ESCOM
ELECTRICAL SAFETY COMMITTEE

GUIDELINES AND BEST PRACTICES FOR ELECTRICAL INSTALLATION FOR NON-PERMANENT INSTALLATION

DOCUMENT NO: ESCOM/2026/06, REVISION 1.0

What is ESCOM?

The Safety, Health and Environment National Authority (SHENA) and Autoriti Elektrik Negara Brunei Darussalam (AENBD) established the Electrical Safety Committee or "ESCOM" in January 2023; with the objectives of promoting regulatory compliance and raising electrical safety standards within Brunei Darussalam.

Who are the ESCOM members?

The Electrical Safety Committee (ESCOM) comprises representatives and industry experts drawn from relevant government institutions and private organisations, collectively bringing extensive technical experience in electrical engineering, safety management, and industry practice.

ESCOM is **chaired by a representative from the Safety, Health and Environment National Authority (SHENA)**, with a **Deputy Chairperson appointed in accordance with the Committee's Terms of Reference**. Subject matter experts from regulatory bodies, utilities, and industry may be invited to participate in specific working groups or provide technical input where required.

ELECTRICAL SAFETY BEST PRACTICES			
DOCUMENT TITLE	**GUIDELINES AND BEST PRACTICES FOR ELECTRICAL INSTALLATION FOR NON-PERMANENT INSTALLATION**		
REFERENCE NUMBER	**ESCOM/2026/06**	**REVISION NO.**	**1.0**
NEXT REVIEW DATE	**AS REQUIRED**		

AUTHORS		
Shaikh Mohd Dzulamali bin Shaikh Hj Abd Mutalib	Core Member	Autoriti Elektrik Negara Brunei Darussalam (AENBD)
Mohd Azri Fadhli bin Hj Jamudin	Core Member	Autoriti Elektrik Negara Brunei Darussalam (AENBD)
Muhd Sabri bin Sulaiman	Core Member	Department of Electrical Services (DES)
Vevie Rafennie Binti Rosle	Core Member	Department of Electrical Services (DES)
Hjh Noorafidah binti Hj Abdullah	Core Member	Institute of Brunei Technical Education (IBTE)
Hj Azmi bin Hj Abdul Wahab	Support Member (Technical lead)	Ex-TG Zones Consultant & Services
Manggau Galawing	Support Member	Ex-TG Zones Consultant & Services
Noor Khadizah bin Hj Omarali	Support Member	Brunei Fire Rescue Department (BFRD)
Pg Noor Faridahwati binti PSM Pg Anak Omar Ali	Support Member	Brunei Fire Rescue Department (BFRD)

REVIEWERS		
Dr. Ir. William Voon	ESCOM Core Member	Berakas Power Company Sdn Bhd
Noramizah binti Haji Marali	ESCOM Core Member	SHENA
Ong Pei Ying	ESCOM Secretary	SHENA

CONTRIBUTORS
Other members of the Electrical Safety Committee (ESCOM) who provided inputs, technical comments and support during the development of this document.

ISSUE DATE	June 2026		
ESCOM CHAIRPERSON			
NAME	Ir. Haji Noryasmin bin Haji Mohd Noor	SIGNATURE	

Disclaimer:

This document was developed to provide guidance and recommendations, as well as to serve as an industry reference for best practices with the aim of improving electrical safety practices. This Guideline and Best Practices is not a statutory document and does not create or replace any legal obligations under the Workplace Safety and Health Act (Chapter 277) or its subsidiary regulations. In the event of any inconsistency, the provisions of the WSHA and its subsidiary regulations shall prevail. Accordingly, this document should not be construed as implying any liability nor should it be taken to encapsulate all the responsibilities and obligations of the law.

TABLE OF CONTENTS

TABLE OF FIGURES

LIST OF TABLES

1 INTRODUCTION

1.1 Background

The concept of electrical safety encompasses the safe and secure handling of electricity across its entire lifecycle, including generation, transmission, distribution and utilization and end-use. For the general public, safety consideration predominantly pertain to the distribution and utilization of electricity within residential, workplace or commercial settings, where direct implications on physical safety are most evident. The unsafe electrical installations poses significant hazards, including but not limited to fire and electric shock and causes injury and fatalities.

It is therefore imperative to safeguard employees, the public and property by cultivating a secure environment that encompasses both electrical installations and infrastructure with a focus on electrical safety. To achieve this, it is essential to adhere to proper design, safe and proper installations as well asproper usage practice and consistently inspect and maintain them to ensure continued integrity and safety.

Additionally, ensuring the safety of electrical installations in residential, workplace or commercial areas requires the engagement of duly registered electrical workers for installations, inspections and maintenance activities. This proactive approach helps prevent unauthorized installations, improper alterations, thereby contributing to a safe electrical environment.

1.2 General

This document shall be read in conjunction with the Electrical Installation Requirement (**EIR**), the Approved Code of Practice on the Safe Use of Electricity at Construction Sites and the SHENA Industry Guidance Note on the Safe Use and Installation of Portable Generators (Less than 10 kVA).

Collectively, these documents establish the fundamental requirements governing electrical installations and the safe use of electrical equipment, and shall serve as guidance references and/or minimum safety standards.

For the purpose of this document, the terms “Employer”, “Principal” and “Occupier” shall have the meanings as defined under the Workplace Safety and Health Act, Chapter 277 (**WSHA, Cap 277**), whereby each retain primary responsibility for ensuring compliance with workplace safety and health requirements.

In practical application, such examples, are not limited to:

- “Occupier” – e.g. asset or venue owner, or the party having control of the premises;
- “Principal” – e.g. event organiser or main contractor responsible for the overall execution of the event or works; and
- “Employer” – e.g. contractors, vendors or service providers employing persons to carry out electrical installation or related activities.

Where multiple duty holders are involved, each party shall discharge their respective duties in accordance with the WSHA and the relevant subsidiary legislations and shall ensure effective coordination and cooperation to prevent any gaps in responsibility.

1.3 Purpose

This Guideline and Best Practices for Electrical Installation for Non-Permanent Installation serves as a guidance for implementation and reference for technical requirements, safety considerations and industry best practices for the design, installation, inspection and maintenance of non-permanent installations.

Non-permanent installations are, by their nature, temporary and are commonly deployed in settings such as public and private events, exhibitions, outdoor markets, temporary vendor booths and festivals. Such installations must achieve an appropriate balance between safety, mobility and flexibility in accordance with the EIR and WSHA. Importantly, non-permanent installations should meet the same level of electrical safety and reliability as permanent installations, as they are subject to equivalent electrical hazards, including but not limited to contact with live parts, overloading, fire and electrocution.

Additionally, this document aims to provide guidance to relevant parties ranging from Employers, Principals and Occupiers (i.e. parties responsible for the workplace), as well as event organisers, on the applicable safety requirements and standards associated with electrical installations.

1.4 Scope

The document establishes guidance intended to enhance awareness and to reduce as well as eliminate, so far as is reasonably practicable, the risks of accidents arising from unsafe and unsound electrical installation. It applies specifically to activities during the planning, design, installation, inspection and maintenance of non-permanent installations, including but not limited to portable generators setup, temporary booths and event-related power supply systems.

In line with the said requirements, the scope of this document is limited to electrical installation operating at a capacity below 1000 V and intended for short-term use in support of public and private events, exhibitions, outdoor markets, temporary vendor booths and any festivals. All such installations comply with the requirements as per EIR as well as other relevant recognised standards such as those issued by the International Electrotechnical Commission (**IEC**) and British Standards (**BS**) or their equivalent.

2 ABBREVIATIONS

BS	British Standards
EIR	Electrical Installation Requirement
IEC	International Electrotechnical Commission
DES	Department of Electrical Services
IP	Ingress Protection
MCB	Miniature Circuit Breaker
RCD	Residual Current Device
Registered electrical workers	Registered under the Department of Electrical Services
SHENA	Safety, Health and Environment National Authority
SLD	Single Line Drawing
SPR	Senior Person Responsible
WSHA, Cap 277	Workplace Safety and Health Act, Chapter 277

3 APPLICABLE STANDARDS AND INDUSTRY GUIDANCE

All principals, employers, occupiers, self-employed persons, and persons at work shall comply with applicable laws, regulations and ensure compliance to relevant standards and requirement as listed in **Appendix A**.

4 DESIGN & PLANNING

4.1 Capacity & Load Requirement

4.1.1 A thorough capacity and load assessment shall form the fundamental requirements for a safe system design. The assessment shall calculate the total connected loads by summing the declared demands of the equipment and auxiliary services such as lighting, fixed appliances and socket outlets and other portable or temporary electrical services, etc.

4.1.2 In addition to the above, an adequate buffer margin shall be incorporate to accommodate unforeseen increase in demand or last-minute additions. Failure to include this margin often leads to an overloaded system during peak usage. The system must therefore be sized to carry the diversified load plus the buffer margin, ensuring smooth operation without overloading protective devices.

4.1.3 It is also recommended to document a load profile showing expected peak and average demand, as well as to plan for load prioritisation in case of the system failure i.e. essential services such as emergency lighting should be on priority circuits.

4.1.4 Further consideration when designing or planning may include the following:

- **Load Segregation** - to minimise disturbance i.e. to separate lighting, audio equipment and power circuits;
- **Phase Balancing** - for three-phase systems, loads should be balanced across all phases to avoid neutral overloading; and
- **Future Provision** - spare capacity should be included for contingency.

4.1.5 Best practice for exhibition booth wiring under BS 7909 and IEC 60364-7-711 is to provide each booth with a dedicated, RCD-protected supply, robust cabling, and clear load limits (typically 2–3 kW per booth unless higher loads are justified and documented).

4.1.6 Allowed Power Rating per Booth

- **Typical allocation –**
  - 2–3 kW per booth (≈ 10–13 A at 230 V) for lighting, laptops, small appliances.
- **Higher loads –**
  - Up to 5 kW per booth, allowed only if declared in advance (e.g., catering equipment, heavy audio video); and
  - Requires dedicated circuits and SPR approval.
- **Overloading prohibited:**
  - Booths must not exceed their allocated rating; and
  - Organisers should publish maximum load per booth in exhibitor guidelines.

4.2 MCB Requirements

4.2.1 The selection of appropriate miniature circuit breakers (MCB) is vital for safe system operation. Each MCB must be carefully rated to match the expected load, cable capacity and installation conditions.

4.2.2 Protection against overload with Type B, MCB which is suitable for resistive load with low inrush currents such as lighting, socket outlets, electronic equipment and small appliances.

4.2.3 Protection against overload with Type C, MCB which is suitable for inductive load with moderate inrush currents such as motors, fluorescent lighting and air-conditioning system.

4.2.4 Type D, MCB may be necessary where heavy-duty equipment is required to be used. This offers tolerance for very high inrushes while still providing reliable protection against sustained overloads and faults.

4.2.5 MCBs must comply with IEC 60898 or equivalent. Each circuit breaker must match the cable size to prevent thermal overload, have a rated

short-circuit capacity suitable for the fault current and to be clearly labelled with its purpose and ratings i.e. vendor stall 5 – 13 A Type B.

4.3 Electrical Outlet Requirements

4.3.1 All electrical outlets must be robust, weather-resistant and suitable for outdoor or semi-exposed environments. The minimum ingress protection (IP) level required is IP54, which guards against water spray and dust. For particularly wet environments such as outdoor kitchens or open-air stalls, outlets with IP65 or higher should be used. Outlets where possible should be mounted 1.2 metres above ground to prevent water ingress and mechanical damage. Industrial type connectors are recommended due to their locking mechanism and waterproofing.

4.3.2 Every outlet must be protected by a Residual Current Device (RCD) of not exceeding 30 mA at 40 ms, ensuring protection against electric shock. Standard outlets for light duty loads should be rated at 13 A, 230 V single-phase. Whereas high-power equipment such as induction cookers, deep fryers, or refrigeration compressors should be connected to dedicated circuits with outlets rated at 15 A depending on demand. Where multiple high-power appliances are used, 400 V three-phase outlets may be required, and care must be taken to balance load across all phases to prevent neutral overloading. Overloading or connecting unapproved high-power devices can result in disconnection of supply.

4.3.3 Recommended Distribution Practice

- Each vendor must be supplied from a dedicated circuit with its own protective breaker;
- Daisy-chaining or unauthorized use of multi-plugs adapter or non-certified plugs is prohibited; and
- Cables supplying outlets should have mechanical protection such as conduit or cable trays

4.3.4 Each outlet shall be tagged with its circuit number and rated capacity.

4.4 Booth Specifications

Dedicated Circuits	• Each booth recommended to have its own circuit from the distribution board (DB). • Circuits must be clearly labeled with booth number and function. • Avoid daisy-chaining multiple booths on one socket circuit.
Socket Outlets	• Provide minimum one double socket outlet per booth, more if equipment demands are higher. • All sockets must be RCD-protected (≤30 mA trip current within 40 ms). • Outdoor booths require IP65 or higher rated outlets.

Lighting	• Booth lighting circuits should be separate from socket outlets to prevent nuisance tripping. • Emergency lighting (exit signs, safety lights) must be backed up by battery or UPS. • Metallic frames or signboards must be bonded to earth. • Avoid use of Halogen spotlight due to intense heat (refer to Table A in Appendix 1)
Cable Selection & Routing	• IEC 60245-1:2003 Rubber insulated cables of rated voltages up to and including 450/750 V • Use H07RN-F neoprene cables for robustness in temporary setups. • Protect cables with ramps, conduits, or elevated runs to avoid mechanical damage. • No SY (Steel wire braided with PVC) / YY (No mechanical protection with PVC) cables for booth supplies (BS 7909 warns against misuse).

4.5 Responsibilities of relevant parties

4.5.1 Responsibilities of the occupier (facility/venue owner)

4.5.1.1 It shall be the duty of the facility/venue owner to ensure that all electrical installation and electrical equipment in the facility is of good construction, sound material and free from defects; and is used and maintained in such manner so that it is safe to use.

4.5.1.2 It shall be the duty of the facility/venue owner to ensure that all reasonably practicable measures are taken to protect any person against the risks of electric shock arising from or in connection with the use of any electrical installation or equipment in the facility.

4.5.1.3 It shall be the duty of the facility/venue owner to engage registered electrical workers to conduct feasibility assessment and electrical installation. Also to ensure good workmanship and the use of proper materials employed throughout the installations.

4.5.2 Responsibilities of SPR

- Ensure the temporary electrical system complies with BS 7909 and BS 7671;
- Approve the design, installation, and testing of electrical systems;
- Maintain documentation (test certificates, risk assessments, compliance records);
- Liaise with event organisers, contractors, and authorities; and
- Take ultimate responsibility for electrical safety decisions.

4.5.3 Responsibilities of Event Organisers

4.5.3.1 Must appoint an SPR and ensure they have authority and competence;

4.5.3.2 Provide adequate resources, time, and planning for safe electrical installation;

4.5.3.3 Ensure contractors and suppliers follow requirements and specifications; and

4.5.3.4 Retain overall accountability for event safety.

4.5.4 Registered Electrical Workers

4.5.4.1 Carry out installation, inspection, and testing under the guidance of the SPR;

4.5.4.2 Implement procedures for temporary systems (earthing, RCDs, cable selection, load balancing);

4.5.4.3 Provide test results and certification to the SPR; and

4.5.4.4 Report hazards or deviations immediately.

4.5.5 Documentation Requirements

4.5.5.1 Before energisation, contractors must provide complete documentation including a Certified Single Line Diagram (SLD), load schedule, inspection certificate, nameplate data of all major equipment and the credential of the registered electrical workers responsible for the work.

4.5.5.2 Additional documentation may include a method statement describing how the system will be installed and operated, and a risk assessment identifying hazards such as fire, electrocution and weather exposure. The asset/venue owner or occupier of a workplace is responsible for ensuring that the system remains compliant for the entire duration of use.

4.5.5.3 Certificates of compliance must be issued for systems above certain thresholds.

4.5.5.4 Testing records (insulation resistance, earth fault loop impedance, RCD operation) must be kept.

5 ORGANISING COMMITTEE'S RESPONSIBILITIES

5.1 Awareness

5.1.1 The organising committee typically assumes the role of the Principal under WSHA, Cap 277, if it has overall control or management of the event and engages others such as contractors or vendors to carry out work for them under a contract of service (for e.g. electrical installations, logistics, booths set up). The organising committee should also ensure all the vendors declare their power requirements in terms of their usage, i.e. lightings, electrical appliances, cooking equipment, digital devices,

freezer, etc to allow for accurate load planning. Example of vendor declaration (not limited to the following):

5.1.1.1 Type of appliances;

5.1.1.2 Rated power (W or kW) and current (A);

5.1.1.3 Voltage requirement (single-phase or three-phase);

5.1.1.4 Whether the appliance has high starting current i.e. motors, compressors, etc; and

5.1.1.5 Expected hours of operation per day.

5.1.2 This declaration enables the organising committee to prepare an accurate load schedule, which forms the basis for generator selection, circuit allocation and protection design. Vendors who bring additional appliances after initial approval should inform the organising committee for reassessment by their registered electrical and workers. Unauthorised additions are **strictly prohibited.**

5.1.3 The organising committee holds overarching responsibility for ensuring all electrical installations are safely implemented. Their duties include:

5.1.3.1 Appointing a registered electrical worker to oversee all electrical activities;

5.1.3.2 Ensuring vendor compliance with declared power requirements and approved appliances;

5.1.3.3 Conducting vendor briefings to raise awareness and explain on electrical safety rules, electrical hazards, load limits, emergency procedures;

5.1.3.4 Implementing access control to prevent unauthorised persons from entering electrical areas such as safety signage and barrier systems;

5.1.3.5 Coordinating with emergency services and establishing an immediate shutdown plan in case of faults or fire;

5.1.3.6 Maintaining site records such as SLDs, test results and daily inspection logs;

5.1.3.7 Providing fire extinguishers and ensuring clear access to all electrical rooms and generation sites especially during emergency;

5.1.3.8 Monitoring fuel storage and refilling operations to prevent fire risk near live electrical areas; and

5.1.3.9 Ensure that all fuel is stored securely in designated containers and kept in a safe location away from public access, with adequate measures in place to prevent spills.

5.1.4 Liaison with Relevant Authorities

5.1.4.1 It should be the responsibilities of the organising committee to have early coordination with relevant authorities such as the utility, regulatory bodies and emergency services to ensure all arrangements comply with all applicable laws, regulations, codes of practices and guidelines. This coordination and arrangement should include (not limited to) the following:

- For compliance inspections;
- For temporary grid connection;
- For fire safety review and standby arrangements;
- For site layout approval; and
- For crowd control compliance.

5.1.4.2 Coordination also ensures that emergency services and first responders are familiar with the site layout and can take action immediately in case of fire or any incidents.

6 SOURCE

6.1 National Grid

6.1.1 Every non-permanent electrical installation connected to the National Grid shall have a clearly identified and accessible point of supply. Essential supply information must be provided to ensure safe connection, correct operation, and effective isolation during maintenance or emergency situations. The supply identification shall include the following:

6.1.1.1 Supply authority name and supply reference number to allow traceability and coordination with the utility provider;

6.1.1.2 Rated supply voltage and frequency (230 V/400 V, 50 Hz) to confirm compatibility with the temporary installation and connected equipment;

6.1.1.3 Supply capacity or maximum demand (in A or kVA) to prevent overloading of the grid connection;

6.1.1.4 Type of supply system (e.g. single-phase or three-phase, TN-S/TT system) which is critical for protection design and earthing arrangements;

6.1.1.5 Main isolation points location and identification to allow rapid disconnection in case of emergency;

6.1.1.6 Earthing arrangement and earthing conductor connection point to ensure effective fault protection;

6.1.1.7 Protective device ratings (e.g. circuit breaker or fuse size) to confirm coordination with downstream protective devices; and

6.1.18 Clear identification of the National Grid supply ensures the temporary installation operates within the permitted capacity

and allows safe isolation when required. Any non-permanent electrical installation connected to the grid without proper supply identification or isolation provisions shall not be energised.

6.2 Generator

6.2.1 Every generator used for non-permanent electrical installations must display essential operational information on its nameplate as these information is crucial for correct selection, operation and maintenance. The nameplate should include the following:

6.2.1.1 Manufacturer name, model and serial number allowing traceability and identification;

6.2.1.2 Rated voltage and frequency (230 V/400 V, 50 Hz) to ensure compatibility with connected loads;

6.2.1.3 Rated power output in kVA or kW specifying continuous and standby capacities;

6.2.1.4 Power factor which is critical for load and cable sizing;

6.2.1.5 Ingress Protection (IP) rating confirming environmental resistance of minimum IP23 for outdoor use;

6.2.1.6 Earthing terminal location and symbol to indicate connection points for grounding; and

6.2.1.7 Fuel type and tank capacity enabling safe refueling planning.

6.2.2 The operators shall not exceed the generator nameplate capacity and ensure that all loads are connected properly within the capacity of the generator with emergency shutdown device. A generator without proper identification shall not be used for event or temporary power supply.

6.2.3 Refer to SHENA's IGN document Guidance on the safe use and installation of portable generators (less than 10 kVA)".

6.3 Solar

6.3.1 Every solar power system used for non-permanent electrical installations shall display clear and durable identification labels providing essential operational and safety information. This information is necessary for correct system operation, load management, and safe maintenance. The identification shall include the following:

6.3.1.1 System type (e.g. solar PV with inverter, solar PV with battery storage) to clearly indicate the source configuration;

6.3.1.2 Rated output voltage and frequency (e.g. 230 V, 50 Hz AC) to ensure compatibility with connected loads;

6.3.1.3 Maximum power output (in kW or kVA) specifying continuous capacity under normal operating conditions;

6.3.1.4 Inverter rating and model details to allow verification of performance and protection characteristics;

6.3.1.5 Battery system details, where applicable, including battery type, nominal voltage, and capacity to support safe operation and energy management;

6.3.1.6 Isolation points for DC and AC sides, clearly labelled, to enable safe shutdown during maintenance or emergencies;

6.3.1.7 Earthing and bonding connection points to ensure effective fault protection and system stability; and

6.3.1.8 Proper identification of solar power systems ensures loads do not exceed system capacity and that isolation can be safely performed. Any solar-powered non-permanent electrical installation without adequate system identification or isolation arrangements shall not be used for event or temporary power supply.

6.4. Protection

6.4.1 Generators must be fitted with protective devices to prevent both equipment damage and personal injury. Overcurrent protection is provided by MCBs that match the generator's output capacity. RCDs rated at 30 mA at 40 ms must be installed on all outgoing supplies to prevent electric shock. Over-voltage and under-voltage should be included to prevent equipment malfunction during unstable generator operation. Automatic Shutdown should also be included as protection in the event of low oil pressure, high coolant temperature or overspeed. Earth fault monitoring, where fitted, provides early warning of abnormal conditions. In addition, voltage regulation and frequency stability must be monitored to prevent sensitive equipment from malfunctioning.

6.4.2 All protective devices must be periodically tested and recorded in maintenance logs. Generator output sockets should be lockable or located inside fenced enclosures to prevent unauthorised access.

6.5 Earthing & Earth Bonding

6.5.1 Proper earthing of portable generators is vital to prevent electric shock and ensure fault current returns safely to the source. Generators rated above 10 kVA are recommended to be connected to a dedicated earth pit constructed specifically for the event or site. The earthing system shall be copper bonded steel core rod or solid copper rod (DES approved earth rod and comply with BS6651) driven at least 2 metres into the ground, copper conductor for bonding between the generator frame and the earth electrode that is sized appropriately to the generator capacity and earth resistance of not exceeding 1 Ω that should be verified using an approved earth tester before energisation.

6.5.2 Additional requirements (not limited to) the following:

6.5.2.1 Multiple rods may be installed and interconnected if resistance exceeds 1 Ω;

6.5.2.2 The earth cable must be mechanically protected from physical damage and trip hazards;

6.5.2.3 The generator neutral should be properly referenced to earth;

6.5.2.4 The earth pit must be clearly marked, fenced and labelled; and

6.5.2.5 Routine testing of earth resistance should be performed before energisation and periodically during prolonged use to ensure integrity;

6.5.2.6 Defined Earthing System

- The generator must operate under a recognized earthing arrangement (usually TN-S or TT);
- TN-S: Neutral connected to earth at the generator, with separate protective earth conductor;
- TT: Generator neutral connected to earth electrode, protective earth provided via local electrode; and
- Floating systems (no earth reference) are **not permitted**.

6.5.2.7 Earth Electrode

- A local earth electrode (rod, plate, or mat) must be installed for each generator;
- Resistance values must be tested and recorded before energizing; and
- Multiple generators must have coordinated earthing to avoid potential differences;

6.5.2.8 Earth Bonding

- All exposed conductive parts (generator frame, feeder pillar, DB enclosures, booth structures) must be bonded to the generator earth; and
- Metallic structures (trusses, signage frames, scaffolding) must be included in the equipotential bonding system.

6.6 Inspection and Testing

6.6.1 Prior to operation, all generators must be tested and verified by certified personnel. The scope of testing shall include but are not limited to insulation resistance to confirm the integrity of windings, continuity and polarity to ensure correct wiring, earth loop impedance to verify fault clearance times, RCD trip times to confirm protective functionality and functional test under load to ensure voltage stability, frequency accuracy & proper protection operation. Regular re-testing during long events is recommended to identify degradation or developing faults.

7 DISTRIBUTION INFRASTRUCTURE

7.1 Feeder Pillar

7.1.1 Feeder pillars serve as the primary distribution point from the generator/source to multiple downstream circuits and must be connected to earth. Proper feeder pillars must be used and located in accessible, dry areas, raised above flood risk levels where possible and in secure locations away from public interference. Feeder pillars should have the following:

7.1.1.1 A minimum rating of IP65 to protect against rain and dust;

7.1.1.2 Clear labeling and warning signage such as “Danger - High Voltage” and restricted access notices must be displayed;

7.1.1.3 Adequate ventilation to prevent heat buildup;

7.1.1.4 Phase indicators, voltage meters and ammeters for monitoring;

7.1.1.5 A numbering system to ensure quick identification during operation and emergencies i.e. FP01 and FP02 with clear information on the source of supply to the feeder pillars;

7.1.1.6 Must be IP rated, lockable, and fire-resistant enclosures.

7.1.1.7 Overcurrent protection (MCBs, fuses) sized correctly to prevent overheating;

7.1.1.8 SLD to be provided for easy DB identification and location; and

7.1.1.9 Labeling: Circuits marked (e.g., “DB1 – Booths A–D,” “DB2 – Catering,” “DB3 – Lighting”).

7.1.2 Feeder pillars must be positioned to minimize cable lengths and to avoid crossing public pathways. Proper spacing between live components and enclosure walls must be maintained to ensure safety and accessibility during maintenance and emergencies.

7.2 Distribution Board

7.2.1 Each distribution board must be located close to the point of use and clearly identified & labelled. Distribution boards should contain the following:

7.2.1.1 A main switch to allow complete isolation;

7.2.1.2 Circuit lists affixed inside the door showing circuit numbers, loads & rating for reference;

7.2.1.3 Suitable rated MCBs for every outgoing circuit;

7.2.1.4 RCD protection rated at 30 mA (at 40 ms) or lower on final circuits;

7.2.1.5 Neutral and earth busbars properly segregated and labelled;

7.2.1.6 Mechanical protection against water and tampering; and

7.2.1.7 Phase indicators should be provided and where practicable, boards should include surge protection devices to protect equipment.

7.2.2 All distribution boards should be mounted securely at an accessible height, away from direct water exposure and heat sources. For outdoor use, a minimum rating of IP65 is recommended. Any modification to circuits should be documented.

7.2.2.1 Must be IP rated, lockable, and fire-resistant enclosures;

7.2.2.2 Overcurrent protection (MCBs, fuses) sized correctly to prevent overheating;

7.2.2.3 RCDs required to disconnect faulty circuits quickly;

7.2.2.4 No unauthorized modifications or “overrides” of protective devices;

7.2.2.5 Tagging of DB and information of supply fed from which feeder pillar and the booth/load to be provided and posted on the DB;

7.2.2.6 SLD to be provided for the easy load identification and location;

7.2.2.7 Labelling: Circuits marked

Eg. DB1 (Booths A–D);

- Fed from FP1 (building supply);
- Outgoing MCBs for each booth (2–3 kW max per booth);
- RCD protection ≤30 mA at 40 ms;
- Earth bar bonded to booth structures;

Eg. DB2 (Lighting Rig):

- Feed from FP2 (Generator 1);
- Dedicated circuits for stage/exhibition lighting;
- Separate from socket outlets to avoid nuisance tripping.

Eg. DB3 (Catering Area):

- Feed from FP3 (Generator 2);
- Dedicated 5 kW circuits for ovens, fryers, and chillers;
- RCD/RCBO protection and reinforced cabling.

7.2.2.8 Routine checks shall be done daily during the event to ensure no breaker shows signs of overheating, mechanical damage or unauthorised modification.

7.3 Cable Entry/Access & Routing

7.3.1 All cables must be installed properly to avoid or minimize mechanical stress, environmental exposure and tripping hazards. Recommendations for cable routing are as follow:

7.3.1.1 Use cable trays, conduits and protective covers for horizontal runs;

7.3.1.2 Overhead cable bridges or insulated ramps should be used in areas where cables cross pedestrian paths or roadways;

7.3.1.3 Avoid routing near flammable materials, sharp edges or moving machinery;

7.3.1.4 Cables must not obstruct emergency exits or fire access routes;

7.3.1.5 Entry points to panels must use glands or grommets to prevent abrasion;

7.3.1.6 Cable joints must be properly insulated and weather-sealed; and

7.3.1.7 Periodic inspections should be done to verify cable condition, tightness of terminations and any visible damage.

7.3.2 Multiple cable entry

Figure 7-1: Example of multiple cable entry

Premises regularly used for events requiring external utility support should be equipped with permanent multiple-cable entry points. Cables should not be routed across fire doors, as this would compromise their function and may lead to fire propagation to other areas of the room or building.

7.3.3 Expanding Foam

7.3.3.1 Expanding foam is often made from polyurethane, a type of foam that expands upon application. It can be used to fill in the holes from a cable entry to seal the gaps and create an airtight and watertight seal.

7.3.4 Fire-Resistant Foam

7.3.4.1 Fire-resistant foam is designed to slow the spread of flames, making it an essential material for fire-rated construction.

7.3.5 Cable routing

7.3.5.1 All cable routes should be properly managed by using cable trenching or by keeping them to one side of the event area that is not accessible to the public.

7.3.6 Cables Laid on the Floor

7.3.6.1 Hazards: Crushing by foot traffic, vehicles, trolleys; trip hazards; water ingress.

7.3.6.2 Controls:

- Use cable ramps/mating at pedestrian and vehicle crossings;
- Route cables away from emergency exits and escape routes;
- Elevate joints above ground to avoid water pooling; and
- Use H07RN-F neoprene cables for robustness in outdoor/tropical conditions.

7.3.6.3 Inspection: Daily checks for abrasion, cuts, or displacement of ramps.

7.3.7 Cable Support

7.3.7.1 All cables being laid out to be supported by means of cable trays or equivalent to protect the cable from being damaged and to prevent cable stress when the cable was hung.

7.3.8 Cables Suspended Overhead

7.3.8.1 Hazards: Sagging, mechanical strain, accidental snagging, collapse of supports.

7.3.8.2 Controls:

- Suspend cables using trusses, catenary wires, or rigging systems designed for load;
- Maintain adequate clearance above walkways;
- Use strain relief at connectors to prevent tension damage; and
- Bond metallic suspension structures to earth.

7.3.8.3 Inspection: Verify secure fixings and absence of sharp edges or pinch points.

7.3.9 Cable bridge

7.3.9.1 Where cables need to crossed the road to be laid out using cable tray when an XLPE SWA or PVC SWA cable are in used to support the weight of the cable; and

7.3.9.2 Cable bridge height to be at a minimum height of 5 metres from the ground to be able to cater for the emergency management team vehicle to pass through.

7.3.10 Cables Fixed to Booth Structures

7.3.10.1 Hazards: Mechanical stress from booth assembly, abrasion against sharp edges, public contact.

7.3.10.2 Controls:

- Fix cables with insulated clips, ties, or trunking — never bare metal fixings;
- Protect against abrasion with grommets or sleeving where cables pass through booth panels;
- Ensure cables are out of reach of the public or enclosed; and
- Bond metallic booth frames to earth if cables are attached.

7.3.10.3 Inspection: Check fixings daily for loosening or damage during event operation.

7.3.11 Documentation & Sign-off

7.3.11.1 All cable routes (floor, overhead, booth) must be included in the risk assessment and method statement.

7.3.11.2 The Senior Person Responsible (SPR) must sign off mechanical protection measures before energizing.

7.3.11.3 Daily inspection logs maintained by technicians, countersigned by SPR.

7.4 Wiring & Installation

7.4.1 All wiring must comply with EIR and relevant or equivalent standards and should be carried out by registered electrical workers. Recommendations for wiring and installation are as follows:

7.4.1.1 Color coding according to standard phase identification (L1 = Brown, L2 = Black, L3 = Grey, Neutral = Blue, Earth = Green/Yellow);

7.4.1.2 Cables must be supported with proper fixings;

7.4.1.3 Joints should be avoided where possible;

7.4.1.4 Any connections must be made with suitable connectors and insulated to prevent accidental contact;

7.4.1.5 Damaged or exposed wires shall never be used;

7.4.1.6 Use of heat-resistant flexible cables for portable and outdoor applications;

7.4.1.7 Avoid coiling excess cables tightly as this can cause heat buildup; and

7.4.1.8 Visual inspections must be done to ensure all cables and terminations are mechanically protected, correctly labelled and free from strain and any damages.

7.5 Cable Types, Sizes & Protection

7.5.1 Neoprene-sheathed cables, XLPE/armored cables or equivalent are recommended to be used due to its durability and resistance to oil, water and abrasion. Cable size must be properly selected based on load, run length and acceptable voltage drop. Under-sized cables can cause overheating and fire hazards. Overcurrent and short-circuit protection must be provided for all cables and protection must be coordinated with the upstream sources or generator and feeder.

7.6 Final Point Tagging & Cable Tagging

7.6.1 All final outlets must be tagged for easy identification, particularly in installations where multiple vendors or circuits are supplied, thereby to ensure traceability. All cables should be labelled at both ends with their respective source and destination, phases should be clearly color-coded and cable tags should be durable and weather-resistant. All tagging and labelling should correspond exactly with the as-built drawing document. This practice reduces troubleshooting time, prevents errors during connection, prevents confusion during inspection, improves safety for maintenance personnel and enhances system safety.

8 ELECTRICAL PROTECTION & SAFETY DEVICES

8.1 Residual Current Devices (RCDs)

8.1.1 All final circuits must be protected with RCDs rated at 30 mA (at 40 ms) or lower to prevent electric shock hazards. RCDs must be installed at the origin of circuits supplying vendors or equipment. Each RCD shall be tested using a calibrated tester before energisation, with results logged in the test record. The test button should be operated monthly during long events to ensure functionality.

8.2 Arc Fault Detection Devices (AFDDs)

8.2.1 AFDDs provide additional protection against electrical fire caused by arcing faults in loose connection or damaged cables. They are strongly recommended for kitchen areas, accommodation spaces and exhibition booths with flammable materials. AFDDs automatically disconnect the supply when abnormal arcing patterns are detected, reducing fire risk significantly.

8.3 Surge Protection Devices

8.3.1 Sensitive equipment such as computers, sound systems and lighting controllers should be protected by surge protection devices installed at the main distribution board or feeder pillar. Surge protection devices absorb transient overvoltage caused by lightning or switching surges, preventing damages to sensitive equipment. Surge protection should comply with IEC 61643 standards and be periodically inspected for condition and continuity.

8.4 Earthing & Grounding

8.4.1 Each installation should include a reliable earthing system to ensure effective fault current dissipation. It is recommended that:

8.4.1.1 Earth electrodes be driven at least 2 metres deep;

8.4.1.2 The earth conductor must be copper and sized according to the generator's fault level;

8.4.1.3 Earth continuity between all metallic enclosures must be verified;

8.4.1.4 Earth resistance must not exceed 1 Ω; and

8.4.1.5 Log of earth test results should be maintained and signed by the responsible person.

8.5 Safety Barriers & Physical Protection

8.5.1 To prevent accidental contact with electrical equipment, physical protection measures should be implemented, where:

8.5.1.1 Generators and feeder pillars should be fenced off or enclosed to restrict public access;

8.5.1.2 Any flammable equipment should be a minimum of 3 metres away from public;

8.5.1.3 Adequate warning and safety signage should be prominently displayed such as "Danger - High Voltage" and "Authorized Personnel Only";

8.5.1.4 All doors and enclosures should have anti-vandal locks;

8.5.1.5 Temporary fencing should be stable and non-conductive;

8.5.1.6 Adequate lighting should be provided for night operations (if any); and

8.5.1.7 Access for emergency exits or fire access routes should not be obstructed.

Figure 8-1: Example of safety barriers & physical protection

8.6 Cable Safety Devices

8.6.1 Light duty cable protectors to be utilised for any cable crossing on light duty systems for offices, exhibitions and temporary installations, enabling quick deployment and safe routing of cable.

Figure 8-2: Example of cable crossing light duty protector

8.6.2 Cable ramps and protectors of the heavy-duty polyurethane ramps to be utilise to allow vehicles and pedestrians safely cross over cable without damaging them.

Figure 8-3: Example of cable crossing heavy duty protector

8.6.3 Americans with Disabilities Act (ADA) compliant ramp can be use where cable need to be protected and ensuring a smooth transition for wheelchairs and carts while protecting the cable.

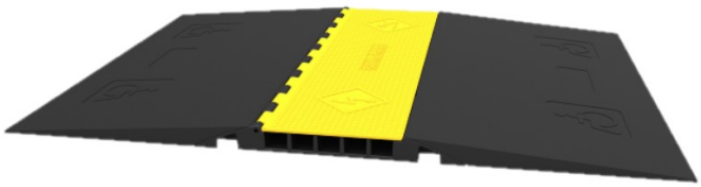

Figure 8-4: Wheelchair/carts cable protector ramp

9 INSPECTION, TESTING & CERTIFICATION

9.1 Inspection and Testing by Competent/Certified Person

9.1.1 Only registered electrical workers are permitted to install, inspect, test and certify non-permanent electrical installations. Each test report should clearly include the person's registration or identification number, signature and date. Unauthorised or unqualified personnel shall not perform any electrical works.

9.2 Pre-Use Testing

9.2.1 Prior to energisation of installation, it is recommended for the following (not limited to) test to be conducted:

9.2.1.1 Earth resistance measurement for all electrodes;

9.2.1.2 Continuity and polarity checks for protective conductors;

9.2.1.3 RCD operation time and tripping current verifications;

9.2.1.4 Insulation resistance between live conductors and earth (minimum 1 MΩ); and

9.2.1.5 Functional load test under simulated operating conditions.

9.2.2 All results should be properly documented and any defect shall be rectified before use.

9.3 Documentation

9.3.1 It is recommended for the following document to be compiled, reviewed and available whenever required:

9.3.1.1 Electrical test reports;

9.3.1.2 Inspection certificates;

9.3.1.3 Earth resistance test results;

9.3.1.4 Load schedule;

9.3.1.5 Single line diagram;

9.3.1.6 Generator and distribution board details and information;

9.3.1.7 Risk assessment;

9.3.1.8 Method statement; and

9.3.1.9 Certificate of competency (for electrical workers).

9.4 Authority Approval

9.4.1 The entire installations should be subject to inspection and approval by the relevant authorities prior to energisation. Following such approval, the installations shall remain in full compliance throughout its operational period. Any subsequent modification, alteration or extension shall be subject to further assessment and re-approval by the relevant authorities.

APPENDIX A: APPLICABLE LAWS

- Workplace Safety and Health Act Chapter 277
- Workplace Safety and Health (Construction) Regulations
- Electricity Act, Chapter 223
- Electrical Installation Requirement, 2011 (EIR)
- SHENA Industry Guidance Note on Guidance on the safe use and installation of portable generators (less than 10 kVA)

GLOSSARY

- **Shall:** indicates a requirement strictly to be followed to conform to the standard and from which no deviation is permitted, unless accepted by all involved parties.
- **Should:** make a recommendation to indicate that among several possibilities one is recommended as particularly suitable without mentoring or excluding others, or that a certain course of action is preferred but not necessarily required.
- **Can**: used for statements of possibility and capability, whether, physical or causal.
- **Could**: used to indicate an allowable course of action within the limits in this standard.
- **Conductor**: of material aluminium or copper metal forming a wire, cable or other designed for carrying electric current.
- **Dead**: electrically discharged by being disconnected from any electrical supply and not having any charge retained by capacitance.
- **Earth electrode**: A conductor or group of conductors in intimate contact with, and providing an electrical connection to, earth.
- **Earth Resistance:** The resistance of the earth between the earth electrode and remote reference earth.
- **Mean ground level:** average ground level.
- **Low voltage:** voltage that does not exceed 1000 V AC or 1500 V DC.
- **Live (1):** electrically charged by connected to low/high voltage electricity supply or having charge retained by capacitance.
- **Live (2):** in all circumstances, all electrical equipment is considered electrically charged until it is demonstrated, isolated, proved to be dead and earthed.
- **High voltage:** voltages exceed low voltage U>1000 V.
- **Insulation:** means separated from adjoining conducting material by a non-conducting substance which provides resistance to the passage of current, or to disruptive discharges through or over the surface of the substance at the operating voltage, and to mitigate the danger of shock or injurious leakage of current.
- **Sag:** the distance measured vertically from a conductor to the straight line joining its two points of support. Unless otherwise stated in the rule, the sag referred to is the sag at the midpoint of the span.
- **Clearance:** the clear distance between two objects measured surface to surface, and usually filled with a gas such as air.

- **Span:** the horizontal distance between two adjacent supporting points of a conductor.
- **Wayleave:** cleared swath of land / area under power overhead line.
- **Standalone:** able to function independently.
- **Senior Person Responsible**: A competent individual formally appointed to take overall responsibility for electrical safety in temporary event installations as per BS7909:2023+A1:2024, supported by event organisers, producers, contractors, and technicians. Their role is central: they ensure compliance, oversee testing, and provide documented sign-off.
- **Power Requirement**: The total anticipated electrical demand of all appliances used by a particular stall or booth.

  In addition to the following may or can be taken as the same meanings

  - **Right-of-Way:** - also known as Wayleave.
  - **Termination:** - make connection.
  - **Tie-in(s): -** make connection.
  - **Transportable / moveable:** - as per “mobile.”

  Extracted from IEC 60050-212

  - Clause 212-11-18 “DC (electrification current)” – current after electrification by constant voltage between two electrodes in contact with an insulating material.

  Extracted from IEC 60050-141

  - Clause 141-02-06 “star connection” – in a polyphase element, connection in which all phase elements have a common node.

  Extracted from IEC 60050-151

  - Clause 151-11-25 “equipment” - single apparatus or set of devices or apparatuses, or the set of main devices of an installation, or all devices necessary to perform a specific task.
  - Clause 151-12-01 “electric circuit” - arrangement of devices, media, or both, forming one or more conductive paths and where these devices and media can have capacitive and inductive coupling.
  - Clause 151-12-07 “connection (1)” - intentional electric contact between conductors or intentional junction between waveguides including optical fibres.
  - Clause 151-12-08 “connection (2)” - conductor or electric circuit for joining terminals or other conductors.
  - Clause 151-12-09 “connecting” - the action of establishing a connection.
  - Clause 151-15-41 “insulation” – all the materials and parts used to insulate conductive elements of a device.
  - Clause 151-16-44 “fixed” - fastened to a support or otherwise secured in a specified location.
  - Clause 151-16-46 “mobile” - capable of operating while being moved.

  Extracted from IEC 60050-601

- Clause 601-01-10 “distribution of electricity” – the transfer of electricity to consumers within an area of consumption.
- Clause 601-03-04 “overhead line” – An electric line whose conductors are supported above ground, generally by means of insulators and appropriate supports.

Extracted from IEC 60050-602-02-01

- Clause 601-01-10 “generator set” – a group of rotating machines transforming mechanical or thermal energy into electricity.

Extracted from IEC 60050-826

- Clause 826-16-04 “mobile equipment” - electrical equipment which can move or can be moved while in operation or which can be moved from one place to another while connected to the supply.
- Clause 826-16-06 “stationary equipment” - fixed equipment or equipment that cannot be easily moved.
- Clause 826-16-07 “fixed equipment” - electric equipment fastened to a support or otherwise secured in a specific location.

Extracted from IEC 61439-1

- Clause 3.1.2 “assembly system” – a full range of mechanical and electrical components (enclosures, busbars, functional units, auxiliary circuits and associated controls, etc.), as defined by the original manufacturer, which can be assembled in accordance with the original manufacturer’s instructions in order to produce various assemblies.
- Clause 3.1.8 “functional unit” – part of an Assembly comprising all the electrical and mechanical elements that contribute to the fulfilment of the same function.
- Clause 3.1.9 “incoming unit” – function through which energy is normally fed into the assembly.
- Clause 3.3.2 “dead front assembly” – open-type assembly with front cover, the live parts possibly being accessible from directions other than the front.
- Clause 3.3.3 “enclosed assembly” – assembly which is enclosed on all sides with the possible exception of its mounting surface in such a manner as to provide a defined degree of protection.
- Clause 3.7.24 “class 1 assembly” – assembly with at least one provision for a basic protection and a connection to a protective conductor as a provision for fault protection.
- Clause 3.7.25 “class II assembly” – assembly which is provided with the following;
    - Basic insulation as provision for basic protection and Supplementary insulation as provision for fault protection, or in which;
    - Basic protection and fault protection are reinforced insulation.
- Clause 3.7.7 “fault current” - current resulting from an insulation failure, the bridging of insulation or incorrect connection in an electrical circuit.

- Clause 3.8.6 “short-circuit current Ic” - overcurrent resulting from a short-circuit due to a fault or an incorrect connection in an electric circuit.
- Clause 3.8.9.1 “rated voltage Un” - highest nominal voltage of the electrical system, declared by the assembly manufacturer, to which the main circuit(s) of the assembly is (are) designed to be connected.
- Clause 3.8.10.1 “rated current” - the value of uninterrupted current, declared by the assembly manufacturer which can be carried without the temperature-rise of various parts of the assembly exceeding specified limits under specified conditions.
- Clause 3.8.10.7 “rated current of an assembly I_nA” rated current which can be distributed by an assembly without the temperature-rise of any of the parts exceeding specified limits.

- **Exhibition**: event intended for the purpose of displaying and/or selling products etc., which can take place in any suitable location, either a room, building or temporary structure.
- **Show:** display or performance in any suitable location, either a room, building or temporary structure.
- **Stand:** area or temporary structure used for display, marketing, sales, entertainment etc.
- **Temporary structure:** a unit or a part of a unit including mobile portable units, situated indoors or outdoors, designed and intended to be assembled and dismantled.
- **Temporary electrical installation:** electrical installation erected and dismantled at the same time as the stand or display with which it is associated.
- **Origin of the temporary electrical installation:** point on the permanent installation or other source of supply from which electrical energy is delivered.

Spotlight Type	Wattage Range	Recommended Minimum Distance	Remarks
LED Spotlight	5 W – 20 W	10 – 30 cm	Very low heat, safe for close use
Halogen Spotlight	35 W – 50 W	30 – 50 cm	Can cause burns if too close
Halogen Spotlight	75 W – 100 W	0.5 – 1.0 m	High heat, risk of ignition/burn
Stage/Industrial Spotlights	500 W+	Several metres	Often require protective grills and ventilation

Table A: Typical safe distance by wattage for spotlight

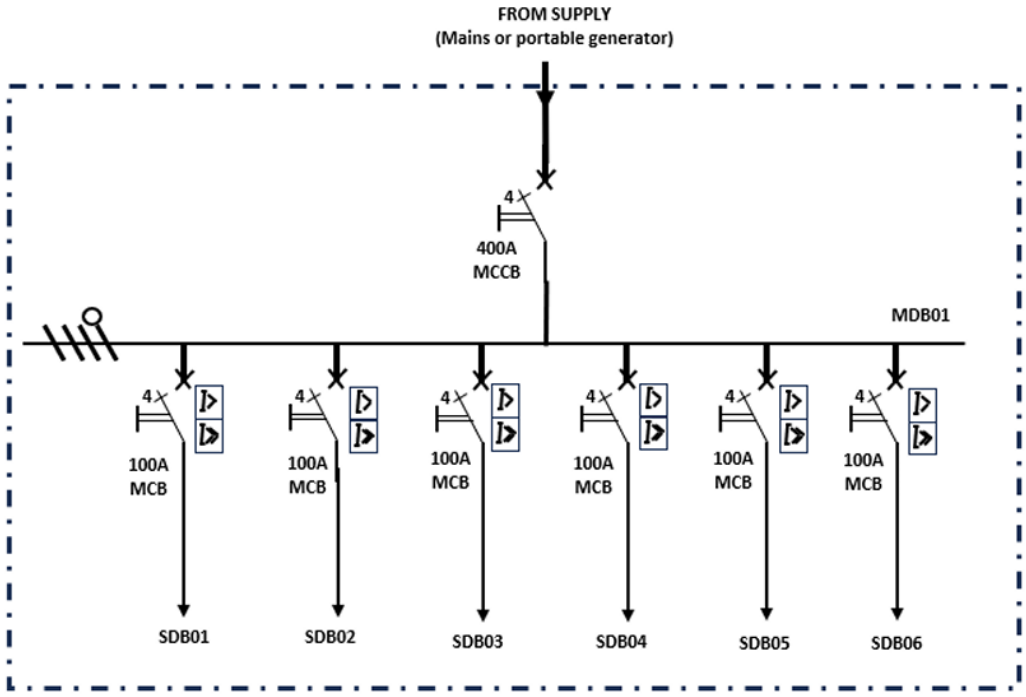

Figure 9-1: Example of SLD (supply from mains or portable generator)

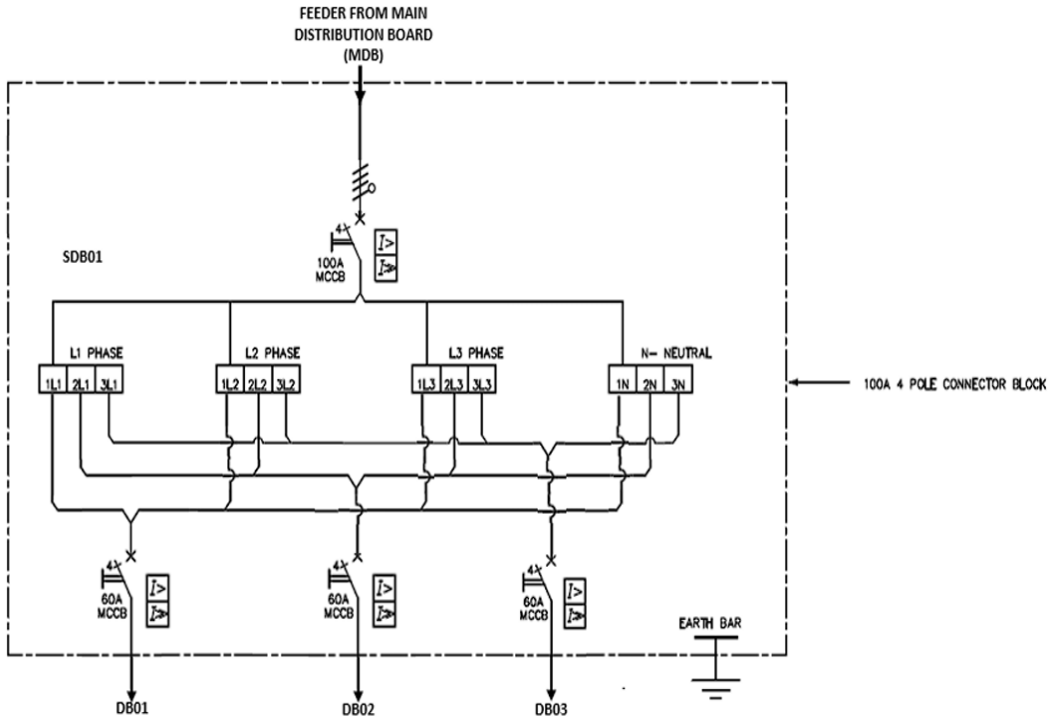

Figure 9-2: Example of SLD for Main Distribution Board

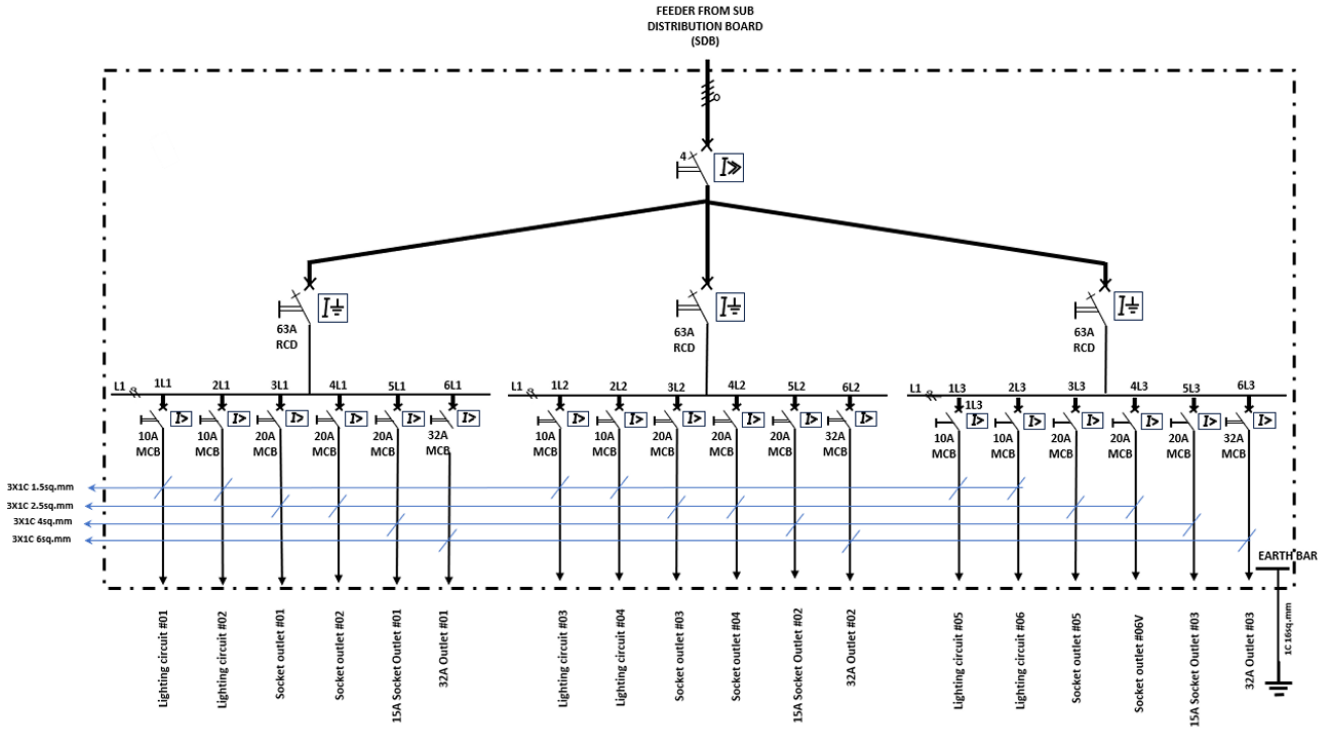

Figure 9-3: Example of SLD for Sub Distribution Board