



STEEL INDUSTRY
GUIDANCE NOTES

Hot Rolling of Open Sections

Hot Rolling is the pre-eminent process for forming open sections for the construction industry in the UK. All sections are produced in serial size groups and are tested at prescribed frequencies to ensure that dimensional accuracy and mechanical properties are maintained.

Hot Rolling of Open Sections

Although the layout of a particular mill may vary the physical processes within the mill are essentially the same.

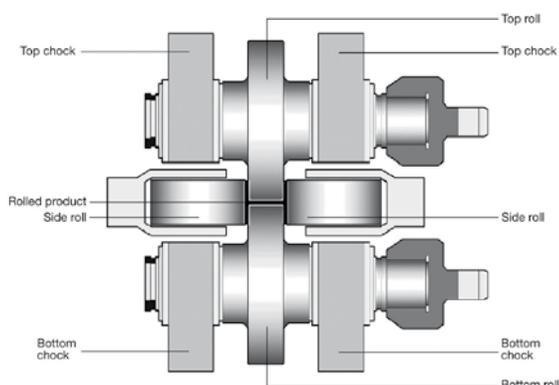
In all hot rolling the rectangular feedstock (billet, bloom or slab) from the steel plant is first heated in a furnace until it reaches a temperature of about 1300°C – at this temperature steel has the consistency of plasticine.

On reaching this temperature the feedstock is discharged onto a roller table and is processed through a series of rolling stands that work the material until the final shape has been achieved (see section below).

After the required shape has been formed the section is allowed to cool before it is straightened, checked for dimensional accuracy, sampled to provide test pieces for the mechanical testing of its properties and cut to the final length required by the customer.

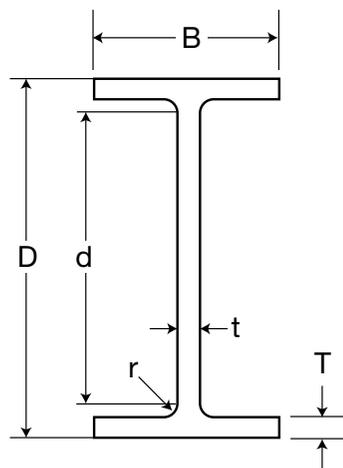
Section Rolling

Sections are formed on a rolling mill comprising pairs of rolls at right angles to each other which can be opened up or closed down to create the desired shape. Clearly the limits on the size of section that can be rolled in a particular mill are governed by the size of the roll stands and the diameter of the rolls themselves.



In principle the rolling process is relatively simple and a typical arrangement of rolls is shown schematically in the accompanying figure.

In the case of an I or H profile, the length and shape of the top and bottom rolls will determine the depth between fillets (d) and the root radii (r) and the spacing between them will define the web thickness (t). Movement of the side rolls will vary the thickness of the flanges (T) of the section.



This simplified process makes it easy to understand how the Corus range of Advance sections has been developed. The serial size of the section is based on the depth between fillets and the range of sections is the result of increased flange and web thicknesses.

Serial Sizes

From the above description it should be clear that the serial size of a section does not fully reflect the actual dimensions of the rolled section. The serial size (by convention) describes the family of sections in terms of depth (D), width (W) and the mass of a section.

For example a UKC 203x203x127 has nominal physical dimensions of

depth(D) = 241.4 mm,

width (B) = 213.9 mm

weight =127.5 kg./m

The nominal dimensions of any product within a given serial size and its associated properties are generally governed by BS4-1:2005 although more bespoke section sizes may be defined.

Tolerances

Owing to the nature of the Hot Rolling process the actual dimension of the sections delivered to a customer are governed by tolerances given in the associated standard.

For example, the tolerances for beams and columns are given in BS EN 10034:1993, whereas for angles the tolerances are governed by BS EN 10056:1993:Part 2.

The purpose of the tolerances is to define an envelope within which an actual measured dimension should fit.

For example on a UKC 203x203x127 the nominal depth (D) is 241.4mm but the permitted deviations say that this

can in practice vary between 245.4mm and 239.4mm without any significant effect on the section's properties.

Testing

Materials must be shown to comply with the EU Directive on Construction Products (CPD 89/106/EEC) if they are to be used on construction projects. CE marking of a product is a declaration by the manufacturer that it complies with all the appropriate provisions of, and the essential safety requirements, embodied in the legislation implementing relevant European Directives.

Typically, open steel sections used in the UK should comply with BS EN 10025:2004:Part 2 – *Technical Delivery conditions for non-alloy structural steels*. This standard specifies not only the mechanical properties that need to be achieved but also the testing frequency (typically 1 test per 40 tonnes of rolled material), which ensures that the test results accurately reflect the material being produced.

For ease of compliance with the EU Directive on Construction Products it is advised that you should specify sections with the CE mark on inspection certificates.

Key Points

1. Hot Rolling is the pre-eminent process for forming open sections for the construction industry in the UK.
2. It should be noted the serial size of a section does not fully reflect the actual dimensions of the rolled section.
3. The actual dimensions of a finished hot rolled section are defined by a combination of the nominal dimensions and the specified tolerances.
4. For ease of compliance with the EU Directive on Construction Products it is advised that you should buy sections with the CE mark on inspection certificates.

Further sources of Information

1. **Advance sections brochure available from www.corusconstruction.com**
2. **Steel Construction...be part of it (Published by BCSA and Corus)**
3. **www.corusconstruction.com**