**Construction of Steel Structures**

The following erection sequence and method are typically used:

The Sequence of **Erection for Steel Structures**

**Stage 1:**

The sizes and precise placements of the holding-down bolts on the foundation and base plates are double-checked before the steelwork erection gets started. Following these examinations, the subsequent actions are taken:

Put the base plates under the columns.

Properly align the columns for straightness and plumpness.

Maintain the required grout space between the bottom of the base plate and the foundation by adjusting the holding-down bolts under the base plate with adjustable screws.

Use temporary bracings to maintain the columns’ vertical alignment and stop them from tipping over.

When the stanchions or columns are long, they are erected in sections and connected on-site.

### Stage 2:

Put in place each rafter’s middle section. The entire section may be erected in one piece following fabrication on the ground when trusses are to be employed.

To complete the structural frame, fasten the truss to the ends of the columns using bolts.

### Stage 3:

Install vertical column bracing and roof bracing to secure the complete structure after final alignments and frame positioning changes.

### Stage 4:

Secure all roof purlins and sheeting rails to the framework using bolted connections.

### Stage 5:

Construct gantry crane girders (for warehouses and commercial structures) if necessary.

### Stage 6:

Mount the overhead cranes on the crane girders where required.

### Stage 7:

Install the top and side panels.

### Stage 8:

Once the erection is finished, [fill the base plates’ undersides with non-shrinking grout.](https://themethodstatement.com/method-statement-for-non-shrink-grouting/)

The erection mentioned above sequence is followed by normal construction. In the case of exceptional constructions, a special sequence should be followed after creating an erection program.

## Lifting of Steel Members

Although alternative methods may be utilized for steel bridge construction, cranes and mobile elevating work platforms (MEWPs) are commonly used for the erection of steel structures. Cranes can be divided into two groups: mobile cranes and non-mobile cranes. The first category includes truck-mounted cranes, crawler cranes, and all-terrain cranes, while the second category includes tower cranes.

## Lifting a heavy steel part with a crane

The required number of crane lifts defines the average erection rates and, as a result, the site work schedule. The number of crane lifts should be minimized using pre-assembled units to the fullest degree practicable. Precast concrete units, which require a crane for each individual placement, are preferable to steel decking, which can be built by hand if crane availability is a concern. The number of lifts required and, consequently, the erection time can be estimated by the designer using a “piece count.”

## Plumbness and alignment

Collaboration between the site engineer, who utilizes a survey tool, and the erection crew, who [tightens and shimmies the last bolts](https://themethodstatement.com/method-statement-for-bolt-tightening/), is required for lining, leveling, and plumbing. Using wedges, jacks, pull-lifts, and specialized pulling tools like Tirfors, the erection crew convinces the frame to move to a position the checking engineer may approve of before securing it with bolts. As a result of this process, some misalignments are removed, and some are created. Local changes are made if the latter is adverse.

## Connections

### Embedded Connections

Bolted connections are preferred over site welding because they are quicker, less weather-sensitive, have fewer access constraints, and require fewer inspections.

In the UK, structural bolting operations (for buildings) commonly employ property class 4.6 and 8.8 non-preloaded bolts to BS EN 15048 in 2 mm clearance holes. The recommended solution, M20 8.8 fully threaded bolts, is commonly available. When 12 mm or 16 mm bolts may be used alternatively, bolts with property class 4.6 are normally only utilized to fix lighter components like purlins or sheeting rails.

### Steel beam bolting at the site

Fully threaded bolts are commonly given, implying that a single bolt size can be used for various connections. M20, 8.8 fully threaded bolts measuring 60 mm in length are recommended since they can be utilized to make about 90% of fundamental connections.

Preloaded bolts should only be utilized where the possibility of dynamic loading exists or when the relative movement of linked parts (slip) is unacceptable.

Using different-grade bolts with the same diameter on the project is best avoided. Washers are not required for strength with non-preloaded bolts in ordinary clearance holes. When possible, corrosion-resistant coatings that do not require further protection on-site should be provided with bolts, nuts, and washers.

**Welded Connections**

Site welding is often avoided if bolted connections can be made. Offering protection from inclement weather and easy access for welding and inspection is essential when using site welding. Giving such protection and access may have program repercussions in addition to additional financial considerations.

**Erection Handover**

The erection process’s final objective is to hand over the frame to the following trades in good functioning order. The most important factor, in this case, is the erected frame’s positional accuracy, which depends on knowing how a steel frame’s erected position is controlled.

A big structure with a large number of relatively thin and flexible components is referred to as a steel-framed structure. With components that can be manufactured with greater variability than 1 part in 1000 separately, finished construction is intended to have plum and line accuracies of roughly 1 part in 1000.

The real location of the structure is also affected by deformations like the flexure of the structure under the self-weight of steel.

**Quality Control**

Under an [inspection and test plan](https://themethodstatement.com/inspection-and-test-plan-itp/), tests carried out after a built steel structure was handed over might be considered final. The following information is required for all tests in order for them to have any value:

* The Testing Procedure
* Location and frequency of the test
* Acceptance Criteria
* What to do if the compliance criteria are not met