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2 MATERIALS

2.1 GENERAL

2.1.1 Scope

- 1 This Part specifies the materials requirements for structural steelwork.
- 2 Related Sections and parts are as follows:

This Section

Part 6..... Bolting

Section 1 General

2.1.2 References

- 1 The following standards are referred to in this Part:

BS 4.....	Structural steel sections, Part 1 1993, Hot-rolled sections.
BS 639.....	Covered carbon and carbon manganese steel electrodes for manual metal-arc welding
BS 729.....	Hot dip galvanised coatings on iron and steel articles.
BS 2901.....	Filler rods and wires for gas-shielded arc welding.
BS 2989.....	Continuously hot-dip zinc coated and iron-zinc alloy coated steel flat products.
BS 3692.....	ISO metric precision hexagon bolts, screw and nuts.
BS 4165.....	Electrode wires and fluxes for the submerged arc welding of carbon steel and medium-tensile steel.
BS 4190	ISO metric black hexagon bolts, screw and nuts.
BS 4320.....	Metal washers for general engineering purposes.
BS 4395.....	High strength friction grip bolts and associated nuts and washers for structural engineering.
BS 4929.....	Steel hexagon prevailing-torque type nuts
BS 4933.....	ISO metric black cup and countersunk head bolts and screws with hexagon nuts.
BS 4848.....	Hot rolled structural steel sections
BS 4921.....	Sherardized coatings on iron and steel
BS 5950.....	Structural use of steel work in building
BS 6363.....	Welded cold formed steel structural hollow sections
BS 7079.....	Preparation of steel substrates before application of paints and related products.
BS 5135.....	Process of arc welding of carbon and carbon manganese steels
BS 7084.....	Carbon and carbon-manganese steel tubular cored welding electrodes
BS 7419.....	Holding down bolts
EN 10025	Hot rolled products of non-alloy structural steels-Technical delivery conditions.

EN 10029	Tolerances on dimensions, shape and mass for hot rolled steel plates 3mm thick or above.
EN 10034	Structural steel I and H sections-Tolerances on shape and dimensions.
EN 10051	Continuously hot-rolled uncoated plate, sheet and strip of non-alloy and alloy steels-Tolerances on dimensions and shape
EN 10147	Continuously hot-dip zinc coated structural steel sheet and strip-Technical delivery conditions.
EN 10163	Delivery requirements for surface conditions of hot rolled steel plates wide flats and sections.
EN 10210	Hot finished steel structural hollow sections.
EN 102101	Technical delivery conditions
EN 10051	Specification for continuously hot-rolled uncoated plate, sheet and strip of non-alloy steels. Tolerances on dimension and shape
EN 10113	Hot rolled products in weldable fine grain structural steels.
EN 10155	Structural steels with improved atmospheric corrosion resistance. Technical delivery conditions.

2.1.3 Material Qualities

- 1 Material shall be steel in rolled sections, structural hollow sections, plates and bars and shall comply with the appropriate standard shown in Table 2.1.
- 2 The steel designations used in this publication are those given in BS 5950.

2.1.4 Material Testing

- 1 All steel shall have been specifically tested in accordance with the appropriate material quality standard shown in Table 2.1.

2.1.5 Test Certificates

- 1 The Contractor shall obtain the manufacturer's test certificates and submit them to the Engineer for review.

2.1.6 Dimensions and Tolerances

- 1 Dimensions and Tolerances shall comply with the appropriate standard shown in Table 2.1.

Table 2.1
Material and Dimension Standards

Form	Material Quality	Dimensions	Dimension Tolerances
U.B. and U.C.	EN 10025 ¹	BS 4 : Part 1	EN 10034
Joists		BS 4 : Part 1	BS 4 : Part 1
Channels		BS 4 : Part 1	BS 4 : Part 1
Angles		BS 4848 : Part 4	BS 4848 : Part 4
Plate and Flats		Not Applicable	EN 10029 ³
Structural Hollow Sections Hot Finished	EN 10210-I ²	BS 4848 : Part 2	BS 4848 : Part 2
Hollow Sections Cold Formed	BS 6363	BS 6363	BS 6363
Galvanised Open Sections and Strip	EN 10147	Not Applicable	BS 2989

Notes:

- 1 Material quality requirements for Fine Grain Steels are given in EN 10113 Material quality requirements for Weather resistant grades are given in EN 10155.
- 2 EN 10210-1 contains material quality requirements for Non-alloy and Fine Grain Steels.
- 3 Tolerances for plates cut from wide strip produced on continuous mills are given in EN 10051.

2.2 SURFACE CONDITION

2.2.1 General

- 1 Steel surfaces when used shall not be more heavily pitted or rusted than Grade C of BS 7079 Part A1.
- 2 Surface defects in hot rolled sections, plates and wide flats revealed during surface preparation which are not in accordance with the requirements of EN 10163 shall be rectified accordingly.
- 3 Surface defects in hot rolled hollow sections revealed during surface preparation which are not in accordance with the requirements of EN 10210-1 shall be rectified accordingly.

2.3 SUBSTITUTION OF MATERIAL OR FORM

2.3.1 General

- 1 Material quality or section form of components may, with the agreement of the Engineer be substituted where it can be demonstrated that the structural properties are not less suitable than the designed component.

2.4 WELDING CONSUMABLES

2.4.1 Standards

- 1 Consumables for use in metal arc welding shall comply with BS 639, BS 2901, Part 1, BS 4165 or BS 7084 as appropriate.

2.4.2 Storage

- 1 Consumables to be stored in the Contractor's works and on the Site, shall be kept in a controlled atmosphere, in accordance with BS 5135. Any drying or baking of consumables before issue shall be carried out in accordance with the manufacturer's recommendations.

2.5 STRUCTURAL FASTENERS

2.5.1 Ordinary Bolt Assemblies

- 1 Shop and site bolts and nuts shall be to one the following grades:
 - (a) Grade 4.6 in accordance with BS 4190
 - (b) Grade 8.8 or 10.9 in accordance with BS 3692.

- 2 Dimensions, tolerance and threaded length to BS 4190.

- 3 Refer to Clause 6.2.1 of this Section for bolt/nut combinations.

2.5.2 High Strength Friction Grip (HSFG) Bolt Assemblies

- 1 HSFG bolt assemblies shall be in accordance with BS 4395.
- 2 Refer to Clause 6.4.1 of this Section for bolt/nut combinations.

2.5.3 Foundation Bolts.

- 1 Holding down bolts shall be in accordance with BS 7419.

2.5.4 Cup and Countersunk Bolts

- 1 Cup and countersunk bolts shall be in accordance with BS 4933.

2.5.5 Washers

- 1 Metal washers shall be made in accordance with BS 4320 Section 2. Unless otherwise specified, black steel washers to Form E shall be used.
- 2 Refer to Clause 3.4.6 for washers for holding down bolts.

2.5.6 Lock Nuts

- 1 Lock nuts shall be in accordance with BS 4929: Part 1.

2.5.7 Fastener Coatings

- 1 Where specific coatings are required, they shall be provided by the fastener manufacturer.

2.6 SHEAR STUDS

2.6.1 General

- 1 Proprietary studs used in composite construction shall be the headed type with the following properties after being formed:
 - (a) minimum yield strength - 350 N/mm²
 - (b) minimum ultimate tensile strength -450 N/mm²
 - (c) elongation of 15% on a gauge length of $5.65 \sqrt{A}$, where A is the area of the test specimen.

2.7 PROTECTIVE TREATMENT MATERIALS

2.7.1 Metallic Blast Cleaning Abrasives

- 1 Chilled iron grit shall be in accordance with BS 7079 Part E2, and cast steel grit shall be in accordance with BS 7079 Part E3.

2.7.2 Surface Coatings

- 1 Paint materials and other coatings supplied shall be in accordance with the appropriate British Standard or European Standard for the materials.

2.7.3 Sherardized Coatings

- 1 Sherardized coatings shall be in accordance with BS 4921.

2.7.4 Galvanizing Materials

- 1 The composition of zinc in galvanizing baths shall be in accordance with BS 729.

2.7.5 Proprietary Items

- 1 All proprietary items shall be used in accordance with the manufacturer's recommendations and instructions.

END OF PART