

STRUCTURAL STEELWORK

British Museum – Number 38 Russell Square

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APPENDIX A - CORROSION PROTECTION

1.00 GENERAL

To be read in conjunction with Preliminaries and General Conditions.

Where this specification conflicts with the relevant British Standard, the requirements of the specification take priority.

1.01 SCOPE OF WORK: the detailed design of connections, fabrication and erection of structural steelwork shown on the drawings and specified in this section, and the protective coatings specified in Appendix A.

1.02 PROGRAMME: submit to Contract Administrator (C.A.) copies of programme for preparation of drawings, fabrication of steelwork and erection within 14 days of appointment.

1.03 COORDINATION: the Contractor must:

- a) Provide co-ordination/fabrication/erection drawings and other information showing such details of the work as required by the C.A.
- b) Make any necessary amendments in accordance with any comments of the C.A. and re-submit.
- c) Submit sufficient copies of final version of the information, including 2 copies for the C.A., for distribution to all parties.
- d) Take all site dimensions necessary to fabricate the steelwork and to ensure accurate fit.
- e) Make allowances in the programme for fabrication and delivery periods including reasonable allowances for submission of drawings, response (if any) thereto and re-submission of drawings if required, prior to commencement of fabrication.
- f) Time to be allowed from receipt of any drawings by C.A. to response to be 14 days.

1.04 FABRICATION DRAWINGS: submission of drawings to the C.A. or any other party will not in any way relieve the Contractor of their sole responsibility for the accuracy of any information contained on the drawings.

1.05 DESIGN:

- a) The structural steelwork shown on the drawings and described in this specification has been designed to BS EN 1993-1 where applicable, unless stated otherwise.
- b) Complete the design and detailing of the connections to BS EN 1993-1 to satisfy loading requirements specified or as may be derived from the information given.
- c) The design imposed loading parameters have been shown on the drawings.

1.06 DESIGN CONSTRAINTS: unless required or permitted otherwise, comply with the following when completing the design and detailing of the work:

- a) Bolts to be not less than 16mm diameter. UNO.
 - b) Bolts to be grade 8.8. Not less than two bolts to be used in any connection. All bolts to have washers.
 - c) H.S.F.G. bolts shall not be used.
 - d) Minimum weld size 6mm continuous fillet, unless noted otherwise.
- 1.07 DRAWINGS, etc.: before preparing detailed fabrication drawings, submit:
- a) Calculations as requested by the C.A.
 - b) General Arrangement drawings with individual steel members clearly identified.
- 1.08 STARTING FABRICATION: inform C.A. when fabrication is due to start. Do not fabricate steelwork for which the drawings have not been commented on by the C.A.
- 1.09 ERECTION METHOD STATEMENT: at least 14 days before starting erection of steelwork, submit details including drawings/sketches showing the principles of the proposed sequence of erection. Include details of any temporary supports or bracing required to maintain stability.
- 1.10 WORKMANSHIP: to comply with BS EN 1090-2 Execution Class EXC 2.
- 1.11 SECONDARY STEELWORK: The Contractor is responsible for determining the extent and requirements for secondary steelwork and then undertaking its design, fabrication and erection, unless noted otherwise in the specification or drawings. Fabrication drawings showing the secondary steelwork and connection details are to be submitted in accordance with clauses 1.02, 1.03, 1.04, 1.06, 1.07 and 1.08. All secondary steelwork is to be designed in accordance with BS EN 1993-1 and BS EN 1090-2.
- 1.12 BEAM AND COLUMN SPLICES: If it is intended to introduce splices to assist with the installation and/or erection of steelwork, drawings showing the location and type of the proposed splice connections must be submitted to the C.A. for approval.

2.00 MATERIALS

2.01 MATERIALS GENERALLY: as required by BS EN 1993-1 and BS EN 1090-2 unless specified otherwise.

2.02 Materials

- a) Universal sections, channels, angles and plate where maximum thickness of flange or plate is less than 30mm made from steel to BS EN 10025-2, Grade S355J0 unless otherwise stated.

Universal sections, channels, angles and plate where maximum thickness of flange or plate is 30mm or more made from steel to BS EN 10025-2, Grade S355J2 unless otherwise noted.

Structural hollow sections to be made from steel to BS EN 10210-1, grade S355J2H.

- b) HOT-ROLLED STEEL SECTIONS not covered by other British Standards: dimensions to BS EN 10365.
- c) STEEL HOLLOW SECTIONS: dimensions to BS EN 10210-2.
- d) HOT-ROLLED STEEL ANGLES: dimensions to BS EN 10056-1.
- e) STEEL TUBES: to BS EN 10296-1 for welded tubes and to BS EN 10297-1 seamless tubes.
- f) STAINLESS STEEL: all sections to be made from stainless steel to BS EN 10088 Grade 1.4301.
- g) BOLTS AND NUTS: to appropriate standards listed for mechanical fasteners in BS EN 1090-2.

All bolts to be Grade 8.8 and nuts Grade 8 unless specified otherwise.

- h) SHERARDIZED BOLTS AND NUTS:
Finish (applied by manufacturer): nuts and bolts - sherardized to BS 7371-8, Class 1.
- i) GALVANIZED BOLTS AND NUTS:
Finish (applied by manufacturer): bolts and nuts- spin-galvanized to BS 7371-6; tap nuts out after galvanizing.
- j) BLACK CUP AND COUNTERSUNK HEAD BOLTS AND NUTS:
to BS 4933.
Steel Grade to BS 4190: 4.8 for bolts, 4 for nuts.
- k) WASHERS: to appropriate standard in Table 2, BS EN 1090-2.
Finish (applied by manufacturer): to match bolt.
- l) HOLDING DOWN BOLTS: Grade 4.6 to BS 7419. Nuts Grade 4 to BS 4190.
- m) STAINLESS STEEL BOLTS AND NUTS: to BS EN ISO 3506.
Stainless steel Grade to BS EN 10088: A2-70 for bolts, A2 for nuts.

- n) WELDING CONSUMABLES: to BS EN 1011.
- o) EXPANDING BOLTS AND NUTS:
Manufacturer: Liebig.
Reference : Liebig safety bolts.
- p) RESIN-BONDED FIXINGS:
Finish (applied by manufacturer): zinc-plated to BS 7371-3.
Reference : Hilti-HY 270 (unless noted otherwise on the drawings)
Manufacturer: HILTI
- q) GROUT:
Reference: Conbextra HF (Fosroc – use in accordance with manufacturers recommendations)

3.00 FABRICATION GENERALLY

3.01 QUALITY OF WORK:

- a) Fabricate steelwork to BS EN 1090-2, execution class EXC 2, ensuring compliance with design and performance requirements.
- b) Cut, shape and assemble parts to ensure accurate erection.
- c) Use proprietary components to manufacturers' recommendations.
- d) All re-entrant cuts to be provided with a 10mm radius unless otherwise agreed with the CA.

3.02 STORAGE AND HANDLING:

- a) Store fabricated steelwork clear of the ground and keep clean.
- b) Handle and store carefully to avoid damage to steelwork and any protective coatings.
- c) Identification marks to be visible when members are stacked.

3.03 PROTECTIVE COATING WORK: condition of steel at time of preparation, the preparation of the steel and protective coatings to be to Appendix A of this specification.

3.04 MARKING:

- a) All members to be marked.
- b) Submit details of proposed methods of identifying and recording materials and components to ensure correct use and location in the structure.
- c) Marks to be placed in positions which can be checked after erection.

3.05 MARKING of steel is to be such that it cannot be obliterated by subsequent processes.

3.06 BASE PLATES: make 25mm diameter holes in all base plates more than 0.25m² in area arranged to allow the escape of air when grouting after erection of columns.

3.07 END CONNECTIONS: ensure that angle cleats, if used, project beyond ends of simply supported members. Provide torsional restraint to end connections.

3.08 STEELWORK TO BE GALVANIZED: provide drainage and air holes and gaps in accordance with the recommendations of Annex A, BS EN ISO 14713-2.

3.09 HOLLOW SECTIONS (except those to be galvanized): seal ends of all members. Ensure that insides of sections are dry and clear of debris, before sealing ends and openings.

3.10 FINISHING:

- a) Remove surface laminations, shelling, cracks, inclusions, and other surface flaws by chipping and/or grinding. Do not exceed the limits specified in current standards.
- b) Remove burrs and sharp edges by grinding.
- c) Carefully dress welds to remove slag and remove weld spatter by grinding.

3.10 SHOP ASSEMBLY: check fit, profile and camber before making connections in lattice girders and trusses which are to be assembled before delivery to site.

4.00 WELDING

4.01 WELDING GENERALLY: to appropriate part(s) of BS EN 1011 unless specified otherwise, using consumables which give a weld deposit with mechanical properties not less than the minimum specified for the parent metal.

4.02 WELDING ON SITE is not permitted.

4.03 WELDERS: when requested by the C.A., provide evidence of welders' competence to undertake specified work. Welders must have been tested to BS EN ISO 9606-1 as appropriate using same electrodes and welding positions which will be used in the work.

4.04 WELDERS: when instructed, test welders to BS EN ISO 9606-1 or BS 4872-1 (fillet welds only) using:

- a) Thickest plate specified and/or
- b) Electrodes of appropriate class.
- c) Welding positions appropriate to the work.

4.05 ADDITIONAL WELDS: do not place any welds (including tack welds) not shown on drawings without agreement of the C.A., even for temporary attachment or repair of faulty plates.

4.06 BUTT WELDS: use run on and run off plates to ensure full throat thickness at ends of butt welds:

- a) Material for plates to be of same grade as material being welded.
- b) Prepare plates in same manner as parts being joined.
- c) After completion of welding, remove plates by cutting and grind smooth the surfaces where they were attached.
- d) Retain and identify plates for inspection.

4.07 BUTT WELDS: unless noted otherwise all butt welds to be full penetration.

- 4.08 WELDING OF STAINLESS STEEL: to BS EN 1011-3. Use double bevel butt welds, backing plates to remove heat, and jiggling, tack welds and any other measures necessary to minimise distortion.
- 4.09 WELDING PROCEDURES: Make available written welding procedure specifications (WPS), in accordance with BS EN ISO 15609-1, which have been tested by the steelwork contractor in accordance with BS EN ISO 15614-1. Welding procedure approval records (WPAR) are to be made in accordance with BS EN ISO 15614-1 by an independent Inspection Authority appointed by the Steelwork Contractor.
- 5.00 BOLTING
- 5.01 USING DRIFTS:
- a) Align holes carefully to prevent distortion or enlargement when using drifts.
 - b) Report any misalignment of holes to the C.A. and submit proposals for rectification.
- 5.02 TAPERED WASHERS: use suitably tapered washers under bolt heads and nuts which bear on sloping surfaces. Prevent from turning when tightening.
- 6.00 ERECTION
- 6.01 BEFORE COMMENCING ERECTION:
- a) Check foundations and other structures to which steelwork will be attached for accuracy of setting out, and holding down bolts for position, protruding length, condition and slackness.
 - b) Report any inaccuracies and defects to the C.A. without delay.
 - c) Submit proposals for erection sequences together with designs for temporary bracing of erection.
- 6.02 ERECTING STEELWORK
- a) Set out and erect to BS EN 1090-2, EXC 2.
 - b) Design and provide all temporary erection bracing necessary to ensure stability of the building at all times during erection. Remove when it is safe to do so.
 - c) Do not distort steelwork and do not exceed stress limits during erection.
- 6.03 MODIFICATIONS:
- a) Inform the C.A. immediately of any defects due to detailing or fabrication errors.
 - b) Obtain agreement from C.A. to methods of rectification before starting modification or remedial works.

6.04 MOVEMENT JOINTS:

- a) Install PTFE bearings or equivalent to steel-to-steel sliding surfaces before connecting.
- b) Unless noted on the drawings, ensure that bolts are in centre of slotted holes after erection of structure and that the joint is free to move.

6.05 COLUMN BASES: completely fill bolt pockets and the space beneath column base plates with grout (see clause 2.02 q).

7.00 TESTING

7.01 GENERAL: arrange for the testing of any material or workmanship when requested by the C.A. Prepare any necessary test pieces.

Submit two copies of all test and examination results to the C.A. immediately they are available.

7.02 TESTING AUTHORITY: all tests to be carried out by an independent company to be agreed by all parties.

7.03 PRODUCTS: when requested by C.A. submit one copy of test certificates for steel.

7.04 DEFECTIVE WORK: as soon as possible after any part of the work or any materials are known or suspected to be defective, submit proposals to the C.A. for further testing, inspection or replacement and obtain instructions.