



STEEL INDUSTRY
GUIDANCE NOTES

Temporary Bracing

It is the obligation of the designer who is responsible for the overall stability of the structure to have in mind a suitable and safe sequence of construction for all structural elements. This means that as the design develops, the design basis for the steel erection method should be devised, recorded and kept under continual review to ensure that there is at least one safe method of erection. Clause 9.3.1 of BS EN 1090-2 lists the items that need to be kept under continual review, which should ensure that the design basis method of erection is not invalidated by constraints imposed during development of the Principal Contractor's chosen sequence of work.

It is essential to be clear about who is responsible for the overall stability of the structure. This is the frame designer. If the frame is of steel or composite steel and concrete construction, the identity of the frame designer should be clear to the Steelwork Contractor. This could be the Steelwork Contractor himself. Otherwise it would be the Engineer who reviews and accepts the Steelwork Contractor's detail drawings and erection method statement (as defined in the NSSS).

For more straightforward structures, the Engineer may simply refer to BCSA guidance as the basis for safe erection provided these are suitable and there are no critical issues that are not apparent from the information issued and no design features that would create an unusual hazard during construction. For instance, the designer would need to define the sequence envisaged if this requires temporary support for members until ties can be post-tensioned.

Even in the absence initially of clarity from the Engineer concerning his design basis method of erection, the Steelwork Contractor has an unambiguous obligation to develop and use a safe method of erection. This construction method statement may build on the design basis method (if available), but may differ – which is the reason why the Steelwork Contractor's chosen needs to be reviewed and accepted by the Engineer.

Even if the steelwork does not rely on other construction elements for its stability, the Steelwork

Contractor's construction method statement may require the use of temporary bracing to ensure the stability of a steel structure during the erection phase. If so, the Steelwork Contractor needs to undertake the design of this temporary bracing during the development of his erection method statement. This design information should accompany the erection method statement sent for review and acceptance by the Engineer, but it remains the Steelwork Contractor's full responsibility to undertake his erection operations safely.

The situations that lead to greater complication are those where the responsibility for stability during construction is split between the Steelwork Contractor and other parties. Five situations may be envisaged:

Case 1: The stability during steelwork erection depends on other permanent features already built, such as stair cores;

Case 2: The final stability of the steelwork depends on other permanent features yet to be built, such as concrete shear walls;

Case 3: The overall construction sequence requires the provision of temporary bracing in lieu of permanent vertical bracing that has to be omitted to provide access for other contractors;

Case 4: The stability of other permanent features yet to be built, such as shear walls, depends on the as-erected steelwork;

Case 5: The stability of the as-erected steelwork could be jeopardised by subsequent actions of other contractors, such as high or localised construction loading from material stacking.

In all these cases, the designer who is responsible for the overall stability of the structure plays the key role. This would rarely be the Steelwork Contractor. It may often be the Engineer. However, the Principal Contractor has a primary duty to ensure that all construction operations are undertaken safely. Hence, the duty of coordinating method statements (which is the mechanism for ensuring consistency) and safe handovers between contractors falls to the Principal Contractor – who is obliged to consider stability during construction. This will require the Principal Contractor to identify and seek advice from the designer responsible for the overall stability of the structure.

It is Case 2 that causes the most problems for the Steelwork Contractor as this will require the provision of temporary bracing during steelwork erection which cannot then be removed until the necessary permanent features are eventually built. In such cases, it is essential that the Principal Contractor ensures that the designer who is responsible for the overall stability of the structure provides a suitable design basis method of erection for the steelwork. In this case it would be this designer's obligation to

specify in his design basis method of erection where and what type of temporary bracing or restraints are necessary, and the conditions for their eventual removal.

In effect for Case 2, the temporary bracing may be viewed by the Steelwork Contractor as part of the permanent works initially required – albeit for a transient period. Hence, just as with permanent works members, the designer needs to specify:

- The type of temporary restraints required; and
- The forces and moments in them.

Its eventual removal should be subject to a separate instruction from the Principal Contractor, who has the duty to ensure (under advice from the designer) that it is timely and safe to remove the temporary bracing.

The Steelwork Contractor has the usual obligation to develop his safe construction method statement for the “initial” requirement including the specified temporary bracing. Separately he has a duty to develop a safe method for removal of the temporary bracing. As the structure after removal of the temporary bracing is in essence the permanent structural works, responsibility for its stability would not lie with the Steelwork Contractor.

Key Points

1. It is the Principal Contractor's duty to identify the designer who is responsible for the overall stability of the structure, and to seek his advice concerning the safety of construction methods to be employed.
2. It is the Steelwork Contractor's duty to undertake his erection operations safely.
3. It is not excusable for the Steelwork Contractor to proceed if key safety information on the design basis method of erection is absent; as it is the Principal Contractor's duty to ensure that it is provided.
4. If the final stability of the steelwork depends on other permanent features yet to be built, then the design of any necessary additional “temporary” members should be viewed as if they are permanent members required for a transient period.

Further sources of Information