

---

# **TII492 Intelligent Transport Systems (ITS) - Equipment Supply and Installation Framework - Generation 2 - Lot 2**

**Volume A: Works Requirements**

**Part 3: Technical Specification  
Section 12: Cabinets**

**June 26**

# Contents Table

<b>1.</b>	<b>Scope .....</b>	<b>1</b>
<b>2.</b>	<b>General Requirements .....</b>	<b>2</b>
2.1	General.....	2
2.2	Standards .....	3
<b>3.</b>	<b>Environmental control .....</b>	<b>5</b>
<b>4.</b>	<b>Materials and Workmanship.....</b>	<b>6</b>
<b>5.</b>	<b>Service Life and Support.....</b>	<b>7</b>
<b>6.</b>	<b>Construction Requirements and Design Constraints .....</b>	<b>8</b>
<b>7.</b>	<b>Mains Power Equipment and Wiring .....</b>	<b>10</b>
<b>8.</b>	<b>Cabinet Cable Management Base/Plinth .....</b>	<b>12</b>
<b>9.</b>	<b>Cabinet Internal Shelving/Frame.....</b>	<b>13</b>
<b>10.</b>	<b>Security .....</b>	<b>14</b>
<b>11.</b>	<b>Cabinet Heating and Ventilation .....</b>	<b>15</b>
11.1	Heater and thermostat Option .....	15
<b>12.</b>	<b>Painting and Protection .....</b>	<b>16</b>
<b>13.</b>	<b>Labels and Identification .....</b>	<b>17</b>
<b>14.</b>	<b>Testing, Approval and Acceptance.....</b>	<b>18</b>
14.1	Prototype testing.....	18
14.2	Documentation.....	19

# 1. Scope

This specification defines the requirements for the supply or supply and installation of the Equipment Cabinets and their internal components.

The Equipment Cabinets are to be installed on the TII road network at roadside level and will be used to house motorway communication and roadside equipment.

The Contractor shall supply Equipment Cabinets in accordance with the TII CC-SCD-01548.

The Contractor shall supply the Equipment Cabinet with power cable termination and distribution, communication cable termination and interconnection, and racking to provide the installed roadside communications equipment with the required level of physical, electrical, Electro Magnetic Compatibility and environmental protection to ensure proper operation in a temperature-controlled environment.

## 2. General Requirements

### 2.1 General

The Contractor shall comply with all the requirements of this specification.

The Contractor shall ensure the Equipment Cabinet is supplied with all necessary fixings, keys, labels, documentation, ancillary items and internal wiring as detailed in accordance with this specification.

The Contractor shall supply and install the Equipment Cabinet that shall meet the following requirements:

- Environmental protection to IP56 (in accordance with IEC 60529) for all equipment housed in the cabinets (with doors closed and locked).
- Termination and distribution facilities for power and telecommunications circuits.
- An internal moisture free environment suitable for the safe operation of the installed equipment (up to an assumed maximum of 3.5kW).
- Provision for manufacturers rack mounted electronic equipment to be installed.

The Equipment Cabinet shall house a standard 19-inch rack constructed in accordance with IEC 60297 for the mounting of Transport Infrastructure Ireland (TII) equipment to a maximum mass of 50kg and depth of 250mm.

The Equipment Cabinet shall be supplied with a Power Distribution Unit (PDU) that shall provide electrical power and protection in accordance with I.S. 10101:2020.

The Contractor shall mount the power bars outside of the rack mounting so as not to impede or deny space for equipment.

The TII ITS roadside cabinet shall serve as a weatherproof enclosure for ITS equipment.

The TII ITS roadside cabinet shall be a platform within which modular components may be added to serve a variety of ITS applications. The major subsystems that may be installed in a cabinet housing are:

- Power Distribution Unit
- Cable Management
- 19" Rack Frame
- Heater & Thermostat
- Climate Control System
- Fixed Shelving
- Optical Distribution Frame
- Main Distribution Frame

The cabinets shall be constructed in a modular manner with power distribution conveniently located throughout the cabinets to facilitate a wide variety of configurations and future expansion.

The cabinet housings shall include, but not be limited to, the following:

- Enclosure & Doors
- Gasketing
- Lifting Eyes & External Bolt Heads
- Door Latches & Locks
- Ventilation and Air Filtration
- Door Hinges & Catches
- Rain hood
- Assembly Supports and Mounting

The cabinets shall be designed to minimise their susceptibility to vandalism. It shall be installed so as to prevent infestation by vermin.

The external cabinet wall shall be manufactured of sufficient thickness to provide adequate strength against vandalism, but in any case, not less than a minimum overall protection of 3 mm minimum sheet thickness, constructed of stainless steel 1.4003.

Gasketing shall be provided on all door openings and shall be dust tight. Gaskets shall be permanently bonded to the metal.

Cabinets shall consist of flush fitting doors with concealed hinges and flush swing handle to minimise leverage points if targeted by vandals.

The supplier shall provide warranties ensuring that spares will be available for a period of 10 years from the date of purchase.

The Contractor shall provide a warranty of 1 year following substantial completion of the works. As part of this warranty, the Contractor shall agree to repair or replace all equipment that are found to be faulting in the warranty period. The Contractor shall provide technical support to the ITS Maintenance Contractor during the warranty period.

## **2.2 Standards**

The relevant TII standards shall be complied with, which includes but not limited to:

- CC-SCD-01508 - Installation Drawing TCC - Equipment Cabinet Arrangement, Typical Plinth Layout and Local Ducts;
- CC-SCD-01509 - Installation Drawing TCC - Cabinet Arrangements General Layout;
- CC-SCD-01507 - Installation Drawing TCC - Local Ducts to Cabinet Sites;
- CC-SCD-01548 - Installation Drawing TCC - Cabinet Enclosure Single Bay - Sheet 1;
- CC-SCD-01549 - Installation Drawing TCC - Cabinet Enclosure Single Bay - Sheet 2;
- CC-SCD-01552 - Installation Drawing TCC - Typical Roadside Cabinet Layout Type A – Front;
- CC-SCD-01550 - Installation Drawing TCC - Cabinet Enclosure Double Bay - Sheet 1;

- CC-SCD-01551 - Installation Drawing TCC - Cabinet Enclosure Double Bay - Sheet 2;
- CC-SCD-01553 - Installation Drawing TCC - Typical Roadside Cabinet Layout Type A – Rear;
- CC-SCD-01554 - Installation Drawing TCC - Typical Roadside Cabinet Layout Type B – Front;
- CC-SCD-01558 - Installation Drawing TCC - Roadside Cabinet Heater Connections;
- CC-SCD-01555 - Installation Drawing TCC - Typical Roadside Cabinet Layout Type B – Rear;
- CC-SCD-01556 - Installation Drawing TCC - Typical Roadside Cabinet Layout Distribution Node – Front;
- CC-SCD-01557 - Installation Drawing TCC - Typical Roadside Cabinet Layout Distribution Node – Rear; and
- CC-SCD-01571 - Installation Drawing TCC - Pole Installation Without Cabinet Typical Plinth Layout.

### **3. Environmental control**

The Contractor shall ensure that the following environmental controls are achieved.

The Equipment Cabinet shall maintain an ambient internal temperature-controlled environment between +5°C and +50°C, non-condensing relative humidity, i.e. above the dewpoint.

Where cabinet heater(s) are fitted to protect the equipment from excessively low temperatures, frost and moisture condensate. The Contractor shall demonstrate the effectiveness of their solution either by test, or simulation.

Where cabinet cooling is fitted to protect the equipment from excessively high temperatures, to prevent fire or failure. The Contractor shall demonstrate the effectiveness of their solution either by test, or simulation.

## **4. Materials and Workmanship**

The Contractor shall ensure all materials and workmanship shall comply where applicable with the current Irish and European Standards.

## **5. Service Life and Support**

The Contractor shall ensure that the Equipment Cabinet material construction, including the electrical power and communications, shall be designed for a minimum service life of 30-years.

## 6. Construction Requirements and Design Constraints

The Contractor shall ensure that the Equipment Cabinets meet the following requirements.

Any seals used shall be maintenance free and shall remain effective for the design life of the equipment.

The Contractor shall supply Equipment Cabinet equipped with doors to provide both 'front' and 'rear' access. The doors shall open to an angle of 90 degrees and be fitted with automatic hold open stays locking at their opening limit. The door hinges shall be placed such that doors open outward asymmetrically.

The doors shall be flush fitting with integral latch / locks. The hinges shall be integral or close fitting to the outside of the cabinets and of an anti-vandal design.

The Contractor shall ensure that all door hardware fitted to the cabinets shall avoid fixings that are unsightly to the outsides or can be tampered with from the outside.

The Equipment Cabinet, with all doors closed, shall provide Electro Magnetic Compatibility protection.

The location of the front of the equipment rack shall provide at least 55mm clearance behind the rear face of the door, including any locking mechanism, and a responder / transponder frame.

If the 19-inch rack support rails are fabricated as a removable subassembly, then the rails shall be fully supported at the top and bottom.

Terminal rail assemblies including support bars shall be installed to the rear of the 19-inch rack thus reducing the available rear access to equipment that is mounted to the front of the 19-inch racks.

The 19-inch rack dimensions; the square hole dimensions, positioning of holes and the available internal width between the inner edges of the support bars shall conform to the requirements of IEC 60297-3-100:2008.

The 19-inch rail sections shall include sufficient material from the inner edge to the square holes to prevent the material twisting or deforming either during manufacture or use and to permit an edge radius to be formed during manufacture. Material edges shall be totally free from burrs and sharp edges.

When cables are installed into the Equipment Cabinet by others it shall be possible to and, if required, earth the cables.

For installation of cables, a pre-drilled gland plate shall be provided in the equipment cabinet base. The Contractor shall supply all cable glands required for the installation of cabling as part of the Works.

All cabinets shall be fitted with base plates. The base plate shall be bonded to the cabinets in accordance with I.S. 10101:2020.

The location of the cabinet shall comply with CC-SCD-01524 - Installation Drawing TCC - Maintenance Vehicle Lay-by Typical Lay-by Layout.

The Contractor shall ensure that welders engaged on the fabrication of the Equipment Cabinet shall have been tested in accordance with ISO 9606-1 and hold a Welder Approval Test Certificate valid for the type of work on which they are employed.

The Contractor shall submit evidence to the Employer's Representative that the welders are properly certified and that the manufacturer's quality system permits only those so certified to produce welds within their range of competence.

The Contractor shall provide a safe method for lifting statement and guidance to facilitate onsite installation of the Equipment Cabinet. The Contractor shall consider if any special lifting frame, clamps or strops are required to be provided to facilitate on-site installation of the Cabinets.

The Contractor shall not cause damage to the cabinet structures or paint finish during the lifting of any equipment. The Contractor shall replace any cabinets damaged at their own expense.

## 7. Mains Power Equipment and Wiring

The Equipment Cabinet power and distribution shall conform to the requirements of I.S. 10101:2020.

The Equipment Cabinet shall include six standard UK / Ireland Type G 3 pin equipment sockets in accordance with IEC 60083 and S.I. No. 526/1997, complete with surface mounting enclosure, all splash proof to IP 44 rating.

A label shall be fitted adjacent to the 'Maintenance Socket' in accordance with I.S. 10101:2020.

The Power Distribution Unit (PDU) enclosure shall be constructed in accordance with I.S. 10101:2020 and shall be designed to accommodate the isolator, protective devices and terminals, and provide sufficient space for the cable entries.

A double-pole isolator shall be provided as the main point of isolation for the whole PDU and subsequently the whole cabinet. The double-pole isolator shall be a switch-disconnector to IEC 60947, and it shall meet the requirements:

- Category of duty: AC22A.
- Rating: 63A, 230V, single-phase 50 Hz.
- Terminal capacity: 16mm<sup>2</sup>.

Residual Current Devices (RCDs) - shall be 2-pole devices, 30mA 40mS tripping characteristics, manufactured in accordance with EN 61008-1:2012

The Contractor shall provide a minimum of five Miniature Circuit Breaker (MCBs).

The Contractor shall ensure that each MCB shall be in accordance with IEC 60898-3 and meets the following requirements:

- Type: Single-pole, Type 'C'
- Rating: 10A, 230V, single-phase 50 Hz
- Short-circuit capacity: 4kA (min)
- Minimum contact gap: 4mm

Isolators, MCBs and RCDs shall be rated as 'commercial installation' grade devices. Devices shall also ensure no unwanted tripping and detection of high frequency faults up to 20 kHz.

The effect on the tripping behaviour of MCBs shall be specified by the manufacturer over the temperature range of -10°C to +60°C.

The adjusted values shall not exceed 1.25 In for -10°C to 0.92 In for +60°C, or similar as agreed with Employer's Representative.

The rating and type of protective device shall be visible from the front. It shall not be necessary to dismantle the PDU to determine this information.

The Contractor shall supply and fit blanks to cover unoccupied slots and prevent access to live terminals.

The termination of input power cable of sizes up to 10mm<sup>2</sup> (conductor CSA) and output power cable sizes up to 10mm<sup>2</sup> (conductor CSA) shall be possible.

The cabinets shall be supplied with all internal 230Vac mains cabling installed away from where communications cables will be installed to ensure the segregation of cables in accordance with the requirements of I.S. 10101:2020. The PDU shall have a minimum environmental rating of IP55 (in accordance with IEC 60529). Cable glands or blanking plugs shall be provided to all cut-outs to maintain the IP rating.

Cable glands shall be in accordance with IEC 62444:2010 for armoured power cables shall incorporate an armour clamp of the E1W type.

Earthing and bonding shall conform to the requirements of I.S. 10101:2020.

Studs or bushes shall be built into the cabinets and sub-assemblies, welded when possible. The Contractor shall determine where additional bonding points are required to suit their design of cabinets.

Equipment and terminal mounting rails may provide the earth return path for Lightning Protection Units, fitted by others, and hence larger sized bonding conductors than the minimum sizes specified in I.S. 10101:2020 may be beneficial.

## 8. Cabinet Cable Management Base/Plinth

The cabinet footprints shall provide sufficient area to provide access by a minimum 4 x 100 mm ducts.

The cabinets shall include a cable management base/plinth which is only accessible with the door open. The base plinth shall be of a minimum height of 100 mm.

The cabinet bases plinth cable entrance to a cabinet shall:

- maintain the environmental and functional conditions
- provide the necessary cable support and prevent kinking at the point of entry
- provide strain relief for the cable if not already done by separate fixtures
- have closed base with bottom gland plate access

All cables shall enter the cabinets through the cable management base plinth shall be via gland plates. The cabinets shall be provided with gland plates and bottom gland plate access for each compartment of the cabinets. The gland plate shall allow cables of a variety of sizes to enter into the cabinet through cable glands or cable grommets ensuring that the cabinets are sealed to prevent the ingress of dust, water, animals, gas etc. while maintaining an ingress protection of IP55.

The base assembly plates of the cabinets shall be designed to be securely anchored to a concrete base/plinth mounted to a concrete plinth.

## 9. Cabinet Internal Shelving/Frame

A standard 19" rack frame shall be installed inside the cabinet housing of each compartment for mounting of the ITS equipment and cabinet assemblies. The 19" rack mounts shall be at the front and rear of the cabinets, for the full length of the cabinets.

The 19" rack mount shall be as such to allow their depth to be adjustable. The 19" rack mounts shall initially be installed as such to ensure that the cabinet doors do not interfere with equipment and cabling housed within the cabinets, when the cabinet doors are fully closed.

The 19" rack shall be centred within the cabinet door opening(s).

Each 19" rack frame within the cabinets shall extend the height of the cabinet; and have a minimum capacity of 32 U.

The 19" rack frames shall be capable of mounting fixed shelves of varying depths and height, and suitable for housing a mounting plate.

As part of each cabinet, 3no. rack shelves shall be provided and installed within the cabinet. The fixed shelves shall be arranged in accordance with TII CC-SCD-01554, allowing for the differences in the cabinet height.

Unobstructed access to the 19" racks shall be available from each door entrance.

The cabinets shall also contain a document storage pocket, which shall be mounted on the internal side of the front right hand side door.

A support rail shall be mounted at the rear base of each cabinet compartment, suitable for the purposes of providing strain relief on cables and Electro Magnetic Compatibility shielding.

Each cabinet shall be provided with a vertical punched cable tray of minimum 150mm width for the full height of the cabinet to the rear of the cabinet.

## 10. Security

The Equipment Cabinet main doors shall be secured by a 3-point latching system operated from one removable 'T' Key on each door and associated locking system.

The doors and/or locks shall incorporate integral dry-contact volt-free switches to detect actuation and tampering.

The 3-point latching system shall include rollers to minimise the torque that needs to be applied to the 'T' Key to compress the door against the door seal when closing a door. A solid cam operating against the door frame shall not be permitted.

All three points of contact with the doors frame shall be adjustable to ensure the correct pressure is applied to the door seal to accommodate manufacturing tolerances and future degradation of the door seal material.

The cabinet 'T' Keys shall include an 8-sided asymmetrical profile. The cabinet 'T' Keys shall also include a round section that forms a shoulder. Once the 'T' Key is inserted into a latch mechanism and turned it shall remain captive and thus provide a handle to pull open the door.

The overall size of the cabinet 'T' Key handle shall enable the operator to unlock the door without undue force required to operate the door latching mechanism and close the door against the pressure of the cabinet door seals.

Each door shall be secured by a single lock cylinder that operates on the 3-point latching system. The cylinder lock shall operate on the latch mechanism to provide the overall cabinet security. The lock type required shall be as per the TII general specification detailed below:

- Manufacturer: BASI
- Part Type: 5721-0000 10/30 GL

Details of the exact lock ID will be provided by the Employer's Representative on award of the Contract. The cylinder lock shall have a unique key with one key being capable of opening all cabinets.

All door latches shall incorporate a hinged stainless-steel dust cover that is retained by a magnet or other suitable mechanism.

The door latches shall be configured such that the 'T' Key can only be removed in the door closed and locked position to prevent a door being left closed but unlocked.

The Contractor shall ensure it shall be possible to operate the 'T' Key to close the door latch whilst the door is in the opened position to facilitate key removal.

The Contractor shall provide three keys for each cabinet.

## **11. Cabinet Heating and Ventilation**

Cabinet ventilation is required to permit the equipment to operate within its designed performance characteristics. Suitably located vents shall be provided to allow adequate airflow through the enclosure. Any vents shall be designed as not to negatively impact on the IP rating of the cabinet.

### **11.1 Heater and thermostat Option**

Cabinets shall be equipped with a heater and thermostat, within the cabinet, in order to avoid condensation within the cabinets. The electric heater shall be suitably sized for the cabinet dimensions and shall be suitable for a single phase 230V 50Hz supply.

Heaters shall be installed in an upright position and adequate space (approx. 50 mm) shall be allowed at the top and bottom in order to allow convection. Heating may be distributed evenly throughout the cabinets, through the use of several low-output heaters.

## 12. Painting and Protection

The Contractor shall ensure that the Equipment Cabinet has protective surface treatments applied in accordance with TII Specification for Road Works Series 1900 - Protection of Steelwork Against Corrosion. Unless otherwise directed by the Employer's Representative, the Cabinets shall be finished in IEC 61966-2-1:1999 'Flint Grey'.

All metal work shall be protected and finished during manufacture, either for corrosion protection or aesthetic appearance. The protection shall be maintenance free and effective for the design life of the equipment.

Material combinations which, when in contact, give rise to Galvanic Corrosion, Bimetallic Corrosion or Dissimilar Metal Corrosion shall not be used without the provision of protection adequate for the design life of the equipment.

Unfinished metal surfaces will not be permitted. All external and internal surfaces of the cabinets and all modules shall be finished using appropriate methods, painting or metal plating or anodising, to provide a high-quality aesthetic appearance.

All connectors, cable glands, fasteners, locks, hinges, fittings, screws, nuts, bolts etc. which form part of any closure system or any removable panel or any fixing shall be manufactured from non-corrodible material.

Any caulking or sealant that is used for the cabinets final assembly that will be visible, shall approximately colour match the paint finish.

It shall be permissible to finish the inside of the cabinets in a colour that is lighter than that specified for the exterior, such as a light-grey or off-white, that would aid the ambient light level within the Cabinets to the benefit of people working on cables or equipment within the cabinets.

The use of any alternative colour shall be agreed with the Employer's Representative.

The Contractor shall ensure that all components and internal sections used to support terminal rails and terminal blocks shall have surface treatment or protective coating applied in accordance with the requirements of TII Specification for Road Works Series 1900 - Protection of Steelwork Against Corrosion.

Items of internal metal work such as frames and brackets within the cabinets that require painting shall be finished in white, or light-grey.

### 13. Labels and Identification

All labelling and identification shall be applied to the cabinets prior to the cabinets being made available for inspection.

The material used for stick-on printed labels shall conform to the requirements of ISO 3864-1:2011. The label shall be self-adhesive and of adequate strength and durability, and fixed to the outside, traffic facing side of the cabinets.

The Contractor shall provide and configure all applicable labels in accordance with the requirements of TII Specification for Road Works Series 1900 - Protection of Steelwork Against Corrosion and I.S. 10101:2020.

The cabinet doors shall be unblemished and exempt of any form of embossed labelling or identification.

The cabinet doors shall incorporate an electricity warning label in accordance with ISO 3864-1:2011.

The Contractor shall provide equipment identification labels in accordance with the requirements of TII Specification for Traffic Control and Communications CC-SPW-01500. It will be desirable for the serial numbers to be machine engraved onto each label although stamped numbers are permitted.

Each cabinet shall have a permanent label on the exterior of the cabinet to denote the following "TII Transport Systems Cabinet". The label shall be fixed to the top right-hand corner of the cabinet front door.

All labelling on the TII ITS roadside cabinet shall be durable, weatherproof. The Label Text shall consist of a white background and black text. The label type shall be subject to the approval of a TII Representative. The label arrangement, text content, font and dimensions are shown in Figure 1.



**Figure 1** TII label (dimensions 200mm x 200mm)

The name of the manufacturer, any logo or any other marking shall not be shown on any external surface other than to identify the equipment.

The Contractor shall supply and fix an A4 clear plastic type document holder to the inside of the Equipment Cabinet door.

## 14. Testing, Approval and Acceptance

The cabinet shall be able to pass all relevant tests as defined in EC 60068-2-13:2021 and EC 60068-2-64:2009

### 14.1 Prototype testing

The following tests shall be conducted by the Contractor on the prototype:

The cabinet shall be compliant with EC 60068-2-13:2021 and EC 60068-2-64:2009. If requested by the ER, the Contractor shall facilitate environmental testing of cabinets to demonstrate compliance with the requirements of those standards.

The cabinet shall be compliant with Category IP56 of IEC 60529. The cabinet is also required to pass the environmental tests that are required by EC 60068-2-13:2021 and EC 60068-2-64:2009.

The Contractor shall test the Equipment Cabinets in accordance with the requirements of EC 60068-2-13:2021 as detailed in the table below.

EC 60068-2-13:2021 Test	Test Parameters
<b>Solar Radiation Test</b>	<ul style="list-style-type: none"> <li>• The Test may be carried out with cabinets free standing, but with base sealed, as if part of a permanent installation.</li> <li>• Cabinets shall be populated with representative equipment installed and running, or a suitable heat source of 400W.</li> <li>• The temperature and humidity in cabinets shall be measured and recorded at the top, middle and bottom of the equipment rack assembly</li> </ul>
<b>Cold Test</b>	<ul style="list-style-type: none"> <li>• As for Solar Radiation Test</li> </ul>
<b>Damp Heat Test</b>	<ul style="list-style-type: none"> <li>• As for Solar Radiation Test</li> </ul>
<b>Water Penetration</b>	<ul style="list-style-type: none"> <li>• The Test may be carried out with cabinets free standing, but with base sealed, as if part of a permanent installation.</li> <li>• The Water Penetration Test duration of “3 minutes” shall be modified to be “1 minute per face of cabinets.</li> </ul>
<b>Drop and Topple</b>	<ul style="list-style-type: none"> <li>• The Test shall be carried out on cabinets without any packaging protecting the Cabinet.</li> <li>• For the Drop &amp; Topple Tests the dummy weights shall not be installed.</li> </ul>
<b>Bump</b>	<ul style="list-style-type: none"> <li>• The Bump test simulates the shocks experienced by the equipment during road transport to site. The equipment would normally be packaged and subjected to 1000 bumps.</li> <li>• Cabinets may not be protected by packaging during the final journey to site. The suitability and scope of the bump test shall be agreed with the Employer’s Representative.</li> <li>• For the Bump tests the dummy weight shall not be installed.</li> </ul>

Cabinet Electro Magnetic Compatibility tests shall be carried out in accordance with IEC 61000-6-2:2019. The test may be carried out with cabinets free standing, but with base sealed, as if part of a permanent installation with representative equipment installed and running.

The Contractor shall test all internal mains wiring in accordance with the requirements of I.S. 10101:2020.

The Contractor shall test all earth bonding within the cabinets in accordance with the requirements of I.S. 10101:2020.

## **14.2 Documentation**

In addition to supply, all test results, as-built documentation and maintenance manuals shall be provided on successful installation of the cabinets. All required documentation shall be provided in electronic format.