भारतीय मानक

Indian Standard

IS 18925 (Part 5) : 2024
IEC 62561-5 : 2023

विद्युत संरक्षण प्रणाली कम्पोनेंट्स (एलपीएससी)

भाग 5 अर्थ इलेक्ट्रोड निरीक्षण आवास और अर्थ इलेक्ट्रोड सील के लिए अपेक्षाएँ

Lightning Protection System Components (LPSC)

Part 5 Requirements for Earth Electrode Inspection Housings and Earth Electrode Seals

ICS 29.020; 91.120.40

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Electrical Installation Sectional Committee, ETD 20

NATIONAL FOREWORD

This Standard (Part 5) which is identical to IEC 62561-5 : 2023 'Lightning protection system components (LPSC) — Part 5: Requirements for earth electrode inspection housings and earth electrode seals' issued by the International Electrotechnical Commission (IEC) was adopted by the Bureau of Indian Standards on the recommendation of the Electrical Installation Sectional Committee and approval of the Electrotechnical Division Council.

This Indian Standard is published in several parts. The other parts in this series are:

Part 1 Requirements for connection components

Part 2 Requirements for conductors and earth electrodes

Part 3 Requirements for isolating spark gaps ISGs

Part 4 Requirements for conductor fasteners

Part 6 Requirements for lightning strike counters LSCs

Part 7 Requirements for earthing enhancing compounds

Part 8 Requirements for components for isolated LPS

The text of the IEC standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words 'International Standard' appears referring to this standard, they should be read as 'Indian Standard'; and

b) Comma (,) has been used as a decimal marker, while in Indian Standards the current practice is to use a point (.) as the decimal marker.

Only the English language text has been retained while adopting it in this Indian Standard, and as such, the page number given here are not the same as in the IEC publication.

India specific changes have been made to the adopted IEC 62561-5 as outlined in National Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated expressing the result of a test, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

CONTENTS

INTRODUCTION

This part of IEC 62561 deals with the requirements and tests for lightning protection system components (LPSC), specifically earth electrode inspection housings and earth electrode seals, used for the installation of a lightning protection system (LPS) designed and implemented according to the IEC 62305 series [1][1].

[1] Numbers in square brackets refer to the Bibliography.

Indian Standard

LIGHTNING PROTECTION SYSTEM COMPONENTS (LPSC)

PART 5 REQUIREMENTS FOR EARTH ELECTRODE INSPECTION HOUSINGS AND EARTH ELECTRODE SEALS

1 Scope

This part of IEC 62561 specifies the requirements and tests for earth electrode inspection housings (earth housings) installed in the earth and for earth electrode seals.

Lightning protection system components (LPSC) can also be suitable for use in hazardous atmospheres. For this reason, there are additional requirements when installing the components under such conditions.

NOTE Different requirements and test procedures are given in the EN 124 series [2] and the EN 1253 series [3].

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1
earth electrode inspection housing
metallic or non-metallic enclosure that houses the down conductor and earth termination connection for inspection and testing purposes and consists of a housing and a removable lid

3.2
earth electrode seal
water pressure seal used in conjunction with an earth electrode that passes through or enters the foundation or wall of the building, preventing ground water from entering the building

3.3
earth electrode
part or group of parts of the earth termination system which provides direct electrical contact with and disperses the lightning current to the earth

EXAMPLE Earth rods, earth conductors and earth plates.

4 Classification

4.1 Earth electrode inspection housings

Earth electrode inspection housings are classified according to the ability to withstand load stress as follows:

a) class H, heavy duty usage for slow moving vehicular traffic, multi-axle, etc;

b) class M, medium duty usage for slow moving automobiles, etc;

c) class L, light duty usage for walkways, etc.

4.2 Earth electrode seals

Earth electrode seals are classified according to the medium in contact with the earth electrode, as follows:

a) earth electrode in watertight housing;

b) earth electrode through watertight concrete.

5 Requirements

5.1 General

All earth electrode inspection housings and earth electrode seals shall be designed and constructed so that, in normal use according to the manufacturer's or supplier's instructions, their performance shall be reliable, stable and safe to persons and surrounding equipment.

The choice of a material depends on its ability to match the particular application requirements.

5.2 Documentation and installation instructions

The manufacturer or supplier of the earth electrode inspection housing and earth electrode seals shall provide adequate information in their literature to ensure that the installer can select and install the materials in a suitable and safe manner.

The literature shall contain at least the following information:

a) classification as per Clause 4;

b) load withstand force for earth electrode inspection housings in kN;

c) installation instructions.

Compliance is checked by review in accordance with 6.2.

5.3 Marking

5.3.1 Content of marking

All products complying with this document shall be marked at least with:

a) the manufacturer's or responsible vendor's name or trade mark;

b) part number or identifying symbol;

c) classification as per Clause 4;

d) load withstand force for earth electrode inspection housings in kN.

Where this proves to be impractical, the marking in accordance with b), c) and d) may be given on the smallest packing unit.

Compliance is checked in accordance with 6.3.

NOTE Marking can be applied for example by moulding, pressing, engraving, and printing.

5.3.2 Durability and legibility

Compliance is checked in accordance with 6.3.

5.4 Earth electrode inspection housing

The design of the earth electrode inspection housing shall be such that it carries out its function of enclosing the down conductor and earth rod termination in an acceptable and safe manner, and has sufficient internal dimensions to permit the assembly or disassembly of the earth rod clamp. The housing body shall be deep enough to permit the lid to sit flush on the body without interfering with the rod or conductor or clamp assembly.

The material of the earth electrode inspection housing shall be compatible with its surrounding environment, i.e. in terms of load rating, and shall comply with the tests given in 6.4.

5.5 Earth electrode seal

The design of the earth electrode seal shall be such that, in an acceptable and safe manner, it carries out its function of preventing ground water bypassing the earth electrode and entering the foundation or the basement or a wall of a building.

The material of the earth electrode seal shall be compatible with its surrounding environment and comply with the tests given in 6.5.

6 Tests

6.1 General

The tests in accordance with this document are type tests. These tests are of such a nature that, after they have been performed, it is not necessary for these tests to be repeated unless changes are made to the materials, design or type of manufacturing process, which can change the performance characteristics of the product.

Tests are carried out with the specimens prepared as in normal use according to the manufacturer’s or supplier’s instructions, unless otherwise specified.

All tests are carried out on new specimens.

Three new specimens are subjected to the tests and the requirements are satisfied if all the tests are met. If only one of the specimens does not satisfy a test due to an assembly or a manufacturing fault, that test and any preceding one which can have influenced the results of the test shall be repeated. The tests which follow shall be carried out in the required sequence on another full set of specimens, all of which shall comply with the requirements, unless otherwise specified.

The applicant, when submitting the first set of samples, can also submit an additional set of samples that can be necessary should one sample fail. The testing laboratory shall then, without further request, test the additional set of samples, and shall only reject if a further failure occurs. If the additional set of samples is not submitted at the same time, a failure of one sample shall entail rejection.

For products already tested according to IEC 62561-5:2011 and IEC 62561-5:2017, the applicability of previous tests according to Annex A, Table A.1 can be applied.

For new products, complete type tests and samples according to Clause 6 are required.

6.2 Documentation and installation instructions

6.2.1 General conditions

The content of the installation instructions is checked as per its completeness by review.

6.2.2 Acceptance criteria

Documentation or installation instructions are deemed to be acceptable if they contain at least the information given in 5.2.

6.3 Marking test

6.3.1 General test conditions

The marking is checked:

a) as per its completeness in accordance with 5.3.1 by review;
b) as per its durability and legibility by rubbing it by hand for 15 s with a piece of cloth soaked with water and again for 15 s with a piece of cloth soaked with white spirit or mineral spirit.

NOTE Marking made by moulding, pressing or engraving is not subjected to the test of 6.3.1 b).

6.3.2 Acceptance criteria

The specimen is deemed to have passed the test if:

a) the marking contains all information of 5.3.1;
b) after the test of 6.3.1 b) the marking remains legible.

6.4 Earth electrode inspection housing

6.4.1 General test conditions

All tests shall be performed on three new lid specimens using one housing.

6.4.2 Load test

Concrete lid and concrete housing specimens shall be tested after a 28 day curing period. Lid specimens of all other materials shall be tested after a seven day curing period.

The test is carried out on a complete assembly and prepared according to the manufacturer’s instructions.

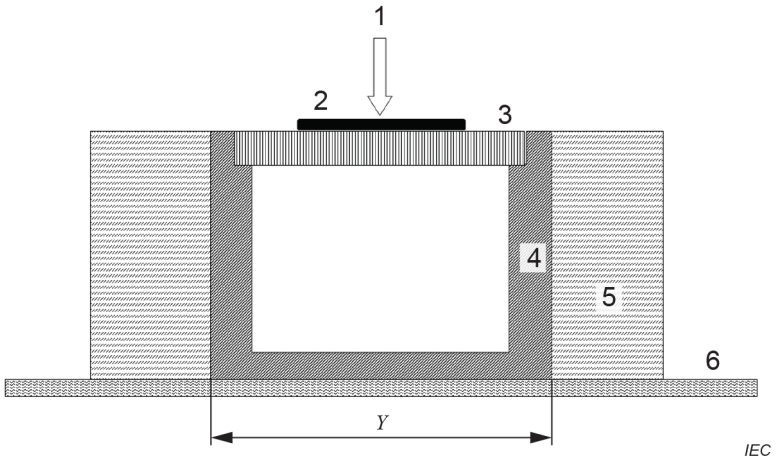
a) First alternative load test

The housing of the specimen shall be surrounded by a material relevant to a declared load rating in accordance with the manufacturer’s instructions.

The thickness of the surrounding material shall be at least 0,5 times the nominal external size of the housing and not greater than the nominal size of the housing or can be reduced as specified by the manufacturer.

The arrangement should be placed on a rigid support.

An example for the test arrangement is shown in Figure 1.



Key

1 force

2 circular steel plate

3 removable lid

4 housing

5 surrounding material

6 rigid support

Y nominal size

The thickness of the surrounding material (5) is usually equal to 0,5 × Y up to 1 × Y . It can be reduced as specified by the manufacturer.

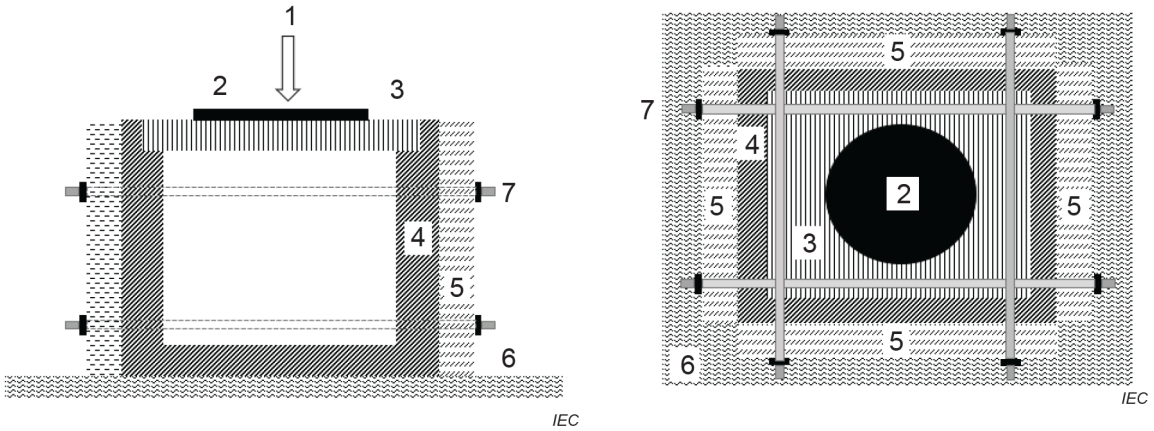
Figure 1 – Test arrangement of the first alternative for load test

b) Second alternative load test

The housing of the specimen shall be confined within steel plates with a minimum thickness of 10 mm, according to the manufacturer's instructions, held together by suitable means for example using threaded rods, fasteners.

The arrangement should be placed on a rigid support.

An example of the second alternative of the load test is shown in Figure 2.



Side view **Top view**

Key

1 force
2 circular steel plate
3 removable lid
4 housing
5 steel plates
6 rigid support
7 threaded rod

Figure 2 – Test arrangement of the second alternative for load test

The product applicable for heavy duty usage, class H (slow moving vehicular traffic, multi-axle, etc.) shall be subjected to a force of 30 kN vertically applied through a circular steel plate with a (170 ± 0,5) mm diameter and a thickness of (20 ± 1) mm with a radius of both edges (top and bottom) of approximately 2 mm.

The product applicable for medium duty usage, class M (slow moving automobiles, etc.) shall be subjected to a force of 15 kN vertically applied through a circular steel plate with a (130 ± 0,5) mm diameter and a thickness of (20 ± 1) mm with an edge radius of approximately 2 mm.

The product applicable for light duty usage, class L (walkways, etc.) shall be subjected to a force of 4 kN vertically applied through a circular steel plate with a (62 ± 0,5) mm diameter and a thickness of (20 ± 1) mm with an edge radius of approximately 2 mm.

The centre of the circular plate should be positioned over the centre of the lid.

The force shall be gradually applied over (60 ± 10) s and maintained for (120 ± 5) s.

The tested load of the product should be declared by the manufacturer.

6.4.3 Acceptance criteria

After the test, the specimens shall show no signs of disintegration, nor crack be visible to normal or corrected vision without additional magnification. One minute after the load has been removed, there shall be no permanent deformation exceeding 3 mm.

The specimens are deemed to have passed the tests if all specimens meet the above requirements.

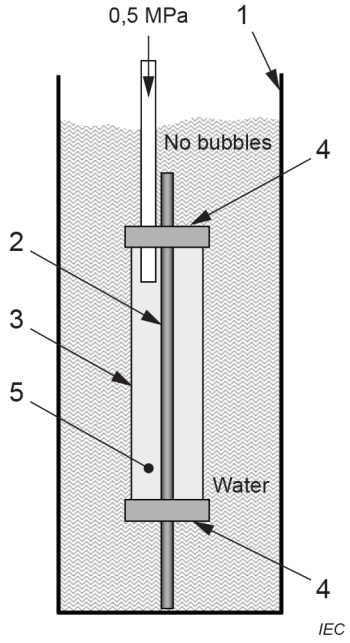
6.5 Earth electrode seal test

6.5.1 Earth electrode in watertight housing

6.5.1.1 General test conditions

Specimens are subjected to a sealing test as follows:

The earth electrode seal shall be assembled in a typical test bed that proves its intended application (as shown in Figure 3).



Key

1 tank filled with water
2 earth electrode rod
3 earth electrode seal arrangement
4 seals
5 air

Figure 3 – Test arrangement for sealing test

A minimum air pressure of 0,5 MPa shall be continuously applied to the seal arrangement for 24 h.

6.5.1.2 Acceptance criteria

The specimens are deemed to have passed the test if no leakage is detected at the sealing points at the completion of the test.

6.5.2 Earth electrode in or through watertight concrete

6.5.2.1 General test conditions

The earth electrode seal shall be set in concrete according to the manufacturer's instructions in a specimen according to 6.5.2.1 a).

a) Specimen

The specimen shall be cubic with a minimum edge length of 150 mm. The composition of the concrete shall be in accordance with Table 1.

Table 1 – Parameters for concrete used for the test arrangement

Component thickness	Water-cement ratio W/C	Cement content	Compressive strength
> 40 cm	≤ 0,7	No requirement	C25/30 or higher
≤ 40 cm	≤ 0,6	≥ 280 kg/m^3 ≥ 270 kg/m^3 where additions are taken into account	

The concrete shall be compacted immediately after placing in the moulds.

b) Curing of specimen

Leave the specimen in the mould for at least 16 h, but not longer than three days, protected against shock, vibration and dehydration at a temperature of (20 ± 5) °C. After removal from the mould, cure the test specimen till immediately before testing, in water at a temperature of (20 ± 2) °C, or in a chamber at (20 ± 2) °C and a relative humidity ≥ 95 %.

c) Application of water pressure

The test shall be started when the specimen is at least 28 days old. Place the specimen in the apparatus and apply a water pressure of (100 ± 10) kPa for (72 ± 2) h (as shown in Figure 4).

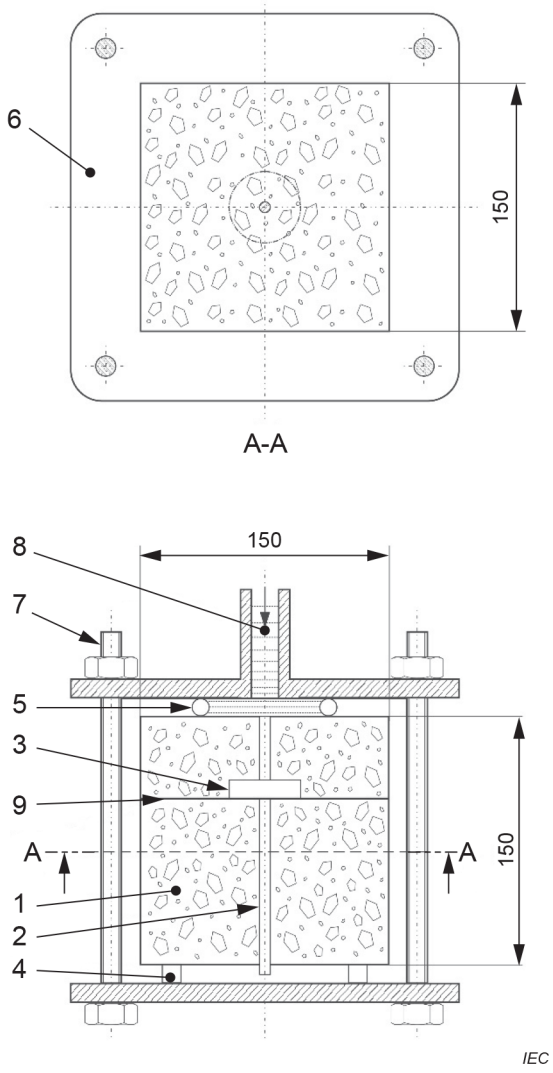
d) Examination of specimen

After the pressure has been applied for the specified time, remove the specimen from the apparatus. Wipe the face on which the water pressure was applied to remove excess water. Split the specimen in half, perpendicularly to the face on which the water pressure was applied. When splitting the specimen, and during the examination, place the face of the specimen exposed to the water pressure on the bottom. As soon as the split face has dried to such an extent that the water penetration front can be clearly seen, mark the water front on the specimen. Measure the maximum depth of penetration under the test area and record it.

6.5.2.2 Acceptance criteria

The specimen is deemed to have passed the test if the depth of water penetration does not exceed the point identified by line 9 in Figure 4.

Dimensions in millimetres



Key

1 specimen made of concrete
2 earth electrode seal (e.g. wall bushing or fixed earthing terminal)
3 water barrier
4 packing piece
5 sealing ring
6 screwed-on plate
7 bolt
8 water under pressure
9 permitted maximum water penetration

Figure 4 – Example of a test arrangement for depth of penetration of water under pressure

7 Electromagnetic compatibility (EMC)

Products covered by this document are, in normal use, passive in respect of electromagnetic influences (emission and immunity).

8 Structure and content of the test report

8.1 General

The purpose of this Clause 8 is to provide general requirements for laboratory test reports. It is intended to promote clear, complete reporting procedures for laboratories submitting test reports.

The results of each test carried out by the testing laboratory shall be reported accurately, clearly, unambiguously and objectively, in accordance with any instructions in the test methods. The results shall be reported in a test report and shall include all the information necessary for the interpretation of the test results and all information required by the method used.

The report shall be arranged and presented in such a way that it is easily assimilated by the reader, especially with regards to presentation of the test data. The format shall be specifically designed for each type of test carried out, but the headings shall be standardized as indicated below.

The structure of each report shall include at least the information specified in 8.2 to 8.9.

8.2 Report identification

The following information shall be included:

a) a title or subject of the report;

b) name and e-mail address or telephone number of the testing laboratory;

c) name, address and telephone number of the sub-testing laboratory where the test was carried out if different from the company which was assigned to perform the test;

d) unique identification number (or serial number) of the test report;

e) name and address of the vendor;

f) paginated report and indication of the total number of pages on each page, including appendices or annexes;

g) date of issue of the report;

h) date(s) test(s) was (were) performed;

i) signature and title, or an equivalent identification of the person(s) authorized to sign by the testing laboratory to attest to the content of the report;

j) signature and title of person(s) conducting the test(s);

k) the following declaration in order to avoid misuse: "This type test report shall not be reproduced other than in full, except with the prior written approval of the issuing test laboratory. This type test report only covers the samples submitted for test and does not produce evidence of the quality for series production."

8.3 Specimen description

a) sample description;

b) detailed description and unambiguous identification of the test specimen and test assembly, for example part number, type, classification, material, dimensions;

c) characterization and condition of the test specimen or test assembly or both;

d) sampling procedure, where relevant;

e) date of receipt of test samples;

f) photographs, drawings or any other visual documentation, if available.

8.4 Standards and references

a) The test standard used shall be identified and the date of issue of the standard shall be given.

b) Reference to this document may only be made if the full set of tests is performed and reported, except where the deviations are clearly justified in 8.5 b).

c) Other relevant documentation with the documentation date shall be provided.

8.5 Test procedure

a) description of the test procedure;

b) justification for any deviations from, additions to or exclusions from the referenced standard;

c) any other information relevant to a specific test such as environmental conditions;

d) configuration of testing assembly and measuring set-up;

e) location of the arrangement in the testing area and measuring techniques.

8.6 Testing equipment, description

Description of equipment used for every test conducted, e.g. presses, air compressors.

8.7 Measuring instruments description

Characteristics, serial number and calibration date of all instruments used for measuring the values specified in this document, e.g. dynamometers, air boost gauges.

8.8 Results and parameters recorded

a) the required passing criteria for each test as defined in the standard;

b) the relevant measured, observed or derived results of the tests.

The above shall be presented by way of tables, graphs, drawings, photographs or other documentation of visual observations as appropriate.

8.9 Statement of pass or fail

A statement that the specimen passed or failed the tests shall be reported. If the specimen has failed, a description of failure is necessary.

Annex A
(normative)

Applicability of previous tests

For earth electrode inspection housings and earth electrode seals already successfully tested in accordance with IEC 62561-5:2011 or IEC 62561-5:2017, differences between versions in the test procedures identified in Table A.1, are not considered significant enough to warrant the re-testing of the product to meet the requirements of IEC 62561-5:2023.

It is not necessary to repeat tests when the manufacturer of that product clearly states that their product meets all the following requirements.

- There is no change in the classification of the product since it was successfully tested;
- There is no change in the method of manufacture of the product since it was successfully tested;
- There is no change in the design of the product since it was successfully tested;
- There is no change in the materials used in the product since it was successfully tested;

For new products, complete type tests according to this document shall be performed.

Table A.1 – Differences in the requirements for earth electrode inspection housings and earth electrode seals complying with IEC 62561-5:2011 or IEC 62561-5:2017

Test description	IEC 62561-5:2011	IEC 62561-5:2017	Re-testing required
Load test	5.2.2	6.2.2	No
Earth electrode in watertight housings test	5.3	6.3.1	No
Earth electrode in or through watertight concrete	-	6.3.2	No

Bibliography

[1] IEC 62305 (all parts), *Protection against lightning*

[2] EN 124 (all parts), *Gully tops and manhole tops for vehicular and pedestrian areas*

[3] EN 1253 (all parts), *Gullies for buildings*

NATIONAL ANNEX A

(*National Foreword*)

A-1 BIS CERTIFICATION MARKING

The product(s) conforming to the requirements of this standard may be certified as per theconformity assessment schemes under the provisions of the *Bureau of Indian Standards* Act,2016 and the Rules and Regulations framed thereunder, and the product(s) may be marked with the Standard Mark.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 2016 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website-www.bis.gov.in or www.standardsbis.in.

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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