SLOVENSKI STANDARD
SIST EN 61478:2004

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Delo pod napetostjo - Lestve iz izolacijskega materiala (IEC 61478:2001)

Live working - Ladders of insulating material

Arbeiten unter Spannung - Leitern aus isolierendem Material

Travaux sous tension - Echelles en matériau isolant

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English version

Live working - Ladders of insulating material (IEC 61478:2001)

Travaux sous tension -
Echelles en matériau isolant
(CEI 61478:2001)

Arbeiten unter Spannung -
Leitern aus isolierendem Material
(IEC 61478:2001)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 78/394/FDIS, future edition 1 of IEC 61478, prepared by IEC TC 78, Live working, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61478 on 2001-12-01.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2002-09-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2004-12-01

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, annexes A, B, C and ZA are normative and annex D is informative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61478:2001 was approved by CENELEC as a European Standard without any modification.

CONTENTS

LIVE WORKING – LADDERS OF INSULATING MATERIAL

1 Scope

This International Standard is applicable to fully insulating spliced or hook ladders with extension or having a combination of insulating and conductive sections and used for live working on a.c. or d.c. electrical installations at 1 000 V and above for a.c. and 1 500 V and above for d.c.

The ladders are classified functionally as Category 1 and Category 2.

This standard concerns only ladders made of synthetic material.

These ladders are used, to provide access, generally on overhead line structures and to facilitate live working, either hot stick, barehanded or a combination of both.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60050(151):2001, *International Electrotechnical Vocabulary (IEV) – Chapter 151: Electrical and magnetic devices*

IEC 60212:1971, *Standard conditions for use prior to and during the testing of solid electrical insulating materials*

IEC 60743, *Live working – Terminology for tools, equipment and devices* [1]

IEC 60855:1985, *Insulating foam-filled tubes and solid rods for live working*

IEC 61235:1993, *Live working – Insulating hollows tubes for electrical purposes*

IEC 61318:1994, *Live working – Guidelines for quality assurance plans*

ISO 2859-1:1999, *Sampling procedures for inspection by attributes – Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

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1 Second edition to be published (presently RDIS/326).

ISO 9000: 2000, *Quality management systems – Fundamentals and vocabulary*

ISO 9001:2000, *Quality management systems – Requirements*

ISO 9004:2000, *Quality management and quality system elements – Guidelines for performance improvements*

3 Definitions

For the purpose of this International Standard, the following definitions apply.

3.1
section
unit of a ladder consisting of a minimum of three rungs

3.2
base section
first element of a ladder designed to support other sections

NOTE It may be the highest or lowest element of a ladder.

3.3
spliced ladder
ladder constructed of sections that are made of metal or synthetic material and spliced together

[IEC 60743, 9.1.3]

3.4
insulating hook ladder
insulating ladder equipped to one end with permanent or removable hooks which can be rigid or can rotate

[IEC 60743, 9.1.4]

3.5
insulating ladder extension
additional insulating section which can be fixed to an insulating hook ladder or another ladder extension

[IEC 60743, 9.1.5]

3.6
support bracket
device designed to be fastened to any level of the structure and supporting the load of the spliced ladder

NOTE It may also be fitted to the structure between spliced ladder sections.

3.7
cradle
device designed to hold the ladder at a fixed distance from the structure on which it is positioned

3.8
fixing system
link device designed to hold the ladder firmly to the structure

3.9
connecting device
constructive arrangement allowing the connection of two ladder extensions or one ladder extension and one base section

3.10
adjustable foot
device inserted on a height-adjustable base section in order to adjust a level difference between the two ladder feet

3.11
type test
test of one or more devices made to a certain design to show that the design meets certain specifications

3.12
routine test
test to which each individual device is subjected during or after manufacture to ascertain whether it complies with certain criteria

3.13
sampling test
test on a number of devices taken at random from a batch

3.14
acceptance test
contractual test to prove to the customer that the device meets certain conditions of its specification

[IEV 151-16-23]

4 Classification

4.1 Category 1

Category 1 ladders are designed to be attached to overhead line structures to allow climbing.

These ladders are positioned vertically on the structures with special cradles and they are attached by fixing systems to prevent the ladder from moving on the structures. The ladder may rest either on the ground or on a special platform fitted to the structure. These ladders shall comprise a minimum of one insulating section. They may be extended by the use of additional insulating or conductive sections suitably interlocked.

Category 1 ladders are restricted to voltages up to and including 36 kV.

4.2 Category 2

Category 2 ladders are designed for live working, either hot stick or bare hand, to provide access to live parts in either a horizontal, vertical or inclined position. Ladders are positioned on the structure by two hooks or by a special turning saddle. These ladders can be extended by the use of a hook ladder extension.

5 Requirements

5.1 General physical requirements

The rungs shall have a non-slip surface and shall be perpendicular to the stiles. The shape of rungs shall be designed to ensure a firm grip for gloved hands and also a support that ensures comfort for the worker wearing shoes or boots.

All metal parts shall be corrosion resistant.

5.2 Category 1 physical requirements

5.2.1 Base section

The length of base sections shall be within the following ranges:

- 2 100 mm to 2 400 mm;
- 3 000 mm to 3 500 mm;

with a margin of ±5 mm in all cases.

NOTE The difference in length of the two stiles should not exceed 2 mm.

A base section includes:

- two stiles, each having an adjustable height foot;
- seven or ten rungs according to the length;
- two cradles;
- two or three fixing systems according to the section length: one is at the same level as each cradle, the other is upon the first lower rung.

The base section shall be equipped at its upper part with a female connecting device of the same type as that of the other ladder sections.

5.2.2 Ladder extensions

The length of extensions shall be within the following ranges:

- 1 200 mm to 2 000 mm;
- 2 400 mm to 3 000 mm;
- 3 500 mm to 4 000 mm;

with a margin of ±5 mm in all cases.

NOTE The difference in length of the two stiles should not exceed 2 mm.

Each extension shall be equipped at its lower part with a male connecting device and at its upper part with a female connecting device of the same type as that of the other ladder extensions.

5.2.3 Stiles

The distance between the stile axis shall be within the range 270 mm to 320 mm which shall also be the distance between the connecting device axis (see figure 1).

5.2.4 Fixing systems

The useful length of a fixing system shall be such that it is suitable for its purpose. If necessary, every fixing system may be fitted with an extension, the useful length of which shall be not less than 1 000 mm.

The most common fixing system is one which consists of a flexible strap together with two adjusting devices to permit the system to be secured. The minimum width of such a fixing system and its possible extension, shall be not less than 20 mm. The strap shall be fitted with safety hooks at the ends to fit easily into one-piece tightening rings. Each end of the strap shall be fitted with a suitable end stop to prevent it pulling through the adjusting devices.

Other similar systems using cords or other flexible components shall meet the same criteria for integrity and security as set out in 6.4.2.4 and 6.4.2.5.

Fixing systems shall have a double adjustment and shall be able to be connected with a safety hook on a ring. They shall be fixed at approximately the same level as the cradle. The adjustment device shall be used with ease from the ladder. For that purpose, the fixing system shall slide easily in the tightening ring. The tightening ring shall be of one piece design. The end of each fixing device shall be equipped with a stop device to prevent it from escaping out of the corresponding ring. The extension shall have an adjustment device.

Fixing systems shall be made of synthetic waterproof material and be designed for easy use.

5.2.5 Connecting device

Except as given in 5.3.4, the shape and dimensions of male and female parts of the same ladder are not prescribed. However they shall be compatible and the whole connecting device shall comply with the mechanical tests as specified in 6.4.

5.2.6 Cradles

Cradles shall be made of conductive or non-conductive material according to the ladder section composition. Each cradle is fixed to the section immediately below a rung. Cradles shall have a shape allowing the sections to be easily stacked. An example of a cradle is shown in figure 2.

5.3 Category 2 physical requirements

5.3.1 Base section

The length of hook ladder base sections shall be within the range 2 400 mm to 6 200 mm with a margin of ±5 mm.

NOTE The difference in length of the two stiles should not exceed 2 mm.

The base section comprises:

- two stiles each having at one end a swiveling hook and safety chain made of corrosion-proof metal and at the other end a ring to anchor a rope;
- 8 to 20 anti-skid rungs according to the section length.

5.3.2 Ladder extensions

The length of ladder extensions shall be within the range 1 500 mm to 6 200 mm with a margin of ±5 mm.

NOTE The difference in length of the two stiles should not exceed 2 mm.

Each stile of a ladder extension shall have a connecting device at one end and a ring at the other for anchoring a rope (see figure 3).

Ladder extensions shall include 5 to 20 rungs according to the section length.

5.3.3 Stiles

The distance between the stile axis shall be within the range 280 mm to 400 mm which shall also be the distance between the connecting device axis.

5.3.4 Connecting device

Each of the ladder extension stiles shall include a connecting device of length within the range 15 mm to 250 mm.

Positive locking of the connecting device between the base section and the ladder extension shall be ensured.

5.4 Mechanical requirements

5.4.1 General mechanical requirements

Each ladder and ladder extension (Category 1 or Category 2 ladders) shall successfully pass the mechanical tests as specified in 6.4.1.

The intermediate sections shall support the weight of the whole ladder plus the safe working load.

These tests guaranty that the ladder complies with the fundamental expected requirements of a ladder. The ladder is not specifically designed to be a fall arrest anchor point.

5.4.2 Category 1 mechanical requirements

Two connected elements shall resist a deflection load of 1 000 N.

The assembly of the rung into the stile shall resist a load of 2 000 N.

The fixing system and its extension shall each resist a load of 1 000 N.

The cradle shall resist a vertical load of 500 N.