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TECHNICAL REPORT

Live working – Guidelines for the installation of transmission and distribution line conductors and earth wires – Stringing equipment and accessory items

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LIVE WORKING – GUIDELINES FOR THE INSTALLATION OF TRANSMISSION AND DISTRIBUTION LINE CONDUCTORS AND EARTH WIRES – STRINGING EQUIPMENT AND ACCESSORY ITEMS

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IEC TR 61328 has been prepared by IEC technical committee 78: Live working. It is a Technical Report.

This fourth edition cancels and replaces the third edition published in 2017. It incorporates some technical changes to update equipment work methods and procedures, bringing them in line with the state of the art. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) Keeping the content of the previous edition but without mandatory terms as required by IEC ISO Directives 2 for a Technical Report.

The text of this Technical Report is based on the following documents:

Draft	Report on voting
78/1455/DTR	78/1475/RVDTR

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Report is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

In this document, the following print types are used:

- Terms defined in Clause 3 are given in *italic* font.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

INTRODUCTION

This document discusses general tensions, *stringing* methods of transmission and distribution line *conductors*. Special attention is given to the equipment involved, such as *tensioners*, *pullers*, grips, *blocks* and rollers. Due to the hazards involved in *stringing* near *energized* lines, the general concepts of electric and magnetic induction are presented along with safe application methods of earthing equipment.

The overall intent of this document is to provide state of the art methods in an informative manner, recognizing that there are several procedural variations within the industry. There are also multiple standards and regulatory jurisdictions which prescribe methods and requirements beyond the scope of this document.

LIVE WORKING – GUIDELINES FOR THE INSTALLATION OF TRANSMISSION AND DISTRIBUTION LINE CONDUCTORS AND EARTH WIRES – STRINGING EQUIPMENT AND ACCESSORY ITEMS

1 Scope

This document, which is a Technical Report, provides information for the selection of *conductor stringing, earthing* and *bond*ing equipment used for the installation of bare and insulated overhead distribution *conductors*, as well as overhead transmission *conductors* and overhead *earth wire*s.

Procedures are given for installation and maintenance of distribution and transmission conductors. A discussion of electric hazards is provided as well as relevant *earthing* and *bond*ing techniques.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050-466:1990, *International Electrotechnical Vocabulary (IEV) – Part 466: Overhead lines* (available at www.electropedia.org)

IEC 60050-651:2014, *International Electrotechnical Vocabulary (IEV) – Part 651: Live working* (available at www.electropedia.org)

IEC 60743:2013, *Live working – Terminology for tools, devices and equipment*

3 Terms, definitions and acronyms

NOTE Terminology for equipment and procedures associated with the installation of overhead *conductors* and *earth wire*s varies widely throughout the utility industry.

For the purposes of this document, the terms and definitions given in IEC 60050-466, IEC 60050-651, IEC 60743 and the following 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 Terms and definitions

3.1.1
anchor
anchor log
deadman
sledge
snub
device that serves as a reliable support to hold an object firmly in place

3.1.2
basket
bucket
device designed to be attached to the boom tip of a line truck, crane or aerial lift to support workmen in an elevated working position

3.1.3
block
tackle
pulley
device designed with one or more sheaves, a synthetic plastic or metal shell, and an attachment hook or shackle

3.1.4
bond
equipotential connection
connection
electrical connection used to bring all personnel and objects in the work area to the same potential

3.1.5
bullwheel
wheel or wheels incorporated as an integral part of a *puller* or *tensioner* with multiple offset grooves allowing the continuous winding of a *conductor* or a rope to generate pulling or braking tension, through friction

3.1.6
circuit
<of an overhead line> *conductor* or system of *conductors* through which an electric current is intended to flow

Note 1 to entry: In transmission and distribution lines, a *circuit* usually consists of three phases for AC lines, and two poles for DC lines.

[SOURCE: IEC 60050-466:1990, 466-01-07]

3.1.7
clearance
minimum separation between two *conductors* operating at different voltages, between *conductor*s and supports or other objects, or between *conductor*s and the earth

3.1.8
clipping-in
clamping-in
clipping
transferring of sagged *conductor*s from the *stringing block*s to their permanent suspension positions and the installing of the permanent suspension clamps

3.1.9
compression joint
conductor splice
sleeve
splice
tubular compression (or implosive) sleeves designed and fabricated from aluminium, copper or steel compressed to join or terminate *conductor*s or overhead *earth wires*

3.1.10
conductor
cable
wire
bare or insulated wire or combination of wires, suitable for carrying an electric current

3.1.11
conductor bundle
set of individual *conductor*s connected in parallel and disposed in a uniform geometrical configuration, that constitutes one phase or pole of a line

[SOURCE: IEC 60050-466:1990, 466-10-20]

3.1.12
conductor car
cable buggy
cable car
conductor trolley
line car
spacer buggy
spacing bicycle
spacer cart
device designed to carry workmen riding on sagged single or bundle *conductor*s, enabling them to inspect the *conductor*s for damage or install spacers, dampers or other attachments

3.1.13
conductor clamp
chicago grip
conductor grip
come-along
come-along clamp
preformed, bolted or wedge-type device designed to permit the pulling or temporary holding of the *conductor* or of the rope without *splicing* on fittings, eyes, etc.

3.1.14
connector link
pulling rope connector
link
peanut
fixed joint
rigid link designed to connect *pulling rope*s and usually designed to pass through the grooves of *bullwheels* on the *puller* when under load

3.1.15
dead-ending
procedure which results in the termination of *conductor*s at an *anchor structure*

3.1.16
earthing cable
flexible *conductor* usually of stranded copper with a transparent cable protective sheath, and attached at both ends to clamps, designed to connect *conductor*s or equipment to *earth* or to an *earth mat*

3.1.17
earth clamp
clamp forming part of an *earthing and short-circuiting* device connecting an *earthing cable*, or a *connecting cluster* to an earthing conductor, or an earth electrode or a reference potential

[SOURCE: IEC 60050-651:2014, 651-25-03]

3.1.18
earth mat
counterpoise
earth grid
system of interconnected bare *conductor*s arranged in a pattern over a specified area on, or buried below, the surface of the Earth

3.1.19
earth rod
earth electrode
rod driven into the Earth to serve as an earthing terminal

EXAMPLE Copper-clad steel rod, solid copper rod, or galvanized steel rod.

3.1.20
earth wire
shield wire
skywire
static wire
conductor connected to *earth* at some or all supports, which is suspended usually but not necessarily above the line *conductor*s to provide a degree of protection against lightning strikes

[SOURCE: IEC 60050-466:1990, 466-10-25]

3.1.21
earthing stick
earthing pole
insulating component equipped with a permanent or detachable *end fitting* for installing clamps, *short-circuiting bars* or *conductive extension components* onto *electrical installation*

[SOURCE: IEC 60050-651:2014, 651-25-05]

3.1.22
earthing system
system consisting of all interconnected earthing connections in a specific area, such as a *pull section*

3.1.23
electromagnetic induction
electromagnetic coupling
phenomenon that produces both an induced voltage and current either through electric or *magnetic field induction*

3.1.24
electric field induction
capacitive coupling
process of generating voltages and/or currents in a conductive object or electrical *circuit* by means of time-varying electric fields

3.1.25
energized
alive
current-carrying
hot
live
at a potential significantly different from that of the *earth* at the work site and which presents an electrical hazard

Note 1 to entry: A part is *energized* when it is electrically connected to a source of electric energy. It can also be *energized* when it is electrically charged under the influence of an electric or magnetic field.

[SOURCE: IEC 60050-651:2014, 651-21-08]

3.1.26
equipotential
set of points all of which have the same potential

3.1.27
fault
physical condition that causes a device, a component, or an element to fail to perform in a required manner

3.1.28
fault current
earth fault current
current flowing at a given point of a network resulting from a *fault* at another point of this network

3.1.29
hold-down block
block designed to prevent uplift and to maintain the *pilot rope* or *conductor(s)* inside the sheaves of the *stringing block* installed on the tower

3.1.30
isolated
<device or *circuit*> disconnected completely from other devices or *circuit*s, and thus separated physically, electrically and mechanically from all sources of electrical energy

Note 1 to entry: Such separation may not eliminate all effects of *electromagnetic induction*.

3.1.31
jumper
dead end loop
conductor that connects the *conductor*s on opposite sides of a dead-end *structure*

3.1.32
magnetic field induction
inductive coupling
process of generating voltages and/or currents in an electrical *circuit* by means of time-varying magnetic fields

3.1.33
pilot rope
lead line/rope
leader
P-line/rope
straw line/rope
pre-pilot rope
lightweight rope, either wire rope or synthetic fibre rope, used to pull heavier *pulling rope*s which in turn are used to pull the *conductor*

3.1.34
pilot rope puller
device designed to payout and rewind *pilot rope*s during *stringing* operations

3.1.35
portable earth interrupter tool
portable switching device designed to break high circulating currents, and which prevents an unmanageable large arc from occurring in the removal of the last *earth* in an *earthing system*

3.1.36
pull section
pull setting
stringing section
section of line where the *conductor* is being pulled into place by the *puller* and *tensioner*

3.1.37
pull site
puller set-up
location in a *pull section* where the *puller*, *reel winder* and *anchors* (snubs) are located

3.1.38
puller
drum
hoist
tugger
equipment designed to pull *pulling rope*s during *stringing* operations

[SOURCE: IEC 60743:2013, 14.1.3, modified – Admitted terms have been changed, "conductor(s)" has been deleted from the definition, and Notes to entry have been deleted]

3.1.39
puller-tensioner
equipment designed to pull *pulling rope*s or *conductor*(s) or to hold mechanical tension against a *pulling rope* or *conductor*(s) during *stringing* operations

[SOURCE: IEC 60743:2013, 14.1.5, modified – Notes to entry have been deleted]

3.1.40
pulling rope
bull line/rope
hard line/rope
sock line/rope
anti-twisting braided rope
high strength rope, normally steel wire rope or less frequently synthetic fibre rope, used to pull the *conductor*, with formation and construction that ensure non-twisting capability under pull operation

3.1.41
pulling vehicle
pulling tractor
towing vehicle
piece of mobile ground or air borne equipment capable of pulling *pilot rope*s, *pulling rope*s or *conductor*s