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Functional Specification

Onshore Compensation Compound

Galvanised Fabricated Steelwork

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1 SCOPE

This functional specification shall apply to the execution of all permanent structural steelwork, and to all temporary structural steelwork required for the execution of the permanent structural steelwork for use in Onshore Compensation Compounds (OCC) that will be owned and operated by EirGrid as part of Offshore Wind Power developments.

This specification should be read in association with the project specific contestable works pack and project documentation and all other relevant functional specifications as issued by EirGrid.

For the purpose of this specification the term Customer shall refer to Offshore Wind Power Developers, Independent Power Producers responsible for the design and build of assets to be handed over to EirGrid.

1.1 STEEL FABRICATION WORKS

The design and fabrication of Steel work for all OCC Civil, Structures and Building works shall be undertaken by the Customer and shall include but is not limited to:-

- Design , Drawings and structural calculations
- Fabrication temporary and permanent steelwork
- Protection
- Delivery
- Erection
- Certification , Testing of all materials, steel members, welds, components and mechanical fasteners

2 LEGISLATION CODES AND STANDARDS

2.1 LEGISLATION

Works, plant and equipment shall be compliant with the provisions of the latest applicable versions of all relevant Irish legislation and directives of the European Union.

These include but not limited to the following or latest versions/ amendments as appropriate:

SI No. 132	Safety signs regulations 1995 (implements EEC Directive 92/58)
SI No. 291	Safety, Health and Welfare at Work (Construction) Regulations
SI No. 299	Safety, Health and Welfare at Work (General Application) Regulations 2007
SI No. 445	Safety, Health and Welfare at Work (General Application) (Amendment) Reg. 2012

Reg (EC) No 1907/2006	Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)
Reg (EC) No 1272/2008	Classification, Labelling and Packaging of Substances and Mixtures (CLP)
Reg (EU) No 517/2014	Fluorinated greenhouse gases and repealing regulation (EC) No 842/2006
Reg (EU) 2015/2068	Format of labels for products and equipment containing fluorinated greenhouse gases
Reg (EU) 2015/2065	Format for notification of the training and certification programmes of the Member States
Reg EU 2015/2066	Minimum requirements and the conditions for mutual recognition for the certification of natural persons carrying out installation, servicing, maintenance, repair or decommissioning of electrical switchgear containing fluorinated greenhouse gases or recovery of fluorinated greenhouse gases from stationary electrical switchgear
Directive 2011/65/EU	Restriction of the use of certain hazardous substances in electrical and electronic equipment (ROHS)
Directive 2012/19/EU	Waste electrical and electronic equipment (WEEE)
Directive 2014/30/EU	Harmonisation of the laws of the Member States relating to electromagnetic compatibility
ECE/TRANS/27 5	Vol. I and II ("ADR 2019") European Agreement Concerning the International Carriage of Dangerous Goods by Road

Equipment shall carry the CE Mark in accordance with Directive 768/2008/EC and the EU Construction Products Regulation (No. 305/2011 – CPR) and adequate documentation to demonstrate full compliance should be retained.

To prove compliance, the equipment shall carry the CE Mark in accordance with Directive 768/2008/EC and the EU Construction Products Regulation (No. 305/2011 – CPR) where required.

In addition, there shall be compliance with the provisions of all current relevant Directives of the European Communities and the Republic of Ireland relating to design, workmanship, materials and equipment. It is the responsibility of the Customer to oversee compliance with current Codes and Standards (Refer to The steel fabrication and equipment shall comply with the latest editions of the international standards, codes and normative references. Key standards used in the specification are indicated in Appendix A and Appendix A -list of standards and references') and the requirements of the Building Control Amended Regulations (BCAR).

2.2 HEALTH AND SAFETY

The Customer is considered to undertake the role of “Client” under the Safety, Health and Welfare at Work (Construction) Regulations 2013 (referred to as the “Regulations” in this document) and responsible for the design. The Customer shall take due account of EirGrid’s Safe by Design Methodology XDS-SDM-00-001-R0.

The Customer is solely responsible for Safety on Site. The project shall be managed in accordance with the Safety Health & Welfare at Work Act 2005 as amended and in compliance with the Safety Health and Welfare at Work (Construction) Regulations 2013.

The Customer and their appointed PSDP and PSCS shall be responsible for compliance, preparation of and liaison with relevant bodies in respect of all documentation associated with the above regulations including but not limited to:

- Design Risk Assessments
- Temporary and Permanent Works Certificates
- Notifications to the HSA (AF1 & AF2)
- Preliminary and Construction Stage Safety & Health Plans
- Risk Assessments and Method Statements (RAMS)
- Safety File and as built steel fabrication drawings

3 SUSTAINABILITY

The Customer shall ensure that the principles of sustainable steelwork for civil and building construction are employed by providing a structure that fulfils its intended function and sustain the specified loads for its intended life, with due regard to sustainability, robustness, economy, and health and safety.

The Steelwork fabrication process shall provide methods that are sustainable and safer through the design and construction phases including .-

- fabrication,
- transportation,
- handling,
- erection, and
- temporary and permanent stability of the structural steel frame

The Customer shall demonstrate through their Environmental Management Systems that all parties in their supply chain have taken practical steps to reduce the greenhouse gas emissions of the processes over which they have control.

The Customer should design, procure, detail and fabricate structural steelwork to minimise material used and reduce waste. The design and detailing of structural steelwork should facilitate its recovery for reuse at its end-of-life stage as part of the circular economy and that all Steel making processes makes full use of available scrap material.

4 GENERAL REQUIREMENTS

The Customer shall prepare and submit complete detailed working drawings to EirGrid in a timely manner for review.

These drawings shall show:-

- 1 Detailed calculations of the load, actual stress and permissible stress in each member and the actual and permissible load in each joint
- 2 Details of all joints.
- 3 The distance between joints
- 4 Details of all bends, shaping and cuts.
- 5 Outline dimensions and thickness of all members, gusset plates and other parts.
- 6 Diameters and lengths of all bolts.
- 7 The identification number of each part or member.
- 8 Centre to centre distances of all bolt holes.
- 9 Size and thickness of all washers.

Any review by EirGrid of the detailed design submitted does not in any way relieve the Customer of its responsibility for the correctness of the design and fabrication.

4.1 NATIONAL INTERNATIONAL AND OTHER APPLICABLE STANDARDS

Except where otherwise stated in the functional specification, materials shall be designed, manufactured, tested and installed according to relevant IEC and/or EN standards.

Where available, the Irish adaptation of European standards (IS EN version), including any national normative aspects shall be applied.

Where no IEC standard or EN standard has been issued to cover a particular subject then an international or British Standard shall be applied. The latest edition and amendments shall apply in all cases.

The steel fabrication and equipment shall comply with the latest editions of the international standards, codes and normative references. Key standards used in the specification are indicated in Appendix A

4.2 WEATHER AND CLIMATE SERVICE CONDITIONS

The OCC and associated buildings, plant and equipment will be located in exposed locations, likely to be less than 1,000 metres above sea-level. The Customer's design for the OCC Steel fabrication shall consider the structural and environmental impact on ferrous metals for the OCC based on temperatures, humidity and wind speeds bespoke to the project's location.

As a guide the is following climate and weather conditions may apply: -

Table 1 Service Conditions

Item	Value
Maximum ambient temperature	40°C
Maximum daily average ambient temperature	20°C
Annual average ambient temperature	30°C
The maximum wind (gust) velocity	50 m/s

The coastal atmosphere conditions will generally be of a high humidity and salt laden.

The relevant Eurocode design standard, IS EN 1991-1-4, is normally use to assess the dynamic effects of wind loading on wind-sensitive structures.

Weather and temperature for project locations may be obtained from the Met Eireann, Ireland's National Meteorological Service, (Department of Housing, Local Government and Heritage).

5 STEEL FABRICATION

5.1 FABRICATION DRAWINGS

2D drawings to be in AutoCAD with pdf copies (in duplicate) and include for 3D Modelling for the Production of Fabrication Drawings. All fabrication and erection drawings shall be made in accordance with BS EN ISO 4157

The Customer design shall prepare all drawings using a 3D Modelling Software (StruCAD/Telka Structures or equivalent). The model shall be issued in a format suitable for the 3D Modelling Viewer and a format suitable for import to Autodesk REVIT. A soft copy of the design shall be made available by the Customer to EirGrid, if requested.

5.2 EXECUTION CLASS

All appropriate structural steelwork intended to both form part or to support part of the works, temporarily or otherwise, shall have an Execution Class 2 (EXC2) as given by IS EN 1090 and bear a CE mark. The following documents shall be obtained by the Customer in advance of any steelworks and be included as part of their Quality systems. :-

Factory Production Control (FPC) Certificate, appropriate for the Works, originating from a Notified Body.

- Welding Certificate, appropriate for the Works, originating from a Notified Body.
- Declaration of Performance (DOP) Certificate as required by the European Construction Products Regulations 305/2011 (ECPR) . A performance shall be declared to meet all the requirements of this Specification and as set out in IS EN 1090 as a minimum.

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5.2.1 MATERIALS

Except where noted as part of the Customers Design the grade of steel used shall be determined in accordance with the design standard IS EN 1993 or approved equivalent standard.

All steel in plate, section and bar forms shall comply with IS EN 10025 or similar approved standard. Structural hollow sections shall be hot rolled in Grade S355JOH to IS EN 10210 and as per the Customer's Design. Welded cold formed structural hollow sections shall not be substituted for hot rolled sections.

Cold formed sections (i.e. Cladding Rails and Purlins etc.) shall comply with IS EN 10219. Identifying marks for the different grades of steel shall be provided in accordance with IS EN 10025.

Except in the case of special plate with through thickness properties guaranteed by the manufacturer, all plates and sections 40 mm or over in thickness shall be ultrasonically tested for laminations and shall meet the requirements of Class S1 of IS EN 10160. The Customer's Design may specify that other plates be ultrasonically tested and, unless otherwise specified, they shall meet the requirements of Class S1 of IS EN 10160.

Dimensional tolerances of:

- I. Hot rolled sections shall comply with IS EN 10365, IS EN 10210-2, IS EN 10056-1 and IS EN 10034
- II. Cold formed section shall comply with IS EN 10162
- III. Plates and flats shall comply with IS EN 10029 / IS EN 10051
- IV. Cold formed galvanised purlins and rails shall comply with BS 2989 & B.S. EN 10142.

Unless otherwise agreed, ordinary bolts and nuts shall generally be Grade 8.8. Pre-loaded bolts, nuts and washers shall comply with IS EN 14399. Design and associated detailing for fatigue, where relevant, shall be in accordance with IS EN 1993-1-9. Note- Further reference to steelwork to be used in the OCC projects can be found within EirGrid functional specification OFS-SSS-417-R0

5.3 CERTIFICATION

Two copies of the manufacturer's test certificate and mill certification verifying that the materials comply with the relevant European Standards or approved equivalent standards shall be issued. These shall form part of the Customers Quality documentation that will be included in the handover documents submitted to EirGrid in relation to all structural steel, bolting materials and welding consumables.

6 TOLERANCES

6.1 STEELWORK

Dimensional tolerances of rolled sections shall comply with IS EN 1090-2, IS EN 10365, IS EN 10210-2, IS EN 10056-1,2 and IS EN 10034.

Flats and Plates shall comply with IS EN 10025/ IS EN 10029 .

Cold formed section shall comply with IS EN 10162. The alignment, level and plumb of the steelwork shall be in accordance with the following tolerances unless superseded by more stringent tolerances dictated by installation and operation e.g. overhead maintenance cranes.

Table 2 Steelwork Tolerances

Position	Permissible deviation of the erected column/support member from its specified Position	+/-5 mm
Level	Permissible deviation between erected column base, column cap, beam, truss and specified level. (level of beam should be taken on top of upper flange)	+/-3 mm
Plumb	Permissible deviation from vertical per 15 m of height subject to a maximum deviation of	+/-5 mm +/-15 mm

Geometrical tolerances shall comply with IS EN 1090-2:

Lifting operations including for Crane rail erection, spreader and lifter beams loading capacities, tolerances and are to be strictly in accordance with OEM manufacturer's requirements and/ or as per Customers design for temporary and permanent works. Work methods for all steel fabrications including lifting apparatus shall as per the relevant approved RAMS.

6.2 DESIGN AND FABRICATION

All fabricated steel shall comply with EN 1993-1-12:2007 Eurocode 3 - Design of steel structures.

Buildings within OCC shall also comply Building Regulations – 2017 as amended) – Ireland with all structural steelwork meeting requirements of TGD -Part A.

The fabrication and workmanship shall be to the best modern practices and comply with the requirements of IS EN 1090 EXC2 or similar approved. Only CE marked fabricators shall be engaged for the work .

All steel members that are fabricated shall be free from bends and twists other than those inherent in the design. Straightening shall be carried out by pressure and not by hammering along a member.

The Customer is responsible for all apertures ,drilling , vents are incorporated into the design and fabrication and as laid down in BS EN ISO 14713:2009. These shall be protected based on their location and extent of exposure as described in Section 10 .

Holing shall be in accordance with IS EN 1090 or equivalent approved standard. Holes

for pre-loaded bolts shall be in accordance with IS EN 1993-1-8 or equivalent approved standard. Reaming or drifting of holes shall not be permitted.

Fabrication shall be carried out exactly in accordance with the reviewed fabricated drawings in a neat and workmanlike manner so as to facilitate cleaning, painting, protection, galvanising and inspection and to avoid spaces in which water can lodge.

Drainage holes shall be provided in members where water could collect during and after erection. To facilitate grouting, holes shall be provided in stanchion bases for the escape of air.

To facilitate connection of the steelwork to the earth grid as per the Customers electrical design, suitable cleats are to be incorporated and protected from painting during fabrication and before any protective coatings applied to the face of cleat.

Where notches are necessary, they shall have smooth radiused internal corners, produced by drilling holes not less than 20 mm diameter before cutting the rest of the notch or by carefully controlled flame cutting.

Bolt holes shall be truly perpendicular to the surface of the member through which they are bored unless the drawings indicate otherwise and may be drilled or punched at the discretion of the manufacturer.

A tolerance of ± 1.0 mm from the dimensions on the drawings shall be allowed on the centre distance of bolt holes spaced up to 2.0 m apart and of ± 2.0 mm for bolt holes spaced more than 2.0 m apart.

Where pedestals for supporting equipment or similar structures are proposed, the top and bottom surfaces shall be flat and truly perpendicular to the vertical axis of the pedestal or structure, unless otherwise indicated on the drawings and the alignment of the transverse and longitudinal axes of the top surface shall correspond accurately with those of the base.

When assembling bolted components, reasonable force may be used to bring the bolt holes together (provided neither members nor holes are thereby distorted), but all force must be removed before the bolt is inserted; otherwise strain shall be deemed to be present and the structure may be rejected, even though it is otherwise apparently in conformity with the reviewed drawing and the specification.

For fabrication of ancillary Steelwork such as for stairs, ladders, walkways refer to Eirgrid functional specification OFS-SSS-417-R0.

7 MARKING AND PACKING

For lattice steel structures which are to be bolted together on site, each member shall be quality approved and stamped before galvanising as applicable and positioned close to one end with the identification number shown on the reviewed drawing. Such identification numbers shall be at least 12mm high and deep enough to be clearly legible after galvanising. Other types of structures shall be marked as shown on the Customers steel fabrication drawings or on associated steel fabrication documentation.

8 WELDING

Welding shall be a metal arc process in accordance with IS EN 1011-1, and the guidance given in IS EN 1011-2. The Customer's QC/QA system for the management of welding shall meet the standard quality requirements described in IS EN ISO 3834-3. Electrodes for metal arc welding shall comply with the requirements of IS EN ISO 2560. Ordinary bolts and nuts shall comply with BS 3692 and BS 4190.

Weld Procedure Specification (WPS) and Qualification Records (WPQR) shall comply with EXC 2 in IS EN 1090-2. Welder procedure qualification (WPQ) acceptance levels shall comply with IS EN ISO 15614 and to EXC 2. The IS EN ISO 3834 quality process for welding shall conform to the requirements for EXC 2.

All welding as part of the Quality documentation (welder qualifications, welding procedure qualification records, welding procedure qualifications and associated work instructions) shall be audited and reviewed by the Customer's person responsible for welding coordination.

The Customer shall ensure that constituent product materials to be welded are compatible with the welding procedure approved. Joints shall be prepared in accordance with IS EN ISO 9692-1 and -2. Precautions shall be taken to ensure cleanliness of the connection prior to welding.

Customer shall ensure that welding operators are tested to meet the requirements of IS EN ISO 9606-1 and IS EN ISO 14732, as appropriate.

The Customer as part of their Quality systems shall produce and carry out welding procedures that comply with IS EN ISO 15609-1.

At joints in all steelwork, surfaces to be welded shall be restored to Sa2½ 'IS EN ISO 8501-1 quality or to bright steel taken back min 75mm and shall be free of any protective or other coating immediately prior to welding (refer to Section 10).

The use of shims shall be avoided where possible by suitable controls on preparation, assembly and weld distortion and, if necessary, by machining.

Welding including shims if required shall be carried out in accordance with IS EN 1090-2.

If the temporary tack weld is to be removed prior to welding of the joint, the minimum permitted size of tack weld shall be subject to a welding procedure test in accordance with IS EN ISO 15614-1. If the tack weld is to be left in the joint, then the full length of the tack weld location shall be subjected to a welding procedure test in accordance with IS EN ISO 15614-1.

The Customer shall ensure that all welding is carried out under the supervision of a competent and experienced welding supervisor. The Customer shall keep all records as part of the Quality procedures and welders to ensure all main welds, in particular butt welds, may be identified with the welder responsible for production.

8.1.1 TESTING OF WELDS

Routine testing includes 100% visual inspection and a supplementary programme of non-destructive testing (NDT) which shall be undertaken by the Customer in accordance with their Quality procedures to ensure that the welding processes and welders / welding operators are producing work of a quality that is consistent with Execution Class 2. The benchmark for the quality of work required for Execution Class 2 is generally quality level C to IS EN ISO 5817. The supplementary programme of NDT shall be in accordance with IS EN ISO 17635.

All welds are to be visually inspected by the Customers competent person and in accordance with IS EN ISO 17637 over the full length of the weld and before NDT inspection is performed.

Non-Destructive Testing [NDT] shall be carried out in accordance with the guidelines in IS EN ISO 17635. Customer shall carry out NDT with their competent person who shall be certified by an authorised qualifying body in accordance with IS EN ISO 9712.

If examination of a weld surface is required, magnetic particle testing shall be used in accordance with the recommendations given in IS EN ISO 17638 and this shall be preceded by visual inspection undertaken by the Customers NDT competent person. If magnetic particle testing is impractical, penetrant testing may be used in accordance with the recommendations given in IS EN ISO 3452-1.

Operators carrying out final surface flaw detection of the weld shall hold a current certificate of competence to Level 2 according to IS EN ISO 9712 in surface flaw detection of the relevant types of work, from a recognised authority.

If ultrasonic testing is required, it shall be carried out in accordance with IS EN ISO 17640, IS EN ISO 11666 using reference level to technique 1, evaluation reference level -14dB and testing level B unless determined otherwise by the Customer's Design.

9 MECHANICAL FASTENERS(BOLTS, NUTS AND WASHERS)

Supply and Verification of mechanical fasteners will be from an organisation with a current quality management system complying with EN ISO 9001. Conformity assessment and application of structural mechanical fasteners shall be undertaken in accordance with IS EN 1090-1/2. A declaration of performance under a CE mark in accordance with the Construction Products Regulations shall be provided for all structural steel components. All mechanical fasteners to conform to Customers specification and relevant design details.

The use of bolts, including permissible stresses, size and pitch of bolts shall comply with the requirements of IS EN 1993, IS EN 14399 Series and IS EN 1090. The combination of bolts and nuts (and washer if used) which may be used shall be to the requirements of IS EN 15048.

Fasteners shall have CE marking for load ability as specified in IS EN 15048-2.

Unless otherwise agreed, bolts shall be provided with a washer under the nut. A suitable plate or heavy-duty washer shall be used under the head and/or nut against plies that have oversize or slotted holes. Plate washers shall not be thinner than 4 mm.

If the bolt head or nut is in contact with a surface which is inclined at more than 2

degrees from a plane at right angles to the bolt axis a taper washer shall be placed to achieve satisfactory bearing as per Customer design.

Nut blanks shall be tapped after being galvanised. Galvanising and re-tapping of nuts is not permitted.

Bolts may be assembled using power tools or shall be fully tightened by hand using appropriate spanners in accordance with BS 2583. Counter nuts or spring washers to be used on connections subjected to a dynamic or quasi-dynamic loading.

Fabricated process shall ensure that bolt threads after galvanising the nut can be easily screwed over the whole threaded length without excessive play. The threaded length shall be such that the nut can be fully tightened up, but also that the minimum practical amount of thread lies between the sections being jointed and that at least two and at most four threads of the bolt shall project through nut when fully tightened.

All structural grading for Bolts used in the fabrication, temporary and permanent stability of the structures and buildings including Cast- in foundation bolts to be as per Customers Design.

Washers to suit nuts and flanges shall be used under all nuts and provided where necessary on tapered flanges. Where nuts and bolts for assembly on site are supplied with any structure, an additional contingency of 5% of the total number of all nuts, bolts, washers and pack washers shall be provided.

10 PROTECTION OF STEELWORK

10.1 PREPARATION OF STEELWORK

Steelwork shall be blast cleaned to remove all mill scale and other contamination to IS EN ISO 8501-3 and BS 7079. The surface finish shall be to standard preparation grade Sa 2½ in accordance with IS EN ISO 8501-1 and IS EN ISO 12944-4. Abrasive used during blast cleaning shall be selected in accordance with IS EN ISO 11124 and IS EN ISO 8501-3 and BS 7079. Sand blasting shall not be used.

Any contamination of the treated steelwork surface shall be removed, using an approved solvent solution, before further protective coatings are applied. The finishing coats to all structural steel shall be a colour as specified by the Customer's Design, in accordance with BS 381C and BS 4800.

10.2 CORROSION AND HOT DIP GALVANISED PROTECTION OF STEELWORK

All exposed steelwork unless otherwise specified by the Customers Design , including externally exposed holding down bolts and internal steelwork below ground floor level shall be hot dipped galvanised.

The requirements for the corrosion protection for steelwork shall comply with IS EN 1090-2. The steelwork and components including nuts(excluding treads), bolts and washers, that are to be hot dip galvanised shall comply with IS EN ISO 1461 (Refer to EirGrid Specification OFS-SSS-420-R0).

10.2.1 REPAIRS TO STEEL PROTECTION AT WELDS

All welds shall have corrosive protection applied in accordance with IS EN 1090-2. The exposed steelwork shall then be treated and protected with hot dip galvanised in accordance with EN ISO 1461.

On site, surfaces of hot dip galvanized steel and components which the Customer has deemed to have minor damage shall ensure that the steel protection system is repaired by :-

- a) Cleaning the bare steel or steel-zinc alloy using needle gun and/or rotary wire brush.
- b) Cleaning, degreasing, washing down/ drying to thinned and adjacent sound galvanised surfaces.
- c) Then Immediately apply zinc-rich paint to bared steel or steel-zinc alloy and thinned galvanising, overlapping sound galvanised surfaces by minimum 20 mm, to give protection equal to that on undamaged surfaces with two coats of Zinc Rich Epoxy Blast Primer, minimum dry film thickness of 50 microns each.
- d) alternatively, the Customer shall ensure the components are re-galvanized as per Section 6.2

10.2.2 INSPECTION

Inspections shall measure zinc thickness with magnetic or electromagnetic meter and shall be re-galvanized if thickness is deficient. All galvanized components shall be subjected to 100% post-galvanizing inspection in accordance with procedure PGI-1 in Table 10.1 of NSSSBC (National Structural Steelwork Specification for Building Construction) unless otherwise specified by the Customer.

The drawings shall identify: -

- i. Any components for which post-galvanizing inspection is not required (PGI-0).
- ii. Any components that shall be subjected to procedure PGI-2A
- iii. Any specific locations that shall be subjected to procedure PGI-2B

10.3 FIRE PROTECTION

Fire protection for fabricated Steelwork to buildings within the OCC shall be treated with intumescent paint coating to provide a 60 minute fire resistance (or higher if required by the Fire Safety Certificate) and shall comply with TGD B -Fire Safety of the Building Regulations as Amended, BS 476-21:1987 and BS EN 1993-1-2:2005. Third party certification installers of fire protection systems, materials, products or structures for all paint protection systems shall form part of the Customers Quality Control documentation.

10.3.1 FIRE PROTECTION - REPAIR OF DAMAGED COATINGS

Before carrying out on-site remedial works a written Method Statement for repair procedures shall be prepared by the Customer for review.

The Customer is responsible for identifying all areas requiring remedial works and

rectification in accordance with the coating manufacturer's recommendations.

Where the dry film thickness (dft) of the intumescent coating does not comply with the nominal dft with that required to provide the specified fire resistance then remedial works will be needed to bring the affected area(s) up to the required thicknesses.

Process above shall include for locally abrading and cutting out area of damage. Re-apply primer, intumescent coat and top sealer coat to original specification. Do not overlap existing intumescent with new primer, or existing top sealer with new intumescent.

Where unscheduled additional connections are to be made to the erected steelwork the intumescent coating is to be removed locally and reinstated.

10.4 STORAGE AND TRANSPORT OF STEEL AND FABRICATED STEELWORK

- 1 Steel awaiting fabrication for the Works and uncoated steelwork shall be adequately protected from contaminants liable to cause heavy rusting and possibly pitting of the surfaces.
- 2 Steelwork shall not be loaded for transport until the paint system is sufficiently hard for handling.
- 3 During storage, steelwork shall be kept clear of the ground and shall be laid out or stacked to prevent water or dirt accumulating on or against any of the surfaces.
- 4 Suitable packings shall be placed between layers of stacked steelwork. When cover is provided it shall be ventilated sufficiently to keep condensation to a minimum.
- 5 Components weighing less than one tonne shall be kept in a storage area away from their erection point to minimise damage to protective coatings.
- 6 Lengths of parapet and individual steel lighting columns and masts shall be supported on timber, and precautions taken to prevent damage to their protective coatings and ingress of water. They shall only be positioned adjacent to their erection point immediately before erection. If the planned erection time is delayed, the components shall be returned to the storage area.
- 7 Hot dip galvanized components shall be transported and stored under dry and well-ventilated conditions, to avoid wet storage staining. If stored outdoors, close contact of surfaces of components shall be avoided, and suitable packing shall be placed between components, and to keep the components clear of the ground. Components shall be stored wherever possible at a slight angle to allow water run-off. When cover is provided it shall be ventilated sufficiently to keep condensation to a minimum.
- 8 If damage to coatings is excessive, or may be difficult to deal with after erection, the Customer shall restore the coatings before erection

10.5 STEELWORK ERECTION

Steelwork erection shall be in accordance with IS EN 1090 . A detailed written risk assessment and method statement (RAMS) for each erection process shall be produced by the Customer prior to commencement of erection.

The Customer shall be responsible for the correct alignment and level of all steelwork and for the accurate plumbing of stanchions. The alignment, level and plumb of the steelwork shall be in accordance with the tolerances outlined in Section 6 of this Specification.

Methodology for the erection Steelwork shall ensure members are securely bolted or otherwise connected together and provided with temporary bracing and/ or effectively anchored using steel guy ropes to resist - all dead loads, loads due to erection equipment and the operation and all lateral including wind.

Temporary bracing and guy ropes as per Customers Design shall be left in position and maintained for as long as is necessary to ensure the safety of the structure without undermining or unduly affecting the permanent or other temporary works.

Any damage to protective coating(s) shall be restored to comply with specification and Customer's design protection requirements.

11 TESTING

All steel used in the fabrication process shall be tested in accordance with the Customers quality, IS EN 1090-2 and standards and codes as listed in this specification. Copies of testing , sampling, materials , records signed certificates shall be supplied as part of the Customers quality plan and issued to EirGrid in a timely manner for review.

Inspection and sample testing of the mechanical fasteners to be used in the OCC shall be in accordance with IS EN ISO 3269:2001, to confirm that the dimensional and mechanical properties comply with the product standard to which the mechanical fasteners have been mechanically manufactured

Sampling and testing for any of the steel fabrication and associated component for the works that results in non-compliance with the specification or relevant codes and standards may result in the whole consignment being rejected.

11.1.1 INSPECTION

The Customer shall inspect the steel fabrication works to ensure specified standards and design are being met. As part of the Customers Quality documentation their detailed records of such inspections shall be recorded and shall be made available to EirGrid as part of the handover documentation.

EirGrid also reserves the right to inspect the fabrication works before and / or during fabrication and should be given every cooperation during these visits.

12 QUALITY CONTROL AND QUALITY ASSURANCE STEEL FABRICATION PROCESSES

During the OCC design and build processes , the Customer in a timely manner shall make available in the factory, and/or at site works locations in advance of any works as applicable , for each of the areas as requested for review/ inspection by EirGrid.

This will cover but not limited to the following areas and associated activities:

1. Witnessing by EirGrid of the full assembly and adjustment process to evaluate the level of skill and experience required to complete each key works activity successfully.
2. Access to QC/QA documents including RAMS (Risk Assessments and Method Statements), work procedures, drawings, checklists, samples, Inspection schedules & test plan, Project Quality Control plan, certifications, audits and other documents for materials, welding, components/mechanical fasteners and the treatment for all steel fabrication protection systems undertaken for the civil, structural and building processes required for the delivery of the OCC.
3. EirGrid will also review the level of the tolerances (See Section 7) available during the adjustment and the overall clarity of the Customers steelwork installation manual for each process.

A detailed inspection of the steel fabrication by EirGrid to evaluate the Customers quality of the design and manufacture in relation to finishes, structural integrity and corrosion resistance, elimination or control of possible failure mechanisms and ease of operation and maintenance.

13 DOCUMENTATION

The following information shall be included for review:-Completed list of deviations.

. Steel Fabrication drawings (2d and 3d models) and details in duplicate (in 3D format, DWG and PDF format)

- 1 3D Modelling Software for Production of Fabrication Drawings. The model shall be issued in a format suitable for the 3D Modelling Viewer and a format suitable for import to Autodesk REVIT
- 2 Structural Steel Calculations for all members and mechanical fasteners
- 3 RAMS including Crane/lifting operations
- 4 Quality Control/Assurance documentation including Certifications from all parties in the supply-chain for materials used and test records and inspections for factory and site fabricated steelwork including any welding.
- 5 Certifications and details of steel protection and finishes applied.
- 6 As built drawings AutoCAD and pdf 2D and 3D models for steel fabrication and details

14 APPENDIX A -LIST OF STANDARDS AND REFERENCES

Code Ref	Year	Description
BS EN 10025-2	2004	Hot rolled products of structural steels: Technical delivery conditions for non-alloy structural steels
IS EN 10204	2004	Metallic materials. Types of inspection documents
BS EN ISO 8501-1	2007	Preparation of steel substrates before application of paints and related products. Visual assessment of surface cleanliness: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings
BS EN 10163-1	2004	Delivery requirements for surface condition of hot-rolled steel plates, wide flats, and sections: General requirements
BS EN 10163-2	2004	Delivery requirements for surface condition of hot-rolled steel plates, wide flats, and sections: Plate and wide flats
BS EN 10163-3	2004	Delivery requirements for surface condition of hot-rolled steel plates, wide flats, and sections: Sections
IS EN 10210-1	2006	Hot finished structural hollow sections of non-alloy and fine grain steels: Technical delivery requirements
IS EN 10219-1	2006	Cold formed welded structural hollow sections of non-alloy and fine grain steels: Technical delivery requirements
BS EN ISO 2560	2009	Welding consumables. Covered electrodes for manual metal arc welding of non-alloy and fine grain steels. Classification
BS EN ISO 14341	2008	Welding consumables. Wire electrodes and deposits for gas shielded metal arc welding of non-alloy and fine grain steels. Classification
BS EN ISO 14171	2010	Welding consumables. Solid wire electrodes, tubular cored electrodes and electrode/flux combinations for submerged arc welding of non-

Code Ref	Year	Description
		alloy and fine grain steels. Classification
BS EN ISO 17632	2008	Welding consumables. Tubular cored electrodes for gas shielded and non-gas shielded metal arc welding of non-alloy and fine grain steels. Classification
IS EN 1011-1	2009	Welding. Recommendations for welding of metallic materials: General guidance for arc welding
IS EN 1011-2	2001	Welding. Recommendations for welding of metallic materials: Arc welding of ferritic steels
IS EN 14399-1	2005	High-strength structural bolting assemblies for preloading: General requirements
BS EN 14399-2	2005	High-strength structural bolting assemblies for preloading: Suitability test for preloading
BS EN 14399-3	2005	High-strength structural bolting for preloading: System HR. Hexagon bolt and nut assemblies
BS EN 14399-4	2005	High-strength structural bolting assemblies for preloading: System HV. Hexagon bolt and nut assemblies
BS EN 14399-5	2005	High-strength structural bolting assemblies for preloading: Plain washers
BS EN 14399-6	2005	High-strength structural bolting assemblies for preloading: Plain chamfered washers
BS 4320	1968	Specification for metal washers for general engineering purposes. Metric series
BS EN ISO 2320	2008	Prevailing torque type steel nuts. Mechanical and performance properties
BS EN ISO 7042	2012	Prevailing torque type all-metal hexagon high nuts. Property

Code Ref	Year	Description
		classes 5, 8, 10 and 12
BS EN ISO 13918	2008	Welding. Studs and ceramic ferrules for arc stud welding
BS EN 1090-2	2008	Execution of steel structures and aluminum structures: Technical requirements for steel structures
BS EN ISO 4157-1	1999	Construction drawings. Designation systems: Buildings and parts of buildings
BS EN ISO 6284	1999	Construction drawings. Indication of limit deviations
BS EN ISO 8560	1999	Construction drawings. Representation of modular sizes, lines and grids
BS EN ISO 9431	1999	Construction drawings. Spaces for drawing and for text, and title blocks on drawing sheets
BS EN 22553	1995	Welded, brazed, and soldered joints. Symbolic representation on drawings
BS EN ISO 4063	2010	Welding and allied processes. Nomenclature of processes and reference numbers
BS 5536	1988	Recommendations for preparation of technical drawings for microfilming
BS EN 1993-1-8	2005	Eurocode 3. Design of steel structures: Design of joints
BS EN ISO 3834-3	2005	Quality requirements for fusion welding of metallic materials: Standard quality requirements
BS EN ISO 9692-1	2013	Welding and allied processes. Types of joint preparation: Manual metal arc welding, gas-shielded metal arc welding, gas welding, TIG welding and beam welding of steels
BS EN ISO 9692-	1998	Welding and allied processes. Joint preparation:

Code Ref	Year	Description
2		Submerged arc welding of steels
BS EN 287-1	2011	Qualification test of welders. Fusion welding: Steels
BS 4872-1	1982	Specification for approval testing of welders when welding procedure approval is not required: Fusion welding of steel
BS EN ISO 15609-1	2004	Specification and qualification of welding procedures for metallic materials. Welding procedure specification: Arc welding
BS EN ISO 15614- 1+A2	2004+2012	Specification and qualification of welding procedures for metallic materials. Welding procedure test: Arc and gas welding of steels and arc welding of nickel and nickel alloys
BS EN 1011-2	2001	Welding. Recommendations for welding of metallic materials: Arc welding of ferritic steels
BS EN ISO 17637	2011	Non-destructive testing of welds. Visual testing of fusion-welded joints
BS EN ISO 3452-1	2013	Non-destructive testing. Penetrant testing: General principles
BS EN ISO 11666	2010	Non-destructive testing of welds. Ultrasonic testing. Acceptance levels
BS 2583	1955	Specification for podger spanners
BS 3692	2001	ISO metric precision hexagon bolts, screws, and nuts.
BS EN 197-1	2011	Cement: Composition, specifications, and conformity criteria for common cements
BS 7079	2009	General introduction to standards for preparation of steel substrates before application of paints and related products
BS EN ISO 8501-1	2007	Preparation of steel substrates before application of paints and related products. Visual assessment

Code Ref	Year	Description
		of surface cleanliness: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings
	2012	Preparation of steel substrates before application of paints and related products. Surface roughness characteristics of blast- cleaned steel substrates: Method for the grading of surface profile of abrasive blast-cleaned steel. Comparator procedure
BS EN 10163-1	2004	Delivery requirements for surface condition of hot-rolled steel plates, wide flats, and sections: General requirements
EN 10210-1	2006	Hot finished structural hollow sections of non-alloy and fine grain steels: Technical delivery requirements

NOTE – The Current standards in the table above are provided for information. Where the references and Codes of Practice have been updated then the most recent version should be used.

14.1 REFERENCES :

DEFRA's Guidance Notes to Environmental Protection Act 1990 [PG6/23].
National Building Specification
ASFP Publications