WESTERN POWER DISTRIBUTION

Serving the Midlands, South West and Wales

Company Directive

ENGINEERING SPECIFICATION

EE SPEC: 140/1

Steel Substation Buildings

Policy Summary

This document provides information on the specification of steel substation buildings for use of the WPD network

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Implementation Date: **September 2020**

Approved by

Carl Ketley-Lowe
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Date: **8th September 2020**

Target Staff Group	**Purchasing, Primary system design and Engineering design, Major Projects**
Impact of Change	**Green**
Planned Assurance checks	**Issue of successful contracts and first orders**

IMPLEMENTATION PLAN

Introduction

This Engineering Specification details the design for Steel Substation Buildings.

Main Changes

The document revision tidies up some issues around fit and finish of buildings.

Impact of Changes

This Engineering Specification is relevant to:

- All staff who are involved with Substation installation at Primary and Distribution levels.
- All staff who are involved with specifying or purchasing Steel substation buildings.

Implementation Actions

Managers should notify relevant staff that this Engineering specification has been issued and brief them on its requirements.

Implementation Timetable

This Engineering specification shall be implemented with immediate effect.

REVISION HISTORY

Document Revision & Review Table		
Date	**Comments**	**Author**
September 2020	• Update to include clarifications	Andrew Reynolds
January 2019	• First issue of document specification of steel substation buildings.	Andrew Reynolds

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1.0 INTRODUCTION

WPD has a requirement to install all switchgear in a building or housing, requirements to use modular steel buildings has increased with time.

Steel buildings have advantages over conventional brick built buildings and GRP housings. This specification covers WPDs requirements for those steel buildings.

2.0 BUILDING DESIGN

2.1 General

The Building needs to be designed and constructed so that it can be lifted and transported with switchgear installed inside it.

2.2 Design Life

The Steel building has to have a design life of 50 years with inspection and preventive maintenance and a periodic recoat included.

2.3 Building dimensions

Example building dimensions are

External: 7,730mm long x 4,030mm wide x 3,850mm high

Internal: 7,500mm long x 3,800mm wide x 3,000mm high

Weights need to be specified at the time of tender. Exact dimensions will be advised at the time of tender.

2.4 Support

The building should be designed to be supported on either of the following concrete foundations (raft, strip or pad/pile) and can also be elevated on steel legs capable of taking the full weight of building and contents for its design life, to create an above ground cable basement.

Buildings to be installed in areas of flood risk will need to have support legs to mitigate the risk of flooding.

2.5 Design

The building shall be designed to an in accordance with the following BS EN 1993-1-1: 2005 (Eurocode 3) with wind loadings based on BS EN 1991-1-4: 2005 (Eurocode 1).

2.6 Construction

The building shall be constructed in accordance with BS EN 1090-1 with processes and procedures in accordance with BS EN 1090-2 Execution Class 2 (EXC2), and will be 'CE' certified accordingly.

2.7 Thermal Ratings

The building shall have as a minimum the following thermal ('U') values –
Roof – 0.37W/m²K, Walls - 0.37W/m²K, Base - 0.35W/m²K. Solar gain needs to be considered and how this is effectively dissipated.

2.8 Fire Resistance

The building shall be manufactured from fire resistant, non-combustible materials throughout. The building shall have a design that has been independently fire tested to EN1364 and achieves up to 60 minutes fire resistance (stability/integrity). Standard performance of 60 minutes to walls, roof, floor and doors is included.

2.9 Moisture Ingress

The building shall have a rating of IP54 with doors rated to IP 4X, have weatherproof louvres and vents.

2.10 Building Finish

The building module exterior walls, roof and doors shall be painted, and consideration should be given to the diverse nature of WPDs network and locations that these buildings may be situated in from town centres to coastal locations an atmospheric corrosivity category C4 should be used as a standard. Enhanced coating systems should be offered for use in atmospheres up to and including Marine Coastal and Offshore. Consideration for special coatings such anti-graffiti top-coats must be considered.

3.0 BUILDING STRUCTURE

3.1 General

The building shall be of a welded carbon steel construction with a durable coating system applied continuously to the exterior/interior surfaces to prevent corrosion.

3.2 Base

The base shall be made up of mild steel, primed to provide corrosion protection, structural sections, sized to suit the equipment loading.

The floor will be of 5mm plain mild steel plate and the base under-drawn with pre-finished, zinc coated steel sheet with the void space insulated.

The building shall be fitted with mountings to allow bolting down to a suitable foundation. Anchor bolts will be included.

Mountings are also included for bolting of jacking brackets to allow the building to be jacked for skating.

Framed apertures are provided within the floor structure for cable entry/exit underneath switchboard and ancillary equipment as required. 3mm stainless steel/aluminium plates are provided to each aperture position.

3.3 Walls

The wall structure shall incorporate a mild steel, primed, structural framework to take the wind and lifting loads.

The external wall skins will be formed from minimum 2mm zinc coated steel sheet with vertical and horizontal stiffening members to cater for the wind loading.

The walls are lined internally in zinc coated steel sheets with the void space insulated. Framed and lined apertures are provided for air inlet louvres, extract fans and arc vent over-pressure systems. Protection system needs to be included to prevent fire from escaping through vents and louvres. These need to come into effect after fire breaks out

3.4 Arc Vent and Over Pressure

A pressure relief panel complete with retaining chains shall be fitted to the rear of the switchboard complete with retaining chains, this will need to maintain building security and have the potential to report back that its operated. Alternative methods will be considered.

3.5 **Roof**

The roof shall have a 5° dual pitch configuration designed with welded lifting points to enable the building to be lifted with all the equipment installed.

The external skins of the roof will be of minimum 2mm zinc coated steel, under-drawn in zinc coated steel sheets with the void space insulated and to create a flat ceiling. Other materials will be considered that allow for corrosion prevention

Rainwater guttering and down pipes are included. Factory trial-fitted and then removed for transportation.

Safety signs shall be fitted to warn of areas of the roof that are no walk areas.

3.6 **Doors**

Each building module shall have a double entrance door for both equipment installation and a personnel access/egress to the front of the switchboard elevation and rear-positioned emergency escape door.

The double door shall be 2,000mm wide x 2,500mm high, outward opening and be of a double skin, insulated construction as per the rest of the buildings construction with the following features:-

Stainless steel hinges.
Locking system including internal panic bar and external lock override supplied with WPD standard cylinder (supplied free of charge) to the normally opening leaf and shoot bolts to the normally closed.
Weather seals that last the expected 40years. All earth bonding to prevent risk of shock.
A removable threshold.
Hook and eye door retainers
Hydraulic door closer to normally opening leaf
Internal panic bars

The single Fire Exit door shall be 1,000mm wide x 2,000mm high, outward opening and of a double skin, insulated zinc-coated construction with the following features:-

Stainless steel hinges.
Internal panic bar
Weather seals to last 50 years
Earth bonding
Removable threshold
Hydraulic door closers.

3.7 Finish

All external surfaces will be painted in to prevent corrosion to a C4 level or better dependent on the location that the building will be situated, this will be advised at time of specific site order.

Colour will be a standard 12B29 Juniper Green or Midnight Green BS4800/5252/ unless otherwise requested at time of order.

The internal walls and ceiling will be painted colour to be white and be maintenance free for the life span of the building.

The module floor surfaces will be painted and be **non-slip for 25 years life** of the building.
The underside of the base shall be coated to prevent corrosion for the life span of the building. Consideration will be given to cold dip galvanised bases

3.8 Labels and Signage

Appropriate internal/external Health and Safety signage shall be provided. Fixing points shall be provided for all WPD substation labels to prevent drilling on site.

4.0 BUILDING SERVICES

4.1 General

The electrical system shall work on a single phase neutral earth system 230V 50HZ AC.

4.2 Wiring

All internal wiring will be to a WPD standard and as per all WPD sites.

4.3 Cable Management

The building services wiring shall be contained in appropriately sized, multi compartment, galvanised steel trunking running round the perimeter of each room, with trunking and conduit drops for lighting and sockets. With tray risers from incoming/outgoing service routes.

Galvanised steel wall surface mounted/overhead ceiling/wall supported cable management trunking/ladder/tray shall been included for interconnecting cables between switchgear and associated panels, this will be shown on all drawings.

4.4 Equipment mounting

Support channels shall be provided where requested.

4.5 Lighting

Lighting shall be controlled through a one way wall mounted switch and of LED type where possible to reduce energy consumption. A percentage of the lights shall a maintained fitting with 3 hour integral battery backup.

A key test switch shall be fitted for testing purposes. This lighting shall operate in the event of a power failure, only if the control switch is in the 'on' position (battery inhibit).

A 2 hour non-maintained (Running Man) legend back-up light, shall be fitted internally above each exit door.

A bulk head light shall fitted externally adjacent to each door, with PIR operation. Each light shall have an internal PIR override switch.

4.6 Lightning Protection

This needs to be considered and advised of requirements on each and every site on a site by site basis due to the differing nature of each site.

4.7 Cooling and heating

The building shall be cooled with forced ventilation using fans. The fans will be controlled with thermostats to ensure the internal temperature is maintained at 10°C above external ambient. The system shall be designed to accommodate any heat load from the installed equipment.

The fans shall include an external weather cowl with gravity flaps.

Air intake will be via IP44 louvre(s) incorporating insect mesh, and internal drop curtain fuse-link fire damper.

The building will be heated via thermostatically controlled heater(s) to maintain a minimum room temperature of +5°C, with a timer override switch (2 hours) and fed from local un-switched fused spurs.

The heating and ventilation shall be provided with a controls and an alarm panel.

4.8 **De-Humidification**

A standard wall mounted De-humidifier will be supplied as per WPD recommended unit EBAC-30E or equivalent.

4.9 **Security Alarm**

To be sourced by others.

4.10 **Labels**

All electrical items are to be identified with engraved labels which are mechanically fixed. A building/site nameplate will be fitted to each door.

Safety labels ‘Mind Your Head’ are also included.

APPENDIX A

SUPERSEDED DOCUMENTATION

This document supersedes EE SPEC: 140 dated January 2019 which has now been withdrawn.

APPENDIX B

RECORD OF COMMENT DURING CONSULTATION

EE SPEC: 140/1 – Comments

APPENDIX C

ASSOCIATED DOCUMENTATION

ST: SP1N

APPENDIX D

KEY WORDS

Housing, steel