

# IEEE Standard for Pole Line Hardware for Overhead Line Construction

IEEE Power and Energy Society

Sponsored by the

Transmission and Distribution Committee

Currently in preview, click buy full version

# IEEE Standard for Pole Line Hardware for Overhead Line Construction

Sponsor

**Transmission and Distribution Committee**  
of the  
**IEEE Power and Energy Society**

Approved 27 March 2014

**IEEE-SA Standards Board**

Currently in preview, click buy full version

**Abstract:** This standard covers the requirements of inch-based wood pole line hardware commonly used in overhead line construction. Metric pole line hardware is not covered by this standard.

**Keywords:** hardware, IEEE C135.90™, line, overhead, pole, wood

---

The Institute of Electrical and Electronics Engineers, Inc.  
3 Park Avenue, New York, NY 10016-5997, USA

Copyright © 2014 by The Institute of Electrical and Electronics Engineers, Inc.  
All rights reserved. Published 28 May 2014. Printed in the United States of America.

IEEE is a registered trademark in the U.S. Patent & Trademark Office, owned by The Institute of Electrical and Electronics Engineers, Incorporated.

PDF: ISBN 978-0-7381-9074-7 STD98626  
Print: ISBN 978-0-7381-9075-4 STDPD98626

*IEEE prohibits discrimination, harassment, and bullying.*

For more information, visit <http://www.ieee.org/web/aboutus/whatis/policies/p9-26.html>.

No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without the prior written permission of the publisher.

## Important Notices and Disclaimers Concerning IEEE Standards Documents

IEEE documents are made available for use subject to important notices and legal disclaimers. These notices and disclaimers, or a reference to this page, appear in all standards and may be found under the heading “Important Notice” or “Important Notices and Disclaimers Concerning IEEE Standards Documents.”

### Notice and Disclaimer of Liability Concerning the Use of IEEE Standards Documents

IEEE Standards documents (standards, recommended practices, and guides), both full-use and trial-use, are developed within IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Association (“IEEE-SA”) Standards Board. IEEE (“the Institute”) develops its standards through a consensus development process, approved by the American National Standards Institute (“ANSI”), which brings together volunteers representing varied viewpoints and interests to achieve the final product. Volunteers are not necessarily members of the Institute and participate without compensation from IEEE. While IEEE administers the process and establishes rules to promote fairness in the consensus development process, IEEE does not independently evaluate, test, or verify the accuracy or any of the information or the soundness of any judgments contained in its standards.

IEEE does not warrant or represent the accuracy or content of the material contained in its standards, and expressly disclaims all warranties (express, implied and statutory) not included in this or any other document relating to the standard, including, but not limited to, the warranties of: merchantability; fitness for a particular purpose; non-infringement; and quality, accuracy, effectiveness, currency, or completeness of material. In addition, IEEE disclaims any and all conditions, relating to: results; and workmanlike effort. IEEE standards documents are supplied “AS IS” and “WITH ALL FAULTS.”

Use of an IEEE standard is wholly voluntary. The existence of an IEEE standard does not imply that there are no other ways to produce, test, measure, purchase, market, or provide other goods and services related to the scope of the IEEE standard. Furthermore, the viewpoint expressed at the time a standard is approved and issued is subject to change brought about through developments in the state of the art and comments received from users of the standard.

In publishing and making its standards available, IEEE is not suggesting or rendering professional or other services for, or on behalf of, any person or entity nor is IEEE undertaking to perform any duty owed by any other person or entity to another. Any person utilizing any IEEE Standards document, should rely upon his or her own independent judgment in the exercise of reasonable care in any given circumstances or, as appropriate, seek the advice of a competent professional in determining the appropriateness of a given IEEE standard.

IN NO EVENT SHALL IEEE BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO: PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE PUBLICATION, USE OF, OR RELIANCE UPON ANY STANDARD, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE AND REGARDLESS OF WHETHER SUCH DAMAGE WAS FORESEEABLE.

## Translations

The IEEE consensus development process involves the review of documents in English only. In the event that an IEEE standard is translated, only the English version published by IEEE should be considered the approved IEEE standard.

## Official statements

A statement, written or oral, that is not processed in accordance with the IEEE-SA Standards Board Operations Manual shall not be considered or inferred to be the official position of IEEE or any of its committees and shall not be considered to be, or be relied upon as, a formal position of IEEE. At lectures, symposia, seminars, or educational courses, an individual presenting information on IEEE standards shall make it clear that his or her views should be considered the personal views of that individual rather than the formal position of IEEE.

## Comments on standards

Comments for revision of IEEE Standards documents are welcome from any interested party, regardless of membership affiliation with IEEE. However, IEEE does not provide consulting information or advice pertaining to IEEE Standards documents. Suggestions for changes in documents should be in the form of a proposed change of text, together with appropriate supporting comments. Since IEEE standards represent a consensus of concerned interests, it is important that any responses to comments and questions also receive the concurrence of a balance of interests. For this reason, IEEE and the members of its societies and Standards Coordinating Committees are not able to provide an instant response to comments or questions except in those cases where the matter has previously been addressed. For the same reason, IEEE does not respond to interpretation requests. Any person who would like to participate in revisions to an IEEE standard is welcome to join the relevant IEEE working group.

Comments on standards should be submitted to the following address:

Secretary, IEEE-SA Standards Board  
445 Hoes Lane  
Piscataway, NJ 08854-4141, USA

## Laws and regulations

Users of IEEE Standards documents should consult all applicable laws and regulations. Compliance with the provisions of any IEEE Standards document does not imply compliance to any applicable regulatory requirements. Implementers of the standard are responsible for observing or referring to the applicable regulatory requirements. IEEE does not, by the publication of its standards, intend to urge action that is not in compliance with applicable laws, and these documents may not be construed as doing so.

## Copyrights

IEEE draft and approved standards are copyrighted by IEEE under U.S. and international copyright laws. They are made available by IEEE and are adopted for a wide variety of both public and private uses. These include both use, by reference, in laws and regulations, and use in private self-regulation, standardization, and the promotion of engineering practices and methods. By making these documents available for use and adoption by public authorities and private users, IEEE does not waive any rights in copyright to the documents.

## Photocopies

Subject to payment of the appropriate fee, IEEE will grant users a limited, non-exclusive license to photocopy portions of any individual standard for company or organizational internal use or individual, non-commercial use only. To arrange for payment of licensing fees, please contact Copyright Clearance Center, Customer Service, 222 Rosewood Drive, Danvers, MA 01923 USA; +1 978 750 8400. Permission to photocopy portions of any individual standard for educational classroom use can also be obtained through the Copyright Clearance Center.

## Updating of IEEE Standards documents

Users of IEEE Standards documents should be aware that these documents may be superseded at any time by the issuance of new editions or may be amended from time to time through the issuance of amendments, corrigenda, or errata. An official IEEE document at any point in time consists of the current edition of the document together with any amendments, corrigenda, or errata then in effect.

Every IEEE standard is subjected to review at least every ten years. When a document is more than ten years old and has not undergone a revision process, it is reasonable to conclude that its contents, although still of some value, do not wholly reflect the present state of the art. Users are cautioned to check to determine that they have the latest edition of any IEEE standard.

In order to determine whether a given document is the current edition and whether it has been amended through the issuance of amendments, corrigenda, or errata, visit the IEEE-SA Website at <http://ieeexplore.ieee.org/xpl/standards.jsp> or contact IEEE at the address listed previously. For more information about the IEEE-SA or IEEE's standards development process, visit the IEEE-SA Website at <http://standards.ieee.org>.

## Errata

Errata, if any, for all IEEE standards can be accessed on the IEEE-SA Website at the following URL: <http://standards.ieee.org/findstds/errata/index.html>. Users are encouraged to check this URL for errata periodically.

## Patents

Attention is called to the possibility that implementation of this standard may require use of subject matter covered by patent rights. By publication of this standard, no position is taken by the IEEE with respect to the existence or validity of any patent rights in connection therewith. If a patent holder or patent applicant has filed a statement of assurance via an Accepted Letter of Assurance, then the statement is listed on the IEEE-SA Website at <http://standards.ieee.org/about/sasb/patcom/patents.html>. Letters of Assurance may indicate whether the Submitter is willing or unwilling to grant licenses under patent rights without compensation or under reasonable rates, with reasonable terms and conditions that are demonstrably free of any unfair discrimination to applicants desiring to obtain such licenses.

Essential Patent Claims may exist for which a Letter of Assurance has not been received. The IEEE is not responsible for identifying Essential Patent Claims for which a license may be required, for conducting inquiries into the legal validity or scope of Patents Claims, or determining whether any licensing terms or conditions provided in connection with submission of a Letter of Assurance, if any, or in any licensing agreements are reasonable or non-discriminatory. Users of this standard are expressly advised that determination of the validity of any patent rights, and the risk of infringement of such rights, is entirely their own responsibility. Further information may be obtained from the IEEE Standards Association.

## Participants

At the time this IEEE standard was completed, the Overhead Line Structural Materials and Hardware Working Group had the following membership:

**Keith Lindsey, *Chair***  
**Tom McCarthy, *Vice Chair***

Dick Aichinger  
Mehmet Arslan  
Tony Baker  
Yair Berenstein  
Allen Bernstorf  
Nelson Bingel  
Tom Bozeman  
Michael Brucato  
Bill Calhoun  
Jerry Cheeks  
Allen Clapp  
Len Consalvo  
Glenn Davidson  
Mike Della Vecchia  
Nicholas DeSantis  
Tony DiGioia  
Michael Dolan  
Bruce Freimark  
Erich Gndant  
Waymon Goch  
Asim Haldar

Steve Harrizon  
Ibrahim Hathout  
Donald Heald  
Michael Hudgens  
Magdi Ishac  
Doug Jones  
Jacob Joplin  
Mark Jurgemeyer  
Kenneth Keller  
Bob Kluge  
Samy Krishnasamy  
Brian Lacoursiere  
Hong To Lam  
Jim Larkey  
Keith Lindsey  
Ming Lu  
Otto Lynch  
Tom McCarthy  
Ray McCoy  
Steven Miller

May Milles  
Robert Milles  
Roger Montambo  
George Niles  
John Olenic  
Bob Oswald  
Doug Proctor  
Brian Reed  
Rafael Rios  
Karen Ross  
Ron Kowalski  
Robert Santarsiero  
Chris Smith  
Steve Smith  
Eric Stemshorn  
Andrew Stewart  
Carl Tamm  
Vinh Tran  
Larry Vandergriend  
Jeff Wan  
Ed West

The following members of the individual balloting committee voted on this standard. Balloters may have voted for approval, disapproval, or abstention.

Saleman Alibhay  
Anthony Baker  
Harvey Bowles  
William Byrd  
Thomas Callsen  
James Chapman  
Robert Christman  
Glenn Davidson  
Gary Donner  
Randall Dotson  
Gary Engmann  
David Gilman  
Waymon Goch  
Edwin Goodwin  
Charles Grose  
Kendall Groves  
Jeffrey Hartenberger

Leif Peterson  
Werner Hoelzl  
Magdi Ishac  
Mark Jurgemeyer  
Gael Kennedy  
Robert Kluge  
Joseph L. Koepfinger  
Jim Kulchisky  
Chung-Yiu Lam  
Paul Lindemulder  
Greg Luri  
William McBride  
Thomas McCarthy  
Gary Michel  
Arthur Neubauer  
Michael Newman  
Carl Orde  
Lorraine Padden

Bansi Patel  
Robert Peters  
Douglas Proctor  
Keith Reese  
Michael Roberts  
Stephen Rodick  
Thomas Rozek  
Bartien Sayogo  
Dennis Schlender  
Gil Shultz  
Jeremy Smith  
Jerry Smith  
Gary Stoedter  
John Toth  
John Vergis  
Daniel Ward  
Luis Zambrano

When the IEEE-SA Standards Board approved this standard on 27 March 2014, it had the following membership:

**John Kulick**, *Chair*  
**Jon Walter Rosdahl**, *Vice-chair*  
**Richard H. Hulett**, *Past Chair*  
**Konstantinos Karachalios**, *Secretary*

Peter Balma  
Farooq Bari  
Ted Burse  
Clint Chaplain  
Stephen Dukes  
Jean-Phillippe Faure  
Gary Hoffman

Michael Janezic  
Jeffrey Katz  
Joseph L. Koepfinger\*  
David Law  
Hung Ling  
Oleg Logvinov  
Ted Olsen  
Glenn Parsons

Ron Peterson  
Adrian Stephens  
Peter Sutherland  
Yatin Trivedi  
Phil Winston  
Don Wright  
Yu Yuan

\*Member Emeritus

Also included are the following nonvoting IEEE-SA Standards Board liaisons:

Richard DeBlasio, *DOE Representative*  
Michael Janezic, *NIST Representative*

Don Messina  
*IEEE Standards Program Manager, Document Development*

Erin Spiewak  
*IEEE Standards Program Manager, Technical Program Development*

## Introduction

This introduction is not part of IEEE Std C135.90-2014, IEEE Standard for Pole Line Hardware for Overhead Line Construction.

This standard combines the following standards for wood pole line hardware for overhead line construction:

- ANSI C135.22, ANSI Standard for Zinc-Coated Ferrous Pole-Top Insulator Pins with Threads for Overhead Line Construction.<sup>a</sup>
- IEEE PC135.11, Draft Standard for Zinc-coated Ferrous Guy Attachments, Wrap and Formed Guy Hooks, Guy Strain Plates, and Pole Eye Plates for Overhead Line Construction.<sup>b</sup>
- IEEE Std C135.2™, IEEE Standard for Threaded Zinc-Coated Ferrous Strand-Eye Screws, Rods and Nuts for Overhead Line Construction.<sup>c,d</sup>
- IEEE Std C135.12™, IEEE Standard for Pole Guards.
- IEEE Std C135.17™, IEEE Standard for Zinc-Coated Ferrous Bolt-Type Insulator Pins with Threads Used with Pin Type Insulators for Overhead Line Construction.
- IEEE Std C135.33™, IEEE Standard for Galvanized Ferrous Cross-arm Clamps for Overhead Line Construction.
- NEMA PH11, NEMA Standards for Galvanized Ferrous Guy Attachments, Wrap and Formed Guy Hooks, Guy Strain Plates and Pole Eye Plates.<sup>e</sup>
- NEMA PH23, NEMA Standards for Steel and Malleable Iron Guy Clamps.

<sup>a</sup> ANSI publications are available from the American National Standards Institute (<http://www.ansi.org>).

<sup>b</sup> This IEEE project was withdrawn in December 2010.

<sup>c</sup> IEEE publications are available from The Institute of Electrical and Electronics Engineers (<http://shop.ieee.org/>).

<sup>d</sup> The IEEE standards or products referred to in this introduction are trademarks of The Institute of Electrical and Electronics Engineers, Inc.

<sup>e</sup> NEMA publications are available from Global Engineering Documents (<http://global.ihs.com/>).

## Contents

1. Overview .....	1
1.1 Scope .....	1
1.2 Purpose .....	1
2. Normative references.....	1
3. Definitions for acceptability and sampling.....	2
4. Strand-eye anchor rods and nuts.....	3
4.1 Anchor rods .....	3
4.2 Nuts for anchor rods .....	3
4.3 Threads .....	5
4.4 Tests for strength .....	6
4.5 Sizes.....	6
4.6 Protective coating .....	7
5. Crossarm braces .....	7
5.1 Material.....	7
5.2 Dimensions.....	7
5.3 Strength.....	8
5.4 Protective coating .....	9
6. Guy attachments, wrap and formed guy hooks, guy strain plates, guy clamps, and pole eye plates .....	9
6.1 Material.....	9
6.2 Guy clamp bolts strength .....	9
6.3 Dimensions .....	9
6.4 Protective coating .....	9
7. Bolt-type and pole-top insulator pins with lead or nylon alloy threads .....	18
7.1 Material.....	18
7.2 Dimensions .....	19
7.3 Threads .....	19
7.4 Strength.....	19
8. Pole guards .....	25
8.1 Material.....	25
8.2 Dimensions .....	25
8.3 Protective coating .....	25
9. Crossarm gains .....	25
9.1 Material.....	25
9.2 Dimensions .....	25
9.3 Protective coating .....	25
10. Protective coatings.....	30
10.1 Galvanizing.....	30
10.2 Other coatings.....	30
11. Marking .....	30
12. Inspection requirements.....	30

13. Determination of acceptability .....	30
Annex A (informative) Bibliography .....	32

# IEEE Standard for Pole Line Hardware for Overhead Line Construction

*IMPORTANT NOTICE: IEEE Standards documents are not intended to ensure safety, security, health, or environmental protection, or ensure against interference with or from other devices or networks. Implementers of IEEE Standards documents are responsible for determining and complying with all appropriate safety, security, environmental, health, and interference protection practices and all applicable laws and regulations.*

*This IEEE document is made available for use subject to important notices and legal disclaimers. These notices and disclaimers appear in all publications containing this document and may be found under the heading “Important Notice” or “Important Notices and Disclaimers Concerning IEEE Documents.” They can also be obtained on request from IEEE or viewed at <http://standards.ieee.org/IPR/disclaimers.html>.*

## 1. Overview

### 1.1 Scope

This standard covers the requirements of inch-based hardware commonly used in wood pole overhead line construction. Metric hardware is not covered by this standard.

### 1.2 Purpose

This standard will combine several existing IEEE, ANSI, and NEMA standards that are either current or archived. These standards provide the user and manufacturer with established manufacturing specifications. The current use of several standards requires work on each standard on a five-year cycle, which has resulted in some of these standards being archive. The combined standard will prove for a timely review process for the standard and will provide the industry with a current standard for widely used pole line hardware.

## 2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used; therefore, each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.