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The University of Newcastle
Infrastructure and Facilities Services
Project Briefing Document
Distribution Board Specification

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1. Scope

This Specification covers the general requirements applicable to the design, manufacture, performance and delivery of distribution boards. Specific requirements are detailed in Appendix 1 - University Requirements and/or Appendix 3 – List of Attachments.

It is not the intention to specify details of design and construction except where necessary to establish performance requirements, nor is it the intention to set forth those performance requirements which are adequately specified by the applicable Standards.

This specification shall be read in conjunction with Standard Specification UON-ESS-101 Electrical Design Criteria.

2. Standards, Specifications and Statutory Obligations

All aspects of design, manufacture, testing, supply, plant, equipment, accessories, materials, construction, erection, installation, operation and performance shall comply with this Specification and the current issue of the relevant Australian Standards, the relevant International Standards, the UON Standard Specifications, as well as all Statutory Acts, Codes, Regulations and Requirements of the relevant Authorities having jurisdiction over them unless specified otherwise within this Specification.

These shall include but not be limited to:

Australian/International Standards

AS 1627	Metal finishing – Preparation and pre-treatment of surfaces.
AS 60044.1	Instrument transformers - Current transformers.
AS 60529	Degrees of protection provided by enclosures for electrical equipment (IP Code).
AS 2700	Colour Standards for general purposes.
AS 2756	Low-voltage switchgear and control gear - Mounting rails for mechanical support of electrical equipment
AS 3000	Wiring Rules
AS 3008	Electrical installations - Selection of cables
AS 3017	Electrical installations – Testing and inspection guidelines
AS 3111	Approval and test specification - Miniature overcurrent circuit-breakers
AS 3439	Low-voltage switchgear and control gear assemblies
IEC 60947	Low-voltage switchgear and control gear
IEC 60947.4.1	Low-voltage switchgear and control gear - Contactors and motor-starters - Electromechanical contactors and motor-starters
AS 5000.1	Electric cables – Polymeric insulated - For working voltages up to and including 0.6/1 kV
AS1100	Computer Aided Drafting.
AS 3858	Fault Capacity 10kA
HB 300	Electrical installations – Guide to using the wiring rules
HB 301	Electrical installations – Designing to the wiring rules

University of Newcastle Standards

UON-DG-001	UON Computer Aided Drafting Specification
UON-ESS-101	General Electrical Specification.

Technical Guidelines

ENA EG1	Substation Earthing Guide
ENA Doc 001	National Electricity Network Safety Code

Authorities and Statutory Acts, Codes, Regulations and Requirements

NCC
Worksafe NSW
NSW Electrical Licencing & Regulation
NSW Service and Installation rules.

Where the stipulations of this Specification, the data sheets and the drawings do not comply with the minimum requirements of the Australian Standards and Statutory Regulations, the latter shall prevail.

Where the stipulations of this Specification, the data sheets and the drawings are more exacting than the minimum requirements of the Australian Standards and Statutory Regulations, the former shall prevail in the following order:

- a) Data sheets and detail drawings
- b) Specification and standard drawings.

2.1. Distribution System Terminology

For the purposes of this document and when dealing with the UoN the following distribution terminology applies.

High Voltage Substation

This is the building, high voltage transformer and switching equipment that provide power to the Low Voltage Substation.

Low Voltage Substation

This is the building and equipment that receives power from the High Voltage Substation and distributes it the Main Switchboard housed in each building.

Main Switchboard or MSB – This is the initial electrical board in a building that provides power to the distribution boards. This board receives power from the Low Voltage Substation.

Distribution Board or DB – This is the board that supplies power to the final sub circuits. The DB is fed from the Main Switchboard.

3. Equipment Ratings

On Non-contract works or projects without a specific Scope of Works, the distribution boards shall be constructed in accordance with the UON requirements given in Appendix 1 and/or Appendix 3.

The distribution boards shall be rated to operate continuously, supplying the maximum demand load, at the applicable site conditions.

4. Design and Construction Details

4.1. General

The supply system is a three phase and neutral 230/400 V +10% - 6%, 50 Hz, solidly earthed system.

The distribution boards shall be constructed of mild steel for indoor installations; or type 316 stainless steel if the board is to be installed outdoors. The board shall be of dead-front construction.

The distribution boards shall have Form 2bi separation in accordance with AS 3439.1, Clause 7.7. The terminals for external conductors on the live side on the Main Switch/Circuit Breaker within the DB shall be enclosed within IP2X housing.

The board shall be equipped with a suitably rated fault current limiting circuit breaker and, unless otherwise agreed in writing, shall have a minimum 40% spare final sub-circuit capacity once installed.

The power supply shall be from an MSB, and the feeder shall be equipped with a suitably rated fault current limiting device as per AS3000.

If a DB is to be integrated into the MSB it shall have a dedicated main switch to provide isolation of the entire DB cubicle to allow work to be undertaken within the DB without isolating power to the MSB.

As a minimum, boards of 32 poles or more shall have a separate lighting and power chassis; and boards of 24 poles or more shall contain energy usage metering with separate meters for power and lights. All boards shall comply with NCC J6 requirements.

When a distribution board is being replaced or upgraded, it is the responsibility of the contractor completing the installation to verify any control circuitry within the existing distribution board is still in use and required and should be reproduced in the new/upgraded board. Circuitry that is still in use and required shall be incorporated into the new distribution board as part of the upgrade/replacement project. Circuitry that is no longer in use or required in the existing distribution board must not be present in the new/upgraded board.

Distribution boards shall have

Maximum ambient temperature: 50°C

Minimum ambient temperature: -5°C

Humidity: between 30% and 95%.

Altitude: not exceeding 1000 m above sea level.

4.2. Tenant Distribution boards.

Areas that are to be leased to a tenant have some additional requirements and exemptions. Tenant distribution boards should supply all lighting and power within the tenanted area and shall be located within the tenanted area. Tenant distribution boards under 32 poles can be metal load centre type horizontal boards.

Tenant distribution boards shall be metered at the main switchboard, the Tenant distribution board and have all the hardware, including the meter base installed to facilitate the installation of an authority meter in the future.

The metering in a tenant distribution board shall be viewable without opening the distribution board outer door. This can be achieved through the installation of a clear, mechanically affixed window in the outer door of the distribution board. Access to the meter shall only be available by opening the outer door of the distribution board. This meter allows the tenant to track their power usage.

The MSB meter can be installed in the functional unit that supplies the distribution board or in a separate enclosure remote from the main switchboard. The MSB meter must be in the main switch room. This meter must be password protected and as per the UON preferred equipment list. This meter is used by the UON for billing.

The electrical supply to a tenant distribution boards shall also have all necessary hardware including cabling and meter base/socket for the future installation of an authority meter if requested by the tenant. Shorting links are to be installed in the meter base/socket to facilitate supply with no authority meter installed. This meter will be utilised if the tenant seeks to enter a supply agreement directly with the distributor. This meter also shall be located within the main switch room.

4.3. Enclosure

All enclosures shall be constructed from mild steel for Indoor installations; and type 316 stainless steel for outdoor installations, with a minimum thickness 1.6 mm.

The enclosure, including doors, shall have the rigidity and strength to withstand without damage the stresses imposed by short circuit forces, winds and the rigours of handling and road transport to the University of Newcastle sites. Where necessary to provide the required rigidity, the sheet metal shall be folded or reinforced with formed section.

The enclosure shall be formed by folding and welding. All welds shall be continuous.

The distribution boards shall have the following degree of protection in accordance with AS 1939:

- a) Indoor locations – IP42
- b) Outdoor locations – IP65

The mounting of equipment, such as circuit breakers, shall be fixed as defined in AS 3439.1, Clause 7.6.3

All distribution boards for internal installation shall be laid out internally such as to accommodate both top and bottom cable entry. Outdoor boards shall utilise bottom cable entry only. All boards shall have removable, gasketed and undrilled gland plates fitted to the top and bottom of each enclosure for indoor distribution boards, and as a minimum, at the bottom for outdoor distribution boards. Gland plates shall be minimum 4mm thick aluminium. Gaskets shall be neoprene. All doors shall have skinned neoprene seals.

All distribution board doors shall have hinged, lift-off doors. Doors up to 1000 mm high shall have two hinges; doors over 1000 mm in height shall have three hinges. Hinges shall have pins of increasing length for ease of removal and replacement. Where space is restricted, and hinged doors are not an option, screwed lift off panels may be used with the permission of UON.

No Circuit Breaker or operable device shall be higher than 1800mm or lower than 300mm once installed. A plinth shall be installed or the DB Mounted to a support structure to ensure compliance with these height requirements.

All distribution board doors shall have an outer door attached to the distribution board that restricts access to circuit protective devices. The outer door shall include a pad-lockable type swing handle as per the preferred equipment list. The outer door shall be capable of being opened to an angle of 110 degrees to escutcheon plain.

This handle shall be type 316 stainless steel for outdoor installations. Doors 1200 mm and above in height shall have three-point locking. Doors less than 1200 mm may have single-point locking.

Doors for outdoor enclosures shall be fitted with steel door stays to prop the outer door open.

All distribution boards shall include an A4 size bound document/booklet that contains all information relevant to that board and as detailed in section 7 of UON-ESS-102 Distribution Board Specification. The document/booklet shall be contained in a holder mounted on the inner side of the distribution board outer door. The document holder shall be separate from the legend holder.

All distribution boards shall be equipped with an escutcheon panel, behind the distribution board door. The escutcheon shall have lift off hinges and shall be retained closed using two (minimum) captive knurled knobs (preferably) or by captive screws.

The escutcheon shall have cut-outs for all circuit breaker, main switch operating handles, lighting circuit control switches and any other device requiring operator action. No wired device to be mounted on the escutcheon. The escutcheon cut-outs shall include provision for future circuit breakers up to the limit of the busbar chassis. Cut-outs for future circuit breakers shall have pole fillers fitted. The distribution board shall maintain a minimum IP 2X rating with the front door open.

Distribution boards for outdoor locations shall have a sloping rain/sun roof, extending out 200 mm front and rear from the cubicle.

4.4. Busbars

Busbars shall be hard-drawn, high-conductivity copper and shall have phase-coloured (red, white, blue) thermosetting insulation.

Busbar current rating shall be as shown on the distribution single line diagram, but in any case shall be not less than 250 Amps. The busbar system short-circuit withstand rating shall be not less than 18 kA for 0.3 seconds. The neutral bar shall be insulated from earth.

Busbar arrangement shall be vertical unless otherwise stipulated or approved, with the main incoming switch (where required) fitted at the top of the busbar chassis. The feeder circuit breakers shall be horizontally mounted on either side of the busbar chassis.

The neutral busbar shall be copper, having sufficient number of suitably sized termination ways to cater for the incoming feeder cable neutral, all outgoing feeder cable neutrals plus 25% additional ways.

The earth bar shall be copper, having sufficient number of suitably sized termination ways to cater for the incoming feeder cable earth, all outgoing feeder cable earths, enclosure frame and gland plate earths, plus 25% additional ways.

Critical installations such as Data centres and Network rooms may require an isolation chassis to be fitting to allow final sub-circuit breakers to be installed without isolating the entire DB. The supplier of the DB should consult with UON to establish any Isolation Chassis requirements.

4.5. Main Incoming Switch

The main incoming switch shall be either a manually operated load-break switch (preferably) or a non-auto circuit breaker that is lockable without the use of an additional lockout device.

The current rating specified in Appendix 1 – UON requirements shall be the rated operational current of the switch. The incoming switch shall be rated for uninterrupted duty.

The incoming switch shall be rated for a utilisation category of AC-22B in accordance with IEC 60947.3 Tables II and III.

The incoming switch shall be installed such that the top of the switch is the live side.

4.6. Circuit Breakers

Feeder circuit breakers in each distribution board shall be in accordance with AS 3111, with current ratings in accordance with the ratings given on the single line diagrams and/or schedules.

Each circuit breaker shall be suitable for mounting a screw-on or clamp-on isolation device for padlocking.

The means/method of holding the circuit breakers in place shall not rely on the bolted connection to the busbar stabs to ensure secure mounting.

Earth-leakage protection shall be provided using residual current circuit breakers, having overload, short circuit and earth-leakage functions. Each residual current circuit breaker shall have a test push button, accessible without removing the escutcheon. Each final sub-circuit shall have its own earth leakage protection, multiple circuits shall not be covered by a single earth leakage protection device.

Unless covered by an upstream current limiting device, fault Loop Impedance calculations shall be completed to establish the required fault rating for any circuit breaker installed a distribution board.

All interlocks that restrict the opening of a door or enclosure while a circuit breaker is closed shall have an interlock override that requires a tool to operate.

4.7. Cascading

Where possible, the entire mains distribution system shall incorporate circuit breakers of the same manufacture selected to achieve required prospective fault level both by inherent fault capacity and in the case of downstream equipment by applying the principles of cascade protection.

4.8. Discrimination

In addition, discrimination under overload and short circuit fault conditions shall be achieved throughout. All adjustable circuit breakers settings shall be documented and handed over with the handover documentation.

4.9. Control Equipment

External lighting circuits shall be controlled manually at the distribution board and automatically via a remote daylight switch or, upon approval/request timer or other control device where specified. To implement this control, the distribution board shall have an Auto/off/Manual selector switch and a contractor, along with the facility to receive the daylight switch or control signal at the terminal strip.

The lighting contactor shall conform to AS 3947.4.1 and shall have a rated operational current equivalent to the rating of the busbar system it feeds, taking into consideration the design ambient temperature of 50°C. The lighting contactor shall have a utilisation category of AC-2.

The selector switch and any other indicating or control devices shall be DIN type and shall be mounted to allow the actuating or indication part of the device to protrude through the escutcheon to allow access.

The control devices shall have a degree of protection not less than that of the distribution board in which they are mounted.

Manual emergency lighting test switches are required in all distribution boards regardless of the installation of monitored or automated emergency lighting systems.

4.10. Metering

As a minimum, boards of 24 poles or more shall include energy usage meter and boards of 32 poles or more shall have separate lighting and power section and associated metering. All boards shall be NCC J6 compliant. Metering shall have the following features as a minimum Volts, Amps and Power Factor. The Meter shall have an accuracy of 0.5% CT measured, Modbus communications, DIN Rail mounted self-powered.

All intelligent meters shall be selected from the preferred suppliers and equipment list and shall be able to be interfaced to a site energy monitoring system and have the following minimum parameters:

- Instantaneous and average monitoring of:
 - Volts phase to neutral for LV (phase to phase for HV) (3 off).
 - Amps each phase and neutral (4 off).
 - Average power factor each phase and neutral (4 off).
- Watts, kVA, kWh.
- Fitted with a communications module for remote data interface such as Modbus RTU RS485 or TCPIP Ethernet to allow interfacing back to the existing energy monitoring system software. The remote monitoring shall allow for graphical, archiving and trending of the data as is equivalent to what is currently undertaken on site.
- Internal storage of MD values and other energy data with date and time when not online to the monitoring software with local retrieval. Automatic download when communications is restored.

On an installation where energy meters are to be connected to the UON energy monitoring system, meters must be compatible with and include all required ancillary equipment including Ethernet bridges, isolation switches to connect with the existing energy monitoring system. All communications equipment shall be located in an area/enclosure separate to the main distribution board enclosure to allow access by personnel not holding an electrical licence. This communications area shall have no exposed voltages above 50 Volts.

Panel meters shall include auxiliary power supply & voltage potential isolation fuses/CB, CT shorting links and CT's shall be wired with both legs of CT all the way to meter.

Installations that will not be connected to the UON energy monitoring system, still require meters with Modbus RS485 compatible cards installed in the meter, no further networking or communication equipment is required.

During design, consideration should be given to metering for tenanted properties. Separate energy meters may be required for individual rental properties. Meters shall be readable without opening the escutcheon panel and but not mounted on the escutcheon panel.

As part of the handover documentation, screenshots of Voltages, Currents, Power Factor, and kW shall be provided. A kWh screenshot shall be provide showing kWh after a minimum of three days of operation. The kWh photo shall be dated. Any anomalies in metering shall be rectified by the installation contractor.

4.11. Surge Protection

All new boards shall incorporate surge protection. If necessary install new surge diverters in enclosures beside DBs within DB cupboards. Any surge protection external to the DB must be approved by UON prior to installation.

Surge protection to be installed in accordance with manufacturer's recommendations.

For the surge diverters BMS alarm; provide the BMS terminal strips in easily accessible locations within DB cupboards. The connecting leads for the surge diverter are to be kept as short as possible. And be as straight as practical. The total length of connection should not exceed 300mm.

Surge diverters must be mounted so the health indication flags are visible without removing the escutcheon panel. If necessary make alterations to the escutcheon panel - Cut, file and paint to original finish.

Surge diverter shall be as per UON preferred equipment list.

4.12. Wiring and Terminations

Where there is a requirement for a remote signal to be wired into a distribution board (e.g. remote daylight cell into a lighting control circuit), the Contractor shall provide terminals for the incoming signal(s). All power supplies for control signals shall originate from the distribution board that contains the lighting control, that is, once the distribution board main switch is opened, there shall be no other voltages present in the board.

All distribution boards shall have open-slotted PVC ducts with clip-on lids installed or equivalent proprietary ducting. The ducts shall be located to run wiring from the gland plate(s) to the feeder circuit breaker(s) and from the control terminal strip to the control devices. The ducts shall be sized to house all wiring.

Wiring looms crossing from fixed to hinged panels shall be mechanically supported on both panels, adjacent to the hinged side, by means of saddles or compression-type supports. Looms shall be enclosed in a flexible web type cable sleeve.

All control, metering and protection wiring shall be identified at each end by full circle, clear-plastic ferrules, having slip-in numbers and letters (e.g. Grafoplast or equivalent). Clip-on ferrules shall not be used. Wire numbering shall be reflected on associated drawings.

All control wiring shall be terminated using insulated crimp pins.

Straight-through joints are not to be used without permission of University Representative. If approved the links are to be in line crimp link with resin filled heat shrink for insulation and be readily accessible.

All cable terminations will have either lug or bootlace lugs. All cables above 16mm Squares will be stud and lug.

Cable shall be multi-stranded copper type,
PVC insulated cables: Use V75 minimum insulation.
Use multi-stranded copper cable or fire rated cables, where nominated on drawings.

Minimum size: 2.5mm² cable for lighting and power circuits.

4.13. Earthing

All metallic, non-current-carrying parts of the distribution board shall be electrically bonded to the earth bar.

All doors, removable panels, gland plates and escutcheon plates containing electric components shall have a flexible earth connection to the distribution board frame. This connection shall be of 2.5 mm² cross section. Connections should not be "Pig tail" or coiled type connections.

4.14. Nameplates, Labels and Circuit Identification

Assembly Name Plates

All Distribution Boards shall be labelled on the front door with essential markings as per AS/NZS3439.1 and AS/NZS3000 plus the following:

- Building Name (15mm)
- Distribution Board Name (10mm)
- UON Asset number. (6mm)
- Fed from (6mm)
- Manufacturer's name and company details. (4mm)
- Specification used eg AS3439.1 2002 (4mm)
- Form of segregation. (4mm)
- IP rating (4mm)
- Rated Voltage and Frequency (4mm)
- Main Switch rating. (4mm)
- Pole capacity. (4mm)
- Busbar current rating. (4mm)
- Manufactured date. (4mm)

If the board is replacing an existing asset, the existing Asset number will be maintained. In the case of a new installation, an asset number should be requested from the UoN.

All outgoing ways (i.e. feeder circuit breaker poles) shall be clearly identified, in accordance with the single line diagrams and schedules. Legends shall be installed upon completion of the board, permanent printed legends shall be in place within a week of completion. Mark-up temporary legends shall be in place if the permanent legends are not yet available. The board shall not be left without a legend at any time. Electronic versions of the legend is to be supplied to UON with one week of the completion of the installation. Any description of power circuits, lighting or other equipment on a legend shall include the room numbers where the equipment is located.

All components both interior and exterior to the board shall be labelled in accordance with the distribution board single line diagram or schematic diagram. Labels shall be located such that

wiring or equipment does not obscure them. Labels shall not be fixed to removable equipment, such as duct covers.

All external labels on distribution boards shall be engraved labels. If the board is installed in an outdoor location, external labels shall be 316 Stainless Steel.

Any distribution board upgrade/installation that is connecting to existing GPO's shall include, as part of the installation, the replacement or installation of labelling on all equipment connected to the upgraded/installed board.

All internal labels shall be traffolyte labels with engraved black letters on a white background. Danger and warning labels shall be traffolyte labels with engraved white letters on a red background. Labels completely contained within the board may be fixed using adhesive, labels on escutcheon or exterior to the board shall be attached by screw or metal thread. All screws on externally installed boards shall be of type 316 stainless steel. Labels larger than 100 mm x 50 mm shall have four fixing screws.

Component label letter sizes shall be as follows:

- a) Component labels (external) 6 mm
- b) Component labels (internal) 4 mm

Any MEN link shall be labelled "MEN LINK" on the link and on the escutcheon or cover that obscures the MEN link.

All warning labels must be installed as required by Australian Standards or Supply Authority rules.

All control wiring is to be uniquely numbered and ferruled. A schematic diagram that complies with UON specification UON-DSS-001 CAD Drafting Standards shall be provided for all control wiring.

Where the removal of any barrier or shrouding could lead to the possibility of direct contact of live conductors, a warning label shall be installed highlighting the danger:

Description	Text Size
DANGER	10mm
ISOLATE ELSEWHERE BEFORE REMOVING COVER	4mm

Where a cabinet contains electrical equipment, a label should be provided on all doors, covers and escutcheon plates or similar, to identify this, an example being:

Description	Text Size
DANGER	15mm
415V	10mm

Where spare cubicles or sections exist in a switchboard, either provided to allow for future expansion, or made spare by the removal of equipment, attach the following label:

Description	Text Size
SPARE	10mm

When a circuit breaker is installed as a spare for future expansion, the sub circuit schedule should reflect this.

Where an internal switchboard is located in a room designed to house a switchboard, or in a cupboard, the door must identify electrical components using the following labels:

Description	Text Size
AUTHORISED ACCESS ONLY	15mm
DISTRIBUTION BOARD	15mm
SWITCHBOARD NAME	10mm
ASSET NUMBER	10mm

The label must be clearly visible. The minimum size of these labels shall be 200mm X 80mm.

All devices external to the distribution board, supplied from that board including light switches and GPO's shall be labelled indicating the distribution board number and circuit number.

4.15. Finish

The external final coat shall be gloss Orange No. X15 to AS 2700. Internal pans and escutcheons shall be Gloss White.

All painting shall be professional spray paint application completed by a third party applied with a minimum paint thickness of 50µm.

All bare metal shall be prepared prior to painting to ensure long surface protection life.

5. Installation

The installing contractor shall satisfy themselves that the board physically will fit in the intended location, any modifications that are required to facilitate the physical installation of the board shall be at the contractor's expense. The contractor is responsible for all equipment or expense involved in delivering the board to its place of installation.

Once installed, the door of the board shall be capable of being opened a minimum of 110 degrees, hinged doors larger than 1500mm in height shall include a door stay. Escutcheon doors do not require a door stay.

The contractor is responsible for the removal of all equipment/cable that is made redundant due to the installation of the new board.

The Installing contractor is responsible for all electrical, mechanical, structural or any other modification that are required for the installation of the DB.

No Circuit Breaker or operable device shall be higher than 1800mm or lower than 300mm once the board is installed in its final location.

The installation of the board is to be completed at a time to minimise disruption to the University staff and students. The contractor shall liaise with the UON to establish acceptable installation times prior to any tender submission or quote to complete the works. Installation times are at the discretion of the UON, variations due to "Out of Hours" works will not be considered.

The contractor is responsible for ensuring that the legend accurately reflects the circuit description. In the event that the contractor is replacing an existing Distribution Board, the contractor shall ensure that the circuit description on the existing legend is transferred to the new Circuit Breaker location on the new legend.

When replacing an existing distribution board the tradesman shall, prior to placing the board back in service, leave a legend in the board. This can be a temporary, hand written legend while waiting for the printed version. The tradesman shall also leave a notice in the board listing all known items to be corrected. This list should include circuits that are tripping on Earth Leakage due to fault or crossed neutrals. The above mentioned legend and list shall be in place prior to the board going back into service.

6. Inspection and Test

Final factory inspection shall be carried out in the presence of the UON representative. Routine tests in accordance with AS 3439.1 Clause 8.3 shall be completed. The contractor shall provide 7 days prior notice for testing.

The contractor must submit the Certificate of Compliance – Electrical Work (CCEW), covering all installation work, to the Local Electricity Distributor. As well as supplying the CCEW, the person who conducted all testing must submit test reports certifying the electrical installation.

The CCEW shall include:

- Confirmation of Circuits
- Megger tests
- Load Balance Data
- Phase Rotation
- Trip test of RCD's and provide test sheets with trip times.

The same phase rotation shall be used throughout installation, generally RWB clockwise.

All hard wired circuits, including lighting circuits are to be energised upon completion of the installation to establish if any earth faults are present. Notification shall be given to the UON immediately of any tripping circuits. These faults will be addressed outside the contract works.

7. Drawings and Data

The Contractor shall supply the following drawings for approval before manufacture, two weeks after award or at such time as stated in the Scope of Works:

- Front and side elevations of the assembly, with material list and component layout showing location of each circuit
- Full termination and wiring diagrams showing terminals
- Holding down details.
- Control wiring diagram

The Contractor shall supply all “as-constructed” drawings in DWG and PDF format.

The following “as-constructed” drawings and/or documentation are to be supplied on the completion of a new installation:

- Maximo New Equipment Entry sheet.
- Photo of front of DB
- Electronic copy of legend
- Photo of escutcheon
- Photo of DB Open
- DB General Arrangement Drawing
- Schematic wiring diagram of control circuitry.

- Single Line Diagrams
- Power Meter Manuals
- Surge protection Manuals
- Main CB settings if applicable

A copy of the documents below shall be placed in a document holder affixed to the inside of the front door of the Distribution Board.

- DB General Arrangement Drawing
- Schematic wiring diagram of control circuitry.
- Single Line Diagrams
- Power Meter Manuals
- Surge protection Manuals
- Main CB settings if applicable
- Manuals for each different piece of equipment mounted within the board.

As part of the handover documentation, screenshots of Voltages, Currents, Power Factor, and kW across all three phases shall be provided. A kWh screenshot shall be provide showing kWh after a minimum of three days of operation. The kWh photo shall be indicate the date the photo was taken.

All adjustable circuit breakers settings shall be documented and handed over with the handover documentation.

The contractor shall also supply manufacturer's instructions for any equipment that requires configuration or programming.

The contractor shall complete the Asset Database update as per Appendix 4 and submit to the UoN representative upon the completion of the works.

Handover documentation shall be supplied within 4 weeks of project completion.

8. Naming Convention

The naming convention for new distribution boards shall be based on the floor on which they are located and origin of their supply

The first DB on Level 1 will be called DB1, if this board has a sub board it will be DB1/1. If there is a second board on level 1, it will be called DB1A, if it in turn has a sub board it will be DB1A/1. A third DB on level 1 would be DB1B etc. The first DB on the Ground floor will be called DBG, if this board has a sub board it will be DBG/1. If there is a second board on the ground level, it will be called DBGA, if it in turn has a sub board it will be DBGA/1.

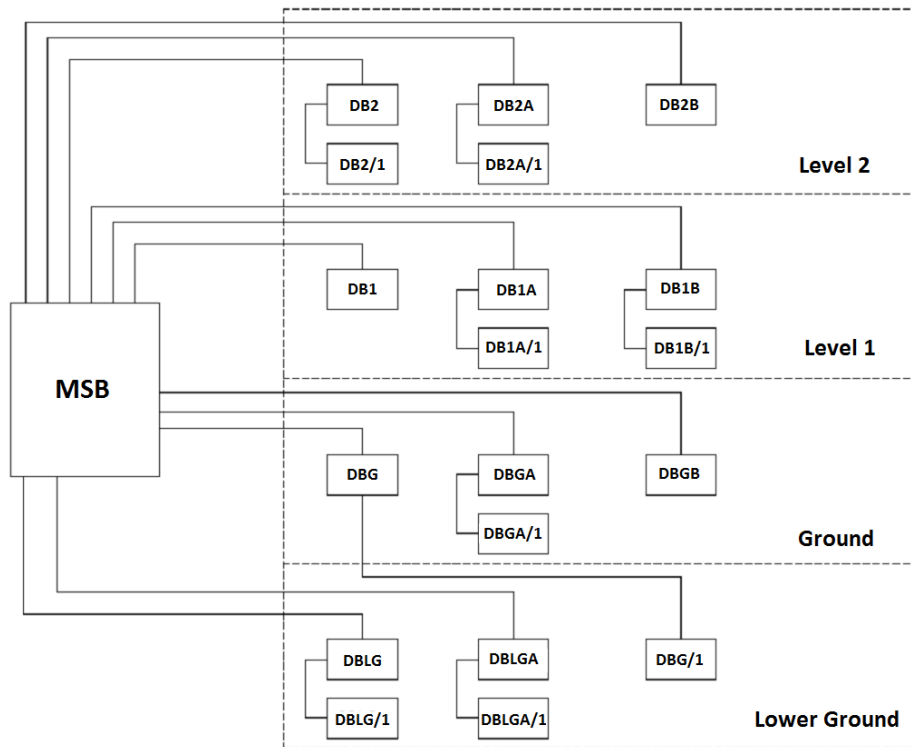


Fig 1. Naming Convention Example.

9. Defects and Liabilities

The Defect Liability Period for the project shall be twelve months. During this time all maintenance, including statutory maintenance is the responsibility of the contractor.

10. Miscellaneous

Pay all fees to authorities in connection with applications, inspections and approvals.

Once the works is complete the area is to be cleaned to the point that there is no sign of the work having taken place.

