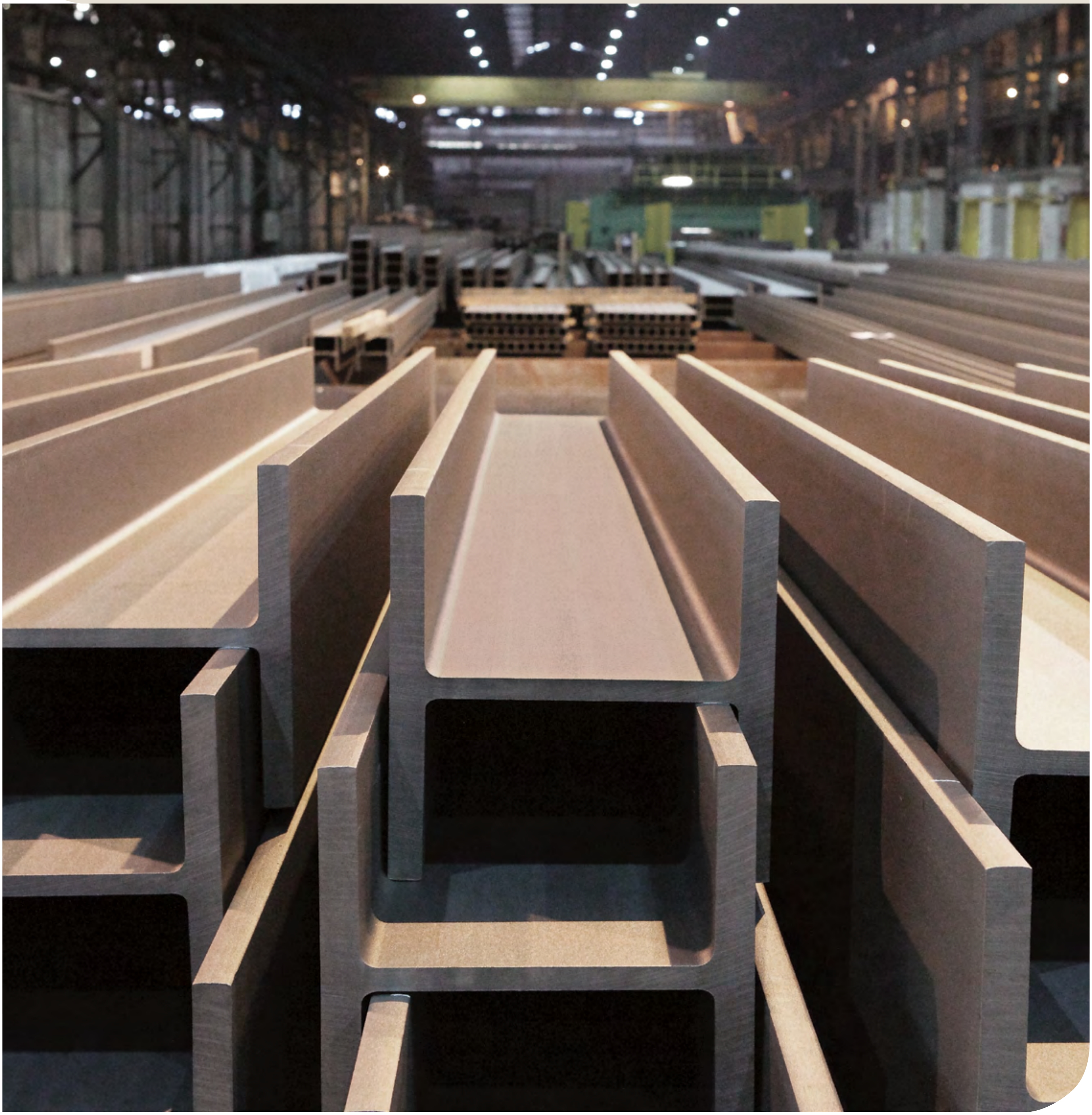
ArcelorMittal International
North America

ArcelorMittal

Structural Shapes

Sales program and product information



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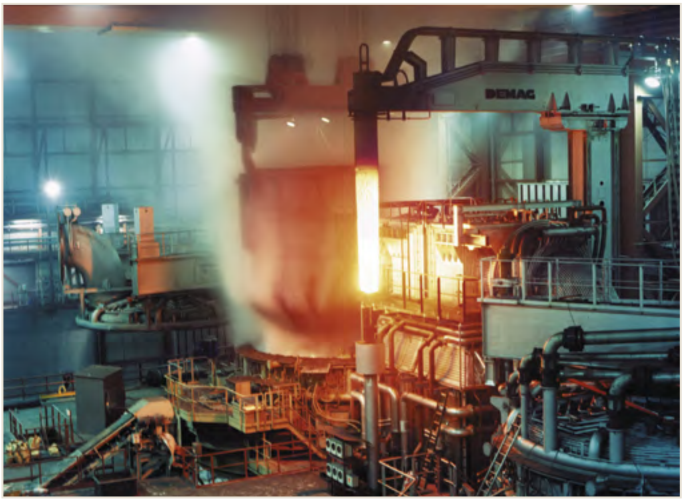
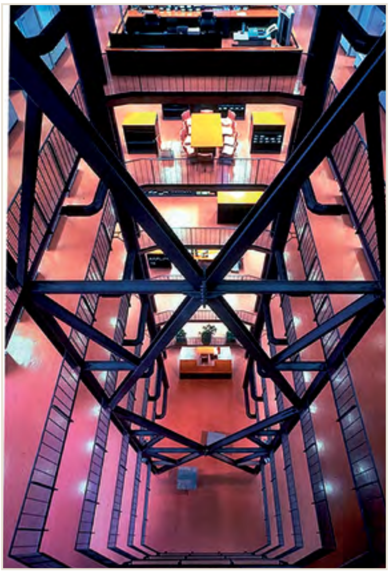
Expert in steel and structural shapes

ArcelorMittal is the world's leading steel and mining company. Employing 197,000 employees across 60 countries and an industrial footprint in 18 countries. Guided by a philosophy to produce safe, sustainable steel, we are the leading supplier of quality steel in all major global steel markets including automotive, construction, household appliances and packaging, with world-class research and development and outstanding distribution networks.



Electric arc furnace

In 2017, ArcelorMittal had revenues of US $68.7 billion and crude steel production of 93.1 million metric tonnes while own own iron ore production reached 57.4 million metric tonnes of iron ore. For the construction industry, ArcelorMittal offers innovative, competitive and sustainable solutions to engineers and fabricators. Our experience in the production of structural shapes is best represented by the history of our Grey mill at ArcelorMittal Differdange.



ArcelorMittal office building (AOB), Luxembourg

Located in Luxembourg, this mill is home to several world firsts in the steel industry. In 1902, we rolled the first parallel wide flange shape and shortly after, in 1911, we produced the first steel section measuring 40 inches (one meter) in depth. This mill also introduced Tallor-Made beams (WTM) in 1979 – profiles that were praised by both structural engineers and fabricators as a cost effective alternative to built-up sections and concrete. Today, ArcelorMittal offers the largest range of shapes in the world including W14 x 16 sections weighting up to 873 lbs/ft, W36 x 16 1/2 profiles weighting up to 925 lbs/ft, and W40 x 16 sections weighting up to 655 lbs/ft.

Rolling program - "W" shapes

Section	Footweights															
W4 x 4	13															
W5 x 5	16	19														
W6 x 4	9	12	16													
W6 x 6	15	20	25													
W8 x 4	10	13	15													
W8 x 5 1/4	14	18	21													
W8 x 6 1/2	24	28														
W8 x 8	31	35	40	48	58	67										
W10 x 4	12	15	17	19												
W10 x 5 3/4	22	26	30													
W10 x 8	33	39	45													
W10 x 10	49	54	60	68	77	88	100	112								
W12 x 4	14	16	19	22												
W12 x 6 1/2	26	30	35													
W12 x 8	40	45	50													
W12 x 10	53	58														
W12 x 12	**65**	**72**	**79**	**87**	**96**	**106**	**120**	**136**	**152**	**170**	**190**	**210**	**230**			
W14 x 5	22	26														
W14 x 6 3/4	30	34	38													
W14 x 8	43	48	53													
W14 x 10	61	68	74	82												
W14 x 14 1/2	**90**	**99**	**109**	**120**	**132**											
W14 x 16	**145**	**159**	**176**	**193**	**211**	**233**	**257**	**283**	**311**	**342**	**370**	**398**				
W14 x 16	**426**	**455**	**500**	**550**	**605**	**665**	**730**	**808**	**873**							
W16 x 5 1/2	26	31														
W16 x 7	36	40	45	50	57											
W16 x 10 1/4	67	77	89	100												
W18 x 6	35	40	46													
W18 x 7 1/2	50	55	60	65	71											
W18 x 11	76	86	97	106	119	130	143	158	175							
W21 x 6 1/2	44	50	57													
W21 x 8 1/4	48	55	62	68	73	83	93									
W24 x 7	55	62														
W24 x 9	68	76	**84**	**94**	**103**											
W24 x 12 3/4	**104**	**117**	**131**	**146**	**162**	**176**	**192**	**207**	**229**	**250**	**279**	**306**	**335**	**370**		
W27 x 10	84	94	**102**	**114**	**129**											
W27 x 14	**146**	**161**	**178**	**194**	**217**	**235**	**258**	**281**	**307**	**336**	**368**	**539**				
W30 x 10 1/2	90	99	**108**	**116**	**124**	**132**	**148**									
W33 x 11 1/2	118	**130**	**141**	**152**	**169**											
W36 x 12	135	**150**	**160**	**170**	**182**	**194**	**210**	**232**	**256**	**286**	**318**	**350**	**387**			
W36 x 16 1/2	**231**	**247**	**262**	**282**	**302**	**330**	**361**	**395**	**441**	**487**	**529**	**652**	**723**	**802**	**853**	**925**
W40 x 12	149	**167**	**183**	**211**	**235**	**264**	**278**	**294**	**331**	**392**						
W40 x 16	**199**	**215**	**249**	**277**	**297**	**324**	**362**	**372**	**397**	**431**	**503**	**593**	**655**			
W44 x 16	**230**	**262**	**290**	**335**	**368**	**408**										

Sections in **bold** are available in HISTAR® ASTM A913, Grades 50, 65 and 70.

Sections in orange are available in A913 Grade 65 from ArcelorMittal's North American stock location.

"S" shapes

Section	Footweights		
S3	5.7	7.5	
S4	7.7	9.5	
S5	10		
S6	12.5	17.25	
S7	15.3	20	
S8	18.4	23	
S10	25.4	35	
S12	31.8	35	
S12	40.8	50	
S15	42.9	50	
S18	54.7	70	
S20	66	75	
S20	86	96	
S24	80	90	100
S24	106	121	

"MC" shapes

Section	Footweights				
MC6	15.1	15.3			
MC7	19.1	22.7			
MC8	18.7	20			
MC8	21.4	22.8			
MC9	23.9	25.4			
MC10	22	25	28.5	33.6	41.1
MC12	31	35	40	45	50
MC18	42.7	45.8	51.9	58	

"L" shapes

Section	Thickness						
L8 x 8	1/2	9/16	5/8	3/4	7/8	1	1 1/8
L10 x 10	3/4	7/8	1	1 1/8	1 1/4	1 3/8	
L12 x 12	1	1 1/8	1 1/4	1 3/8			

"C" shapes

Section	Footweights	
C8	11.5	13.75
C10	15.3	20
C12	20.7	25

sections.arcelormittal.com

Subject to change without notice. For complete product information and other section ranges, please refer to ArcelorMittal Sections and Merchant Bars sales program.

HISTAR®

In 1990, ArcelorMittal introduced high-strength, low-alloy HISTAR® steel to the world market. HISTAR® is different from other steel on the market as it is produced using the specialty, in-line Quenching and Self-Tempering (QST) process.

With the development of HISTAR® steel, ArcelorMittal succeeded in creating structural steel that combines high yield strength with excellent toughness and outstanding weldability – material properties that had historically been considered incompatible. fabrication and reduced costs.

W36 X 925 in HISTAR®

W14 x 90 – 132
W14 x 145 – 873
W36 x 150 – 387
W36 x 231 – 925
W40 x 167 – 392
W40 x 199 – 655
W44 x 230 – 408

Popular sizes available in HISTAR®

Rolled section entering QST bank (left)

HISTAR® steel is delivered in accordance with the European Technical Approval ETA 10/156 and is compatible with material standards throughout the world. Hot-rolled I-shaped structural profiles delivered in HISTAR® grades enable the design of innovative structures that have improved efficiency, simplified fabrication and reduced costs.

Material specification: ASTM A913

Conforming to the ASTM A913 specification, which was originally published in 1993, HISTAR® is well recognized in the North American market. The material is available in yield strengths of 50 ksi [345 MPa], 65 ksi [485 MPa] and 70 ksi [450 MPa] - the highest in the market for structural shapes. In addition, HISTAR®'s toughness characteristics demonstrate good performance in even the most taxing of environmental conditions. Its low-alloy content allows for favorable welding characteristics, in many cases requiring no preheat prior to performing welding procedures.

Chemical requirements

Element	Maximum content in %		
	Grade 50 [345]	Grade 65 [450]	Grade 70 [485]
Carbon	0.12	0.12	0.12
Manganese	1.60	1.60	1.60
Phosphorus	0.030	0.030	0.030
Sulphur	0.030	0.030	0.030
Silicon	0.40	0.40	0.40
Copper	0.45	0.35	0.45
Nickel	0.25	0.25	0.25
Chromium	0.25	0.25	0.25
Molybdenum	0.07	0.07	0.07
Columbium	0.05	0.05	0.05
Vanadium	0.06	0.08	0.09

Key material properties

Mechanical Properties
1. Charpy V-notch tests shall be made in accordance with Specification A673/A673M, Frequency H.
2. The test results of full-size specimens shall meet an average value of 40 ft-lbf [54 J] at 70ºF [21 °C].

Maximum Carbon Equivalent
Grade 50 [345]: 0.38%
Grade 65 [450]: 0.43%
Grade 70 [485]: 0.45%

Tensile requirements

Grade	Yield point, min.	Tensile strength, min.	Elongation, min.	
	ksi [MPa]	ksi [MPa]	8 inch [200 mm], %	2 inch [50 mm], %
50 [345]	50 [345]	65 [450]	18	21
65 [450]	65 [450]	80 [550]	15	17
70 [485]	70 [485]	90 [620]	14	16

Supplementary requirements

S30. Charpy V-Notch (CVN) Impact Test for Structural Shapes: Alternate Core Location*
S30.1 For shapes with a flange thickness equal to or greater than 1-1/2 in. [38.1 mm] that are specified in the purchase order to be tested in accordance with this supplementary requirement, CVN impact tests shall be conducted in accordance with Specification A673/A673M, using specimens taken from the alternate core location. Unless otherwise specified in the purchase order, the minimum average absorbed energy for each test shall be 20 ft-lbf [27 J] and the test temperature shall be 70 °F [21 °C].

S75. Maximum Yield Point to Tensile Strength Ratio - Grade 50 [345].
S75.1 The maximum yield point shall be 65 ksi [450 MPa].
S75.2 The maximum yield to tensile ratio shall be 0.85.
S77. Reduced Sulphur – Grade 65 [450]*
S77.1 The Grade 65 [450] shall be furnished with a maximum sulphur of 0.010 percent.
S77.2 The Grade 70 [485] shall be furnished with a maximum sulphur of 0.010 percent.

*extra costs may apply

Design and fabrication

As a result of the material's favorable mechanical properties, HISTAR® has received widespread approval by major structural design and fabrication codes throughout the world. This acceptance includes the incorporation of the ASTM A913 specification into the International Building Code; AISC's Steel Construction Manual (AISC 360) and Seismic Design Manual (AISC 341); CISC's Handbook of Steel Construction; and AWS's Structural Welding Code (AWS D1.1).

A913 Grade 65 sections used in transfer trusses

Strength

Available in yield strengths of up to 70 ksi [485 MPa], A913 steel has been an approved material specification by AISC since 1995. This acceptance was first reflected in the 1999 version of AISC 360. The material, at any yield strength, can be used in gravity designs with the same phi factors and design limits as any other material in the code.

For seismic design, AISC 341 Section A3.1 permits the use of A913 Grade 50 [345] in any part of the seismic force resisting system. When using A913 Grade 50 [345] in locations where inelastic behavior is expected, Supplementary Requirement S75 needs to be indicated in the purchase order. This requirement is made available at no additional cost.

AISC 341, Section A3.1 also permits the use of A913 Grade 65 [450] in members where the steel is not expected to yield, i.e. column sections in strong-column, weak-beam applications. This allowance can lead to more efficient designs and cost savings for projects.

A913 Grade 70 [485] is expected to be incorporated into the 2016 version of AISC 341. Prior to its publication, ArcelorMittal promises to work with design and construction teams to provide any background information requested by building code officials when A913 Grade 70 [485] has been specified for seismic applications.

Design and fabrication

Weldability

With maximum carbon equivalent values less than or equal to 0.45 percent, A913 Grades 50 [345], 65 [450] and 70 [485] have inherently good weldability characteristics. Recognition of this benefit is reflected by acceptance of A913 into AWS D1.1. Preheat requirements for the material are summarized as follows:

AWS D1.1, Minimum preheat temperatures

Thickness, in. [mm]	Minimum preheat temperatures, °F [°C]		
	A913		
	Grade 50 [345]	Grade 65 [450]	Grade 70 [485]
1/8 to 3/4 incl. [3 to 20 incl.]	32 [0]*	32 [0]*	50 [10]
Over 3/4 to 1-1/2 incl. [Over 20 to 38 incl.]	32 [0]*	32 [0]*	150 [65]
Over 1-1/2 to 2-1/2 incl. [Over 38 to 65 incl.]	32 [0]*	32 [0]*	225 [110]
Over 2-1/2 [Over 65]	32 [0]*	32 [0]*	300 [150]

*Requires low hydrogen diffusible electrode, H8 or better. For metal at temperatures below 32°F [0°C], minimum preheat is 70°F [20°C].

When selecting welding consumables compatible with ASTM A913 grades, AWS D1.1 suggests E70, E80 and E90 electrodes be used when matching weld metal strength is required for Grades 50 [345], 65 [450] and 70 [485], respectively. For locations where undermatching weld metal is permitted to be used, the code recommends using E60, E70 and E80 electrodes.

Toughness

For all grades and thicknesses of A913 steel, the minimum toughness is 40 ft-lbf [54 J] at 70°F [21°C] at the flange location. This is guaranteed at no extra cost to the end user and is included in the test results on the material test report.

Upon agreement, ASTM A913 sections can be provided meeting a CVN requirement of 20 ft-lbf [27 J] at 70°F [21°C] at the alternate core location (web-flange intersection). This enables the material to meet the requirements of AISC 360 Section A3.1, which requires such CVN values for steel used in tensile applications and featuring flange thickness exceeding 2 in. (50 mm), as well as those of AISC 341 Section A3.3, which requires such values for steel used in seismic force resisting systems and featuring flange thicknesses exceeding 1-1/2 in. (38 mm).

Also upon agreement, ASTM A913 steel can be supplied meeting CVN requirements down to -58°F [-50°C], a characteristic that is particularly attractive when the material is used in exposed, cold weather applications.

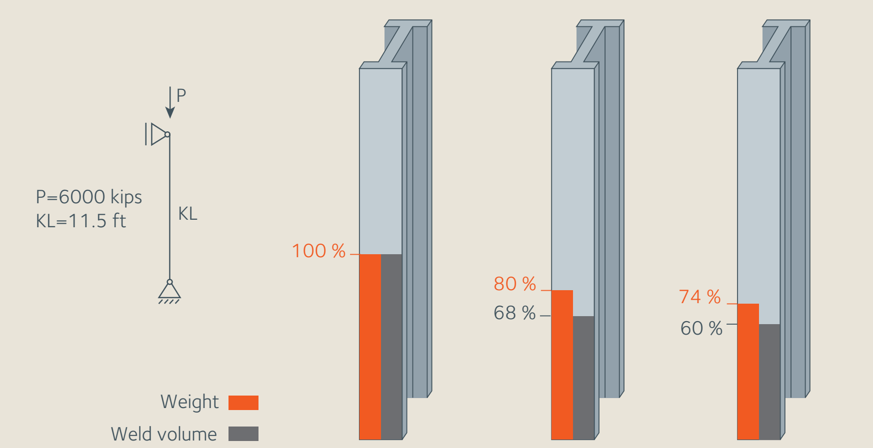
Extra value, same price

HISTAR® steel under the ASTM A913 specification is sold in the North American market without a premium over comparable steels (i.e. ASTM A992, A572 Grade 50 and CSA 40.21 350W). This means that users benefit from all the extra value HISTAR® has to offer – high strength, improved weldability and good toughness characteristics – for the same price they would pay for comparable materials.

Comparing A913 to other material

	A913			A992
	Grade 50 [345]	Grade 65 [450]	Grade 70 [485]	
Yield strength ksi [MPa]	50 [345]	65 [450]	70 [485]	50 [345]
Tensile strength, ksi [MPa]	65 [450]	80 [550]	90 [620]	65 [450]
Max. yield, ksi [MPa]	65 [450]*	No Max	No Max	65 [450]
Max yield to tensile ratio	0.85*	No Max	No Max	0.85
Min CVN: 40 ft-lbf [54 J] @ 70°F [21°C]	Yes	Yes	Yes	No
Max sulphur %	0.030	0.030	0.030	0.045
Max carbon %	0.12	0.12	0.12	0.23
Max CE %	0.38	0.43	0.45	0.47/0.45**
Weldable without preheat	Yes***	Yes***	No***	No

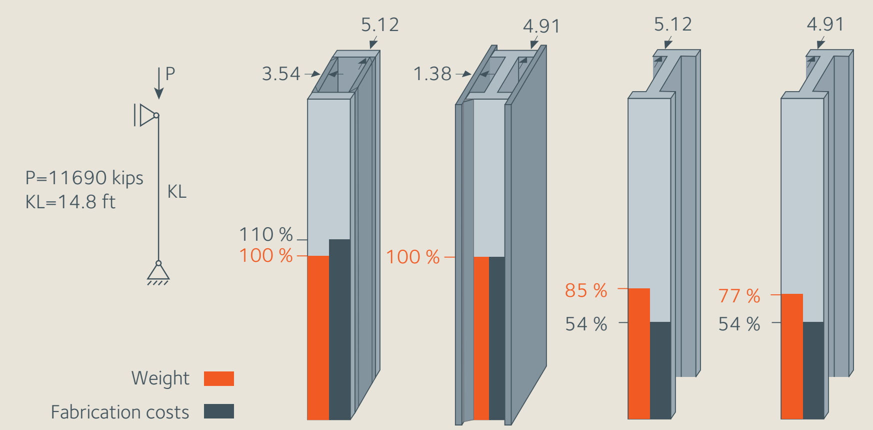
*S75 available upon request at no additional charge
**0.47% for section with flange thickness above 2 in. [50 mm], 0.45% for all other shapes
***See page 7 for complete details



Steel grade	A992 Grade 50	A913 Grade 65	A913 Grade 70
Section	W14x16x500	W14x16x398	W14x16x370
LRFD Ultimate load (kips)	6165	6232	6184
Weight (lbs/ft)	500	398	370

Figure 1: Using HISTAR® sections to reduce column weight

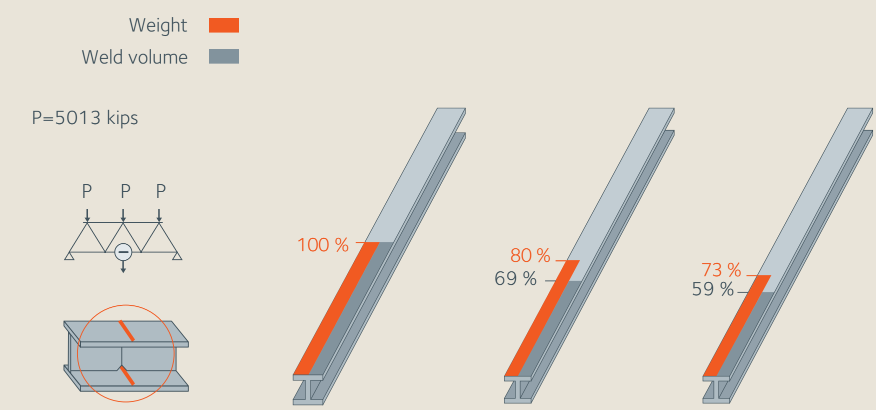
When compared to other structural steels, high-strength HISTAR® steel results in reduced weight and material costs of structures. HISTAR® also contributes to cost savings in welding, fabrication and erection.



Steel grade	A709 Grade 50	A992 Grade 50	A913 Grade 65	A913 Grade 70
Section	Box column	W14x16x730 +plates	W14x16x808	W14x16x730
LRFD Ultimate load (kips)	11828	11825	12241	11740
Weight (lbs/ft)	950	949	808	730

Figure 2: Using HISTAR® sections to replace built-up columns

Employing high-strength HISTAR® steel enables designers to substitute complicated and expensive built-up sections with economical hot-rolled profiles.



Steel grade	A992 Grade 50	A913 Grade 65	A913 Grade 70
Section	W14x16x426	W14x16x342	W14x16x311
LRFD Ultimate load (kips)	5014	5252	5142
Weight (lbs/ft)	426	342	311

Figure 3: Using HISTAR® sections to reduce weight of truss chord members

HISTAR® steel brings great benefit to the design of tension members in trusses. When used in these applications, the high-strength steel can not only lead to material cost savings but also reduction of the dead load of the system. The weight savings result in the ability to use thinner, more efficient sections and ultimately reduced fabrication costs.

HISTAR® frequently asked questions (FAQs)

How are HISTAR® and ASTM A913 material related?
HISTAR® is the trademark name of ArcelorMittal's high-strength low-alloy steel produced by a quenching and self-tempering process. ASTM A913 is the designation to which HISTAR® steel conforms in the ASTM specification.

What is the availability of ArcelorMittal's wide-flange sections?
The wide-flange sections indicated in the ArcelorMittal rolling program (see page 3) are rolled a minimum of once every six weeks with delivery approximately eight to 10 weeks after rolling (add two weeks for West Coast ports). Many of the more popular shapes, including W14x16s and W36x16s, are rolled more frequently.

What lengths are available?
Standard shipping lengths are 30 to 60 feet and can be ordered in one-inch increments. Other lengths are available subject to agreement.

What sections are available in HISTAR®/ASTM A913?
The section sizes available in HISTAR®/ASTM A913 are summarized below and in the ArcelorMittal rolling program (see page 3).

W14 x14 1/2 x 90 – 132*	upon agreement:
W14 x 16 x 145 – 873*	W12 x 65 – 230
W24 x 9 x 84 – 103	W27 x 146 – 539
W24 x 12 3/4 x 104 – 370	
W27 x 10 x 102 – 129	
W27 x 14 x 146 – 539	
W30 x 10 1/2 x 108 – 148	
W33 x 11 1/2 x 130 – 169	
W36 x 12 x 150 – 387*	
W36 x 16 1/2 x 231 – 925*	
W40 x 12 x 167 – 392	
W40 x 16 x 199 – 655	
W44 x 16 x 230 – 335	* most popular shapes

Additional profiles available. Check with local representative for more information.

If I order steel meeting the ASTM A913 specification, does the production process lengthen the lead time?
No. Sections produced in ASTM A913 Grades 50, 65 and 70 have the same availability as indicated in the previous question. The quenching and self-tempering process used to produce HISTAR® and ASTM A913 sections is an in-line process, meaning the steel will not leave the production line to receive the treatment.
As a result, it is an inherently efficient, performance enhancing treatment method and will not adversely affect the delivery time for the material.

Are ASTM A913 sections available from North American stock locations?
Yes. ArcelorMittal carries ASTM A913 Grade 65 sections in stock in North America. The section sizes available from stock are summarized below and in the ArcelorMittal rolling program (see page 3).

W14 x 16 x 145 – 873	W36 x 16 1/2 x 231 – 925
W40 x 16 x 503 – 655	

What are the design rules for columns, beams and connections in A913?
A913 is a referenced standard in the International Building Code; AISC's Steel Construction Manual (AISC 360) and Seismic Design Manual (AISC 341); and CISC's Handbook of Steel Construction.

How does the toughness of A913 compare to other hot-rolled steel grades?
The in-line quenching and self-tempering process results in a very fine grain material, showing a superior toughness when compared with hot-rolled steels without this treatment.

What toughness values are available?
Based on impact tests per ASTM A673, a minimum average CVN value of 40 ft-lbf at 70°F at the flange location is a general requirement of A913. Upon request, a minimum average CVN value of 20 ft-lbf at 70°F in the alternate core location (S30 per ASTM A6) is also available. In addition, A913 can be supplied with CVN values at temperatures as low as -58°F for cold-weather applications. Other test temperatures and impact values are available upon agreement.

Which sections can be delivered according to ASTM A6 Supplementary Requirement S30?
The following profiles are available with CVN values of 20 ft-lbf at 70°F in the alternate core location (S30 per ASTM A6):

W14 x 16 x 211 – 873	upon agreement:
W24 x 12 3/4 x 229 – 370	W12 x 12 x 170 – 230
W27 x 10 x 102 – 129	
W27 x 14 x 146 – 539	
W36 x 16 1/2 x 282 – 925	
W40 x 12 x 235 – 392	
W40 x 16 x 277 – 655	
W44 x 16 x 290 – 33	

How do the residual stresses in A913 compare to other materials?
There will be little to no difference between the residual stresses of a particular profile in A913 and the same profile in a comparable specification.

How does the fatigue behavior of A913 compare to other steel grades?
Full-scale tests of A913 shapes showed a fatigue behavior exceeding the requirements of the codes for comparable steels. Hence A913 is also particularly suited for bridge applications.

How does the fire resistance of A913 compare to other steel grades?
Tests have demonstrated that the fire resistance of A913 is the same as that of other hot-rolled structural grades.

How does the corrosion resistance of A913 compare to other steel grades?
The corrosion resistance of A913 shapes is the same as that of other hot-rolled structural grades.

HISTAR® frequently asked questions (FAQs)

Can A913 be galvanized?
Yes. Upon request, the Silicon limit of A913 can be limited to a range between 0.14 and 0.25 percent making it suitable to be galvanized.

Are heavy plates available in A913?
No. However, heavy plates in Grades 50, 65 and higher are available in other material specifications.

How ductile are A913 Grades 65 and 70?
Based on tension tests per ASTM 370, the minimum elongation percentage for A913 Grade 65 is 15 percent for an 8-inch specimen and 17 percent for a 2-inch specimen. The minimum elongation percentage for A913 Grade 70 is 14 percent for an 8-inch specimen and 16 percent for a 2-inch specimen. These elongation values, in consideration with A913s favorable toughness characteristics, have led to acceptance of these high-strength specifications in seismic design codes.

For A913 Grade 50, what is the maximum YS and YS/TS ratio?
A913 Grade 50 is available with maximum yield strength (YS) of 65 ksi and maximum yield strength to tensile strength ratio (YS/TS) of 0.85, thereby making it comparable to A992 steel and an acceptable alternative for use in seismic applications. This supplementary requirement is available upon request at no additional cost and is identified as S75 per ASTM A913.

How can A913 be used in seismic applications?
Based on its favorable ductility and toughness characteristics, A913 steel is approved for use in AISC 341. Per Section A3.1, A913 Grade 50 material, when specified with Supplementary Requirement S75 (available at no additional cost), can be used in any part of the seismic force resisting system (SFRS) where material of up to 50 ksi yield strength is permitted. Also per Section A3.1, A913 Grade 65 is permitted for use in SFRS members when the member is not expected to yield (i.e. column sections in strong-column, weak-beam applications). Based on approvals received to date, ASTM A913 Grade 70 steel is expected to be included in the 2016 version AISC 341. Similar to A913 Grade 65, the higher yield strength Grade 70 material will be permitted for use in the SFRS in members where the steel is not expected to yield.

How do I weld A913 material?
ASTM A913 is a prequalified weldable material per AWS D1.1. Grades 50 and 65 are weldable without preheating when the product temperature is above 32°F and when using a low-hydrogen electrode (H8) – an advantage that is the result of the material's low Carbon Equivalent (CE%) values compared to other hot-rolled structural steel. For ASTM A913 Grade 70 material, minimum preheat requirements vary from 50°F to 300°F (dependent on thickness), thereby falling in line with other 70 ksi steel available on the market.

...okay, if the conditions of a connection require preheating, is it acceptable to preheat A913 steel?
For all types of steel, complex and highly restrained conditions may require preheating. Oftentimes, this can be avoided by careful coordination of the weld sequencing; however, if the preheat cannot be avoided, no issues should arise from preheating A913 steel.

What electrodes should be used when welding A913 material?
When selecting welding consumables compatible with A913 grades, it is suggested by AWS D1.1 that E70, E80 and E90 electrodes be used when matching weld metal strength is required for Grades 50, 65 and 70, respectively. For locations where undermatching weld metal is permitted to be used, the code recommends using E60, E70 and E80 electrodes.

Can A913 be welded in combination to other grades?
Yes. Per AWS D1.1, however, the minimum preheat temperature applied to a joint composed of base metals with different preheats is required to be the highest of the minimum preheats. Therefore, in connections with mixed metals (i.e. A913 steel combined with A992, A572, A36, etc.) preheat requirements of the other materials may control the welding procedure. Again, preheating the A913 has no detrimental effect.

Is flame cutting of A913 shapes permitted?
Yes. A913 can be cut with a torch using the same procedures applied to any structural steel. due to the low carbon equivalent of A913, preheating in order to prevent cracking is generally not necessary for product temperatures above 32°F.

Can A913 steel profiles undergo flame straightening treatments?
Yes. As with any structural steel it is possible to eliminate deformations or to give an A913 member a special shape by flame straightening. For local reheating of the entire material thickness the maximum flame straightening temperature is 1200°F. For local superficial reheating of the surface only, the maximum flame straightening temperature is 1650°F.

Can stress relieving treatments be performed on A913 steel?
Stress relieving post-weld heat treatment (PWHT) may be necessary when the layout of the structure and/or the expected stress condition after welding requires a reduction of the residual stresses. If stress relieving is required, it should be performed in the same manner as for any structural steel grade. The temperature should range between 980°F and 1080°F. The holding time should be two minutes per mm (1/25") of material thickness, but not less than 30 minutes and not more than 90 minutes.

What can I expect when machining shapes in A913?
A913 can be machined under the same conditions as grades with the same level of yield strength. Drilling and cutting tests on A913 showed no difference in tool wear than for other structural grades of the same strength level. In fact using higher strength steel allows the designer to reduce the size (thickness) of the material and thus to reduce the machining time.

Is there a premium for ASTM A913 sections?
No. With ASTM A913 material you can get all the extra value – high yield strength (up to 70 ksi); outstanding toughness (40 ft-lbf at 70° F, standard for all sections and strengths); and excellent weldability (no preheat for Grades 50 and 65) – at the same price you would pay for 50 ksi material (A992, A572 Grade 50, CSA 40.21 350W).

Applications of HISTAR®

HISTAR®'s outstanding mechanical properties, coupled with its attractive price, enable it to bring value to various elements of a structure's design. Most frequently, high-strength HISTAR® profiles are used to reduce the weight of strength-governed structural elements, including those in gravity systems, long-span trusses, transfer trusses, outrigger systems, belt trusses, seismic force resisting systems and bridge girders. In addition to weight savings, use of HISTAR® can also positively impact fabrication, transportation, handling, and erection. In heavy shapes, for example, the welding time and costs are lowered as thinner members reduce the weld volume and in many situations, the material can be welded without preheat, thereby leading to considerable savings of time and energy.

Typical applications of HISTAR® include:

Gravity columns

When design is not governed by drift or vibration issues, the use of HISTAR® Grades 65 [450] and 70 [485] in gravity columns with reasonable buckling lengths enables the engineer to reduce the weight and cost of their structures. The typical weight savings on a project that incorporates HISTAR® into gravity columns can vary from 10 to 25 percent of the weight of the entire structure.

Long-span trusses

In long-span trusses, HISTAR® Grades 65 [450] and 70 [485] bring the most value when used as tension members, such as the system's bottom chord, or in compression members with short buckling lengths. Employing high-strength HISTAR® steel in trusses can generally result in a 25 percent reduction in weight compared to designs using only 50 ksi [345 MPa] steel. This reduction in weight is a function of the total span-length and the importance of dead loads on the design.

Seismic design

The use of HISTAR® steel allows the engineer to design a moment-frame structure with the economical "strong column – weak beam" concept. HISTAR® Grade 65 [450], and soon Grade 70 [485], is permissible for use in column sections where the steel is not expected to yield. Coupled with 50 ksi [345 MPa] beam sections, this material enables the engineer to efficiently confine plastic hinging to the beam sections.

Bridge girders

When the design of a bridge is not governed by deflection, which is typically the case for those with light loads and/or short spans, the use of HISTAR® Grades 65 [450] or 70 [485] enables engineers to reduce the weight and the cost of the structure. In addition, the use of A913 Grades 50 [345] and 65 [450] make it possible for the fabricator to weld the steel without preheating (minimum 32°F [0°C] with low-hydrogen electrodes).

HISTAR® reference projects

Since its introduction in 1990, HISTAR® has been incorporated into the design and construction of more than 300 projects throughout the world. These projects range from supertall structures including One World Trade Center, The Bow, Shanghai World Financial Center, and Puerta Europa and long-span sports facilities such as Lucas Oil Stadium, Air Canada Centre, and Astana Arena, to aviation facilities, convention centers, industrial buildings, offshore platforms, car parks and bridges. A selection of commissions featuring HISTAR® includes:

High-rise
One Manhattan West, New York
One World Trade Center, New York
Three World Trade Center, New York
Four World Trade Center, New York
Hearst Tower, New York
Hudson Yards, New York
4 Times Square, New York
425 Park Ave, New York
111 South Wacker, Chicago
150 North Riverside, Chicago
151 North Franklin, Chicago
155 North Wacker, Chicago
300 North LaSalle, Chicago
One Grant Park, Chicago
Roosevelt University Wabash Building, Chicago
111 Huntington, Boston
Brickell City Centre, Miami
The Bow, Calgary
Eighth Avenue Place, Calgary
Brookfield Place Calgary
One London Place, London, ON
Bay Adelaide Centre, East and West Towers, Toronto
Hyatt Regency, Seattle
Russell Investments Center, Seattle
Advanced Equities Plaza, San Diego
Emirates Tower, Dubai
Shanghai World Financial Center, Shanghai
New Poly Plaza, Shanghai
Broad J57, Changsha
VietinBank, Hanoi
Puerta de Europa, Madrid
Torre de Cristal, Madrid
Torre Cepsa, Madrid

Hospitality and Entertainment
The Cosmopolitan, Las Vegas
The Palazzo, Las Vegas

Healthcare
Loma Linda University Medical Center, Loma Linda
Simpson Querrey Biomedical Research Center, Chicago
Ann & Robert H. Lurie Children's Hospital of Chicago, Chicago
Prentice Women's Hospital, Chicago
Kaiser Permanente Oakland Medical Center, Oakland
Intermountain Medical Center, Salt Lake City
Cymbaluk Medical Tower at Providence Regional, Everett

Aviation
Boeing 777 Assembly Building, Everett
Qatar International Airport, Doha
Sabiha Gokcen Hangars, Istanbul

U.S. Football Stadiums
Los Angeles Stadium at Hollywood Park, Inglewood
AT&T Stadium, Arlington
NRG Stadium, Houston
Lucas Oil Stadium, Indianapolis
University of Phoenix Stadium, Glendale
The Dome at America's Center, St. Louis
U.S. Bank Stadium, Minneapolis
Mercedes-Benz Stadium, Atlanta

Baseball stadiums
Globe Life Field, Arlington
Marlins Park, Miami
Chase Field, Phoenix
Miller Park, Milwaukee
Safeco Field, Seattle

Arenas
Chase Center, San Francisco
Wisconsin Entertainment and Sports Center, Milwaukee
Moda Center, Portland
Spectrum Center, Charlotte
Sprint Center, Kansas City
Rogers Arena, Vancouver, B.C.
Canadian Tire Centre, Ottawa
Air Canada Centre, Toronto

Convention centers
The Huntington Convention Center of Cleveland, Cleveland
Walter E. Washington Convention Center, Washington D.C.
McCormick Place Expansion, Chicago
Phoenix Convention Center Expansion, Phoenix
Metro Toronto Convention Centre, Toronto
Vancouver Convention Centre, West Building, Vancouver, B.C.
Reliance BKC Convention Center. Mumbai

Industrial
Tesla Gigafactory 1, Sparks, NV
Nucor Steel Decatur, Decatur, AL
Glider Offshore, Gulf of Mexico
URSA Offshore, Gulf of Mexico
Lanxi Power Station, Zhejiang, China
Diandong Power Station, Yunnan, China

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