Document Reference: OFS-SSS-426-R1

Functional Specification

220kV Post Insulators for Air Insulated Stations

Revision	Date	Description	Originator	Reviewer	Checker	Approver
R0	14/04/2022	First Issue	Vitali Garon	Niall McMahon Daniele Giustini	Leon Notkevich, Neil Cowap	Aidan Corcoran, Richard Blanchfield
R1	28/09/2022	Issued for use after industry feedback	Vitali Garon	James Staunton Daniele Giustini	Neil Cowap	Louise O'Flanagan

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1 SCOPE

This Functional Specification is applicable for use in offshore wind transmission links delivered by the Customer as Contestable Works, to be owned and operated by EirGrid.

This Functional Specification covers the supply and installation of post insulators for the Onshore Compensation Compound.

The TECHNICAL SCHEDULE OTS-SSS-426 is available and should be filled for each type of post insulators.

2 LEGISLATION CODES AND STANDARDS

2.1 LEGISLATION

Equipment offered shall be compliant with the provisions of the latest applicable versions of all relevant Irish legislation and directives of the European Union.

These include the following or latest versions/ amendments as appropriate:

Number	Title
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/275	Vol. I and II ("ADR 2019") European Agreement Concerning the International Carriage of Dangerous Goods by Road

Unless the Customer can show to EirGrid's satisfaction that CE marking is not required,

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.

2.2 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 equipment shall comply with the latest editions of the international standards, codes and normative references indicated below, and the latest editions of the standards that they reference.

Number	**Title**
IEC 60815-1	Guide for the selection of insulators in respect of polluted conditions. Part 1 definitions, information and general principles
IEC 60815-2	Guide for the selection of insulators in respect of polluted conditions. Part 2 ceramic and glass polluted conditions. Part 2 ceramic and glass insulators for a.c. systems
IEC 60815-3	Guide for the selection of insulators in respect of polluted conditions. Part 3 polymer insulators for a.c. systems
IEC 62271-1	High-voltage switchgear and control gear common specifications.
IEC60507	Artificial pollution tests on high voltage insulators to be used on a.c. systems.
IEC60060-1	High Voltage test techniques – Part 1: General definitions and test requirements.
IEC62271-102	High Voltage switchgear and control gear – Part 102: AC disconnectors and earthing switches
IEC60695-11-10	Test Flames – 50W horizontal and flame test methods. Fire hazard testing – Part 11-10
IEC60865-1	Short Circuit Currents – Calculations of effects – Part 1: Definitions and calculation methods
IEC62217	Polymeric insulators for indoor and outdoor use with a nominal voltage greater than 1000V – General Definitions, test methods and acceptance criteria.
ISO Publication	Plastic and ebonite – Determination of indentation hardness by

Number	Title
868:3ED 2003	means of a durometer (shore hardness)
ISO Publication 3452:1ED 1984	Non-destructive testing – General principles
ISO Publication 4892-1:2ED 1999	Plastics – Methods of exposure to laboratory light sources – Part 1: General Guidance
ISO Publication 4892-2:1ED 1994	Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon arc sources
ISO Publication 4892-3:IED 1994	Plastics – Methods of exposure to laboratory light sources – Part 3: Fluorescent UV lamps
IEC 66231	Composite station post insulators for substation with a.c. voltages greater than 1000V up to 245kV – Definitions, test methods and acceptance criteria.
IEC 60273	Characteristics of indoor and outdoor post insulators for systems with nominal voltages greater than 1000V.
IEC 60168	Tests on indoor and outdoor post insulators of ceramic materials or glass for systems with nominal voltages greater than 1000V.
IEC 62271-301	Dimensional standardisation of terminals for high-voltage switchgear and control gear.
EirGrid Spec	Specification for the hot-dip galvanising of iron and steel articles other than wire.
	EU ROHS (2002/95/EC) and WEEE (2002/96/EC) Directives published in January 2003
	REACH Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 and any amending legislation.
	CLP (Classifying, Labelling, Packaging) Regulation (EC) No 1272/2008
	SI 132/1995 Safety signs regulations 1995
	EU ROHS (2002/95/EC) and WEEE (2002/96/EC) Published in Jan 2003

This specification shall take precedence in case of conflict between it and any of the listed standards.

In addition, there shall be compliance with the provisions of all relevant Directives of the European Communities relating to work equipment, i.e. in regard to safety of personnel who operate and maintain the equipment. In order to prove compliance, the equipment shall carry the CE Mark in accordance with Direction 93/465/EEC.

3 NETWORK PARAMETERS

The equipment shall be suitable for installation in the Onshore Compensation Compound. The design parameters including service conditions are specified in EirGrid's functional specification OFS-SSS-400, Onshore Compensation Compound General Requirements.

4 TYPE AND DUTY

The Post Insulators shall consist of one or more units as required by the network insulation level. They shall be outdoor cylindrical type of best quality porcelain or alternatively made of composite material with external fittings. The preferred colour for porcelain insulators is brown and that for polymer insulators is grey. A modified design will be required for a small number of installations to allow a number of units be assembled in stack arrangement.
The Post Insulators shall be so constructed that, under short circuit conditions, movement is kept to a minimum and there is no tendency for them to work loose from their bases.
The Post Insulators shall be capable of working with the system parameters without failing.
Concrete, if used in the busbar support construction, shall be designed and constructed to adequately support busbar, structures, insulator loadings (static & dynamic) and tube / anchor bolt requirements.
The post insulator stacks will be mounted on earthed, galvanised steel supports supplied by the Customer and will be used to support high voltage busbars and connections between various items of high voltage switchgear.

5 INSULATION WITHSTAND VOLTAGES

The insulation withstand voltage levels, lightning impulse (1.2/50µs), switching impulse (250/2500µs) and power frequency (50Hz, 1 minute) shall be as specified under NETWORK PARAMETERS in EirGrid functional specification OFS-SSS-400, Onshore Compensation Compound General Requirements.
As the post insulators are for outdoor service, the switching impulse and power frequency withstand capability shall be under wet conditions.

6 CREEPAGE

Creepage distance to earth shall be the higher value as specified under NETWORK PARAMETERS in EirGrid functional specification OFS-SSS-400, Onshore Compensation Compound General Requirements.
The Reference Unified Specific Creepage Distance (RUSCD) for the phase to earth insulators shall be in accordance with IEC 62271-1 and IEC 60815 for rated voltage 245kV and very heavy pollution level 53.7mm/kV.

7 MECHANICAL STRENGTH

The rated static withstand load for straight-load and cross-load conditions as defined in IEC60273, shall be as specified in the TECHNICAL SCHEDULE OTS-SSS-426.

The Post Insulators shall be capable of withstanding the specified static loads which include for the effects of wind and ice.

Under normal conditions, the sum of the loads acting should not exceed 50% of the specified withstand load.

The Post Insulators shall withstand rarely occurring extreme dynamic loads (e.g. short

circuits)

Typical requirements for static withstand load capability on the networks covered by this specification are as follows:

- 6kN for horizontal loads parallel to the pole/current circuit
- 4kN for horizontal loads perpendicular to the pole/current circuit

The cantilever mechanical strength shall be adequate for all operating scenarios. Its rated cantilever breaking strength shall be as stated by the Customer in the TECHNICAL SCHEDULES.

8 Fixing Arrangements

Post insulators shall be suitable for mounting vertically or horizontally.

Typical requirements for the base flange of the insulators installed on the transmission system are below. Installing similar would be advantageous

Table 1 Typical Fixing Arrangements

PCD	No. of holes	Type	Diameter
275mm	8	Plain	18mm

9 Corrosion Protection

All exposed ferrous parts, including nuts and bolts, shall be hot-dip galvanised to comply with EirGrid Specification, OFS-SSS-420 Hot Dip Galvanising of Iron and Steel Other Than Wire.

The Customer shall state clearly in the schedule of Corrosion Protection (part of TECHNICAL SCHEDULES) the corrosion protection applied to any aluminium or aluminium-alloy parts.

The Customer shall draw attention to all exposed points in their equipment at which aluminium or aluminium-alloy parts are in contact with or in close proximity to other metals and shall state clearly the protection employed at each point to exclude air and moisture.

Experience has shown that extreme precautions are necessary, because of the high humidity, to prevent the aggressive ingress of moisture between flange plates, around gaskets and 0-rings, at insulator/flange interfaces, etc.

10 Markings

All post insulators shall be marked with a serial number and year of manufacture. All markings shall be clear, indelible, corrosion proof and shall be in English.

11 Tests

11.1 Type

All post insulators offered shall have been fully type tested in accordance with IEC 62231 as applicable.

These type tests shall have been carried out at an independent testing station or alternatively have been witnessed by a representative of an independent testing authority

or other independent witness.

EirGrid reserve the right to request further testing to be carried out at another independent testing station. All proposals are subject to this condition. Such testing may be witnessed by EirGrid.

11.2 SAMPLE

The post insulators shall be sample tested in accordance with IEC 62231 as applicable. Full details of the proposed sample tests shall be submitted.

EirGrid may wish to witness the sample tests and type tests if applicable.

11.3 ROUTINE

Full details of the proposed routine tests shall be submitted. Details of the routine mechanical test shall be agreed between EirGrid and the Customer Standard routine tests as per relevant IEC standards referenced in this Functional Specification to be carried out

EirGrid may wish to witness the routine tests.

12 DELIVERY

12.1 TEST RESULTS

At the conclusion of routine tests, results shall be submitted to EirGrid for review.

13 INSTALLATION INSTRUCTIONS

While Installation is the responsibility of the Customer, EirGrid require that a copy of the manufacture's installation instructions be provided. The instructions shall be in English and shall cover all aspects of installation including putting into service. The Customer shall ensure that the information supplied is clear and specific to the equipment being provided.

14 COMPLIANCE WITH SPECIFICATION

All deviation requests from the requirements of this Specification shall be submitted to EirGrid for review using approved Derogation (Deviation) procedure. [OFS-GEN-24]

15 DOCUMENTATION

All documentation shall be in English

15.1 SUBMISSION FOR DESIGN REVIEW

The following information shall be submitted for review, when the order is placed

1. Complete drawings, detailing physical dimensions, layout of equipment, support structures, fixing details and high voltage connections.

   Complete set of Electrical drawings detailing in full all electrical circuits and associated accessories.
2. Completion of all technical schedules. Terms and definitions shall be in accordance with IEC 60056 and IEC 60694
3. Fully detailed Type test certificates and reports

4 Details of routine testing carried out on equipment at any stage prior to dispatch
5 Completed list of deviations.
6 Complete technical documentation
7 Complete set of technical drawings
8 Complete list of recommended spare parts
9 Complete list of specialist tools
10 Complete installation instructions
11 Complete operational instructions
12 Complete maintenance instructions
13 Complete decommissioning and dismantling instructions
14 Statement of acceptance of EirGrid warranty
15 Reference list of the specific equipment proposed

The above list is not exhaustive and does not preclude the Customer from disclosing any further information pertaining to the Item of plant.

Plant offered without the complete submission of the above requirements may not be reviewed.

EirGrid require that the following information be submitted after design review:.