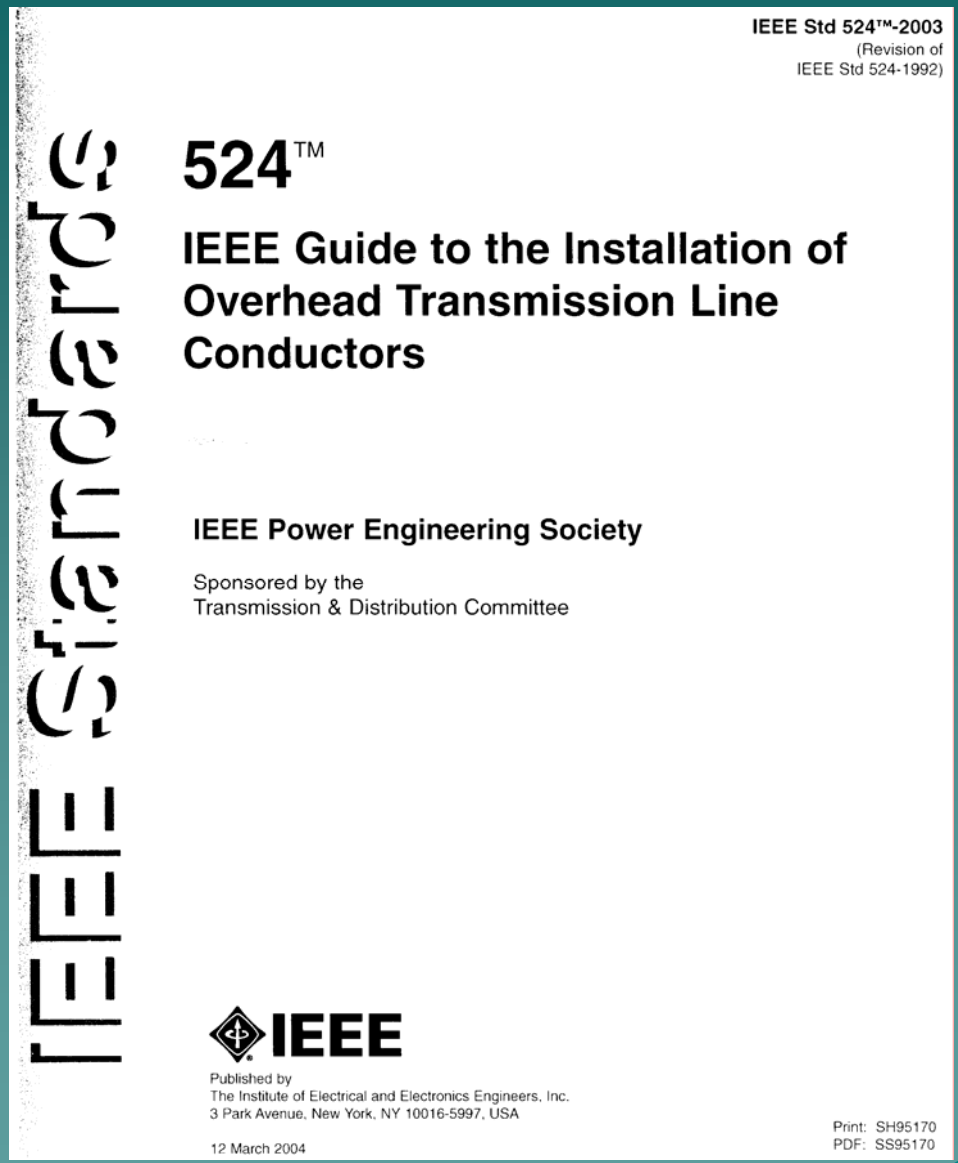
IEEE Guide P524 to the Installation of Overhead Transmission Conductors

A Tutorial Developed for the
IEEE TP&C Subcommittee 15.11

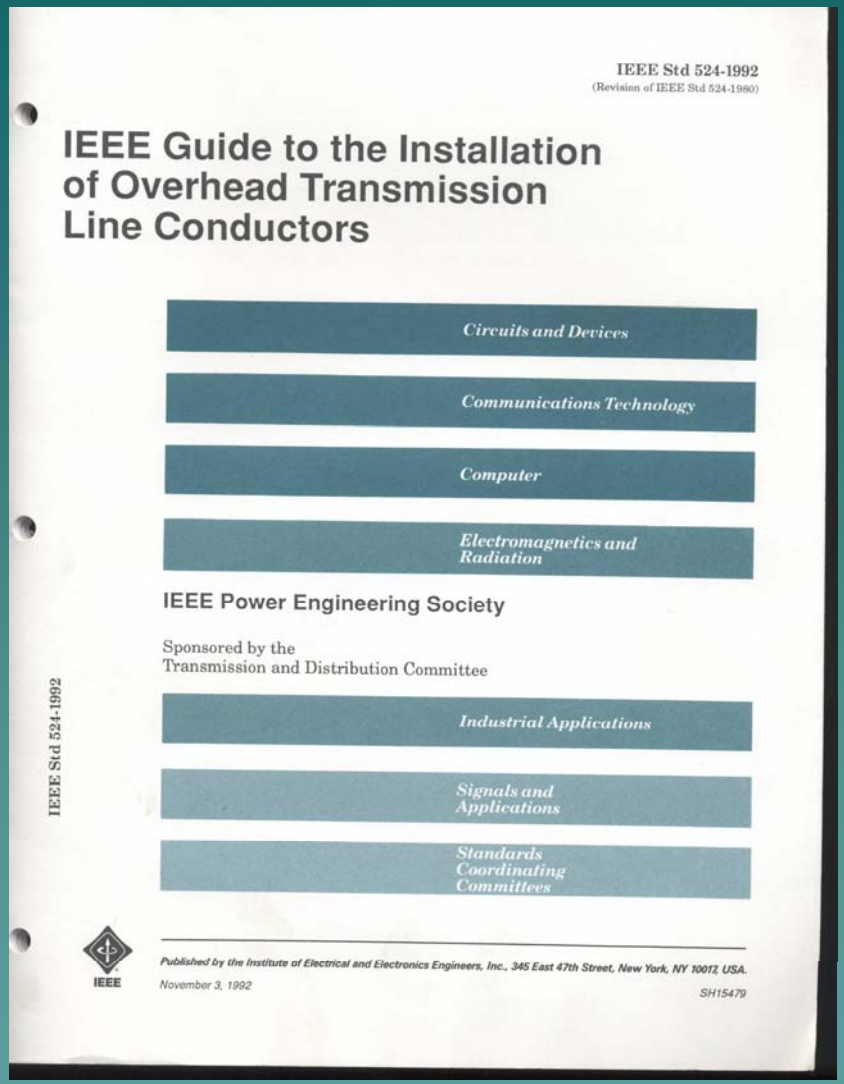
by Doug Proctor

June 14, 2005


IEEE Std 524™-2003
(Revision of
IEEE Std 524-1992)
IEEE Standards
524™
IEEE Guide to the Installation of Overhead Transmission Line Conductors
IEEE Power Engineering Society
Sponsored by the
Transmission & Distribution Committee
IEEE
Published by
The Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue, New York, NY 10016-5997, USA
12 March 2004
Print: SH95170
PDF: SS95170

Document's Development

- IEEE Guide to the Installation of Overhead Transmission Line Conductors
- IEEE Guide to Grounding During the Installation of Overhead Transmission Line Conductors



IEEE Std 524-1992
(Revision of IEEE Std 524-1980)

IEEE Guide to the Installation of Overhead Transmission Line Conductors

Circuits and Devices

Communications Technology

Computer

Electromagnetics and Radiation

IEEE Power Engineering Society

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Transmission and Distribution Committee

Industrial Applications

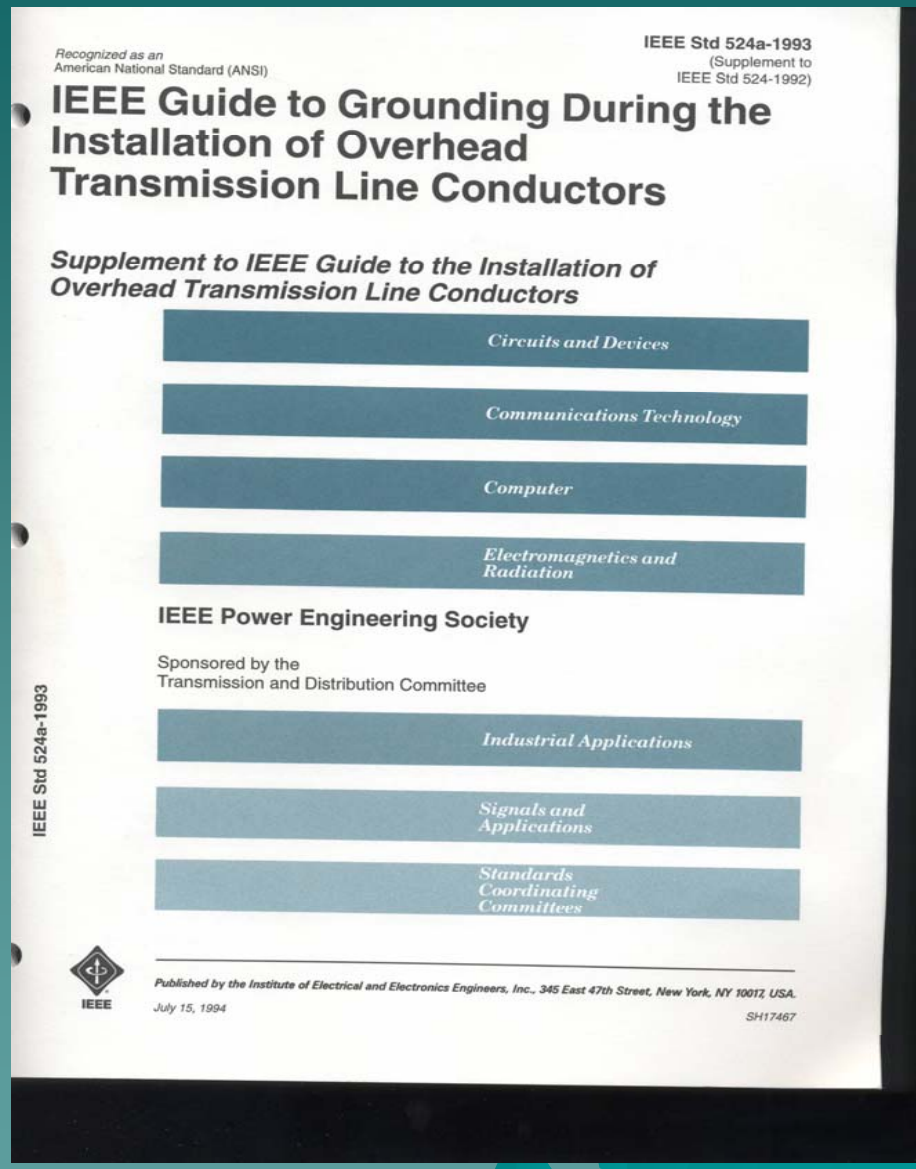
Signals and Applications

Standards Coordinating Committees

IEEE Std 524-1992

IEEE

Published by the Institute of Electrical and Electronics Engineers, Inc., 345 East 47th Street, New York, NY 10017, USA.
November 3, 1992
SH15479



Recognized as an
American National Standard (ANSI)

IEEE Std 524a-1993
(Supplement to
IEEE Std 524-1992)

IEEE Guide to Grounding During the Installation of Overhead Transmission Line Conductors

Supplement to IEEE Guide to the Installation of Overhead Transmission Line Conductors

Circuits and Devices

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IEEE Std 524a-1993

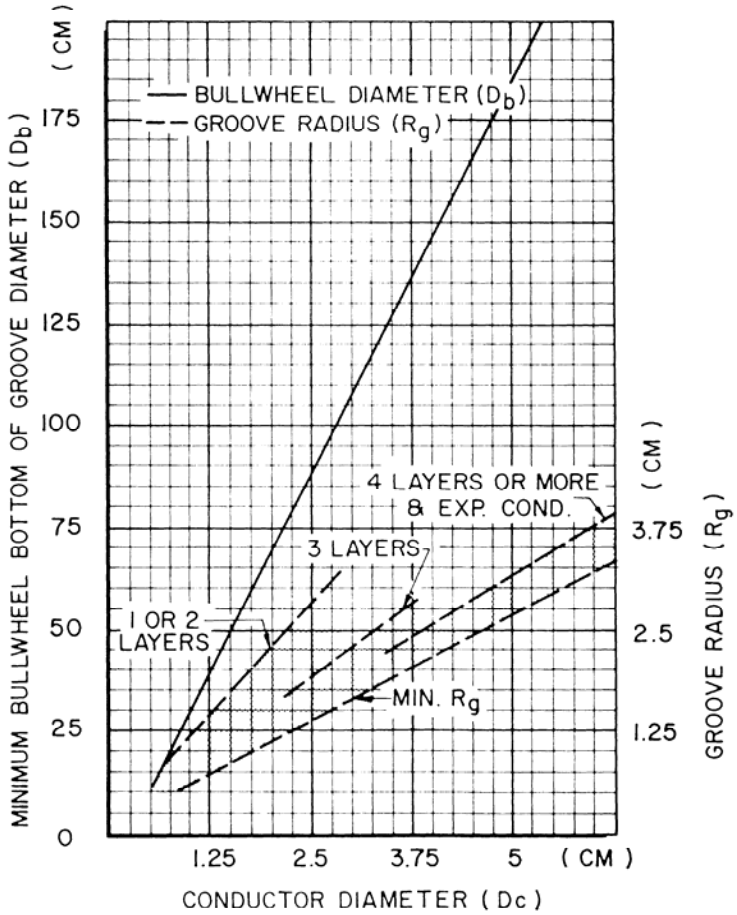
IEEE

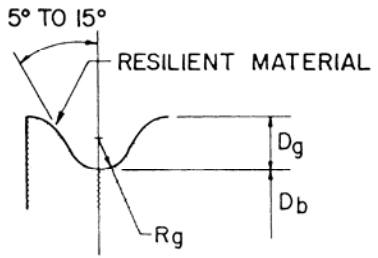
Published by the Institute of Electrical and Electronics Engineers, Inc., 345 East 47th Street, New York, NY 10017, USA.
July 15, 1994
SH17467

Layout Features

- Metric Units
- Diagrams
- Tables
- Photographs
- “Caution” Boxes
- Figures
- Concepts

Sample Diagram





LEGEND

D_b BULLWHEEL BOTTOM OF GROOVE DIAMETER

D_c CONDUCTOR DIAMETER

D_g GROOVE DEPTH

R_g GROOVE RADIUS

LAYERS OF ALUM. WIRES *	GROOVE RADIUS MIN.	MAX.
1, 2	0.525 Dc	1.100 Dc
3	0.525 Dc	0.750 Dc
4 OR MORE & EXPANDED	0.525 Dc	0.625 Dc

* THE 7 CENTRAL WIRES OF ALL ALUMINUM CONDUCTORS ARE CONSIDERED THE CORE.

Sample Table

Table C.1—Effects of ac and dc current

Effects	Current (mA)			
	Direct current		60 Hz rms	
	Men	Women	Men	Women
No sensation on hand	1.0	0.6	0.4	0.3
Slight tingling—"threshold of perception" level	5.2	3.5	1.1	0.7
Shock; uncomfortable, but not painful; muscular control not lost	9.0	6.0	1.8	1.2
Painful shock; muscular control not lost—"safe let-go" level for 99.5% of persons tested	62.0	41.0	9.0	6.0

Sample Photograph

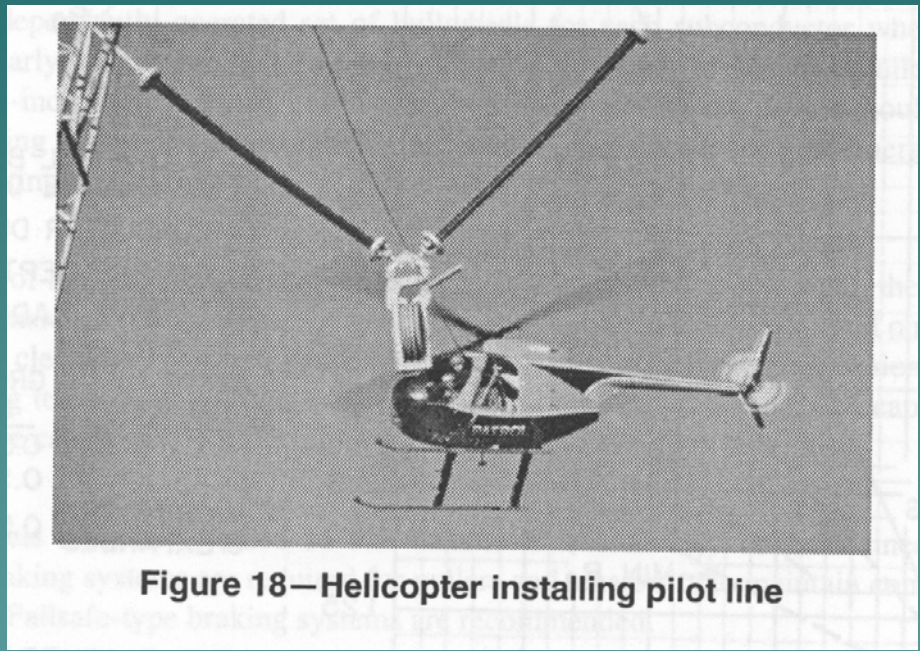


Figure 18—Helicopter installing pilot line

Typical “Caution” Box

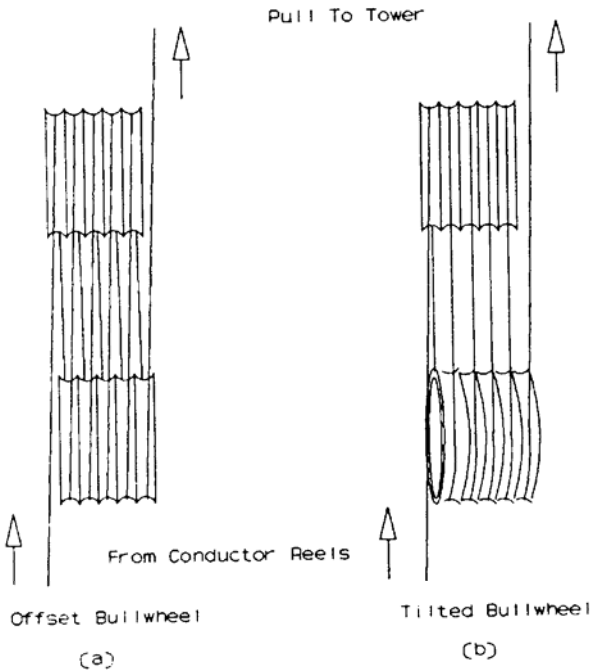
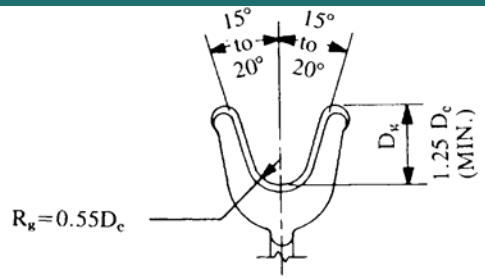


Figure 30—T-2 bullwheel tensioners

CAUTION
Smaller than recommended diameter sheaves and/or high stringing tensions may cause a build-up of torsional stress into the conductor.

Sample Figure



where

D_s(min) = 20 D_c – 20 cm except that D_s shall not be less than 12 D_c,

D_s = sheave diameter at base of groove,

D_c = conductor diameter,

R_g = sheave groove radius,

D_g = groove depth.

Number of layers of aluminum wires*	R_g		D_g
	Minimum	Maximum	Minimum
1 or 2	0.55 D_c	1.1 D_c	1.25 D_c
3	0.55 D_c	0.75 D_c	1.25 D_c
4 or more and Expanded Conductors	0.55 D_c	0.625 D_c	1.25 D_c

A sheave designed for a conductor of a given diameter, in accordance with this figure, may be used for stringing conductors of smaller diameters using above table or as follows:

Number of layers of aluminum wires*	Minimum diameter conductor that may be used in a sheave designed for a conductor of a larger diameter in percent of the diameter of the larger conductor
1 or 2	50%
3	75%
4 or more and Expanded Conductors	87.5%

What's New

- Conductor Types
- OPGW
- ADSS
- Helicopter Construction

Document Organization

- Table of Contents
- Definitions
- Main Sections
- Annexes
- References

Main Sections

- Definitions and Cross Reference of Terminology
- Conductor Stringing Methods
- Grounding Equipment and Methods
- Communications
- Conductor Reels
- Special Requirements for Mobile Equipment
- Travelers
- Typical Procedures for Stringing Operations
- Special Conductors

Definitions

- Extensive Update
- Latest Terminology
- Common Vernacular
- Cross References
- Acronyms

Conductor Stringing

- Methods
- Grounding
- Equipment Grounding
- Master Ground
- Sagging

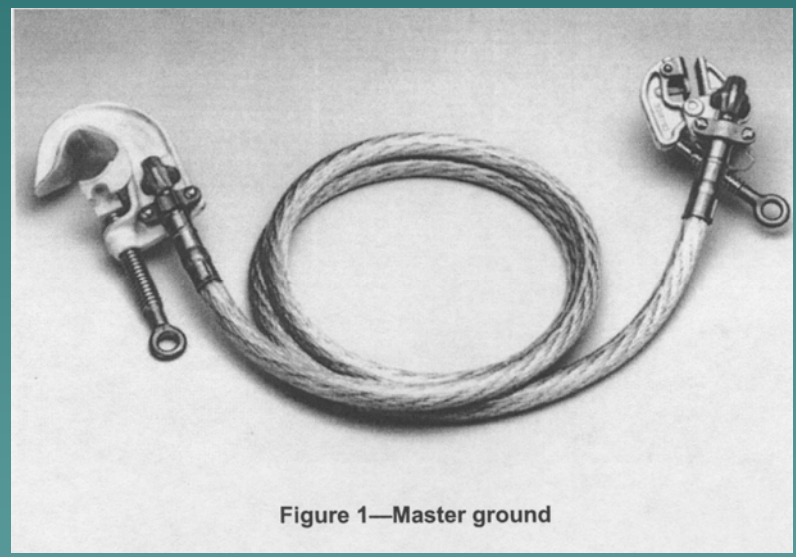
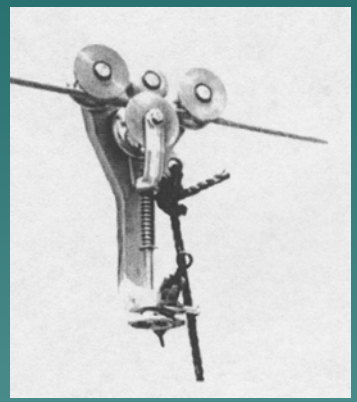
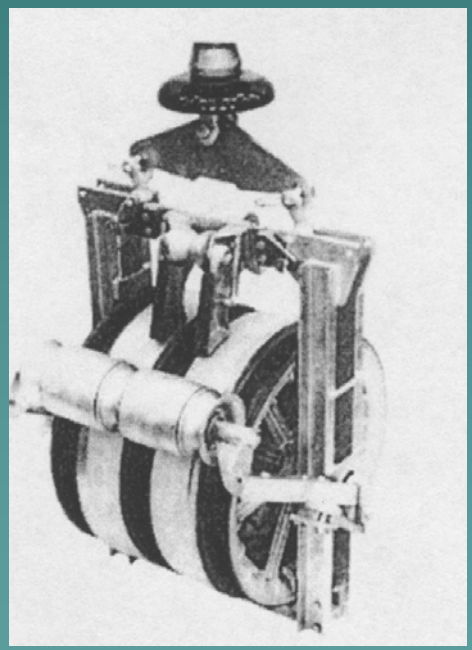


Figure 1—Master ground

Traveler Grounding



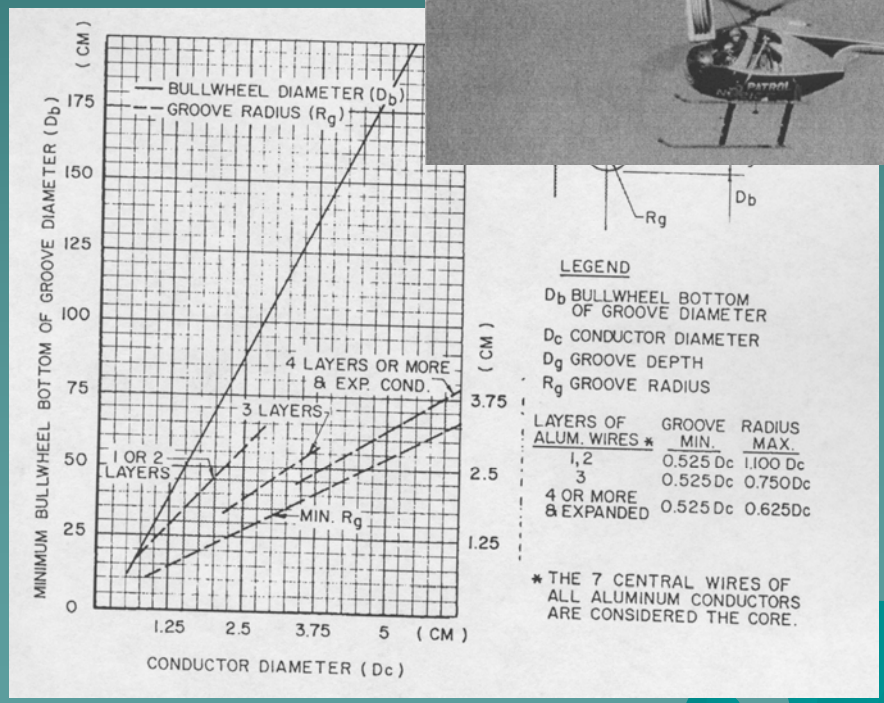


Grounding Methods

- Soils and Ground Rods
- Mechanical Connections
- Ground Wires
- Pullers
- Tensioners
- Splicing

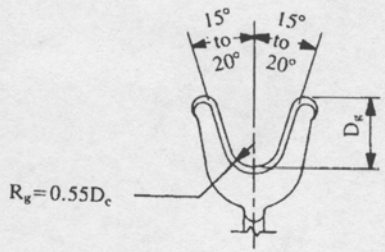
Special Requirements

- Mobile Equipment
- Reel Stands
- Helicopters
- Bullwheels
- Pullers
- Tensioners



Tables and Figures

- Travelers
- Reel Sizes
- Stringing Operation Setup
- Annexes



Where:

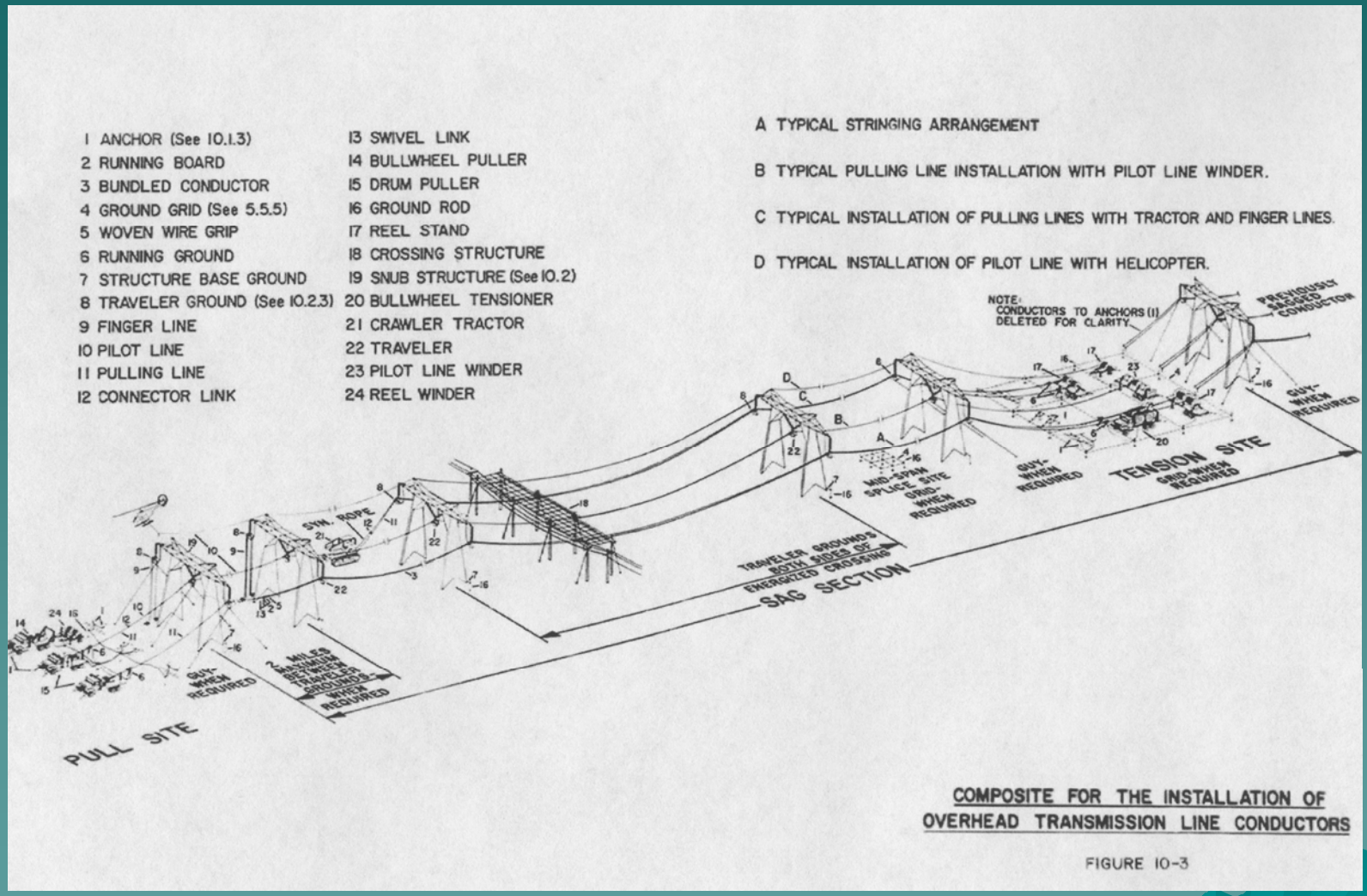
D_s(min) = 20 D_c – 20 cm except that D_s shall not be less than 12 D_c
D_s = Sheave diameter at base of groove
D_c = Conductor Diameter
R_g = Sheave groove radius
D_g = Groove depth

Number of Layers Of Aluminum Wires*	Rg		Dg
	Minimum	Maximum	Minimum
1 or 2	0.55D_c	1.1 D_c	1.25 D_c
3	0.55D_c	0.75 D_c	1.25 D_c
4 or more & Expanded Condr.	0.55D_c	0.625 D_c	1.25 D_c

A sheave designed for a conductor of a given diameter, in accordance with this figure, may be used for stringing conductors of smaller diameters using above table or as follows:

Number of Layers of Aluminum Wires*	Minimum diameter conductor that may be used in a sheave designed for a conductor of a larger diameter in percent of the diameter of the larger conductor
1 or 2	50%
3	75%
4 or more & Expanded Conductors	87.5%

The 7 central wires of all-aluminum conductors shall be considered as a core.



COMPOSITE FOR THE INSTALLATION OF OVERHEAD TRANSMISSION LINE CONDUCTORS

FIGURE 10-3

Fiber Optics

- OPGW
- ADSS
- Stringing Techniques
- Guidelines
- Sagging

Other Topics

- Dampers
- Spacers and Spacer Dampers
- Special Conductors
- Grips
- Splices

Annexes

- Bibliography
- Electrical Theory
- Grounding Electrical Concepts
- Travelers or Snub Structure Load Calcs
- Clipping Offsets and Sagging
- Efficiency of Travelers During Stringing
- Bearing Pressure on Sheave Lining
- AAC Standard Packaging
- ACSR Standard Packaging
- Drum or Reel Winding
- Drum or Reel Capacities

Sample of Retained Resource

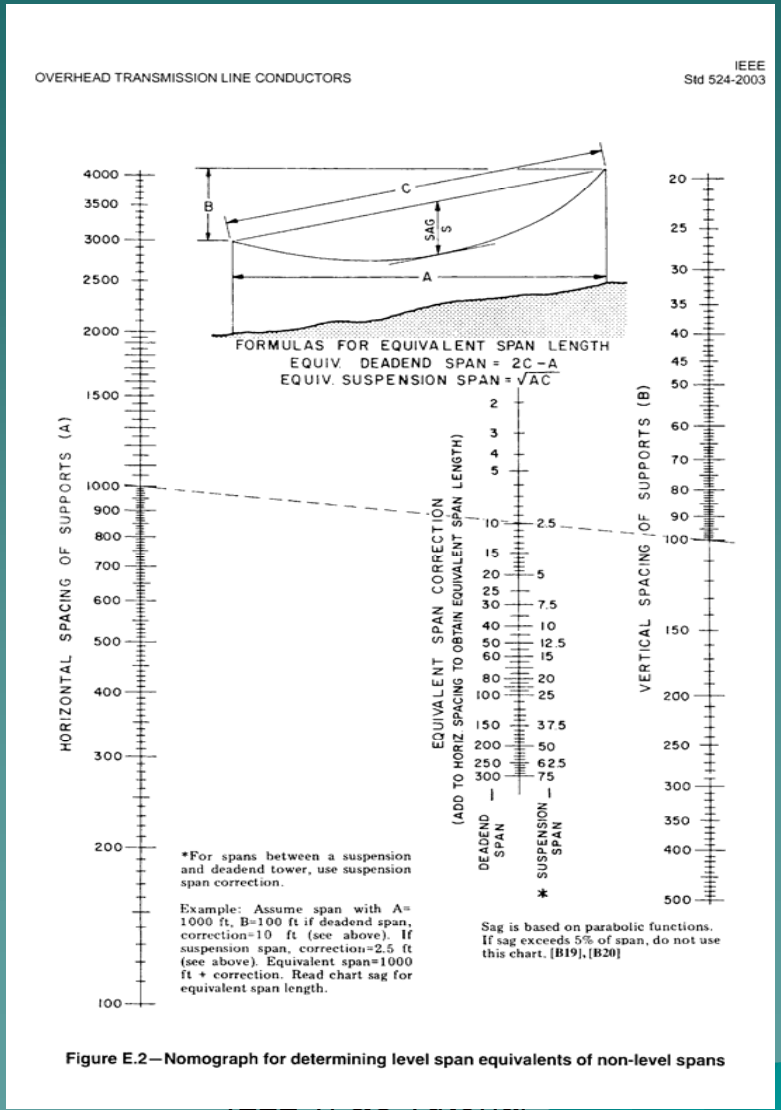


Figure E.2—Nomograph for determining level span equivalents of non-level spans

Summary

- New Guide a Better Reference
- Integrated Grounding Guidelines
- Improved Annexes
- Coverage of Fiber Optic Components
- Retains Key Components