



वर्गीय आवश्यकताओं के लिए मानक

सं. टीईसी ६६१३०:२०२५

(सं: टीईसी ६६१३०:२०२४ को अधिक्रमित करता है)

STANDARD FOR GENERIC REQUIREMENTS

TEC 66130:2025

(Supersedes No. TEC 66130:2024)

लाइटनिंग एंड सर्ज प्रोटेक्शन ऑफ टेलीकॉम साइट्स

**LIGHTNING AND SURGE PROTECTION
OF TELECOM SITES**



ISO 9001:2015

दूरसंचार अभियांत्रिकी केंद्र

खुरशीदलाल भवन, जनपथ, नई दिल्ली-११०००१, भारत

TELECOMMUNICATION ENGINEERING CENTRE

KHURSHIDLAL BHAWAN, JANPATH, NEW DELHI-110001, INDIA

www.tec.gov.in

© टीईसी, २०२५

© TEC, 2025

इस सर्वाधिकार सुरक्षित प्रकाशन का कोई भी हिस्सा, दूरसंचार अभियांत्रिकी केंद्र, नई दिल्ली की लिखित स्वीकृति के बिना, किसी भी रूप में या किसी भी प्रकार से जैसे -इलेक्ट्रॉनिक, मैकेनिकल, फोटोकॉपी, रिकॉर्डिंग, स्कैनिंग आदि रूप में प्रेषित, संग्रहीत या पुनरुत्पादित न किया जाए ।

All rights reserved and no part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form and by any means - electronic, mechanical, photocopying, recording, scanning or otherwise, without written permission from the Telecommunication Engineering Centre, New Delhi.

Release 4: September, 2025

FOREWORD

Telecommunication Engineering Centre (TEC) is the technical arm of Department of Telecommunications (DOT), Government of India. Its activities include:

- Framing of TEC Standards for Generic Requirements for a Product/Equipment, Standards for Interface Requirements for a Product/Equipment, Standards for Service Requirements & Standard document of TEC for Telecom Products and Services
- Formulation of Essential Requirements (ERs) under Mandatory Testing and Certification of Telecom Equipment (MTCTE)
- Field evaluation of Telecom Products and Systems
- Designation of Conformity Assessment Bodies (CABs)/Testing facilities
- Testing & Certification of Telecom products
- Adoption of Standards
- Support to DoT on technical/technology issues

For the purpose of testing, four Regional Telecom Engineering Centers (RTECs) have been established which are located at New Delhi, Bangalore, Mumbai, and Kolkata.

ABSTRACT

This document contains the generic requirements for Lightning and Surge Protection of Telecom Sites in the Indian telecom network. The Lightning & Surge Protection System Stage-I & II (Type 1 + 2) in TT configuration shall be installed at the entry of AC mains of the telecom site to protect the complete site against direct lightning strikes and switching surges as per this GR. The Lightning & Surge Protection system shall be compatible with other electrical appliances at the site.

CONTENTS

<u>Clause</u>	<u>Description of Items</u>	<u>Page No.</u>
	History Sheet	5
	Reference Documents	7
	CHAPTER 1– GENERAL REQUIREMENTS & TECHNICAL REQUIREMENTS	9
1.0	Scope.....	9
1.2	Functional & Technical Requirements	9
1.2.1	Functional Requirements	9
2.0	General Requirements.....	13
2.1	Accessibility	14
2.2	Terminations	14
2.3	Cabling and Wiring.....	14
2.4	Earthing	15
2.5.	Mounting of components and Layout.....	15
2.6.	Documentation.....	15
2.7.	Quality Requirements	16
2.8.	Name Plate	18
	CHAPTER 2 - GUIDELINES FOR THE PURCHASER/USER.....	19
	Abbreviations.....	20
	Annexure - Lightning & surge protection drawings	22

HISTORY SHEET

Sr. No.	Name of the Generic Requirements	No. of the Generic Requirements	Remarks
1	Lightning & surge protection of Telecom sites	TEC/GR/FLA/LSP –001/01/June.2010	<p>First issue:</p> <p>The relevant clauses pertaining to surge protection devices for protecting the entire telecom site, have been separated from the GR on SMPS Power Plant. Changes in few parameters Have been Incorporated to accommodate advancement. All cases for certification shall be treated as fresh cases, and no incremental tests are recommended for renewal of type approval.</p>
2	Lightning & surge protection of Telecom sites	TEC/GR/FA/LSP – 001/02/JUN-17	<p>Second issue: revised version of GR on Lightning & surge protection of Telecom sites (No. TEC/GR/FLA/LSP– 001/02/June.2010)</p> <p>Document code is changed from 'TEC/GR/TX/LSP – 001/02/JUN-17 'as per numbering scheme circulated vide letter no. 5-1/2016-RC/TEC(Pt) dated</p>

			19.01.17
3	Lightning & surge protection of Telecom sites	TEC 66130:2024	<p>Third issue: revised version of GR on Lightning & surge protection of Telecom sites (No. TEC/GR/FLA/LSP-001/02/Jun-17).</p> <p>Aligned with latest TEC template in addition to make it compatible with latest IEC standards and enabling provision for Indian Labs.</p>
4	Lightning & surge protection of Telecom sites	TEC 66130:2025	<p>Fourth Issue: Requirements in respect of some of the parameters have been changed in the relevant clauses to accommodate advancements, more optional features for the purchaser and for better clarity.</p>

REFERENCES

1)	QM-115	Quality standard for calculation/verification of MTBF
2)	QM-118	Quality reliability in product design.
3)	IS: 1554 with Amend-1 (June 1994)	Standard for Cables & Wires.
4)	ISO-9001-2015	Quality Management Systems Requirements.
5)	IEC 62305-1:2010	Protection against Lightning – Part 1: General Principle
6)	IEC 62305 - 2:2010	Protection against Lightning – Part 2: Risk Management
7)	IEC 62305 - 3:2010	Protection against lightning – Part 3: Physical damage to structures and life hazard
8)	IEC 62305 - 4:2010	Protection against lightning – Part 4: Electrical & Electronic System Within Structure
9)	IEC 60364 - 5 – 53:2019	Electrical Installation of Building – Part 5 - 53: Selection & Erection of Electrical Equipment
10)	IEC 61643-11:2011 and EN 61643-11: 2012	Low-voltage surge protective devices - Part 11: Surge protective devices connected to low-voltage power systems - Requirements and test methods
11)	IEC 61643-12:2020	Low-voltage surge protective devices - Part 12: Surge protective devices connected to low-voltage power systems - Selection and application principles

Note:

1. Unless otherwise explicitly stated, the latest approved issue of the standard/GR/IR, with all amendments in force, listed in references, on the issuance date of this GR/IR are applicable”.

CHAPTER 1

1.0 Scope

1.1 This document contains the generic requirements for Lightning and Surge Protection of Telecom Site in Indian telecom network. The Lightning & Surge Protection System Stage-I & II (Type 1 + 2) in TT configuration shall be installed at the entry of AC mains of the telecom site to protect the complete site against direct lightning strike and switching surges as per this GR. The Lightning & Surge Protection system shall be compatible with other electrical appliances at the site.

1.2 Functional and Technical Requirements

1.2.1 Functional Requirements

1.3 The Lightning and High Voltage Surge Protection devices, comprising of coordinated Stage-I and Stage-II Protective devices (separately installed or combined/cascaded) in TT configuration shall be deployed/provided. Combined/cascading is the term used to describe the method of combining two stages (I & II) of surge protection devices into one installation as shown in Figure 1(b).

1.3.1.1 The two-stage protection, stage I & stage II separately installed or stage I & stage II combined/cascaded shall be designed in TT configuration as shown in Annexure (Fig-1(a)& 1(b)), to protect the whole station, as detailed below.

Stage-I Protection

This protection, against Lightning Electromagnetic Impulse (LEMP) and

other high surges, shall be provided at the distribution panel provided at the mains supply panel. These protections shall be in compliance with IEC 62305:2010 & IEC 60364-5- 53:2019 and IEC 61643-11: 2011, IEC 61643- 12:2020 and EN 61643-11: 2012 for the following values of current:

(i) For three Phase and single phase supply

Between	Requirement
R, Y, B & N	Greater than or equal to :limp: 25 KA, 10/350 μ S for each Phase; In: 25KA @8/20 μ S for each phase
N & PE	Greater than or equal to : limp: 100KA, 10/350 μ S ; In: 100KA @8/20 μ S

limp: Value of lightning impulse current @10/350 μ S.

In: Value of Nominal Discharge current @ 8/20 μ S.

(ii) For Single Phase supply

Between	Requirement
L & N	Greater than or equal to :limp: 25 KA @ 10/350 μ S ; In: 25KA @8/20 μ S
N & PE	<p>a) Option-I Greater than or equal to : limp: 50 KA @ 10/350 μS ; In: 50 KA@8/20 μS</p> <p>b) Option-II Greater than or equal to : limp: 100 KA @ 10/350 μS ; In:</p>

	<p>100 KA@8/20</p> <p>a) μS</p>
--	--

limp: Value of lightning impulse current @10/350 μ S.

In: Value of Nominal Discharge current @ 8/20 μ S

Purchaser shall specify the protection requirement in respect of Single phase supply i.e. Option I or Option II.

- 1.3.1.2** Necessary enclosure and mounting arrangement for these devices will form part of the arrangement depending upon the types of the SPD. The device shall be din rail mountable with the varistor/spark gap module being pluggable per pole. However, if the purchaser/ user requires pluggable per unit device, the purchaser/ user shall specify it.
- 1.3.1.3** Technology based on low line-follow or zero line-follow current would be adopted as per the requirement of the purchaser. In case of low line-follow current, short circuit current extinguishing value (line depth current extinguishing capacity) without backup fuse/circuit breakers shall be as per IEC guideline, with a minimum of 25 KA rms.
- 1.2.1.4** Rated voltage for the Stage-I arrestors shall not be less than 300 V. Arrestors connected between line and neutral should withstand or Safe Failure Mode voltage up to 440 Volts for 120 minutes as per IEC-61643-11: 2011.
- 1.2.1.5** **SPD status indication**
- SPD status indication shall be provided as per IEC 60364-5- 53:2019 and IEC 61643-12.
- 1.2.1.6** **Protection Voltage**

Voltage protection level (Up) for the co-ordinated stage I & II (Type 1 + 2) separately installed or combined/cascaded SPD shall be ≤ 1.5 KV.

1.2.1.7 Stage-II Protection

Protection against, low voltage surges, shall also be provided at the power plant level. This protection shall be equipped with thermal disconnection and potential free contact for arrestor(s) connected between live & neutral and neutral & earth. This protection shall be in compliance of IEC 62305: 2010 & 60364-5-53 amendment 1-2002 and amendment 2: 2015 for the following values of current:

Between	Protection Requirement
R, Y, B & N	Greater than or equal to $I_n: 20 \text{ KA}, 8/20 \cdot S$ for each phase
N & PE	Greater than or equal to $I_n: 40 \text{ KA}, 8/20 \cdot S$

Where I_n : Value of nominal discharge current @ $8/20 \cdot S$.

Note: Voltage rating of MOVs shall be more than 320 V.

1.2.1.8 The response time of the Stage-I protective devices shall be ≤ 100 nanoseconds, and that of Stage-II devices shall be ≤ 25 nanoseconds.

1.2.1.9 Co-ordination between the two stages (If applicable)

1.2.1.9.1 The protection devices of the two stages shall be tested to work in tandem and in perfect co-ordination to give complete protection against lightning and surges, and also to ensure that the voltage protection level up to 1.5 KV is ensured for the entire site (if applicable).

To cater for this requirement, it is imperative that these devices should be tested simultaneously to ensure perfect coordination. The test agency

will accept a Test Certificate by the labs as mentioned in clause 1.2.1 of this chapter, provided the protective devices of both the stages are tested in the same Lab as per testing procedure given in Standard IEC 61643-11 and IEC 62305-4 (if applicable).

1.2.1.9.2 The Protective device of the two stages shall be of protection level \leq 1.5kv

1.2.1.10 Other features, viz., electronic-triggering for coordination, 'Encapsulated device', plug ability (if applicable, please refer to clause 1.2.1.2 above) for ease of maintenance, and other arrangements for the devices, may be decided to ensure complete protection, as per IEC guidelines, of the entire site along with all installations, against lightning strikes and voltage surges

1.2.1.11 Installation procedures of SPDs

All the requirements for these devices shall be adhered to, as per Annexure (Figure 1a, 1b, 1c, 2 & 3).

The supplier of the devices shall give the installation procedures in their Installation Manual.

1.2.1.12 The cross-sectional area of the conductor required for Stage-I protection shall not be less than 16 mm² and for the second stage shall not be less than 6 mm².

1.2.1.13 The failure of stage-I and stage-II protection devices shall create an extendable visual alarm. If required by the purchaser, an extendable audio alarm shall also be created.

2.0 General Requirement

2.1 Accessibility

2.1.1 All the termination points shall be easily accessible.

2.1.2 All terminals shall be separated by physical barriers to ensure safety.

2.1.3 All the terminals except AC earth shall be electrically isolated.

2.2 Terminations

2.2.1 AC Terminations

2.2.1.1 The input terminals shall be clearly marked as R, Y, B & N for three phase, and L and N for single phase, as applicable.

2.2.1.2 AC input termination shall be suitably protected against accidental touch/contact for the protection of working staff, and shall also have clear and prominent "DANGER" mark. AC terminations shall be standard finger-safe lock-in type connectors conforming to BIS or any other international standard, with the concurrence of the test agency.

2.3 Cabling and Wiring

All the wires and cables including Uninyvin cables used shall be fire retardant as per IS 1554 with amendment 1 (June 94). All the cables & wires including Uninyvin cables used shall also be Rodent & reptiles repellent.

2.3.1 All wiring shall be neatly secured in position and adequately supported. Where wires pass through any part of a metal panel or cover, the hole through which they pass shall have the suitable bush.

2.4 Earthing: Suitable terminals shall be provided for terminating earth conductors, as per IS standards.

2.5 Mounting of component & layout

2.5.1 Component mounting and fixtures shall be secured.

2.5.2 In case of pluggable modules, suitable mechanical structure/ arrangement for holding them in position shall be provided so that they are held firmly.

2.6 Documentation

Technical literature in English and Hindi with complete layout, detailed block schematic and circuit diagrams of its assemblies shall be provided. A soft copy as well as a hard copy of the above shall also be provided. All aspects of installation, operation, maintenance, trouble shooting and replacement shall be covered in this manual. The manual shall also include the following:

a) Installation, Operation and Maintenance:

- i) Safety measures to be observed in handling of the equipment.
- ii) Precautions at the time of installation, operation and maintenance.
- iii) Procedures for routine maintenance, preventive maintenance (by carrying out inspection as per IEC 62305-3:2010), trouble shooting and replacement.
- iv) Complete layout, detailed block schematic and circuit diagrams of its assemblies.

b) Replacement manual:

- i) List of replaceable parts used with the source of procurement.
- ii) Detailed ordering information for all replaceable parts for ordering of spares as and when required.
- iii) Procedure with flowchart for trouble shooting and sub-assembly replacement.
- iv) Test Instruments, Test fixtures, accessories and tools required for maintenance and repair.
- v) Systematic trouble shooting charts (fault-tree) for probable faults and their remedial action.
- vi) Address and telephone numbers of Maintenance centre.

2.6.1 Hard copy of the documentation shall be prepared using good quality paper with clear and crisp printing. All the drawings in clear printing shall be attached to the hand-book binding. The binding of the manual shall be long lasting and presentable. One set of flow chart drawings necessary for trouble-shooting shall also be provided with lamination, with each manual.

2.7 Quality Requirements

2.7.1 Components

The components of the equipment shall be of industrial grade from reputed manufacturer to ensure prompt and continuous service and delivery of spare parts.

2.7.1.1 Fuse/circuit breakers or circuit breakers shall be provided wherever appropriate for the protection against failure of control/sensing circuit. Fuse/circuit breakers shall conform to B.I.S specification.

2.7.1.2 Component Approval

The components used in the Lightning & Surge Protection system

shall be certified by recognized National/International Institutions and approved by a test agency. Components shall be fire retardant.

2.7.2 Quality and Workmanship:

a)The equipment shall be manufactured following international quality management systems ISO-9001-2015, for which the manufacturer shall be duly accredited. A quality plan describing the quality assurance system followed by the manufacturer would be required to be submitted.

b)The equipment shall be manufactured as per the latest BSNL QA Guidelines indicated in Quality Manuals QM-118 (Quality reliability in product design, and discrete terminal assemblies).

c)All wiring shall be neatly secured in position and adequately supported.

2.7.3 Quality Assurance Tests

Each set of the units supplied against the specific order, after type approval, shall be inspected and tested to ensure that the requirements of this document have been met. These tests shall be carried out by QA wing of BSNL.

2.7.4 Finish and painting

The finish of the structure shall conform to color Siemens grey, RAL7035 for indoor or outdoor usage with coating thickness 70 to 130 microns.

2.7.5 Marking and Labelling

2.7.5.1 All terminals shall be properly sign-written and all components properly

labelled so that it shall be easy to identify them with reference to the supplier's Instruction and Maintenance Manuals. Designation of keys, switches and other components and their operating positions shall be clearly engraved or sign-written. The wiring shall be clearly and permanently identified with the designation or colour code which corresponds to the equipment circuit diagram.

2.7.5.2 Fuse/circuit breakers holder identification shall include details of fuse/circuit breakers rating and type.

2.7.5.3 A cabling diagram, screen printed or any other better arrangement ensuring better life expectancy shall be placed in the inside of the front door or any other convenient place for ready reference of the maintenance staff.

2.8 Name plate

A name plate anodised, screen printed or any other better arrangement shall be suitably fixed and shall contain following information :

1. Specification Number:
2. Type of the Unit:
3. Manufacturer's name and identification:
4. Model No.:
5. Unit Serial No.:
6. TAC/TSEC No.:
7. Input voltage and phase:
8. Year of manufacture:

CHAPTER 2

- 3.0 Guidelines for the Purchaser/User:** Purchaser should clearly specify the exact requirements against purchaser guidelines, including any requirements to be specified by the purchaser, before initiating procurement process.
- 3.1** The purchaser shall ensure the availability of coordinated Stage-I & II protection devices, to ensure perfect co-ordination between the two stages at the site, for proper protection against lightning and high voltage surges.
- 3.2** These protections should be housed in an enclosure, supplied by the manufacturer, depending upon the types of the SPDs ordered, with clear instructions of installation.
- 3.3** The purchaser shall decide the features, viz., electronic-triggering for coordination, 'Encapsulated device', pluggability (if applicable) for ease of maintenance, and other arrangements for the devices to ensure complete protection, as per IEC guidelines, of the entire site along with all installations, against lightning strikes and voltage surges.
- 3.4** The purchaser shall clearly specify the requirement of Technology i.e Technology based on low line-follow or zero line-follow current. In case if no specific mention of technology in this regard, OEMs / manufacturers may supply devices based on any one of these technologies.
- 3.5** The purchaser /user shall specify the protection requirement in respect of Single phase supply i.e. Option I or Option II as prescribed in clause 1.2.1.1 (ii).
- 3.6** In case of requirement of pluggable per unit device, the purchaser/ user shall specify the same as mentioned in clause 1.2.1.2.

Abbreviations

A or Amps	Amperes
AC	Alternate Current
AH	Ampere Hour
BIS	Bureau of Indian Standards
BSNL	Bharat Sanchar Nigam Limited
CIGRE	International Conference on Large High Voltage Electric Systems
dB	Decibel
dBA	Decibel Absolute
DC	Direct Current
Deg C	Degrees Celsius
DG	Diesel Generator
DOT	Department of Telecommunication
DSCA	Distribution, Switching, Control, Alarm and Monitoring
e.m.f.	Electro motive force
EMI	Electro Magnetic Interference
FET	Field Effect Transistor
FSD	Full Scale Deflection
FR/FC	Float Rectifier cum Float Charger
FR/BC	Float Rectifier cum Battery Charger
GR	Generic Requirements
IEC	International Electro-technical Commission
ILAC	International Laboratory Accreditation Cooperation
IS	Indian Standards
ISO	International Organisation for Standardisation
Kg	Kilo Grams
KHz	Kilo Hertz
LCD	Liquid Crystal Device

LED	Light Emitting Diodes
LPZ	Light Protection Zone
MHz	Mega Hertz
MIB	Management Information Base
MOV	Metal Oxide Varistor
MTBF	Mean Time between Failures
ms	milliseconds
PCB	Printed Circuit Board
PF	Power factor
QA	Quality Assurance
QM	Quality Manual
RTEC	Regional Telecom Engineering Centre
SMPS	Switch Mode Power Supply
T & D	Technical & Development
U _w	Impulse Withstand Voltage
V	Volts

STAGE 1 & STAGE 2 FOR LIGHTNING & SURGE VOLTAGE PROTECTION EQUIPMENT IN TT SYSTEM

(Co-ordinated)

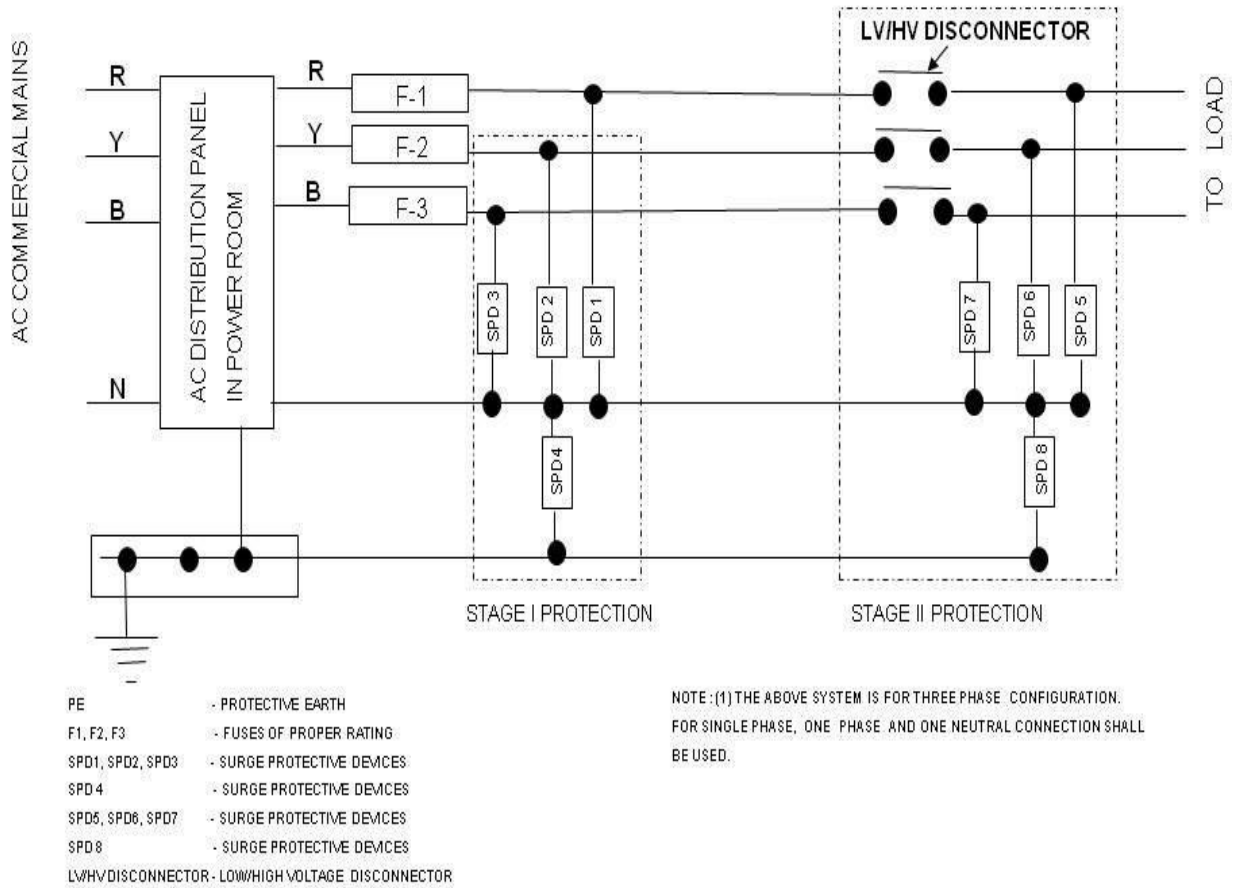
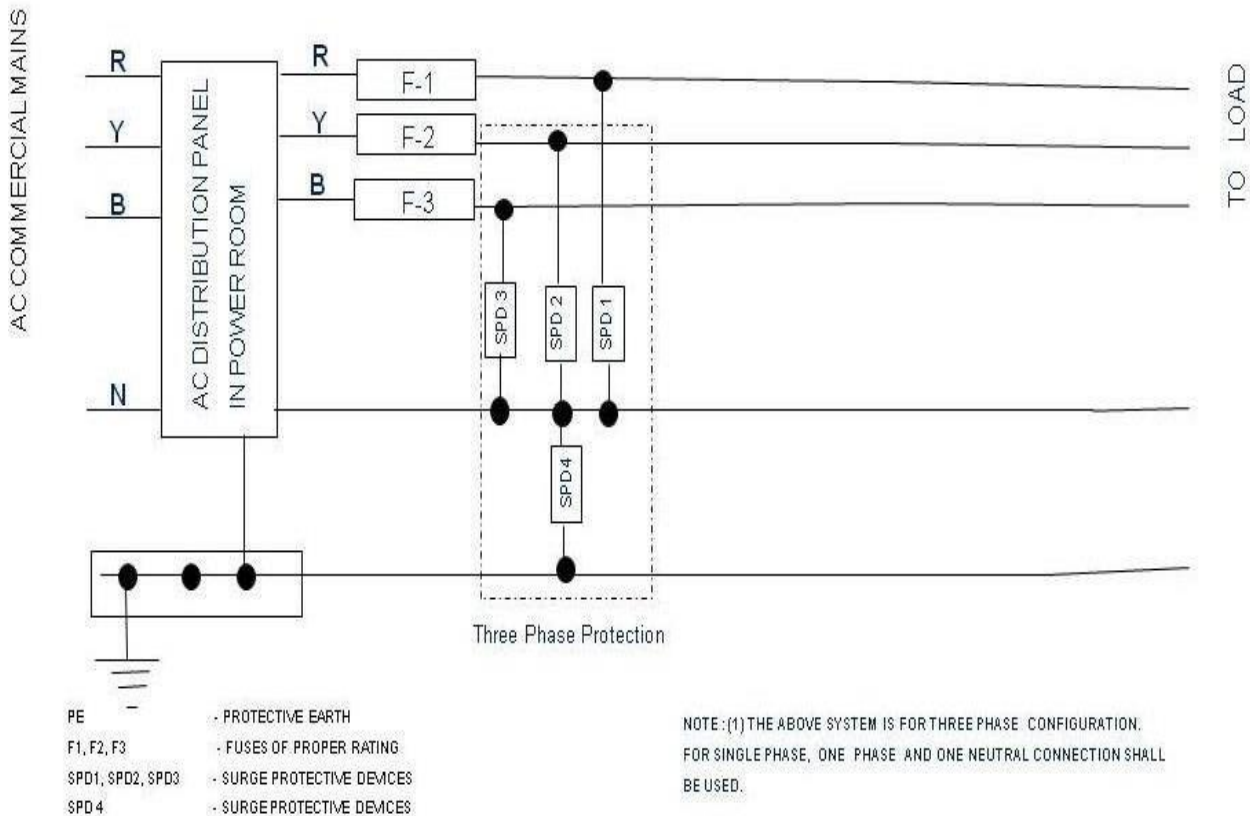


FIGURE 1 (a)

STAGE 1 & STAGE 2 FOR LIGHTNING & SURGE VOLTAGE PROTECTIONEQUIPMENT IN TT SYSTEM

CASCADED



NOTE2: Combined/Cascaded SPD is open to both the technologies spark gap as well as MOV.

Figure - 1(b)

STAGE 1 & STAGE 2 FOR LIGHTNING & SURGE VOLTAGE PROTECTION EQUIPMENT IN TT SYSTEM

CASCADED

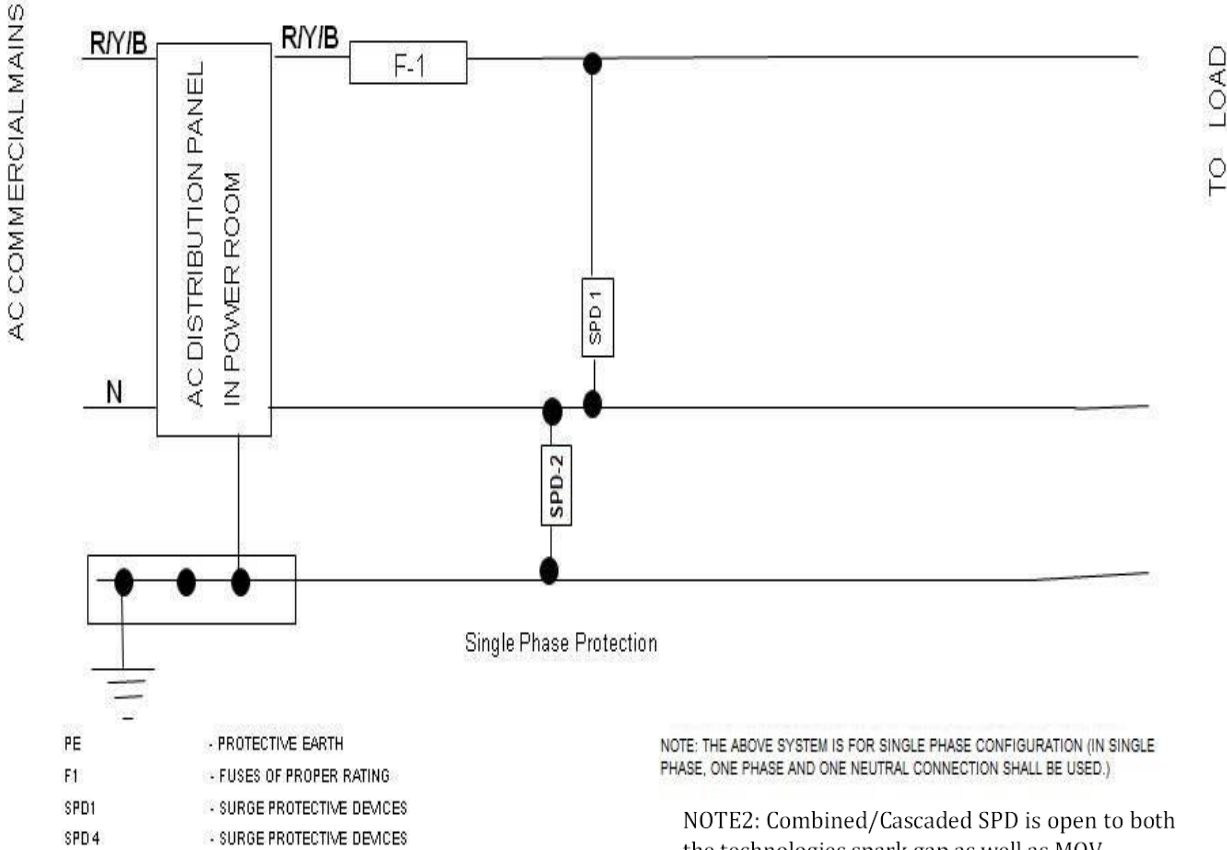
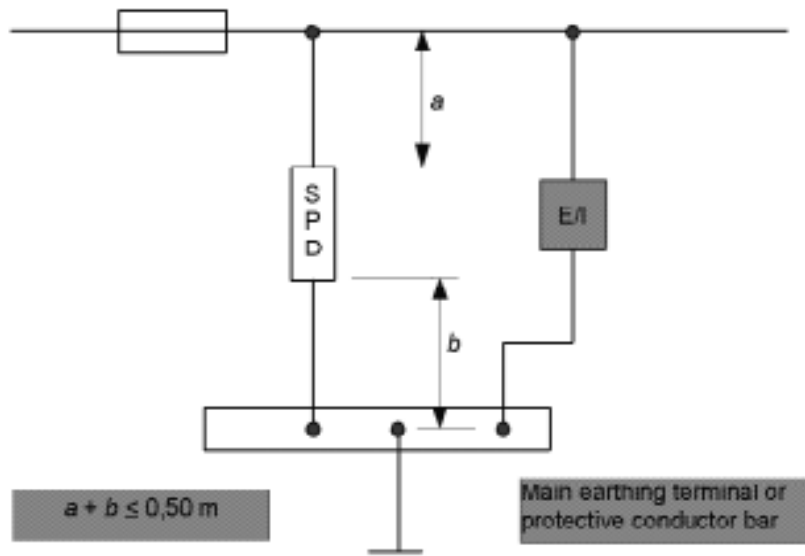
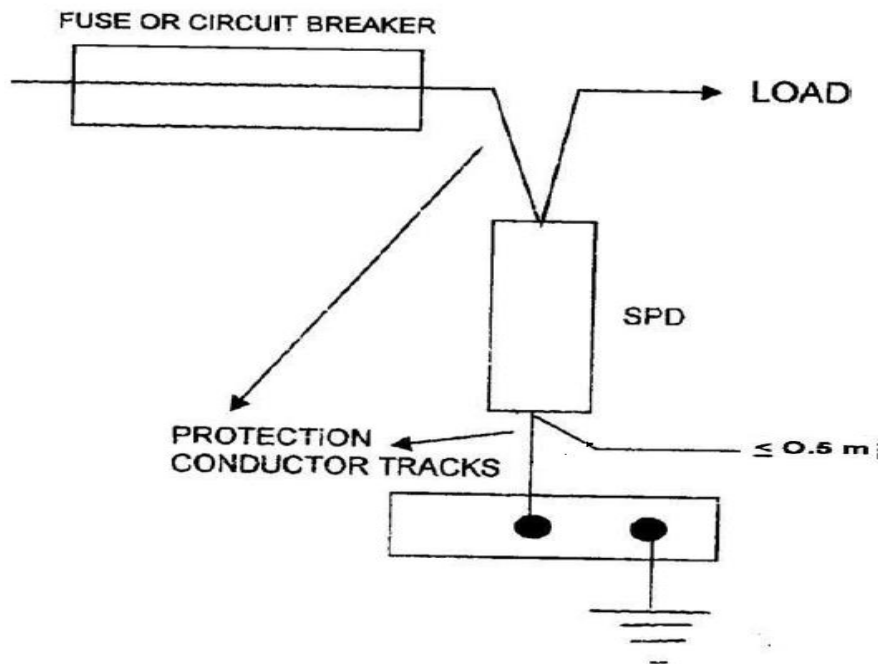


FIGURE 1 (c)



$a + b \leq 0.50 \text{ m}$ (meter) as per IS 732:2019 as amended time to time.

Figure 2



Cable length as per IS 732:2019 as amended time to time.

Figure 3

End of Document