

# 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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INTERNATIONAL  
ELECTROTECHNICAL  
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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, which is a Technical Report, has been prepared by IEC technical committee 78: Live working.

This third edition cancels and replaces the second edition published in 2003 and IEC TR 61911:2003. It incorporates some technical changes to update equipment work methods and procedures, bringing them in line with the state of the art.

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

Enquiry draft	Report on voting
78/1145/DTR	78/1174/RVDTR

Full information on the voting for the approval of this Technical Report can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

Terms defined in Clause 3 are given in *italic* print throughout this standard.

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## INTRODUCTION

With the increased difficulty of de-energizing existing overhead lines, installing *conductors* or *earth wire* in *circuits* nearby, or crossing these existing *circuits*, creates hazards requiring special considerations particularly with regard to earthing and bonding. It is also important to provide protections against induced static charge due to atmospheric conditions, lightning strikes, or accidental energization.

These potential electrical hazards demand that certain requirements be observed when choosing equipment and work methods for the protection of personnel or equipment.

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# 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 recommendations for the selection and testing where necessary of *conductor stringing* equipment and accessory items used for the installation of bare and insulated overhead distribution *conductors*, bare overhead transmission *conductors* and overhead *earth wires*.

Procedures are recommended for proper earthing in order to protect equipment, components and personnel from currents which can result from accidental contact with nearby *energized conductors* or from the induced or *fault currents* which can result in some circumstances.

The items of equipment under consideration in this document are used for transmission and distribution systems.

## 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.

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IEC 60050-466, *International Electrotechnical Vocabulary – Chapter 466: Overhead lines* (available at [www.electropedia.org](http://www.electropedia.org))

IEC 60050-651, *International Electrotechnical Vocabulary – Part 651: Live working* (available at [www.electropedia.org](http://www.electropedia.org))

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

## 3 Terms and definitions

NOTE Terminology for equipment and procedures associated with the installation of overhead *conductors* and *earth wires* 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 terminological databases for use in standardization at the following addresses:

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

**3.1****anchor**

anchor log  
deadman  
sledge  
snub

device that serves as a reliable support to hold an object firmly in place

**3.2****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

**3.3****birdcaging**

opening up of the outer layers of a *conductor* to form a bulge in the *conductor*

**3.4****block**

tackle  
pulley

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

**3.5****bond**

equipotential connection  
connection

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

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**3.6****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

**3.7****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]

**3.8****clearance**

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

**3.9****clipping-in**

clamping-in  
clipping

transferring of sagged *conductors* from the *stringing blocks* to their permanent suspension positions and the installing of the permanent suspension clamps

**3.10****compression joint**

conductor splice

sleeve

splice

tubular compression (or implosive) sleeves designed and fabricated from aluminium, copper or steel compressed to join or terminate *conductors* or overhead earth wires

**3.11****conductor**

cable

wire

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

**3.12****conductor bundle**

set of individual *conductors* 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]

**3.13****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 *conductors*, enabling them to inspect the *conductors* for damage or install spacers, dampers or other attachments

**3.14****conductor cover**

line hose

line guard

flexible or rigid protective cover used to shroud the *conductor* providing electrical protection

**3.15****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.

**3.16****connector link**

pulling rope connector

link

peanut

fixed joint

rigid link designed to connect *pulling ropes* and usually designed to pass through the grooves of *bullwheels* on the *puller* when under load

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**3.17****cradle blocks system**

system of cradle *stringing blocks*, spacer rope, *pulling rope*, a brake unit, and a radio controlled motorized tug, which use the existing *conductor* as support when installing the new *conductor*, to create a supporting protection in case of critical crossings

**3.18****crossing structure**

guard structure

H-frame

rider pole structure

scaffolding

temporary structure

*structure* built of poles, tubes, or other specialized equipment, sometimes using rope nets, used whenever *conductors* are strung over roads, power lines, communications *circuits*, highways or railroads to prevent the *conductor* from contacting any of these facilities in the event of equipment failure, broken *pulling ropes*, loss of tension, etc.

**3.19****dead**

de-energized

at an electric potential equal to or not significantly different from that of the earth at the work site

[SOURCE: IEC 60050-651:2014, 651-21-09]

**3.20****dead-ending**

procedure which results in the termination of *conductors* at an *anchor structure*

**3.21****(local) earth**

(local) ground (US)

part of the Earth which is in electric contact with an *earth* electrode and the electric potential of which is not necessarily equal to zero

[SOURCE: IEC 60050-195:1998, 195-01-03]

**3.22****earthing cable**

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

**3.23****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]

**3.24****earth mat**

counterpoise

earth grid

system of interconnected bare *conductors* arranged in a pattern over a specified area on, or buried below, the surface of the Earth

**3.25****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.

**3.26****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 *conductors* to provide a degree of protection against lightning strikes

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

**3.27****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]

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

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**3.29****electromagnetic induction**

electromagnetic coupling

phenomenon that produces both an induced voltage and current either through electric or *magnetic field induction***3.30****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**3.31****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]

**3.32****equipotential**

set of points all of which have the same potential

**3.33****factor of safety**

ratio of *ultimate strength* or *yield strength* to the maximum allowable applied force or load

**3.34****fault**

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

**3.35****fault current**

earth fault current

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

**3.36****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

**3.37****isolated**

<device or *circuit*> disconnected completely from other devices or *circuits*, 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*.

**3.38****joint protector**

joint stiffener

sleeve protector

splice protector

cover joint

split sleeve which fits over a *compression joint* or splice, and is used to protect the *compression joint* from bending or damage if the joint passes through *stringing blocks*

**3.39****jumper**

dead end loop

*conductor* that connects the *conductors* on opposite sides of a dead-end *structure*

**3.40****magnetic field induction**

inductive coupling

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

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**3.41****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 ropes* which in turn are used to pull the *conductor*

**3.42****pilot rope puller**

device designed to payout and rewind *pilot ropes* during *stringing* operations

**3.43****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*

**3.44****pull section**

pull setting

stringing section

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

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**3.45****pull site**

puller set-up

location in a *pull section* where the *puller*, *reel winder* and anchors (snubs) are located

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**3.46****puller**

drum

hoist

tugger

equipment designed to pull *pulling ropes* 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.]

**3.47****puller-tensioner**

equipment designed to pull *pulling ropes* 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.]

**3.48****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