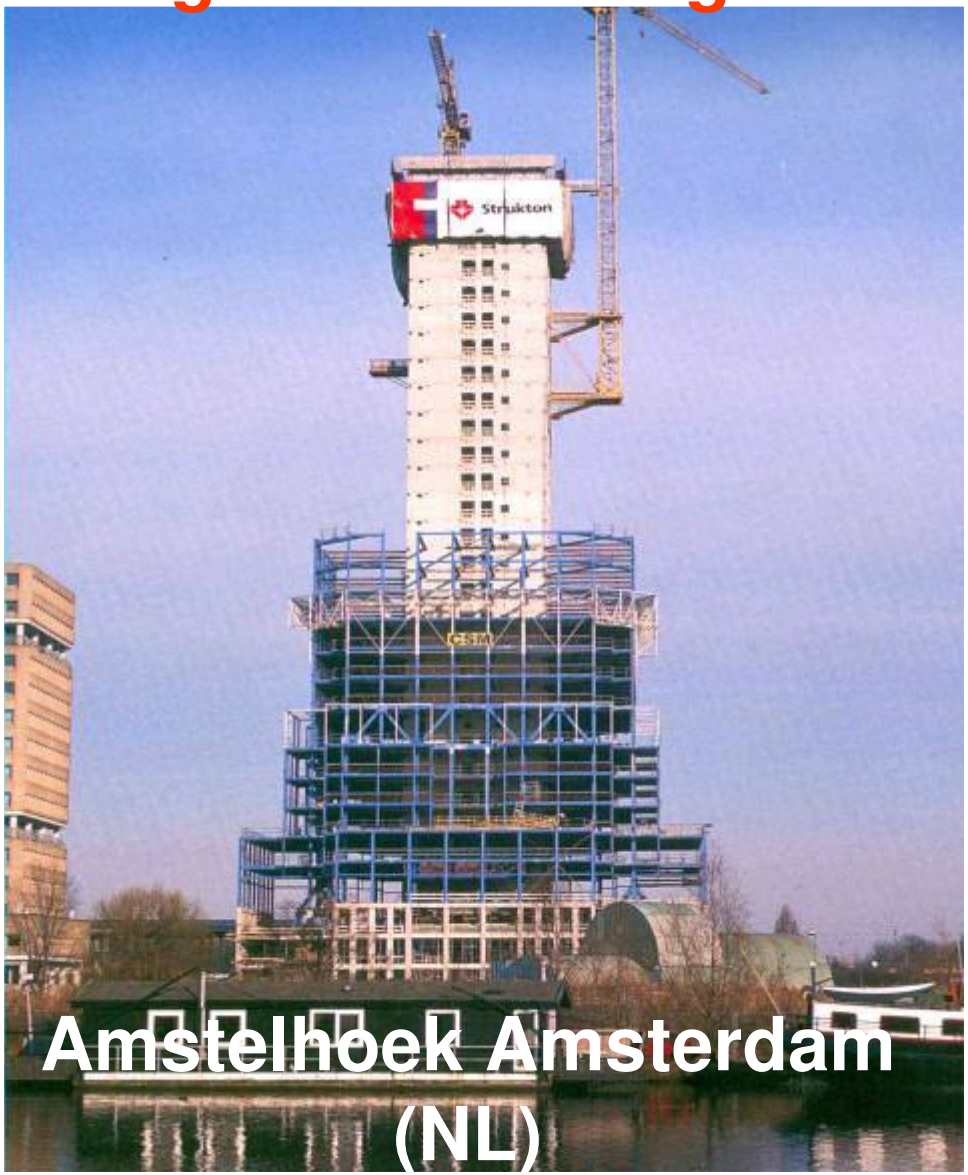
Desio Tower in Milano, ITALY

HD400 columns in Histar 460

Typical applications
High-rise buildings



Amstelhoek Amsterdam (NL)

Freedom Tower - Manhattan

Architect:

David Childs SOM

Structural Engineer:

WSP Cantor Seinuk

1776 ft, 69 Office Floors, 105 Floors total

Concrete Core with a perimeter of steel columns (total of 80,000 tons of steel)

Approx. 8,100 MT Jumbos in A913 Gr.65

Differdange Histar Sections for the Hearst Tower in New York

"Vertical extension" of existing 1928 Art-Deco style building.

Architect: Sir Norman Foster

3000 T Histar Sections

Australia

Building:	Southern Cross (SX)
Location:	Melbourne
Year:	2005
Developer:	Multiplex
Architect:	Woods and Bagot
Designer:	Bonacci
Quality:	HISTAR 460
Size:	HD 400 x 262 – 744
Length:	9 – 14 m
Tonnage:	1155 mt

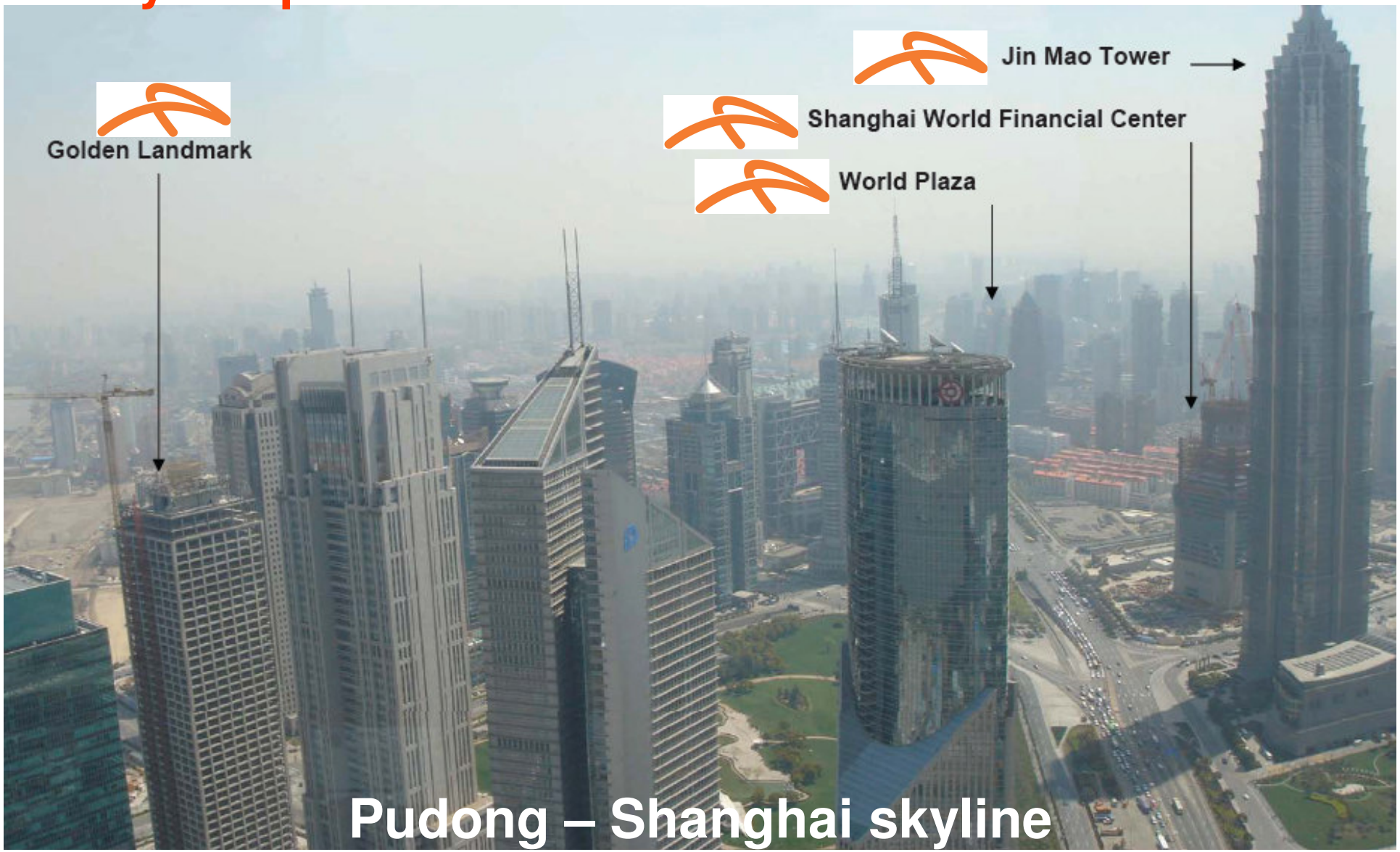
Shanghai World Financial Center

Height 492m – 90 floors

17 000t sections
in HISTAR 355 (ASTM A913 gr50)

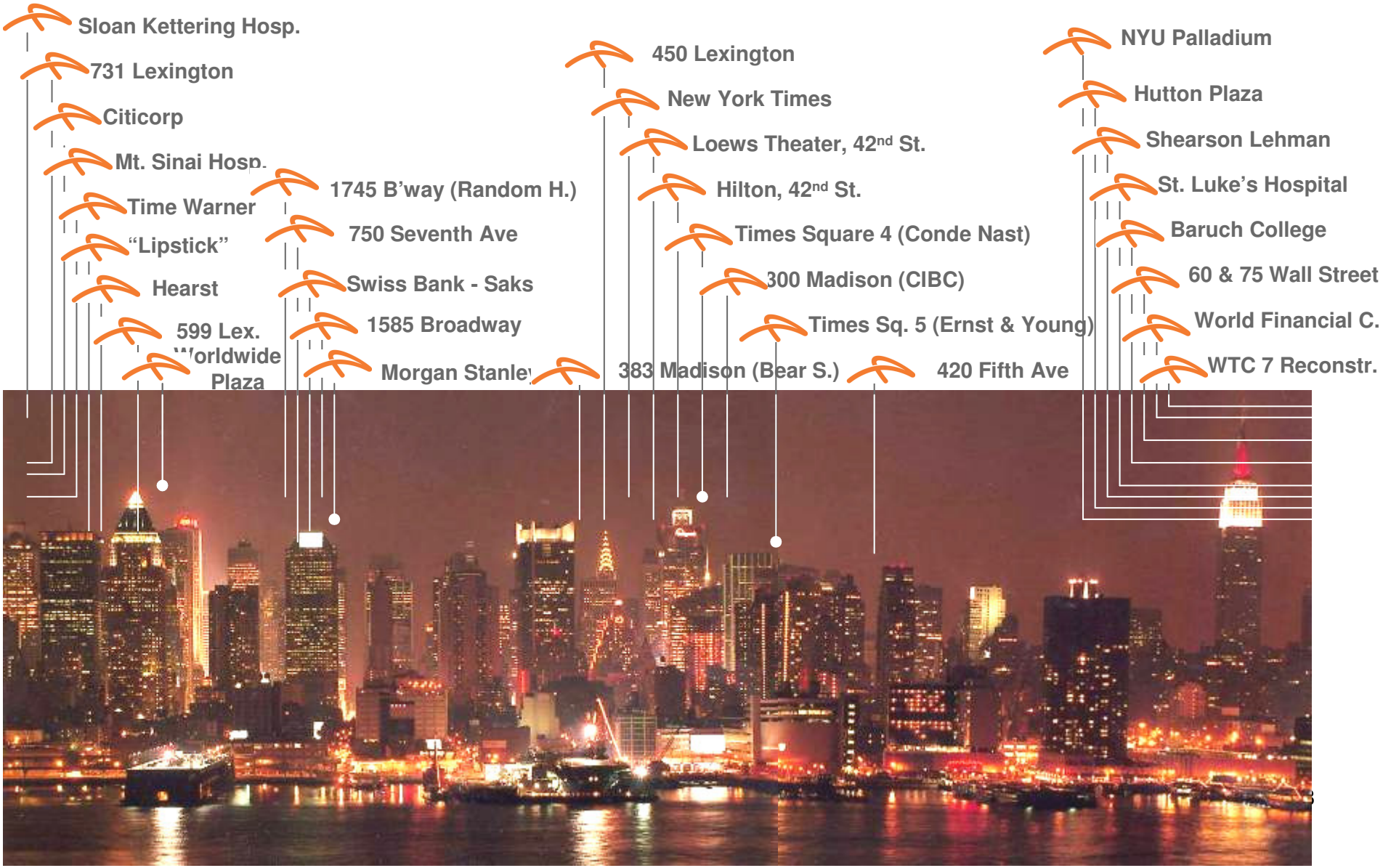
Architect: Kohn Petersen Fox Ass., NY
+ Mori Building Architects
Engineer: Leslie Robertson Ass. NY

Typical applications
Skyscrapers



Pudong – Shanghai skyline

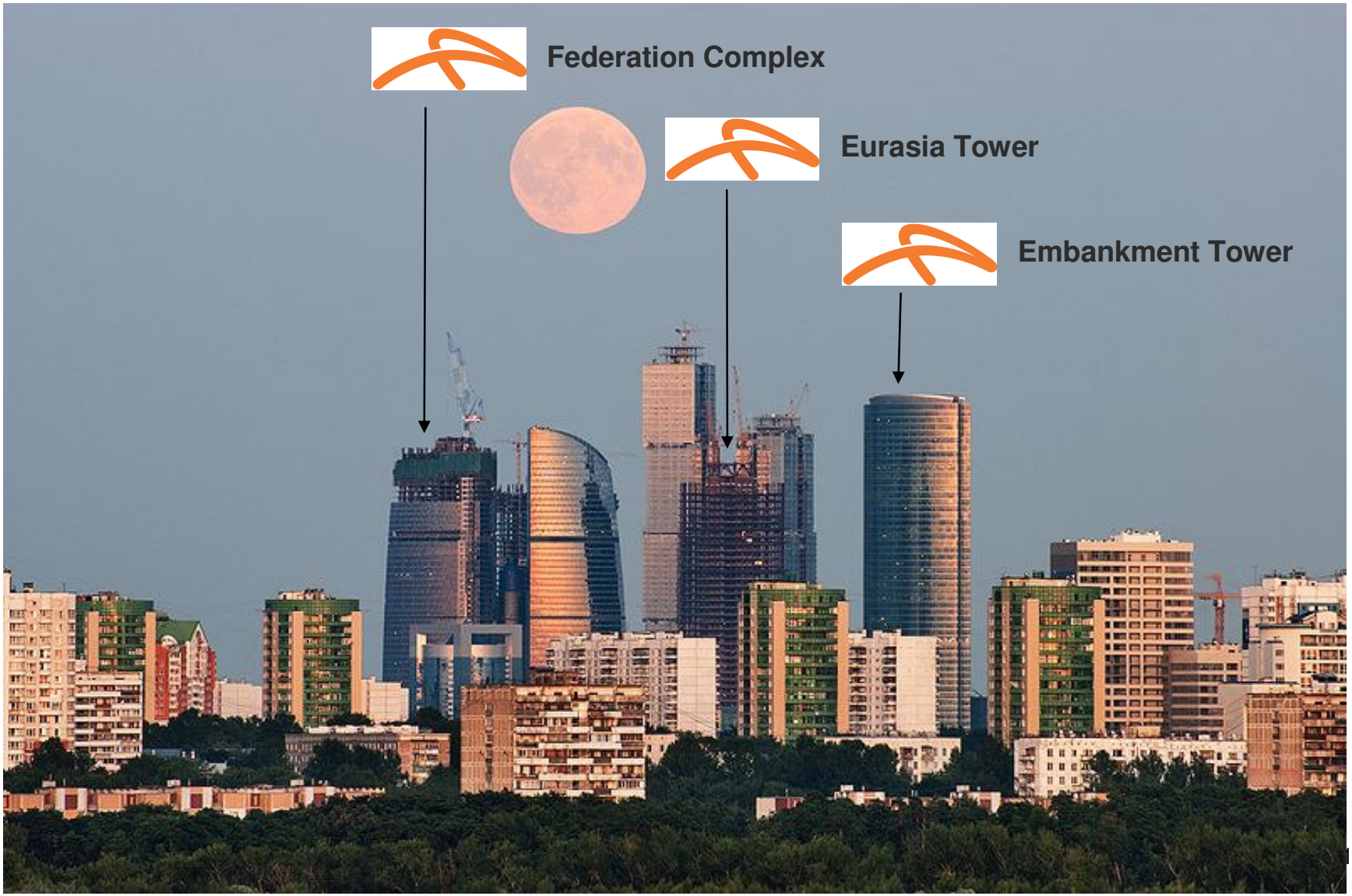
Buildings in New York with Jumbo Shapes from ArcelorMittal



Buildings in Madrid with Jumbo Shapes from ArcelorMittal

Emirates Tower - Dubai

Buildings in Moscow with Jumbo Shapes from ArcelorMittal



ArcelorMittal

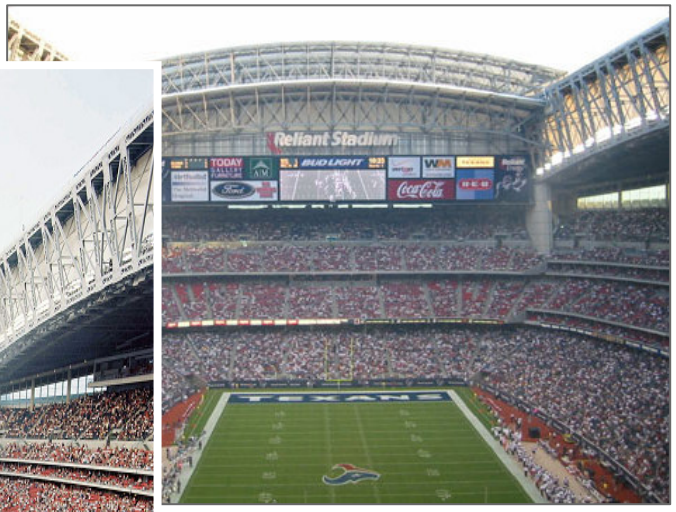
Reference projects: Stadia / Trusses

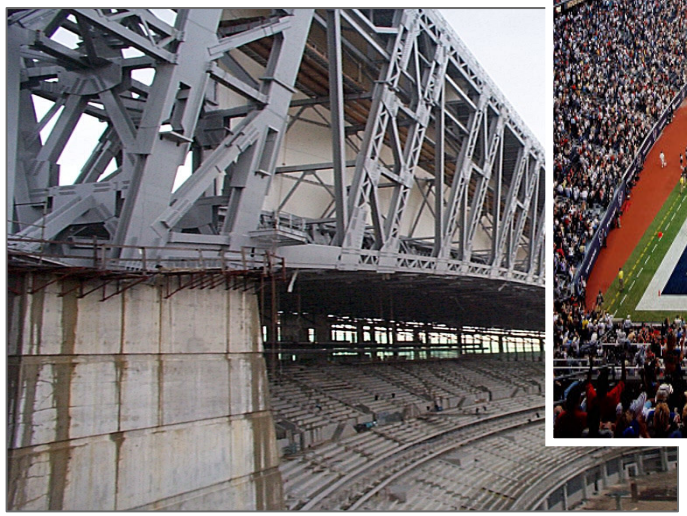
Trusses with Jumbo Shapes from ArcelorMittal

SUPERTRUSS

Reliant Stadium – Houston, TX

Reliant Stadium – Houston, TX





Architect: HOK Sport
Engineer: Walter P Moore
Fabricator: Hirschfeld

Opened in 2002

Retractable Roof

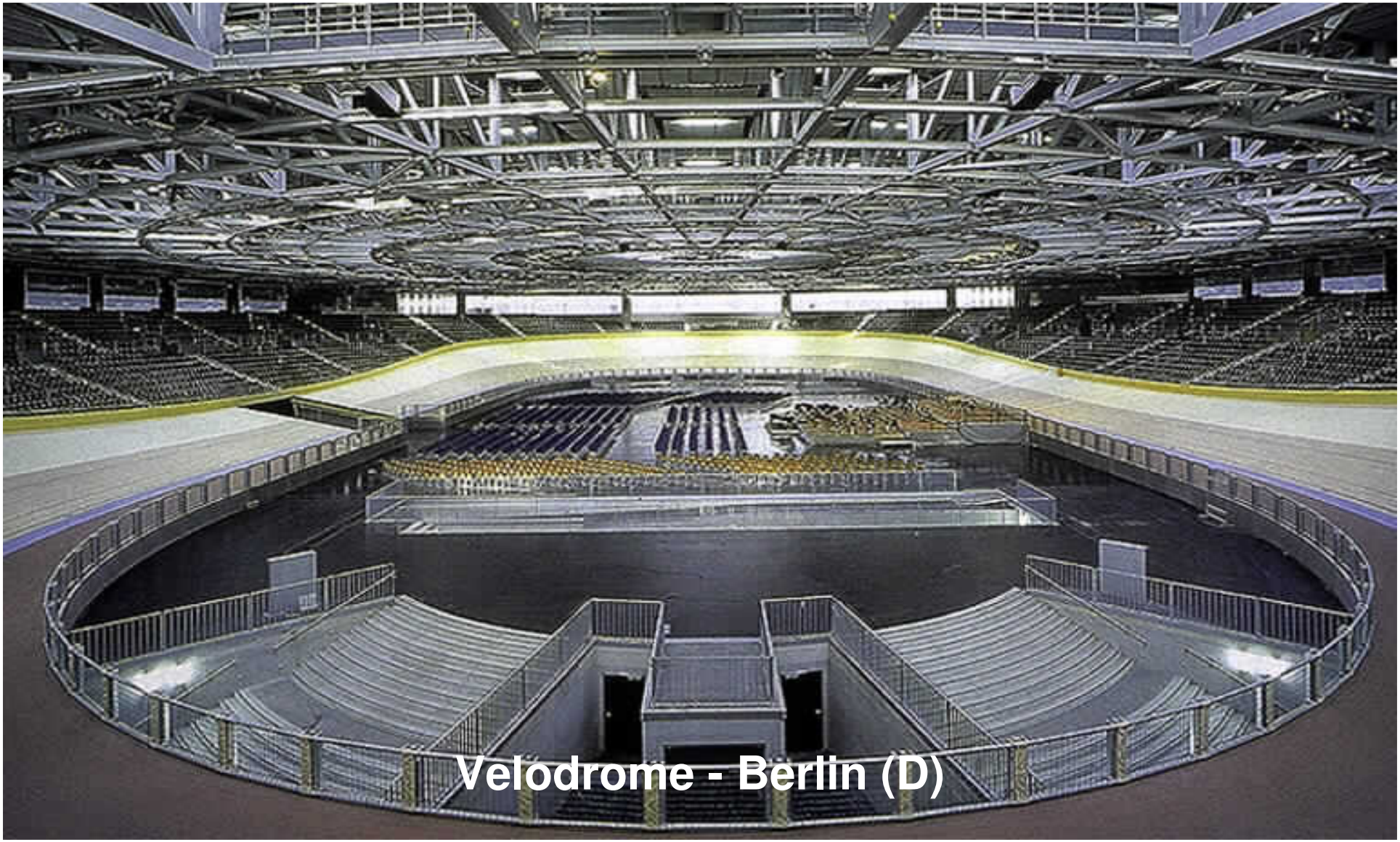
72,000 Seat Capacity

3,300 MT Jumbos

Trusses with Jumbo Shapes from ArcelorMittal

New Engineering Center of Emirates Airlines - Dubai

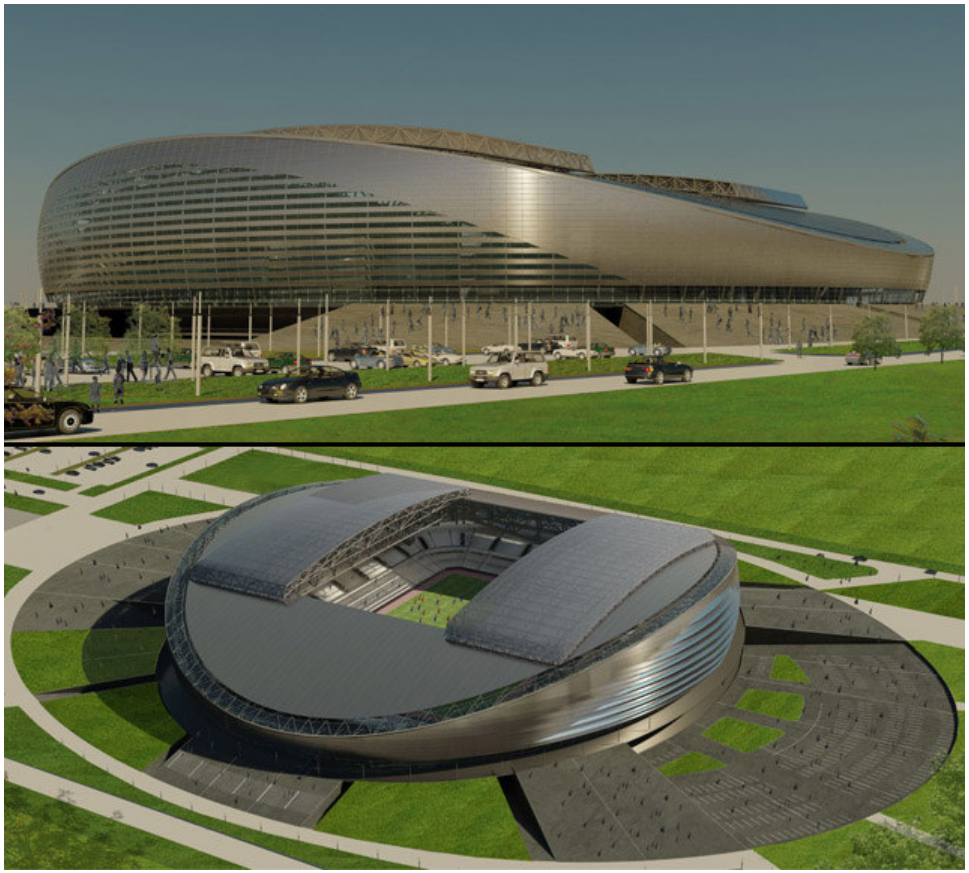
Trusses with Jumbo Shapes from ArcelorMittal

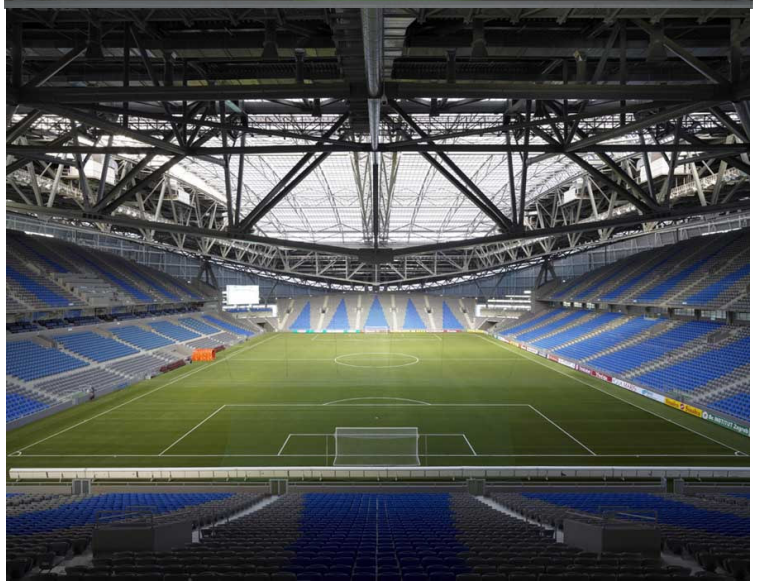


Trusses with Jumbo Shapes from ArcelorMittal

Truss nodes:
Excellent weldability is not only wishful but an absolute must

Astana Arena, Kazakhstan





- total steel tonnage for upper tribune and retractable roof: ~10 000 t
- 2 main trusses with span 124.4m: 950t each in HISTAR460

Trusses with Jumbo Shapes from ArcelorMittal

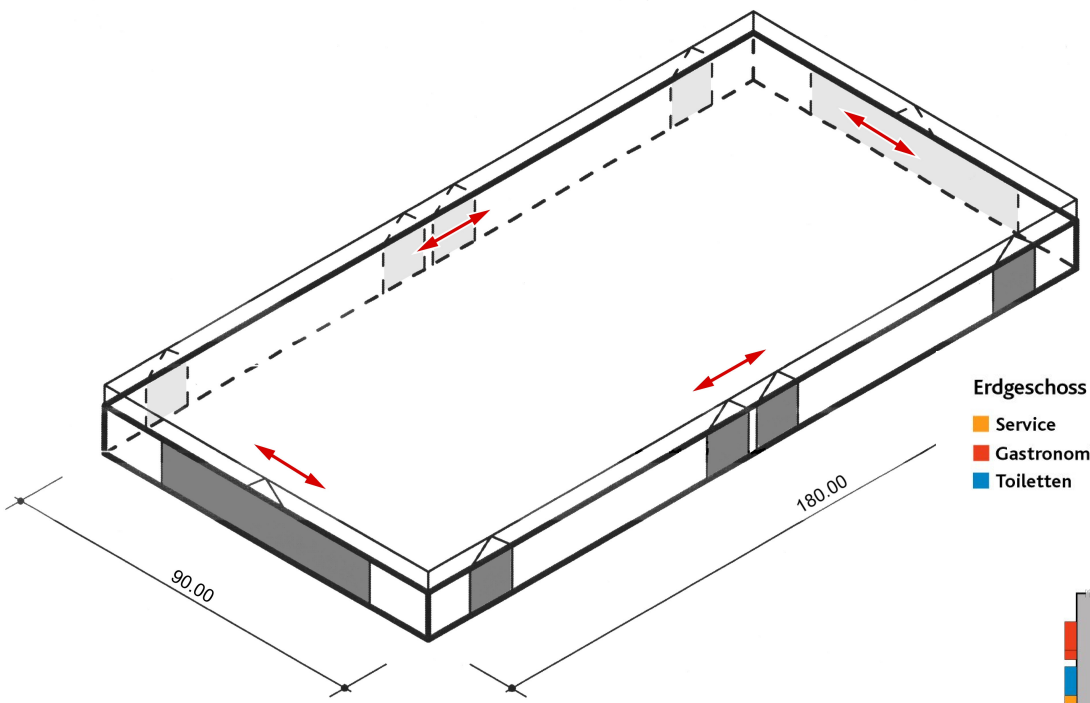
New Engineering Center of Emirates Airlines - Dubai

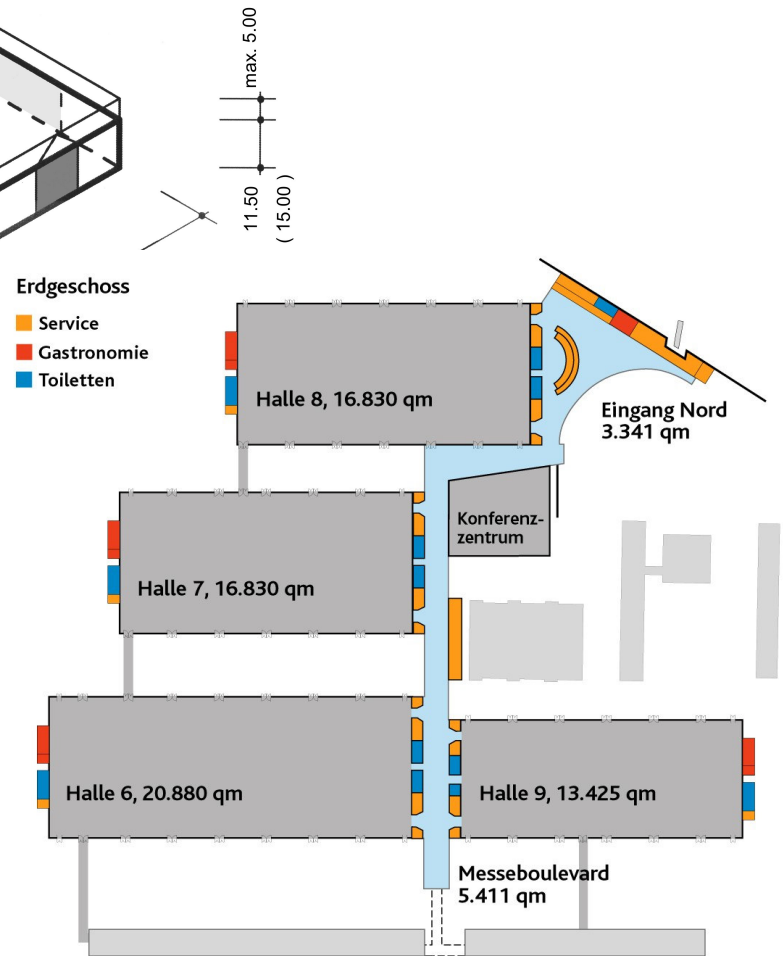
Simple truss connections

Typical applications
Special applications

Vancouver International airport

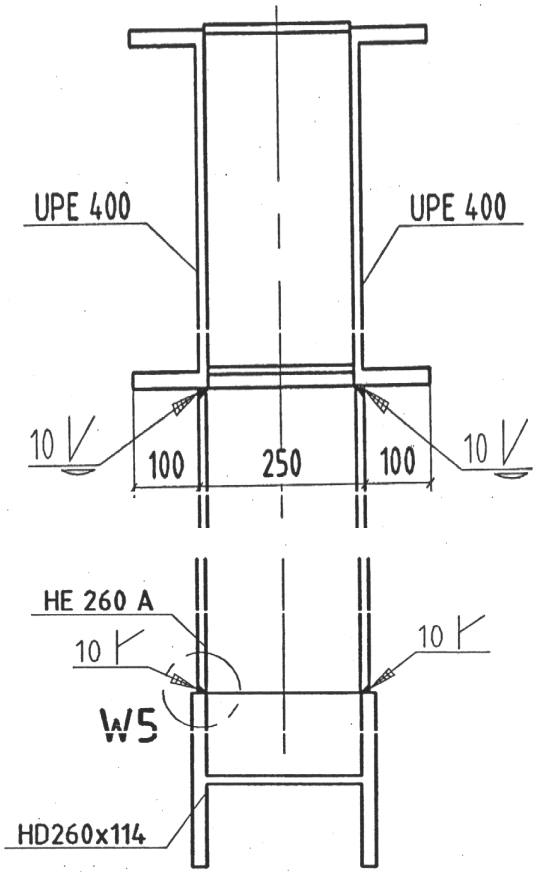
Example Cologne fair





Cologne fair – Hall 7

Counterproposal: Truss with secondary beams



Upper chord: Boxprofile from 2 UPE 400 with plates t=10-30 mm
S355
Diagonals: HE 260 B, HE 260 A, IPE 270
S235
Lower chord: HD 260x114 und HD 260x142
S460

Result: significant gain in weight compared to tender solution through optimized steel grades while keeping the geometry

Example Cologne fair

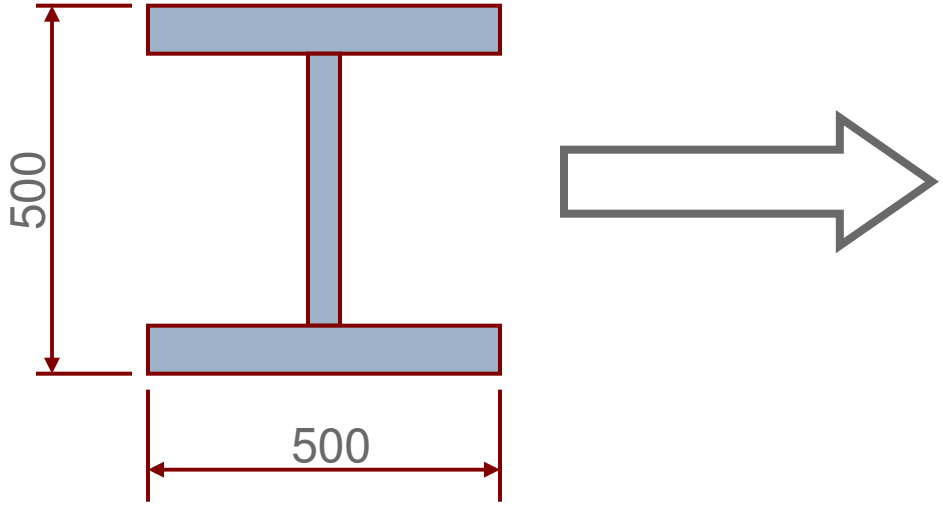
Example Cologne fair

Example Rheinenergiestadion

Truss girder – upper chord

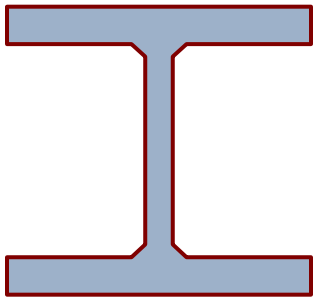
Example Rheinenergiestadion

Tender documents: welded beams



t= 25 / 35 / 40 / 50 mm
1`250 to

Proposal ArcelorMittal:



HD 400 x 287 / 382
HISTAR 355

1`050 to

16 % gain on weight

Car parks

Advantages of high strength steels

⇒ long spans
⇒ flexible interior arrangements

Customer friendly car parks shall have no columns in the parking spaces !

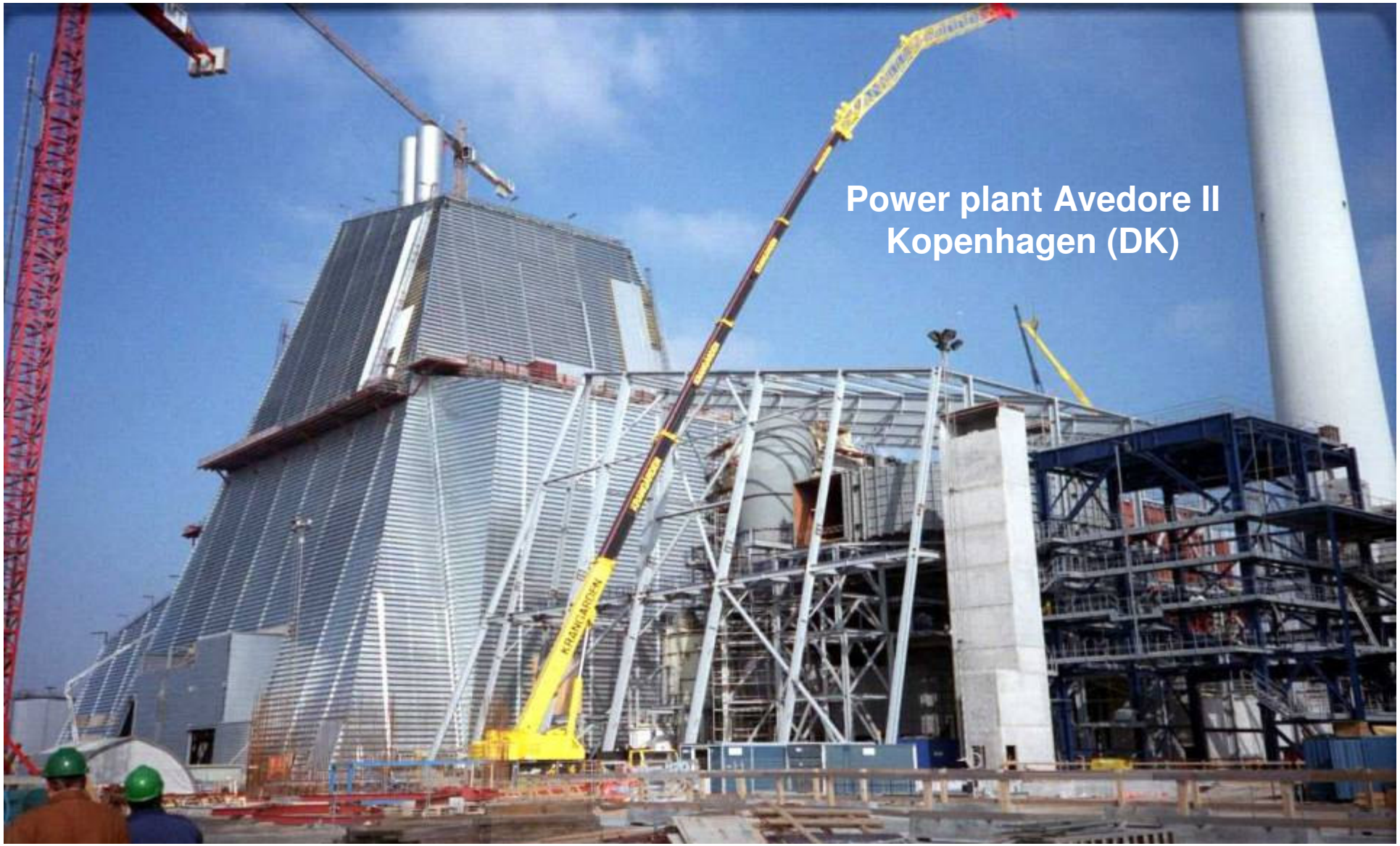
Car parks

Car parks

ArcelorMittal

Reference projects: Power plants

Power plants



Power plants

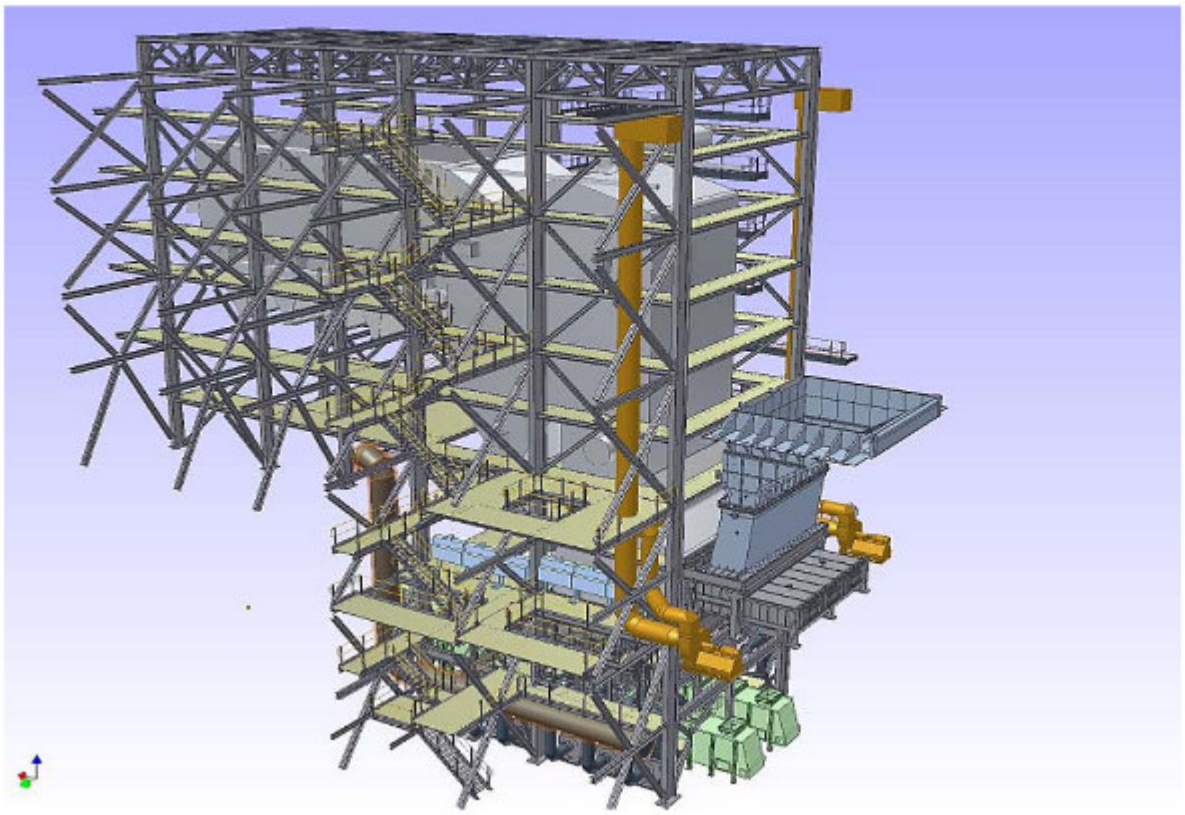
coal power plant

Neurath / Germany

Power plants

ArcelorMittal

Waste power plant Rheinberg



Power plants

Lanxi Power Plant (China)

Cross-columns and heavy sections in HISTAR460

Diandong2 powerplant in China

ArcelorMittal

Other reference projects

Shopping mall - Istanbul

Space Launch Complex 37B – Cape Canaveral, FL

220 MT Jumbos

ArcelorMittal

New shape: Angelina

Angelina®

ArcelorMittal

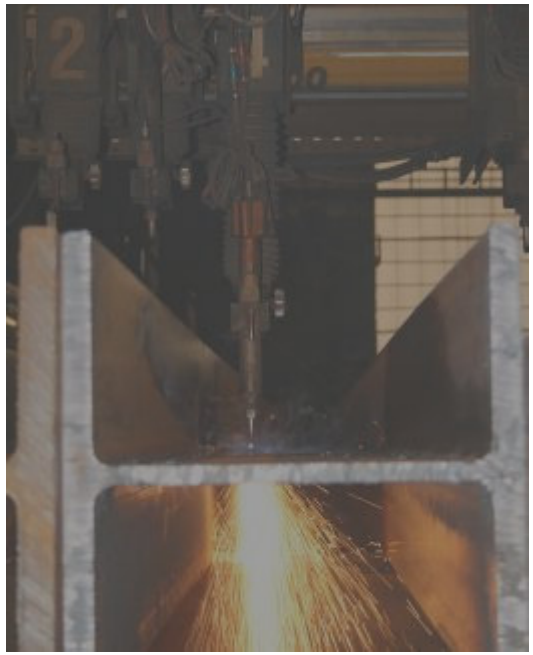
Advanced Cellular Beam
-- Reduced Weight
-- Improved Look

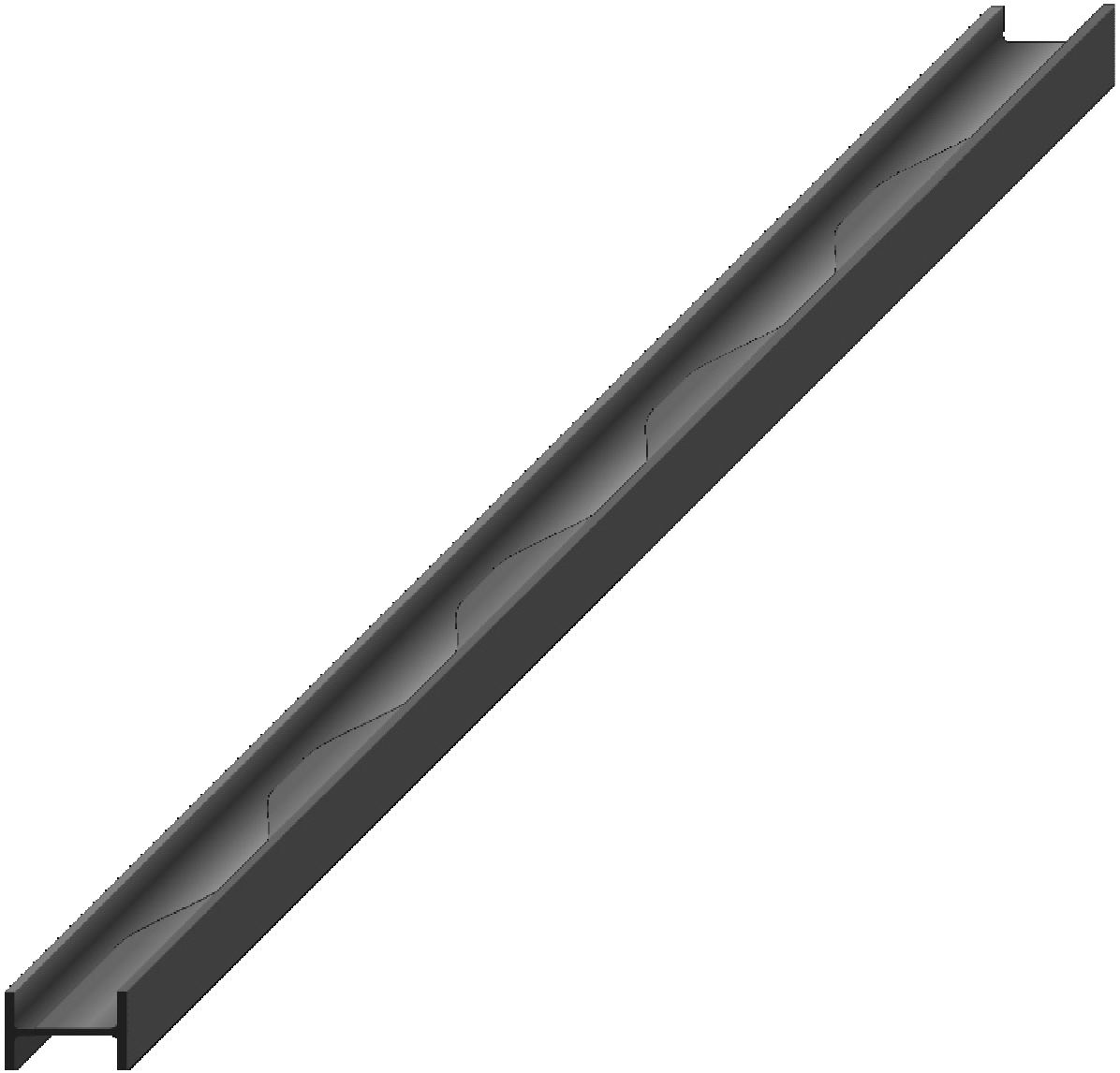
Office Building,
Switzerland

Fabrication process **Angelina™**

ArcelorMittal

Oxycutting





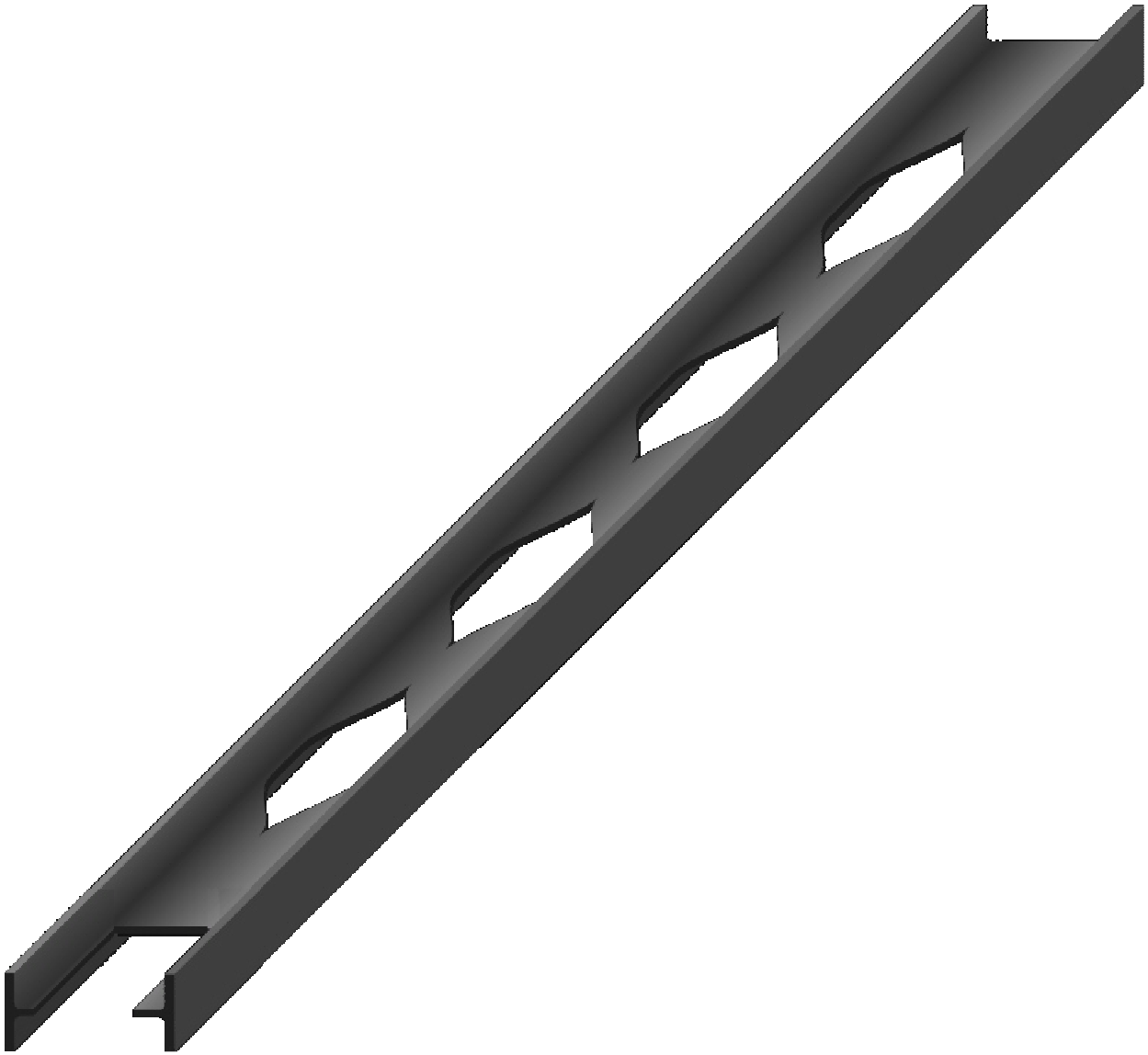
Fabrication process **Angelina™**

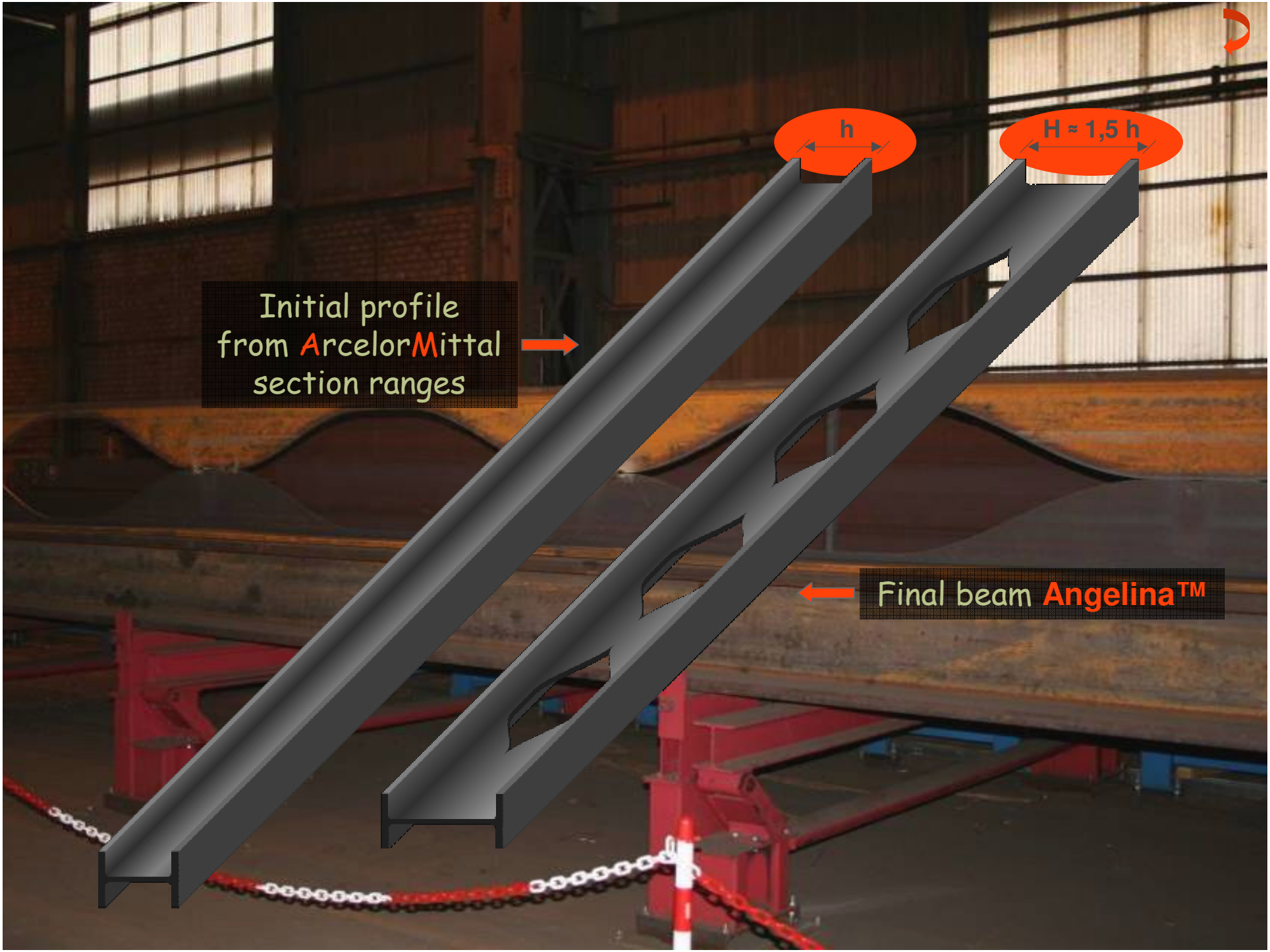
Oxycutting Separation Rotation Assembling

ArcelorMittal

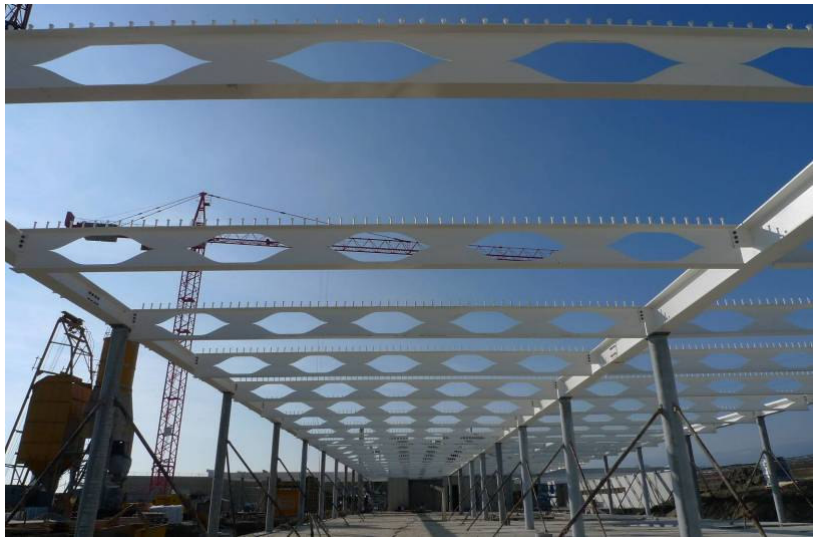
Fabrication process **Angelina™**

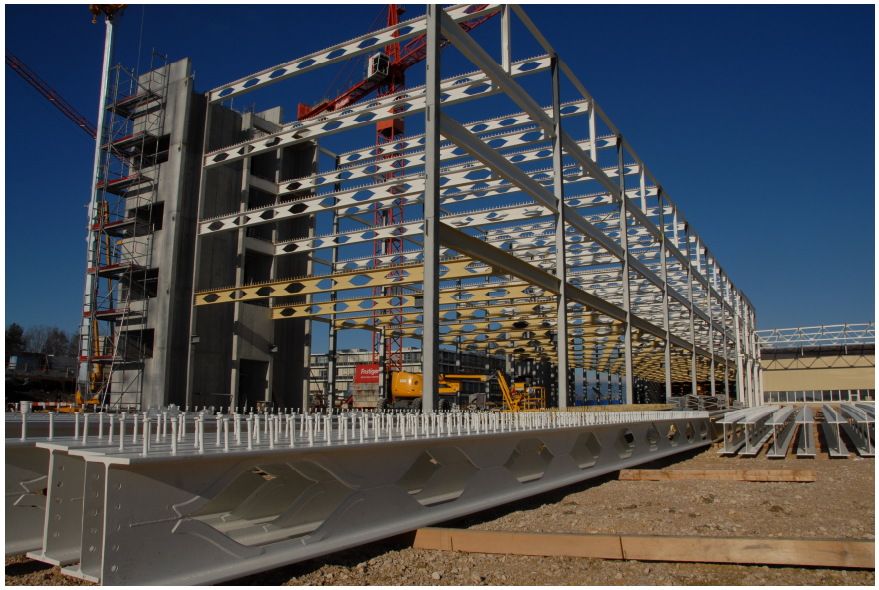
Oxycutting Separation Rotation Assembling Welding ArcelorMittal



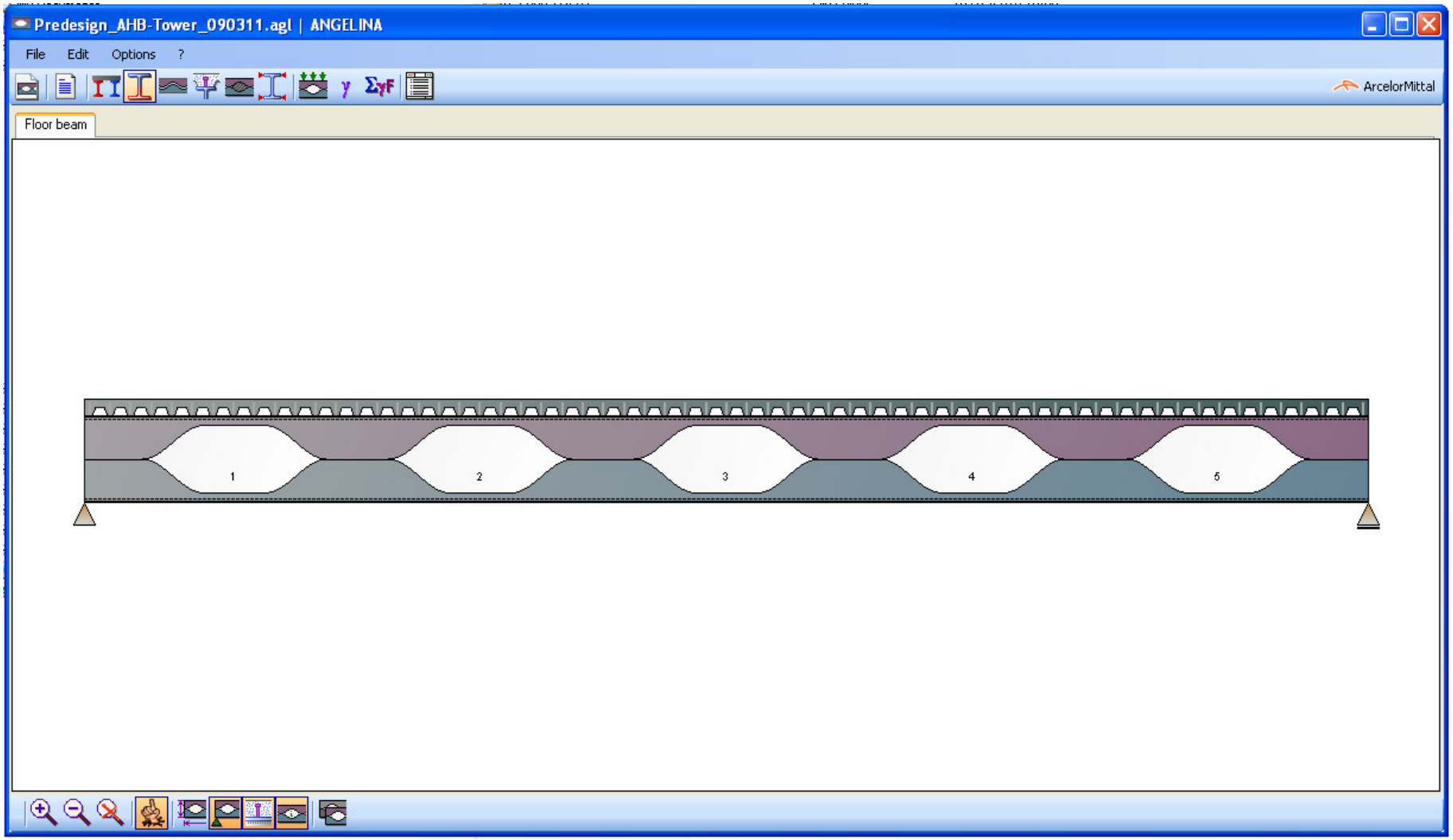

h
H ≈ 1,5 h
Initial profile
from ArcelorMittal
section ranges
Final beam Angelina™

New shape: Angelina





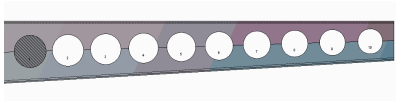
Angelina predesign software



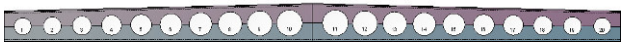
Optimized Cellular Beams

ArcelorMittal

Tapered with Constant openings



Tapered with Variable openings



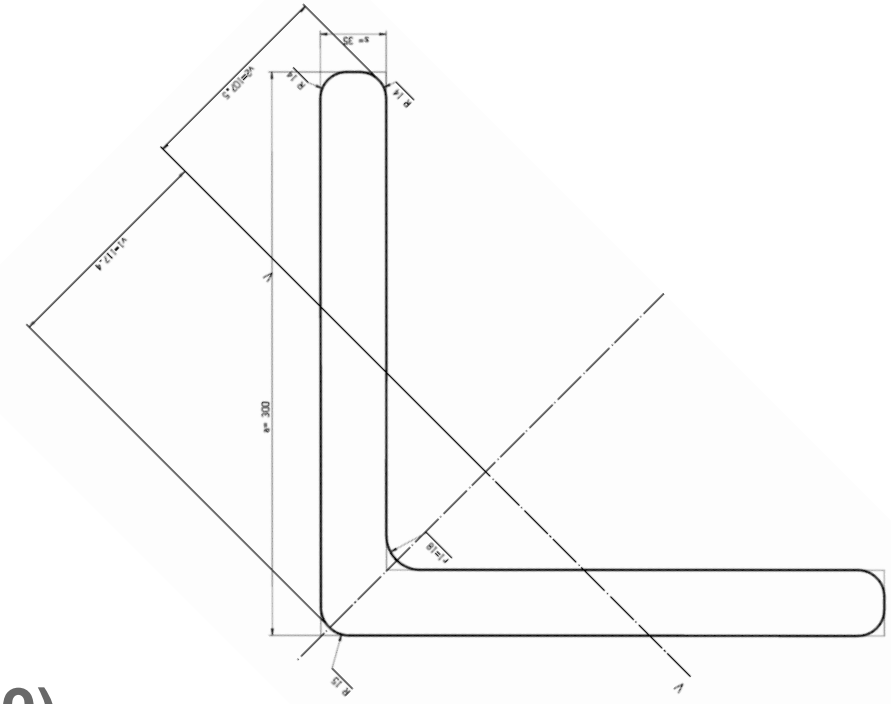
ArcelorMittal

New: L300 heavy angles

New dimensions - L 300 x 300 x t

New ArcelorMittal angles

L 300 x 300 x 28 mm
L 300 x 300 x 29 mm
L 300 x 300 x 30 mm
L 300 x 300 x 31 mm
L 300 x 300 x 32 mm
L 300 x 300 x 33 mm
L 300 x 300 x 34 mm
L 300 x 300 x 35 mm
(production started 2010)



Wind mills

Windenergieanlage E-82 (© www.enercon.de)

Height of Tubular Wind Towers:

+/- 100 m

Limitations caused by transport (maximum dimensions and weight of segments)
and erection (lifting capacities).

ArcelorMittal angles for wind towers

Advantages of lattice trusses:

- **Hub heights >150m possible**
- **Significant savings in material use (tower and foundations)**
- **Easy to fabricate, transport and erect**
- **Standard profiles with high availability**
- **Transparency**

ArcelorMittal angles for wind towers

Windpark Fledderweg – Norden (Ostfriesland)

Powerline masts

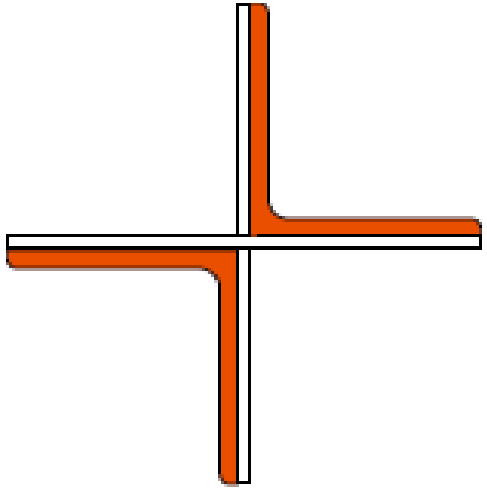
ArcelorMittal angles for lattice wind towers

Wind power generator Laasow (Germany)

2,5 MW generator

161m hub height (world record in 2006)

Application of L 250 x 250 x 28 as Butterfly-profile



Higher performance angles

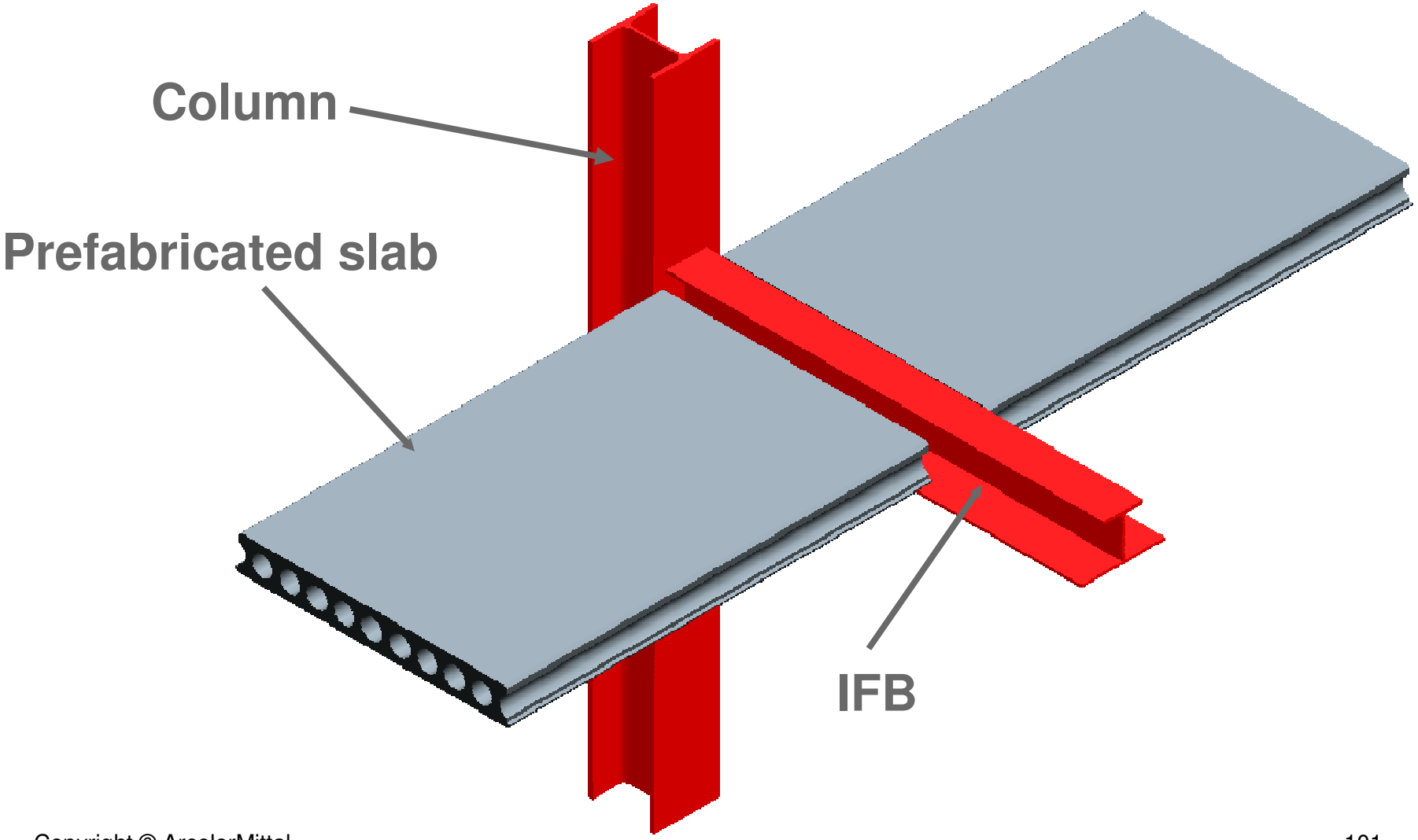
Comparison of
L 250 x 250 x 35 (weight 128.0 kg/m) with
L 300 x 300 x 29 (weight 128.8 kg/m)
-> Increased inertia $I_{y,z}$ of more than 30%
-> Increased bending resistance W_{pl} and buckling resistance $i_{y,z}$ of more than 20%

Windenergieanlagen SeeBa/Nordex S70 im Windpark Osterkappeln 2003 (© Schaumann)

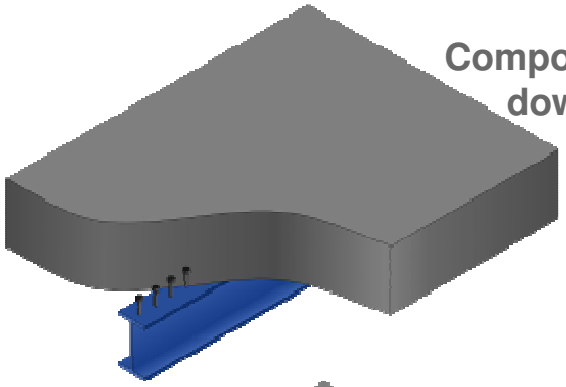
ArcelorMittal

NEW Composite Slim Floors

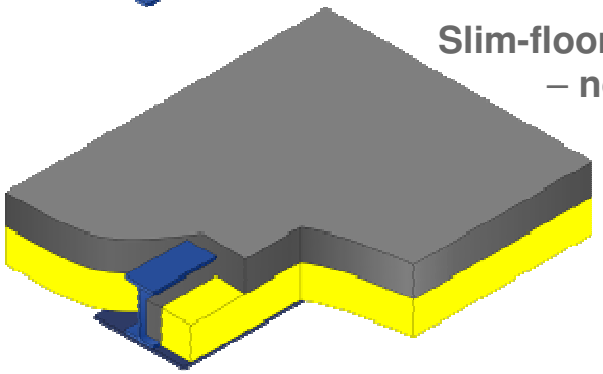
Slim Floor – Construction System



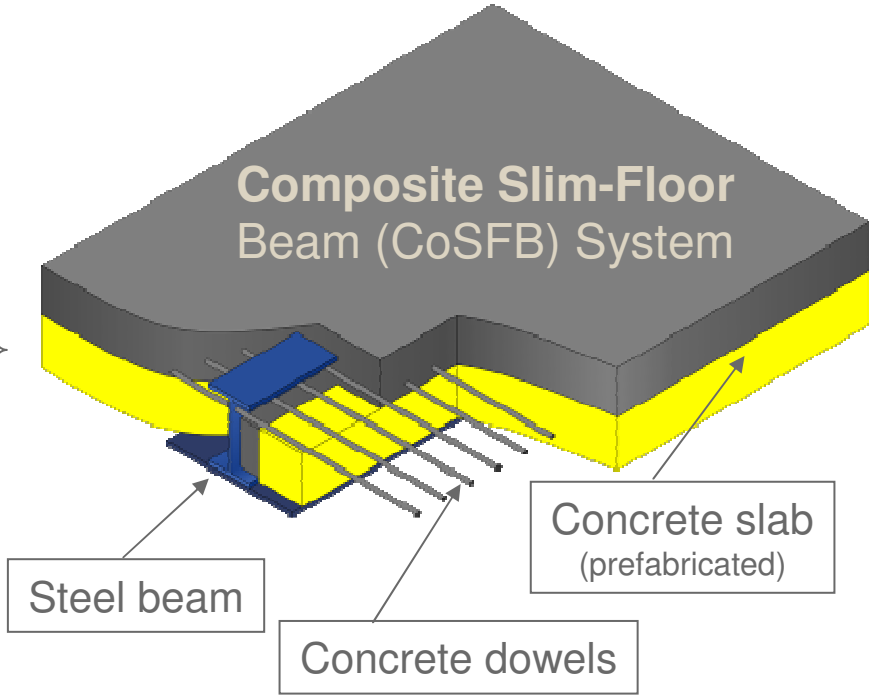
CoSFB – Composite Slim-Floor Beam



Composite floor system with **downstanding** beam



Slim-floor beam (SFB) system – **non composite**



2 existing systems → 1 Innovative system

Major benefits without adding to the complexity of the fabrication or compromising of the cost

Slim Floors for Large Spans = CoSFB

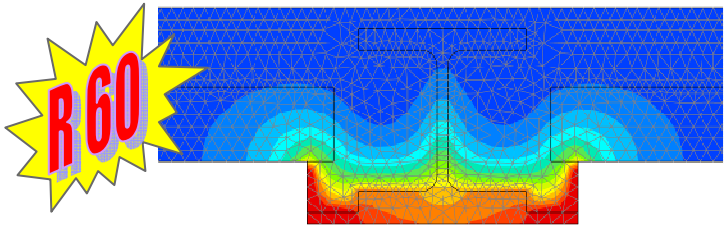
ArcelorMittal

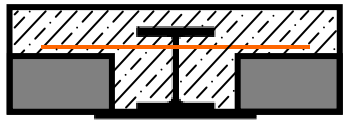
Slim-Floor construction = integration of the steel section into the floor slab.

⇒ No impact on ductwork layout

⇒ Reduced construction height

⇒ Integrated fire protection





Execution detail

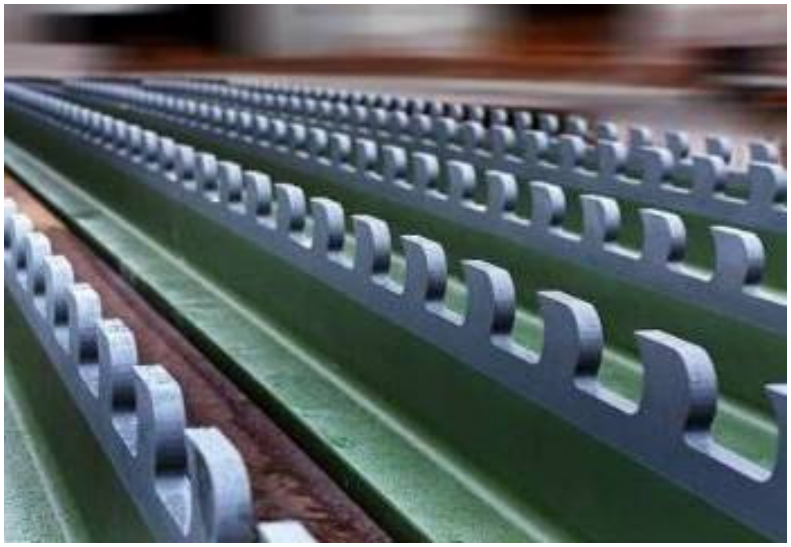
ArcelorMittal

NEW Prefabricated composite Bridge Girder

Road and railway bridges

Typical spans: 10 - 45m

Innovative Bridge Girders - Precobeam



EXAMPLES: GERMANY, AUSTRIA, POLAND

ArcelorMittal Commercial Sections

ARCOROX ®

ArcelorMittal

Arcorox weathering steel

S355 J0 W EN10025 - 5
for sections and merchant bars

Advantages of Arcorox Steel in Sections and Merchant Bars

- Attractive appearance
- No need for any corrosion protection

➔ REDUCED CONSTRUCTION COSTS

- No corrosion-protective treatment
- Shorter construction time

➔ REDUCED COSTS OF MAINTENANCE

- Less maintenance materials
- Shorter time of maintenance operations

➔NO ENVIRONMENTAL IMPACT

- No maintenance operations and residue

Design

- Eurocode 3 : Design of Steel Structure (EN 1993-1-1)
  - Arcorox sections are covered by EC3
- Generally should be avoided :
  - Rust staining of other materials
  - Details that would promote retention of moisture
- Design recommendations
  - Provide 50 mm copes where stiffeners are attached to the bottom flange
  - Ensure ventilation by avoiding closely spaced girders
  - Avoid overlaps, pockets, faying surfaces and crevices which can collect and retain moisture
  - Hermetically seal box girders or provide adequate access, drainage and ventilation
  - Ensure that web plates of box girders extend 20 mm below the bottom flange
  - Avoid run off of water to run down the visible external surface of the substructure (bridges)
  - Grind flush weld details which may cause water traps

ArcelorMittal Commercial Sections

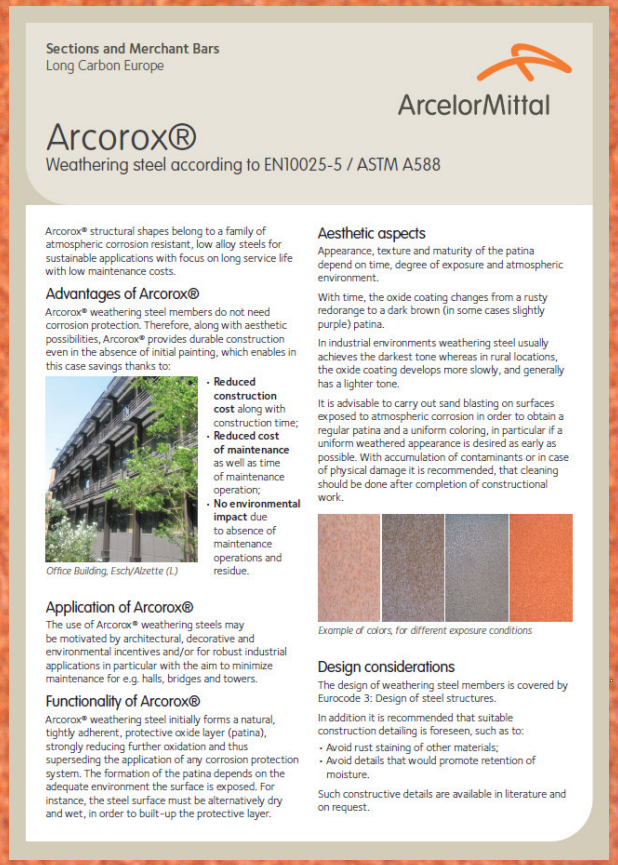
ARCOROX ®

ArcelorMittal

For further informations :

www .arcelormittal.com/sections

✉ *Sections.tecom@arcelormittal.com*



Sections and Merchant Bars
Long Carbon Europe

ArcelorMittal

Arcorox®

Weathering steel according to EN10025-5 / ASTM A588

Arcorox® structural shapes belong to a family of atmospheric corrosion resistant, low alloy steels for sustainable applications with focus on long service life with low maintenance costs.

Advantages of Arcorox®

Arcorox® weathering steel members do not need corrosion protection. Therefore, along with aesthetic possibilities, Arcorox® provides durable construction even in the absence of initial painting, which enables in this case savings thanks to:

- **Reduced construction cost** along with construction time;
- **Reduced cost of maintenance** as well as time of maintenance operation;
- **No environmental impact** due to absence of maintenance operations and residue.

Office Building, Esch/Alzette (L)

Application of Arcorox®

The use of Arcorox® weathering steels may be motivated by architectural, decorative and environmental incentives and/or for robust industrial applications in particular with the aim to minimize maintenance for e.g. halls, bridges and towers.

Functionality of Arcorox®

Arcorox® weathering steel initially forms a natural, tightly adherent, protective oxide layer (patina), strongly reducing further oxidation and thus superseding the application of any corrosion protection system. The formation of the patina depends on the adequate environment the surface is exposed. For instance, the steel surface must be alternatively dry and wet, in order to built-up the protective layer.

Aesthetic aspects

Appearance, texture and maturity of the patina depend on time, degree of exposure and atmospheric environment.

With time, the oxide coating changes from a rusty redorange to a dark brown (in some cases slightly purple) patina.

In industrial environments weathering steel usually achieves the darkest tone whereas in rural locations, the oxide coating develops more slowly, and generally has a lighter tone.

It is advisable to carry out sand blasting on surfaces exposed to atmospheric corrosion in order to obtain a regular patina and a uniform coloring, in particular if a uniform weathered appearance is desired as early as possible. With accumulation of contaminants or in case of physical damage it is recommended, that cleaning should be done after completion of constructional work.

Example of colors, for different exposure conditions

Design considerations

The design of weathering steel members is covered by Eurocode 3: Design of steel structures.

In addition it is recommended that suitable construction detailing is foreseen, such as to:

- Avoid rust staining of other materials;
- Avoid details that would promote retention of moisture.

Such constructive details are available in literature and on request.

New
Steel grade 16Mo3
for small and medium sections

Steel with specified properties at elevated service temperature

New steel for sections: Grade 16Mo3

- Grade 16Mo3 withstands service temperatures up to 530° C
- ➔ Typical use: hot parts in power plants

Grade 16Mo3

- **Standards**

  EN10025 part 1 and 2 : for production and delivery condition, except for chemical and mechanical properties, -- ref. to EN10273 and EN10028

  Reference standards for chemical and mechanical properties:

  - EN 10028:2 : “flat products made of steel for pressure purposes”
  - EN 10273 : “hot rolled weldable steel bars for pressure purposes with specified elevated temperature properties”

  Chemical composition

	C	Si max	Mn	P max	S max	Cr max	Cu max	Mo	Ni max
Standard EN10273	0.12-0.20	0.35	0.40-0.90	0.030	0.010	0.30	0.30	0.25-0.35	0.30

Grade 16Mo3

- Tensile properties at ambient temperature (+20° C):

		Yield strength ReH (MPa)	Tensile Strength (MPa)	Elongation A5d (%)
Standard (EN10028)	<16mm	275 min	440-590	22 min
	16-40 mm	270 min	440-590	22 min

- Charpy V-Notch impact toughness:

  test temperature +20 ° C , minimum absorbed energy: 31 J

- Shape sizes: beams and channels (HE and IPE $\leq$ 600 mm)

Grade 16Mo3

- Properties at elevated temperatures

  For thickness up to 60 mm

0,2% proof strength at temperature, N/mm² min						
200 ° C	*250 ° C*	*300 ° C*	*350 ° C*	*400 ° C*	*450 ° C*	*500 ° C*
215	200	170	160	150	145	140

Requirements of EN 10273:2000

Test subject to agreement

Environmental Product Declaration

- To meet future European regulation of CE Mark
- EPD for Structural Steel: Sections and Plates according to ISO 14025

ArcelorMittal

Institut Bauen und Umwelt e.V.

ArcelorMittal

DILLINGER HÜTTE GTS

GALLARDO SECTIONS
Sales Organisation STAHLWERK THÜRINGEN

ILSENBURGER GROBBLECH
Ein Unternehmen der Salzgitter Gruppe

PEINER TRÄGER
Ein Unternehmen der Salzgitter Gruppe

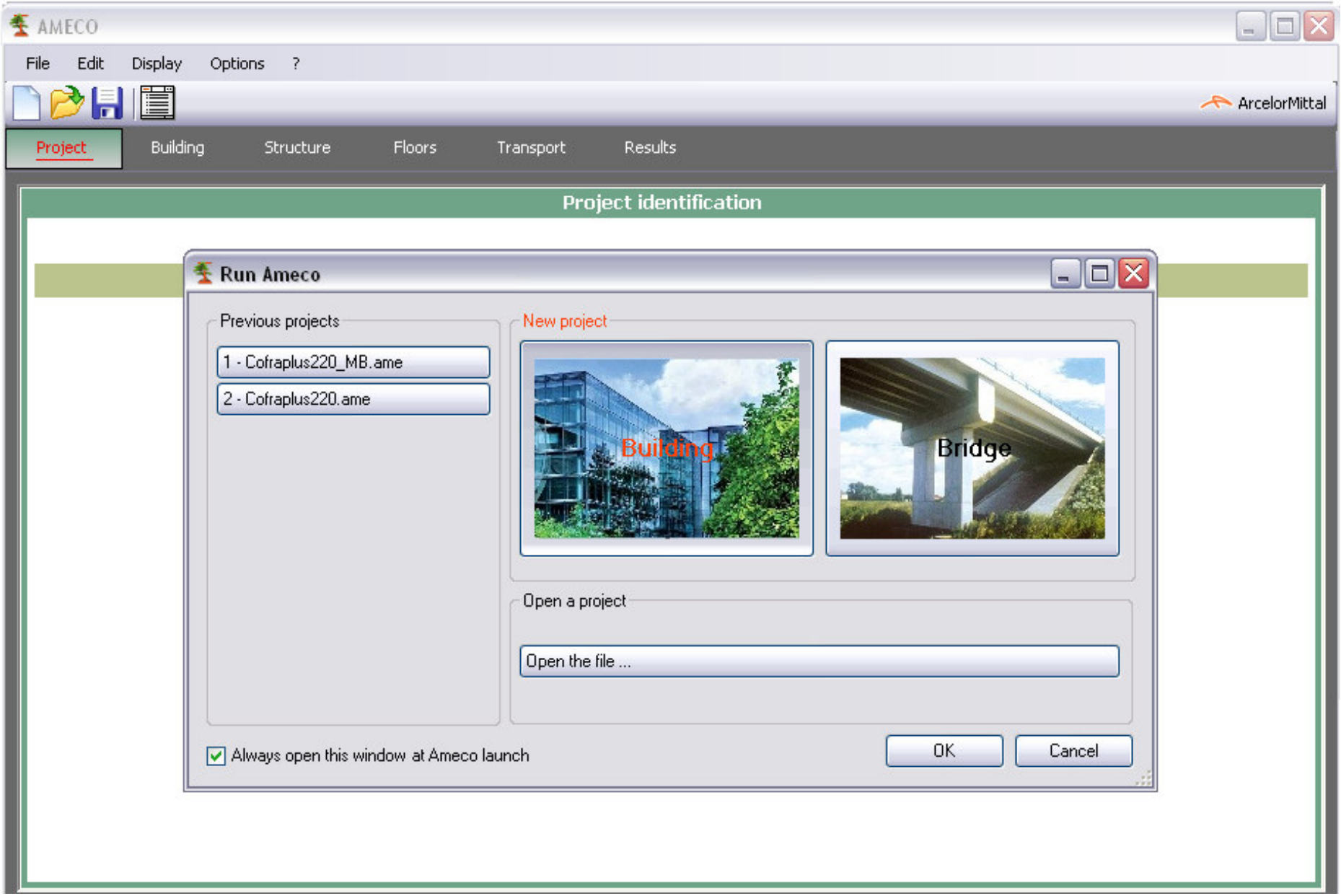
EPD - LCA according to ISO 14040 ff.
Structural Steel: Sections and Plates

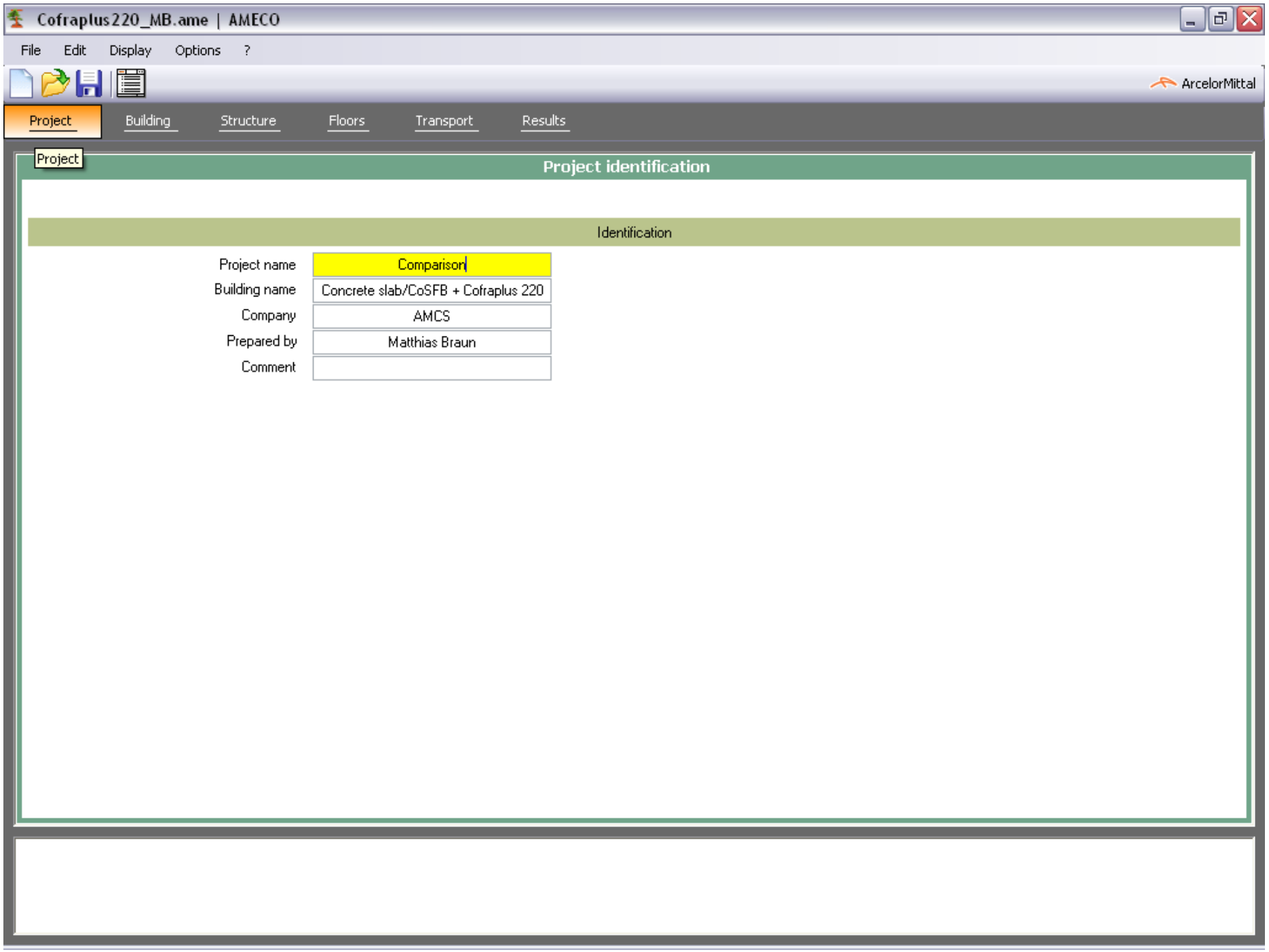
	Unit per kg	Production	End-of-Life	Total
Primary energy, non-renewable	[MJ]	19,48	-7,70	**11,78**
Primary energy, renewable	[MJ]	0,65	-0,08	**0,57**
				12,35
Global Warming Potential (GWP 100 years)	[kg CO2-Eq.]	1,68	-0,88	**0,80**
Ozone Depletion Potential (ODP)	[kg R11-Eq.]	3,19E-08	1,04E-08	**4,23E-08**
Acidification Potential (AP)	[kg SO2-Eq.]	3,47E-03	-1,68E-03	**1,79E-03**
Eutrophication Potential (EP)	[kg PO4 3-Eq.]	2,89E-04	-1,31E-04	**1,58E-04**
Photochemical Ozone Creation Potential (POCP)	[kg C2H4-Eq.]	7,55E-04	-4,57E-04	**2,98E-04**

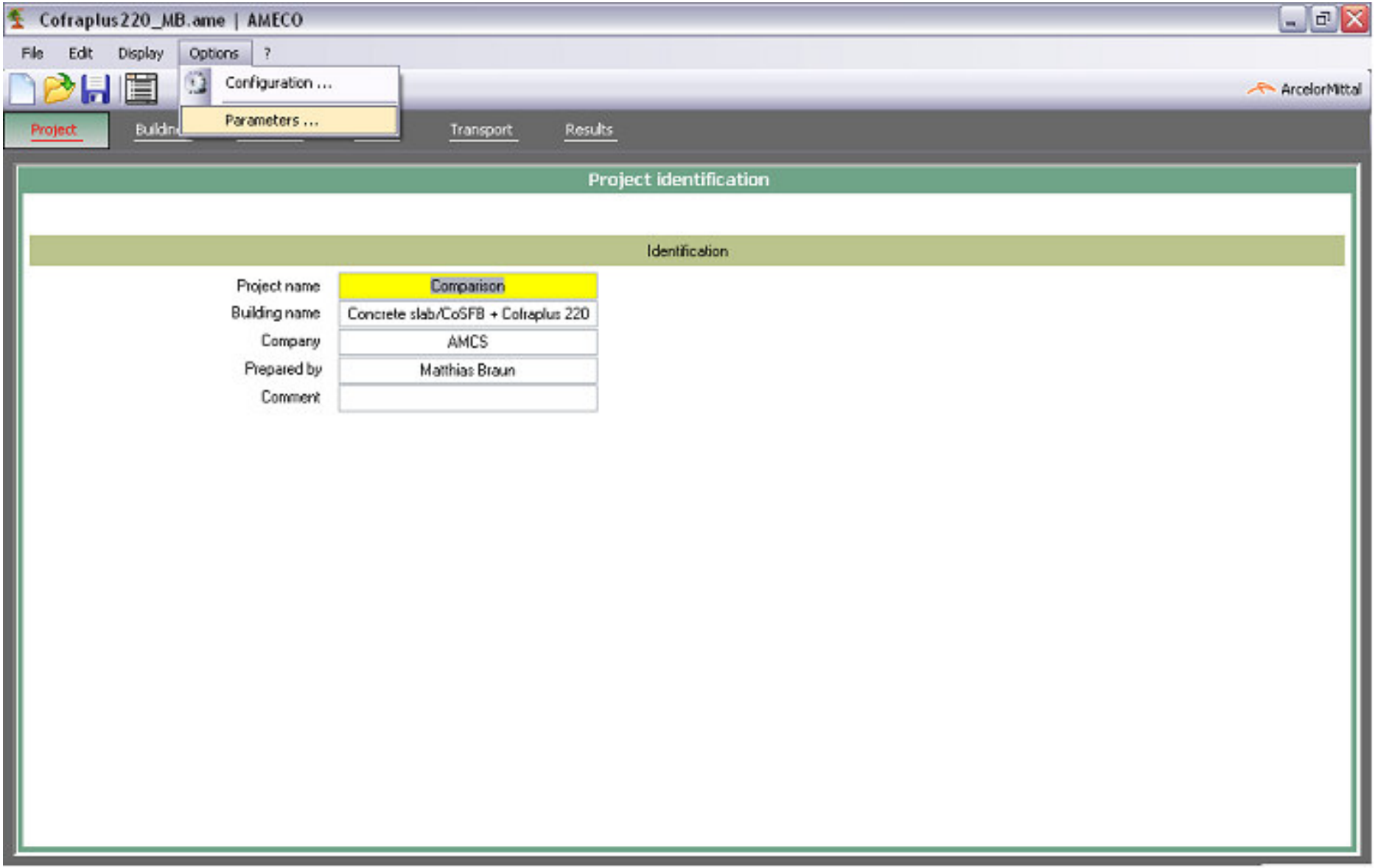
ArcelorMittal

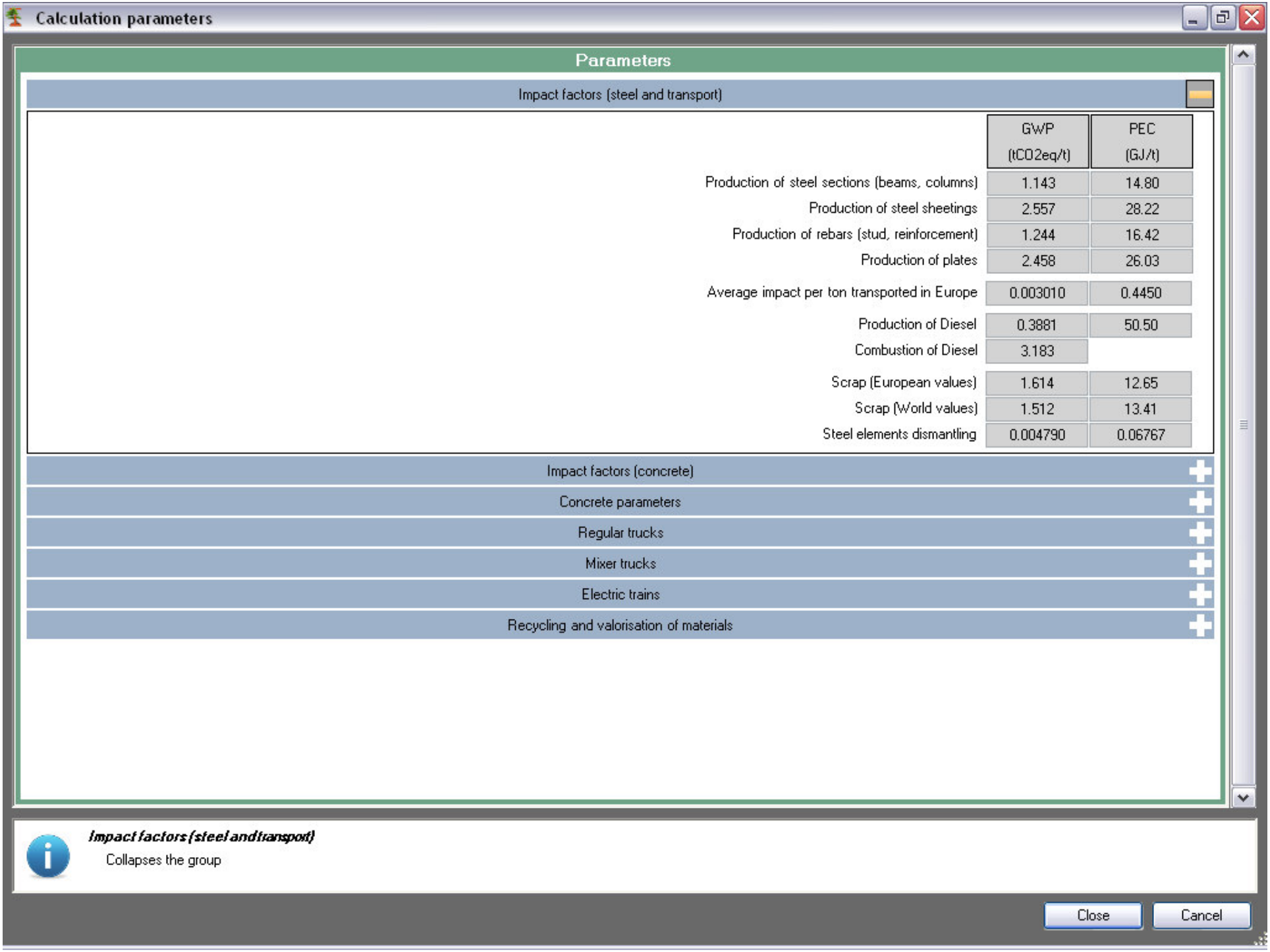
 www.arcelormittal.com/sections

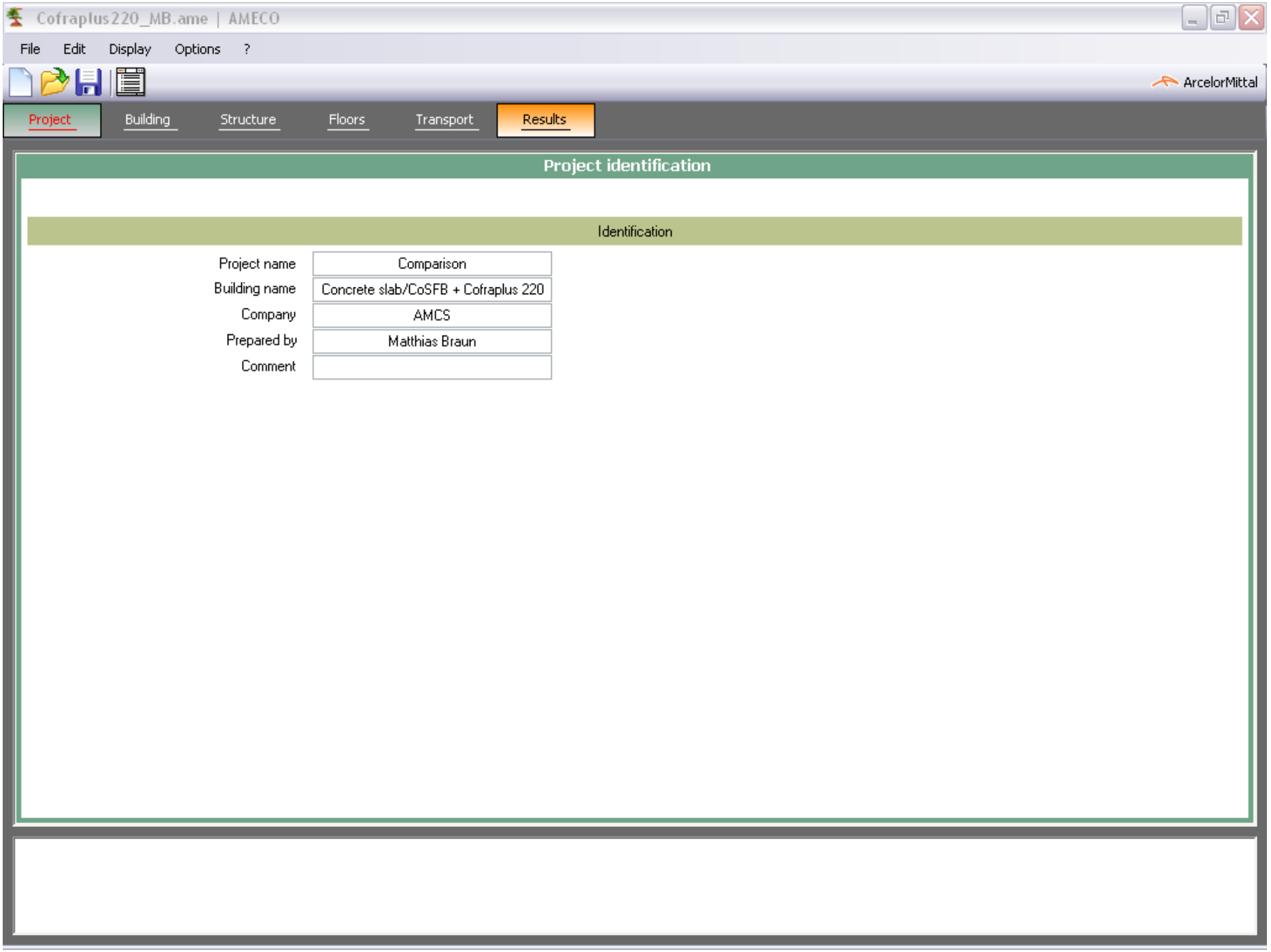
Close




Cofraplus220_MB.ame | AMECO
File
Edit
Display
Options
?
ArcelorMittal
Project
Building
Structure
Floors
Transport
Results
Project
Project identification
Identification
Project name
Comparison
Building name
Concrete slab/CoSFB + Cofraplus 220
Company
AMCS
Prepared by
Matthias Braun
Comment




Calculation parameters
Parameters
Impact factors (steel and transport)
GWP (tCO2eq/t)
PEC (GJ/t)
Production of steel sections (beams, columns) 1.143 14.80
Production of steel sheetings 2.557 28.22
Production of rebars (stud, reinforcement) 1.244 16.42
Production of plates 2.458 26.03
Average impact per ton transported in Europe 0.003010 0.4450
Production of Diesel 0.3881 50.50
Combustion of Diesel 3.183
Scrap (European values) 1.614 12.65
Scrap (World values) 1.512 13.41
Steel elements dismantling 0.004790 0.06767
Impact factors (concrete)
Concrete parameters
Regular trucks
Mixer trucks
Electric trains
Recycling and valorisation of materials
Impact factors (steel and transport)
Collapses the group
Close
Cancel


Cofraplus220_MB.ame | AMECO
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?
ArcelorMittal
Project
Building
Structure
Floors
Transport
Results
Project identification
Identification
Project name
Comparison
Building name
Concrete slab/CoSFB + Cofraplus 220
Company
AMCS
Prepared by
Matthias Braun
Comment

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Project Building Structure Floors Transport Results

Calculation sheet

Display

- [x] Production
- [x] Transport
- [x] End of life
- [x] Life cycle

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Export results

Concrete slab/CoSFB + Cofraplus 220		GWP (tCO2eq)	PEC (GJ)
Production	Concrete of floors	3.46	19.71
	Steel sheets	4.08	44.99
	Concrete of structure	0.45	2.543
	Steel reinforcement	4.57	60.25
	Steel beams	0.0	0.0
	Steel columns	0.0	0.0
	Steel studs and bolts	0.0	0.0
	Total Production	**12.54**	**127.5**
Transport	Concrete of floors	0.21	2.970
	Steel sheets	0.0	0.709
	Concrete of structure	0.03	0.383
	Steel reinforcement	0.01	1.633
	Steel beams	0.0	0.0
	Steel columns	0.0	0.0
	Steel studs and bolts	0.0	0.0
	Total Transport	**0.25**	**5.696**
End of Life	Concrete of floors	0.42	9.081
	Steel sheets	-1.95	-15.29
	Concrete of structure	0.05	1.172
	Steel reinforcement	0.50	5.869
	Steel beams	0.0	0.0
	Steel columns	0.0	0.0
	Steel studs and bolts	0.0	0.0
	Total End of Life	**-0.97**	**0.833**
Life cycle	Concrete of floors	4.09	31.76
	Steel sheets	2.13	30.41
	Concrete of structure	0.53	4.098
	Steel reinforcement	5.07	67.76
	Steel beams	0.0	0.0
	Steel columns	0.0	0.0
	Steel studs and bolts	0.0	0.0
	Total Life cycle	**11.82**	**134.0**


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PEC
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Life cycle
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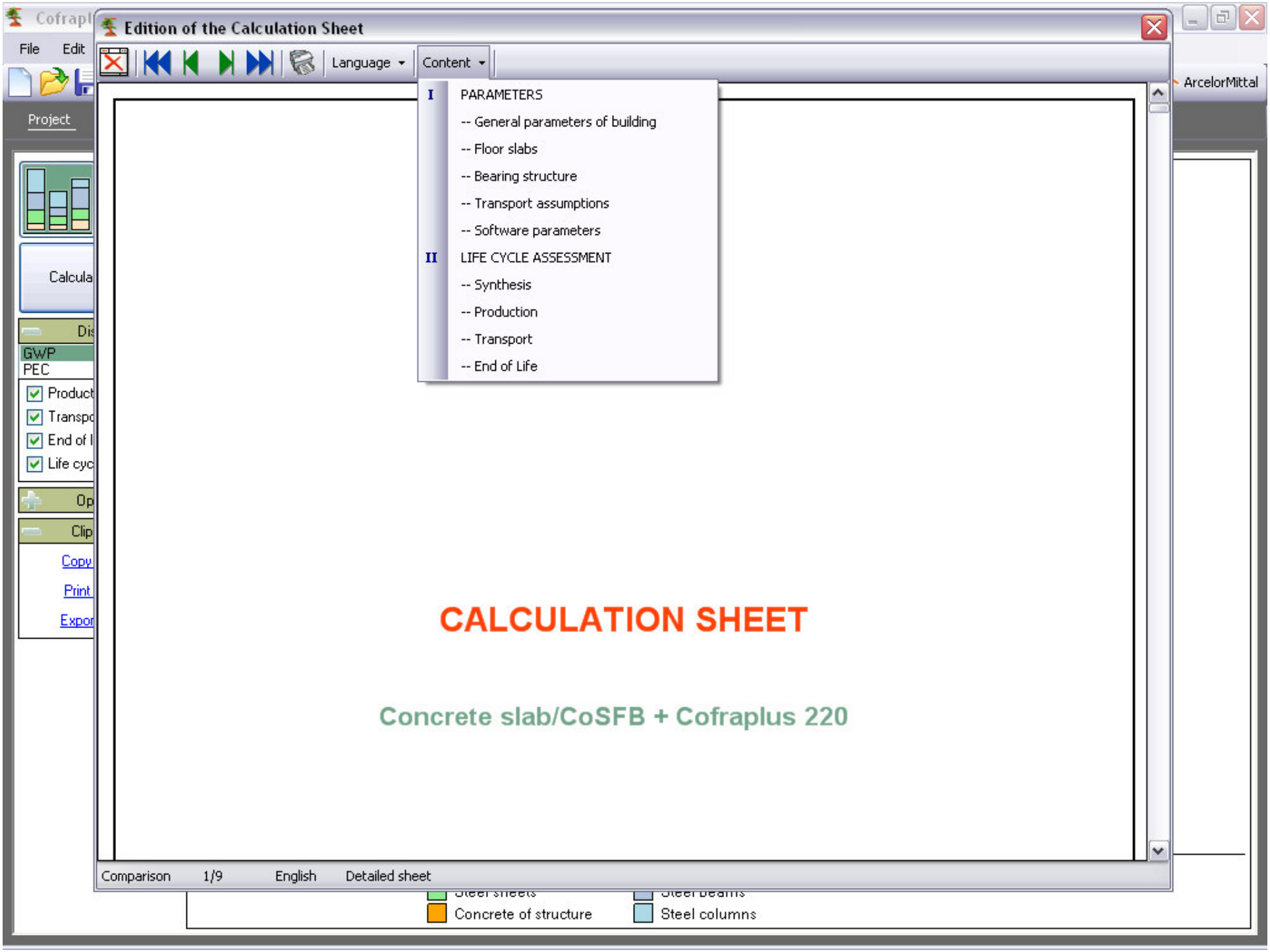
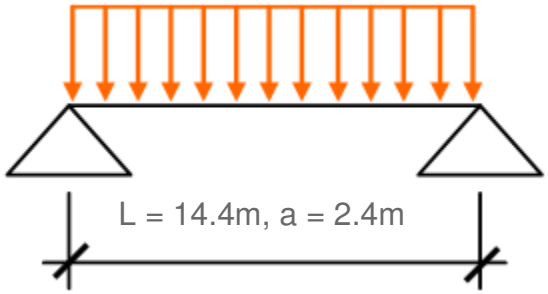
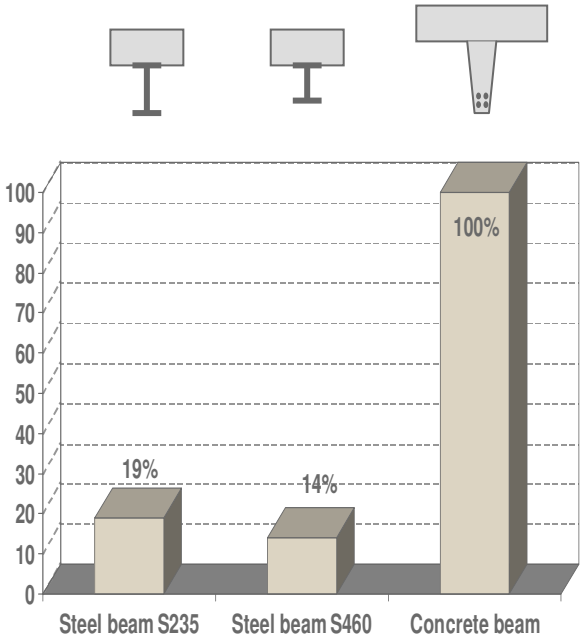
Global Warming Potential (tCO2eq)
14
12
10
8
6
4
2
0
-2
12.54
0.25
0.98
-1.95
11.82
Production
Transport
End of Life
Life cycle
Concrete of floors
Steel sheets
Concrete of structure
Steel reinforcement
Steel beams
Steel columns
Steel studs and bolts

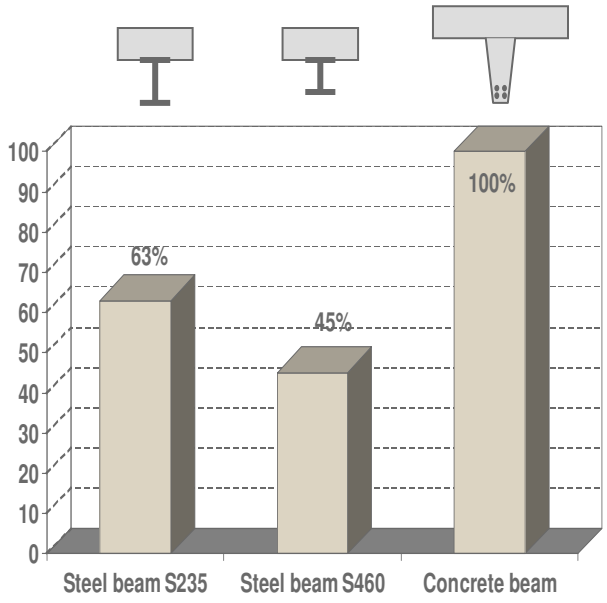

Edition of the Calculation Sheet
File
Edit
Language
Content
I PARAMETERS
-- General parameters of building
-- Floor slabs
-- Bearing structure
-- Transport assumptions
-- Software parameters
II LIFE CYCLE ASSESSMENT
-- Synthesis
-- Production
-- Transport
-- End of Life
CALCULATION SHEET
Concrete slab/CoSFB + Cofraplus 220
Comparison 1/9 English Detailed sheet
Project
ArcelorMittal
GWP
PEC
Concrete of structure
Steel columns

Life Cycle Assessment of beams

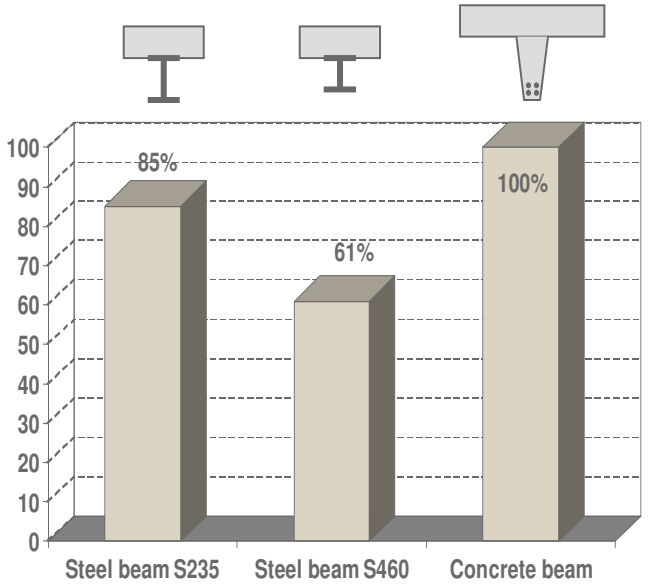




Weight



Global Warming Potential



Primary Energy Consumption

Sustainability

- Hot-rolled heavy steel sections are produced based on steel scrap => Recycling of material with **lowest reduced carbon footprint and** energy consumption
- Steel is can be recycled again and again = **multicycling**, without quality loss, even **upcycling** to HISTAR material is
- Material consumption in construction is significantly **reduced** through high material efficiency of steel
- Steel buildings score higher in sustainability criteria (e.g. **LEED**) and are be certified for high quality, **reliability and flexibility**
- Prefabrication off-site ensures high quality construction, **higher safety working conditions**, **less noise and waste** on the jobsite (e.g. no formwork required)
- Due to large spans without interior columns, steel buildings can easier and cheaper refurbished and adapted to changing market demands => longer buildings lifetime and higher occupancy rate
- Reduced life cycle cost and maintenance thanks to steel

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