NATIONAL ELECTRICAL SAFETY CODE, ANSI-C2
2007 EDITION
SUBCOMMITTEE 5
GRADES (24), LOADS (25), STRENGTHS (26), INSULATION (27)

DRAFT MINUTES

June 23-25, 2003 Meeting
Working Groups, Task Forces, and S/C 5
Morse Room
IEEE Headquarters, Piscataway, NJ

Date	**Time**
Monday, 6/23/03	1:00 pm – 5:00 pm
Tuesday & Wednesday, 6/24&25/03	8:00 am – 5:00 pm

1. **Introduction of Subcommittee Members, Alternates, Guests and Staff Personnel**

   1.1. General Scheduling Comments, Information on Meeting Room Facilities, etc.

   Frank Denbrock, William Ash, Sue Vogel

   1.2. Welcoming New Members and Alternates on S/C5

   1.3. Status of e-mail, fax, correct addresses, etc.

2. **Determination of Voting Eligibility of Subcommittee 5 Membership Present**

   2.1. Explanation of voting/balloting procedure (ANSI/NESC Procedures Manual)

   Allen Clapp

3. **Review, Discussion and Approval of Meeting Agenda**

   3.1. Additions and placement in agenda

   A presentation on submitting change proposals was made by Bill Ash.

   3.2. Deletions

   3.3. Approval to proceed as covered by agenda

4. **Approval of Minutes from the Meeting at Las Vegas, Nevada, January 30-31, 2003**

   4.1. Additions, deletions or other corrections

   4.2. Approval of Minutes

5. **Brief Review and Discussion of New Developments, Standards, Guides and Research Efforts Affecting S/C 5 Work on Revising/Updating 2002 Edition of NESC**

   5.1. Update on ASCE 7 Section 9 (Earthquakes) and Section 10 (Atmospheric Ice Loads)

   Wong, Friemark, Peters, Clapp discussed methods of handling changes to ASCE 7 ice/wind map that occur for 2002 Ed of ASCE 7 after NESC deadlines: adopt present ASCE 7 map and allow use of changed map or local studies made on

same statistical basis. Shultz discussed work now being performed by southeast utilities for validated ice data for that region. Rempe stated that the Northwest utilities will want to use the revised map when it is available.

5.2. ASCE 7 – Extreme Wind Map

Leon Kempner, Jerry Wong, Jerry Hanson, Others

5.3. ASCE 7 and U.S. Corps of Engineers Ice Data, Ice/Wind Map

Clayton Clem, Leon Kempner, Robert Peters, Larry Slavin, Others

5.4. Status of ASCE Guides, ASCE SRBD Manual, ANSI 05, ANSI C29, and Other Standards, Guides for Possible Application in NESC Editions

Leon Kempner, Nelson Bingel, Jerry Wong, Donald Heald, Brian Lacoursiere, Nicholas DeSantis, Others

ASCE is preparing a new Guide for concrete poles. The ASCE RBD (reliability based design) manual is in peer review; Kempner is chair of the review committee. The RBD manual should be available later in the year. The ASCE fiber reinforced design manual is out—it is not a Guide. The ASCE substation committee is chaired by Kempner.

ASCE 7 classifies utilities as life support systems; utility lines are exempt from the earthquake design and ice design, but not wind under the present wording of ASCE 7. SC5 will request high-level discussions with ASCE to prevent duplication of NESC requirements. Possible changes to NESC Rule 10 scope language was discussed in general, such as "The NESC includes requirements for grounding, clearances, arrangements, assumed loads, load factors and strength factors for overhead and underground lines and equipment and electrical supply stations. Other standards contain design formulas used to calculate stress, etc."

ANSI C29 Committee on Insulator standards retains its view that the 50% limitation on insulator loading should be on the factored load, not just the unfactored load that has traditionally been used in the NESC.

5.5. Additional Developments, such as I.E.C. T.C. 99, etc.

Frank Denbrock, Others

6. **Review Past, Present, and Future Subcommittee 5 Activities and Need to Retain, Delete or Establish New Working Groups, Task Forces, etc.**

6.1. Past, Present Working Groups and Task Forces Activity

- W.G. 5.1; **L. Kempner (Chair)** – Continuity of Sections 24, 25 and 26
    - T.F. 5.1.1 **(Clapp)** – Construction and Maintenance Loads

      In the original discussion on Monday, Clapp presented the progress to date and received guidance from the group as to preferred ways to handle the issue of worker loads and stringing block hangup loads. Clapp, Lacoursiere, and Rempe then prepared a Change Proposal for presentation

on Wednesday. The CP (a) specifies worker loads on poles, tower legs, crossarms, and braces; transformer installation loads; and stringing block hangup loads for poles and towers and (b) realigns the values in Table 253-1 for vertical loading to differentiate between Grade B and Grade C, as was traditionally the case. These loading cases are independent of the "district" loads of the heavy, medium or light loading cases.

The present CP includes the extra weight of half a span picked up by structures on each side of one where the attachment is dropped (i.e., 1/5 times the weight span, but it does not yet include the impact effect of dropping a wire off one structure during construction or maintenance and having the dynamic loading occur on the crossarms or insulators of the next two structures.

- T.F. 5.1.2 **(Heald)** – Review 60-foot Exemption

  Four change proposals are being prepared. The first directly addresses the different criteria for Grades B and C with load factors of 1.00 and 0.87, respectively. The name overload factors will be changed to load factors.

  The second proposal addresses the present 60-ft exemption by using load factor for Grade B or 0.87 when the structure height is below 60 ft.

  Clapp instituted a discussion of whether it is practical to have all load factors be 1.00 or greater and handle everything else with importance factors (so the same load could be applied to a Grade B structure sitting next to a Grade C structure—so you wouldn't have one structure under a 50-yr wind sitting beside one loaded to a 25-yr wind). A 50-yr mean recurrence interval is a 2% annual probability, which translates into a 64% probability of exceeding the load in 50 years. A 25-yr mean recurrence interval is a 4% annual probability, which translates into an 87% probability of exceeding the load in 50 years and a 64% probability of exceeding the load in 25 years. [A 2% probability of occurrence = 98% probability that it will not occur. The probability of being exceeded in 50 years = $1.00 - 0.98^{50} = 0.64$.]

  The third and fourth CPs are two options for dealing with the 60-ft exclusion issue. One limits the extreme wind loading for any structure under 60 ft to 15 psf. The other limits the wind pressure to 10 psf below 90 ft and 15 psf above 90 ft.

  Bullinger commented that many of the overbuilders that have caused some recent overloading problems are pulling back, because of satellite competition; they are using more fiber and less copper with correspondingly less loading. Rempe commented that part of the problem created by some communication utilities is caused by using span-by-span tensioning, rather than using stringing blocks.

- T.F. 5.1.3 **(Clapp)** – Inconsistencies of Sections 24, 25, 26 and 27

Clapp discussed the difficulties in achieving uniformity in the overload factors for structure importance (deadends, angles, and crossings vs tangent structures), Grade of Construction, materials, and type of loading (wind vs wire tension and ice/wind vs extreme wind) while retaining traditional resultant required strengths. The present system is not uniform and several changes made the numbers less uniform over time. Clapp will attempt to prepare a bogey CP for submittal by July to formally place coordination of these values on the table.

Also discussed was adjustment of the 50-yr ASCE extreme wind and ice/wind data to other return periods. Multiplying the 50-yr extreme wind by 1.15 yields a 100-yr return period. To get a 100-yr set of data for the ice/wind case, the ice would be multiplied by 1.25, but the wind would not change (multiply by 1.0).

- T.F. 5.1.4 **(Kluge)** – Old, Alternate vs. Recommended Method

  A CP will be submitted to remove the old method.

- T.F. 5.1.5 **(Kempner)** – Wind Loading

  There were no changes in the ASCE wind loading criteria in ASCE 7-2002.

  The issue of the global distribution of wind over the entire structure versus loading on large areas at the top of the structure was discussed. The present system assumes that the centroid of the structure wind silhouette area is at 2/3 the structure height. This is simple and works well for most pole structures. However, with towers having large arm structures at or near the top of the structure, or for poles having large equipment at or near the top of the pole, it may be desired to use wind pressures applicable to such heights.

  The issue of shape factors was also reviewed, including both the values used in the NESC and the terminology. The NESC term *shape factor* is called a *force coefficient* in other standards addressing the same subject and it is thought to be appropriate to conform to general terminology use. A new CP will apply appropriate force coefficients to multiple face towers and different member shapes and, when it is desired to determine the wind loading of a specific area, such as a large arm system on a transmission structure, will apply appropriate k_z values. Clapp preferred the simplicity of sending the user to the k_z values for the wire height, but others preferred a separate statement.

  The present EXCEPTION under Rule 252B2c is incorrectly indented: it applies to Rules 252B2a, b, and c, as shown in the rule. IEEE NESC Secretary Bill Ash was requested to place an errata on the web to show the correct positioning of this EXCEPTION.

- T.F. 5.1.6 **(Freimark acting for Clem)** – Ice Loading

The present wind/ice combined loading maps in ASCE 7 are based upon a 50-yr return ice loading with correlated 7-day winds after such events. The wind is not a 50-yr return wind. When changing the return period for wind to a lesser term (such as 25-yr) or greater term (such as 100-yr), only the amount of ice is changed; the wind remains the same in all cases.

The new ASCE 7 ice/wind map is for freezing rain and does not include in-cloud icing. The present loading case will need to be retained as a separate case for areas where the new freezing rain map is not controlling.

Shultz discussed the proposals to allow alternate icing studies and the ability to use the next edition of the ASCE 7 ice/wind map when it comes out.

- T.F. 5.1.7 **(Bingel)** – Fiber Reinforced Composite Structures

  The new ASCE publication on FRP (fiber-reinforced polymer) structures is out. There are 4 different processes in use to produce such structures and structure components. As a result, you cannot use one strength factor for all. The 5% LEL (lower exclusion level) system must be used. A CP will be submitted by the task force.

- T.F. 5.1.8 **(Bingel)** – Grade B vs. Grade C Reliability & SRBD

  Three different proposals have been developed to incorporate the RBD guide. Howver, they are not needed, since a CP is being prepared by the ASCE RBD group. TF 5.1.8 will shepherd and monitor the RBD proposal.

  Questions have been raised about whether the 2/3 reduction for remaining strength after deterioration applies, or should apply, to crossarms. Traditional code language applies the reduction to wood poles, but not wood crossarms and braces. There is a new IR (discussed in Las Vegas) requiring the use of the overload factors of Table 253-1 for wood crossarms and braces. A new CP will appropriately reflect crossarms and braces in FN2 and appropriate parts of tables. Heald mentioned that old codes required replacement when the pole deteriorated down to the next Grade of Construction and that this was where the 2/3 factor was derived: B = 1.5 x C.

- T.F. 5.1.9 **(Freimark)** – Conductor Tension Limits

  Freimark discussed the CP on tension limits for aeolian vibration control included in the CP initially generated by Dr. David Havard.

- T.F. 5.1.10 **(Bingel)** – Coordination of NESC with Changes in ANSI O5.1

  Bingel presented a review of major changes in the 2002 Ed. of ANSI O5.1 that may affect the use of the document with the NESC and vice versa. This discussion originally occurred under TF 5.1.8 and resulted in formation of this new task force.

A large part of the discussion centered around the requirement in ANSI O5.1 to consider the point of maximum stress when it is above the ground line. ANSI O5.1 now provides information on COV of some woods within the document that can be used with RBD methodologies.

Earlier data used to prepare ANSI O5.1 was based upon test data on shorter poles typically used in distribution lines at the time and on clear specimens. Further work has considered the EPRI data taken in the 1980s that included taller poles typically used in transmission and the tallest distribution structures. Clear specimen data is no longer considered. The new ANSI O5.1 recognizes that the strength of the pole decreases with height. There is debate as to whether this occurs as a result of size, geometry, or both. The mean (5% LEL) strength at the ground line for the smaller pole group was 8380 (6401) psi, compared to 6630 (4825) psi for the taller pole group. The taller poles will break above the ground line. As a result, ANSI O5.1-2002 includes an adjustment for distance below the top of the pole.

The 2002 edition no longer includes an adjustment for load sharing or for variability. The 8000 psi for Southern pine is now stated as a mean with a COV of 20%. If the point of maximum stress is above the groundline, the mean strength is adjusted with a height adjustment. This should have no effect on shorter distribution poles, but may require larger, tall transmission poles. Kluge remarked that Western red cedar fiber stress is actually greater at the top, but the adjustment is made to all woods (even if it does not exist in specific species) in ANSI O5.1.

Bingel showed some charts plotting the resultant stress location on poles with both single loads 2 ft from the top and multiple loads distributed below the top of the pole. While the often-used translation of all loads to an equivalent load located at 2 ft from the pole top will give the same bending moment at the ground line as the distributed loads, it produces a falsely high bending moment in the top portion of the pole.

There is controversy surrounding the actual distribution of wood strength. A normal distribution is often used, since the formula to adjust the mean to a 5% LEL value is relatively easy: 1-1.645 COV x mean = 5% LEL. It appears that the actual distribution of the wood strength may be closer to a log normal distribution. This is more complicated to derive a 5% LEL value, since the adjustment itself depends upon the covariance. The following adjustments would be substituted for the 1.645 value above: 1.46 if COV = 20%, 1.55 if COV = 10%, and 1.60 if COV = 5%.

- W.G. 5.2; **R. Peters (Chair)** – Total New NESC (CP 2372)

  There are no new changes since those issued after the Jan 2003 meeting in Las Vegas. The Las Vegas comments caused several changes. Peters believes that the deadends and heavy angles are now overdesigned, since the 15% overload factor was reinstated for wire tension.

This new method will be proposed as an alternate for this edition, with a long-term view of replacing present methodology.

- T.F. 5.2.1 **(Freimark, Slavin)** – Continuing Reviews/Comments

- W.G. 5.6; **A. Schwalm (Chair)** – Section 27 – Line Insulation

  DeSantis reported that C29 has not changed its stated position relative to the proper loading for use with the present strength factors in Rule 277.

  A unanimous MOTION was made to table the TIA on insulators until better backup is provided in the rationale.

  Affirmative: Amato, Bingel, Bullinger, Clapp, Denbrock, DeSantis, Freimark, Heald, W. Jones, Kempner, Kinghorn, Kluge, Lacoursiere (Alt for Rubiez), Peters, Rempe, Shultz, Slavin, Standford, Wong

  Negative: none

  A MOTION passed to submit a CP to add a new table of overload factors for insulators in the 2007 Edition.

  Affirmative: Amato, Bingel, Bullinger, Clapp, Denbrock, DeSantis, Freimark, W. Jones, Kempner, Kinghorn, Kluge, Lacoursiere (Alt for Rubiez), Peters, Rempe, Shultz, Slavin, Standford, Wong

  Negative: Heald,

  - T.F. 5.6.1 **(Schwalm)** – Coordinate Changes/Improvements/New Materials

  - T.F. 5.6.2 **(Schwalm, DeSantis)** – Test Methods/Extreme Loading/Emergency Conditions/Temporary Conditions/etc.

- W.G. 5.7; **Lawrence Slavin (Chair)** – Seminars, Research, Coordination with Other S/C's, etc.

  - T.F. 5.7.1 **(Slavin)** – Seminars, When, Where, Who, etc.

    A panel session on the relationship between the NESC and the ASCE RBD Guide will be held on September 10, 2003 in Dallas at the T&D Expo. A paper has been prepared by Wong, Bingel, and Slavin from the NESC plus others from the ASCE RBD committee. Slavin is to email the paper to all SC5 members.

  - T.F. 5.7.2 **(Slavin)** – Solicit Comments on WG 5.2 Methodology-Status?

- W.G. 5.8; **Brian Lacoursiere (Chair)** – Liaison with ASCE on Reliability Based Design

  Most of this presentation was made during TF 5.1.8 discussions.

  - T.F. 5.8.1 **(Lacoursiere)** Presentations of New Concepts for NESC Considerations

- W.G. 5.9; **Bob Peters (Chair)** – Liaison with SC1 Working Group on Coordination Betweeen NESC and ASCE Standards

6.2. New Working Group and Task Force Requirements

A new TF 5.1.9, new TF 5.1.10, and new WG 5.9 were formed with scope and membership as shown on revised SC5 Working Group and Task Force list.

7. **Scheduling of Future Subcommittee 5, Working Group and Task Force Meetings**

7.1. Piscataway, NJ September 1:00 pm 29 to October 2, 2003

7.2. IEEE T&D, Substation, ESMOL mtg @ Riviera ?? Las Vegas Jan?? 04

8. **S/C 5 Secretary's Information on Proper Minutes Format, Records, Reports, Distribution, etc.**

8.1. Review of ANSI/IEEE/NESC Requirements

Allen Clapp, S/C 5 Secretary

8.2. Discussions, Clarifications, etc.

A MOTION was made and passed unanimously to request (a) that IEEE send a CD with all 2007 change proposals and all Interpretation Requests since the start of the last code cycle in September 1998 on it to all NESC subcommittee members as soon as practical after July 17 (b) provide a three-hole punched paper copy of all relevant CPs in rule order for each member at each subcommittee meeting (with a few extra for guests) and (c) if requested by a subcommittee member in writing by email to w.ash@ieee.org, send the paper copies to the requesting members not less than one month prior to the meeting. **Secretary's Note: it may be easier and preferable if the relevant IRs can be sent to all subcommittees early, so they can be reviewed and members can come to the fall meetings with suggestions for handling these problems.**

9. **Adjournment 4:45 pm 25 June 2003.**

9.1. See you at 1:00pm on Sep 29, 2003.