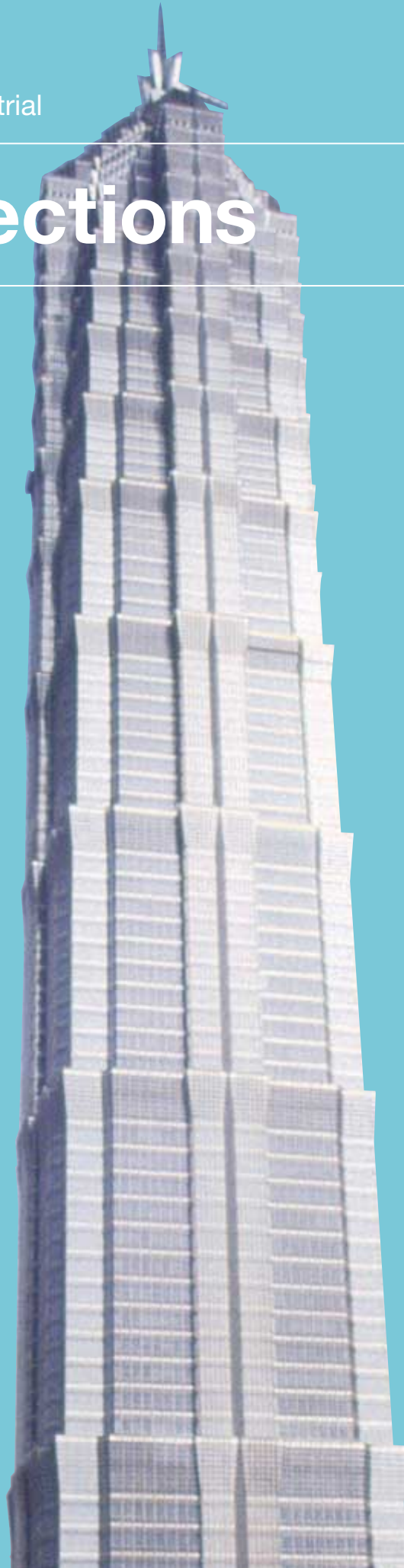


Corus Construction & Industrial

Jumbo sections



Bigger, stronger,

Product knowledge

“Nothing can compare with steel as far as sustainability is concerned”, Dr Stanley Rhodes, Scientific Certification Systems, Oakland USA.

Corus, as one of the world’s leading steel producers, has unrivalled experience in the manufacture and application of jumbo beams and columns. Our in-depth understanding of the total construction process has been rewarded with close working relationships with some of the most prestigious construction firms in the world. As a consequence of this we have supplied material to some of the most celebrated structures around the globe.

Some recent developments that we’ve been involved in include:

- 383 Madison Avenue, New York, USA
- Guangdong Olympic Stadium, Guangzhou (formerly Canton), China
- Jin Mao Building, Shanghai, China
- Petronas Towers, Kuala Lumpur, Malaysia
- Hong Kong Stadium, Hong Kong

Quality as a company

Corus actively undertakes continuous improvement and continually assesses the performance and characteristics of its jumbo range. We offer customers excellent service, backed up with technical support and advice which is available from the enquiry stage right through to the finished construction.

Corus’ manufacturing plants are quality assured to the standards of ISO 9002. This assessment is undertaken by Lloyds Register Quality Assurance Ltd. and, following the award of a certificate, a bi-annual audit is carried out to ensure compliance. We also hold approvals from a range of national certifying authorities.

Manufacturing excellence

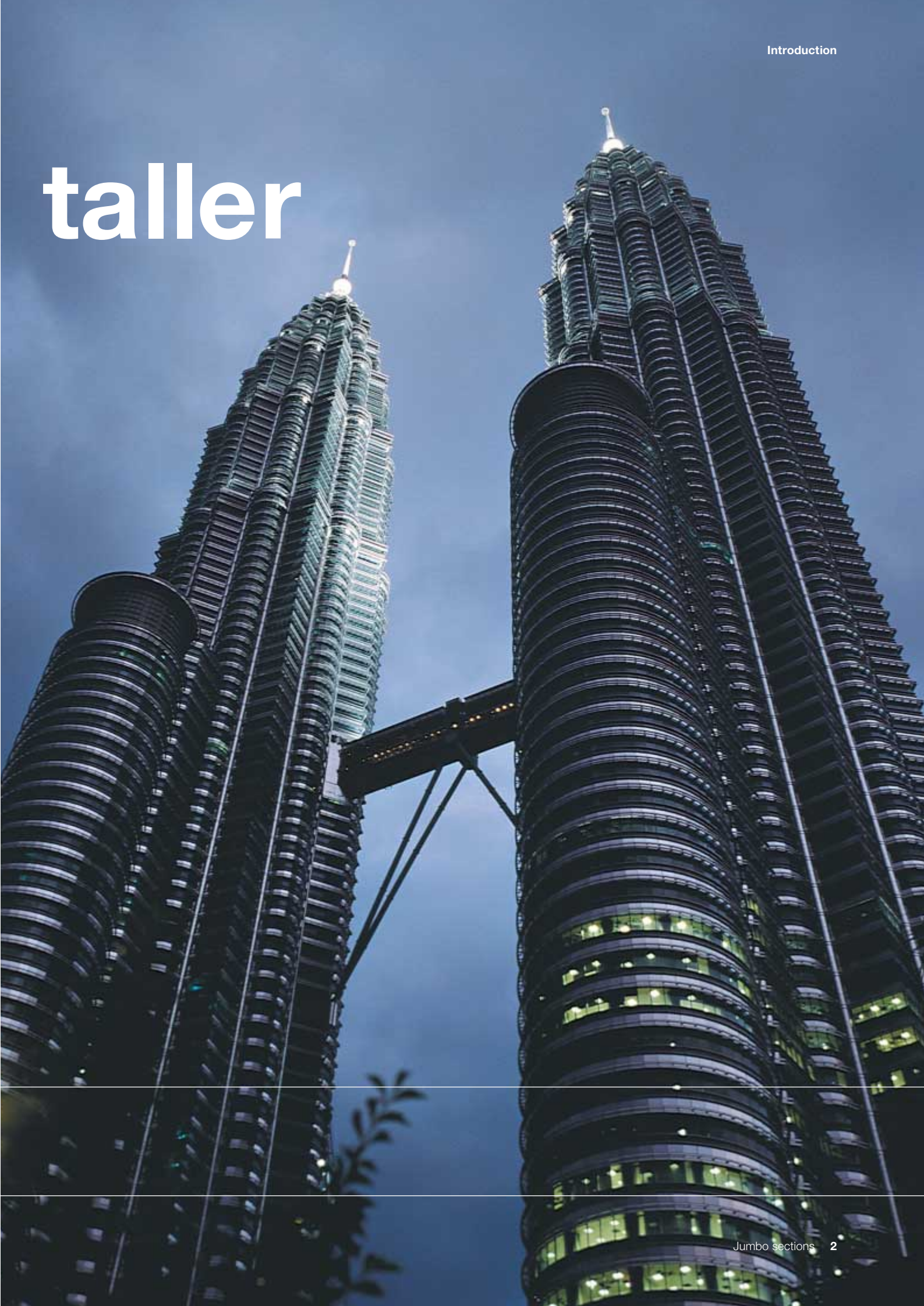
Jumbo sections are manufactured at Teesside Beam Mill, which is located in the north east of England. Through continual investment this has become one of the world’s premier section rolling mills with advanced process control at every stage of production. This, together with automatic gauge control, ensures that products are consistently of the highest quality and dimensional accuracy.

Environmental issues

Steel is one of the world’s most recyclable materials and for this reason environmental management is a high priority within Corus. Its importance is such that it has been integrated into all levels of the Company’s activities. This extends to suppliers and customers, energy emissions, water, noise and by-products. Currently around 80% of our by-products are either recycled or sold.

Far right
Petronas Towers, Kuala Lumpur

taller



“It’s quite simple, if you want to be safe in an earthquake, the best thing you can do is build in steel.”
– Time Magazine.



This page

Jin Mao Building, Shanghai, China

Opposite

383 Madison Avenue, New York, USA

Our successful involvement with landmark construction projects stretches around the globe taking in North America, Europe, the Far East and Australasia. Over the last decade Corus has led the way in the use of jumbo sections for such projects. Their use is not limited to high-rise structures, they are suitable wherever there is the need for increased strength or load bearing capabilities.

The 88-storey Jin Mao Building in Shanghai, China is an excellent example of a multi-use project. Storeys 1-51 are designated as office space while 52-88 house the Grand Hyatt Hotel. The building, which stands at a height of 420m

was designed by SOM of the USA on behalf of the China Shanghai Foreign Trade Centre Co. Ltd. The steel structure was fabricated by Nippon Steel Construction and used 10,000 tonnes of Corus sections.

383 Madison Avenue, New York, USA; this 45-storey, 757-foot high office building, owned by Bear Stearns was constructed for The Turner Corporation Group. The Au Dragon Forge (Canadian Fabricator) contract included the engineering, fabrication and erection of heavy built-up superstructures on a fast-track schedule.

Located in the centre of Manhattan, the building used approximately

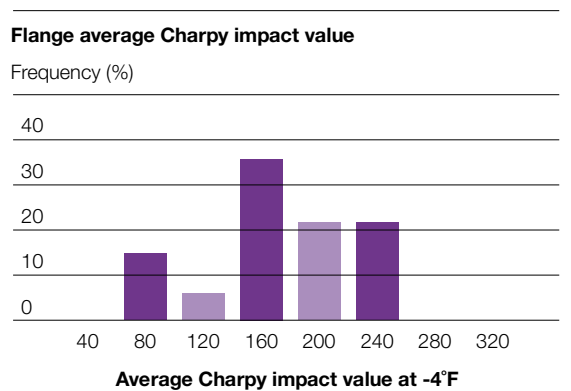
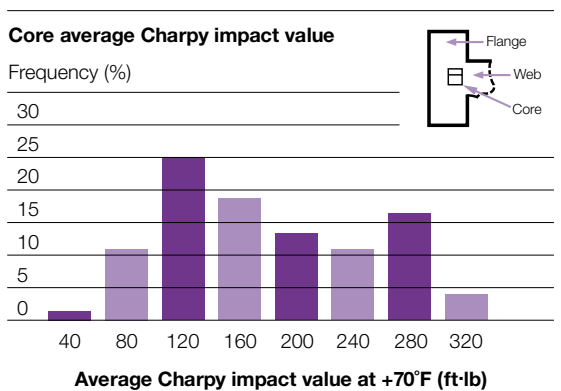
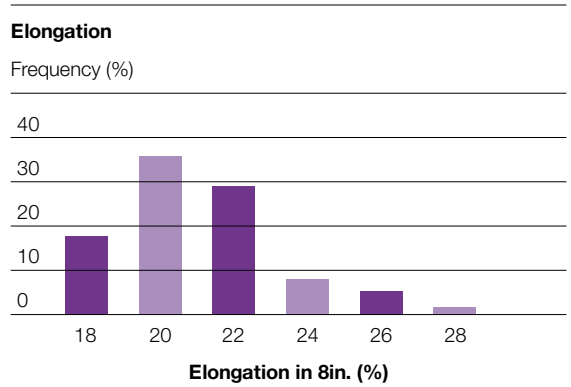
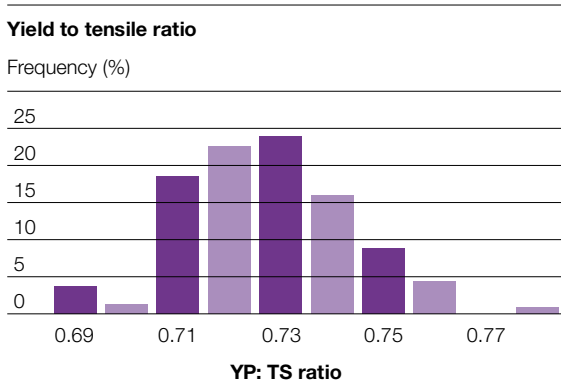
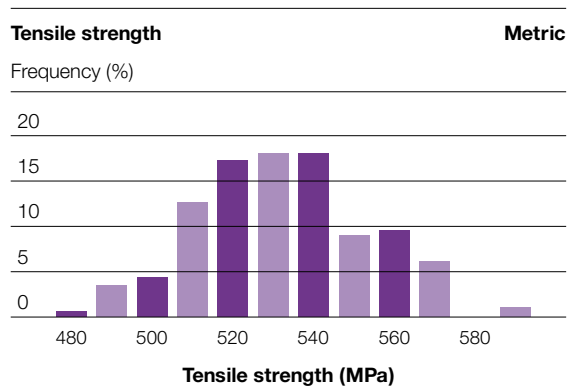
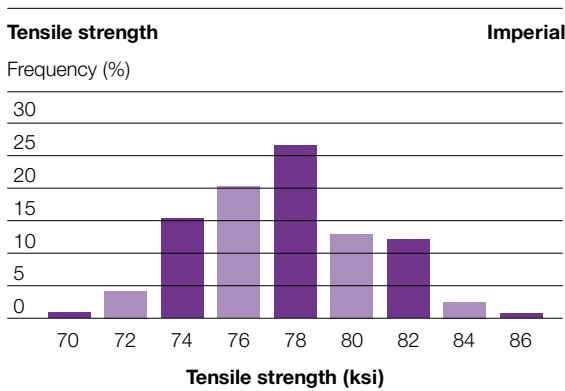
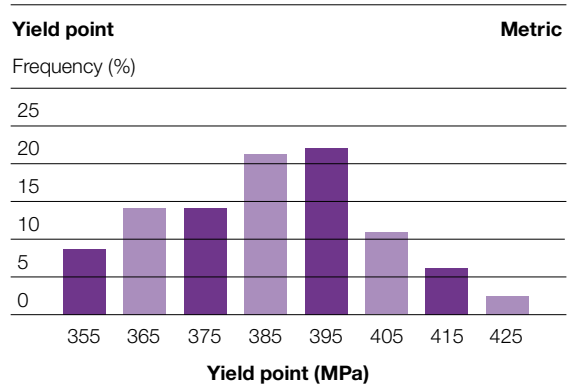
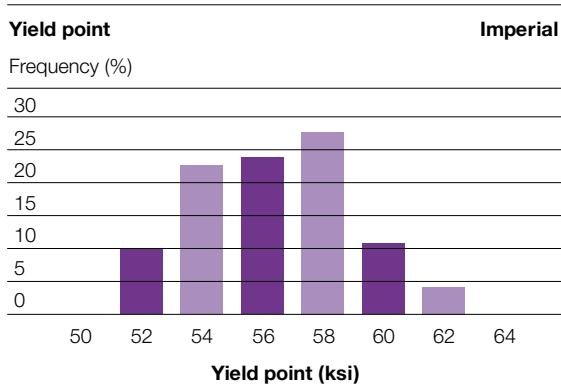
7,860 tonnes of heavy built-up components, including 1455 tonnes of Corus Jumbo sections, and some 10,810 drawings were made for the fabrication and the erection.

The integrated approach met the fast-paced requirements of the project: its completion took a total of 16 months.

Innovative engineering solutions had to be developed for special charge transfers of the building portion cantilever over the New York subway.



Jumbo section properties



Product range

Section sizes

Jumbo sections can be classified according to the table below:

Imperial

	Serial size in	Mass per foot lb	Depth of section D in	Width of section B in	Thickness of web t in	Thickness of flange T in
1	W14 x 16	730	22.420	17.890	3.070	4.910
2	W14 x 16	665	21.640	17.650	2.830	4.520
3	W14 x 16	605	20.920	17.415	2.595	4.160
4	W14 x 16	550	20.240	17.200	2.380	3.820
5	W14 x 16	500	19.600	17.010	2.190	3.500
6	W14 x 16	455	19.020	16.835	2.015	3.210

Metric

	Serial size mm	Mass per metre kg	Depth of section D mm	Width of section B mm	Thickness of web t mm	Thickness of flange T mm
1	356 x 406	1086.0	569.5	454.4	78.0	125.0
2	356 x 406	990.0	549.7	448.3	71.9	115.0
3	356 x 406	900.0	531.4	442.3	65.9	106.0
4	356 x 406	818.0	514.1	436.9	60.5	97.0
5	356 x 406	744.0	497.8	432.1	55.6	88.9
6	356 x 406	677.0	483.1	427.6	51.2	81.5

In addition to the sizes stated above, other heavyweight beams and columns are available. Please contact us for further details.

Requirements for ASTM A992: Standard specification for steel for structural shapes for use in building framing

Tensile strength, min ksi, [MPa]	: 65 [450]
Yield point, ksi, [MPa]	: 50 to 65 [345 to 450]
Yield to tensile ratio, max	: 0.85
Elongation in 8in [200mm], min %	: 18
Elongation in 2in [50mm], min %	: 21
Core Charpy impact	: 20ft·lb [27J] absorbed energy at 70°F [21°C]

Total quality

Corus jumbos can be manufactured in accordance with ASTM A992, A572 and A36 or according to Euronorm specifications. In each case they meet the necessary applicable standards for mechanical properties and chemical composition, surface quality and dimensions. They are based on carefully controlled levels of carbon, manganese, copper, nickel, vanadium and sulphur. For weldability, the Carbon Equivalent Value (C.E.V.) is also maintained within specified limits.

Identification and traceability

Every Corus jumbo section is labelled with a unique barcoded label. This label contains order and product details and allows complete traceability of the section to its cast of origin and rolling history.

Product knowledge

The success of our products is no accident. It is the result of detailed scientific analysis covering raw materials, the process route, the construction process and suitability in use.

Research and development

Corus has played an integral part in the SAC program, (Structural Engineers Association of California, Applied Technology Council and California Universities for Research in Earthquake Engineering), a joint venture which was set up to investigate the performance of materials and systems which are subjected to earthquake loading. Due to this collaboration, Corus has been able to undertake extensive research into the properties of jumbo sections under seismic loading conditions and is fully conversant with the requirements of A992, the standard for "Structural Shapes For Use In Building Framing".

The diagram below shows an example of this type of test being performed.

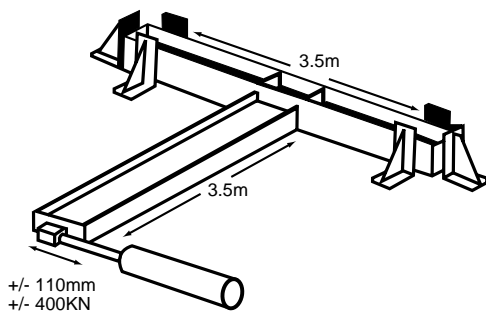


Figure 1: Section cyclic loading seismic test.

As shown in the histograms, Corus jumbo sections comfortably exceed the requirements of A992 for yield and tensile strength. Impact toughness performance at the core position allows us to meet the

supplementary requirements of SX3 of A992 ("Charpy V-Notch Impact Test for Group 4 and 5 Structural Shapes").

Weldability

The steel sections described in this brochure are readily weldable and, due to their low carbon equivalent value, can generally be welded without preheat, provided extra low hydrogen consumables are used.

Figure 2 shows that due to its low carbon content, our steel belongs to Zone 1 and this means that cracking is unlikely. If extra low hydrogen levels are used, preheat need not exceed 65°F (18°C) when restraint levels are low. If welding involves higher levels of restraint or higher hydrogen levels, the minimum preheat and interpass temperatures required can be obtained from Annex XI of ANSI/AWS D1.1-98 or an experienced welding engineer.

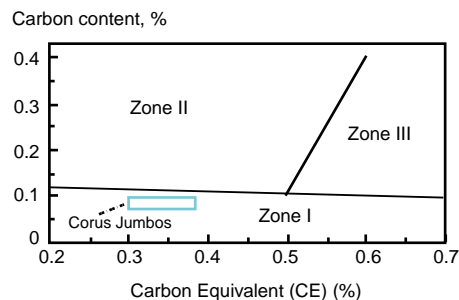


Figure 2: Compositional range for Corus jumbo sections according to ANSI/AWS D1.1-98 guidelines on methods of determining preheat.

Jumbo sections are often welded at the flange face. For example, when joining beams to columns, complete joint penetration welds may be required. For such welds, the toughness of the weld and heat affected zone (HAZ) may be of interest, particularly if there are seismic requirements. The HAZ toughness was determined following the production of a test weld, (as per figure 3), in which a 4in. (120mm) thick plate was welded to the flange face of a 4.9in. (125mm) thick jumbo section using a heat input of 89ft·lb. (3.5kJ/mm).

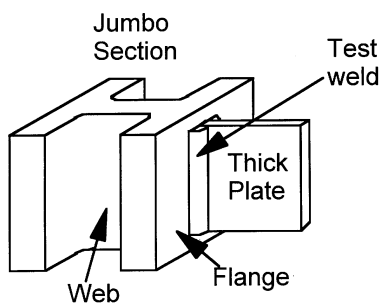


Figure 3: Test weld made on flange face of jumbo section

Due to the low carbon and carbon equivalent value of the steel, the Charpy impact tests made on the HAZ of the test weld showed impact toughness to be very high even at low temperatures. Following some weld failures after the Northridge earthquake, a weld Charpy requirement of 20ft·lb (27J) at -20°F (-29°C) has been suggested as an appropriate service requirement, although there are as yet, no specific HAZ requirements, the values recorded during our tests easily exceed this, (see figure 4).

Welding fabrication specifications sometimes set limits on the maximum hardness levels in the HAZ. Due to the lean composition of this low carbon microalloyed steel, it is not likely to produce high HAZ hardness values. Examples of hardness measurements made on the above test weld show that the peak HAZ hardness in this multipass weld was only slightly above 210 HV, (as per figure 5).

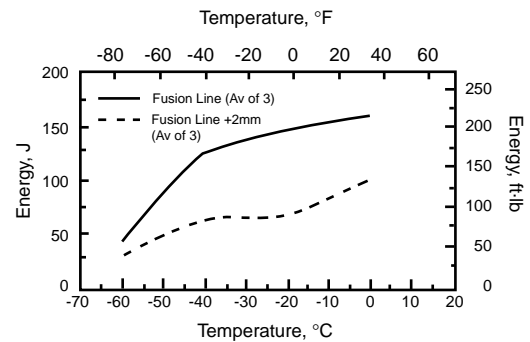


Figure 4: Charpy impact transition curves for the HAZ of a welded section.

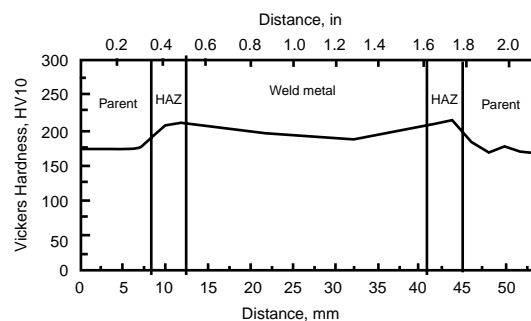


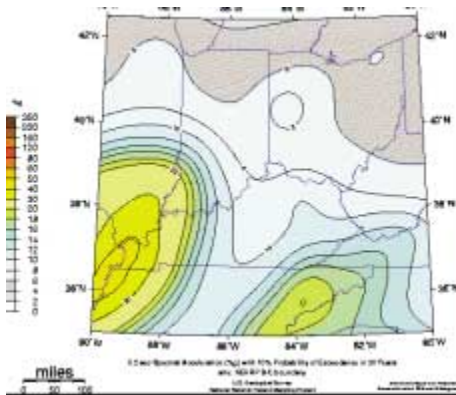
Figure 5: Hardness traverse across welded section.

Structural performance

Further to measurement of the more usual mechanical properties, such as strength and toughness, Corus has taken great interest in the structural performance of its jumbo sections, particularly with respect to their use in seismically active regions. Using the resources of Corus Research, Development and Technology, and in conjunction with our customers, we are able to examine the risks of seismic activity in regions being considered for development.

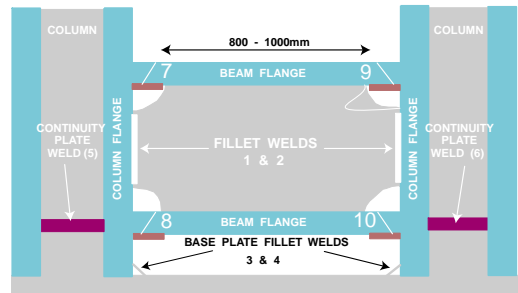
The diagram illustrates the kind of research which might be involved - in this example, regional seismic hazard ratings were provided for a customer who was examining a power station project in Ohio. Using such data we can advise whether core testing is appropriate.

Seismic hazard map

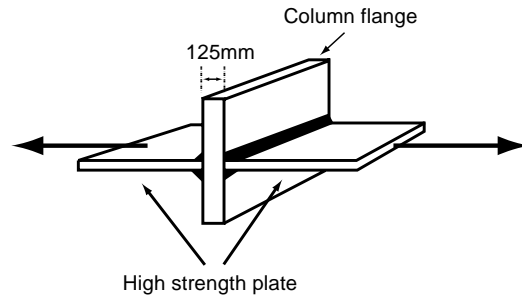


In addition to the SAC project, an extensive research and development programme has been carried out by Corus Research Development and Technology to confirm that Corus jumbos are suitable for fabrication and use in the most severe loading conditions. Various sophisticated tests and investigations have been carried out including:

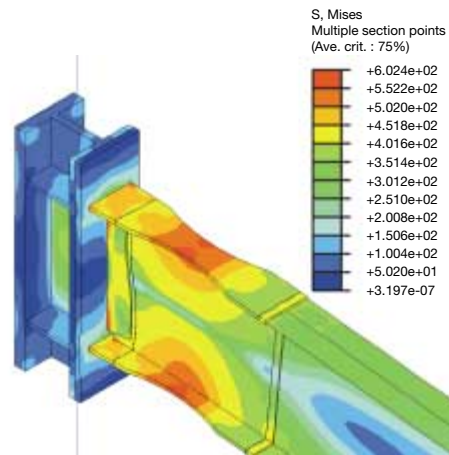
Resistance to tearing during welding



Through-flange thickness fracture



Modelling of stresses in joints



The results from the SAC programme and Corus' own testing have proven that Corus sections should be your first choice for any large scale construction project anywhere in the world.

The next step

Corus can bring a bespoke service to your company. In addition to steel and delivery schedules which are planned and executed to the highest standards, our expertise is equally applicable to the design and product selection stages, and, where required this can include advice on design and on the seismic and metallurgical aspects of construction.

Please contact us if you have any queries about any of the issues raised in this brochure.

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