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Electricity Specification 366

Issue 2 Dec 2021

Heating, Lighting and Small Power Installations in Grid & Primary Substations

Amendment Summary

ISSUE NO. DATE	DESCRIPTION
Issue 2 **Dec 2021**	Addition of specification for dehumidifiers and general update of equipment used. Re formatted into new branding. Prepared by: Kelvin Smith Approved by: Policy Approval Panel and signed on its behalf by Steve Cox, Engineering and Technical Director

Contents

1 Introduction

The purpose of this document is to provide additional guidance on the design, specification and installation of low voltage Lighting and Small Power (L&SP) installations within Electricity North West Ltd (ENWL) Grid, Primary and generation connection substation.

This document should be read in conjunction with the following documents: -

Code of Practice 351 - Civil Design Aspects of Primary Substations

Code of Practice 355 - Civil Design Aspects of 132kV Substations

Code of Practice 365 - Design of substations designated for asset replacement

Electricity Specification 366 - Heating and Lighting Installations in Primary Substations ***Design Handbook, Chapter 1*** - L&SP and LVAC

The following standard drawings shall also be referenced for Primary Substations: -

900201-001 Standard Schematic Diagram for Primary Substation LVAC Distribution System

900201-002 Standard Equipment Schedule for Primary Substation LVAC Distribution System

900201-010 Standard Equipment Layout for Primary Substation LVAC Distribution System

900201-011 Standard Containment Layout for Primary Substation LVAC Distribution System

900201-012 Standard Internal Wall Details for Primary Substation LVAC Distribution System

900201-013 Standard External Wall Details for Primary Substation LVAC Distribution System

The following standard drawings shall also be referenced for Distributed Generation Connection Substations:-

900206-003 Standard Heating and Lighting Layout for a Single Panel CB Board

900206-012 Standard Heating and Lighting Layout for a Multi Panel CB Board

900206-060 Standard Schedule of Equipment for Distributed Generation Substation LVAC Distribution System

900206-061 Standard Schematic Diagram of Single Panel CB Board Substation LVAC Distribution System

900206-062 Standard Schematic Diagram of Multi Panel CB Board LVAC Distribution System

900206-063 Standard Containment Layout for Single Panel CB Board Substation LVAC Distribution System

900206-064 Standard Containment Layout for Multi Panel CB Board Substation LVAC Distribution System

900206-065 Standard Internal Wall Details for Single Panel CB Board Substation LVAC Distribution System

900206-066 Standard Internal Wall Details for Multi Panel CB Board Substation LVAC Distribution System

900206-067 Standard External Wall Details for Single Panel CB Board Substation LVAC Distribution System

900206-068 Standard External Wall Details for Multi Panel CB Board Substation LVAC Distribution System

The details contained within this guidance note shall be applied in full for all new substation developments and for new L&SP installations installed in existing substations as part of asset replacement projects, however it is not intended that existing substation L&SP installations which are not affected by part of the asset replacement projects need to be modified in line with this document.

Where additional clarification is required on any items of this document, guidance shall be obtained from the Grid and Primary design team.

Where any items of this guidance note cannot be accommodated, advice shall be obtained from the Grid and Primary design team.

2 Scope

The following sections provide guidance on the lighting and small power installations to be provided grid and primary substation and to be applied at new generation connection substations.

3 Definitions

Approval	Sanction by the Engineer that specified criteria have been satisfied.
Contract	The agreement between Electricity North West and the Contractor for the execution of the Works including therein all documents to which reference may properly be made in order to ascertain the rights and obligations of the parties under the said agreement.
Contract Price	The sum named in the tender subject to such additions thereto or deductions there from as may be made and shall mean the total financial commitment of Electricity North West to the Contractor under the Contract.
Contractor	The person or person's firm or company, including personal representatives, successors and permitted assigns, who's Tender has been accepted by Electricity North West.
Engineer	Electricity North West ' Policy and Standards Manager or his successor or such person specifically nominated on his behalf.
Guarantee	A document serving as security for the materials supplied/contract works for the specified period.
Specification	The Specifications and schedules (if any) agreed by the parties for the purpose of the Contract.
Sub-Contractor	Any person (other than the Contractor) named in the Contract for any part of the Works or any person to whom any part of the Contract has been sub-let with the

	consent in writing of the Engineer, and the legal representatives, successors and assigns of such person.
Supplier	Any person or person's firm or company who supplies goods to Electricity North West or to its Contractor.
Tender	An offer in writing to execute work or supply goods at a fixed price.
Tenderer	The person or person's firm or company, including personal representatives, successors and permitted assigns, invited by Electricity North West to submit a Tender.
Works	All materials, labour and actions required to be provided or performed by the Contractor under the Contract.

4 Contractor's Responsibilities

The Contractor shall be responsible for the installation of the whole of the electrical engineering Works, as generally set down on the architect's layout drawings and in this Specification.

The Works shall comprise the heating and lighting electrical installation to a new Primary Substation for Electricity North West.

The Contractor shall be responsible for the installation and proper working of the electrical installations and all equipment therein to the complete satisfaction of Electricity North West. The Contractor shall be responsible for carrying out all tests called for herein or otherwise required by Electricity North West and for demonstrating that the installation of all equipment therein is capable of performance and operation in accordance with standards laid down in this Specification.

If the Contractor has reason to believe that anything described in this Specification or shown on drawings is inconsistent with his Guarantee and responsibilities, he shall draw attention to such matters at the time of tendering.

If after acceptance of the Tender, the Contractor has reason to believe that there are further inconsistencies, he shall immediately bring this to the attention of the Engineer, but in this event the Contractor shall not be entitled to any alteration of the Tender price, or the waiving of any Guarantee, or of the modification in any respect of his obligations as stated in the Specification, save at the discretion of the Engineer. The Contractor is strongly advised to visit site prior to starting the Contract to ascertain at first hand the extent of the Works, and to carry out any relevant survey work.

The Contractor shall be responsible for any drawings, specifications, orders or other particulars supplied by him and any discrepancies, errors or omissions in the same.

When compiling his Tender the Contractor shall take account of the particular type of construction, and the finishes to be used.

The Contract drawings show the general structural layout of the development and are not to be regarded as working drawings. All necessary bends, elbow offsets, diversions etc, required to 'complete the installation' in a neat and workmanlike manner and overcome any site difficulties are to be included.

The words 'complete installation' used above shall mean not only the major items of plant and equipment conveyed by this Specification, but all the incidental sundry components necessary for the complete execution of Works and for the proper operation of the installation. If any queries arise out of the Specification or drawings the Contractor shall obtain the Engineer's decision before submitting his Tender.

5 Programme for the Works

The Works shall be carried out in accordance with the programme, which will be prepared by the Contractor.

The Contractor shall prepare a programme indicating dates for commencement and completion of all relevant main components of the Works. This shall be submitted at the time of Tender return.

The programme shall incorporate periods for commissioning the installations prior to practical completion of the Works. It should also include information as to when working drawings, "as fitted" drawings and maintenance manuals will be completed.

6 Electrical Specification

6.1 Incoming Supplies

A 415 volt AC, 50Hz, Three Phase and Neutral (TP+N) supply shall be provided to the site from the local distribution network or the local Earthing Auxiliary Transformers.

To maintain discrimination with the downstream protection devices the minimum cut-out fuse size shall be rated at 100 amps.

The incoming LV service shall be equipped with LV metering equipment between the fused cut-outs and the substation distribution equipment as detailed on the LV distribution schematic drawing.

A typical diversified 3 phase load for a Grid or Primary substation will be approximately 30kVA (i.e. 10kVA per phase).

The metered LV supply shall feed all the non-essential and essential services associated with the site.

A minimum space of 850mm x 850mm (above finished floor level) shall be provided for the installation of the cut out and metering equipment and shall be positioned directly below the distribution equipment detailed in section 6.2.1.

A Surge Proof Device (SPD) shall be provided at the source (between the metering equipment and the distribution equipment), or a risk assessment confirming there is no requirement for an SPD shall be completed.

All cables between the fused cut-outs, metering equipment and distribution equipment shall be single core PVC / PVC insulated cables (i.e. double insulated) of the appropriate size for the incoming fuse rating.

6.2 Building Low Voltage Services

6.2.1 Distribution Equipment

A 12 way, TP+N distribution board, referenced DB1 shall be installed within the switch house building to provide LV supplies to all non-essential services (i.e. lighting, small power, heating, dehumidification etc). The distribution board shall contain an integral 125 amp incoming isolator and be equipped with Miniature Circuit Breakers (MCB's) and Residual Current Circuit Breaker with Overcurrent Protection (RCBO's) as detailed on LV distribution schematic drawing.

The distribution board DB1 shall be supplied via a 100 amp fuse switch (for isolation) fitted with 63 amp High Rupturing Current (HRC) fuses, referenced FS1.

A 12 way, TP+N fuse board, referenced DB2 shall be installed within the switch house building to provide LV supplies to all essential services (i.e. transformer kiosks, battery systems etc). The fuse board shall be equipped with HRC fuses as detailed on LV distribution schematic drawing.

The fuse board DB2 shall be supplied via a 100 amp fuse switch (for isolation) fitted with 63 amp HRC fuses, referenced FS2.

The distribution equipment shall be located by the main entrance door as detailed on the LV distribution general arrangement drawing.

The maximum protection device rating which shall be installed in either distribution board (i.e. DB1 or DB2) is 32 amps to ensure discrimination is maintained with the upstream protection devices.

6.2.2 Containment and Wiring

A 150 mm x 150 mm galvanised steel trunking shall be installed locally around the LV distribution boards to provide a cabling interface between the distribution boards, internal trunking systems and external multicore cables.

A 75 mm x 75 mm galvanised steel trunking shall be installed internality around the parameter of the switch room building at a height of 3100 mm above finished floor level to the underside of the trunking.

A 50 mm x 50 mm galvanised steel lighting trunking shall be installed on the ceiling to support the light fittings directly above the switchgear.

The containment shall be installed as detailed on the LV containment general arrangement drawing and LV distribution internal wall views drawing.

All conduit droppers to light switches, socket outlets, fused spur units etc, shall be galvanised steel.

The steel containment system shall be earthed at each outlet (by flying lead), however a separate Circuit Protective Conductor (CPC) shall be installed for each circuit (i.e. the containment system shall not be used as the main circuit earth). The steel containment system does not require additional bonding between joints if correctly installed and the installation is proved to be adequately earthed by testing.

The containment system shall be connected to the Main Earthing Terminal (MET) of the installation local to the LV distribution boards.

The LVAC installation shall be wired in PVC insulated single core cables as standard, however for large, complex building layouts or where the substation is located within a building with access to the general public (i.e. shopping centres etc) and the risk to personnel and public of smoke inhalation when exiting the building is considered high in the event of fire, Low Smoke Zero Halogen (LSZH) insulated cables shall be specified.

All wiring contained within the containment system shall be rated to the highest voltage contained within the containment system (i.e. where 48v DC wiring is installed, the cable shall be of equal specification to that of the mains LV wiring).

6.2.3 Internal Lighting

The internal lighting shall be a combination of wall and ceiling mounted to achieve the best light distribution to suit the building size, shape and internal equipment layout.

The internal lighting installation shall achieve the following lighting levels.

Table 1 – Internal Lighting Levels

WORKING PLANE / AREA	MEASUREMENT PLANE / LEVEL	AVERAGE LUX LEVEL	MAINTENANCE FACTOR
Floor	Horizontal at 0 mm	300	0.7
Switchgear	Vertical at 750 mm	400	0.7
Toilet / Store Rooms	Horizontal at 0 mm	150	0.6

All internal lights shall be batten type LED fittings which meet the requirements specified in table 2 below.

Table 2 – Internal Lighting Fitting Specifications

FITTING LENGTH	FITTING TYPE	MINIMUM COLOR TEMPERATURE	MINIMUM LIGHT OUTPUT
1200mm	Single	4000k	2000 lumens
1200mm	Double	4000k	4000 Lumnes
1500mm	Single	4000k	3000 Lumens
1500mm	Double	4000k	6000 Lumens

NOTE: 1500mm fittings shall be installed as standard, with 1200mm fittings being installed where space requirements dictate.

All fittings shall have a minimum rating of IP65 and suitable for installation in a non-corrosive industrial environment. This specification is required to ensure light fittings have a suitable level of mechanical protection and therefore suitable for installation within a substation environment.

All light fittings shall be connected via a plug in ceiling rose to facilitate safe replacement of the light fitting without disconnection of the main circuit wiring.

All wall mounted light fittings shall be installed at a height of 2750 mm above finished floor level to the underside of the lights.

The light fittings shall be installed as detailed on the LV distribution general arrangement drawing and LV distribution internal wall views drawing.

All lighting circuits shall be controlled via a main lighting contactor which is controlled by the main substation light switch (SW1) located by the main entrance door. The neon light associated with switch SW1 shall be arranged to be illuminated when the switch is in the 'OFF' position (i.e. substation lights not on) to allow the location of the switch to be easily identified in the dark.

The rating of the circuit protection device shall be suitable for the connected demand, however shall be a type B

MCB.

The lighting circuits shall be wired in single core pvc insulated cables contained within the parameter trunking containment system. The CSA of the pvc cable shall be 1.5mm^2 where possible (subject to voltage drop of disconnection time assessment).

The lighting control circuit shall be of the radial type supplied from a 6 amp type B MCB on the LV distribution schematic drawing and the CSA of the pvc insulated cable shall be 1.5mm^2.

The control and monitoring scheme of the lighting circuits be installed as detailed on the LV distribution schematic drawing, noting the end of each circuit being connected to a contactor to monitor the integrity of the supply and associated wiring. Failure of any lighting circuit when the main substation lighting switch is on shall cause the emergency lights to operate.

In exceptional circumstances (i.e. buildings with high emergency lighting requirements and loads) alternative emergency lighting approaches including self contained emergency light fittings may be considered, however additional measures to ensure adequate test facilities are provided and test regimes established must also be considered.

6.2.4 Emergency Lighting

The internal emergency lighting shall be a combination of wall and ceiling mounted to achieve the best light distribution to suit the building size, shape and internal equipment layout.

The internal emergency lighting shall achieve the following lighting levels.

Table 3 – Emergency Lighting Levels

WORKING PLANE / AREA	MEASUREMENT PLANE / LEVEL	MINIMUM LUX LEVEL	MAINTENANCE FACTOR
Floor	Horizontal at 0 mm	1	0.7

All emergency lights shall be emergency bulkhead type LED fittings (typically 300 mm long) suitable for connection to a centralised 110v DC battery system.

Emergency light fittings shall be installed on the emergency escape route, at all final exits (internally and externally) and changes in elevations as detailed on the LV distribution general arrangement drawing and LV distribution internal wall views drawing.

All fittings shall have a minimum rating of IP65 and suitable for installation in a non-corrosive industrial environment. This specification is required to ensure light fittings have a suitable level of mechanical protection and therefore suitable for installation within a substation environment.

All external fittings shall also be vandal resistant by design or provided with additional mechanical protection (i.e. cage type guard).

All emergency lights shall have a 1 hour fire rating.

All internal wall mounted emergency light fittings shall be installed at a height of 2750 mm above finished floor level to the underside of the lights.

All external wall mounted emergency light fittings shall be installed at a height of 2600 mm above finished floor level to the underside of the lights.

All emergency light fittings shall be connected via a plug in ceiling rose to facilitate safe replacement of the light fitting without disconnection of the main circuit wiring.

The emergency lighting circuits shall be wired in fire resistant wiring (i.e. type FP200 cable) with a CSA of the 1.5mm^2, which shall be contained within the parameter trunking containment system. The control circuit wiring between contactors, light switch and junction boxes shall be in fire resistant single core cables installed within the containment system around the distribution boards and shall have a CSA of 2.5mm^2.

The main DC supply cable from the battery system to the junction box, referenced ELJB, (as detailed on the LV distribution schematic drawing) shall be wired in fire resistant wiring (i.e. type FP200 cable) with a CSA of the 2.5mm^2. Where the cable is installed in a cable trench system the cable shall be provided with additional mechanical protection (i.e. Copex).

The fuse size for the 110V DC emergency lighting circuit shall be rated at 16 amps.

The control and monitoring scheme of the lighting circuits be installed as detailed on the LV distribution schematic drawing, noting the end of each circuit being connected to a contactor to monitor the integrity of the supply and associated wiring. Failure of any lighting circuit when the main substation lighting switch is on shall cause the emergency lights to operate.

In exceptional circumstances (i.e. buildings with high emergency lighting requirements and loads) alternative emergency lighting approaches including self contained emergency light fittings may be considered, however additional measures to ensure adequate test facilities are provided and test regimes established must also be considered.

6.2.5 Compound/External Lighting

The substation compound lighting shall be a combination of wall and post mounted fittings to achieve the best light distribution to suit the compound shape and equipment layout.

The external lighting shall achieve the following lighting levels.

Table 4 – Compound/External Lighting Levels

WORKING PLANE / AREA	MEASUREMENT PLANE / LEVEL	AVERAGE LUX LEVEL	MAINTENANCE FACTOR
Floor	Horizontal at 0 mm	50	0.5
Plant	Vertical at 750 mm	200	0.5

All external lights shall be bulkhead or flood type LED fittings which meet the requirements specified in table 5 below.

Table 5 – Compound/External Lighting Fitting Specifications

MOUNTING	FITTING TYPE	MINIMUM COLOR TEMPERATURE	MINIMUM LIGHT OUTPUT
Wall	Bulkhead	4000 k	500 lumens
Post / Wall	Flood	4000 k	6000 lumens

All fittings shall have a minimum rating of IP65 and suitable for installation in a non-corrosive industrial environment. This specification is required to ensure light fittings ha a suitable level of mechanical protection and therefore suitable for installation within a substation environment.

All external wall mounted fittings shall also be vandal resistant by design or provided with additional mechanical protection (i.e. cage type guard).

Wall mounted lights fittings shall be installed above all final exits to the building and around the perimeter of the building as detailed on the LV distribution general arrangement drawing and LV distribution external wall views drawing.

All external wall mounted light fittings shall be installed at a height of 2600 mm above finished floor level to the underside of the lights.

All wall mounted light fittings shall be connected via a plug in ceiling rose located internally to the building immediately adjacent to the external mounting location, with the flex connection passing through the fabric of the building and directly into the back of the external lighting fitting, to facilitate safe replacement of the light fitting without disconnection of the main circuit wiring.

Post mounted light fittings shall be installed on 4 m high folding lighting columns equipped with LED flood lights in the substation compound as detailed on the LV distribution general arrangement drawing.

All external lights mounted on the side of the building shall be switched by a separate 'outside lighting' switch, referenced SW2, located by the main entrance door. The external lights shall be interlocked with the main lighting circuits such that the 'main lighting' switch (SW1) must be in the 'ON' position for the external lighting circuits to be energised. This interlocked external lighting arrangement is design for security purposes and ensure no external lights are left on when the substation is unoccupied.

The wall mounted external lights circuits shall be wired in single core cables contained within the parameter trunking containment system. The CSA of the pvc cable shall be 1.5mm^2 where possible (subject to voltage drop of disconnection time assessment).

All compound lighting columns shall be switched by a separate 'compound lighting' switch, referenced SW3, located by the main entrance door. The compound lights shall be interlocked with the main lighting circuits such that the 'main lighting' switch (SW1) must be in the 'ON' position for the external lighting circuits to be energised. This interlocked compound lighting arrangement is design for security purposes and ensure no external lights are left on when the substation is unoccupied.

The compound lighting columns shall be wired in 2.5mm^2, 3 core, XLPE/PVC/SWA/PVC multicore cables installed in ducts.

The rating of the circuit protection device for the external lighting circuit shall be suitable for the connected demand, however shall be a type B MCB.

The compound lighting control circuit shall be of the radial type supplied from a 6 amp type B MCB on the LV distribution schematic drawing and the CSA of the pvc insulated cable shall be 1.5mm^2.

For security reasons Passive Infra Red (PIR) sensors are not installed to control the external lighting circuits.

6.2.6 Small Power

4 off metal clad double socket outlets shall be installed within the building to provide outlets for general small power equipment. All socket outlets shall be installed with an integral 30 milliamp RCD.

All socket outlets shall be installed at a height of 400 mm above finished floor level to the underside of the socket outlet and located as detailed on the LV distribution general arrangement drawing and LV distribution internal wall views drawing.

The socket circuits shall be of the radial type supplied from a 16 amp type C MCB as detailed on the LV distribution schematic drawing.

The socket outlet circuits shall be wired in pvc insulated single core cables contained within the parameter trunking containment system. The CSA of the pvc cable shall be 2.5mm^2 where possible (subject to voltage drop of disconnection time assessment).

6.2.7 Heating

Industrial finned type tubular heaters connected via 13-amp metal clad un-switched spur connection outlets shall be installed within the building to provide general heating. The finned type tubular heaters shall be fitted with a cage to prevent direct contact with the fins.

A site specific heating assessment calculation shall be completed on a site by site basis to accommodate for the specific room dimensions and building construction.

The heating calculations shall be based on the following parameters:-

Target temperature - 20°C.

External temperature - 0°C.

Air Changes - 6 per hour.

Specific Heat Capacity - 1005 j/kg °C

Density - 1.292 kg/m^3

The number of heaters shall be selected to provide greater than or equal to the calculated heat losses plus one additional heater to provide an element of redundancy.

All heaters shall be installed at a height of 400 mm above finished floor level to the underside of the heater and all 13 amps metal clad un-switched spur connection outlets shall be installed at a height of 400 mm above finished floor level to the underside of the spur outlet and located as detailed on the LV distribution general arrangement drawing and LV distribution internal wall views drawing.

The heater circuits shall be of the radial type supplied from a 16 amp type B MCB via a heating contactor as detailed on the LV distribution schematic drawing.

The heater circuits shall be wired in pvc insulated single core cables contained within the parameter trunking containment system. The CSA of the pvc cable shall be 2.5mm^2 where possible (subject to voltage drop of disconnection time assessment).

Heating Control

The heating control contactor shall be controlled via a single thermostat (referenced TC) located centrally to the switchroom at the rear of the switchgear at a height of 1600 mm above finished floor level to the underside of the thermostat. A timer push button (referenced TO) shall be wired in parallel with the thermostat to allow a 'boost' function to be provided when engineers are working within the substation. The push button timer shall be located by the main substation entrance door at a height of 1600 mm above finished floor level to the underside of the timer.

The heater control circuit shall be of the radial type supplied from a 6 amp type B MCB on the LV distribution schematic drawing and the CSA of the pvc insulated cable shall be 1.5mm^2.

The heating thermostat which controls the heaters shall be set 12°C.

Heating Alarm

A single alarm thermostat (referenced TA) shall provide an alarm to telecontrol and shall be installed local to the control thermostat at the rear of the switchgear at a height of 1600 mm above finished floor level to the underside of the thermostat.

The volt free contact of the alarm thermostat shall be wired in parallel with the alarm outputs of the dehumidifiers and humidistats which shall control the environmental alarms relay (referenced AR1 located in EAJB).

The volt free output contact of AR1 shall provide an input to the telecontrol SCADA system and raise the alarm 'SS ENVIRONMENT OUTSIDE LIMITS'.

The environmental alarms circuit shall be configured as a radial circuit supplied from a 6 amp type B MCB on the LV distribution schematic drawing and the CSA of the pvc insulated cable shall be 1.5mm^2.

The heating thermostat which provides the alarm output shall be set at 7°C.

6.2.8 Dehumidification

EBAC CD30E dehumidifiers connected via 13 amp metal clad un-switched spur connection outlets shall be installed within the building to provide general dehumidification.

Due to manual handling and noise issues, EBAC CD100E units shall only be used in circumstances where a larger quantity of EBAC CD30E units becomes impracticable. In situations where CD100E units are installed these shall be connected via 13 amp metal clad switched spur connection outlets to allow the dehumidifier to be locally isolated to temporarily reduce the noise level within the substation environment.

A site specific dehumidification assessment calculation shall be completed on a site by site basis to accommodate for the specific room dimensions.

Typically 1 off dehumidifier shall be installed at a height of 500 mm above finished floor level to the underside of the dehumidifier and 2 off dehumidifiers shall be installed at a height of 2200 mm above finished floor level to the underside of the dehumidifier and located as detailed on the LV distribution general arrangement drawing and LV distribution internal wall views drawing.

The 13 amp metal clad un-switched spur connection outlets associated with dehumidifiers installed at a height of 2200 mm above finished floor level shall be installed at 1600mm above finished floor level to the underside of the connection outlet to allow for ease of fuse replacement without additional access equipment requirements.

The 13 amp metal clad un-switched spur connection outlets associated with dehumidifiers installed at a height of 500 mm above finished floor level shall be installed at 400mm above finished floor level to the underside of the connection outlet.

The dehumidifier circuits shall be of the radial type supplied from a 10 amp type B MCB via a dehumidifier contactor as detailed on the LV distribution schematic drawing.

The dehumidifier circuits shall be wired in pvc insulated single core cables contained within the parameter trunking containment system. The CSA of the pvc cable shall be 2.5mm^2 where possible (subject to voltage drop of disconnection time assessment).

Dehumidifier Control

Dehumidifiers shall only be controlled by their integral humidistat's. Control via external humidistat's is not used due to the requirement for a permanent (i.e. un-switched) 230V AC supply to the maintained at the unit to energise the trace heating element within the drip pipe. Switching of this supply can cause the drip pipe to freeze in sub-zero temperatures and render the units inoperative.

The control humidistat's integral to the dehumidifiers shall also be set 50% relative humidity.

Dehumidifier Alarms

2 off humidistat's to provide an alarm to telecontrol shall be located centrally to the switchroom at the rear of the switchgear. A low level alarm humidistat (referenced HA – LL) shall be installed at a height of 100 mm above finished floor level to the underside of the humidistat and a high level alarm humidistat (referenced HA – HL) shall be installed at a height of 2300 mm above finished floor level to the underside of the humidistat.

The alarm humidistats require a 230V AC supply for their operation. The output contact of the alarm humidistats shall be wired in parallel with the alarm outputs of the dehumidifiers and heating alarm thermostat and shall control the environmental alarms relay (referenced AR1 located in EAJB).

The volt free output contact of AR1 shall provide an input to the telecontrol SCADA system and raise the alarm 'SS ENVIRONMENT OUTSIDE LIMITS'.

The environmental alarms circuit shall be configured as a radial circuit supplied from a 6 amp type B MCB on the LV distribution schematic drawing and the CSA of the pvc insulated cable shall be 1.5mm^2.

The alarm humidistat's at the rear of the switchgear shall be set at 70% relative humidity and the alarm humidistat's integral to the dehumidifiers shall also be set 70% relative humidity.

6.3 Security Systems

6.3.1 Intruder Alarm

All substation building shall be protected by a security system equipped with door sensors only.

The alarm panel and associated keypad shall be located by the main entrance door and supplied via a 13 amp metal clad un-switched spur connection outlet.

The alarm system shall also incorporate an internally and externally mounted sounder.

The alarm circuit shall be of the radial type supplied from a 16 amp type B MCB as detailed on the LV distribution schematic drawing and the CSA of the pvc insulated cable shall be 2.5mm^2.

An output contact from the alarm system which shall close when the alarm system is triggered and shall control the security alarms relay (referenced AR2 located in SAJB).

The volt free output contact of AR2 shall provide an input to the telecontrol SCADA system and raise the alarm 'SUBSTATION SECURITY ALERT'.

6.3.2 Electric Fence

Typically only Grid substation compounds will be protected by an electrified fence system.

The electric fence control panel shall be located by the main entrance door and supplied via a 13 amp metal clad un-switched spur connection outlet.

The electric fence keypad shall be located in an IP65 rated enclosure located on the outside of the building local to the main entrance door.

The electric fence circuit shall be of the radial type supplied from a 16 amp type B MCB as detailed on the LV distribution schematic drawing and the CSA of the pvc insulated cable shall be 2.5mm^2.

A volt free alarm output contact shall be connected to telecontrol to raise an alarm in the event of the electric fence system being triggered.

6.3.3 CCTV

CCTV shall only be installed in special circumstances.

The CCTV control panel shall be located by the main entrance door and supplied via a 13 amp metal clad unswitched spur connection outlet.

The CCTV circuit shall be of the radial type supplied from a 16 amp type B MCB as detailed on the LV distribution schematic drawing and the CSA of the pvc insulated cable shall be 2.5mm^2.

The number and location of cameras to be determined by specialist to ensure suitable coverage is achieved.

Image storage / publication will be determined on a project by project basis.

6.4 Testing and Documentation

All installations shall be tested in line with the latest regulations.

Completed test certificates for the installation shall be provided to Grid and Primary Design for reference and a duplicate copy included within the projects health and safety file.

7 Product Data

The following sheets are attached for reference.

DISTRIBUTION EQUIPMENT				
REFERENCE	**DESCRIPTION**	**PRODUCT CODE**	**MANUFACTURER**	
FS	100 Amp Fuse Switch Disconnector	Glasgow – 103GNC	Eaton	
	63 Amp HRC Cartridge Fuse	63SD5	Eaton	
DB1	12 Way, TP+N, MCB Distribution Board	SEA9BN12	Schneider	
	Distribution Board Extension Module	SEA9BNEX034N	Schneider	
	125 Amp, 3P+N Incoming Switch Disconnector	SEA91253N	Schneider	
	MCB – 6 Amp, Single Pole, Type B	A9F53106	Schneider	
	MCB – 6 Amp, Single Pole, Type C	A9F54106	Schneider	
	MCB – 10 Amp, Single Pole, Type B	A9F53110	Schneider	
	MCB – 10 Amp, Single Pole, Type C	A9F54110	Schneider	
	MCB – 16 Amp, Single Pole, Type B	A9F53116	Schneider	
	MCB – 16 Amp, Single Pole, Type C	A9F54116	Schneider	
	MCB – 20 Amp, Single Pole, Type B	A9F53120	Schneider	

	MCB – 20 Amp, Single Pole, Type C	A9F54120	Schneider	
	MCB – 32 Amp, Single Pole, Type B	A9F53132	Schneider	
	MCB – 32 Amp, Single Pole, Type C	A9F54132	Schneider	
	RCB0 – 6 Amp, Single Pole, Type B	A9D31806	Schneider	
	RCB0 – 16 Amp, Single Pole, Type B	A9D31816	Schneider	
	25 Amp, 2 Pole, Normally Open Contactor, 230V AC	A9C20732	Schneider	
	25 Amp, 4 Pole, Normally Open Contactor, 230V AC	A9C20834	Schneider	

DISTRIBUTION EQUIPMENT				
REFERENCE	**DESCRIPTION**	**PRODUCT CODE**	**MANUFACTURER**	
	20 Amp, 4 Pole, Normally Closed Contactor, 230V AC	A9C22740	Schneider	
DB2	12 Way, 32 Amp, TP+N, Fuse Board	Excel - 312XTNC	Eaton	
	16A HRC Cartridge Fuse	16SB3	Eaton	
	32A HRC Cartridge Fuse	32SB3	Eaton	

NOTE: Alternative products of an equal or greater specification shall be permitted subject to approval from G&P design layouts team leader.

SMALL POWER EQUIPMENT

REFERENCE	DESCRIPTION	PRODUCT CODE	MANUFACTURER	
SO	2 Gang, 13 Amp Metal Clad Socket Outlet with integral RCD protection c/w back box	K6233ALM	MK	
SP	1 Gang, 13 Amp Metal Clad Spur Connection Outlet c/w 13 Amp fuse and back box	K954ALM	MK	
JB	1 Gang Metal Clad Blanking plate and back box	K899ALM & K3390ALM	MK	

NOTE: Alternative products of an equal or greater specification shall be permitted subject to approval from G&P design layouts team leader.

HEATING EQUIPMENT

REFERENCE	DESCRIPTION	PRODUCT CODE	MANUFACTURER	
HTR	1000W, IP65, Electric Finned Tubular Heater c/w Cage Guard	CFT-1000 & CWG-1000	Turnbull & Scott	
	1500W, IP65, Electric Finned Tubular Heater c/w Cage Guard	CFT-1500 & CWG-1500	Turnbull & Scott	
HO	1 Gang, 13 Amp Metal Clad Spur Connection Outlet c/w 13 Amp fuse and back box	K954ALM	MK	
TC	Heating Control Thermostat	TLX 2356	Sunvic	
TO	2 Hour Over-ride push button boost time switch	PSB 011B	Sangmo	
	Pattress Back box	143609	Sangmo	

TA	Alarm Thermostat	TLX 2356	Sunvic	
AR1	Environmental Alarm relay (3PDT, 230v AC coil) and base	RS 352-474 & RS 403-229	Relco	
EAJB	180mm (L) x 130mm (W) x 150mm (H) junction box for AR1	RS 498-5163	FIBOX	

NOTE: Alternative products of an equal or greater specification shall be permitted subject to approval from G&P design layouts team leader.

DEHUMIDIFICATION EQUIPMENT

REFERENCE	DESCRIPTION	PRODUCT CODE	MANUFACTURER	
DH	Dehumidifier with heating tape	CD30E - 1139500	Ebac	
DO	1 Gang, 13 Amp Metal Clad Spur Connection Outlet c/w 13 Amp fuse and back box	K954ALM	MK	
HA	Alarm Humidistat	RS 540-558	RS Components	
JB	1 Gang Metal Clad Blanking plate and back box	K899ALM & K3390ALM	MK	
AR1	Environmental Alarm relay (3PDT, 230v AC coil) and base	RS 352-474 & RS 403-229	Relco	

EAJB	180mm (L) x 130mm (W) x 150mm (H) junction box for AR1	RS 498-5163	FIBOX	

NOTE: Alternative products of an equal or greater specification shall be permitted subject to approval from G&P design layouts team leader.

LIGHTING EQUIPMENT

REFERENCE	DESCRIPTION	PRODUCT CODE	MANUFACTURER	
LGT	1200mm, IP65, Non-Corrosive LED Light Fitting (Single)	ATORLED4	Ansell	
	1200mm, IP65, Non-Corrosive LED Light Fitting (Twin)	ATORLED2X4	Ansell	
	1500mm, IP65, Non-Corrosive LED Light Fitting (Single)	ATORLED5	Ansell	
	1500mm, IP65, Non-Corrosive LED Light Fitting (Twin)	ATORLED2X5	Ansell	
EM	110V DC, IP65, Central Battery LED Bulkhead Light Fitting (Slave type)	X-CS3/SL/110	Ringtail	
	400mm x 350mm x 230mm Vandal Resistant Wire Guard	**BULKHEAD WIRE GUARD**	**Tamlite**	

BH	**230V AC, IP65, Square LED bulkhead light fitting**	**XCBH65SWP**	**X-Cite**	

LIGHTING EQUIPMENT				
REFERENCE	**DESCRIPTION**	**PRODUCT CODE**	**MANUFACTURER**	
	400mm x 350mm x 230mm Vandal Resistant Wire Guard	CEF - 0515-2888	Tamlite	
FL	230V AC, IP65, Flood Light	NSESPRO50	Nightsearcher	
	4m Folding lighting Column	Supplied and Installed by Civil Contractor		
SW1	32 Amp, TP+N Switch c/w back box	K5116ALM	MK	
SW2	10 Amp, 1 Gang, 2 Way Light Switch c/w back box	K3591ALM	MK	
SW3	10 Amp, 1 Gang, 2 Way Light Switch c/w back box	K3591ALM	MK	
CR	3 Pin Ceiling Rose	K3242WHI	MK	
ELJB	1 Gang Metal Clad Blanking plate and back box	K899ALM & K3390ALM	MK	

NOTE: Alternative products of an equal or greater specification shall be permitted subject to approval from G&P design layouts team leader.

8 Documents Referenced

DOCUMENTS REFERENCED	
BS 31	Specification. Steel conduit and fittings for electrical wiring
BS 88	Cartridge fuses for voltages up to and including 1000V ac and 1500V dc
BS 1363	Specification for 13 A fused plugs and switched and unswitched socket-outlets
BS 2484	Specification for straight concrete and clayware cable covers
BS 4678	Cable trunking. Steel surface trunking
BS 5467	Specification for 600/1000 V and 1900/3300 V armoured electric cables having thermosetting insulation
BS 5486-12	Low-voltage switchgear and controlgear assemblies. Specification for particular requirements of type-tested miniature circuit-breaker boards
BS 5486-13	Low-voltage switchgear and controlgear assemblies. Specification for particular requirements of consumer units
BS 5733	Specification for general requirements for electrical accessories
BS 6004	Electric cables. PVC insulated, non-armoured cables for voltages up to and including 450/750 V, for electric power, lighting and internal wiring
BS 6007	Electric cables. Single core unsheathed heat resisting cables for voltages up to and including 450/750 V, for internal wiring
BS 6346	Specification for 600/1000 V and 1900/3300 V armoured electric cables having PVC insulation

BS 6360	Specification for conductors in insulated cables and cords
BS 6469	Insulating and sheathing materials of electric cables
BS 6500	Electric cables. Flexible cords rated up to 300/500 V, for use with appliances and equipment intended for domestic, office and similar environments
BS 7671	Requirements for Electrical Installations, IEE Wiring Regulations
BS EN 60439-1	Low-voltage switchgear and controlgear assemblies. Specification for type-tested and partially type-tested assemblies (general requirements)
BS EN 60529	Degrees of protection provided by enclosures (IP code)
BS EN 60669	Switches for household and similar fixed electrical installations. General requirements
BS EN 60947	Specification for low-voltage switchgear and controlgear.
ES 400D4	Supply of Plastic Ducts, Conduit & Accessories

9 Keywords

BS; Contractor; ES; Lighting; Primary; Substation.