Proposed Changes In The NESC

George Bagnall, Director, Electric Staff Division, RUS

National Electrical Safety Code Importance

The National Electrical Safety Code (NESC) is an extremely important document to electric utilities for many reasons. The NESC is the paramount document that most state and local authorities look to for mandating how operators of electric and telecommunications utilities are to install, operate, and maintain their facilities. In addition, from years of experience, NESC compliant electric facilities have proven to provide a reliably safer environment for the general public and for utility employees. Utility operators must also keep in mind that the NESC is the most authoritative referenced document used in courtroom dramas where electric utilities sometimes find themselves defending claims of causing harm to people and animals; and proof of historical, continuous, NESC compliance provides utilities one of the strongest defenses.

NESC Subcommittee Composition

The Institute of Electrical and Electronic Engineers (IEEE) is the NESC Secretariat and entity responsible for development and revision of the NESC. IEEE maintains an Executive Committee and seven subcommittees to oversee this revision responsibility. Subcommittee membership includes a balanced representation of individuals from electric, telecommunications and other utilities, labor unions, various associated industry groups, government agencies, and industry experts.

Committee/Subcommittee*	Committee Responsibility*
Accredited Standards C2	Final IEEE Approval of NESC; Comments received from letter ballots and public.
Subcommittee 1	Purpose, Scope, Application, Definitions, and References **Sections 1, 2, and 3**.
Subcommittee 2	Grounding Methods **Section 9**
Subcommittee 3	Electric Supply Stations **Sections 10, 11, 12, 13, 14, 15, 16, 17, 18, and 19**
Subcommittee 4	Overhead Lines - Clearances **Sections 20, 21, 22, and 23**
Subcommittee 5	Overhead Lines - Strength and Loading **Sections 24, 25, 26, and 27**
Subcommittee 7	Underground Lines **Sections 30, 31, 32, 33, 34, 35, 36, 37, 38, and 39**
Subcommittee 8	Work Rules **Sections 40, 41, 42, 43, and 44**

* There is no Subcommittee 6 and there are no Sections 4, 5, 6, 7, 8, 28, and 29.

The Rural Utilities Service (RUS), Electric Staff Division (ESD), maintains membership on NESC Subcommittees to assure the NESC includes a perspective of the concerns and reality of installing and operating electric facilities in rural America.
The following details RUS subcommittee membership:

RUS NESC Committee and Subcommittee Membership

Name	ESD Job Title	Committee
George J. Bagnall	Director, ESD	NESC (Main) Committee
Harvey Bowles	Chair, Technical Standards Committee "A" (Electric)	Subcommittee 2
James L. Bohlk	Electrical Engineer	Subcommittee 4
Donald G. Heald	Structural Engineer	Subcommittee 5
Trung Hiu	Electrical Engineer	Subcommittee 7

NESC Revision Activities

At the present time, all seven subcommittees are actively engaged in developing the Year 2002 edition of the NESC. The first step in revision involves entertaining submissions from the public of proposed changes to the 1997 edition of the code. (The NESC calls proposed changes **"Change Proposals" or CPs** and assigns CPs consecutive numbers as the CPs are received by mail from the public). For the current NESC revision cycle, all CPs had to be submitted to IEEE by July, 1998. The Subcommittees subsequently met in October, 1998, and considered all CPs submitted by the public. Actions taken on the CPs by the Subcommittees were published in the September 1, 1999, publication, "NESC Preprint 2002 Proposals." Interested parties have until May 1, 2000, to provide comments or suggestions on the actions taken by the Subcommittees. The Subcommittees will meet again in October, 2000, to discuss and consider the public comments received in response to the actions taken by subcommittees. On January 15, 2001, the final recommended version of the 2002 NESC will be sent to the NESC Accredited Standards C2 Committee for letter ballot and to the American National Standards Institute (ANSI) for concurrent public review. Publication of the final 2002 NESC is expected in August, 2001.

For the revision process to work effectively, it is crucial that all interested parties participate by:

(1) Submitting CPs that will help improve the content of the NESC[1],
(2) Obtaining and reviewing the NESC Subcommittee CP resolutions included in the Preprint 2002 Proposals, and

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* [1] CPs for the 2007 NESC will be due sometime in July, 2003.

(3) Submitting comments on the NESC Subcommittees' recommendations and actions with respect to submitted CPs[2].

RUS highly recommends that RUS borrowers, their consulting engineers, suppliers, and others associated with the rural electric utility industry, become involved in this three-step process.

Order Your Copy of the Preprint

It is too late to submit CPs for the 2002 revision cycle but it is not too late to review the subcommittees' actions taken on CPs and to provide comments on these actions. Preprint 2002 Proposals can be ordered by telephoning IEEE at: **1 (800) 678-4333.**

Send Your Comments

Comments, post marked no later than May 1, 2000, must be in writing on the form provided in the Preprint 2002 Proposals. A copy of this form is shown on Page 26 of this paper. IEEE also requires that a separate form be used for each comment. Comments must be sent to:

Secretary, National Electrical Safety Code
IEEE Standards Activities
445 Hoes Lane, P.O. Box 1331
Piscataway, NJ 08855-1331

Change Proposals of Interest to RUS Electric Borrowers

The balance of this paper presents, in order of appearance in the Preprint 2002 Proposal publication, Subcommittee actions on CPs that may be of interest to RUS electric borrowers. (The pages on which the CPs appear in the Preprint are shown in parenthesis after the CP number). Where text of Subcommittee actions is quoted in this paper, proposed new text additions are shown in underlined italic fonts with existing text shown in italic fonts. Only CPs that would result in changes to the NESC are presented here. Note, however that the Subcommittees acted on many CPs in such a manner that the NESC would not be revised but these Subcommittee determinations are as meaningful and useful as those actions that result in code revisions because the Subcommittee explanations provide excellent insight and background information about the NESC. RUS encourages all borrowers' engineers and their consultants to obtain a copy of the Preprint 2002 Proposals.

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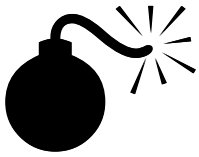
* [2] Comments on the Subcommittees CP actions for the 2002 NESC are due by May 1, 2000.



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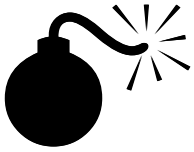


Remember that the proposals presented here may not survive the entire process of revision so provisions could be amended or they could be completely removed from consideration and not appear in the 2002 edition of the NESC. Readers should not count on or use any of the proposed changes included in this paper or the Preprint 2002 Proposals publication for utility construction to be completed in 2002. Only the officially published 2002 version of the NESC should be used.

Change Proposals

CP 2205 (Page 4)

Subject: Safe Clearances provided in Parts 1, 2, and 4

Proposal: This CP advised that there are inconsistencies in the ac and dc safe clearances that need to be corrected in the following NESC Parts:

- Part 1, "Rules for the Installation and Maintenance of Electric Supply Stations and Equipment," (Related to Clearance Guard to Live Parts),
- Part 2, "Safety Rules for the Installation and Maintenance of Overhead Electric Supply and Communication Lines," (Related to Electrical Components of Clearance), and
- Part 4, "Rules for the Operation of Electric Supply and Communications Lines and Equipment." (Related to Work Rules - Minimum Approach Distance).

Subcommittee Actions: The revisions required by this CP fall under the responsibility of Subcommittees 1, 3, 4, and 8. Subcommittee 1 agreed to form Working Group 1.8 which is to either define a common basis or source for clearances recommended in Parts 1, Part 2, and Part 4, or identify the appropriate differences in the various clearances. Subcommittees 3 and 4 both agreed to the establishment of a working group to resolve the issue. Subcommittee 4 rejected the proposal citing that it did not see a clear need to change the clearance values in Part 2. The Preprint 2002 Proposals does not definitively address the resolution or status of these subcommittee actions, making it difficult to develop and submit public comments.

CP 2140 (Page 14)

Subject: Rule 011 (NESC Scope) and recognizing street and area lighting in NESC

Proposal: Revise NESC Rule 011 (Scope) to include in the NESC scope that the NESC includes provisions for street lights and area lights that are under the control of utilities or

other qualified persons while provisions for other types of facilities are found in the National Electric Code (NEC).

Subcommittee Action: Subcommittee 1 acted by proposing to change Rule 011 by adding new language that states the NESC covers utility facilities and functions up to the service point and that the NEC covers utilization wiring requirements beyond the service point.

CP 2136 (Page 15)

Subject: Rule 013 (NESC Application) and experimental construction and methods of installation

Proposal: Revise Rule 013A2 to add to the provisions for experimental installations such that, in addition to requiring qualified supervision, that equivalent safety be provided and that all affected parties of joint use construction agree to allow the experimental installation.

Subcommittee Action: Subcommittee 1 agreed in part to the CP request by proposing to revise Rule 013A2 as proposed in CP 2136 except for the requirement related to joint use facilities. Subcommittee 1 revised the proposed language such that on joint use facilities, all affected parties be notified rather than requiring all affected parties to agree to allow the experimental construction.

CP 2312 (Page 16)

Subject: Rule 015 (NESC Intent) and exceptions to NESC Rules

Proposal: Add a new Rule 015G that states that exceptions to a rule have the same force and effect required or allowed by the rule to which the exception applies.

Subcommittee Action: Subcommittee 1 is proposing to rearrange Rule 015 and include as "D" the exact language requested in the CP.

CP 2370 (Page 27)

Subject: Section 2 (Definitions) and inclusion of a definition for Fiber-reinforced composite structure

Proposal: Include a definition for fiber-reinforced composite structure to read: "Fiber-reinforced thermoset or thermoplastic resin structure and structural components.

Subcommittee Action: Subcommittee 1 is proposing to add the following definition:

Fiber-reinforced composite structure and components. Fiber-reinforced thermoset or thermoplastic resin structure and structural components.

CP 2383 (Page 28)

Subject: Section 2 (Definitions) and inclusion of various definitions related to grounding

Proposal: Include definitions for ungrounded system, grounded system, unigrounded or single grounded, impedance grounded, multigrounded system, shield wire/conductor and neutral conductor. Language for all requested definitions was provided in CP 2383.

Subcommittee Action: Subcommittee 1 proposed that the request be referred to Working Group 2.1. Working Group 2.1 met and considered each of the definitions proposed. The Working Group proposed definitions for "ungrounded system," "multigrounded/multiple grounded system," "single grounded/unigrounded," neutral conductor," and "shield wire/conductor." Of particular interest was the proposed addition of the definition for "multigrounded/multiple grounded system. This definition includes a statement that a multigrounded or multiple grounded system may not be effectively grounded.

CP 2162 (Page 33)

Subject: Section 2 (Definitions) and Definition of "Qualified"

Proposal: Replace the present definition of "qualified" with the one included in the proposed CP.

Subcommittee Action: Subcommittee 1 proposed its own definition to read as follows:

"qualified. Having <u>been trained in and having demonstrated</u> adequate knowledge of the installation, construction, or operation of <u>lines and equipment</u> and the hazards involved, <u>including identification of and exposure to electric supply and communication apparatus in or near the workplace. An employee who is undergoing on-the-job training and who, in the course of such training, has demonstrated an ability to perform duties safely at his or her level of training, and who is under the direct supervision of a qualified person, is considered to be a qualified person for the performance of those duties."</u>

CP 2314 (Page 50)

Subject: Rule 93A (Grounding Conductor and Means of Connection – Composition of Grounding Conductors) and allowing equipment tanks as part of conduction path

Proposal: Include in Rule 93A the provision that the case of metallic equipment is allowed to be part of the grounding conduction path.

Subcommittee Action: Subcommittee 2 proposed to revise the last sentence of Rule 093A as follows:

<u>Metallic electrical equipment cases or</u> the structural metal frame of a building or structure may serve as <u>part of</u> a grounding conductor to an acceptable grounding electrode.

CP 2244 (Page 58)

Subject: Rule 94B2b (Driven Rods) and alternative driven rods

Proposal: Include an exception to Rule 094B2b to read as follows:

> *Exception 1: Other dimensions or configurations may be used if their suitability is supported by a qualified engineering study.*

Subcommittee Action: Subcommittee 2 accepted this proposal as submitted. The supporting documentation submitted with the proposal includes a sample of the type of engineering study intended for consideration when implementing this proposed new exception.

CP 2382 (Page 66)

Subject: Rules 96C (Ground Resistance Requirements – Multi-Grounded Systems), 97A and B (Separation of Grounding Conductors) and shield wires used for lightning protection

Proposal: Working Group 2.1 proposed to add a "Recommendation" to Rule 96C (Multi-grounded systems) that reads as follows:

> *Recommendation: This Rule may be applied to shield wire(s) used as lightning protection conductor(s), which is grounded at the source and that meets the multigounding requirements of this Rule.*

Working Group 2.1 also proposed to revise Rule 97A by adding shield wires of power circuits as an additional class of the classes included in the Rule. The Working Group 2.1 proposal also included changing Rule 97B such that shield wires of power circuits would be added as a third equipment class to which a single bonding conductor (bonded to all [of the three] equipment classes cited in the Rule) would be allowed for grounding the equipment.

Subcommittee Action: Subcommittee 2 accepted the Working Group 2.1 proposal as submitted.

CP 2264 (Page 83)

Subject: Rule 110B1 (Protective Arrangements in Supply Stations – Rooms and Spaces) and addition of a note re not preventing use of wood poles

Proposal: Add to Rule 110B1 wording that advises it is not intended that this Rule prevents the use of wood poles in equipment rooms.

Subcommittee Action: Subcommittee 2 proposed revision of Rule 110B1 as follows:

1. *Construction*
   They shall be as much as practical noncombustible.
   Note: This Rule is not intended to prevent wood poles from being used to support conductors or equipment in electric supply stations.

CP 2211 (Page 107)

Subject: Rule 214A2 (Overhead – Inspection and tests of Lines and Equipment) and allowing inspections while performing other duties

Proposal: Include language in Rule 214A2 that allows inspections to be performed while performing other duties.

Subcommittee Action: Subcommittee 4 accepted a modified version of the proposal by adding the following sentence to Rule214A2:

> *Inspections may be performed in a separate operation or while performing other duties.*

CP 2388 (Page 121)

Subject: Rule 230A (Overhead – Clearances and General Applications) and the application of NESC clearances

Proposal: Subcommittee 4 proposed the following revision of Rule 230A to help alleviate confusion of NESC clearance requirements:

A. Development and Application of Clearances

This section covers clearances, including climbing spaces, involving overhead supply and communication lines. Rules 232 and 234 contain tables of required clearances from overhead facilities to land and water areas and to structures used, occupied, or worked upon by members of the public. These clearances were developed from the methodology, reference dimensions, and clearance building blocks shown in Appendix A. This accepted good practice is based upon the results of almost a century of application of NESC clearances in the field.

The clearances specified in Section 23 apply to the vast majority of overhead installations. It is exceptionally rare that local conditions are not specified in these Rules. However, the clearances specified in Section 23 do not cover unusual activities or use of oversized equipment, such as may occur at construction sites. If such a circumstance occurs where the known dimensions of conflicting activity exceed the Reference Dimensions of Table A-2a or Table A-2b, Rule 012C requires accepted good practice to be met. Although, Appendix A is not a mandatory section of the NESC, Rule 012C may be met by adding the applicable M&E values from Table A-1 to the known dimensions of conflicting activity to develop the clearance that is appropriate for the unspecified condition.

This methodology may be used to determine applicable clearances for unusual situations.

Note: The NESC recognizes that activities of construction personnel and other workers in close proximity to existing supply lines are governed by Occupational Safety and Health Administration (OSHA) regulations contained in 29 Code of Federal Regulations Parts 1910 and 1926. These regulations require construction personnel and other workers to maintain appropriate working clearances of personnel, tools, and equipment from supply lines. Also, most states have similar requirements applicable to individuals working in close proximity to supply lines.

Subcommittee Action: Subcommittee 4 accepted the proposal as presented.

CP 2256 (Page 136)

Subject: Rule 231B1 (Overhead – Clearances of Supporting Structures from Other Objects – From Streets, Roads, and Highways) and recognition of "Swale-type" curbing

Proposal: This proposal included a revision to Rule 231B that would add an alternative to existing text requiring supporting structures, support arms or equipment attached thereto to be located behind the curb. The proposal also requested removal of the last sentence of the rule pertaining to the minimum distance 150 mm (6 in) because the requirement could not be readily applied to “Swale-type” curbs.

Subcommittee Action: Subcommittee 4 accepted the proposal in principle by adding the following sentence to the end of the rule:

For paved or concrete swale-type curbs, such facilities shall be located behind the curb.

CPs 2325 (Page 139) and 2326 (Page 139)

Subject: Rule 232B2 and 3 (Overhead – Clearances of Wires, Conductors, Cables, and Equipment Above Ground, Roadway, Rail, or Water Surfaces) and clearances to unguarded rigid live parts of equipment and equipment cases

Proposal: Both CPs requested that "water" be specifically added as a surface over which clearances are specified in the two Rules.

Subcommittee Action: Subcommittee 4 accepted both proposals as presented.

CP 2327 (Page 149)

Subject: Table 232-1 (both metric and English unit tables) [Vertical Clearance of Wires, Conductors, Cables, and Equipment Above Ground, Roadway, Rail, or Water Surfaces] and correction of redundancies

Proposal: This proposal suggested implementing the following revisions to both the metric and English unit version of Table 232-1:

(1) Adding "not subject to truck traffic" to the wording for Footnote 13 for the table to clear up a redundancy and misuse created during previous revisions,

(2) Deleting Footnote 13 from Table 232-1, Row 9, category because it does not apply, and

(3) Adding Footnote 21 to the Row 3 category of Table 232-1 to help clarify the truck height definition as it relates to the category.

Subcommittee Action: Subcommittee 4 accepted the proposal as submitted.

CP 2143 (Page 167)

Subject: Rule 234B1 (Clearances of Wires, Conductors and Cables From Other Supporting Structures) Exception and “effectively grounded”

Proposal: This proposal suggested adding the wording "effectively grounded" before "guys and messengers" in the exception which allows a clearance of 3 ft. (0.9 m), in lieu of the Rule requirement of 4 ft. (1.2 m). The submitter stated that the Rule was originally written with the intent that the exception pertains only to effectively grounded guys and messengers and, thus, the addition is needed for clarity.

Subcommittee Action: Subcommittee 4 accepted the proposal as submitted.

CPs 2114 (Page 171) and 2144 (Page 172)

Subject: Rules 234C3d and d1 (Clearances of Wires, Conductors, Cables, and Rigid Live Parts from Buildings, Signs, Billboards, Chimneys, Radio and Television Antennas, Tanks, and Other Installations Except Bridges), and revision of the Exception related to service drop clearances

Proposal: These proposals suggest substantive revision of service drop clearances from roofs or balconies that would change a current 3 ft. (0.9 m) requirement to 18 in. (0.5), under specified installation conditions. The proposals also include adding wording to specify that the service drop conductors must comply with the covered conductors provisions of Rule 230D so that it is explicitly understood that bare conductors are not allowed.

Subcommittee Action: Subcommittee 4 accepted the proposals as submitted.

CP 2146 (Page 183)

Subject: Rule 234F1 (Clearances of Wires, Conductors, Cables, and Rigid Live Parts from Grain Bins) and probe ports at grain bin installations

Proposal: This proposal adds an Exception to Rule 234F1 to require clearances near the probe ports of grain bins to be not less than the clearances of Rule 234C. The revision intent was to make certain that supply circuits are not in the way of farm personnel or oriented such that the conductors could fall and dangerously electrify any part of the bin installation.

Subcommittee Action: Subcommittee 4 accepted a modified version of the CP which essentially changes the requirements for service drops installed near grain bins with the concerns of the proposer considered.

CP 2147 (Page 187)

Subject: Rule 235C (Clearances for Wires, Conductors, or Cables Carried on the Same Supporting Structure – Vertical Clearance Between Line Conductors) and using the word “conductors” to mean “wires and cables”

Proposal: This proposal asked that the following sentence be added to Rule 235C: "For the purposes of this Rule, the term conductors shall include wires and cables, unless otherwise specified.

Subcommittee Action: Subcommittee 4 accepted the proposal in principal by making the substitution "line wires, conductors and cables" wherever "conductors" appears in Rules 235C2a(1) and b(1). As a result of this CP, Subcommittee 4 also established a special Working Group which reviewed all Rules in Section 23 for the "conductors"/"wires, cables, lines, etc.," concern. The Working Group prepared a version of Section 23 which includes the Working Group’s recommended choice of terminology for the entire Section. If the Working Group’s proposal is accepted following review of the Preprint 2002 Proposals, the entire section will be revised to more specifically refer to the terminology the Working Group chose for each occurrence of these words.

CP 2336 (Page 203)

Subject: re Rule 235C2b (Clearances for Wires, Conductors, or Cables Carried on the Same Supporting Structure – Vertical Clearance Between Line Conductors – Sag-Related Clearances) and addition of a new method of calculating loading for determining sag clearances

Proposal: This proposal includes significant changes in the method of determining the maximum sag for installations where the voltage is more than 50 kV between conductors. Under the proposed revision, the designer must consider both a line’s upper and lower conductors’ summer and winter loading conditions and, from the results, design for the greater vertical clearance determined for the structure. The current Rule only involves determining the maximum final sag of the upper conductor

with the maximum sag of the lower conductor under the same ambient conditions. The current Rule could result in focusing on summer conditions when winter loading conditions may be more severe.

Subcommittee Action: Subcommittee 4 accepted this proposal as submitted.

CP 2138 (Page 210)

Subject: Rule 235C2b(1)(a) (Clearances for Wires, Conductors, or Cables Carried on the Same Supporting Structure – Vertical Clearance Between Line Conductors – Sag-Related Clearances), this Rule's Exception, and Footnote 1 of Table 238-1 and bonding interval requirements

Proposal: This proposal recommends Including in the exception to Rule 2352b(1)(a) and Footnote 1 of Table 238-1 wording indicating that the supply neutral or messenger must be bonded to the communication messenger at the intervals specified in Rule 92C. The current requirement makes it seem as though the reduced sag clearance allowed by the exception would apply when the neutral/messenger bonding exists at one structure. The proposed change makes certain that the bonding is performed at specific intervals (four or eight times per mile depending on messenger conductivity) along a well-defined area, not at just one or two structures.

Subcommittee Action: Subcommittee 4 accepted a modified version of the proposal. The proposed wording of the exception provided was accepted as submitted. Subcommittee 4 modified the proposed wording for the Footnote 1 slightly but satisfied the intent of the CP.

CP 2167 (Page 212)

Subject: New Rules 235C4 (Clearances for Wires, Conductors, or Cables Carried on the Same Supporting Structure) and 238E (Vertical Clearance Between Certain Communications and Supply Facilities Located on the Same Structure), and worker safety zones

Proposal: Create two new Rules 235C4 and 238E which advise of a worker safety zone that cannot be violated with location of facilities or equipment.

Subcommittee Action: Subcommittee 4 accepted this proposal by proposing to include the following wording in new Rules 235C4 and 238E:

> *Communications Worker safety Zone*
>
> *The clearance specifications of Rules 235C and 238 create a communication worker safety zone between the facilities located in the supply space and facilities located in the communication space, both at the structure and in the span between structures. Except as allowed by Rules 238C and 238D and 239, no supply or communication facility shall be located in the communication worker safety zone.*

CP 2151 (Page 236)

Subject: Rules 250 (General Loading Requirements and Maps) A1 (General) and C (Extreme Wind Loading) and significant changes in loading requirements

Proposal: This proposal includes revising Rule 250A1 such that the two methods of calculating wind loads contained in Rules 250B and 250C be used for calculations and the result having greatest effect be used in line design. The changed proposed for Rule 250 C involves removing reference to support facilities exceeding 18 meters (60 feet) above ground or water level. This change means that extreme loading has to be calculated for all structures no matter what height above ground or water.

Subcommittee Action: Subcommittee 5 did not act on this proposal and instead included it in the Preprint 2002 Proposals for public comment.

The current Rule requires both methods of calculation be used only if both Rules apply to the design under consideration and the calculations are only necessary for structures taller than 18 meters (60 feet). This proposed Rule will necessitate calculations for all structures no matter what their height. This proposal does not provide any distinction between Grade B and Grade C construction and, thus, introduces a significant change in NESC policy as a result. If included in the final version of the 2002 NESC, these changes could result in a distribution line being required to have the same strength as a transmission line, if extreme winds control the design. In such circumstances, such a change could also affect distribution line construction costs.

CP 2308 (Page 238)

Subject: Rule 250A3 (General Loading Requirements and Maps – General) and addition of a statistical 50 Year return period

Proposal: This proposal includes addition of wording in Rule 250A3 that allows designers to use statistical ice and wind data base information where available in lieu of the requirements specified in Rule 250C. The information must cover a statistical minimum 50-year return period.

Subcommittee Action: Subcommittee 5 accepted a modified version of the proposal which will allow designers to use loading determined from available, analyzed, 50-year weather data in lieu of the requirements specified in NESC Section 25.

CP 2394 (Page 239)

Subject: new Rule 250A4 (General Loading Requirements and Maps) and earthquake ground motions

Proposal: This proposal includes revising Rule 250A by adding new Subparagraph 4:

> *4. The structural capacity provided by meeting the loading and strength requirements of Sections 25 and 26 provides sufficient capability to resist earthquake ground motions.*

Subcommittee Action: Subcommittee 5 accepted the proposal as submitted.

CP 2306 (Page 241)

Subject: Rule 250C (General Loading Requirements and Maps) and extreme wind loading for all material structure types

Proposal: This proposal includes language that would require all structure material types (prestressed concrete, steel, etc.,) greater than 18 meters (60 feet) in height to be designed to withstand, without conductors, the extreme wind load in Rule 250C in any direction. The current code only requires this loading design for wood structures.

Subcommittee Action: Subcommittee 5 accepted the proposal in principal. The subcommittee is proposing to require all structures in excess of 18 m (60 ft.,) no matter what material type, to be designed to withstand the Rule 250C extreme wind load (without conductors) in any direction by revising Rule 250C as follows:

> *B. Extreme Wind Loading*
> *If no portion of a structure or its supported facilities exceeds 18 m (60 ft.) above ground or water level, the provisions of this Rule are not required, except as specified ~~by the addition~~ in Rule 261A1c or Rule 261A2f.*

Subcommittee 5 also added a new Rule, Rule 261A2f which is to read exactly as present Rule 261A1c.

CP 2307 (Page 242)

Subject: Rule 250C (General Loading Requirements and Maps) and extreme wind loading for single pole structures

Proposal: This proposal includes wording to make Rule 250C applicable to only a single pole structure by inserting "single pole" before the word "structure" in Rule 250C. The reasoning provided focused on how the various methods of calculating wind loads on a

single structure (less than 18 m [60 ft.]) seldom result in loads being as critical as the combined wind and ice loads design required by Rules 250B, 253, and 261.

Subcommittee Action: Subcommittee 5 accepted this proposal as submitted.

CPs 2309 (Page 250) and 2363 (Page244)

Subject: Rules 250B (Loadings for Grades B and C - General Loading Requirements and Maps - Combined Ice and Wind Loading) and 250C (Loadings for Grades B and C - General Loading Requirements and Maps – Extreme Wind Loading) and new equations for extreme wind loading calculations and addition of a new map

Proposal: CP 2309 involves creating a new Rule 250D entitled, "Extreme Ice Plus Wind Loading." This new Rule would require calculation of vertical and horizontal wind and tension loads utilizing a new 50-Year wind map. CP 2363 proposes significant change and addition to Rule 250C which would incorporate new formulas for calculating wind pressure and use of data from a 50-Year wind map based on a 3-second wind gust with probability factoring included. New tables and charts are also included to assist in making the calculations.

Subcommittee Action: Subcommittee 5 accepted modified versions of these proposals. Instead of creating a new Rule 250D the Subcommittee proposed revision of Rule 250B such that it now includes two alternative methods for determining loads for combined Ice and wind loading. Either method may be used. Method 1 consists of current Rule 250B; Method 2 includes the CP 2309 proposed method and use of the proposed 50-Year wind map data. The Subcommittee modified the CP 2363 proposal but essentially Rule 250C will involve use of a new equation and data from the also introduced 50-Year wind map.

Although the 50-Year wind map proposed provides a sound basis for selecting extreme ice and wind loads, RUS voted against including the map in the NESC as a requirement because the map is incomplete. RUS believes that the 50-Year map should be included for information only in an NESC Appendix until the map is more complete. Concern was expressed for these proposals on a number of other fronts. The proposals can significantly reduce the required strength for Grade B wood structures in many parts of the country. The new equation for calculating wind loads can become significantly complicated. The alternative methods for determining loads for combined Ice and wind loading can, under some scenarios, provide significantly different results and, thus, raise questions about their equivalency.

CPs 2287 (Page 260), 2384 (Page 264), 2233 (Page 268), and 2230 (Page 268)

Subject: Table 253-1 (Overload Factors for Structures, Crossarms, Guys, Foundations, and Anchors to Be Used with the Strength Factors of Table 261-1A) and a revision to include other materials

Proposal: These four proposals include revision of Table 253-1. CPs 2287 and 2230 propose increasing the Grade C, Rule 250B Vertical Load, load factor requirement from 1.5 to 1.9. These two CPs also propose adding a new Footnote 6 (to the proposed upgraded "1.9" load factor value) which advises the reader to use a value of 1.5 for

metal and prestressed concrete structures and crossarms, guys, foundations, and anchors. CP 2219 proposes to amend Footnote 5 such that readers are advised to use a value of 1.5 for fiber-reinforced composite structures and crossarms. CP 2384 provided considerable changes to Tables 253-1, 253-2, and 261-1A, all to obtain equivalent and consistent levels of safety between wood and reinforced concrete and between steel and prestressed concrete poles for both Grade B and Grade C construction. CP 2233 proposes a change in Footnote 4 of Table 253-1 that removed "wood and reinforced (not prestressed) concrete" from the footnote. Footnote 4 addresses a reduced strength requirement allowed at structures other than structures installed at crossings.

Subcommittee Action: Subcommittee 5 accepted all of these proposals in principal and proposed revision of the NESC that will result in a more uniformly applied requirements for the various types of material structures as intended by the four CPs.

CP 2241 **(Page 276)**

Subject: Rule 261(Strength Requirements – Grade B and C Construction) and inclusion of reference to new ANSI 05 Wood Product documents

Proposal: This proposal includes suggested changes of wording throughout Rule 261 to include reference to expected revisions of ANSI 05.1, 05.2, and 05.3 specifications for the design of wood pole, laminated wood and wood crossarms, respectively.

Subcommittee Action: Subcommittee 5 accepted the proposal in principal with full acceptance contingent upon publication of the ANSI 05 documents and the public comments received in response to the ANSI 05 documents' review.

CPs 2219 (Page 263), 2220 (Page 278), 2221 (Page 286) and 2222 (Page 296)

Subject: Rules 261A1 (Strength Requirements – Grade B and C Construction – Supporting Structures), 261C1 (Strength Requirements – Grade B and C Construction – Strength of Guys and Guy Insulators) and Table 261-1A (Strength Factors for Structures, Crossarms, Guys, Foundations, and Anchors for Use with Overload factors of Table 253-1) and addition of Fiber-reinforced composite structures

Proposal: These proposals include revising current Rules 261A1 and 261C1 and Table 261-1A to add Fiber-Reinforced Composite Structures to the requirements.

Subcommittee Action: Subcommittee 5 accepted the proposals in principal by creating a new Rules 261A3 and 261C3 entitled, " Fiber-Reinforced Composite Structures."

CP 2365 (Page 282)

Subject: Rule 261A1e (Strength Requirements – Grades B and C Construction – Supporting Structures – Metal, Prestressed-, and Reinforced-Concrete Structures) and addition of spliced and reinforced structures

Proposal: This proposal includes adding a new Rule 261A1d which would allow permanent splices or reinforcements of structures other than just wood poles as is now allowed. The proposal also added wording to require splices/reinforcements of all material types to obtain the required strength.

Subcommittee Action: Subcommittee 5 accepted a modified version of the proposal that accomplished the proposer's intent.

CP 2154 (Page 288)

Subject: Rule 261H1 (Overhead Supply Conductors and Overhead Shield Conductors) and Tables 261-3 (Conductor Sizes) and 261-4 (Communication Wire Sizes with Respect to Loading District and Span Length) and inclusion of ACSR and Aluminum conductor

Proposal: This proposal recommends that the Subcommittee either add values for ACSR and all aluminum conductors in Tables 261-3 and -4 or delete the tables and reference to Rules 261H and 261J. The CP suggested that the NESC should be updated for these modern conductors.

Subcommittee Action: Subcommittee 5 accepted this proposal by deleting the two tables and Rule 261H1 and by modifying Rule 261J, 261L2a, and 263E1a(2).

CP 2400 (Page 299)

Subject: Table 261-1A (Strength Factors for Structures, Crossarms, Guys, Foundations, and Anchors for Use with Overload factors of Table 253-1) and inclusion of notes to dispel confusion regarding the strength required "when installed" and "after degradation"

Proposal: This proposal includes significant editing of the existing notes for Table 261-1A. The purpose of the proposed editing is to clear up confusion regarding reference to the strength required "when installed" and "after degradation" provisions.

Subcommittee Action: Subcommittee 5 accepted a modified version of the proposal by adding the following text to Table 261-1A:

> *(It is recognized that structures will experience some level of deterioration after installation, depending upon materials, maintenance, and service conditions. The table values specify strengths required at installation. Footnotes specify deterioration allowed for wood and reinforced-concrete structures. Structures of other materials shall be both installed and maintained to meet the table values.*

When new or changed facilities add loads to existing structures (a) the strength of the structure when new shall have been great enough to support the additional loads and (b) the strength of the deteriorated structure shall exceed the strength required at replacement. If either (a) or (b) cannot be met, the structure must be replaced, augmented, or rehabilitated.)

CP 2156 (Page 317)

Subject: Rule 314B (General Requirements Applying to Underground Lines – Grounding of Circuits and Equipment – Conductive Parts to Be Grounded) and grounding riser guards exposed to contact with supply conductors

Proposal: This proposal includes adding to Rule 314B the wording "or are exposed to contact with open supply conductors of greater than 300 V." The Rule would require conductive-material ducts and riser guards that enclose electric supply lines or that are exposed to contact with open supply conductors of greater than 300 V to be effectively grounded. Communications risers do not have to be effectively grounded now.

Subcommittee Action: Subcommittee 7 accepted this proposal as presented.

CP 2104 (Page 332)

Subject: Rule 323E3 (Manholes, Handholes, and Vaults - Covers) and adding warning signs in vaults and tunnels

Proposal: This proposal includes adding a recommendation to Rule 323E3 that advises "when vaults and utility tunnels contain exposed live parts, a prominent Caution or other appropriate warning sign should be posted where visible before entering the vault.

Subcommittee Action: Subcommittee 7 accepted this proposal by modifying Rule 323E3 by adding the following sentence and Note:

When vaults and utility tunnels contain exposed live parts, a prominent safety sign shall be posted where visible before entering the vault.

NOTE: ANSI Z535.1-1991, ANSI Z535.2-1991, ANSI Z535.3-1991, ANSI Z535.4-1991, and ANSI Z535.5-1991 contain information regarding safety signs.

CPs 2196 (Page 344) and 2200 (Page 351)

Subject: Rules 352 (Separations From Other Underground Structures) and 354 (Random Separation-Additional Requirements) and separation of cable and underground structures

Proposal: These two proposals include revision of Rules 352 and 354 to remove mention of horizontal and vertical and, instead, provide provisions for the radial separation requirements of underground cable from other structures and cables. The

proposals also would change the Rule titles and the format of the NESC in this underground topic. The proposed new titles are Rule 352, “Deliberate Separations-Equal to or Greater than 300 mm (12 In.),” and Rule 354, “Random Separation-Separation Less Than 300 mm (12 in.) From Underground Structures and Other Cables.” The proposals also included gas lines as structures to recognize the need for safety in installation.

Subcommittee Action: Subcommittee 7 accepted these proposals as presented.

CP 2201 (Page 352)

Subject: Rule 354D (Random Separation-Additional Requirements – Supply and Communication Cables or Conductors) and a new exception for random burial of entirely dielectric fiber-optic cables with supply cables

Proposal: This proposal adds an exception to Rule 354D to allow random separation of supply cables or conductors and entirely dielectric fiber-optic communication cables with no deliberate separation and no additional requirements, provided all parties are in agreement.

Subcommittee Action: Subcommittee 7 accepted the proposal with modification. The Subcommittee proposed changing the wording to require the installation to comply with Rules 354D1a, b, and d. These Rules refer to grounded systems not operating in excess of 22,000 V to ground, ungrounded system not being operated in excess of 5,300 V phase-to-phase, and ungrounded systems operating above 300 V between conductors being equipped with a ground-fault indication system, respectively.

CP 2341 (Page 356)

Subject: Rule 380D (Safety Rules for Underground Lines – Equipment – General) and padmounted equipment location re fire hydrants

Proposal: This proposal includes adding a new Rule 380D which states that padmounted equipment, pedestals, and other above ground enclosures should be located not less than 1.2 meters (4 feet) from fire hydrants. An exception was also included that states where conditions do not permit a clearance of 1.2 meters (4 feet,) a clearance of no closer than 0.9 meters (3 feet) is allowed.

Subcommittee Action: Subcommittee 7 accepted this proposal as submitted.

CP 2342 (Page 357)

Subject: Rule 381G (Safety Rules for Underground Lines – Equipment – Design – Pad-Mounted Equipment) and locking of above ground enclosures

Proposal: This proposal includes adding to Rule 381G "other above ground" equipment in addition to padmounted equipment shall have an enclosure that is either locked or otherwise secured against unauthorized entry.

Subcommittee Action: Subcommittee 7 accepted this proposal by editing the proposed text so the Rule refers to padmounted equipment enclosures and supply pedestals.

CP 2356 (Page 361)

Subject: Rule 410A2 (Safety Rules for Underground Lines – Supply and Communications Systems – Rules for Employers - General) and establishment of specific safety requirements

Proposal: This proposal includes a revision of Rule 410A2 to require employers to see to it that work is performed in a safe manner, be in compliance with Section 42, and have a mechanism for retraining of employees when necessary.

Subcommittee Action: Subcommittee 8 accepted this proposal in principal by providing the following edited version of Rule 410A2 with the underlined portion being the new requirements added by this proposal and Subcommittee action:

> 2. *The employer shall provide training to all employees who work in the vicinity of exposed energized facilities. <u>The training shall include applicable work rules required by this Part and other mandatory referenced standards or rules. The employer will ensure that each employee has demonstrated proficiency in required tasks. The employer shall provide retraining for any employee who, as a result of routine observance of work practices, is not following work rules.</u>*

CP 2349 (Page 373)

Subject: new Rule 423D5 (Underground Line Operating Procedures) and requiring shoring of excavations

Proposal: This proposal includes creation of a new Rule 4235D which would require shoring, sloping, or benching methods be used to protect employees when employees are required to perform tasks in trenches or excavations in excess of 1.5 meters (5 feet) in depth.

Subcommittee Action: Subcommittee 8 accepted this proposal in principal by providing the following revised new Rule 423D5:

> <u>5. *When a worker is required to perform tasks in trenches or excavations where a cave-in hazard exists, or the trench or excavation is in excess of 1.5 m (5 ft.) in depth, then shoring, sloping, or benching methods shall be used to provide employee protection.*</u>

CP 2123 (Page 379)

Subject: Rule 441 (Additional Rules for Supply Employees – Energized Conductors or Parts) and transient overvoltage studies for high voltage switching

Proposal: This proposal included adding a note to Table 441-1, “AC Live Work Minimum Approach Distance” to advise that minimum approach distances for 3 phase reclosing into trapped charges on 121 kV to 362 kV single break per pole switching devices have to be determined by transient overvoltage studies.

Subcommittee Action: Subcommittee 8 accepted this proposal in principal and rather than include a Rule in a Table revised Rule 441A3b to read as follows:

4. Transient Overvoltages Above 72.5 kV

a. For 121 kV to 362 kV single break per pole switching devices with 3 phase reclosing into trapped charges the maximum per-unit values given in the table (3 per unit for 121 to 362 kV) may increase significantly. Minimum approach distances for these devices shall be determined by a transient overvoltage study.
Note: These overvoltages will not exceed the values of Table 441-1 if reclosing is blocked.

CP 2385 (Page 386)

Subject: Rule 441A3b (Additional Rules for Supply Employees – Energized Conductors or Parts – Approach Distance to Live Parts) and adding a "Maximum Use Voltage" requirement for rubber gloves

Proposal: This proposal would revise Rule 441A3b such that rubber gloves and sleeves must be insulated for the "Maximum Use Voltage" which is specified in a new Table 441-6 which was also Included with the proposal.

Subcommittee Action: Subcommittee 8 accepted this proposal as submitted.

CP 2355 (Page 387)

Subject: Rule 441A3b (Additional Rules for Supply Employees – Energized Conductors or Parts – Approach Distance to Live Parts) and addition of a requirement for supplemental insulation when working at voltages above 15 kV

Proposal: This proposal included adding a new paragraph to Rule 441A3 which would require use of supplementary insulation, tested for the maximum working voltage at the work site, to be used to support the worker.

Subcommittee Action: Subcommittee 8 accepted the proposal in principal by providing the following new Rule 441A3C to read as follows:

c. *When the rubber glove work method is employed at voltages above 15 kV phase to phase, supplementary insulation, (e.g., insulated aerial device or structure-mounted insulating work platform), tested for the voltage involved, shall be used to support the worker.*

CP 2372 (Page 411)

Subject: reorganization of Sections 25, 26, and 27 on Loading and Strength

Proposal: NESC Subcommittee 5 Working Group 5.2 submitted expansive full text revisions of Sections 25, 26, and 27. The proposal eliminates use of the "Light," "Medium," and "Heavy" loading districts concept and introduces in their place a "Construction," Extreme Wind," and "Extreme Wind and Ice" concept. The proposal also includes introduction of an alternative method of determining strength factors and new wind maps and tables to be used for calculating structure loading requirements. **Unlike all other proposals in the Preprint 2002 Proposals publication, CP 2372 includes no "Supporting Comment" from the submitter to justify the need or purpose for the changes proposed.**

Subcommittee Action: Subcommittee 5 accepted this proposal as modified at an April, 1999, Subcommittee 5 meeting. A review of the explanations for some subcommittee members' votes is interesting. One Subcommittee 5 member voted in favor of this proposal to allow it to obtain public review and comment. Several Subcommittee 5 members voted against this proposal because they felt that it was incomplete, as written. These negative voting members also claimed that the proposal contains material and requirements that are going to introduce confusion to readers because, among other reasons, the alternative calculation method will produce results that differ from the method already included in the NESC. Concern was also expressed for the added weather maps not being complete for certain portions of the U.S.

Because this proposal includes potentially significant changes which may have significant impact on the design and cost of electric utility plant, RUS recommends that borrowers read this CP and submit their comments by May 1, 2000.

BIOGRAPHICAL SKETCH

GEORGE J. BAGNALL

George Bagnall was appointed Director of the Electric Staff Division (ESD) in May of 1994.

In this capacity, George is responsible for development of RUS standards, specifications, and technical guidance documents for electric distribution and transmission systems.

George also assists in the development of RUS policies and procedures relating to engineering planning, design, and construction of electric distribution and transmission systems.

Prior to this appointment, George spent:

- *8 years as Chief of the Engineering Standards Branch, and (concurrently) Chairman of Technical Standards Committee "A" in the RUS Telecommunications Program;*

- *4 years as Distribution and Transmission Engineering Branch Chief in the former Western Area Electric; and*

- *17 years in ESD (with a 2 year break in the US Army) ending as Chief of ESD's Engineering Services Branch.*

Mr. Bagnall is:

- *A Senior Member of the Institute of Electrical and Electronics Engineers;*

- *A member of NACE the Corrosion Society, and*

Represents RUS on the National Electrical Safety Code.

COMMENT on
PROPOSAL FOR REVISION of
2002 Edition,
NATIONAL ELECTRICAL SAFETY CODE

(A separate form must be used for each Comment)

CHANGE PROPOSAL No. RULE

COMMENT:

SUBMITTER:

Name Date

Company

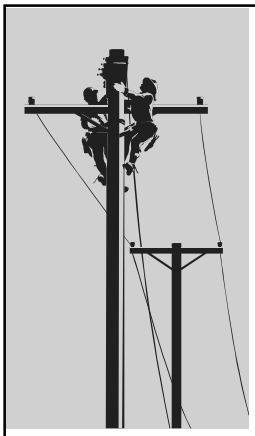
Address

City/State/Zip

Organization Represented (if any)

Mail to: Secretary, NESC Committee, IEEE Standards Department,
445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331
Fax: 732-562-1571

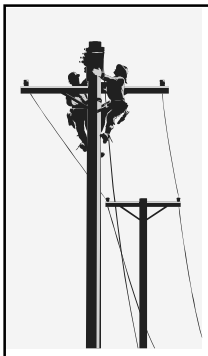
This form may be duplicated. A diskette containing the comment text in any electronic form should be submitted, in addition to the hard copy.



2002

~~1997~~ National Electrical Safety Code

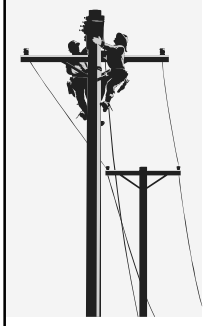
You Can Participate !



NESC Purpose

- Safeguarding of persons during:
  - ✓ Installation
  - ✓ Operation
  - ✓ Maintenance

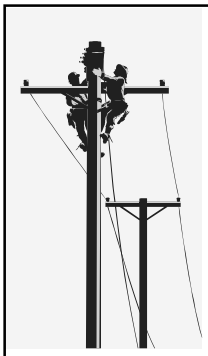
Lines and Equipment



NESC Scope

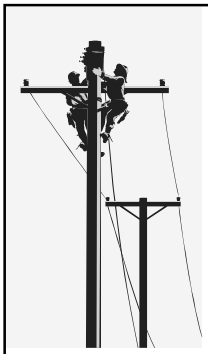
- Rules that Cover:
  - ✓ Supply & Communications Lines
  - ✓ Associated Equipment
  - ✓ Work Practices

Public or Private Utilities



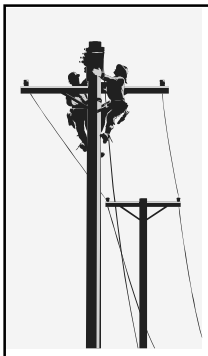
What NESC Means To You

- Mandated by Authorities
- Reliable Safe Installations
- Legal Reference of Choice



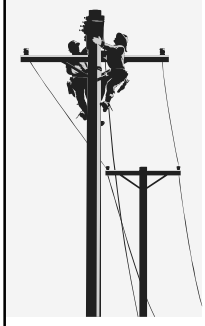
NESC Drafters

- IEEE C2 Secretariat
  - ✓ Executive Committee
  - ✓ Seven Subcommittees



RUS NESC Members

Sub 2 (Grounding)	Harvey Bowles
Sub 4 (Clearances)	Jim Bohlk
Sub 5 (Strength)	Don Heald
Sub 7 (URD)	Trung Hiu
Main Committee	George Bagnall



2002 Revision Timeframe

7/17/1998	Receive CPs
10/1998	Sub. CP Reviews
9/1999	Preprint 2002
5/1/2000	Public Comments
1/2001	C2 Vote & ANSI
5/15/2001	Submit to ANSI
8/1/2001	Publish 2002 NESC

FORM FOR CHANGE PROPOSALS ON THE NATIONAL ELECTRICAL SAFETY CODE

(A separate form must be used for each Change Proposal)

Name _____ Date_____

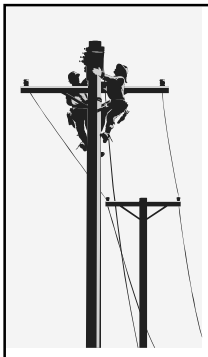
Address _____

Organization Represented_____

1. Rule: _____

2. Proposal: Include proposed exact wording, or identification of wording to be deleted. (Underline added words, strike through deleted words)

3. Statement of Problem and Supporting Comments



CP 2314

CP 2372

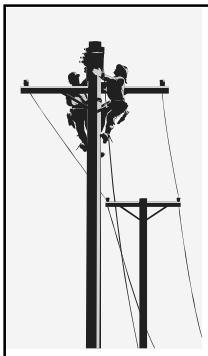
CP 2196

Change Proposals of Interest to Electric Utilities

CP 2312

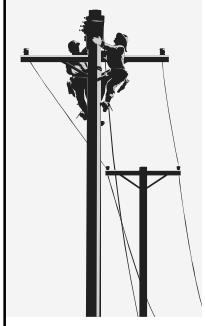
CP 2288

CP 2308



Warning

- CP's Not Code
- Don't Assume Will Be
- Published 2002 NESC



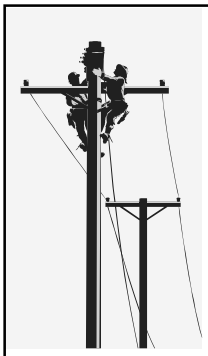
CP 2136
Experimental Construction

<u>Proposal:</u> Add to **Rule 013**:

- Equivalent safety
- Joint Use Parties <u>Agree</u>

<u>Sub 1 Action:</u> Accept as Modified

- Equivalent Safety
- Joint Use Parties <u>Be Notified</u>



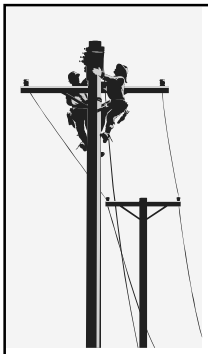
CP 2312
Exceptions To NESC Rules

Proposal: New **Rule 015G**:

Rule Exceptions = Same Force/Effect as Rule

Sub 1 Action: Accept as Modified

Same Wording Use In Rule 015D



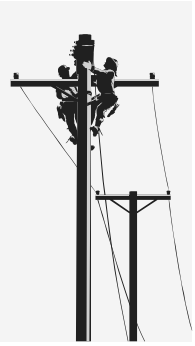
CP 2314
Grounding Path

Proposal: Add to **Rule 93A**:

Allow Equipment Tanks as Part of Grounding Conduction Path

Sub 2 Action: Accept as Modified:

Metallic Electrical Equipment Cases May Serve as Part of a Grounding Conductor To an Acceptable Grounding Electrode



CP 2211
Utility Inspections

Proposal: Change **Rule 214A2**:

Allow Inspections While
Performing Other Duties

Sub 4 Action: Accept as Modified

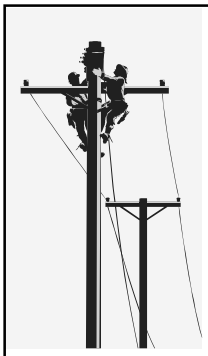
...Separate operation or
while performing other duties

CPs 2325 and 2326
Clearances Above Water

Proposal: Change **Rules 232B2 & 3**:

Add Water as Surface
Where Clearances Apply

Sub 4 Action: Accept



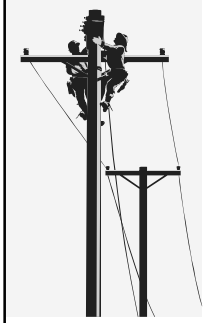
CP 2147
Conductors Vs Wires & Cables

Proposal: Change **Rule 235C**:

"Conductors" Means "Wires and Cable"

Sub 4 Action: Accept in Principal

- Change "Conductors" to "Line Wires, Conductors, and Cables"
- Similar Change for All Section 23



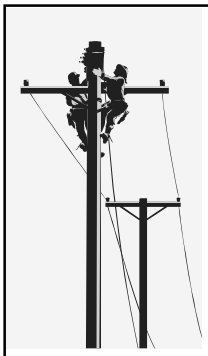
CP 2151
Loading Requirements

Proposal: Change **Rule 250A1**:

- Use Max Rules 250B and 250C Wind Load Calculations
- 250C Remove 18 m Pole Reference

Sub 5 Action: None

Expose to Public Comments

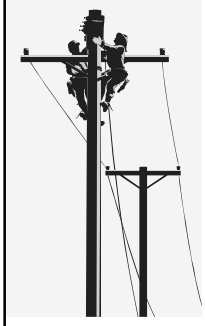


CPs 2196 and 2200
URD Separations

Proposal: Change **Rules 352 & 354**:

- "Horizontal" & "Vertical" to "Radial"
- Deliberate vs Random Separation
- Add Gas Lines

Sub 7 Action: Accept

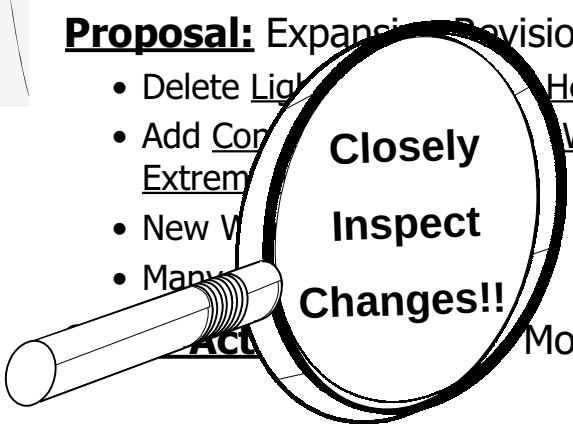


CP 2372
New Sections 25, 26, and 27

Proposal: Expansion/Revision:

- Delete Light Heavy
- Add Combined Wind and Extreme
- New W
- Many

Act Modified



COMMENT on
PROPOSAL FOR REVISION of
2002 Edition,
NATIONAL ELECTRICAL SAFETY CODE

(A separate form must be used for each Comment)

CHANGE PROPOSAL No. CP # RULE
COMMENT: Rule #

Comment

SUBMITTER:
Name Date
Company
Address
City/State/Zip
Organization Represented (if any)

Mail to: Secretary, NESC Committee, IEEE Standards Department,
445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331
Fax: 732-562-1571

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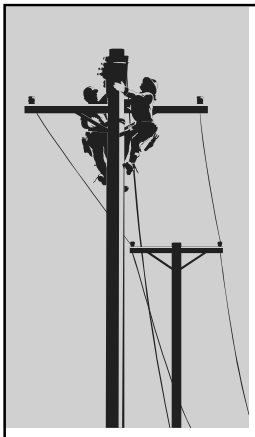

Comment Deadline

May 1, 2000