

**INTERNAL  
HOUSE  
WIRING  
REGULATIONS  
2016**

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## **INTERNAL HOUSE WIRING REGULATIONS**

In exercise of the power vested by section 87 of the Electricity Act, 2001; in order to provide for the safe electrical wiring system and electrical installations, the Bhutan Electricity Authority hereby adopts the Internal House Wiring Regulations as follows:

### **CHAPTER I PRELIMINARY**

#### **Title and Commencement**

1. This Regulation shall:
  - (1) Be cited as the Internal House Wiring Regulations 2016; and
  - (2) Come into force with effect from January 2016.

#### **Application**

2. This Regulation shall apply to all users of low voltage electricity supply provided or connected by an electricity supplier including:
  - (1) The owner of the buildings and public premises;
  - (2) Person involved in the installation, maintenance or operation of electrical installations; and
  - (3) All electrical installations including alterations and modifications to existing installations which are constructed after commencement of this regulation.

#### **Transitional provision**

3. Any owner and users who installed the electrical system before entry into force of this Regulation shall comply with the provisions within two years from the date of entry of this Regulation.

#### **Objective**

4. The objective of this Regulation is to facilitate the safe installations, operation and maintenance of internal house wiring to ensure that these do not endanger life, health and property, whilst fulfilling the intended functions.

#### **Amendment**

5. The Regulations may be amended as and when deemed necessary by the Authority.

**CHAPTER II**  
**GENERAL REQUIRMENTS FOR ELECTRICAL WIRING**

**Technical Standards, Materials and Workmanship**

6. The electrical wiring shall be consistent with the principles contained in the Bhutan Building Rules 2002 and amendment thereof.
7. All materials, equipment and installations shall comply with the relevant standards/codes prescribed by the relevant agency.
8. The materials, equipment and installations shall be in accordance with the instructions provided by the manufacturer.
9. Only electricians certified by the competent authority shall execute all works involving internal house wiring, repair or installation of electrical connections.
10. Earthing shall be carried out as per the standards prescribed by relevant agency.
11. Earthing of exposed metallic parts of an installation and appliances, as well as extraneous metallic parts in a premise shall be carried out for safety reasons, protection system requirements, and provide a path for electrical discharge.
12. All electrical installations shall be inspected and tested at the time of completion and at intervals thereafter to ensure ongoing safety, as detailed under Chapter VII of these Regulations.
13. All parts of an electrical installation shall be sufficiently sized and rated to safely carry out the function for which they are required.
14. All parts of an electrical installation shall be insulated appropriate to the function they serve, in consideration of the expected operating environment, so as to prevent danger.
15. Main bus bar connection and wiring shall follow the color coding as per the standard practice prescribed by the relevant agency.

**CHAPTER III**  
**REQUIREMENTS FOR SAFETY**

16. The owner and person engaged in electrical installations and maintenance shall ensure the safety of all general public and property against dangers and damage.

17. The owner and person shall ensure that any dangers arising from contacts with live wire or exposed-conductive-parts of the installation are prevented.
18. The owner and person shall prevent the risk of damage or ignition of flammable materials due to high temperature, electric arc or mechanical stress during the installations and operation.
19. The owner and person shall ensure that all parts of electrical installation shall be suitably located and protected against accidental or deliberate interference, as well as risk of damage from other services including water supply.
20. The cautionary signs shall be placed on main distribution box and wherever necessary by the owner and person.

#### **CHAPTER IV APPLICATION FOR ELECTRICITY SUPPLY**

21. The owner and person shall seek approval of the relevant agency on the proposed design of the installation before commencement of the construction.
22. The owner and person shall provide an estimate of the expected maximum electricity demand and/or connected load at the premises.
23. The owner and person shall submit application to the electricity supplier for new supply connections or alteration to an existing supply.
24. The owner and person shall not undertake any extension or alteration to an electrical installation without prior approval of the relevant agency.

#### **CHAPTER V PROTECTION**

##### **General Principles**

25. The owner and person shall design, install and maintain all electrical installation to provide protection against overload, short circuits and associated electrical hazards.

##### **Protection against over current and short circuit**

26. The owner and person shall ensure that:
  - (1) All electrical installations shall be provided with devices that protect against overload and short circuits, located at suitable sections and circuits as to give effective isolation

of such conditions; and

- (2) The main circuit breaker shall include Miniature Circuit Breaker for protection of the circuits and Moulded Case Circuit Breaker shall be used for protection of the sub main and main cables. Miniature Circuit Breaker and Moulded Case Circuit Breaker shall be enclosed in an enclosure or mounted on such material that is heat resistive and free from ignition.

### **Protection against over voltage and earth faults**

27. The owner and person shall ensure that:

- (1) The installation withstands the overvoltage as and when it occurs;
- (2) All exposed metallic parts of an installation is earthed via appropriate earth conductors;
- (3) All electrical installations are fitted with an earth leakage circuit breaker, residual current device, or similar protective device at appropriate points; and
- (4) All electrical installations shall be provided with a means of isolating the electricity supply at suitable sections, subsections and circuits, and at points where appliances are used.

### **Electric Shock Protection**

#### **Direct Contact**

28. The risk of person coming into direct contact with electricity by touching phase or neutral conductors shall be prevented by one or more of the following ways:
  - (1) appropriate insulation of conductors;
  - (2) secure enclosures, barriers or covers on all un-insulated parts including connection terminals, busbar sections; and
  - (3) limitation of contact time and current by use of a Residual Current Device.

#### **Indirect Contact**

29. The risk of electric shock through indirect contact shall be prevented by ensuring that the maximum voltage rise on the earthing system is limited to a safe value and that different parts of the earthing system are maintained at similar voltage levels.

#### **Earthing**

30. The neutral and metal parts of all the mains, sub-mains, distribution mains and trunk or conduit lining including the socket outlets shall be effectively connected to earth electrode with suitable size wire in accordance with the relevant standard.
31. The earth electrode resistance shall be reduced by appropriate treatment of the soil where necessary.

32. Proper care shall be taken while choosing the location of the earth electrode so that excavations for earth electrode may not affect the foundation of the building. Entrances, pavements and roadways shall be avoided for locating the earth electrode.

### **Lightning Protection**

33. Lightning protection systems and associated earth electrodes shall be kept separate from main earthing system.
34. Lightning protection systems shall be designed and installed in accordance with the relevant standards or codes.

## **CHAPTER VI INSTALLATION REQUIREMENTS**

### **Lighting**

35. All switches provided for local isolation of appliances and equipment shall comply with relevant Standards and Codes prescribed by relevant agency.
36. For outdoor locations or damp or wet areas, weather protected switches shall be used.
37. The normal mounting height for switches shall be as specified in relevant standards and codes prescribed by relevant agency.
38. Heat resistant cables between luminaries and connection points shall be used where necessary.
39. Luminaries and other fittings shall be installed with due consideration to the weight taken by fixings and supports with adequate ventilation and heat dissipation.
40. Outdoor lighting shall be weatherproof installation with appropriate connection points and fittings.

### **Cables**

41. All cables shall conform to relevant Standards and Codes prescribed by relevant agency.
42. Poly Vinyl Chloride (PVC) and rubber insulated stranded copper or equivalent conductor shall be used for internal wiring.
43. The size of cables shall be selected according to the expected load and voltage drop using relevant standards and codes prescribed by relevant agency.



44. All cables which are not armoured, shall be installed in plastic or metal conduit or trunking.
45. Cables running through inaccessible areas such as walls, floors and ceilings shall be installed in conduit or trunking so as to be withdrawable in the future. In such a case, suitable inspection plates and pulling out points shall be provided.

### **Switch Board**

46. Switch boards shall be of robust construction, capable of withstanding expected electrical, thermal and environmental stresses during normal operation and faults.
47. All switch boards shall be installed in locations easily accessible for inspection, operation and maintenance. Such locations shall be secured from unauthorized interference, particularly from children.
48. Switch board shall be placed in dry and ventilated rooms. It shall not be placed in the vicinity of storage batteries, gas and exposed to chemical fumes. If the switch board is exposed to harsh or humid weather conditions, the outer casing shall be weather proof with cable glands and bushing for incoming and outgoing cable.
49. All main switches, sub-main switches and distribution main switches shall be provided with appropriate enclosure having proper insulation.

### **Socket Outlets**

50. Socket outlets accessible for normal use may be positioned at a height as specified in standards and codes prescribed by relevant agency.
51. Socket outlets in kitchen/toilet or other areas where water is used shall be positioned as specified in standards and codes prescribed by relevant agency.

### **Conduits and Trunking**

52. In a conduit system, pipe shall be continuous when passing through walls and floors.
53. If the materials are of the galvanized iron (GI) or steel, the outer surface of the conduit including all bends, unions, tees, junction boxes forming part of the conduit system shall be adequately protected against rust when such system is exposed to weather as specified in standards and codes prescribed by relevant agency.
54. Metal conduits shall not be used as the sole means of providing an Earth. A separate earth conductors may run inside the conduit.

55. Conduits and trunking shall be installed so as to provide ease of access to cable circuits throughout the route. Sufficient inspection plates and pulling points shall be provided to enable inspection, repair and drawing out of cables throughout the life of the installation.
56. Separate conduits shall be provided for different network installations.

## **CHAPTER VII INSPECTION AND TESTING OF INSTALLATION**

57. Every new installation, alteration, extension or modification shall, on completion and before being energized, be inspected, tested and certified by the electricity supplier.
58. Routine inspection and testing shall be recorded and shall include:
- (1) Insulation Resistance Test;
  - (2) Polarity Test of Switch;
  - (3) Earth Continuity Test; and
  - (4) Earth Electrode Resistance Test.
59. The insulation resistance test shall be carried out as per the standards prescribed by the relevant agency.
60. The polarity test of switch shall be carried out as per the standards prescribed by the relevant agency.
61. The earth continuity test shall be carried out as per the standards prescribed by the relevant agency.
62. No earth electrode shall have a resistance greater than the one specified by the electricity supplier. However, in rocky soils, higher resistance may be allowed. The earth resistance measurement shall be carried by an approved earth testing apparatus as per the standards prescribed by the relevant agency.
63. Insulation resistance test and polarity test of switch shall be inspected, tested & certified at least once in every ten years and for earth continuity test & earth electrode resistance test, inspection, testing and certification shall be carried out atleast once in every four years or earlier when requested by the owner or users.
64. The electricity supplier may inspect and enforce provisions of this Regulation or otherwise, assign a relevant agency for the purpose.

**CHAPTER VIII  
FINES AND PENALTY**

65. Failure to comply with these regulations, or any part thereof, shall result in action in line with Guidelines for Fines (Punitive and Correctional) of Bhutan Electricity Authority.

**CHAPTER VIII**

**DEFINITIONS**

66. In this Regulation, unless the context otherwise requires,

- (1) **“Appliance”** means an item of current using equipment;
- (2) **“Cables”** means one or more than one insulated conductors, which are laid and surrounded by armour or protecting cover;
- (3) **“Competent Authority”** means the capacity of an official body to certify the electricians;
- (4) **“Circuit breaker”** means a mechanical switching device capable of breaking or closing flow of currents under normal circuit conditions;
- (5) **“Earthing or Earthed”** means a general term used to describe the connection of metallic parts of an Electrical installation or an Appliance to Earth;
- (6) **“Earth Conductor”** means the protective conductors used to connect the Exposed Metallic Parts of an Electrical installation and associated Appliances to Earth, via a Main Earth Terminal to local Earth Electrodes;
- (7) **“Earth Electrode”** means a conductor or group of conductors in intimate contact with Earth, providing an electrical connection to Earth, and normally having a known and measurable value of Earth Resistance;
- (8) **“Earth Leakage Circuit Breaker (ELCB)”** means a circuit breaker which is designed to open the phase and neutral conductors of a circuit upon detection of a leakage of current (above a specified value) through the Earth Conductor or through Extraneous Metallic Parts of an installation;

- (9) **“Earth Resistance” means** the resistance (in Ohms) of any point on an installation to Earth, being measured using an approved testing device and approved procedure;
- (10) **“Electrical installation” means** an installation that generally comprises any fixed or temporary cable, switchgear, transformer or other electrical equipment or apparatus within a Premises or other place where there is an electricity supply (including outdoor locations);
- (11) **“Electricity Supplier” means** the holder of a Licence for the distribution of electricity issued by the Authority under the Electricity Act of Bhutan, 2001;
- (12) **“Exposed Metallic Part” means** a metallic part of an installation or appliance which can be touched by person and which is not normally live but may become live due to a fault condition;
- (13) **“Extraneous Metallic Part” means** a metallic part, structure or any metalwork within Premises which is not part of the electrical installation and which is not designed to carry current, but which may become live due to a fault condition. Extraneous Metallic Parts are required to be connected to Earth using Equipotential Bonding Conductors where there is significant risk that they may become live due to a fault condition;
- (14) **“Indirect Contact”** with electricity can occur when a voltage rise appears on the earthing of an installation due to the passage of earth fault current and whilst a person is in contact with either:
- (1) an Exposed (earthed) Metallic Part of an Appliance;
  - (2) an Exposed (earthed) Metallic Part of an Installation;
  - (3) an Extraneous (earthed) Metallic Part in a Premise.
- (15) **“Low Voltage” means** voltage not exceeding 400 volts between phase to phase for three phase supply or 230 volts between phase to neutral in case of single phase supply;
- (16) **“Electrician” means** a person who has been certified by a competent authority to work on electrical installations in the country;
- (17) **“Network Installations” means** installations including telephone network, television network, LAN, security system, etc.
- (18) **“Other fittings” means** fittings including fans that serve purposes other than lighting.
- (19) **“Outdoor” means** electrical equipment intended for outdoor application without any protection but shall withstand damage from external environmental factors.

- (20) **“Owner” includes** the legal owner of a building or property in which an electrical installation is installed and connected to a supply of electricity;
- (21) **“Person” means** a certified electrician involved in the installation, maintenance or operation of electrical installations;
- (22) **“Property” means** anything that is owned by a person or entity;
- (23) **“Public Premises” includes** any occupied or un-occupied building or enclosure or other place where there is an electricity supply. Such locations would include institutions like school, hospital, army cantonment;
- (24) **“Safe” means** no significant risk of injury or death to any person, or of damage to any property, as a result of the use of electrical equipment;
- (25) **“Switchboard” means** a large single panel, frame or assembly of panels having switches, over current and other protective devices; and
- (26) **“User” means** a person(s) or institution making use of the electricity supply for permanent and temporary structures.