ESCOM
ELECTRICAL SAFETY COMMITTEE

GUIDELINES AND BEST PRACTICES FOR LOW VOLTAGE (LV) WIRING AND ELECTRICAL APPLIANCE SAFETY

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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?

Members of the ESCOM comprised of industry experts from both government institutions and private organisations with decades of collective experience and a shared passion to drive improvements and promote electrical safety in Brunei Darussalam. The committee is co-chaired by both SHENA and AENBD.

ELECTRICAL SAFETY BEST PRACTICES			
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Disclaimer:
This document was developed as a recommendation and as an industry reference of best practices to improve electrical safety practices.

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.

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1 INTRODUCTION

1.1 The concept of "electrical safety" encompasses the secure handling of electricity during its generation, transmission, distribution, and utilisation.

1.2 For the general public, safety considerations primarily revolve around the distribution and utilisation of electricity within residential or workplace settings, directly impacting physical safety.

1.3 The presence of unsafe electrical appliances and installations poses potential risks not limited to fire, and electric shocks, and causes injuries or fatality.

1.4 It is imperative to safeguard employees and property by cultivating a secure workplace environment, encompassing both the building structure and residential units, with a focus on electrical safety.

1.5 To achieve this, it is essential to use reliable electrical appliances, proper usage practices, and consistently maintain them.

1.6 Additionally, ensuring the safety of electrical installations in workplace areas requires the engagement of registered electrical contractors for periodic inspections and maintenance.

1.7 This proactive approach helps prevent unauthorized additions or improper alterations, contributing to a safe electrical environment.

2 GLOSSARY OF TERMS AND ABBREVIATIONS

HSE	Health, Safety and Environment
WSH	Workplace Safety and Health
WSHO, 2009	Workplace Safety and Health Order, 2009
DES	Department of Electrical Services
EIR	Electrical Installation Requirements

3 PURPOSE

3.1 This Guidelines and Best Practices for Electrical Safety functions as a source of guidance and reference for all aspects related to workplace for low voltage (LV) wiring and electrical appliances safety in accordance with the Workplace Safety and Health Order, 2009.

3.2 Additionally, this document aims to inform the public about the safety and standards associated with electrical installations and appliances. It serves as a guide for contractors to ensure compliance with established standards and regulatory requirements.

4 SCOPE

4.1 This document provides best practices for any electrical installation and appliance requirements as per Brunei Electrical Installation Requirements as well as some recommendations to establish good practice in the workplace.

4.2 In line with the said Requirements, the scope of this Electrical Safety Best Practice only applies to any workplace with an installation capacity below 1000V.

5 APPLICABLE LAWS

5.1 SHENA would like to remind all principals, employers, occupiers, self-employed persons, and persons at work to comply with applicable laws and regulations as follows:

5.1.1 Workplace Safety and Health Order, 2009 (WSHO, 2009):

5.1.1.1 To ensure that the workplace and any machinery or equipment used in the activities are safe and without risks to every person within the workplace, as stipulated under:

5.1.1.1.1 Section 11 – Duties of occupier of workplace

5.1.1.1.2 Section 12 – Duties of employers

5.1.1.1.3 Section 13 – Duties of self-employed persons

5.1.1.1.4 Section 14 – Duties of principals

5.1.1.1.5 Section 15 – Duties of persons at work.

5.1.2 Workplace Safety and Health (Risk Management) Regulations, 2014:

5.1.2.1 Principals, Employers and Self-Employed Persons are required to conduct a risk assessment in relation to the safety and health risks posed to any person who may be affected by his undertaking in the workplace.

5.1.3 Workplace Safety and Health (Construction) Regulations, 2014:

5.1.3.1 The employer or principal is required to provide adequate safety and health training to any person who conducts manual work or supervisory work in a worksite.

5.1.4 Workplace Safety and Health (Incident Reporting) Regulations, 2014:

5.1.4.1 The employer or occupier is required to report any accident in a workplace that leads to death, reportable injury, or any dangerous occurrence.

6 ELECTRICAL INSTALLATIONS

6.1 Responsibilities Of Occupier of Electrical Installations

6.1.1 With the reference from Workplace Safety and Health (General Provisions) Regulations, 2014

6.1.1.1 (1) It shall be the duty of the occupier of a workplace to ensure that every electrical installation and electrical equipment in the workplace— (40/2014) (a) is of good construction, sound material and free from defects; and (b) is used and maintained in such manner so that it is safe to use.

6.1.1.2 (2) It shall be the duty of the occupier of a workplace 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 at work of any electrical installation or equipment in the workplace.

6.2 Registered Electrical Contractors and Workers

6.2.1 Name lists of registered electrical contractors / workers have been uploaded to the website of the Department of Electrical Services at http://www.des.gov.bn/ at Downloadable Resources for reference.

6.2.2 Registered electrical contractors shall display their certificates prominently in their places of business.

6.3 New Installations, Additions or Alterations

6.3.1 All additions to or modifications to already-existing electrical installations must adhere to the most recent statutory safety requirements.

6.3.2 The occupiers should hire a registered electrical contractor to do a feasibility assessment before adding to or changing an electrical installation. When determining whether to apply to the power company to increase the installation's authorized loading, the occupiers should also take future electricity demand into account.

6.3.3 Before the electrical installation is turned on, a registered electrician must inspect and test it after all electrical work including new installations, additions, alterations, and repairs has finished.

6.3.4 To verify that the electrical installation is safe and complies with the legal safety criteria, the licensed electrical contractor and worker must provide an Occupational Permit following inspection and testing.

6.4 General Tips for Electrical Installations

6.4.1 An efficient earthing arrangement is required for electrical installations. To ensure safety, do not remove any earthing connection.

6.4.2 Adequate mechanical protection, such as conduits, must be installed around hidden electrical wires in new electrical installations.

6.4.3 Telephone and telecommunication wire needs to be kept apart from electrical wiring. Unless certain safety conditions are met, the wire of these two groups cannot be put inside the same conduit or trunking.

6.4.4 Identification labels on distribution boards are required to indicate the purposes of individual circuits.

6.4.5 An electrical appliance with high power consumption should receive power supply from a single socket outlet. Therefore, there should be an adequate number of socket outlets installed.

6.4.6 Plug outlets ought to be placed as far away from kitchen ranges, gas taps, and water taps as is practical.

6.4.7 Distribution board (DB) with rating of 100A to 400A incomer shall be protected by proper fuse size or molded case circuit breaker (MCCB) with inbuilt overcurrent and earth leakage protection.

6.4.8 Residual Current Devices (RCDs) with ≤ 30 mA leakage settings are required to safeguard socket outlet circuits. RCDs shall be function tested periodically and inspect earthing connections at the earth pits are in good conditions.

6.4.9 Outdoor luminaires, socket outlets and switches must be of weatherproof types.

6.4.10 For the luminaire, exhaust fan and electric water heater inside a bathroom, the on/off switches should be installed outside the bathroom.

6.4.11 Refer to registered electrical contractors or workers for additional information on safety requirements for electrical installations.

6.5 Periodic Inspection, Testing and Certification

6.5.1 While the electrical installation in common residential units often does not exceed 100A, the approved loading of the communal electrical installation in most buildings does exceed 100A. The occupiers may schedule an inspection by a licensed electrician if they are in doubt.

6.5.2 To verify that the electrical installation is safe and complies with the legal safety criteria, the registered electrical contractor and worker must provide a Periodic Test Certificate following inspection, testing, and repair.

6.5.3 For information on the checklists for routine testing and inspection of electrical installations, occupiers may consult with a registered electrician or contractor.

6.6 Defects Commonly Found in Electrical Installations

6.6.1 Untidy, ageing and worn-out electrical wiring arising from lack of maintenance and repair.

6.6.2 Exposed electrical wiring that contains conductive parts.

6.6.3 Unused or abandoned wiring that is left in place.

6.6.4 Age or poor maintenance and repair have left the electrical installation improperly earthed.

6.6.5 Unauthorised upgrades or modifications to electrical systems result in overload.

6.6.6 Lack of warning signs and identification markings

6.6.7 Switch rooms being used as storerooms.

6.6.8 Access to switches or distribution boards (DBs) is being obstructed.

7 SAFETY GUIDELINES FOR ELECTRICAL APPLIANCES

7.1 Safety Tips for Electrical Appliances

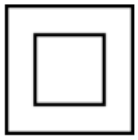
7.1.1 Purchase only electrical appliances that are suitable and safe for use in Brunei Darussalam, which satisfy the legal criteria for safety.

7.1.2 The nominal supply voltage used in Brunei Darussalam is 400V, 50Hz, 3-phase, 4-wire AC (L1, L2, L3, N) or 230V single-phase, 2-wire AC (L, N).

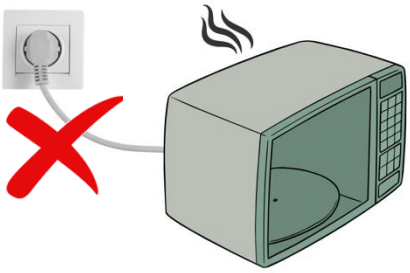
7.1.3 Electrical appliances brought from outside of Brunei Darussalam may not work properly in the local power supply due to factors such as rated voltage and frequency and environmental factors such as humidity and temperature.

7.1.4 Additionally, the starting current for some electrical appliances may be several times higher than that during normal operation. Thus, to prevent a temporary circuit overload and subsequent blackout upon the resumption of power, large electrical appliances should be turned off during a power blackout.

Table 7-1: Information about General Safety Tips for electrical appliances.

No	Description/Image	Description/Image
1.	Electrical appliances need to have the correct safety markings, or come with a manual stating the rated specifications.	
2.	When operating an electrical appliance, follow the instructions provided carefully in the instruction manual.	
3.		Electrical appliances must be properly earthed, that is, their metallic casing must be linked to the "earth" prong of their plug, to prevent electric shock.
4.	 Double Insulated Symbol	Electrical appliances that do not have an earth connection need to be designed with protective double insulation or reinforced insulation.
5.	Before use, make sure that all electrical appliances including flexible power cords and plugs are in good condition. This is especially important if the appliances have not been used for a long time.	

No	Description/Image	Description/Image
6.		For stable operation, electrical appliances need to be fitted correctly and have sturdy constructions. There should not be any indications of overheating (such as discolouration, charring, or deformation) or difficult starting, loud noises or vibrations, or loosening or cracking of any parts during normal operation. When in doubt about an electrical appliance's safety, put it away and give it to a registered technician for inspection.
7.	Make sure an electrical appliance is securely plugged into a socket outlet before turning it on, and only unplug it after turning it off. Otherwise, there could be a sparking hazard.	
8.		Do not pull the flexible power cord to unplug the electrical appliance. It may damage the wire connection and may be dangerous. Switch off the socket and then pull by its head plug to unplug it. If the plug is damaged and cannot be removed, ensure it is switched off and put warning sign. Inform a

No	Description/Image	Description/Image
		registered electrician to inspect and repair it.
9.	Make sure kids stay away from electrical appliances, especially ones that have rotating or heating parts (such as hair dryers, irons, luminaires, electric fans, electric cooking ovens, and washers/dryers).	
10.		Keep the flexible power cord of any electrical appliance away from heat sources (such as stove or oven) and avoid letting it comes into contact with them.
11.	Keep electrical appliances dry at all times. To prevent potential hazards, electrical appliances also should not be placed near windows or balconies. Additionally, overcrowded objects may lead to falling off and cause tripping hazards.	

No	Description/Image	Description/Image
12.	Never use an extension cord for an electric appliance in a damp or wet area (such as the kitchen or bathroom) as to prevent electric shock. If hands are wet, avoid contact with any electrical appliance, socket, or switch as water is a good conductor of electricity and this can also lead to electric shock.	
13.		Set an electrical appliance down on a stable, level surface and make sure no excessive tension is applied to its flexible power cord.
14.	Avoid using any flammable chemicals near an electrical appliance that is in use, such as insecticide and thinner.	
15.		Electrical appliances (apart from those that are necessary) should be turned off as much as possible before leaving the premises for safety's sake.

7.2 Maintenance And Repair of Electrical Appliances

7.2.1 Follow the instructions in the user manual to clean electrical appliances on a regular basis. Before cleaning, switch off and unplug all the electrical appliances.

7.2.2 Verify that the environment in which an electrical appliance operates, such as the humidity and temperature aligns with the parameters mentioned in the user manuals.

7.2.3 Call registered electrical contractors to perform routine inspections and maintenance on the electrical appliances.

Figure 7–1 Check Electrical Appliances Manual and Inspections by Certified Electrical Contractors

7.3 General Electrical Safety

7.3.1 Electric Plugs

7.3.1.1 Use acceptable plugs only such as 3-pin plugs that meet safety requirements, unless they have a 2-round-pin plug that complies with safety standard BS 1363-1.

7.3.1.2 Plug terminal for both Live and Neutral shall be partially insulated.

7.3.1.3 Never overload the plugs. Each plug (with the appropriate fuse rating) connecting to electrical equipment should match the equipment's power and current rating, complying with the BS 1362 safety standard.

7.3.1.4 However, ensure that the total sum of the power / current for all the equipment connected together to the extension unit shall NOT exceed the rating (13A) of the single incoming extension plug.

7.3.1.5 Plugs should always be kept clean, away from dust, oil, grease or other dirt.

7.3.1.6 3-pin plugs must be marked with all the information.

7.3.2 Extension Units

7.3.2.1 It is highly recommended that the extension unit is fused protected and safety shutters are installed in socket holes.

7.3.2.2 Socket outlets should have their own individual switch.

7.3.2.3 Purchase and use extension cords and adapters exclusively that meet safety requirements:

7.3.2.3.1 For plug portion (13A) – BS 1363-1

7.3.2.3.2 For socket portion – IEC 60884-2-7

7.3.2.3.3 For cable reels – IEC 61242

7.3.2.4 A socket outlet should only hold one adaptor or one extension unit at a time to avoid circuit overload and fire.

7.3.2.5 Under no circumstances should an extension unit be connected to another extension unit or adapter or vice versa.

7.3.2.6 A 2-pin plug should never be forced into a 3-pin socket outlet, converter, or extension unit.

7.3.2.7 If an adaptor or extension unit's socket holes are unable to securely hold a plug or if plug insertion is excessively difficult, stop using it.

7.3.2.8 Any extension unit should not be suspended by its flexible power cord.

7.3.3 Electric Storage Water Heaters

7.3.3.1 For installation of electric storage water heaters, the fixed electrical installations shall be installed by a competent and registered electrical contractor (EO1 DES Passcard Holder).

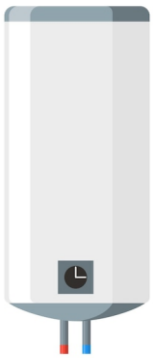


Figure 7–2 Sample of Electric Storage Water Heater

7.3.3.2 The water storage tank of an unvented thermal storage type electric storage water heater can withstand a certain amount of high pressure. This kind of electric water heater needs to have a thermostat, a thermal cutout, and a temperature and pressure relief valve installed.

7.3.3.3 Switch off the storage water heater when it is not in use to save energy and to prevent overheating if its components do fail. Do not use the storage water heater if it appears to be damaged or is leaking.

7.3.3.4 Do not try to modify or repair the water heater on your own. Engage a professional to service the water heater regularly to ensure it is running safely and efficiently.

7.3.3.5 Electric Instantaneous Storage Water Heater should be protected with an external 10mA RCD and shall not be placed within arm reach.

7.3.4 Chargers and AC Adaptors

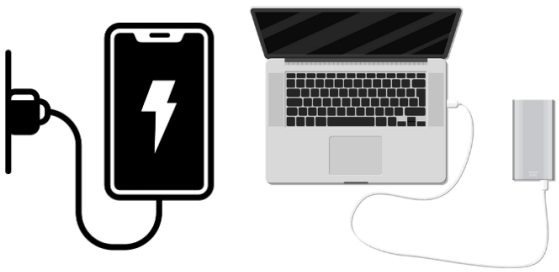


Figure 7–3 Sample of Chargers and AC Adaptors for portable devices

7.3.4.1 Caution is advised when buying or utilising the following products and services:

7.3.4.1.1 Battery chargers for mobile phones; and

7.3.4.1.2 AC adaptors for laptops or portable electronics.

7.3.4.2 When not in use, avoid connecting to the power source.

7.3.4.3 Always ensure chargers and AC adaptors are kept away from moisture to prevent short circuits and do not handle them with wet hands.

7.3.4.4 Monitor the temperature of the appliances; if it becomes excessively high, turn it off immediately. Even though some adaptors have inbuilt fuse and thermal protection.

7.3.4.5 Ensure that the input voltage of the appliance to be connected matches the output voltage of a power transformer, charger, or AC adapter. Also, the input must be less than the rated output power (or current).

7.3.4.6 Battery charging time should not be too long. Follow the instructions provided in the user manual. Never leave a running battery charger unsupervised.

7.3.4.7 Always use adapters with a power output that is suitable for your product. Failure to do so may damage your product, leading to hazards such as short circuits, fires, and electrocutions.

7.3.5 Luminaires

7.3.5.1 Avoid touching an operating light bulb to prevent burns. Additionally, doing so with moist palms

Figure 7–4 Refrain from touching an active light bulb.

7.3.5.2 Always ensure to use bulbs that have the correct wattage requirements for each fixture. A light bulb's rated wattage cannot exceed the light holder's specifications. Otherwise, it can cause overheating of the lampshade or the light holder and ignite a fire.

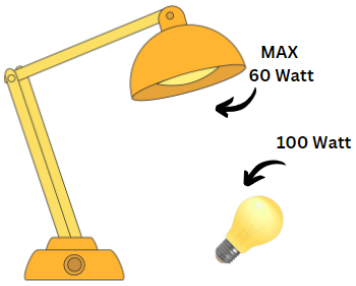


Figure 7–5 Wattage of a light bulb must not surpass the specifications of the light fixture

7.3.5.3 Before replacing a light bulb, ensure to switch it off and let it cool down.

Figure 7–6 Prior to replacing a light bulb, ensure it is turned off and allowed to cool down.

7.3.5.4 Avoid placing any type of luminaire, especially a high-power luminaire near any type of textile, rug, or curtain to prevent fire.

7.3.5.5 Use energy-saving lights whenever possible to conserve electricity.

7.3.5.6 Decorative luminaires used are not earthed. Consequently, the design of these luminaires needs to be double-insulation or reinforced-insulated. Furthermore, the design of these luminaires is not weatherproof. Use of these outside is not advised.

7.3.5.7 Always screw bulbs tightly as loose bulbs can cause sparks or short circuits.

8 ENQUIRIES

8.1 For complaints on the supply of unsafe workplace electrical appliances or on unsafe electrical installations, you may contact directly to Registered Electrical Contractors which can be found on the DES website.

8.2 You may also communicate with Talian Darussalam 123 for any enquiries on general matters in relation to electrical safety.

9 REFERENCES

- Electrical Installation Requirements
- IET Wiring Regulations 18th Edition, BS7676:2018
- Workplace Safety and Health Order, 2009
- Getting Electricity DES
- Hong Kong EMSD (Electrical and Mechanical Services Department), Electricity Safety