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ARAB ENGINEERING BUREAUS

8 STEEL STRUCTURES

8.1 STRUCTURAL STEEL

8.1.1 General

- 1 This Section includes the production and erection of structural steelwork, as shown on the Contractor's drawings.
- 2 All project related steelworks shall be according to QCS. Workmanship and materials shall be in accordance with EN 1993 (which shall have priority), EN 10025 and relevant standards.
- 3 Shop drawings shall include connection designs, complete details and schedules for fabrication and assembly of structural steel members, procedures, diagrams, and erection plans.

8.1.2 References

- 1 Related Sections are as follows:-

Section 1 General
Section 4 Foundations and Retaining Structures
Section 5 Concrete
Section 16 Structural Steelworks.

- 2 The following standards are approved and/ or referred to in this Section:

BS 4604-2Specification for the use of high strength friction grip bolts in structural steelwork. Metric series - Higher grade (parallel shank); (EN 1993-1-8 Eurocode 3 - Design of steel structures - Part 1-8: Joints)

EN 287Qualification test of welders - Fusion welding –

EN 287-1Qualification test of welders - Fusion welding - Part 1: Steels; (ISO 9606-1 Qualification testing of welders — Fusion welding — Part 1: Steels; ISO/AWI 9606.2 Qualification testing of welders — Fusion welding)

EN 571Non destructive testing - Penetrant testing – (ISO 3452 Non-destructive testing - Penetrant testing -)

EN 571-1Non destructive testing - Penetrant testing - Part 1: General principles; (ISO 3452-1 Non-destructive testing — Penetrant testing — Part 1: General principles)

EN 970Non-destructive examination of fusion welds - Visual examination; (ISO 17637 Non-destructive testing of welds — Visual testing of fusion-welded joints)

EN 1011Welding - Recommendations for welding of metallic materials –

EN 1011-1Welding - Recommendations for welding of metallic materials - Part 1: General guidance for arc welding

EN 1290Non-destructive testing of welds - Magnetic particle testing of welds; (ISO 17638 Non-destructive testing of welds — Magnetic particle testing)

EN 1714Non-destructive testing of welds - Ultrasonic testing of welded joints; (ISO 17640 Non-destructive testing of welds — Ultrasonic testing — Techniques, testing levels, and assessment)

- EN 1435Non-destructive testing of welds - Radiographic testing of welded joints; (ISO 17636-1 Non-destructive testing of welds — Radiographic testing — Part 1: X- and gamma-ray techniques with film; ISO 17636-2 Non-destructive testing of welds — Radiographic testing — Part 2: X- and gamma-ray techniques with digital detectors)
- EN 1990Eurocode - Basis of structural and geotechnical design
- EN 1991Eurocode 1: Actions on structures:
- EN 1992Eurocode 2: Design of concrete structures:
- EN 1993Eurocode 3: Design of steel structures:
- EN 1994Eurocode 4: Design of composite steel and concrete structures;
- EN 1997Eurocode 7 - Geotechnical design:
- EN 1998Eurocode 8: Design of structures for earthquake resistance:
- EN 10025Hot rolled products of structural steels
- ISO 1460Metallic coatings — Hot dip galvanized coatings on ferrous materials — Gravimetric determination of the mass per unit area
- ISO 1461Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods
- ISO 12944Paints and varnishes — Corrosion protection of steel structures by protective paint systems —
- ISO 15614-1Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys.

8.1.3 Products

- 1 Materials
 - (a) All structural steelwork, including structural fasteners and welding consumables etc. shall comply with the EN 1993 and EN 10025.
- 2 Fabrication
 - (a) All structural steel, before and after fabrication, shall be straight unless otherwise specified, and shall be free from twists. The fabrication tolerances shall comply with EN 1993.
 - (b) Appropriate measures shall be taken to prevent internal corrosion of hollow structural steel members.
- 3 Testing
 - (a) The tests shall be in accordance with EN 1993. Test certificates for the materials and welding shall be maintained.
- 4 Tolerances
 - (a) The tolerances for erected steelwork shall comply with EN 1993.
- 5 Galvanizing
 - (a) Galvanising shall be in accordance with ISO 1461.
 - (b) Cold formed or cold worked steel sections shall not be hot dip galvanised.

8.1.4 Execution

- 1 Erection
 - (a) Structural steelwork shall be distinctly marked before delivery.
 - (b) Permanent bolts shall not be used as service bolts during erection, where such use is liable to cause damage to the protective treatment provided to the bolt.
 - (c) Welds shall be kept free from slag or other inclusions. All adhering slag shall be removed immediately after the completion of each run. Slag and weld spatter shall be removed from surrounding surfaces after welds have been completed.
- 2 Surface preparation
 - (a) All surfaces shall be clean before protective treatment is commenced and shall comply with EN 1993.
 - (b) Blast-cleaned steelwork shall be free from dust.

8.1.5 Protection and repairs

- 1 General
 - (a) Protective work shall be carried out in accordance with ISO 12944, and all damage shall be repaired.
 - (b) Protective treatment shall be carried out in the steelwork fabricator's works after fabrication. Shop treatment shall be carried out in a weather-proof structure under clean, dry conditions.
 - (c) All protective paint systems to structural steel shall have full compatibility between coats and with the metal substrate. There should be adequate adhesion to substrate and between coats over the operating temperature range and there should be no under-softening to cause lifting, wrinkling or bleeding through of stains. All components of a specific paint system shall be from the same manufacturer.
 - (d) All paints and coatings shall be non-toxic and shall not produce toxic fumes or other toxic substances during application and/or when exposed to fire.
 - (e) Structural steel shall be degreased prior to painting. Where steelwork is partially embedded in concrete, the steelwork shall be coated over an area extending to at least 100 mm beyond the exposed area.
- 2 Paints
 - (a) All paints shall comply with ISO 12944.

8.1.6 Bolted connections

- 1 Bolts shall be threaded only over the length of shank which is outside the parts bolted together. The bolt shall protrude by at least two complete threads and not more than four complete threads beyond the outer face of the tightened nut.
- 2 Holes shall not be distorted or enlarged by the use of drifts.
- 3 High strength friction grip bolts shall be fitted in accordance with BS 4604, Part 2.

8.1.7 Welding

- 1 Welding of structural steelwork shall comply with EN 1011-1.
- 2 All welders shall possess valid test certificates in accordance with EN 287-1. These test certificates shall be appropriate to the type of work being carried out and shall be always available for inspection.

3 Testing of Welds

- (a) Facilities, equipment and qualified personnel shall be provided to carry out any testing and visual inspection of welds. The type of testing shall include but not be limited to the following:
 - (i) Magnetic particle flaw detection test (to EN 1290);
 - (ii) Penetrant flaw detection test (to EN 571-1);
 - (iii) Ultrasonic examination (to EN 1714); and
 - (iv) Radiographic examination (to EN 1435).
- (b) The quality of welds shall be assessed in accordance with the acceptance levels given in ISO 15614-1. The visual inspection of fusion welds shall be carried out in accordance with EN 970. All inspection records and test results shall be available on Site for inspection.
- (c) Where failures are identified in the weld tests, the Engineer may require any additional testing.

4 Welding procedure

- (a) Details of the proposed welding procedures together with diagrams showing the build up of all main welds shall be included in the Contractor's method statement.
- (b) No distortion shall be allowed.

END OF PART