



STEEL INDUSTRY
GUIDANCE NOTES

Execution of Steel Structures

The European standard for the fabrication and erection of steel and aluminium structures (**BS EN 1090-2: 2008 'Execution of steel structures and aluminium structures Part 2: Technical requirements for the execution of steel structures'**) was published by the British Standards Institute (BSI) on 31st December 2008.

This Standard will supersede several existing Standards, such as BS 5950-2 (Buildings), BS 5400-6 (Bridges) and part of BS 8100 (Towers and Masts). It has a very wide scope of application and requires specifiers to make a series of project or application-specific decisions before execution (fabrication and erection) can commence. This Standard introduces a number of new concepts which will be unfamiliar to most designers and specifiers. A description of these new concepts is given in the national foreword to BS EN 1090-2 and is briefly outlined below.

Execution Class

BS EN 1090-2 introduces the concept of Execution Class. There are four execution classes which range from Execution Class 4 which is the most onerous through to Execution Class 1 which is the least onerous. Each Execution Class contains a set of requirements for fabrication and erection and these requirements may be applied to the structure as a whole, an individual component or a detail of a component. Those items which are dependent on the choice of Execution Class are itemized in Annex A.3 of BS EN 1090-2.

It is a design decision for the specifier to select the Execution Class required for the structure, an individual component or a particular detail of a component. The main reason for giving four execution classes is to provide a level of reliability against failure that is matched to the consequences of failure for the structure, the component or the detail. Execution Class is widely used throughout the Standard as a reliability differentiator for providing choice of quality, testing and qualification requirements.

Determination of Execution Class

Annex B of BS EN 1090-2 recommends that the choice of Execution Class is based on the 'service category' (SC) (SC1 – quasi-static, SC2 - fatigue) and the 'production category' (PC) (method of fabrication, PC1 or PC2 where structures/components/details in PC2 are more difficult to produce than those in PC1). Most steel structures in the

UK will include components in both production categories and most will be in SC1 (static) unless they are designed for fatigue (in which case they will be in SC2). Thus the default execution classes are likely to be:

**Execution Class 2 –
Building structures/components/details**

**Execution Class 3 –
Bridge structures/components/details**

Weld Quality Levels

For structures/components/details that are designed for fatigue additional requirements to those given in BS EN 1090-2 are required. This is because the simple choice between SC1 (for quasi-static) and SC2 (for fatigue) does not sufficiently discriminate the required weld quality levels in terms of fatigue classes.

Further information on weld quality levels is given in the national foreword to BS EN 1090-2 which refers the reader to the following Standards:

PD 6695-1-9, *Recommendations for the design of structures to BS EN 1993-1-9*

PD 6705-2, *Recommendations for the execution of steel bridges to BS EN 1090-2*

BS EN ISO 5817, *Welding – Fusion welded joints in steel, nickel, titanium and their alloys (beam welding excluded) – Quality levels for imperfections*

Tolerances

BS EN 1090-2 is more complicated than the British Standards that it supersedes in its approach to specifying permitted geometrical tolerances. BS EN 1090-2 defines the following three types of geometrical tolerance:

1. Essential tolerances that are essential for the mechanical resistance and stability of the completed structures and which are used to support CE Marking to BS EN 1090-1;
2. Functional tolerances required to fulfil other criteria such as fit-up and appearance;
3. Special tolerances that may be specified for project-specific reasons and which would need to be clearly defined in the execution (fabrication and erection) specification.

Two classes of functional tolerances are given. Class 1 which is the less onerous tolerance is the default for routine fabrication. Tolerance class 2 will require special and more expensive measures in fabrication and erection.

CE Marking

The relevant European harmonised Standard for CE Marking fabricated steelwork is EN 1090-1 Execution of steel structures and aluminium structures – Part 1 Requirements for conformity assessment of structural components. This harmonised Standard is due to come in to force in August 2009 and will become mandatory in most European countries in July 2011.

BS EN 1090-2 is not a harmonised Standard but it supports the application of EN 1090-1 by providing the technical requirements relevant to the manufacture of steel components. With respect to CE Marking the relevant clauses of BS EN 1090-2 are as follows:

- Documentation (clause 4 and Annex A)
- Constituent steel products (clauses 5, 12.1 and 12.2)
- Geometrical tolerances (clauses 11 and 12.3 and Annex D)
- Welding and other fabrication operations (clauses 7, 6 and 12.4)
- Surface treatment for corrosion protection and durability (clauses 10, 12.6 and Annex F)

Further information on CE Marking of structural steelwork can be found on the 'Guide to the CE Marking of Structural Steelwork' published by BCSA.

Publications

To help specifiers the British Constructional Steelwork Association and the Steel Construction Institute are updating the National Structural Steelwork Specification (Black book) to take account of the requirements given in BS EN 1090-2 and the forthcoming CE Marking standard for fabricated steelwork, BS EN 1090-1. The Model Project Specification for the Execution of Steelwork in Bridge Structures together with the Guidance Notes on Best Practice in Steel Bridge Construction are also being updated. All of these publications will be available later this year.

Key Points

1. The new European Standard for the fabrication and erection of steel structures was published by BSI on 31st December 2008 and will eventually replace existing national Standards such as BS 5950-2, BS 5400-6 and parts of BS 8100.
2. The new Standard introduces the concept of Execution Class. There are four execution classes ranging from Execution Class 4 which is the most onerous to Execution Class 1 which is the least onerous.
3. It is a design decision for the specifier to select the Execution Class required for the structure, an individual component or a particular detail of a component.
4. The default execution classes are:
 - a. Execution Class 2 – Building structures/ components/details
 - b. Execution Class 3 – Bridge structures/ components/details
5. For structures/components/details that are designed for fatigue additional requirements to those given in BS EN 1090-2 are required.
6. BS EN 1090-2 defines the following three types of geometrical tolerance:
 - a. Essential tolerances
 - b. Functional tolerances
 - c. Special tolerances
7. The National Structural Steelwork Specification for buildings and the Model Project Specification for the Execution of Steelwork in Bridge Structures are being updated to take account of the requirements in BS EN 1090-2.

Further sources of Information

1. **BS EN 1090-2: 2008 'Execution of steel structures and aluminium structures Part 2: Technical requirements for the execution of steel structures'**
2. **Guide to the CE Marking of Structural Steelwork, BCSA Publication No. 46/08**
3. **National Structural Steelwork Specification for Building Construction (CE Marking Edition) – BCSA and SCI publication. In preparation, title subject to confirmation.**
4. **Model Project Specification for the Execution of Steelwork in Bridge Structures, published by the SCI. In preparation.**
5. **Guidance Notes on Best Practice in Steel Bridge Construction, published by the SCI. In preparation.**