STRUCTURAL ENGINEERING

REHABILITATION OF THE SAUDI MATERNITY HOSPITAL

KASSALA HEALTH CITADEL, SUDAN

DETAILED DESIGN

TECHNICAL CONDITIONS

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1. INTRODUCTION

Throughout the present Technical Conditions, when not indicated, the specification referred shall be the Specification for Highways Works, published by the Stationary Office (formerly HMSO) as the Manual of Contract Documents for Highway Works.

Recurring references to this specification will be:

- Clauses or sub-Clauses represented by brackets, e.g.: [601] – Clause or [601.1] – Sub-Clause;
- Tables, e.g.: Table 6/1;
- Appendices, e.g.: Appendix 1/6.

2. EARTHWORKS

2.1. CLASSIFICATION OF EXCAVATIONS

Based on the length of the foundation, its width and its depth measured vertically from the level of the ground as it appears at the beginning of the excavations, the following types are defined for these:

- Ditch: width not exceeding 2m and depth not exceeding 1m;
- Trench: width not exceeding 2m and depth greater than 1m; or a width exceeding 2m and a depth of more than half the width;
- Shallow excavation: width greater than 2m and depth not more than half the width.

Dry excavations are those which are performed under a layer of water of less than 10cm and excavations under water which are performed under a layer of water of more than 10cm.

2.2. REQUIREMENTS FOR ACCEPTABILITY AND TESTING OF EARTHWORKS MATERIALS

1. Acceptable limits for the fills in Table 6/1 and including:

(i) (a) Permitted general fill materials in embankments shall be restricted to the following classes and test limits:

Class	General Description	Lower m/c *	Upper m/c *
1A	Well Graded	optimum m/c -2%	optimum m/c +1%
1B	Uniformly Graded	optimum m/c -2%	optimum m/c +1%
1C ***	Coarse Granular	-	-
2A	Wet Cohesive	PL -4% **	optimum m/c +1%
2C	Stony Cohesive	optimum m/c -2%	optimum m/c +1%

Table 1 - Restrictions to general fill materials in embankments

* Determined on material less than 37.5mm size for each class by BS 1377: Part 4:1990, Test No. 3.6.

** If the material is classified as having non-plastic fine material passing a 425 microns B.S. test sieve then the lower limit shall be as Class 2C material.

*** Class 1C material is only applicable to naturally occurring materials that after deposition can be compacted satisfactorily regardless of the moisture content. Class 1C will not be attributed to material artificially created by mixing a number of materials.

The characteristics of soil arising from the site shall be determined in relation to the above by reference to the site investigation report. Further laboratory testing running concurrent with the earthworks operation may be carried out in order to ascertain continued acceptability. Once a naturally occurring or imported material has been classified it shall not be re-classified as a different class of material unless three consecutive test results confirm that the nature of the material has substantially altered. Imported materials shall be classified and tested by before earthworks material importation commences.

All imported fill material shall achieve a minimum CBR value of 15%.

Imported fill material which does not achieve a CBR value of 15% may be used provided that the additional sub-base and capping layer thicknesses.

(i) (b) Acceptable limits in respect of material properties of fill Class 6F2, 6I and 6N1 shall comply with Table 6/1 and the following:

Class	Lower C'	Lower Φ	Coefficient of Permeability	Lower m/c *	Upper m/c *
6I **	-	35	-	optimum m/c -1%	optimum m/c +2%
6N1	0	30	5×10^{-5} m/sec	optimum m/c -2%	optimum m/c +1%

Table 2 - Class 6F2 - 10% fines value - Minimum Strength 50kN

* Determined by BS 5835: Part 1 method.

** Lower bound coefficient of friction Fill/Element 30º

(ii) Those materials, which may be used for landscape fill Class 4 [601.2(i)(b)];

(iii) Location of 'zoning' of general and selected fills;

(iv) Additional sub-divisions of Classes in Table 6/1, e.g. to set out environmental requirements for processed Class U1B material;

(v) Alternative and additional requirements for triaxial and shear box tests [633], [636];

(vi) Class 9D lime stabilized material [615.5], [615.6].

2. Special Requirements for determining Acceptability:

The classification of the material must be confirmed and must be carry out subsequent tests when delivered to the site.

3. Designation (if required) of material Class 3 [601.5(ii)], [605.1];

4. Any requirement for processing to render unacceptable material (other than Class U2) acceptable, for each type of material to be processed and class of material to be produced [601.1(ii)], [601.1(iii)]; [601.4];

5. Requirements for groundwater lowering or other treatment [602.17];

6. Minimum MCV (Moisture Condition Value) required immediately before compaction for lime stabilised Class 9D material [615.13];

7. Specific (local) requirements for acceptability and testing of unburnt colliery spoil [601.15];

8. Any permitted use of the rapid assessment procedure for material acceptability [632.3];

9. Requirements (if any) to remove off site excavated acceptable material or unacceptable material requiring processing or retention of surplus material on site [602.5];

10. Permitted use (if any) of acceptable or unacceptable material required to be processed for purposes other than for general fill [602.4];

11. Requirements for In Situ Resistivity Tests [637.2];

12. Requirements for In Situ Redox Potential Tests [638.2], [638.5];

13. Bearing ratio requirements for Class 6R and 7I material [643.6];

14. Requirements for the assessment of the effects of water-soluble sulfate (WS) and total potential sulfate in accordance with TRL report 447, Test Nos. 1 to 5 [644.1];

15. Requirements for the magnesium sulfate (MS) soundness test [634.2];

2.3. REQUIREMENTS FOR DEALING WITH CLASS U1B AND U2 UNACCEPTABLE MATERIAL

1. Drawing references for excavation and disposal of known U1B and U2 material;

2. Pre-agreed requirements of the Environmental Authority etc. for disposal including specific sites;

3. List of known hazardous materials likely to be encountered;

4. Methods of excavation, precautions and requirements for handling;

5. Special requirements for dealing with leachate and contaminated water;

6. Requirements for special drainage and for sealing exposed surfaces of contaminated materials;

7. Test methods to be used for chemical analysis of hazardous materials, leachate and contaminated water should be scheduled in Appendix 1/5 [602.5], [602.18].

2.4. REQUIREMENTS FOR EXCAVATION, DEPOSITION, COMPACTION (OTHER THAN DYNAMIC COMPACTION)

1. The drawing numbers of all drawings which give related earthworks requirements including line and level;

2. Blasting for excavation is not permitted;

3. Cutting Faces - requirements for:

(i) Undercutting restrictions – extent and limitations for sequential excavation and backfilling, where is required to undercut slopes or toes of cuttings [603.2];

(ii) Clearing loose material, where no top soiling is required, by airline hose including maximum pressure and nozzle arrangements [603.5(iv)];

(iii) Making face stable, where no top soiling is required, including tolerances of irregularities in the face, depth of cut-back and thickness of cementitious material to be applied if different from Clause [603], extent of cementitious material to be applied, location and type of reinforcement and details of weep holes;

(iv) Protecting face of soft or insecure material interlayered with rock, where no top soiling is required, including depth of back and details of masonry infill;

(v) Making good prior to tops oiling.

4. Watercourses - including ditches, streams, rivers, lagoons and ponds:

(i) New or modifying old – details including any protection, lining, revetment or other works [606.1];

(ii) Redundant – where draining and clearing required, extent of excavation and Classes of fill for their infilling [606.4].

5. Embankment Construction:

(i) Limits on oversteepening or in increase in width [608.5];

(ii) Stage construction of fills – details and rates of controlled filling [608.6];

(iii) Surcharging – details including time period, type of surcharge material, initial level of top of surcharge above designed formation or sub-formation [608.7];

(iv) Minimum thickness of capping or of sub-base as appropriate for weather protection of sub formation or formation [608.9(i)];

(v) Description of location, class and thickness of starter layers [608.2].

6. Compaction:

(i) General:

(a) Requirements if compaction does not comply with Clause 612 [612.1];

(ii) Method compaction:

(a) Locations where extra compaction in top 600mm for Classes 1A, 1B, 2A, 2B, 2C and 2D is not required for full width of embankment or between outer extremities of verges;

(b) Requirements for compaction of drainage materials other than Class 6H;

(c) Frequency of field dry density testing [612.9].

(iii) End-product compaction:

(a) Whether a nuclear surface density gauge is to be used or is permitted for measuring field dry densities [612.15].

7. Limiting distance for deposition of materials referred to in sub-Clauses [601.13] to [601.17].

8. Locations of excavations that are permitted to be battered and requirements for benching prior to backfilling and compaction [602.12];

9. Locations where excavation supports are to be left in position [602.12], [505.8];

10. The benching of slopes to receive fill shall be benched; the height of benches shall not be greater than 500mm;

11. Variation not permitted.

2.5. CLASS 3 MATERIAL

Class 3 material is not permitted.

2.6. GEOTEXTILES USED TO SEPARATE EARTHWORKS MATERIALS

1. Locations of geotextiles can be found on the drawings pieces;

2. Geotextile reference and material type as following:

(i) The Quality Control strength of the geogrid, when tested in accordance with BS 6906 and expressed as the lower 95% confidence limit in accordance with ISO 2602 - 1980 (BS 2846-2:1981), shall be 40 KN/M with a peak strain of around 11% in both the longitudinal and transverse directions. In addition, typically the loads at 2% and 5% strain shall be 14KN/M and 28KN/M respectively in both the longitudinal and transverse directions.

(ii) The ribs of the geogrid shall be rectangular cross section in both the longitudinal and transverse directions with a minimum edge thickness of 1.4mm. The geogrid aperture size shall be approximately 30mm x 30mm.

(iii) The geogrid shall be manufactured from polypropylene sheet, oriented in two directions so that the resulting ribs shall have a high degree of molecular orientation which continues through the area of the integral node.

(iv) The geogrid shall be inert to all chemicals naturally found in soils and shall have no solvents at ambient temperature. It shall not be susceptible to hydrolysis, shall be resistant to aqueous solutions of salt, acids and alkalis, and shall be non-biodegradable.

(v) The geogrid shall have a minimum of 2% finely divided carbon black, as determined by BS 2782: Part 4, Method 452B, well dispersed in the polymer matrix to inhibit attack by ultra violet light.

(vi) The typical strength of the nodes between the longitudinal and transverse ribs, as determined by the Geosynthetics Research Institute, Drexel University, USA, Test Method GG2-87, shall be > 90% of the Quality Control Strength in both longitudinal and transverse directions.

(vii) The geogrid shall be manufactured in accordance with the Quality Assurance requirements BS EN ISO 9002:1994.

3. Life expectancy of 40 years;

4. Sample required for testing shall be taken at the rate of 1 set of samples per 400 sq.m. A set shall consist of the minimum number of test pieces sufficient to carry the Declaration Performance for each product stating compliance with BS EN 13251 and the required levels of performance;

5. Geogrid shall be laid as to the manufacturers recommendations; minimum lap length of 300mm.

2.7. SUB-FORMATION AND CAPPING AND PREPARATION AND SURFACE TREATMENT OF FORMATION

1. Drawing references which show locations where capping is required and its thickness [613.1] and where capping will only be required when one of the pavement types is adopted [eg. rigid or rigid composite where subgrade CBR > 5 and < 15];

2. Allowed surface level tolerance [616.1];

3. Permitted Classes of capping singly and in combination [613.3];

4. In cuttings and on embankments, the procedure to be adopted for construction of capping, or which alternatives are permitted [613.11] and [613.12] respectively. This is mostly governed by material Classes in (3) above];

5. Requirements for a demonstration area or areas [613.4] including location and protection [613.5]. Requirements for removal and reinstatement of demonstration area if not forming part of the Permanent Works [613.6];

6. Locations where treatment of formation in accordance with sub-Clause [616.4(i)] or [616.4(ii)] is required;

7. Intervals for preparation and availability of chemical analysis reports if different to weekly [615.4].

8. Preparation of formation on existing sub-base material [616.6].

9. Requirements for alternative thickness of layers to be stabilized [643.9].

10. Alternative treatment requirements for layers to be stabilized [643.10], [643.16].

2.8. TOPSOILING

1. Imported areas of topsoil Class 5A to specification clause [618] but material of Class 5A arising on site shall be used as far as the available quantities will allow;

2. Locations where topsoil and vegetation is to be left in place and where topsoil is to be stripped as turf are shown on the drawings;

3. Depth of topsoil to be stripped is shown on the drawings and in Clause [602.9] ;

4. Topsoil stockpiles shall not exceed 2m;

5. Topsoil shall not be stockpiled for more than 2 years;

6. Excavated material should be laid down in the thickest layers which still allow steady forward traction of earth scrapers to avoid subjecting every layer of the heap to severe surface compaction. Soil should be laid down in flat strips approximately 5m wide and not more that 2.0m high. Where possible, storage piles should be short and wide rather than long and thin in order to minimize repeated running over the soil. Soil storage piles should be on reasonably level, well drained land and should not be allowed to become waterlogged. Soil storage piles should be kept weed-free by applications of appropriate herbicides with particular emphasis given during the growing season to prevent weeds seeding;

7. Imported topsoil Class 5B is permitted;

8. Locations detailed in Appendix 30/5;

9. The requirements of sub-Clause [618.3] apply.

2.9. SWALLOW HOLES AND OTHER NATURALLY OCCURRING CAVITIES AND DISUSED MINE WORKINGS

To be developed, if required:

1. Location methods for identifying and inspecting shallow workings or voids where required;

2. Requirements for bulk fill and methods of placement;

3. Grouting, types and procedures;

4. Details of excavation, clearance and flushing of soft infilling;

5. Details of other treatments or support requirements;

6. Requirements for concrete caps to voids or soft areas;

7. Requirements for inspecting, monitoring, clearing, flushing, filling, caps or other treatments of disused mine workings [628.1].

2.10. INSTRUMENTATION AND MONITORING

1. Drawing references showing locations and extent of instrumentation including that required for staged construction;

2. Schedules of instruments by type and description with alternatives where possible;

3. Details of housings required;

4. Installation techniques;

5. Calibration requirements;

6. Protection to instruments, connections and housing;

7. Requirements for electric power;

8. Frequency of reading and method of reporting readings where the Contractor is required to carry out these tasks.

2.11. LIMITING VALUES FOR POLLUTION OF CONTROLLED WATERS

The limiting values for pollution of controlled waters shall be:

1. Limits on the amount of contaminants in a material above which there is a significant possibility that controlled waters (surface water and groundwater) will be polluted. These may be expressed as total concentrations in the material or, preferably, as concentrations or cumulative leached amounts in standard leaching tests carried out on the materials [601.2(ii)(a)];

2. An explanation of the derivation of the limits (e.g. generic guideline values for given soil conditions, or values derived from site specific risk assessment quoting relevant input parameters and methods) [601.2(ii)(a)];

3. Testing requirements should be scheduled in Appendix 1/5. These should include frequencies, certification and any other scheme specific requirements.

2.12. LIMITING VALUES FOR HARM TO HUMAN HEALTH AND THE ENVIRONMENT

1. Limits on the amount of contaminants in a material which, if exceeded, will lead to a significant possibility of significant harm to human health or the environment [601.2(ii)(a)];

2. An explanation of the derivation of the limits (e.g. generic guideline values, such as the Soil Guideline Values published by DEFRA and the Environmental Agency or values derived from site specific risk assessment quoting relevant input parameters and methods) [601.2(ii)(a)];

3. Testing requirements should be scheduled in Appendix 1/5. These should include frequencies, certification and any other scheme specific requirements.

3. STRUCTURAL CONCRETE

3.1. CONCRETE - SCHEDULE FOR THE SPECIFICATION OF DESIGNED CONCRETE

Requirement	Schedule	
Mix Ref	C35/45A	C35/45B
*Intended Working Life of Structure	120 years	120 years
*Nominal Cover to Reinforcement	40 + Δc	50 + Δc
*Applicable Exposure Classes (Excluding DC-class)	XC3/4, XD1, XF1	XC2, XC3/4, XD3, XF2

ΔDC-class (where appropriate)	DC-1	DC-1
ΔCompressive Strength Class of Concrete	C35/45	C35/45
ΔMinimum Cement Content (kg/m3)	340	380
ΔMaximum Free Water/Cement Ratio	0.50	0.40
ΔRequired Group or type and Class of Cement or Combination (where a DC-class has not been specified)	All in table A.6 of *BS 8500-1*	IIB-V, IIIA
ΔMaximum Aggregate Size (mm)	20	20
ΔChloride Content Class	Cl 0,30	Cl 0,30
ΔFor Lightweight Concrete, the Density Class or Target Density	N/A	N/A
ΔFor Heavyweight Concrete, the Target Density	N/A	N/A
Δ+Consistence Class	S3	S3
Special Type or class of Cement or Combination	-	-
Required Source/Special Type of Aggregate	-	-
Max. Cement Content (kg/m3) [See NG 1704.7]	550	550
Required Admixture	-	-
Air Entrainment Required (YES/NO)	NO	NO
Min. or Max. Temp. of Fresh Concrete °C	As *Clause [1710.2]*	
Sampling and Testing	As *Clause [1707.2(ii)], App1/5 & App 1/6*	
Other Requirements	-	-

Table 3 - Schedule for the Specification of Designed Concrete

Notes:

(i) Additional Water to Ready Mix Concrete on Site:

No water shall be added to the truck mixer drum before discharge at the point of delivery unless undertaken to an agreed documented procedure established between supplier and the customer before deliveries commence. The volume of any water added at the point of delivery shall be recorded on the delivery ticket. Reworking of over wet concrete is not permitted.

The addition of water will not be permitted for loads that are below the minimum specified slump value on arrival on site. These loads will be rejected after two slump tests confirm that the load does not comply with the specification.

(ii) Quality Assurance

Suppliers of ready mixed concrete shall satisfy the relevant requirements of the Specification for Highway Works (SHW) Clause [104] with reference to Appendix B, Product Certification Schemes.

(iii) Delivery Tickets

Before discharging the concrete at the point of delivery the supplier shall provide the purchaser with the delivery ticket for each batch of concrete. The information shall be as described in BS 8500.

(iv) Mix Design Information

Mix design certificates for concrete grades specified for the contract or for the works are required. Full admixture information shall accompany the mix design certificate.

(v) Admixture Data

If an admixture is proposed in (iv) above copies of admixture data sheet/s for approval acceptance is/are required. When admixtures are offered as a combination of two or more separate materials written confirmation that they are compatible and have no adverse effects on each other or the concrete properties being designed should be provided by the concrete supplier.

(vi) Aggregate Data

Aggregate data sheet/s including typical grading information is/are required.

(vii) Manufacturing Certificates for Cement/Binders

Manufacturers' cementitious and non-cementitious material certificates shall be available on request for the duration of the contract.

(viii) Max. Cement Content

The above mix is proposed for the reinforced concrete in order to avoid thermal cracks. A maximum cement content of 400 kg/m3 is based on this requirement. Cement contents above this value may be allowed depending on the amount of cement replacement material proposed. Use of mix designs with cement content exceeding 400 kg/m3 should be agreed with the Designer.

4. STRUCTURAL STEELWORK

4.1. REQUIREMENT FOR STRUCTURAL STEELWORK

In the table below is indicated the requirements for structural steelwork. It is referenced the following Clauses references: *[1804] – Specifications and Documentation, [1805] – Constituent Products, [1806] – Preparation and Assembly, [1807] – Welding, [1808] – Mechanical Fastening, [1809] – Erection, [1810] – Surface Treatment, [1811] - Geometrical Tolerances and 1812 – Inspection, Testing and Correction.*

			Drawings and Documents that give related structural steelwork requirements	
Series 1800 Clause Reference:	Additional Information Required	Not Applicable	See Drawings Listed in *Appendix 0/4* (Specification)	See Appended Documents
[1804] – Specifications and Documentation				
[1804.1.1]	Execution Specification, General – drawing numbers of all drawings in *Appendix 0/4*, and document references of all appended documents that give all the necessary requirements for the execution of the steelwork.			✓
[1805] – Constituent Products				
[1805.1]	Constituent Products, General - properties of products not covered by listed standards.	✓		
[1805.3.3]	Structural Steel Products, General - grades, qualities and, if appropriate, coating weights and finishes for steel products.		✓	
[1805.3.3]	Surface conditions - additional requirements related to special restrictions on either surface imperfections or repair of surface defects by grinding in accordance with *BS EN 10163*, or with *BS EN 10088* for stainless steel.	✓		
[1805.3.3]	Surface conditions - surface finish requirements for other products.	✓		
[1805.3.3]	Surface conditions - where decorative or specialist surface finishes are required.	✓		
[1805.3.4]	Special properties - Additional requirements for special properties if relevant.	✓		
[1805.4]	Steel castings - Grades, grade suffixes', finishes and options for steel castings.	✓		

[1805.6.3]	Structural bolting assemblies for non preloaded applications - property classes of bolts and nuts, and surface finishes for structural bolting assemblies for non-preloaded applications.		✓	
[1805.6.3]	Structural bolting assemblies for non preloaded applications - mechanical properties for large diameter bolting assemblies.	✓		
[1805.6.3]	Structural bolting assemblies for non preloaded applications - full details for the use of insulation kits.	✓		
[1805.6.4]	Structural bolting assemblies for preloading - property classes of bolts and nuts and surface finishes for structural bolting assemblies for preloading.	✓		
[1805.6.4]	Structural bolting assemblies for preloading - where stainless steel bolts can be used in preloaded applications.	✓		
[1805.6.7]	Foundation bolts - where reinforcing steels may be used for foundation bolts together with the steel grade.	✓		
[1805.6.8]	Locking devices - where locking devices are required.	✓		
[1805.6.8]	Locking devices - if products other than those in the referred standards are to be used.	✓		
[1805.6.11]	Fasteners for thin gauge components - mechanical fastener type for use in stressed skin applications.	✓		
[1805.6.12]	Special fasteners - special fastener not standardized in *CEN* or *ISO* standards, as well as any tests necessary.	✓		
[1805.8]	Grouting materials - grouting materials to be used.		✓	
[1805.9]	Expansion joints for bridges - requirements for type and characteristics of expansion joints.		✓	

[1805.10]	High strength cables, rods and terminations - tensile strength grade and coating of wires.	✓		
[1805.10]	High strength cables, rods and terminations - designation and class of strands.	✓		
[1805.10]	High strength cables, rods and terminations - minimum breaking load and diameter of steel wire ropes and requirements related to corrosion protection.	✓		
[1805.11]	Structural bearings - Schedule of design requirements and acceptance tests.		✓	
1806 – Preparation and Assembly				
[1806.2]	Identification - where soft or low stress stamps may not be used for stainless steel	✓		
[1806.2]	Identification - zones where identification marks are not permitted or shall not be visible after completion.		✓	
[1806.4.4(2)]	Identification - zones where identification marks are not permitted or shall not be visible after completion.	✓		
[1806.5.4 c)]	Cold forming - minimum bending radii for stainless steels other than those to grades listed in *[1806.5.4 b)]*.	✓		
[1806.5.4 d)]	Cold forming - protective membranes for cold formed thin gauge components.	✓		
[1806.6.1]	Dimensions of holes - special dimensions for movement joints.	✓		
[1806.6.1]	Dimensions of holes - nominal hole diameter for hot rivets.	✓		
[1806.6.1]	Dimensions of holes - dimensions of countersinking.		✓	
[1806.7(1)]	Cut outs - re-entrant corners where a smaller radius than that described in 1806.7 is permitted.	✓		

[1806.8]	Full contact bearing surfaces - where full contact bearing surfaces are required.		✓	
[1806.9(2)]	Connections for temporary components – special requirements applying to connections for temporary components, including those related to fatigue.	✓		
[1806.9(3)]	Connections for temporary components – where the removal or addition of permanent material or the introduction of permanent notches is permitted.	✓		
[1806.10]	Assembly check – if, and to what extent, trial assembly is to be used.	✓		
1807 – Welding				
[1807.1(1)]	Welding Quality Requirements - if the *BS EN ISO 3834* quality requirements shall conform to the requirements for EXC2.	✓		
[1807.5.6(1)]	Temporary attachments –areas where welding of temporary attachments is not permitted.		✓	
[1807.5.9.1]	Butt welds, general - the location of butt welds used as splices.		✓	
[1807.5.9.1]	Butt welds, general - where a flush surface is required.			✓
[1807.5.9.2(1)]	Single sided welds – where the use of permanent steel backing is permitted.			✓
[1807.5.13]	Slot and plug welds – the dimensions of holes for slot and plug welds.	✓		
[1807.5.14.1]	Arc spot welds - if weld washers are accepted for stainless steels.	✓		
[1807.5.14.1]	Arc spot welds – the minimum visible width of arc spot welds.	✓		
[1807.5.15]	Other weld types - requirements for other weld types.	✓		
[1807.5.17]	Execution of welding - requirements for grinding and dressing of the surface of completed welds	✓		

[1807.7.2]	Amendments to EN 1011-3 requirements – the surface finish of the weld zones on stainless steels.	✓		
[1807.7.3]	Welding dissimilar metals - requirements for welding different stainless steels to each other or to other metallic materials.	✓		
1808 – Mechanical Fastening				
[1808.2.1]	Use of bolting assemblies, General - where, in addition to tightening other measures or means are to be used to secure the nuts.	✓		
[1808.2.1(1)]	Welding of mechanical fasteners – where welding of property class 4.6 nuts, bolts and washers is permitted.	✓		
[1808.2.2]	Bolts - minimum diameter of fasteners for thin gauge components and sheeting.	✓		
[1808.2.2]	Bolts - dimensions of bolts in connection utilising the shear capacity of the unthreaded shank.	✓		
[1808.2.4]	Washers - dimensions and steel grade of plate washers to be used with slotted or oversized holes.	✓		
[1808.2.4]	Washers - dimensions and steel grade of taper washers.	✓		
[1808.3]	Tightening of non-preloaded bolts - where full contact bearing is required (see *[1806.8]*).	✓		
[1808.3]	Preparation of contact surfaces in slip resistant connections - requirements related to contact surfaces in slip resistant connections for stainless steels.	✓		
[1808.5.1(2)]	Cover Pates in Preloaded Joints – measures permitted to limit the out-of-plane bending stiffness of cover plates.	✓		
[1808.5.1(6)]	Tightening of preloaded bolts, General - preloaded bolts that shall be tightened by the torque method.	✓		

[1808.7.2]	Installation of rivets - where a flush surface of countersunk rivets is required.	✓		
[1808.7.3]	Acceptance criteria - where outer faces of plies are required to be free of indentation by the riveting machine.	✓		
[1808.8.4]	Fastening side laps - requirements for the side lap fasteners as structural fasteners in stressed skin applications.	✓		
[1808.9]	Use of special fasteners and fastening methods - requirements for procedure tests.	✓		
[1808.9]	Use of special fasteners and fastening methods - requirements for use of hexagon injection bolts.	✓		
1809 – Erection				
[1809.4.1(1)]	Reference system – the reference temperature for setting out and measuring the steelwork if different from 15oC.		✓	
[1809.5.3]	Maintaining suitability of supports - if compensation for settlement of supports is required.	✓		
[1809.5.4]	Temporary supports - where leveling nuts on foundation bolts under the base plate are required to be removed.	✓		
[1809.5.4]	Temporary supports - where packings for bridges may be left in position.	✓		
[1809.5.5(1)]	Grouting and sealing – requirements for the treatment of steelwork, bearings and concrete surfaces before grouting.	✓		
[1809.5.5]	Grouting and sealing – the method of sealing the edges of a base plate if no grouting is needed.	✓		

Table 1 - Requirement for structural steelwork

4.2. APPENDED DOCUMENTS

Clause Reference	Requirements
[1804.1.1]	Execution class for all steelwork fabrication shall be EXC3 as per BS EN 1090-2.
[1806.2]	Identification marks are not permitted on any exposed surface after completion. The use of wax or oil based markers are not permitted.
[1807.5.9.1]	Any proposal by the fabricator for shop butt welded splices shall be submitted to the Design Organization for approval at least 4 weeks prior to fabrication. All butt welds shall be ground flush.
[1809.4.1 (1)]	The steelwork dimensions on the drawing are specified for a mean temperature of 12°C. The Contractor shall make adjustments as necessary to achieve the specified dimensions at this temperature.

Table 2 - Appended documents