

Edition 3.0 2017-04

TECHNICAL REPORT



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

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ICS 13.260; 29.240.20; 29.260.99

ISBN 978-2-8322-4130-1

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FC	DREWO	RD	4		
IN	INTRODUCTION				
1	Scop	e	7		
2	Normative references				
3	Term	s and definitions	7		
4	Unde	rstanding the hazard – Basic theory	.17		
	4.1	General			
	4.2	Electric field induction from nearby circuits			
	4.2.1	Overview			
	4.2.2				
	4.2.3	C C			
	4.2.4	Electrostatic charging	.20		
	4.3	Magnetic field induction from nearby circuits	.20		
	4.3.1	Induced current	.20		
	4.3.2	Induced voltage	.21		
	4.4	Re-energization	.22		
	4.5	Mechanical risk	22		
5	Conc	luctor stringing methods and equipment	23		
	5.1	General	23		
	5.2	Slack stringing method	23		
	5.3	Tension stringing method	25		
	5.4	Stringing equipment	34		
	5.4.1	General	34		
	5.4.2	Tensioners	34		
	5.4.3				
	5.4.4				
	5.4.5				
	5.4.6				
	5.4.7	· · · · · · · · · · · · · · · · · · ·			
	5.4.8				
	5.4.9	5 5			
	5.4.1	5.5			
	5.4.1	5 5			
	5.4.1	5			
	5.4.1		-		
	5.4.1 5.5	4 Conductor car			
6		ial earthing requirements			
0					
	6.1	General			
	6.2	Work site earthing systems			
	6.2.1	Overview Use of earth rods			
	6.2.2 6.2.3				
	6.2.3				
	6.2.4				
	6.2.5 6.2.6				
	0.2.0	Lattis for find-span joining of conductors of callin wilds	.00		

6.2.7	7 Earths for clipping in the conductors or earth wires	57
6.2.8	B Earths for installation of jumper loops for the conductor	57
6.2.9	9 Stringing block earths	57
6.2.1	10 Earth mat	57
6.3	General procedures and use of earthing systems	62
6.3.1	1 Overview	62
6.3.2	2 General procedures	62
6.3.3	3 Installation of the pilot or pulling rope	63
6.3.4	4 Stringing of conductors	64
6.3.5	5 Splicing of conductors	65
6.3.6	6 Sagging of conductors	66
6.3.7	7 Clipping-in conductors	67
6.3.8	B Dead-ending and installation of jumper loops	67
6.3.9	9 Spacing	68
6.3.1	10 Special work on conductors	68
6.3.1	11 Fuelling	69
7 Test	ing of earthing devices	69
7.1	General	69
7.2	Number of type tests	70
7.3	Type test set-up	70
7.4	Type test acceptance criterion	70
Bibliogra	phy	73

Figure 1 – Electric field induction from nearby circuits – Induced voltage	18
Figure 2 – Electric field induction from nearby circuits – Induced current	19
Figure 3 – Magnetic field induction from nearby circuits – Induced current	21
Figure 4 – Magnetic field induction from nearby circuits – Induced voltage	22
Figure 5 – Slack stringing method	25
Figure 6 – Tension stringing method	
Figure 7 – Bullwheel tensioners	
Figure 8 – Bullwheel pullers	41
Figure 9 – Stringing blocks	47
Figure 10 – Stringing rollers	
Figure 11 – Conductor cars	50
Figure 12 – Earthing systems	62
Figure 13 – Typical test set-up for stringing block earth	71
Figure 14 – Typical test set-up for running earth	72

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. However, a technical committee may propose the publication of a Technical Report when it has collected data of a different kind from that which is normally published as an International Standard, for example "state of the art".

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

- 5 -

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.

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

- 6 -

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.

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.

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

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

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