Fabrication Procedure For Steel Structure

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1. Purpose

To ensure that all phases of structural steel fabrication undertaken by the Company is managed and that workmanship meets Client requirements.

2. Reference

- AWS D1.1
- EN 1090
- Project Specification

3. Procedure

3.1 Documentation for Field Fabrication

In accordance with the project distribution matrix, the Project Engineer receives copies of any or all of the following documents from Document Control following their "release" or "issue for construction":

- drawings
- specifications
- procedures and work instructions
- project management plan (Quality Plan)
- inspection and test plan/s.

The production Engineers resolves any documentation queries with Document Control and the Project Manager.

The Project Engineer consults the Welding Engineer regarding welding procedure requirements.

Where the Company's fabrication facilities are remote from the project office, the Project Engineer completes a Fabrication Request, and forwards it and copies of the drawings, specifications, weld procedures, ITPs and other relevant documentation and, where appropriate, a copy of the fabrication schedule with all subsequent updates to the Supervisor.

3.2 Documentation Review

The Supervisor reviews the work request and attached documents or purchase order as applicable to ensure that:

- appropriate manpower is available
- equipment is available
- inspection, testing and measuring equipment is available
- materials are available or require ordering
- Identification, traceability, NDT, etc requirements are identified.

Where a fabrication request is issued and following the review, the Supervisor endorses it and returns a copy to the originator as confirmation that the work will proceed.

3.3 Calibration

Employee owned measuring equipment is accepted as purchased, provided that it is in good working order and is confirmed as being manufactured to a recognised national standard. The Supervisor may verify the accuracy of measuring equipment at any time throughout the duration of the work, using Company master equipment of known accuracy.

Company supplied inspection, measuring and test equipment is calibrated in accordance with Procedure for Calibration Control.

3.4 Materials

Incoming materials for fabrication are received, inspected, identified and issued in accordance with Procedure for handling, storage, traceability of materials.

The Warehouse Supervisor stores the materials in designated lay down areas, racks, bins, bays etc immediately following receipt or relocates them from the warehouse to the area designated by the Supervisor.

Un-approved materials shall be marked clearly and separated from other materials immediately.

3.5 Fabrication Planning

3.5.1 General

Once the Supervisor receives the drawings they are stamped as follows:

- one set marked "ISSUED FOR FABRICATION"

3.5.2 Traceability

Where materials traceability is required, the Quality Manager in conjunction with the relevant Supervisors establishes the level and method of traceability which is maintained and controlled to satisfy contract/client requirements.

Traceability may be achieved by any of the following:

- recording information on the item/s only
- recording information on the item/s and drawings
- recording information on specific traceability records only
- a combination of any of the above

Generally, the Welding Traceability Record and the Materials Traceability Record are used.

3.5.3 Material Identification

Where fabrication markings, transfer of identification, and inspection and test status need to be shown on materials or fabrications the following are used:

a) Markers

b) Hard stamps (low stress where necessary) for carbon steel materials

c) Colored spray paints or colored ribbons

3.5.4 Inspection and Test Status

Inspection and test status during fabrication is identified by the use of the colour codes listed below:

Green - Assembly /fit up/Welding acceptable

Yellow - Repair items

Red - Hold/quarantine

Hold/Quarantined items shall be moved from the shop yard immediately.

3.6 Cutting

If not already prepared by the Drawing Office, the Supervisor prepares a Material Cutting Sheet/s for each drawing or for a particular type/grade/size of material. Where cutting sheets are prepared for each drawing, the drawing may be attached to the cutting sheet for reference purposes and/or for recording the material traceability information directly onto the drawing.

The Supervisor verifies materials to be cut are of the correct size, grade and where applicable component code as described on the material cutting sheet and issues it for cutting to the Material Cutter. The Material Cutter transfers a combination of the following prior to cutting:

- unique number or symbol identifier
- heat number or symbol identifier
- drawing number
- Piece number.

On small items this information may be recorded by the Material Cutter on the material cutting sheet instead.

If traceability is required, the Material Cutter transfers the unique/heat/symbol numbers to offcuts.

3.7 Welding Consumables

All consumables for SAW and GMAW are handled and stored in accordance with manufacturer's recommendations.

- On delivery, packets are inspected for damage.
- Where traceability is required, batch numbers are verified as complying with consumable certification.
- unopened packets are stored in a dry place

3.8 Assembly/Fit Up

On completion of assembly/fit up the Q.C Inspector visually and dimensionally inspects each item in accordance with the drawings. If the drawings or other Client specifications do not include dimensional tolerances the relevant industry standards apply. When accepted the item is sprayed with green paint or tagged with green ribbon indicating assembly/fit up "acceptable ".

3.9 Welding

Welders and welding procedures (WPS) are qualified in accordance with project Procedures & Q.C Dep. Welders only work on items marked with green identification in accordance with the qualified and approved welding procedure specifications (WPSs). The Supervisor displays the applicable WPSs at the welding shop or notice board.

On completion of the welding, the Q.C Inspector performs a visual inspection to confirm Weld acceptance. When accepted the item is sprayed with yellow paint or tagged with Yellow ribbon indicating “welding visually acceptable”, and may be non-destructively tested and/or checked for final inspection.

If welding traceability is required:

On completion of the weld, the Welder marks (generally in white ink) their welder number, consumable symbol used adjacent to the weld. The Supervisor checks the completion of the weld and marks the weld number in white ink.

3.10 Non-Destructive Testing

Where required by contract non-destructive testing (NDT) is performed by subcontractors at the fabrication site. The drawings or specifications indicate the method and extent of NDT. If this is not shown the information is provided by the Project Engineer. The Q.C Inspector indicates which welds are to be examined by NDT.

The Inspector or Supervisor:

a) Enters the welding information for the shift and the NDT requirements on the Welding Report/NDT Request

The NDT MANS:

a) Performs the NDT as requested
b) Enters the result and the NDT report number on the copy of the welding report/NDT
c) Advises the production Supervisor of the details of repairs required
d) Returns the completed welding report/NDT to the Q.C Inspector or Supervisor
e) Forwards the NDT report to the Q.C Dep. /Inspector or Company

3.11 Weld Repairs

The Q.C Inspector sprays red paint or applies to any welds which have failed NDT indicating "repair required". The Inspector identifies the area of weld requiring repair, if not a cut out, from information noted on the NDT report.

NDT of the repaired weld is carried out in accordance with Section 3.10 where applicable. The Q.C Inspector enters records of each repair into N.D.T report.

3.12 Final Inspection and Release

Following successful completion of all the necessary stages of fabrication and inspection, i.e. welding, NDT, straightening, final dimensional checks the Inspector sprays white paint or applies white ribbon to the item/s indicating “Final Acceptance”.

The Q.C Inspector completes an Inspection Release Certificate with reference to all items accepted.

When final inspection is required by Q.C DEP. The Client, Statutory body, etc, the Inspector notifies the parties concerned that items are awaiting inspection and release. Where possible, the Q.C Inspector and Client inspect the items jointly.

3.13 Coating

Coatings are applied by the Fabricator. An Inspector or the Painting Supervisor inspects the surface preparation and coating to verify conformance to the specifications and this may include in-process inspections to verify surface preparation, paint application, paint thickness etc.

a) The Q.C Inspector or the Painting Supervisor records the progress each day on a Daily Coating Report and the Inspector or a Technical Clerk transfers the information to the relevant coating record sheet.
b) Painting will be in accordance with project painting specification.

3.14 Non-conformances

At all stages of fabrication, from issue of materials to completed product, non-conformances which cannot be easily rectified are processed in accordance with Procedure for Nonconformance.

3.15 Records

All records are retained and subject to contract requirements:

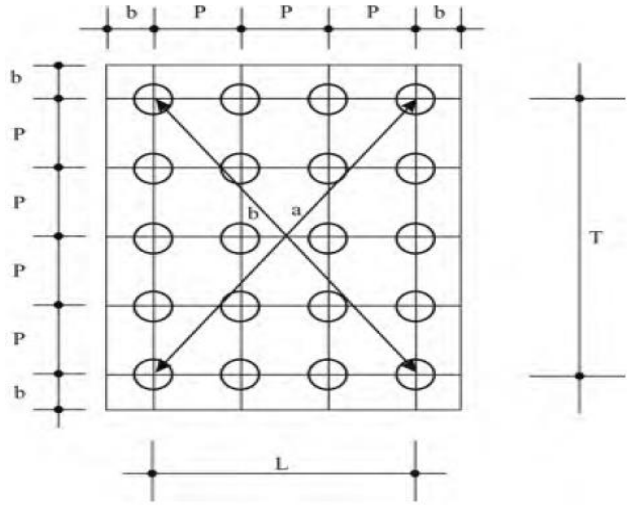
- materials certification
- welding procedures
- welder qualifications
- welding consumable certification
- NDT reports
- coating records
- NCRs

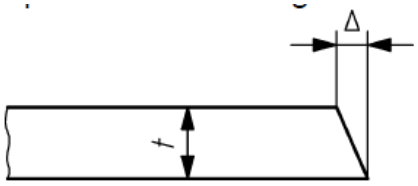
The Q.C DEP. collates all records into the manufacturer's data report or forwards the master copies of all applicable records as a package to Document Control for incorporation into the Project Data Book.

4. Acceptance Criteria

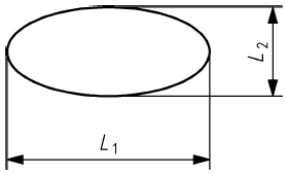
4.1. Cutting & Drilling:

$$\Delta p = \pm ۲ \text{ mm}$$
$$\Delta b = \pm ۳ \text{ mm}$$
$$\Delta L = \pm ۳ \text{ mm}$$
$$\Delta T = \pm ۳ \text{ mm}$$
$$|a - b| \leq ۳ \text{ mm}$$

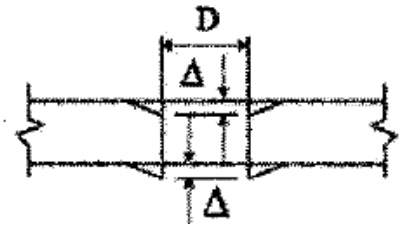




$$\Delta = \pm 0,1t$$

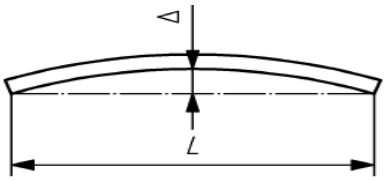
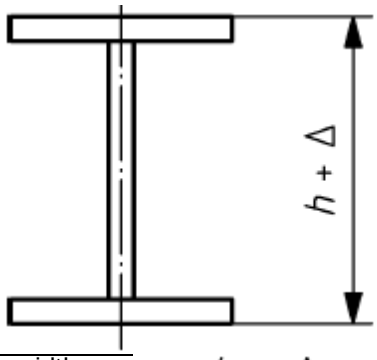
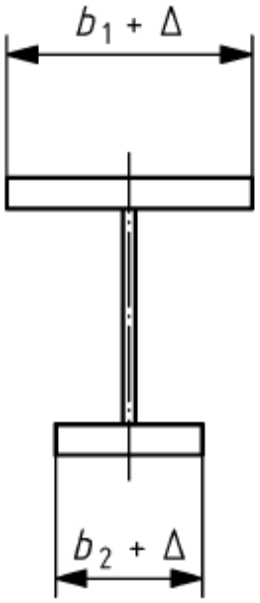


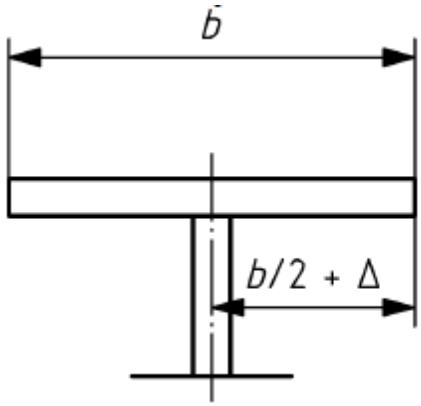
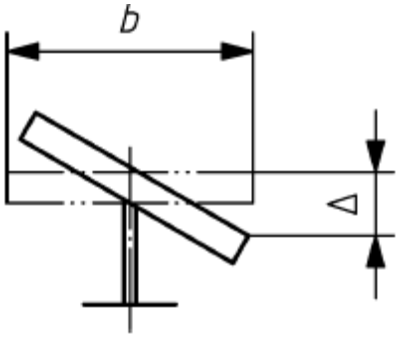
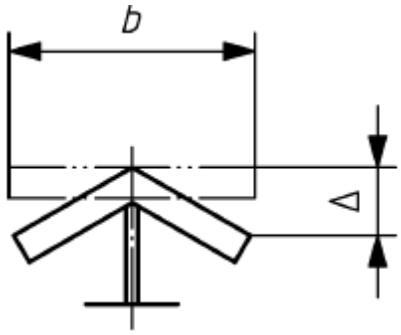
$$\Delta = L_1 - L_2 \qquad \Delta = \pm 1 \text{ mm}$$

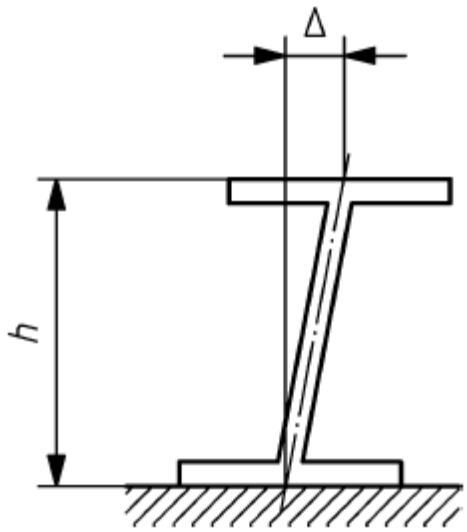
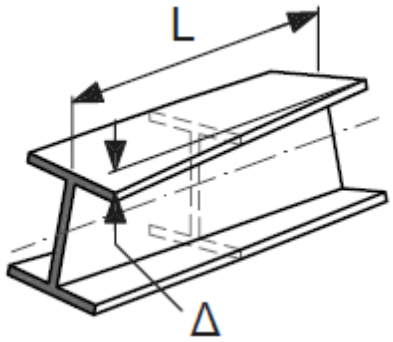
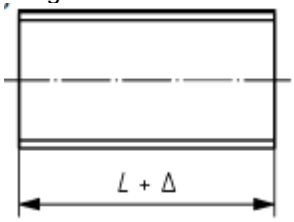


$$\Delta = 1\text{mm}$$

4.2. Final Dimensional Check:

NO	Criterion	Parameter	Permitted deviation Δ
1	Straightness for components to be used unrestrained: 	Deviation Δ from straightness	Δ = ± *L* / 750
2	Depth: 	Overall depth *h*: *h* ≤ 900 mm 900 < *h* ≤ 1 800 mm *h* > 1 800 mm	Δ = ± 3 mm Δ = ± *h* /300 Δ = ± 6 mm
3	Flange width: 	Width b_1 or b_2	+ Δ = *b* /100 but |Δ| ≥ 3 mm

4	Web eccentricity: 	Position of web: - general case - flange parts in contact with structural bearings	Δ = ± 5 mm Δ = ± 3 mm
5	Squareness of flanges: 	Out of squareness: - general case - flange parts in contact with structural bearings	Δ = ± *b* /100 but |Δ| ≥ 5 mm Δ = ± *b* /400
6	Flatness of flanges: 	Out of flatness: - general case - flange parts in contact with structural bearings	Δ = ± *b* /150 but |Δ| ≥ 3 mm Δ = ± *b* /400

7	Squareness at bearings: 	Verticality of web at supports, for components without bearing stiffeners	Δ = ± *h* /300 but |Δ| ≥ 3 mm
8	Twist: 	Overall deviation Δ in a piece of length *L:*	Δ = ± *L* / 700 But 4 mm ≤ |Δ| ≤ 20 mm
9	Length: 	Cut length measured on the centreline:	Δ = ± *3 mm*