

**Scope**

This Guidance Note describes the aspects that need to be specified to ensure that the steel material is of the strength and quality presumed when designing in accordance with the design Standard EN 1993-2 (Ref 1).

**General**

EN 1993-2 presumes that steel materials will be supplied in accordance with EN 1090-2 (Ref 2). Clause 5.1 of this European Standard states that structural steel products used for the execution of steel structures shall be selected from the following product standards:

For plates & open sections:

EN 10025 (Ref 3):

- Part 2 – Non-alloy structural steels
- Part 3 - Fine grain structural steels (Normalised / normalised rolled)
- Part 4 - Fine grain structural steels (Thermomechanical rolled)
- Part 5 - Weathering steels
- Part 6 - Quenched & tempered steels

For structural hollow sections:

- EN 10210-1 (Ref 4) - *Hot rolled*
- EN 10219-1 (Ref 5) - *Cold formed*

Where steels complying with the requirements of other specifications are offered, EN 1090-2 requires, in Clause 5.1, that their properties shall be specified. The implication is that the properties can be compared to those of the steels listed above to assess the suitability of the alternative material. For most of the requirements this is a sufficient control to ensure that there will be no problem in their use. However, with respect to weldability, the 'indication' is only the maximum carbon equivalent. As some of the characteristics of a weldment, e.g. the profile or surface finish, are sensitive to the actual chemical composition and/or the particular concentration of certain elements, substitution by steels of a different specification may have unexpected consequences.

**Requirements to be specified**

There are three basic categories of requirements that need to be specified:

- mechanical properties
- dimensional properties
- physical condition

These requirements are covered either in the execution standard (EN 1090-2) and the various supporting standards that it invokes, the client's requirements, such as the SHW (Ref 7), or in the project specification .

**Mechanical properties**

Mechanical properties are simply specified by reference to EN 10025-2, etc. (see GN3.01). These standards include 'Options' relating to the tests for properties, but none of these Options need be explicitly invoked in normal situations.

For some applications, it is necessary to ensure that the material has adequate tensile strength in the 'through thickness' direction. GN 3.02 gives more advice about the subject and makes reference to specification in accordance with EN 10164 (Ref 6).

**Dimensional requirements**

EN 1090-2 specifies a class A tolerance on plate thickness, except for EXC4, for which it specifies class B. In the UK, class A is considered appropriate for all execution classes - see the SHW, Clause 1805.3.2. It should not be necessary to specify any other project-specific tolerances on other dimensional tolerances. Such matters are covered by the various standards invoked elsewhere

Nevertheless, it is prudent to be aware of these tolerances when designing, particularly in the design of connections. The tolerances on plates do not usually give problems, although extremely unfavourable combinations of tolerances on thick plates can give steps at bolted joints that are outside the allowable assembly tolerances and which may need additional packings. Problems are more common with rolled sections, both open and closed; if rolled sections are to be butted end-to-end, for example, the only practical solution is to try to secure all the material from a single source and rolling.

**Physical condition**

Unless there are particular requirements for a superior surface finish quality, there should be no need to make any additional reference to any other option for new material supplied by a manufacturer. The relevant European Standard is EN 10163 (Ref 9), which is explicitly referenced in the standards for technical delivery conditions. The SHW,

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Clause 1805.3.3 is clear that for most cases the surface condition shall comply with Class A3 (for flat products) and Class C3 (for sections) to EN 10163.

Sometimes, however, a proposal is made to use old material, from a stockholder or from the fabricator's own stock, which has become rusty. Commonly this arises from the requirement to provide a small amount of material of uncommon thickness. Inclusion of the following wording in the SHW, Clause 1805.3.3 prevents the use of material with excessive corrosion or pitting:

“Steel with pitted surfaces, i.e. rust grades C and D according to BS EN ISO 8501-1:2007 shall not be used.”

The issue here is that it is difficult to remove the corrosion products from the deepest pits; such residues often lead to the premature breakdown of the protective treatment.

EN 1090-2 and the SHW requirements cover all that is necessary and ensure that surface defects, which arise in the rolling process, are treated in accordance with the standards designated in Clause 5.1. Note that the SHW, Clause 1805.3.3 generally specifies sub-class 3 to EN 10163, which prohibits repair of defects by welding; this avoids the risk of repaired areas occurring in fatigue-sensitive locations.

GN 3.05 and GN 3.06 are relevant to surface and internal defects in steel materials, as supplied, and should be consulted.

### Inspection and testing

EN 1090-2 and the SHW cover all the normal requirements for inspection and testing of the finished product. This includes such things as the marking for different grades, testing for internal defects to the appropriate level in EN 10160 (Ref 10) and the requirements for the manufacturer's inspection certificate in accordance with EN 10204 (Ref 11).

When material is procured from a reputable manufacturer, so long as it is ordered correctly, all these matters will be available for checking. If however, a request is made to use material from a stockholder or unknown or non-approved source, it will be necessary to require inspection, testing and certification in accordance with the Standard. Certificates

of Conformity seldom contain much, if any, of the detailed information that should be available.

### References

1. EN 1993-2: 2006, Eurocode 3: Design of steel structures – Part 2: Steel Bridges
2. EN 1090-2: 2008+A1:2011, Execution of steel structures and aluminium structures - Part 2: Technical requirements for steel structures.
3. EN 10025: 2004, Hot rolled products of structural steels.  
Part 1: General technical delivery conditions.  
Part 2: Technical delivery conditions for non-alloy structural steels.  
Part 3: Technical delivery conditions for normalized/normalized rolled weldable fine grain structural steels.  
Part 4: Technical delivery conditions for thermomechanical rolled weldable fine grain structural steels.  
Part 5: Technical delivery conditions for structural steels with improved atmospheric corrosion resistance.  
Part 6: Technical delivery conditions for flat products of high yield strength structural steels in the quenched and tempered condition
4. EN 10210-1:2006, Hot finished structural hollow sections of non-alloy and fine grain structural steels. Part 1: Technical delivery requirements.
5. EN 10219: 2006, Cold formed welded structural sections of non-alloy and fine grain steels. Part 1: Technical delivery requirements.
6. EN 10164: 2004, Steel products with improved deformation properties perpendicular to the surface of the product. Technical delivery conditions.
7. Manual of Contract Documents for Highway Works (MCHW). Volume 1: Specification for Highway Works. Series 1800 Structural Steelwork. August 2014, TSO.
8. EN 10029:2010, Specification for Tolerances on dimensions, shape and mass for hot rolled steel plates 3 mm thick or above..
9. EN 10163, Delivery requirements for surface conditions of hot-rolled steel plates, wide flats and sections (Parts 1 to 3, 2004)

10. EN 10160: 1999, Ultrasonic testing of steel flat plate product of thickness equal to or greater than 6 mm (reflection method).
11. EN 10204: 2004, Metallic products. Types of inspection documents.