1. SCOPE

This document outlines SP Energy Networks installation and commissioning requirements for ground mounted secondary substations and includes all transformer substations where the lower voltage is 400/230V.

2. ISSUE RECORD

This is a Reference document. The current version is held on the EN Document Library.

It is your responsibility to ensure you work to the current version.

Issue Date	Issue No.	Author	Amendment Details
June 2004	3	A.Graham	Minor revisions
October 2005	4	I.McFadyen	Door specification revised in section 8.8
January 2007	5	A.Graham	LSOH cables and Midel requirements added, civil requirements changed, Protection commissioning updated.
October 2014	6	F. Berry	Revised
December 2025	7	T. Cochrane	General review – minor updates

3. ISSUE AUTHORITY

Author	Owner	Issue Authority
Name: Terry Cochrane Title: Lead Engineer Engineering Design & Standards	Name: Jon Ruiz De Aguirre Title: Substation Manager Engineering Design & Standards	Name: Fraser Ainslie Title: Head of Engineering Design & Standards Fraser Ainslie ..... Digitally signed by Fraser Ainslie Date: 2025.12.22 10:35:29 Z Date: .....

4. REVIEW

This is a Reference document which has a 5 year retention period after which a reminder will be issued to review and extend retention or archive.

5. DISTRIBUTION

This document is part of the SP Distribution & SP Manweb System Design Virtual Manuals, and the Construction Virtual Manual, but does not have a maintained distribution list. It is also published to the SP Energy Networks website.

© SP Power Systems Limited

Internal Use

6. CONTENTS

1. SCOPE 1
2. ISSUE RECORD 1
3. ISSUE AUTHORITY 1
4. REVIEW 1
5. DISTRIBUTION 1
6. CONTENTS 2
7. REFERENCE AND RELATED DOCUMENTS 3
8. INTRODUCTION 4
9. DEFINITIONS 4
10. GENERAL REQUIREMENTS 6
11. UNIT SECONDARY SUBSTATIONS 8
12. 'X' TYPE – SECONDARY SUBSTATIONS 9
13. INDUSTRIAL HV CUSTOMER RMU SUBSTATIONS 9
14. INDUSTRIAL LV CUSTOMER SUBSTATIONS 10
15. HV CUSTOMER MULTI-PANEL BOARD SUBSTATION 11
16. COMMISSIONING 11
APPENDIX 1 – DIAGRAMS 14
APPENDIX 2 – EQUIPMENT CHECK LIST 17
APPENDIX 3 – SUBSTATION COMMISSIONING PROGRESS CARD 19

© SP Power Systems Limited

Internal Use

7. REFERENCE AND RELATED DOCUMENTS

It is important that users of the documents listed below ensure that they are in possession of the latest issues of the documents together with any amendments.

Statutory Legislation

ESQCR 2002	The Electricity Safety Quality and Continuity Regulations 2002.

SP Energy Networks

SUB-02-613	Electrical Insulation Testing of HV Equipment up to 33kV
ASSET-01-021	SP Asset Inspection and Condition Assessment Policy
ASSET-01-023	Substation Security Policy
ASSET-04-072	Apparatus Investigation Protocol
BATT-03-001	Auxiliary DC Power Supplies for Primary and Secondary Substations
CAB-03-036	Technical Specification for General Wiring Cables Policy
CAB-15-003	Handling and Installation of Cables up to and including 33kV
CAB-04-009	Policy and Application Guide for 11kV Polymeric Cables
EART-01-002	Low Voltage Earthing Policy and Application Guide
EART-03-003	Technical Specification for Earthing and Bonding at Secondary Substations
ESDD-02-012	Framework for Design & Planning of LV Housing Developments, Including U/G Networks and Associated HV/LV S/S
ESDD-01-005	Distributed Generation Connection Requirements
PROT-03-019	Primary and Secondary Substations Protection and Control Equipment
PROT-15-027	11kV and 6.6kV Protection and Control Settings Guidance
SUB-03-017	General Specification for the Civil Engineering and Building Design and Construction of Secondary Substations.
SUB-02-013	Policy and Specification for the Interface with Independent Distribution Network Operators Installations
SUB-03-018	Specification for Prefabricated Glass Reinforced Plastic Enclosures
SUB-03-021	Specification for the Assembly of Unit Substation Equipment
SUB-03-029	Substation LVAC Installation Wiring Specification for new and refurbished substation sites
AER	Approved Equipment Register
TRAN-06-001	Approved Equipment Register Transformers

© SP Power Systems Limited

Internal Use

8. INTRODUCTION

This document outlines SP Energy Networks installation and commissioning requirements for ground mounted secondary substations and includes all transformer substations where the lower voltage is 400/230V.

9. DEFINITIONS

For the purpose of this document the following definitions shall apply:

Approved:	Equipment which is Approved in accordance with SP Energy Networks documents for use or installation on the Company network.
Company:	SP Energy Networks
Equipment:	Switchgear, transformers, cables, overhead lines, surge arresters, voltage transformers, current transformers, unit substations.
Energisation:	The application of Voltage to an item(s) of Equipment from the system.
High Voltage:	An AC voltage exceeding 1000 volts measured between the phase conductors.
IDNO:	Independent Distribution Network Operator.
ICP:	Independent Connections Provider: Suitably Lloyds/*National Electrical Registration Scheme* – Accredited Contractors undertaking contestable work in the competitive connections market.
Indoor Equipment:	Equipment designed solely for installation within a building or other housing where the Equipment is protected against wind, rain, snow, abnormal dirt deposits, abnormal condensation and frost.
Low Voltage:	An AC voltage not exceeding 1000 volts measured between the phase conductors.
LSOH:	Low Smoke Zero Halogen – cables with this type of sheath have an enhanced fire performance characteristic.
Midel	Midel is a synthetic ester based transformer insulating fluid with enhanced fire performance characteristics.
New:	Approved Equipment which has not previously been connected to the system and which has been routine tested in a Manufacturing Facility with a Quality Management System in accordance with the relevant standard prior to delivery.
SP Energy Networks:	SP Power Systems Ltd, operator of network assets on behalf of the Company.
Previously In Service:	Equipment which, has previously been connected to the Company system and is deemed suitable for re-use, and has been electrically tested prior to site in accordance with SUB-02-613 where appropriate.
Secondary substation:	An assembly of High Voltage Switchgear, Transformers and LV Switchgear in an enclosure where the lower voltage is 400/230V.

© SP Power Systems Limited

Internal Use

Second Hand:	Equipment which has previously been energised out with the Company network.
Switching Station:	A secondary substation containing only High Voltage Switchgear.
Unit Substation:	A Unit substation comprises an 11kV/400V transformer fitted with a directly mounted ring main unit and an LV fuse cabinet. Other combinations of directly mounted attachments to the transformer may also be used (e.g. cable box in lieu of HV switchgear or LV fuse cabinet).

© SP Power Systems Limited

Internal Use

10. GENERAL REQUIREMENTS

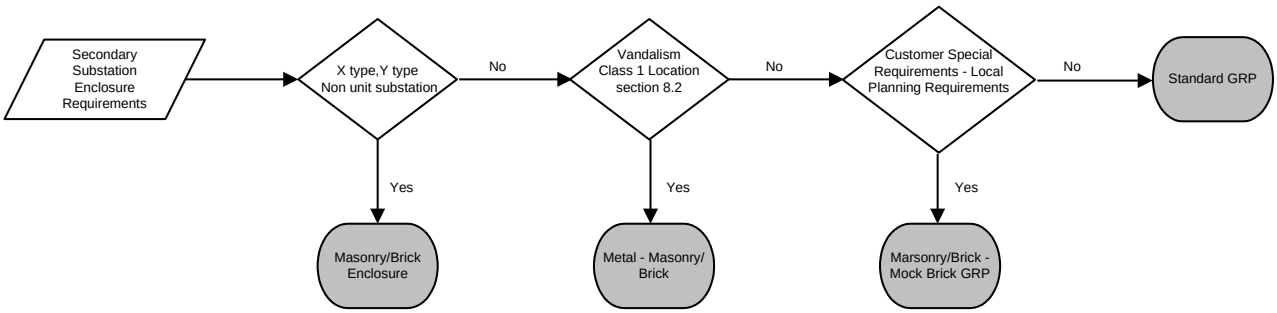
10.1 Approved Equipment

Only New Approved Equipment as detailed within the SP Energy Networks Approved Equipment Register shall be installed on the Company network. Second Hand equipment shall not be installed, unless formal written approval has been given by the Distribution Network Manager.

SP Energy Networks policy is to adopt only New Approved Equipment from ICP undertaking contestable work. Second Hand Equipment shall not be adopted.

10.2 Enclosures

An Approved substation enclosure as specified in SUB-03-018 shall be erected and made lock-fast or appropriate measures taken to prevent access prior to any Equipment being energised as detailed in this document.



10.3 Protection from Vandalism

SP Asset Inspection and Condition Assessment Policy (ASSET-01-021) defines nationally recognised levels of vandalism and trespass to which the standard of secondary substation enclosures used within SP Energy Networks will be related.

Substations which fall into High-Risk locations shall be constructed with a galvanised steel enclosure or masonry/brick enclosure as agreed on a site-by-site basis. Substations which fall into other categories shall be constructed with a GRP enclosure, except for ‘X’-type, ‘Y’-type non-unit and Industrial HV Switching substations which shall only be installed in a suitable masonry/brick built weatherproof enclosure.

The following deviations from the above policy on enclosures may be applied at the discretion of SP Energy Networks:

- ***Customer Special Requirements*** – Where a customer requests a Masonry/Brick constructed enclosure in lieu of a standard GRP enclosure then this shall only be installed after the customer has contractually agreed to pay for the additional costs associated with this type of enclosure.

- ***Local Planning Requirements*** – Where Local Planning requires a Brick fascia enclosure, then a mock brick GRP enclosure shall be installed. Where this is deemed unacceptable by the Local Planning department formally in writing, then subsequent to a site assessment by SP Energy Networks a Masonry/brick enclosure may be installed.

Substations which are proposed to be constructed at SP Energy Networks expense with a Masonry/brick enclosure or a type that falls out with the guidelines detailed in section 10.2 shall only be installed after formal written approval has been given by the Distribution Network Manager.

© SP Power Systems Limited

Internal Use

10.4 Access/Egress

The substation shall have suitable access & egress in line with the requirements as detailed in SP Energy Networks documents ESDD-02-012 and SUB-03-017.

10.5 Land Requirements

All enclosures shall have a minimum 1.5 metre gap between all sides and the site boundary. Wherever possible or unless required for expected future extensions, the area of the site purchased should be the minimum required. However additional land area may be required to fulfil the earthing design requirements particularly for overhead line supply substations adjacent to areas of high risk e.g. Swimming pools, nurseries, petrol forecourts etc in accordance with EART-03-003.

10.6 Earthing

The HV & LV Earth system shall be installed and tested in accordance with the EART-03-003 noting requirements for non-standard, high-risk sites & when EPR requires specific mitigation.

10.7 Labelling

Safety signs and notices shall be fitted in accordance with SP Energy Networks document EPS-01-004 and as detailed on the appropriate civil drawings.

10.8 Substation LV Services

All substations shall have suitable LV services *(heating, lighting, small power and auxiliary supplies)* Installed in accordance with SUB-03-029 *(Substation LVAC Installation Wiring Specification for New and Refurbished Substation Sites)*. Requirements detailed in EART-03-003 *(Provision of Building services/auxiliary supplies to High EPR sites)* for non-standard, high-risk sites & when EPR requires specific mitigation must be implemented.

When LV services are being installed by an ICP a BS7671 “Electrical Installation Certificate” shall be provided at the point of adoption certifying that the LV services are BS7671 compliant.

10.9 IDNO Interface Substations

Where the Company network interfaces with an IDNO, this shall be undertaken in accordance with SUB-02-013.

10.10 Requirements for SS’s installed within Customer owned/Publicly occupied buildings

The implementation of the CDM regulations has placed a requirement for the Designer to consider the technical risks when new network assets are being installed. Consequently, SP Energy Networks preferred option when determining the location of secondary substations is for standalone, discrete sites away from buildings with public occupancy. Where it is considered necessary by the customer and has been appropriately agreed with SP Energy Networks, Secondary substations may be installed within a customer owned building. The appropriate risk assessment shall be undertaken by the Designer to ensure that all risks associated with the secondary substation are considered and mitigated to an appropriately low level. At all times, unless otherwise agreed in writing by the Distribution Network Manager, the following engineering requirements shall be complied with:

- SP Energy Networks civil engineering requirements, detailed within section 10.12, shall be adhered with. Particular attention shall be given by the civil engineering designer to the risks associated with live secondary substation equipment in the building design.
- Secondary substation transformers installed within Customer owned/publicly occupied buildings shall be installed with ‘Midel’ oil.
- Company cables installed within Customer owned/Publicly occupied buildings shall be of an approved LSOH sheathed design.

© SP Power Systems Limited

Internal Use

In addition:

- The minimum spatial envelope shall be no less than that indicated on the appropriate SP Energy Networks drawing detailed within SUB-03-017 & SUB-03-017 Appendix 1. In addition, no single dimension shall be less than that indicated within the appropriate drawing. Where other dimensions are offered by the customer/developer this shall be by negotiation with SP Energy Networks on a site-by-site basis.
- The substation shall have suitable 24-hour access/egress for SP Energy Networks Authorised personnel.
- The substation shall have suitable 24-hour street-level vehicular access/egress for Company Equipment, in line with SP Energy Networks document ESDD-02-012.
- Where High/Low voltage Indoor Switchgear is utilised, it shall be installed in a suitable building with a controlled environment to ensure compliance with clause 2.1 of IEC 60694 for class “minus 5 indoor”.
- Sufficient ventilation shall be provided to ensure that the ambient temperature does not exceed 30°C, for losses of 14kW for a 1000kVA transformer and 9kW for a 500kVA transformer.
- Suitable means of access shall be provided to Company cables installed within the Customers building.

10.11 Embedded Generation

All embedded generation installations and associated connections to the Company’s network shall comply with the requirements of the ESQC regulations, the appropriate Engineering Recommendations and the specific requirements of SP Energy Networks policies, including ESDD-01-005.

10.12 Civil Works

All secondary substations civil and structural designs shall be installed in accordance with SP Energy Networks specification SUB-03-017.

All Civil Engineering drawings referenced in this document can be found in SP Energy Networks specification SUB-03-017 Appendix 1.

10.13 Cabling

All cables connecting substation Equipment to the Company network, shall be installed in accordance with SP Energy Networks specification CAB-15-003 and CAB-04-009.

11. UNIT SECONDARY SUBSTATIONS

This section covers the requirements for Unit type substations installed on the Company network. The general layout of the standard GRP unit substation is shown in Figure 1, Appendix 1.

A Unit substation typically comprises of the following Equipment:

- 11kV/433V (Dual ratio 11kV/6.6kV/433V where appropriate) Transformer (500kVA, 1MVA rating).
- Transformer mounted 400V fuse cabinet, 1600A busbars, 5 way, 92mm centre fuses.
- Transformer mounted 11kV Ring Main Unit.
- LV Monitoring Equipment, RTU equipment (as Applicable)

Other combinations of directly mounted attachments to the transformer (e.g. cable box in lieu of HV switchgear or LV fuse cabinet) shall only be installed where formal written approval has been given by the Distribution Network Manager.

© SP Power Systems Limited

Internal Use

11.1 Enclosure

An Approved prefabricated GRP enclosure shall be the preferred means of installation in compliance with section 10.2. The dimensions and construction of the GRP enclosed Unit substation shall be as detailed in SUB-03-018 & SUB-03-017

Where required by section 10.2, a masonry/brick or galvanised steel enclosure shall be constructed as detailed in SUB-03-017. Unit substations which are proposed to be constructed at SP Energy Networks expense with a Masonry/brick enclosure or a type that falls out with the guidelines detailed in section 10.2 shall only be installed after formal written approval has been given by the Distribution Network Manager.

12. 'X' TYPE – SECONDARY SUBSTATIONS

This particular type of substation utilises pilot wire unit protection. The general layout of the site shall be as per Figure 2 in Appendix 1.

SP Energy Networks recommend that ICP's undertaking contestable work contact SP Energy Networks to discuss the significant technical issues prior to commencing the design, procurement or installation of an 'X' Type substation.

An 'X' type substation comprises of the following Equipment:

- 11kV/433V "tall" Transformer (500kVA rating)
- Free standing X type 11kV Ring Main Unit (fully rated T off earth switch)
- Wall mounted 400V fuse cabinet (Type 'A')
- Wall Mounted Solkor Protection Panel
- Battery and Charger

12.1 Enclosure

X Type substations contain Indoor Equipment which requires to be installed in a suitable permanent enclosure of a masonry/brick construction. Detail of construction and foundations in SUB-03-017 & SUB-03-017 Appendix 1.

NOTE: It should be noted that suitable supports are required in order to wall mount the Solkor Protection Panel.

12.2 Associated Drawings

Equipment layout and multicore cables shall be in accordance with SP Energy Networks SUB-03-029 Appendix 2.

13. INDUSTRIAL HV CUSTOMER RMU SUBSTATIONS

The general layout of the Industrial HV Type substation site will be as per Figure 3 Appendix 1, and comprise of the following Equipment:

- 11kV Ring Main Unit
- 11kV Metering Unit
- 11kV Tariff Metering Equipment
- Customer Emergency 11kV Disconnection Equipment

© SP Power Systems Limited

Internal Use

13.1 Enclosure

An Approved prefabricated GRP enclosure shall be the preferred means of installation in compliance with section 10.2. The dimensions and construction of the GRP enclosed HV Customer RMU substation shall be as detailed in SUB-03-018, SUB-03-017 & SUB-03-017 Appendix 1.

Industrial HV Customer RMU substations which are proposed to be constructed at SP Energy Networks expense with a Masonry/brick enclosure or a type that falls out with the guidelines detailed in section 10.2 shall only be installed after formal written approval has been given by the Distribution Network Manager.

The customers' incoming switchgear must be situated so as to provide easy access and the HV cable should be as short as possible between the point of supply and the customers' switchgear.

The HV cable shall not be exposed by more than 1m inside the customers' premises as it still falls under the SP Energy Networks zone of protection. The cable itself shall be adequately protected with respect to mechanical damage.

An Emergency Trip facility will be provided to the customer for HV disconnection of the incoming supply. The tripping facility shall be mounted adjacent to the customers metering equipment and be easily identifiable.

In addition, a flag relay shall be mounted adjacent to the SP Energy Networks RMU to give local indication of a customer emergency tripping action being carried out.

13.2 Metering

The metering unit shall be of an approved type as detailed in the SP Energy Networks Approved Equipment Register.

14. INDUSTRIAL LV CUSTOMER SUBSTATIONS

The general layout of the Industrial LV Type substation site will be as per Figure 4 in Appendix 1, and comprises of the following equipment:

- 11kV/433V Transformer
- Transformer mounted 11kV Ring Main Unit
- Transformer mounted 400V fuse cabinet with metered ways.
- 400V Tariff Metering Equipment
- Secondary RTU
- LV monitoring (as applicable)

The general layout of the site is similar to the unit substation except it has a customer metering annex as shown in Figure 4. It should be noted however, that depending on the distance between the LV point of supply and industrial premises, the customer tariff metering equipment may be situated in the metering annex to the secondary substation or could be situated in the customers' premises.

14.1 Enclosure

An Approved prefabricated GRP enclosure shall be the preferred means of installation in compliance with section 10.2. The dimensions and construction of the GRP enclosed Industrial LV Customer substation shall be as detailed in SUB-03-017 & SUB-03-017 Appendix 1.

Industrial LV customer substations which are proposed to be constructed at SP Energy Networks expense with a Masonry/brick enclosure or a type that falls out with the guidelines detailed in section 10.2 shall only be installed after formal written approval has been given by the Distribution Network Manager

© SP Power Systems Limited

Internal Use

14.2 Metering

The metering current transformers shall be located in the LV distribution board.

The metering unit shall be of an approved type as detailed in the SP Energy Networks Approved Equipment Register

15. HV CUSTOMER MULTI-PANEL BOARD SUBSTATION

The general layout of the HV customer multi-panel board type substation site will be as per Figure 5 in Appendix 1, and comprises of the following equipment:

- 11kV Multi Panel Board with Appropriate Protection
- 11kV Tariff Metering Equipment (as applicable)
- Customer Emergency 11kV Disconnection Equipment
- Auxiliary DC power supply (Battery and Charger)

15.1 Enclosure

HV customer multi-panel board type substations contain indoor equipment which requires to be installed in a suitable permanent enclosure. The enclosure shall be in accordance with SUB-03-017 & SUB-03-017 Appendix 1.

15.2 Emergency HV Disconnection

An Emergency Trip facility will be provided to the customer for 11kV disconnection of the incoming supply. The tripping facility shall be mounted adjacent to the customers metering equipment and be easily identifiable.

In addition, a flag relay shall be mounted on the SP Energy Networks customer feeder circuit breaker protection panel to give local indication of a customer emergency tripping action being carried out.

16. COMMISSIONING

Prior to Energisation, all Equipment shall be visually inspected and Mechanically & Electrically tested in accordance with sections 16.1 to 16.5.

Where it is deemed by the nominated SP Energy Networks commissioning Engineer that the equipment does not comply with the requirements outlined in sections 16.1 to 16.5, then where this cannot be resolved on site, the Equipment shall not be energised and a defect report, as detailed in ASSET-04-072 shall be submitted to the Distribution Network Manager. Where the Equipment is being installed by an ICP, the Equipment shall not be adopted.

The Distribution Network Manager shall decide if any previously in service equipment can be re-used. When approved the equipment shall be refurbished and electrically tested in accordance with the requirements detailed in SUB-02-613.

All substation commissioning results shall be formally recorded in the Corporate IT system (SAP), the details of which shall be sent to SP Energy Networks Data Management. Data templates for all plant and apparatus (currently referenced under QUAL-12-302 to QUAL-12-349) can be found on the EN Document Library.

Network Data can be contacted for any clarification points or to obtain data sheets via the emails below.

© SP Power Systems Limited

Internal Use

License area of SPD – Network Data	
Email	DataManagementNorth1@SPPowersystems.com
Address	Network Data, ScottishPower HQ, Glasgow

License Area of SPM	
Email	DataManagementSouth1@SPPowersystems.com
Address	Network Data, ScottishPower HQ, Glasgow

16.1 Visual Inspection

A visual inspection shall be undertaken once the equipment has been delivered to site in accordance with Appendix 2 – Equipment Check List and Appendix 3 – Substation Commissioning Progress Card – 'Visual Inspection'.

16.2 Mechanical Testing

On site mechanical tests shall be undertaken at site in accordance with Appendix 3 – Substation Commissioning Progress Card – '*Mechanical Testing*'.

16.3 Protection Testing

Protection commissioning shall be undertaken in accordance with the Flow Chart detailed below and the appropriate guidance given in sections 16.3.1 and 16.3.2. IDNO protection commissioning shall be undertaken in accordance with section 16.3.3.

New installations shall utilise switchgear that is either extensible or non-extensible. When the new switchgear is non-extensible Type 'Y' RMU then Standard Protection Commissioning shall be undertaken.

When the new switchgear is non-extensible Type 'X' RMU or comprises extensible switchgear, then Enhanced Protection Commissioning shall be undertaken.

16.3.1 Enhanced Protection Commissioning

For protection schemes where site protection wiring has been undertaken, protection testing shall be carried out in line with SP Energy Networks requirements. In all cases, a site-specific commissioning schedule will be developed prior to commencing commissioning, and shall include the following tests where appropriate:

Current Transformers:	Mag Curves D.C Resistance test Insulation Resistance test Flick Test Primary injection for ratio/polarity and scheme functionality
Voltage Transformers:	Ratio/vector group test D.C resistance test Insulation Resistance test Flick test
Switchgear:	Reduced voltage test on open/closing
Relays:	Secondary Injection of all relays Pick up/drop off of auxiliary relays
Protection Scheme:	Insulation resistance of secondary wiring

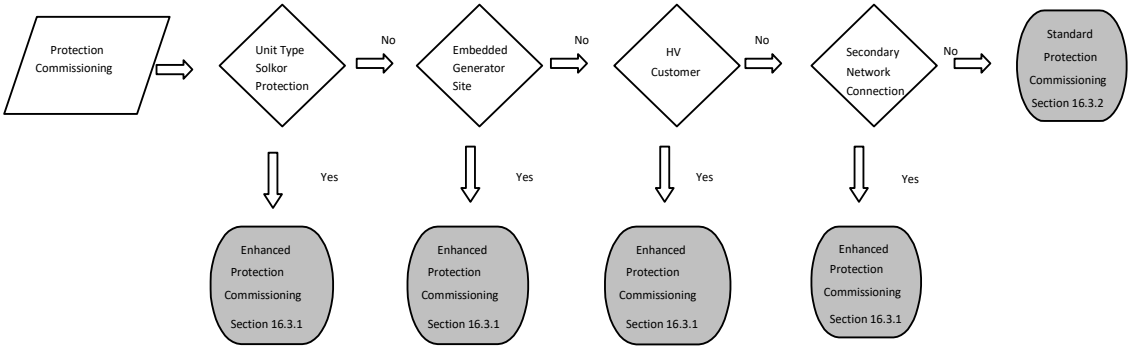
© SP Power Systems Limited

Internal Use

Full functional test of scheme according to the appropriate schematic

Batteries: Functional Test

Post energising tests: Trip test
Load checks on protections



Where the enhanced Protection commissioning is being undertaken by an ICP, then it is SP Energy Networks policy to witness the tests prior to adoption. Tests to be witnessed, to be agreed locally prior to commissioning starting.

16.3.2 Standard Protection Commissioning

The standard protection commissioning tests shall be employed on non-extensible RMUs which utilise either time lag fuses (TLFs) or a self-powered relay to protect the outgoing cable (and transformer, where appropriate).

- Where TLFs are used, each fuse/link shall be removed and the ac trip coil injected using an approved Test Set. This test will confirm tripping of the HV circuit breaker. This test should be carried out on both phases and earth.

Where a self-powered relay is employed, then the relay should be programmed & tested using a relay specific test device to ensure tripping of the circuit breaker.

16.3.3 IDNO Protection Commissioning

Where the Company network interfaces with an IDNO network then the appropriate Protection commissioning as detailed in SUB-02-013 shall be undertaken.

16.4 Electrical Insulation Testing

All HV Equipment shall be electrically tested where appropriate, at site in accordance with SP Energy Networks document SUB-02-613.

16.5 Pre-Energisation Checks

Appendix 3 details the Pre-Energisation checks to be undertaken.

© SP Power Systems Limited

Internal Use

APPENDIX 1 – DIAGRAMS

- **Typical Site Layout for a Unit Substation – Figure 1**
- **Typical Layout for a 'X' Type Substation – Figure 2**
- **Typical Layout for an Industrial HV Customer Substation – Figure 3**
- **Typical Layout for an Industrial LV Customer Substation – Figure 4**
- **Typical Layout for an Industrial HV Switching Substation – Figure 5**

Figure 1 – Typical Site Layout for a Unit Substation

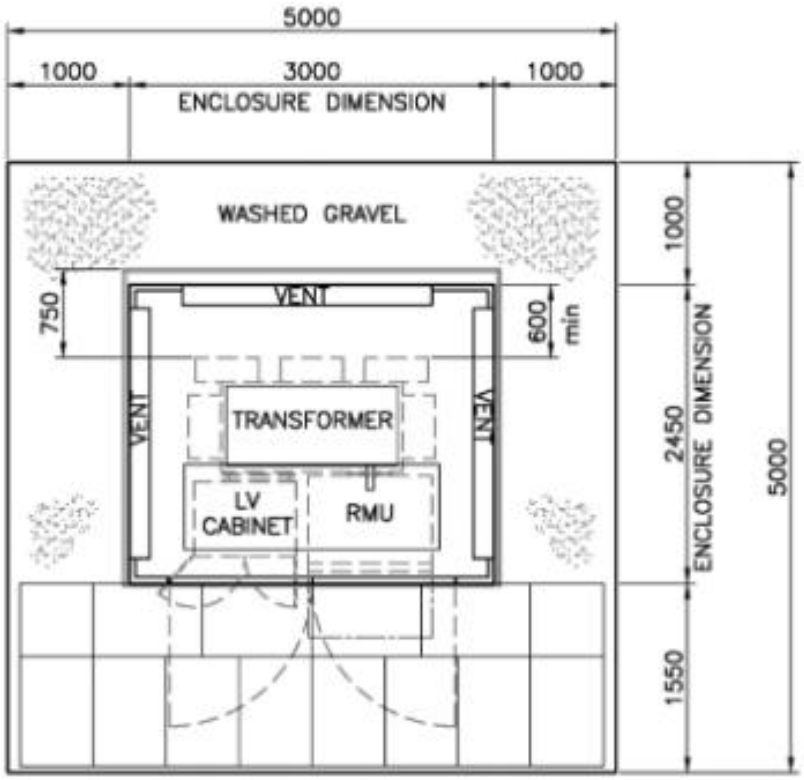


Figure 2 – Typical Layout for a 'X' Type Substation

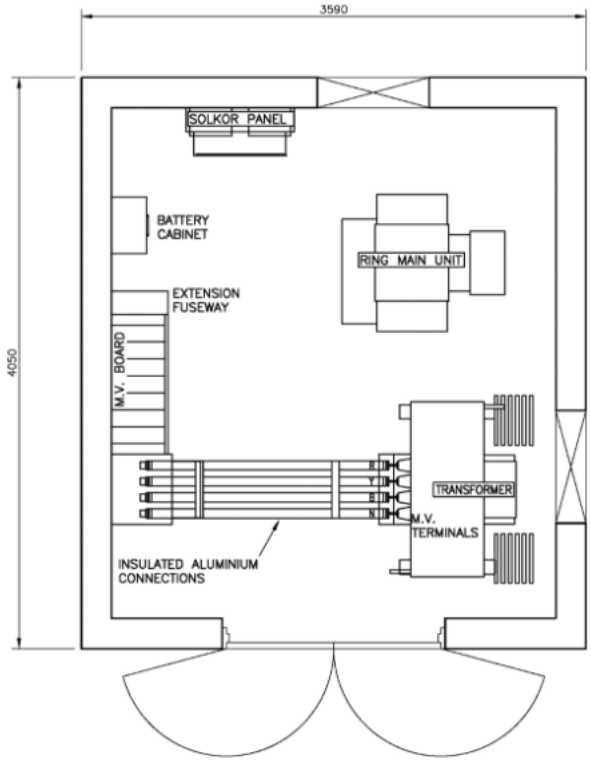


Figure 3 – Typical Layout for an Industrial HV Customer Substation

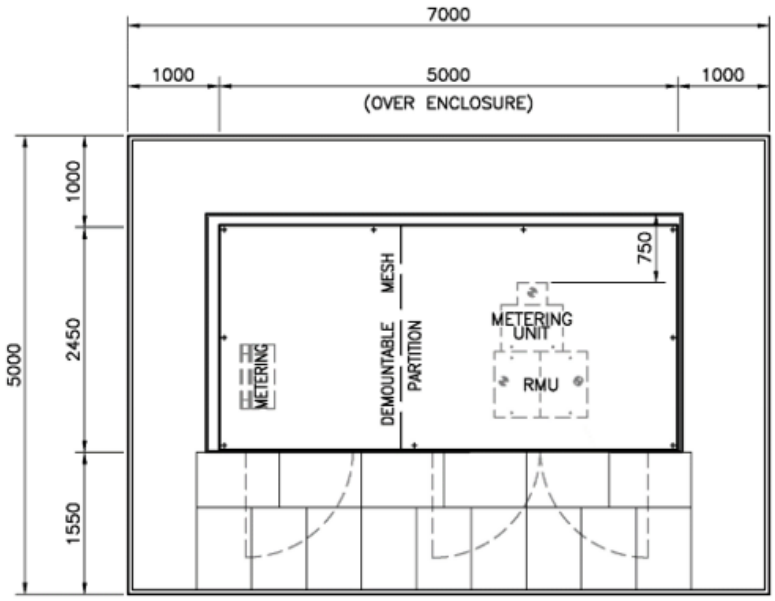


Figure 4 – Typical Layout for an Industrial LV Customer Substation

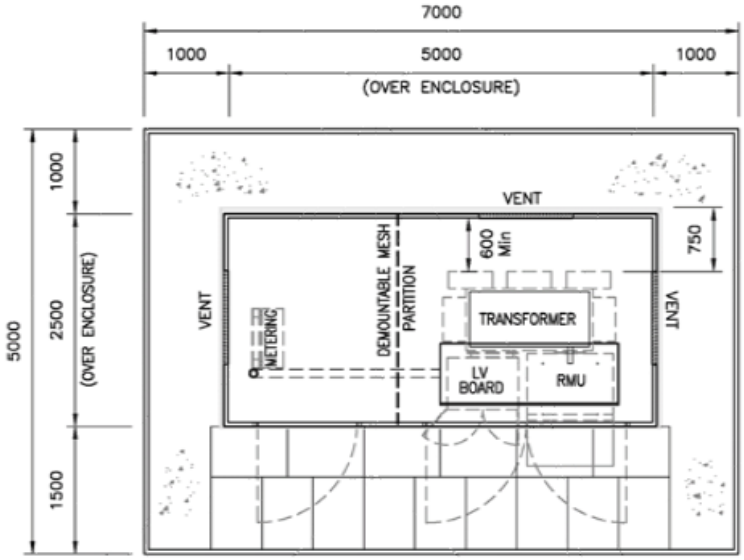
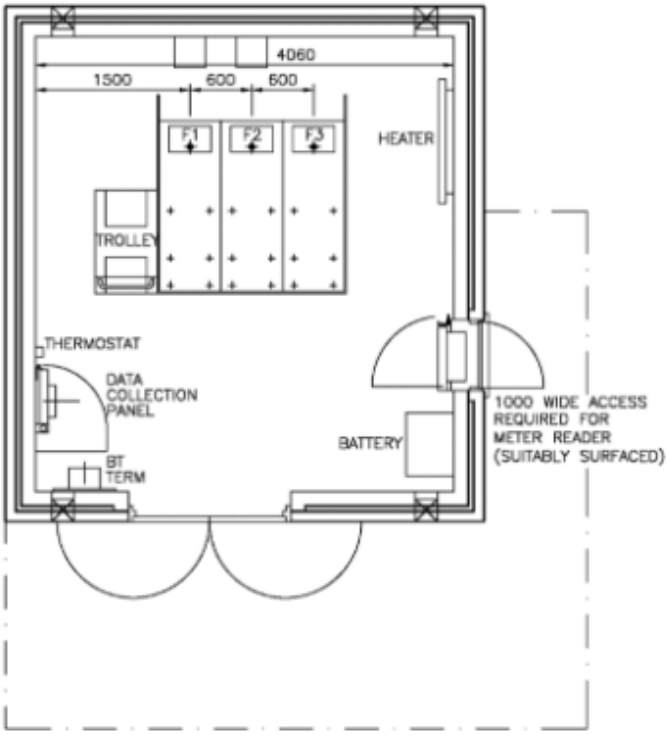


Figure 5 – Typical Layout for an Industrial HV Switching Substation



APPENDIX 2 – EQUIPMENT CHECK LIST

This list is not exhaustive and should completed in conjunction with specific substation and manufacturers requirements.

Switchgear

Check Item	Action	Required Standard
Main Equipment	Visual	Type & Rating as required
CTs & VTs & Instruments	Visual	Type & Rating as required
External Condition	Visual	Free form rust, damage & oil leaks
Breather/Explosion Vent	Test	Unobstructed
Gaskets	Visual	Correctly fitted
Covers, Tanks, Doors	Test	Secure
Cable Boxes (internally)	Visual	Bushings & terminations clean & undamaged
Auxiliary Contacts, Switches	Visual	Correctly fitted, undamaged
Secondary Connections & Wiring	Test	Correctly fitted, secure
Spout Bushings & Isolating Contacts	Visual	Clean & undamaged
Electrical Trip/Close	Test	Correct operation
Earth Circuit Continuity	Test	Test satisfactory with earth switches closed
Labels	Visual	Operational & circuit as required
Earth Bonding & Connections	Visual	Correctly fitted, secure
Primary & Secondary Insulation	Test	Between phases & to earth satisfactory
Primary & Secondary Continuity of Switchgear & Busbars	Test	Test satisfactory with switches/breakers closed

© SP Power Systems Limited

Internal Use

Transformers (1000kVA and below)

Check Item	Action	Required Standard
Main Equipment	Visual	Type & Rating as required
External Condition	Visual	Free form rust, damage & oil leaks
Insulating Oil – Level	Visual	Filled to correct level
Gaskets	Visual	Correctly fitted
Breather	Visual	Transport plug removed, unobstructed
Drain Plug Valve	Visual	Tight, free from leaks
Tap Change Switch	Test	Correct operation, locked
Internal Tapping Links	Visual	Correct position, secure
Cable Boxes (internally)	Visual	Bushings & terminations clean & undamaged
Bushings & Insulation in Air	Visual	Clean, undamaged, secure
Spark Gaps	Measure	Correct for voltage
Earth Bonding & Connection	Visual	Correctly fitted, secure

LV Equipment

Check Item	Action	Required Standard
Main Equipment	Visual	Type & Rating as required
External Condition	Visual	Free form rust, damage & oil leaks
Interior	Visual	Assembled correctly, undamaged
Contact Alignment	Operate	Correct in all fuse & link positions
Operating Handles	Operate	Correct operation, undamaged
Transformer Isolating Links	Operate	Correct operation, lockable
Inter-phase & Earth Screen Barriers	Visual	Secure & correctly fitted
Locking Facilities	Visual	Correct
MDI Metering	Visual	Correctly fitted
Auxiliary Supply Connection	Visual	Secure
Labels	Visual	Circuit, Resuscitation, PME fitted as required

© SP Power Systems Limited

Internal Use

APPENDIX 3 – SUBSTATION COMMISSIONING PROGRESS CARD

This list is not exhaustive and should completed in conjunction with specific substation and manufacturers requirements.

Substation Name		**Project Number**	

Equipment Type	Manufacturer	Serial Number(s)
Switchgear		
Transformer		
LV Equipment		

Visual Inspection

The equipment has been inspected on-site in accordance with the **Appendix 2** of the Equipment Check List.

The transformer ***has/has not** been filled with insulating oil
The switchgear ***is/is not** filled with Dielectric gas
The equipment is ready for use

Signed ……..... Date …….....

Mechanical Testing

Operational Checks	Operate	Operate mechanism	
Operational Locks Fitted	Visual		
Interlocks	Operate	Correct operation	
Switch Position Indicators	Visual	Correct flagging & colour	
Operating Handles	Operate	Correct operation, undamaged	
VPIS	Operate	Correct Indications	
Test Prods/Extensions	Operate	Correct fitting, operation, interlocks	
Spout Bushings & Isolating Contacts	Visual	Clean & undamaged	
Shutters & Mechanisms	Operate	Secure, correct operation & colour	
Racking Mechanism	Operate	Lubricated, correct operation	
Locking Facilities	Visual	Correct	

© SP Power Systems Limited

Internal Use

Protection Testing

The following protection has been tested and the results recorded in accordance with section 16.3.

Protection Type	Comments

Signed ……..... Date …….....

Electrical Insulation Testing

The equipment has been tested and the results recorded in accordance with Scottish Power specification SUB-02-613.

Pressure Test carried Out	Voltage Used

Signed ……..... Date …….....

Earthing System Testing

Substation earthing has been installed and tested in accordance with EART-03-003 Technical Specification for Earthing and Bonding at Secondary Substations.

Signed ……..... Date …….....

© SP Power Systems Limited

Internal Use

Pre-Energising Checks

The following checks have been carried out and signs fitted in accordance with EPS-01-004 prior to energising:

Pre-Energising Checks						
LV Fuses correctly fitted						Y/N
Bonding & Earthing complete						Y/N
Earth Resistance Value	HV		Ohm	LV		Ohm
LV Neutral/HV Steelwork Earth Link	Open			Closed		Y/N
Signs						
Property Notice						Y/N
SF6						Y/N
Operational Restriction						Y/N
PME						Y/N
Danger of Death						Y/N

Signed ……..... Date …….....