

MINUTES OF THE IEEE/PES

TRANSFORMERS COMMITTEE

April 17, 1985

St. Louis, Missouri.

MEMBERS OR REPRESENTATIVES PRESENT (68)

D. J. Allan  
R. Allustiarti  
E. H. Arjeski  
J. C. Arnold  
R. Bancroft  
J. J. Bergeron  
J. V. Bonucchi  
J. D. Borst  
E. Chitwood  
O. R. Compton  
F. W. Cook  
D. Crofts  
D. H. Douglas  
J. C. Dutton  
J. A. Ebert  
E. C. Edwards  
R. L. Ensign  
C. G. Evans  
P. P. Falkowski  
W. R. Farber  
H. G. Fisher  
M. Frydman  
H. E. Gabel  
R. L. Grubb  
G. Gunnels  
J. H. Harlow  
W. R. Henning  
K. R. Highton  
P. J. Hoefler  
C. C. Honey  
C. Hurty  
C. P. Kappeler  
J. G. Lackey  
W. Lampe  
H. F. Light  
T. G. Lipscomb

M. L. Manning  
J. W. Mathews  
L. S. McCormick  
C. J. McMillen  
G. G. McCrae  
J. McGill  
W. J. McNutt  
S. P. Mehta  
C. K. Miller  
C. E. Mitchell  
R. J. Musil  
E. T. Norton  
H. A. Pearce  
D. Perco  
D. A. Roach  
L. J. Savio  
L. R. Smith  
W. W. Stein  
L. R. Stensland  
R. B. Stetson  
R. C. Thomas  
F. W. Thomason  
T. P. Traub  
D. E. Truax  
R. E. Uptegraff Jr.  
R. A. Veitch  
L. B. Wagenaar  
R. J. Whearty  
W. E. Wrenn  
A. C. Wurdack  
D. A. Yannucci  
E. J. Yasuda

MEMBERS ABSENT (42)

B. F. Allen	D. A. Gillies	H. B. Margolis
S. J. Antalis	A. W. Goldman	N. J. Melton
R. J. Alton	W. F. Griffard	C. Millian
P. L. Bellaschi	G. Hall	R. E. Minkwitz
S. Bennon	T. K. Hawkins	H. R. Moorc
G. H. Bowers	F. W. Heinrichs	W. H. Mutschler
F. J. Brutt	G. W. Iliff	C. A. Robbins
D. J. Cash	R. G. Jacobsen	D. E. Shefka
J. Corkran	O. Keller	L. Swenson
M. G. Daniels	J. J. Kelly	A. L. Tanton
J. D. Douglass	A. D. Kline	J. A. Thompson
J. K. Easley	R. E. Liebich	J. W. Walton
J. A. Forster	R. Little	S. A. Wiencek
S. L. Foster	R. I. Lowe	A. Wilks

GUESTS (50)

D. Barnard	J. N. Davis	E. Howells
J. A. Gauthier	A. J. Jonnatti	J. McAlpin
C. L. Moore	M. A. Franchek	C. R. Hoesel
F. N. Young	C. J. Kalra	J. Goodavish
F. Hubet	B. K. Patel	C. Herig
H. J. Windisch	E. Koenig	P. Nobile
V. Shenoy	G. Bryant	J. Hupp
E. W. Kalkstein	E. R. Lane	W. J. Carter
D. A. Whiteley	B. Hunter	
R. H. Hollister	D. A. Duckett	
J. Antweiler	F. E. Willett	
R. L. Grunert	C. V. Brown	
D. Heath	E. L. Morrison	
T. Kluczynski	W. E. Boettger	
S. P. Kennedy	A. M. Iversen	
R. G. Hansen	L. M. Nicholas	
S. Moore	C. S. Yung	
J. M. Pollitt	S. K. Okln	
P. Nanert	B. Poulin	
V. Thenappan	R. J. Hellweg	
M. I. Mitelman	R. L. Kollmeyer	

1. CHAIRMAN'S REMARKS AND ANNOUNCEMENTS

Chairman Dean Yannucci convened the meeting at 8:00 A.M. with 68 members and 50 guests present. Appreciation was expressed to Charles Mitchell for the very excellent work done in organizing the St. Louis meeting. Total registration was reported at 170 with 122 attending the symposium on Direct Measurement of Local Temperatures in Transformer Windings presented by K. A. Wickersheim. All attendees made self-introductions.

Other remarks by the Chairman are reported in the Administrative Subcommittee minutes, Section 4, Review of Technical Council Activities and Section 12, Committee Finances and Meeting Arrangements.

1.0 Recognition and Awards

1.0.1 The Working Group Recognition Award of the IEEE/PES was presented by Bill McNutt to members of the Task Force to Develop a Loading Guide for Transformers Above 100 MVA for their work in developing IEEE Std. 756, Trial-Use Guide for Loading Mineral-Oil-Immersed Power Transformers Rated in Excess of 100 MVA.

1.0.2 The Prize Paper Award was presented to R. C. Degeneff, W. J. McNutt, W. Neugebauer, J. Panek, M. E. McCallum and C. C. Honey for their paper, "Transformer Response to System Switching Voltages."

1.0.3 George Iliff was presented, in absentia, with the Distinguished Members Award.

2. APPROVAL OF MINUTES OF THE BOSTON MEETING HELD  
OCTOBER 17, 1984

The minutes were approved as issued.

3. REPORT OF SUBCOMMITTEES

3.0 Administrative - D. Yannucci (See Appendix "A")

3.0.1 <u>Future Meetings</u>	<u>Date</u>	<u>Hotel</u>
Toronto, Ontario.	October 27-30/85	Delta Chelsea Inn
Little Rock, AK.	April 6-9/86	Excelsior
Pittsburgh, PA.	October 12-15/86	William Penn.
Fort Lauderdale, FL.	Spring '87	
New Orleans, LA.	November 1-4/87	Monteleone

### 3.0.2 New Members

The following new members were approved by the ABSUBCOM:

- Vis Thenappan                      - ASEA Electric
- Anthony J. Jonnatti               - Square "D" Co.
- Bill Kennedy                        - General Electric Co.

### 3.1 Audible Sound and Vibration - R. E. Liebich

See Appendix "B"

The Subcommittee report was presented by Joe Pollitt.

### 3.2 Bushing - L. B. Wagenaar

See Appendix "C"

At the conclusion of the Chairman's report, a question was raised by Ray Alustiarti concerning a "flashover" test for bushings. This was once a prototype test but is no longer required. Should a "flashover" test be added to the standard? This item will be added to the agenda for the next meeting in Toronto.

### 3.3 Dielectric Tests - L. S. McCormick

See Appendix "D"

### 3.4 Dry Type Transformers - R. E. Uptegraff Jr.

See Appendix "E"

### 3.5 Instrument Transformers - R. C. Thomas

See Appendix "F"

### 3.6 Insulation Life - C. J. McMillen

See Appendix "G"

At the conclusion of the Chairman's report, a question was raised concerning the applicability of the Loading Guides to other liquids, such as Silicone. Do the Loading Guides apply to liquids other than mineral-oil immersed transformers? The Chairman will look into this matter prior to the next meeting in Toronto.

### 3.7 Insulating Fluids - H. A. Pearce

See Appendix "H"

At the conclusion of the Chairman's report, Charles Honey raised a question regarding field failures which were attributed to static charges in oil. In reply, the Chairman stated that this question will be looked into by his Subcommittee.

A second question was raised by Dave Douglas concerning limits of gas produced during "normal" and "overload" heat runs. No guide is currently available. This subject will be the responsibility of the Insulation Life Subcommittee.

### 3.8 Performance Characteristics - J. D. Borst

See Appendix "I"

At the conclusion of the Chairman's report, Charles Honey raised the following questions re core loss correction as a function of temperature:

- Is there a difference in core loss at different temperatures?
- If there is, what is the method of correction?

These questions are being actively pursued by W. R. Henning's Working Group on Loss Tolerance and Measurement.

A second question was raised by Dave Douglas regarding the necessity of showing whether a transformer has directed or non-directed oil flow. This will be referred to Bill Wren's Working Group on Guides for Loading.

### 3.9 Recognition and Awards - W. J. McNutt

The Working Group Recognition Award and the Prize Paper Award were presented by Bill McNutt immediately after the Chairman's remarks. (See 1.0 above)

Bill McNutt also reported on other recommendations for awards as follows:

- Edison Medal - Peter Bellaschi's name will be resubmitted.
- Past Subcommittee and Working Group chairmen will be considered for a certificate of recognition.
- Fellow Status - A "Fellow Engineer" Committee will be established within the Transformers Committee to nominate worthy members to "Fellow" status. This committee will be chaired by Bill McNutt. All members of this committee will be "Fellow Engineers."

### 3.10 Transformer Standards - L. R. Smith

See Appendix "A" - Enclosure III

Reporting to the Standards Subcommittee are Working Groups P801, Requirements, Terminology and Test Code for Step-Voltage and Induction-Voltage Regulators and PC57.21 Revisions to Test Code for Shunt Reactors. The minutes of these meetings are included in Appendix "J" (1) and "J" (2).

### 3.11 West Coast - H. Johnson

A brief West Coast report was given by Ray Allustiarti outlining committee activities. A West Coast Subcommittee meeting was held on July 17, 1985 at the summer PES meeting in Vancouver. Minutes of this meeting are included. (See Appendix "K")

4. REPORT OF LIAISON REPRESENTATIVES

4.1 EPRI Report - Ed Norton

See Appendix "L".

4.2 IEEE/ANSI C57 - D. A. Yannucci

See Appendix "M"

4.3 ANSI C89 - S. J. Antalis

See Appendix "N"

5. TECHNICAL PAPERS FOR FUTURE IEEE/PES MEETINGS - O. R. Compton

See Appendix "A" - Enclosure V.

Respectfully submitted.

R. A. Veitch,  
Secretary.

APPENDIX "A"

ADMINISTRATIVE SUBCOMMITTEE

The Administrative Subcommittee met at 7:00 p.m. on Monday, April 15, 1985 with 15 members and two guests present.

1. Introductions were made.
2. Minutes of the Boston meeting were approved as written.
3. Review of PES Standards Coordinating Committee Activity - Olin Compton

The Standards Coordinating Committee, chaired by Joe Bonucchi, met at the Winter Power Meeting on Monday, February 4, 1985.

Since this was the first meeting for several of the members there was a general discussion of standards and our responsibilities as representatives of our technical committees.

I raised questions on the disposition of C76, Apparatus Bushing Standards since C76 has been dissolved by the Standards Board. The Standards Staff responded that the former C76 standards will be folded into C57 as they are revised and approved. When C57 meets, I will propose that a subcommittee be formed within C57 to look after bushings.

Note: I've written to the Standards Board protesting the lack of communication with members of the old C76 and C57 on this matter.

There was discussion of EEI returning to the standards area by seeking representatives upon standards committees.

The next meeting of the committee will be in Vancouver at the Summer Power Meeting.

4. Review of Technical Council Activities - Dean Yannucci

- Dean Yannucci's report of the Technical Council Meeting of February 4, 1985 is attached (See Enclosure I). At the request of the chapters council, each committee is to prepare five slides with the objective of increasing student membership. This presentation is to convey:
  - A. An improvement in the student's impression that the power industry presents new and exciting challenges.
  - B. Show two or three examples of where new technology is being applied to provide improved solutions to old and new problems.

These slides would be used for presentation at Student IEEE Section meetings. Suitable slides should be sent to Dean Yannucci.

- A letter was received from J. J. Skiles, Chairman of the Tutorial Sessions Subcommittee, asking for suggestions of subjects that might be developed into tutorials to serve the needs of PES members. Attached to Mr. Skiles letter were the following:



- (a) IEEE/PES Tutorials under development or proposed.
- (b) Organizing Tutorial Sessions.
- (c) Organizing an IEEE/PES Tutorial Course.
- (d) Recent Tutorials.

The above is covered by Enclosure II.

It was agreed that since a tutorial had just been issued, it was too soon for a new tutorial to be prepared. It was suggested that a new tutorial might be considered in about three years.

5. Review of Standards Project Status - L. R. Smith

A review of IEEE Standards Project Status was presented by L. R. Smith (See Enclosure III).

It was noted that the "book has been closed" on all revisions for the 1985 edition of C57-12.00 and C57-12.90. Ray will continue to collect revisions for the next rewrite of these standards.

Ray has also requested a copy of all Project Authorization Requests.

6. Review of ANSI Standards Status - J. C. Dutton

A review of ANSI standards status was presented by John Dutton - See Enclosure IV.

7. Subcommittee Activities Discussion

(a) Instrument Transformers - R. C. Thomas

After many years at the helm Ray Thomas has tendered his resignation as chairman of this subcommittee. He will be replaced by Ralph Stetson of General Electric.

(b) Dry Type Transformers - R. E. Uptegraff

A question was raised regarding Dry Type Transformer standards C57-12.01 and 12.91 with regard to an insulation flammability test for cast coil transformers.

Is there a need for a flammability test for dry type transformers and if so, should this be the responsibility of ASTM?

This questions was to be reviewed with the Working Group on Cast Coil transformers to determine if a need exists.

(c) Performance Characteristics - J. Borst

ASEA Electric and the National Bureau of Standards have recently completed a joint study of transformer loss measurement techniques.

Sam Mehta of ASEA and Dr. O. Petersons of NBS have offered to put on a seminar on this study at the next Transformers Committee meeting in Toronto. It was agreed that this seminar will be presented during the last session of the afternoon of Tuesday, October 29, 1985.

John also brought to the committee's attention the problem of inadequate time for all the Task Force and Working Group sessions. After some discussion, it was agreed that the following schedule changes would take place on a trial basis, for the next meeting only.

- On Tuesday, there will be three sessions in the morning and two in the afternoon within the 8:00 a.m. to 5:00 p.m. period.
- The following schedule will be tried:

- 8:00 - 9:45 - Insulating Fluids Subcommittee
  - Instrument Transformer Subcommittee
  - Three working groups, one each from the Insulation Life, Performance Characteristics and Dielectric Test Subcommittees.
- 10:00 - 11:10 - Subcommittee meetings
- 11:15 - 12:25 - " "
- 12.30 - 1:45 - Transformer Committee Luncheon
- 1:50 - 3:00 - Subcommittee meetings
- 3:15 - 5:00 - Seminar

(d) Dielectric Tests - L. S. McCormick

L. S. will contact NEMA to determine their intentions on revising TR1-0.06, External Clearances Between Bushing Live Parts.

Note: This has now been done and NEMA advises that the table will be revised at the next revision of TR1 which is due and being worked on.

(e) Insulation Life - C. J. McMillen

Chuck proposed that the Loading Guide for Current Limiting Reactors should be divided into an oil filled part and a dry type part. The oil filled part would be incorporated into the oil filled transformer loading guide and the dry type part would be incorporated into the dry type transformer loading guide.

(f) Insulating Fluids - H. A. Pearce

Standards on askarels will be dropped.

(g) Bushings - L. B. Wagenaar

- The Working Group on Gas Insulated Bushings will be incorporated into the subcommittee.
- The Bushing Loading Guide (P757) will be published as an IEEE trial use guide.
- The Bushing Application Guide (P800) will eventually become part of C57.

8. Liaison Representation

Leonard Long has retired from the National Public Affairs Council and will be replaced by Olin Compton.

9. Papers for Power Meetings - O. Compton

A report was given by Olin Compton - See Enclosure V.

A letter was received from W. A. Elmore, Vice Chairman, Technical Committees, stating that overhead projectors would no longer be allowed at the Winter and Summer PES meetings.

10. Future Transformer Committee Meetings - D. A. Yannucci

No new meetings were considered by the Admin. Subcommittee.  
Future committee meetings will be held as follows:

<u>Date</u>	<u>Location</u>	<u>Hotel</u>
October 27 - 30/85	Toronto, Ontario.	Delta Chelsea Inn
April 6 - 9/86	Little Rock, AK	Excelsior
October 12 - 15/86	Pittsburgh, PA	William Penn.
Spring '87	Fort Lauderdale, FL	
November 1 - 4/87	New Orleans, LA	Monteleone

11. Committee Membership and Nominations

Three new members were approved by the ADSUBCOM:

- Vis Thenappan - ASEA Electric
- Anthony J. Jonnatti - Square D Corp.
- Bill Kennedy - G. E. Company.

12. Committee Finances and Meeting Arrangements

Charles Mitchell presented the second draft of his "Meeting Host Procedure Document" dated April 1985. He requested that members review this document and return their comments to him within one month so that the final document can be issued.

The ADSUBCOM expressed their appreciation to Charles for the work that he put into preparing such an excellent and useful document as well as the arrangements made for the St. Louis meeting.

*1988 - possibilities of Washington DC.  
and Long Beach, Cal*

The following items of business concerning future Transformers Committee meetings were discussed:

- Pre-Registration

Pre-registration appears to be successful and will be continued.

The question of refunds of pre-registration fees, to individuals who find that they cannot attend, was discussed. It was agreed that a "Refund Policy" must be formulated and published. It was further agreed that fees would be refunded only upon request, provided the meeting was in a surplus financial position.

- Host Registration

It was agreed that the host can have a total of six people, including himself, who do not have to pay registration fees. Each individual must have the word "Host" on his name-tag.

- Sunday Reception

It was agreed that the reception should provide six or seven hors d'oeuvres per person and the cost of these can increase from \$1,000 to \$1,500.

- Luncheon Guest Speaker

It was agreed that we should attempt to have a guest speaker at the Tuesday luncheon. This will begin at the Toronto meeting in October. Topics for discussion should preferably be concerned about the Electric Power Industry.

- Meeting Dates

When hosts are arranging meeting dates, they should avoid conflict with other technical committees, such as Doble and ASTM, so that attendance at the Transformers Committee is not affected.

• 13. PES Awards - Bill McNutt

The Working Group Recognition Award will be presented to the Task Force to Develop A Loading Guide for Transformers Above 100 MVA for their work in developing IEEE Std. 756, Trial-Use Guide for Loading Mineral-Oil-Immersed Power Transformers Rated in Excess of 100 MVA.

The Prize Paper Award will be presented to R. C. Degeneff, W. J. McNutt, W. Neugebauer, J. Panek, M. E. McCallum and C. C. Honey for their paper "Transformer Response to System Switching Voltages."

Other recommendations for awards:


- Edison Medal - Peter Bellaschi's name will be resubmitted.
- Past Subcommittee and Working Group chairman will be considered for a certificate of recognition.

- Fellows Status

It was agreed that a "Fellow Engineer" Committee be established within the Transformers Committee to nominate worthy members to "Fellow" status. This committee will be chaired by Bill McNutt. All members of this committee will be "Fellow Engineers."

14. Other Business

Olin Compton received a letter from Fred Vogel concerning the "Vogel Detector" and the work of the Partial Discharge Working Group. This was passed to L. S. McCormick who will answer it in due course.



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R. A. Veitch,  
Secretary,  
ADSUBCOM.

RAV:pm

Report of Technical Council Meeting  
February 4, 1985  
New York, New York

The Technical Council Meeting was chaired by Mel Olken. He announced that he had recently joined the IEEE staff. The new chairman will be Frank Denbrock and the new secretary will be Walt Elmore.

The items of interest are as follows:

- 1. A major goal of the PES was that of increasing student interest and membership. A request had been made of all subcommittees for slides that could be used in a student slide presentation showing challenges and high technologies being applied to solve power engineering problems.

The Transformer Committee has not yet responded.

- 2. A request for tutorial sessions on technical topics of interest has been issued by the Power Engineering Education Committee.
- 3. A task force headed by J. W. Hagge has been formed on technical council procedures and organization updates.

The Transformer Committee will be represented on this task force by Leo Savio.

- 4. Planning has been initiated on the 1986 IEEE T&D Conference in Anaheim, California, September 14-19. Mr. C. A. White of South Carolina Electric and Gas is the chairman. The Transformer Committee technical contact has been designated as Olin Compton.
- 5. It was reported by the Standards Coordinating Committee that the delay in the publication of standards is a major concern. The problem lies within IEEE and ANSI. The process is taking over two years.
- 6. EEI has applied for standards representation on IEEE technical committees where it has special interest. The IEEE Standards Board has approved the application and in accordance with procedures of IEEE, EEI representatives may fully participate in the standards making activities of the committees. R. L. Ensign is the designated Transformer Committee EEI representative.

Projects of major interest from the Transformer Committee were reported as follows:

- o A task force has been established to develop a Loss Measurement Guide for power transformers.

Report of Technical Council Meeting  
February 4, 1985  
New York, New York  
Page 2

- o A task force to develop a test procedure for the thermal evaluation of oil immersed transformers has been established.
- o A telephone interference test addition is being considered in C57.12.00 for transformers  $\leq$  500 KVA.
- o Harmonic load current heating guide - in Working Group.
- o Complete review of all transformer loading guides have been initiated.

*D. A. Yannucci*

D. A. Yannucci

DAY/bvs



TABLER

ADCOM MTS

(4)

POWER ENGINEERING SOCIETY  
POWER ENGINEERING EDUCATION COMMITTEE

March 15, 1985

PLEASE REPLY TO:  
Professor James J. Skiles  
Energy Research Center  
University of Wisconsin  
1500 Johnson Drive  
Madison, Wisconsin 53706  
(608) 263-1997

TO: Chairmen of IEEE/PES Technical Committees

SUBJECT: Tutorials for IEEE/PES Meetings

4B

Gentlemen:

Tutorials Sessions on technical topics of current interest have been a feature of PES Winter and Summer Meetings for many years. Tutorials must be sponsored by PES Technical Committees and the active participation of PES members knowledgeable in the subject matters is essential to the success of the Tutorial program.

The PES Technical Committees are the major source of ideas for tutorials and there is a continuing need for new tutorials. The Tutorial Sessions Subcommittee of the Power Engineering Education Committee (PEEC) will appreciate your committee giving consideration to subjects that might be developed into Tutorials to serve the needs of PES members.

Please communicate to me suggestions for possible tutorials that your committee may be interested in co-sponsoring with PEEC. The names of individuals to coordinate the proposed tutorials will be welcome also.

The Power Engineering Education Committee has the responsibility of working with PES Technical Committees to identify subject areas for tutorials, in the development of tutorial outlines and the required special tutorial text, and securing PES and meeting approvals, and scheduling of tutorials.

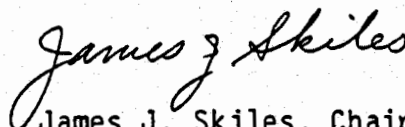
The enclosed memo "Organizing Tutorial Sessions" outlines the mechanics and suggested timetable to organize and conduct a tutorial at a PES meeting.

Attached to the memo is a list of tutorials that have been offered recently.



For your further information, I have attached a list of proposed tutorials in various stages of development, the sponsoring Technical Committee, and the names of the tutorial coordinators.

Sincerely,



James J. Skiles, Chairman  
Tutorial Sessions Subcommittee

JJS:hd

Enclosures: Organizing Tutorial Session 9/10/84  
Recent Tutorials offered  
Proposed Tutorials 3/13/85

cc: Chairmen of PES Technical Committees  
PEEC Tutorial Session Subcommittee Members  
A.J. Wood, PEEC Chairman  
L.L. Grigsby, PEEC Vice Chairman  
C. Flick, PEEC Secretary  
T. Balaska, PES Meetings Department Chairman  
J.G. Derse, PES Meetings Department Secretary  
T.W. Hissey, PES Vice President  
F.E. Schink, PES Chapters Council Chairman  
Nancy Heitman, PES Special Activities

## ORGANIZING TUTORIAL SESSIONS

Tutorial Sessions on topics of timely interest have been an important part of the programs of the IEEE Power Engineering Society (PES) Winter and Summer Meetings for many years. The Power Engineering Education Committee and the PES Technical Committees share the responsibility for the organization and presentation of these programs.

The Power Engineering Education Committee (PEEC) selects topics for future tutorials to meet perceived needs of members of PES and solicits suggestions from the PES Technical Committees & others for possible topics for tutorials.

The attached memorandum outlines the procedure for developing a Tutorial in some detail. Tutorials need the approval of a Technical Committee, the Power Engineering Education Committee and the Chairmen of the Meeting at which they are to be offered. The roles of PEEC are in selecting suitable topics, working with the Technical Committee Chairmen in selecting Organizers for proposed tutorials, approving the tutorial course outlines, and working with PES headquarters staff to expedite necessary further approvals and scheduling of the Tutorials. The Chairman of the sponsoring Technical Committee works with the Tutorial Organizer in the selection of the instructional staff for the Tutorial.

The Instructional Staff is responsible for preparation of a Text for the Tutorial and for presentation of the Tutorial at PES Meetings. The Text is published by the PES Publications Department for the first Tutorial session and the text is then available for public sale. A nominal honorarium is paid to tutorial instructors.

Tutorials are usually one full day in length and are usually given at no more than two PES General Meetings, commonly at consecutive Summer and Winter Meetings. It has become the practice to schedule no more than two Tutorials at any meeting in order not to detract from the Technical Sessions.

The course materials, i.e. the Text and copies of the visual aids used in the Tutorials, are made available to local PES Chapters through the PES Chapters Department after the last presentation as a Tutorial for possible use as Chapter sponsored short courses.

Suggestions for Tutorials should be made at least a year in advance of the meeting at which the Tutorial is to be first offered to allow time for approvals, assembling the instructional staff, preparation of the Text, and to allow time for the IEEE Publications Department to reproduce the Text. We welcome suggestions of tutorial topics where there is current interest and a body of technical information not readily available from conventional sources that can be developed into attractive and informative tutorials.

When proposing a Tutorial, it will be helpful to include a suggested title for the Tutorial, the name of a suggested organizer, the name of the PES Technical Committee sponsor, and an outline of the proposed Tutorial.

Please direct any questions or suggestions for new Tutorials to:

Professor James J. Skiles, Chairman  
Tutorial Sessions Subcommittee  
PES Power Engineering Education Committee  
Energy Research Center  
University of Wisconsin - Madison  
1500 Johnson Drive  
Madison, Wisconsin 53706  
(608) 263-1997

ORGANIZING AN IEEE/PES TUTORIAL COURSE

1. The Tutorial Sessions Subcommittee (TSS) of IEEE/PES Power Engineering Education Committee (PEEC) selects appropriate tutorial subjects. Suggestions for tutorials are usually obtained from Chairman of Technical Committees in the Technical Operations Department (TOD).
2. Tutorials must be sponsored by a Technical Committee of TOD. The Chairman of the sponsoring Committee recommends an Organizer for the preparation of a Tutorial.
3. The Organizer prepares a preliminary outline of the proposed tutorial. The TSS reviews the outline of the proposed tutorial and works with the Tutorial Organizer(s) in developing a satisfactory tutorial outline.
4. The TSS seeks approvals from the TOD and Meetings Departments of IEEE and the General Chairmen at PES meetings where the Tutorials are to be offered.
5. The TSS then finalizes arrangements with the Organizer, and notifies the Technical Program Chairman of the Power Meetings where tutorials are to be presented that approvals have been secured and asks that any suggestions and/or deadlines and names of contact people be passed on to the Organizer.
6. TSS maintains close relationship with the Organizer and PES headquarters and Meetings contact people to see that all proceeds on schedule.
7. The Technical Program Chairman of the Power Meeting notifies all within his organization of the tutorial; assignments and responsibilities are formulated, and all publicity to the IEEE Power Engineering Review is prepared, etc. He usually requests a preliminary agenda or outline for advance publicity. Later on he has prepared detailed publicity including latest outline, speakers, cost, date, etc. He assigns someone to be Tutorial Coordinator for the meeting, who is responsible for handling details of the Tutorials Session such as registration, announcements, arrangements for a room to accomodate about 75 to 100 people with tables and chairs, and arranges for projectors for visual aids, microphones, etc.
8. IEEE Headquarters in New York has a Director of PES Special Activities to handle the details with respect to getting the tutorial text prepared. The Special Activities Director passes along directions and schedules that must be met to the Organizer of the Tutorial.
  - a. Course material is typed on IEEE mats in camera-ready format. Information on the number of mats required and how to get them is passed on to the Organizer.
  - b. The Text is prepared in book format and the Organizer of the Tutorial usually prepares a forward.

- c. Due dates for typed mats are established by PES Special Activities.
  - d. PES Special Activities then takes care of printing of the text.
  - e. As soon as an estimate of printing costs have been established, a sale price is established. This price is passed on to the General Chairman of the Meeting and the Tutorial Coordinator and the Chairmen of the Meeting who then determines the cost to be charged to attendees at the Tutorial.
8. Organizer establishes a schedule similar to this:
- a. At least six to eight months before the due date that typed mats of the text are required by PES Special Activities in New York (earlier if possible), the Organizer writes authors and suggests a course outline and requests comments. (The due date for final typed mats is usually four months prior to winter or summer power meeting date.)
  - b. 5 months before due date comments on outline due from authors.
  - c. 4 months before due date authors to have submitted detailed outline of their presentations to the Organizer for approval.
  - d. 3 months before due date Organizer informs authors as to what outline is approved and they are instructed to proceed with preparation. He releases final outline to others concerned.
  - e. 1/2 month before due date deadline for all final material to be received by the organizer from authors along with biographies and pictures.
  - f. 1 week before due date camera ready text material transmitted to New York PES Special Activities.
9. Organizer keeps following people informed of his group's progress and responds to requests for information from:
- a. Chairman of Tutorial Sessions Subcommittee of PEEC
  - b. General Chairman of PES Meeting
  - c. Technical Chairman of PES Meeting
  - d. Tutorial Coordinator of the PES Meeting
  - e. PES Special Activities Director
  - f. Editor-IEEE PES Power Engineering Review
  - g. Chairman of the Sponsoring TOD Committee

revised September 10, 1984  
by James J. Skiles

RECENT TUTORIALS

1. Applications of Power Circuit Breakers
2. Surge Protection in Power Systems
3. Electric and Magnetic Field Effects of A.C. Transmission Lines
4. Computer Relaying
5. Applications of Power Electronics in Electric Power Systems
6. Recloser/Sectionalizer/Fuse Applications and Coordination
7. Energy Control Center Design
8. The Location, Correction and Prevention of RI/TVI Sources from Overhead Power Lines
9. Applications of Distribution and Power Transformers
10. Power System Stabilization Via Excitation Control
11. Digital Simulation of Electrical Transients
12. Fundamentals of Supervisory Control Systems
13. Power System Reliability Evaluation
14. Power Transformer Considerations of Current Interest to the Utility Engineer
15. Power Systems Harmonics
16. Fiber Optic Applications in Electric Power Systems

IEEE/PES TUTORIALS  
Under Development or Proposed  
as of March 14, 1985

Subject: Control Data Networks for Power and Industrial Plants  
Sponsor: Power Generation Committee  
Organizer: Dr. D.J. Damsker  
531 Main Street, Apt. #1010  
New York, New York 10044  
(212) 753-0034

Subject: Distribution Automation  
Sponsor: Transmission and Distribution Committee  
Organizer: John R. Redmon  
Division Distribution Engineer  
Public Service Electric and Gas Company  
900 West Grand Street  
Elizabeth, New Jersey 07202  
(201) 558-7519

Subject: VAR Management  
Sponsor: Power System Engineering Committee  
Organizer: Dr. Gerald B. Sheble  
Energy Control Consultants ECC  
Suite 300  
7575 Golden Valley Road  
Golden Valley, Minnesota 55427  
(612) 546-7446

Subject: Microprocessor Relays and Protection Systems  
Sponsor: Power System Relaying Committee  
Organizer: Dr. Moh S. Sachdev  
Department of Electrical Engineering  
University of Saskatchewan  
Saskatoon, Saskatchewan  
CANADA S7N 0W0  
(306) 966-5379

Subject: Spare Parts & Equipment Qualification for Nuclear Power Plants  
Sponsor: Nuclear Power Engineering Committee  
Organizer: Newell S. Porter  
Systems Engineering Manager  
Washington Public Power Supply System  
P.O. Box 968, Mailcode 981C  
Richland, Washington 99352  
(509) 377-8000, x8640

Subject: Load Management  
Sponsor: Power System Engineering  
Organizer: Reynolds M. Delgado  
Senior Consultant  
Stone & Webster Management Consultants  
1160 Dairy Ashford, Suite 310  
Houston, Texas 77079  
(713) 531-0948

REPORT  
OF  
THE STANDARDS SUBCOMMITTEE  
IEEE TRANSFORMER COMMITTEE MEETING  
ST. LOUIS, MISSOURI  
APRIL 15-17, 1985

My records have the subcommittee chairmen as listed below:

R. E. Uptegraff, Jr.	Dry-Type Transformers
J. D. Borst	Performance Characteristics
R. E. Liebich	Audible Sound and Vibration
Herb Johnson	West Coast
L. S. McCormick	Dielectric Tests
C. J. McMillen	Insulation Life
H. A. Pearce	Insulating Fluids
L. R. Smith	Standards
R. C. Thomas	Instrument Transformers
Loren Waggenar	Bushing

The following is a summary of the activities and status of the various subcommittee projects as reported through April 9, 1985. Mr. Little has been replaced by Herb Johnson as Chairman of the West Coast Subcommittee.

Project Status

PC57.12.00 - General Requirement for Liquid Immersed Distribution Power and Regulating Transformers

PC57.12.00 Table 6B - Revision of Dielectric Test Requirements for Distribution Transformers. Submitted to Standards Board, February 1985.

C57.12.00, Section 5, and C57.12.90, Section 10 - Dielectric Tests for Transformers. Submitted to Standards Board, February 1985.

PC57.12.01 - General Requirements for Dry-Type Distribution and Power Transformers

Development of specific changes related to solid resin encapsulated coils is continuing. (No change)

PC57.12.91 - Test Code for Dry-Type Distribution and Power Transformers

Specific concerns to be worked on are partial discharge tests, thermal cycling tests, and insulation tests. (No change from October 1984).

PC57.18.10 - Semi-Conductor Rectifier Transformer

A draft has been prepared for review. (No change from October 1984)

Enclosure III



- PC57.21 - American National Standard Requirements, Terminology and Test Code for Shunt Reactors  
Draft #1 will be discussed in St. Louis. This project is being discussed at the Task Force Level.
- PC57.93 - Guide for Installation of Liquid Immersed Power Transformers  
No report
- PC57.95 - Loading Guide for Regulators  
ANSI C57 has proposed Guide out for review and has requested comment by April 16, 1985.
- PC57.96 - Guide for Loading Dry-Type Distribution and Power Transformers  
Draft #6 is being balloted in the Working Group and Dry-Type Transformer Subcommittee.
- PC57.104 - Guide for the Detection and Determination of Generated Gases in Oil Immersed Transformers and their Relation to the Serviceability of the Equipment  
Questionnaire out to users.
- PC57.110 - Harmonic Load Current Heating of Transformers  
Draft #6 is being balloted in the Working Group and Subcommittee.
- PC57.111 - Guide for Acceptance and Maintenance of Silicone Liquid in Equipment  
Will review results of Draft #6 ballot in St. Louis.
- P21 - Revision of ANSI C76.1  
Negative ballots on Draft #5 still being resolved.
- P65 - Thermal Evaluation of Ventilated Dry-Type Power and Distribution Transformers  
ANSI approved August, 1984. To be published soon.

- P93 - Transformer Impulse Tests (C57.98)
- ANSI Standards action due on February 16, 1985. Task Force formed to begin new revision.
- P262E - Revision of C57.12.90 Loss Tolerance and Measurement
- P262E/D7 - Proposed addition to C57.12.90, Section 9.2.4.2. Corrections to Load Loss Measurements. Draft #7 being balloted in the Performance Characteristics Subcommittee and main committee with returns due April 1, 1985.
- P262E.1/D4 - Proposed revision of C57.12.90, Sections 8.1 and 8.2.2 (new). No load loss temperature correction. Draft #4 being balloted in the Working Group with returns due April 1, 1985.
- P262E.2/D7 - Proposed addition to C57.12.90, Section 8.3.2.1 and deletion of Section 8.3.3. Voltmeter connection for no-load loss measurement. Draft #7 being balloted in the Working Group with returns due April 1, 1985.
- C57.12.90; 8.2.1 - Assumed to be still waiting additional data. Need information as to status.
- P345 - Review of IEEE Std. 345-1972 Test Procedures for Thermal Evaluation of Oil Immersed Distribution Transformers (C57.100-1974)
- C57 ballot out. Due in by February 18, 1985.
- P462C - Revision of C57.12.00, Section 5.9, Loss Tolerance and Measurements
- Draft #4 being balloted in Working Group with returns due April 1, 1985.
- P462D - Revision of C57.12.00, Section 9.1. Wording of Ratio Tolerance.
- Draft #5 is out for ballot to subcommittee and main transformer committee. To be returned by April 10, 1985.
- P513 - Seismic Guide for Power Transformers and Reactors
- Balloting completed. Final document transmitted to IEEE Standards Board in 1983. Standards Board raised questions on documentation. Working Group Chairman addressed questions in March 27, 1985, letter to Standards Board Secretary.
- P545 - Recommended Practice for Partial Discharge (Corona) Tests for Transformers
- Draft #4 of a trial use document is being balloted in the Working Group.

- P546 - Revision of ANSI Requirements for Instrument Transformers  
C57.13-1978.
- Draft #2 submitted to Transformer Committee for ballot. Due back for discussion at St. Louis meeting.
- P637 - Proposed Guide for the Reclamation of Insulating Oil and the  
Criteria for Its Use
- Complete. Waiting for issue. Been at printer's for two years. Have been promised publication by July 1985.
- P638 - Standard for Type Tests on Class 1E Transformers for Nuclear Power  
Generating Stations
- The negative ballots received on draft #13 from NPEC SC-2 are still being addressed.
- P670 - Switchgear and Transformers Working Group on Instrument Trans-  
formers for High-Voltage Circuit Breakers
- New Chairman, John Reckleff of A.E.P., Columbus, Ohio has accepted chairmanship and has re-issued last ballot to get project restarted. Meeting to be held June 1985 to discuss results.
- P731 - Revision of Guide for Loading Current Limiting Reactors,  
ANSI C57.99
- Still looking for Task Force Chairman.
- P732 - Revision of Current Limiting Reactor Standards, ANSI C57.16
- No progress.
- P745 - Guide for Conducting a Transient Analysis for Dry-Type Transformers  
(C57.XX)
- Draft #5 approved by Transformer Committee. To be submitted to IEEE Standards Board. No change reported since October, 1984.
- P757 - IEEE Guide for Loading Power Apparatus Bushings
- Still working to incorporate new document in Bushing Application Guide C76.3 (P800).
- P784 - Transformer Through Fault Current Duration Guide
- Still awaiting publication by ANSI as C59.109. ANSI Standards Action due February 1985.

- P785 - Transformers Connected to Generators  
Still under deliberation by Working Group. (No change)
- P786 - Transformer Failure Reporting and Reliability Analysis  
Draft #7 dated January 1985, is currently being balloted in the transformer committee with returns due April 1, 1985.
- P799 - Guide for Handling and Disposing of Askarels  
Draft #5 ballot reviewed and completed in Boston and forwarded to IEEE Standards Board.
- P800 - Bushing Application Guide  
Work still being done in ANSI C76 to incorporate a bushing application guide to include forward and already approved sections on purpose, scope, cantilever loading and loading of bushings applied to transformers above nameplate ratings.
- P801 - Recommendations for Revisions to ANSI C57.15 Requirements, Terminology, and Test Code for Step-Voltage and Induction-Voltage Regulators  
All questions and comments on Draft #9 ballots have been resolved and final review will be held in St. Louis.
- P838 - Guide for Performing Overload Heat Runs  
Draft #9 being held up pending resolution of D. Douglas's proposal.
- P842 - Loss Evaluation Guide  
Marked up version of Draft #10 with comments of Working Group from February 13, 1985 meeting. General membership to review and prepare an example using method in guide and their company's economic values.
- P852 - Bushings to Operate in Gas-Insulated Substation  
Draft #1 still in progress in Working Group.
- P954 - Guide for High Temperature Hydrocarbon  
Draft #4 will be revised in St. Louis.
- P1052 - Dry-Type Transformer Through Fault Current Duration Guide  
Draft #3 balloted by both subcommittee and Working Group and approved. Draft #4, incorporating minor editorial changes, will soon be sent to ballot by full committee.

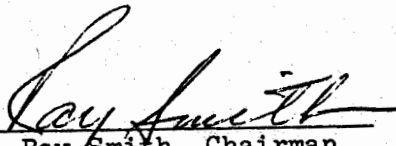
In the Insulation Life Subcommittee:

- a. Under the Working Group on Guides for Loading, a new Project Authorization has been requested for revision and/or combination of all three guides C57.91, C57.92, and IEEE Std. 756.
- b. Under the Working Group on Thermal Evaluation of Power and Distribution Transformers a project number has been requested for Standard Test Procedure for Thermal Evaluation of Oil-Immersed Power Transformers -- Development of documentation of procedure similar to C57.100.

In the Dry-Type Transformer Subcommittee:

- a. Project Authorization Request applied for on "Proposed Standard Test for Thermal Evaluation of Insulation Systems for Solid Cast and Resin Encapsulated Power and Distribution Transformers." Draft #2 was sent to ballot by Working Group on October 18, 1984.
- b. Project Authorization Request applied for on November 30, 1984 for "A Guide for Conducting Partial Discharge Tests on Dry-Type Transformers." This activity by the Working Group on Dielectric Problems coordinates with PC57.12.01 and PC57.12.91.

Your help in updating the status of any project covered or omitted in this report would be greatly appreciated. Please include project number, title and relation to IEEE or ANSI standards.

  
Ray Smith, Chairman  
Standards Subcommittee

STATUS OF IEEE AND ANSI C57 BALLOTS, AND PRINTING

4/25/85

SC C57

BALLOT NO.

OR

IEEE PROJ. NO.	BRIEF DESCRIPTION	IEEE STD BD SUBM.	ASC C57 SUBM.	ANSI BSR SUBM	STDS ACT PUB. REV.	ANSI BSR APP	EDIT, TYPESET	PRINT
P353	HVACC, C57.12.55 Dry Type	N/A	C	Subm.				
P356	HVACC, C57.13.2 Inst. Tr.		C	Subm.				
P65	ANSI/IEEE C57.12.56 Dry-Type Insul. Test	C	C	C	C	C		
P93	ANSI/IEEE C57.98 Impulse Test Guide	C	C	C	C			
P784	ANSI/IEEE C57.109 Short-Circuit Duration	C	C	C	C			
	ANSI C57.12.23 Under 1 Ø Dist. Trans.	N/A	C	C	C			
	ANSI C57.12.26 Padmount 3 Ø Dist. Trans.	N/A	C	C	C			
	ANSI/IEEE C57.95 Load Gd Step & Ind. Regul		C	C	C			
	ANSI/IEEE C57.100 DT Therm Eval	C	C	C	C			
	ANSI/IEEE C57.12.00 Requirements	C						
	ANSI/IEEE C57.12.90 Test Code	C						

Subm. = Submitted Bltg. = Balloting IP = In Process C = Complete N/A = Not Applicable

SA = ANSI Stds Action

*John C. Dutton*

John C. Dutton, Chairman - IEEE Delegation to ASC C57

IEEE-TR.C.

IEEE-NY

ASC C57

OTHER

DA Yannucci  
OR Compton  
→ R Veatch  
RL Smith

SI Sherr  
J Gorum  
F Huber  
P Lance

R Uptegraff  
R Ensign  
R Hansen  
JV Bonucchi

LS McCormick  
WJ Neiswender  
H Tucker  
HD Smith

D Kelly  
V Morgan  
TL Mayes

*Franklin TIT*

Report on Technical Papers - For 1985 Summer Power Meeting  
Olin Compton

A total of 12 papers were received for review. One was referred to the Electrical Insulation Society. One paper was rejected. One paper was withdrawn by the authors. After returning the paper work to New York two weeks early like a new eager beaver, I received information that our quota for the Vancouver meeting was 5 papers, i.e. 56% of 9 papers. The remaining four papers have been returned with suggestions for changes for improvement and possible re-submittal at later power meetings. We will have one five-paper session at the Summer Meeting.

I'm sure I join the committee in expressing my sincere appreciation to the members who took time from their busy schedules to review these papers.

In an effort to spread the burden somewhat, I propose to ask the subcommittee chairman to submit a list of willing reviewers in each of their areas of expertise.



IEEE

APPENDIX "B"

**POWER ENGINEERING SOCIETY**

TRANSFORMERS COMMITTEE  
Dean A. Yannucci, Chairman

AUDIBLE SOUND AND VIBRATION SUBCOMMITTEE  
Richard E. Kiebich, Chairman

L.A. Swenson ENTE  
Bonneville Power  
Administration  
P.O. Box 3621  
Portland, OR 97208  
PLEASE REPLY TO: (Above)

MINUTES OF THE MEETING OF THE AUDIBLE SOUND AND VIBRATION SUBCOMMITTEE  
at St. Louis, Missouri, April 16, 1985

The Subcommittee was convened by J.M. Pollitt at 1:15 p.m., April 16, 1985.  
The following were present:

MEMBERS

W. D. Lampe  
J. W. McGill  
W. J. McNutt  
L. M. Nicholas  
J. M. Pollitt  
A. M. Teplitzky

GUESTS

W. B. Binderta  
O. R. Compton  
R. Hayes  
T. V. Kluczynski  
C. L. Moore  
D. A. Yannucci

Minutes of the last meeting in Boston, October 15, 1984, were approved with minor editorial changes.

Mr. Teplitzky presented a proposal for a new IEEE transformer sound measurement standard. This proposal emphasizes sound power, not pressure. It deviates from IEC 557 which had been suggested earlier as a possible base for a new IEEE standard. The consensus of those present was that sound power measurement is needed. The current NEMA sound pressure level method has discrepancies when used to predict sound levels in the far field.

It was also agreed that ANSI C57.12.90 should not be revised at this time, but could be supplemented if the need arises. The existence of ANSI C57.12.90 also precluded the issuance of a new sound measurement standard for transformers.

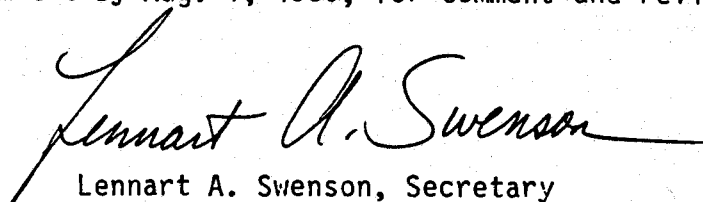
It was requested that subcommittee members comment on the proposed standard by June 1, 1985.

It was also the consensus of those present that:

1. The chairman of the subcommittee submit a project authorization request to Mr. Yanucci.
2. Mr. Pollitt will discuss the need for future meetings of the AS&V subcommittee steering committee with the chairman.



3. Messrs. Teplitzky, Swenson, and Liebich compare C57.12.90, IEC551-1984, and the proposed transformer sound measurement standard draft and "fold" changes into C57.12.90 and create a possible C57.12.90A supplement to hopefully be mailed to members by Aug. 1, 1985, for comment and review at the October meeting.



Lennart A. Swenson, Secretary  
Audible Sound & Vibration Subcommittee

(WP-ENT-1306h)

APPENDIX "C"

BUSHING SUBCOMMITTEE

Report to the Transformers Committee

The Bushing Subcommittee met at 1:15 p.m. on Tuesday, April 16, 1985 with eight (8) members and seven (7) guests present. D.H. Douglas has requested membership on the subcommittee, bringing the total membership to 19.

It was announced at the meeting that current and future Apparatus Bushing Standards will be administered and approved by the ANSC57 Transformers Committee. Olin Compton, one of the IEEE delegates to C57 will recommend that a bushing subcommittee be established within that committee.

The one item caught up in the discontinuation of ANS C76 is the Bushing Application Guide, P800 which includes the Bushing Loading Guide as well as allowable line pull guidelines. This document was voted on within C76 about a year ago and received one negative vote and several comments. These were resolved but the document did not pass out of C76 before its official expiration date of September 1, 1984. We must therefore try another approach to get this document published. This situation was discussed at the Bushing Subcommittee and the Administrative Subcommittee. It was decided that we attempt to publish the Bushing Loading Guide, which was developed within the Bushing Subcommittee as P757, as an IEEE Trial Use Guide. Meanwhile, we will suggest that one of the first bushing projects for C57 be the Bushing Application Guide.

Negative ballots for the Transformer Committee ballot P21/d5 of IEEE 21 (formerly ANS C76.1) were resolved at the Boston meeting. At Tuesday's meeting we reviewed all of the comments made during this ballot. Several changes will be incorporated in P21/d6 and the document will be reballoted within the Transformers Committee.

The Working Group on Bushings to operate in Gas Insulated Substations met on Monday with three members present. The need and interest level for a document on these bushings was first discussed. Although the interest level is relatively low at this time, it is felt that the application of these bushings would be better coordinated if a guide is generated for them. Furthermore, considerable work was done by the working group under the direction of Rick Stockman and John Easley has volunteered to pull the information together. The group then reviewed a draft of a guide prepared by Mr. Easley.

Under new business, there is some concern that bushings are not being tested rigorously enough with respect to RIV limits and test levels. Recent failures of bushings in the field have prompted this discussion. This subject will be researched in more detail before the next meeting and be included on the next agenda.

L.B. Wagenaar  
Chairman

APPENDIX "D"

MEETING MINUTES

Dielectric Tests Subcommittee

St. Louis, Missouri  
April 16, 1985

The subcommittee met at 8:00 a.m. with 43 members and 46 guests present.

Since the last meeting in Boston, we have had two members resign due to retirement. The first is Bill Griffard who was secretary of this committee for a number of years. Bill will be long remembered for his many hours of effort and work he contributed. The second is Leonard Long who was an active member whose input was valued and will be missed in the future.

The following new members have been added:

V. Shenoy - Ontario Hydro  
W. E. Saxon - Duke Power Co.  
C. R. Hoesel - Arizona Public Service Co.

Membership now stands at 57.

The minutes of the previous meeting in Boston were approved as published.

The working groups reported as follows:

Working Group on Revision of Dielectric Tests - John Bergeron

This group now has a new chairman due to the resignation of G. Iliff at the Boston meeting.

John reported that the Task Force on Revision of Dielectric Tests for Shunt Reactors met earlier in the day. In the absence of the Chairman, Mr. W. N. Kennedy, Mr. L. Wagenaar conducted the meeting which was devoted to a detailed review of the current draft of this document. The draft had been prepared by Mr. Kennedy prior to the meeting. The Task Force members (4) and guests (3) present had numerous comments regarding the draft and after expiration of the allotted time, they had completed a review of only slightly more than one-half of the document. It is expected that another task force meeting will be required to reconcile comments on the draft prior to balloting of the Working Group.

The Task Force to Investigate Phase to Phase Voltages, chaired by Jim Douglass, did not meet. A letter to the Task Force, which summarized progress to date, was read to the Working Group. Discussion in the Working Group and in the Subcommittee centered on the exact direction this Task Force should be headed. There is a need to assure the adequacy of EHV transformers to phase to phase transient voltages and to do this either by specifying tests or clearances presents problems. The result

of the discussion was that the chairman of the subcommittee will contact NEMA to determine their intentions on revising TR1-0.06 (Subsequently, this was done and NEMA advises that the table will be revised at the next revision of TR1, which is due and being worked on). John Bergeron will review the previous correspondence between G. Iliff and J. Douglass and then discuss the scope of the Task Force with J. Douglass.

The status of the revisions to C57.12.00 and C57.12.90 was presented. Both documents are at the Standards Board and publication is expected in 1985. The fate of the last revision of the Impulse Test Guide was also questioned and it was determined that the document has received ANSI approval and the next step is to start the printing process.

The Impulse Test Guide proposed revisions were discussed. George Iliff with the assistance of Carl Hurty had compiled a list of considerations which should be studied as a basis for the next Impulse Test Guide revision. This list had been disseminated to the Working Group for consideration. Each item was discussed in turn and John requested that individuals knowledgeable in any of these given areas come forward and assist in the revision. At present they will try to operate within the Working Group framework and try to get a start on this revision by obtaining draft submittals of given areas from individuals and disseminate them for wider comment.

Working Group on Revision of Dielectric Testing of Distribution Transformers - W. R. Farber

Their meeting on Monday was devoted to discussion of Draft 2 of their proposed "Distribution Transformer Production Line Impulse Test Code" dated 1/31/85. The ballot of the Working Group was:

12 Approved  
4 Approved with comments  
1 Not approved  
1 Not returned

Draft 2 required testing of dual voltage units on both the series and parallel positions. One of the approved comments suggested that if both connections were rated at the same BIL the impulse tests could be made on the parallel connection only. This suggestion was rejected on the basis that it could allow an improper connection or insulation clearance at the switch to be undetected.

The 3 other approval comments were editorial in nature and were accepted.

The single negative ballot was submitted by a member who was unable to attend the meeting. He questioned whether or not the staged short circuited turn sensitivity requirement was an adequate representation of a fault that may develop on test. He thought that recently developed methods using digital monitoring techniques may be more effective in detecting faults occurring during the test. He plans to investigate these methods on distribution transformers over the next six months.

The Working Group believed that although the newer methods may offer some future refinement, they should proceed with the present staged single turn fault sensitivity requirement rather than delay the standard for further investigative work. The standard could be modified in the future if more appropriate and effective sensitivity methods are found. Mr. Henning will attempt to reconcile the negative ballot on this basis.

Mr. Henning will incorporate the editorial changes as Draft 3 of the code and further adapt it as an addition to C57.12.90. He will also prepare a statement to modify C57.12.00 to specify these tests as mandatory on distribution transformers.

These two proposals will then be simultaneously balloted in the Working Group and in the Dielectric Tests Subcommittee.

The Working Group also recognized the desirability of developing Test Guide type information, but took no action on this point.

Working Group on Dielectric Tests for HV DC Stressed Transformers and Reactors - W. N. Kennedy

The work of this group was reported by Heinz Fischer as follows:

Since the last meeting, the Working Group's paper entitled "Recommended Dielectric Tests and Test Procedures for Converter Transformers and Smoothing Reactors" was submitted to the IEEE/Power Engineering Society and approved for presentation at the Summer Meeting July 14-19 in Vancouver. The paper was also recommended for publication in the "Transactions on Power Apparatus Systems".

The Working Group members commended Bill Kennedy for a great job done in putting the paper into its final form.

The Working Group would appreciate comments on the paper from members of the Dielectric Test Subcommittee and the members of the Main Transformers Committee.

The Working Group voted on requesting guidance from the Dielectric Test Subcommittee as to the future of the Working Group. Should we regard our task complete and dissolve the Working Group -- or should we collect comments on the issued paper and work towards publication of a guide?

Discussion in the subcommittee resulted in the Working Group being directed to continue its work with the objective of producing a test requirement (standard) for HV DC transformers.

Working Group on Partial Discharge Tests - H. R. Moore

Mr. George Vaillancourt reported on the work of this group in the absence of the chairman. As chairman of the Task Force on measurements of apparent charge, he had prepared written responses to comments made on

Draft 4 of the Trial Use Guide for Partial Discharge Measurement in Power Transformers and Shunt Reactors. These responses were made in an attempt to resolve differences in opinion that existed on the draft. These points were discussed in detail at the Task Force meeting prior to the Working Group meeting. Editorial changes will be made in accordance with the various comments.

The primary difference that still existed was wide band versus narrow band partial discharge measurement methods. After various viewpoints including data from transformer measurements were presented, the Task Force made the following recommendation:

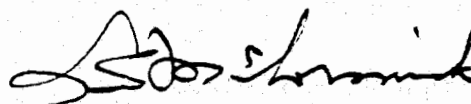
"The 5th draft of the Trial Use Guide for Measurement of Partial Discharge recognizes both narrow band and wide band apparent charge measurement methods. Since the narrow band method is well defined in IEC, the Guide will reference the proper IEC documents. The guide will cover all of the details for the wide band method."

The Working Group voted 9 to 0 in favor of this recommendation.

The Task Force will prepare the 5th draft of the Guide. It will be balloted in the Working Group and possibly the Subcommittee before the next meeting.

Mr. E. Howells presented the report of the Task Force on Acoustic Detection of Partial Discharges. The revision of the Proposed Guide for the Detection of Acoustic Emissions was presented. This revision was well received by the Working Group. Their next task is to prepare the draft of the calibration procedure. The Working Group agreed that the scope of the Proposed Guide should be limited to detection of PD at present and that location will be considered in the future.

There being no new business brought before the subcommittee, the meeting was adjourned at 8:50 a.m.



L. S. McCormick  
Chairman

APPENDIX "E"

IEEE DRY-TYPE  
TRANSFORMERS SUBCOMMITTEE  
MINUTES OF APRIL 16, 1985 MEETING  
ST. LOUIS, MO.

MEMBERS PRESENT

R. A. Bancroft  
G. H. Bowers  
J. L. Corkran  
J. C. Dutton  
E. C. Edwards  
H. E. Gabel

A. Jonatti  
A. D. Kline  
E. Koenig  
M. L. Manning  
J. Rodden  
R. E. Uptegraff

MEMBERS ABSENT

S. J. Antalis  
B. F. Allen  
A. Bimbiris  
F. Brutt  
G. L. Gaibrois  
(Liason Member)  
N. J. Melton

W. H. Mutschler, Jr.  
J. J. Nay  
D. F. Shefka  
B. E. Smith  
S. A. Wiencek  
C. R. Willmore  
(Liason Member)



GUESTS PRESENT

<u>Name</u>	<u>Affiliation</u>	<u>Address</u>
Dave Barnard	Square D	P. O. Box 5002 Monroe, N. C. 28110
Bill Yung	Federal Pioneer	445 Horner Avenue Toronto, Canada
R. W. Simpson, Jr.	Spaulding Fibre Co.	Spaulding Avenue N. Rochester, N. H. 03867
B. K. Patel	Southern Co. Services	P. O. Box 2625 Birmingham, Alabama 35202
James Cross	Carte Electric	1995 Logan Avenue Winnipeg, Manitoba Canada RZROH8
Henry Windisch	Black & Veatch	P. O. Box 8405 Kansas City, MO 64114
Alan M. Iversen	General Electric	P. O. Box 1701 Ft. Wayne, IN 46804
Bob Gruvert	Square D. Co.	P. O. Box 5002 Monroe, N. C. 28110
Rick Marek	National Industri	2520 58th St. Hampton, VA 23661
Joe Hupp	Acme Electric Corp.	Rt. 4, Box 54 Lumberton, N. C. 28358
Henry D. Smith	Pemco Corp.	Box 511 Bluefield, VA 24605
Fred Huber	IEEE Stds. Office	345 E. 47th St. New York, NY 10017
Sheldon Kennedy	Uptegraff Mfg. Co.	P. O. Box 182 Scottsdale, PA 15683
Philip Nobile	Ebasco Services	Two World Trade Center New York, N. Y. 10048
R. V. Hollister	Westinghouse Electric	Box 920 South Boston, VA 24592
J. H. Harlow	Siemers-Allis	P. O. Box 6289 Jackson, MS 39208
John A. Gauthier	NEMA	2101 L St. N.W., Washington D.C. 20037
R. J. Hellweg	Union Electric	P. O. Box 149 St. Louis, MO 63166

The Dry-Type Transformer Subcommittee met at 1:00 p.m., April 16, 1985 with 12 members and 18 guests present. Following introductions and approval of the minutes of the previous meeting (Oct. 16, 1984), the Chairman reviewed current status of ballots, new IEEE Transformer Committee projects, and ANSI Dry-Type Transformer standards and guides.

#### Working Group Reports

- 1.0 W. G. on Standards for Dry Type Transformers incorporating Solid Resin Encapaulated Coils-Egon Koenig, Chairman.

This W. G. met on April 15, 1985 with 10 members and 11 guests.

- 1.1 The W. G. reviewed a proposed revision of Table 3-C57.12.01 submitted by Bill Mutschler. The proposed revision would consist of two tables. The first table would show the relationship of nominal system voltage and BIL levels in common use for system 34.5kV and below. The table will also show; 1) standard BIL levels, 2) optional higher levels where exposure to overvoltage occurs and higher protective margins are required, and 3) lower levels where protective devices can be applied with lower spark-over levels. An optional BIL level of 110 kV was added for 15 kV equipment of Dave Barnard's request. W. G. agreed to the addition.

- 1.2 The second table will show the interrelationship of dielectric insulation levels for dry type transformers used on systems with BIL levels 200 kV and below. John Dutton will review these tables for possible conflicts with existing table 3 of C57.12.01. Chairman will distribute a draft copy of C57.12.01 incorporating these changes to W. G. members for review and comment.

- 1.3 Partial Discharge Tests

Chairman reviewed available reference documents dealing with partial discharge tests. These include:

- a. Partial discharge test guide for large transformers-prepared by Transformer Committee Working Group.
- b. Partial discharge test procedure T-24-380-Insulated Cable Engineers Association.
- c. W. G. draft of a proposed partial discharge test guide prepared by A. J. Jonnatti.
- d. European standards previously provided to the W. G.

The Chairman appointed a task force to review the above documents and select a test procedure most suitable for cast coil transformers. Task force will consist of Dave Barnard, Chairman, M. L. Manning, T. Massouda, A. Jonnatti, and J. Rodden.

- 1.4 The issue of flammability of cured resins used in encapsulated dry type transformers was discussed. This issue relates to public safety, it is not addressed in transformer standards, and IEEE policy is not clear on this subject. Guidance was therefore requested from the Administrative Committee.

(The matter was brought to the Administrative Committee. W. G. was advised to prepare a definition of need for flammability testing and that any such test procedures should be referred to ASTM or other recognized testing organization.)

- 1.5 The Chairman informed the W. G. that NEMA was developing a product standard for cast coil transformers and that an informal liason would be maintained between the NEMA activity and this W. G.

- 2.0 Dielectric Problems W. G.-Jerry Corkran, Chairman

This W. G. met on April 15, 1985 with 9 members and 12 guests present

- 2.1 Guide for conducting a transient voltage analysis of a dry type transformer coil-(P745) has been forwarded the IEEE Standards Board for approval and publication.

- 2.2 A task force was created at the last meeting to develop a guide for conducting partial discharge tests on dry type transformers. Task force members are; Don Kline, Chairman, Roy Bancroft, Egon Koenig, Ben Allen, and Jerry Corkran. A Project Authorization Request was forwarded for approval in November, 1984.

- 2.3 Don Kline led a discussion on partial discharge testing. Task force will focus on unique problems of quality control as related to detecting destructive discharges in cracks and voids on insulating surfaces of dry type transformer insulating systems.

- 2.4 Dielectric problems and Cast Coil W.G. meeting times will be reversed at the next meeting to make any information on partial discharge testing available to the cast coil W.G.

- 3.0 W.G. in Thermal Evaluation, George Bowers, Chairman.

W.G. on Thermal Evaluation of Insulation Systems for Solid Cast and Resin Encapsulated Power and Distribution Transformers met on April 15, 1985 with 10 members and 9 guest present.

- 3.1 Balloting of D/3 of the proposed standard resulted in 10 affirmative, 3 affirmative with comment, and one negative for a total of 78% return on the ballot. Comments were generally editorial in nature.

The negative vote was resolved by agreement to issue the proposed document as a trial use standard until experience is gained. A new draft will be balloted in the W.G. and Dry Type Transformer Subcommittee simultaneously.

- 4.0 W.G. on Revision of ANSI C57.96 "Guide for Loading Dry Type Transformers." - Bill Mutschler, Chairman.

This W.G. met on April 15, 1985 with 11 members and 9 guests present. Roy Uptegraff served as acting Chairman in the absence of Bill Mutschler.

- 4.1 Draft #6 was balloted in the W.G. in March, 1985 with 13 affirmative and 4 negative votes out of a total of 21 ballots. Three of the negative ballots were editorial in nature. One rejected the short time overload table 96.01-250. The Chairman in response to this negative vote submitted three short time overload tables based on 30, 60, and 90 minute time constants. A discussion of these tables did not produce a clear consensus. Various W.G. viewpoints will be transmitted to the Chairman for use in resolving short time overload concerns.

- 5.0 W.G. on Dry Type Through-Fault Current Duration Guide-Roy Uptegraff, Chairman.

This W.G. did not meet since the last draft (#4) was successfully balloted by the W.G. and the Dry Type Transformer Subcommittee. The proposed guide will be prepared for balloting by the Transformers Committee after soliciting comments from the following groups:

IEC, TC 14  
IEC, TC 17  
IEC, SC 32A  
IEEE, High Voltage Fuses Subcommittee  
IEEE, Relay Committee - Transformers and Bus Protection Subcommittee  
IAS, Power Systems Protection Committee

- 6.0 New Business

W.G. on Evaluation of Insulated Systems for Specialty Transformers will be activated at the Toronto Meeting. This W.G. has the responsibility to revise or re-affirm IEEE Std 259 "Standard Test Procedure for Evaluation of Systems of Insulation for Specialty Transformers".

- 6.1 Insulation Life Subcommittee has suggested that the Dry Type Subcommittee establish a W.G. to develop a loading guide for dry-type current limiting reactors. Present guide is ANSI C57.99 "Guide for Loading Dry Type and Oil Immersed Current-Limiting Reactors". Portions of this guide are far out of date. The Chairman suggested that this subject be explored further before a response is prepared.

7.0 Administrative


Pre-registration fee will be continued for the next Transformers Committee at Toronto.

Further plans include a speaker at the Tuesday luncheon.

7.1 Future Meetings:

Fall	1985 10/27-30	Toronto
Spring	1986 4/6-9	Little Rock
Fall	1986	Pittsburgh
Spring	1987	Fort Lauderdale
Fall	1987	New Orleans

Meeting Adjourned

  
E. C. Edwards, Secretary  
Dry Type Transformer Subcommittee

APPENDIX "F"

REPORT OF THE INSTRUMENT TRANSFORMERS SUB-COMMITTEE

TO THE TRANSFORMERS COMMITTEE

The Instrument Transformers Sub-Committee met in St. Louis, Missouri, Tuesday, April 16, 1985 in an all day meeting with ten (10) members and ten (10) guests present.

Minutes of the Boston meeting were approved.

The Switchgear and Transformer Working Group on Instrument Current Transformers for A.C. High Voltage Circuit Breakers has finally come to life and has reported that they are now reorganized with Mr. John G. Reckleff of AEP as chairman. Mr. Reckleff has sent out for rebalot of Draft #4 of Project P670 dated 9/16/80. A meeting of the Working Group is scheduled for June 19 in Columbus, Ohio.

The rest of the day was spent reviewing comments and resolving negative ballots of Draft #2 of P546 Revision of C57.13, Requirements for Instrument Transformers.

Comments and suggestions for additions to be included in C57.13 were received from the Relay Committee. It was decided that no more additions to the present draft would be considered at this time. We felt that we now have a complete draft of C57.13 to be presented to the Transformers Committee for final approval. Any suggested additions will be considered in the next revision of C57.13.

Time did not permit review and discussion of Draft #4, Detection of Partial Discharges and Measurement of Apparent Charge in Instrument Transformers.

At this time, I would like to announce that I believe it is time for me to step down as chairman of this Sub-Committee. Mr. Ralph Stetson of General Electric, has agreed to accept the chairmanship and has been approved by the Administrative Sub-Committee. Mr. John Davis of Sangamo-Weston has agreed to be the secretary.

R. A. Thomas, Chairman,  
IEEE Instrument Transformers Sub-Committee.

APPENDIX "G"

REPORT TO THE IEEE TRANSFORMERS COMMITTEE, APRIL 17, 1985, CLARION HOTEL, ST. LOUIS, MO.

The Insulation Life Sub-Committee met yesterday with 23 members and 29 guests in attendance.

The first working group reporting was the Thermal Evaluation of Oil-Immersed Power and Distribution Transformers group. Chairman Al Wurdack reported. They met Monday, April 15, with 8 members and 26 guests in attendance. Since their last meeting, all members of the working group received a condensation of the revised Procedure for Thermal Evaluation of Distribution Transformers, IEEE No. 345. ANSI C51-100. The purpose was to familiarize the members with that procedure so they will be better prepared to deal with the proposed procedure for thermal evaluation of power transformers. All those in attendance at the meeting also received a comparison listing the apparent differences between power and distribution transformers from the standpoint of thermal evaluation. There was some discussion at the meeting of these differences. It was agreed that the chairman will provide to the members before the next meeting, an outline of a document that will attempt to merge evaluation of both types of transformers into one procedure.

The next working group reporting was the Thermal Tests group chaired by Bob Grubb. Bob made his introductory report as chairman, succeeding Bob Veitch, who has graduated to Secretary of the Transformers Committee. This group had 14 members and 3 guests in attendance at their meeting Monday. Most of their meeting was a discussion of Dave Douglas' proposal for modifying the proposed "Procedure for Performing Temperature Rise Tests on Oil-Immersed Power Transformers at Loads Beyond Nameplate Rating." Dave's proposal was to either combine Parts "A" and "B" into one test procedure or to add a Part "C". The latter was approved and will be incorporated into Draft 9. This resolves all negative ballots on Draft 8. Draft 9 will be submitted for a combined Working Group and Subcommittee Ballot before the Toronto meeting next Fall. The group also discussed the issue of the number of oil samples taken for gas analysis during the test. All agreed that samples are desirable before and after the test, but no consensus was obtained on the need for sampling during the test.

Our last working group reporting was the Loading Guides group. Bill Wrenn, Chairman, reported his attendance was 17 members and 9 guests. Jacques Aubin reported that IEC Working Group No. 18 for revision of their loading guide has completed Draft 3 which will soon be submitted for "National Comment". C57.95, the revised "Loading Guide for Liquid Immersed Step Voltage and Induction Voltage Regulators, has been announced in ANSI "Standards Action" with yesterday as deadline for comments.

C57.99, the Current Limiting Reactor Loading Guide, has been distributed to the membership of the group for comment. There was minimum response, but three comments suggested that the revision be split so that the oil-immersed loading be incorporated into the proposed revision of C57.91 and C57.92, the transformers guide. To do this, it will require that the Dry Type Transformer Subcommittee assume coverage of the dry type reactors. Roy Uptegraff, Chairman of that Subcommittee, has taken the suggestion under study.

The working group then adjourned so that the Task Force on Revision of C57.91, .92, and IEEE No. 756 could start their meeting chaired by Olin Compton. Olin reviewed the intent of the task force, which is to combine these three guides, eliminating redundancies and to consider new issues, such as undue conservatism and identification of the difference between directed and non-directed forced oil flow. Olin closed the session with efforts to recruit volunteers for specific tasks, such as treatment of ancillary devices, average oil temperature, eddy losses, cold load pick-up etc.

There being no other new business brought before the Subcommittee, the meeting was adjourned at 1:37 p.m.

Charles J. McMillen, Chairman,  
April 16, 1985

APPENDIX "H"

Westinghouse  
Electric Corporation

Transmission and Distribution

Materials & Manufacturing  
Technology

469 Sharpsville Avenue  
Sharon Pennsylvania 16146 USA  
(412) 983-4335  
Telex 81-2349

May 13, 1985

TO: IEEE TRANSFORMER COMMITTEE  
Insulating Fluids Subcommittee

FROM: Henry A. Pearce, Chariman

SUBJECT: Minutes of meeting held April 15-16, 1985 in St. Louis, MO

MEMBERS PRESENT

G. Bryant  
J. Bryant  
N. Burns  
J. Corkran  
M. Frydman  
H. Hauptert  
P. Hoeffler  
B. Hunter  
T. Lipscomb  
R. Lowe  
G. McCrae

C. Miller  
E. Morrison  
R. Musil  
S. Northrup  
T. Orbeck  
H. Pearce  
L. Savio  
G. Schreuders  
L. Wagenaar  
R. Young

GUESTS PRESENT

R. L. Provost  
Mark Ashford  
Bob Lane  
Jim Antweiler  
H. Light  
R. Hayes  
J.C. Lackey  
E. Arjeski  
Anthony Jannatti  
Vince Grelle

DuPont  
Texas Power & Light  
Shell Oil  
Square D  
Niagara Mohawk  
Ferranti-Packard  
Ontario Hydro  
Detroit Edison  
Square D  
Union Electric



The insulating Fluids Subcommittee met on April 15 and April 16, 1985 with 20 members and 14 guests present.

1. The minutes of the October 1984 meeting in Boston were approved as presented.
2. Mr. Brian Hunter of American Nuclear Ins., Mr. Rich Young of Toledo Edison, Mr. Gerard Schreuders of Gulf Research and Mr. Neil Burns of ICS Chemicals have been added to the list of members of the subcommittee.
3. The Chairman reported that IEEE Headquarters has promised printing of the Guide for Reclamation of Transformer Oil, Project P637, will begin in July 1985. Members are urged to call Judy Gorman (202-705-7115) and call about the status.
4. The Guide for Handling and Disposal of Transformer Grade Insulating Liquids Containing PCB's has been edited and submitted to the IEEE Standards Board for approval. This is Project P799.
5. Project C57.104, Gas Guide. The Subcommittee had conducted a questionnaire and Mr. Earl Morrison had tabulated the responses to the questionnaire of which we have received approximately 90 to date. A copy of Earl's tabulation is attached. After receiving these responses the Subcommittee decided to proceed to revise the Gas Guide. It was decided that inasmuch as ASTM now has adapted procedures for sampling and testing, these items will be dropped from the Guide and the ASTM procedures, will be referenced. The largest single consideration for the remainder of the Guide is the Interpretation Section and a Working Group was set up with Leo Savio as Chairman to re-write this section. Other members are Ted Hauptert, Earl Morrison, Maurice Frydman, Lauren Wagenaar and Brian Hunter. Tom Lipscomb will make a revised write-up for Sections 445 and Sampling and Analyzing to refer to the ASTM procedures.

Brian Hunter will rewrite Section 1, Scope & Introduction, Section 2, Calibration & Use of Field Instruments and Section 3, Use of Fixed Instruments for Gas Space Analysis.

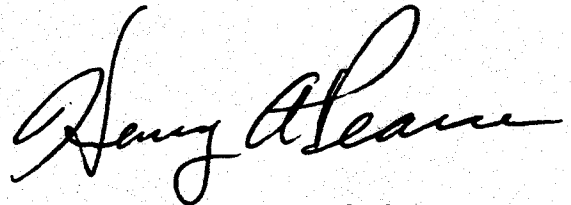
George McCrae will update Section 7 Bibliography.

All revisions except Interpretation should be sent to the Chairman by August for preparation of copies to be sent out for review at the October meeting.

Leo's Working Group will attempt to have some of the write-up ready for review in October.

6. Project P954, Draft 4A of the Guide for Acceptance and Maintenance of Less Flammable Hydrocarbon Fluid and Its maintenance in Equipment, was reviewed carefully and suggested changes were made for incorporation into Draft 5. The Subcommittee voted to submit Draft 5 to a Subcommittee letter ballot prior to the next meeting.

7. Project C57.111, Covers the Silicone Fluid Guide and Draft 6 was reviewed carefully. Many changes are still required and Draft 7 will be prepared for review at the next meeting.
8. With no further business being introduced the Subcommittee adjourned until the Fall meeting in Toronto.
9. The next meeting is October 27 - 30, 1985 at Delta Chelsea Inn in Toronto, Ontario.



Henry A. Pearce, Chairman  
Insulating Fluids Subcommittee

/slr

*Conover*

REVISION OF C57.104  
Responses to Questionnaire

4/10/85

There were returns from 91 utilities, and 22 manufacturers, service organizations or consulting firms for a total of 113 returns. Eight utilities and 15 of the manufacturing or service organizations indicated they were not involved in gas analysis and did not answer the questions. This summary is therefore based on the returns from 83 utilities and 7 manufacturing or service organizations.

A summary of the responses are as follows:

1.	Yes	53	No	37
2.	Yes	72	No	18
2.1	Yes	54	No	13
2.2	McGraw-Ed	38	Johnson-Williams	13
	Penn Trans Co	10	Gas Tech	7
			Other	4
2.3	TCG &	22	Rate increase	3
			Both	52
3.	Yes	23	No	60
3.1	Type 3.2.1.1	15,	Type 3.2.1.2	10,
			Other	2
3.1.1	Yes	8	No	33
3.1.2	Service interval	1 to 4 days	2	1 to 2 weeks
	Monthly	11	Quarterly	3
			Annually	6
4.	Yes	28	No	62
4.1	Glass syringe	17	Plastic syringe	1
	Glass cylinder	0	Stn. Stl. cyl.	10
	Bladder	1		
4.2	TCG only	2	Individual gasses	23
4.3	Conc. only	0	Increase/time	0
			Both	9
5.				
6.	Yes	75	No	15
6.1	Gla. Syringe	52	Plas. Syr.	1
	Gla. Cyl.	3	Screw-Cap Can	4
6.1.1	30 ml	4	50 ml	34
			100 ml	13
			250 ml	6
			1 pt	5

## 6.2 Frequency of test:

### NORMAL OPERATING CONDITION

	<u>69kV</u>	<u>288kV</u>	<u>325kV</u>
$\leftarrow$ 5MVA	1/4 yr = 2 1/2 yr = 1 1 yr = 15 2 yrs = 3 3 yrs = 3 5 yrs = 1	1/4 yr = 2 1/2 yr = 3 1 yr = 20 2 yrs = 3 3 yrs = 1 5 yrs = 1	1/4 yr = 2 1/2 yr = 10 1 yr = 14 2 yrs = 1
5- 20MVA	1/4 yr = 2 1/2 yr = 3 1 yr = 22 2 yrs = 3 3 yrs = 3	1/4 yr = 2 1/2 yr = 5 1 yr = 28 2 yrs = 4 3 yrs = 3	1/4 yr = 2 1/2 yr = 10 1 yr = 21 2 yrs = 2
$\rightarrow$ 20MVA	1/4 yr = 2 1/2 yr = 4 1 yr = 26 2 yrs = 3 3 yrs = 3	1/4 yr = 2 1/2 yr = 7 1 yr = 39 2 yrs = 3 3 yrs = 2	1/4 yr = 2 1/2 yr = 18 1 yr = 35 2 yrs = 1
*Varies	13	10	9

\*Test frequency varies depending on nature of service, eg nuclear, generator step-ups, distribution operations.

### INCIPIENT PROBLEM CONDITION

	<u>69kV</u>	<u>288kV</u>	<u>325kV</u>
Mo. $\leftarrow$ 5MVA	Weekly = 3 1 Mo. = 5 2 Mos. = 1 3 Mos. = 10 6 Mos. = 2	Weekly = 2 1 Mo. = 9 2 Mos. = 1 3 Mos. = 9 6 Mos. = 1	Weekly = 1 1 Mo. = 8 2 Mos. = 1 3 Mos. = 6 12 Mos. = 1
Mo. 5-20MVA	Weekly = 3 1 Mo. = 8 2 Mos. = 1 3 Mos. = 10 6 Mos. = 3	Weekly = 4 1 Mo. = 10 2 Mos. = 2 3 Mos. = 12 6 Mos. = 3	Weekly = 1 1 Mo. = 10 2 Mos. = 2 3 Mos. = 8 6 Mos. = 2 12 Mos. = 1
Mo. $\rightarrow$ 20MVA	Weekly = 3 1 Mo. = 8 2 Mos. = 1 3 Mos. = 10 6 Mos. = 2	Weekly = 6 1 Mo. = 12 2 Mos. = 1 3 Mos. = 11 6 Mos. = 2 12 Mos. = 1	Daily = 1 Weekly = 3 1 Mo. = 12 2 Mos. = 3 3 Mos. = 9 6 Mos. = 3
*Varies	7	7	5

**KNOWN PROBLEM CONDITION**

	<u>69kV</u>	<u>286kV</u>	<u>325kV</u>
Days < 5MVA	1 day = 1	1	1
	3 day = 3	2	3
	7 day = 14	13	13
	30 day = 5	4	3
	Quarterly		
Days 5-20MVA	1 day = 2	2	1
	3 day = 2	1	-
	7 day = 13	16	12
	30 day = 8	9	7
	Quarterly		
6 Mos. = -	1	-	
Days > 20MVA	1 day = 2	2	3
	3 day = 2	1	1
	7 day = 13	19	16
	30 day = 7	8	7
	Quarterly		
6 Mos. = -	1	-	
*Varies	18	22	14

7.	In	49	Out	44	
7.1	Fig. 3 or 4	28	Fig. 6	2	CO2 Extr 3
7.2	Determine gases individually, hydrogen through acetylene 80.				
	Determine additionally propane and propylene				15.
	Determine additionally fluoro-carbon gases				3.
8.	Mfgs.	53	anal. lab	40	consultant 7
8.1	Yes	55	No	20	
8.2	Conc. lim.	35	Conc. rate (trend)	61	Ratio 46
8.3	Detection Limits, ppm				

	1	5-10	25-50	100-250	250
Hydrogen	3	5	4	3	
Methane	7	3	0	3	2
Carbon Monoxide	4	6	4	4	3
Carbon Dioxide	4	5	5	3	5
Ethane	10	2	3	3	1
Ethylene	14	2	0	3	1
Acetylene	15	3	3	-	-

8.3	Normal Limits	25-50	51-100	101-500	>500
	Hydrogen	5	8	14	0
	Methane	3	16	6	0
	Carbon Monoxide	2	0	18	3
	Carbon Dioxide	-	-	-	-

	Normal Limits	10-25	26-50	51-100	>100
	Ethane	15	3	7	4
	Ethylene	16	2	5	5

	Normal Limits	1-4	5-10	11-25	26-100	>100
	Acetylene	9	7	7	1	-

8.3	Require more frequent testing	<51	<101	<251	<501	>501
	Hydrogen	3	7	5	3	2
	Methane	5	9	6	1	0
	Carbon Monoxide	1	0	0	6	12
	Carbon Dioxide					
	Ethane	10	9	6	-	-
	Ethylene	6	10	9	-	-

	More freq.	<11	<21	<51	<100	>100
	Acetylene	16	2	2	2	2

8.3	Planned Outage	<200	201-500	501-1000	>1000
	Hydrogen	0	3	6	1
	Methane	5	1	3	0
	Carbon Monoxide	1	0	5	1
	Carbon Dioxide				

	Planned Outage	<50	51-100	101-300	>300
	Ethane	2	1	3	3
	Ethylene	0	0	6	3
	Acetylene	6	5	0	0

8.3.1 Modify limits? Yes 14 No 45

8.4

8.5 Dornenberg 16 Rogers 58 Duval 2 IEC 7  
Other 2

8.5.1 Min conc. limits? Yes 14 No 50

8.5.2

9. Test other equipment

CT's Routine	Yes	3	No	6
CT's Occasional diagnostic	Yes	31	No	2
PT's Routine	Yes	3	No	6
PT's Occasional	Yes	32	No	2
Select comp on Tap chgrs. Routine	Yes	11	No	6
Select comp on Tap chgrs. Occasional	Yes	24	No	3
Under Oil Vac Tap chgrs. Routine	Yes	10	No	21
Under Oil Vac Tap chgrs. Occasional	Yes	6	No	3
Bushings, Routine	Yes	8	No	3
Bushings, Occasional	Yes	24	No	5

9.1 Same limits?                      Yes      21                      No      1

10 Additional tests                      Metal in oil      30                      Neut No,      43  
     IFT      37                      H<sub>2</sub>O      45                      Dielectric B.V.      10                      PF      11

APPENDIX "I"

PERFORMANCE CHARACTERISTICS SUBCOMMITTEE  
St. Louis, MO. - April 16, 1985  
MEETING MINUTES

I. INTRODUCTION/ATTENDANCE

The Performance Characteristics Subcommittee (PCS) met at 10:05 a.m. on Tuesday, April 16, with 39 members and 50 guests registering their attendance.

II. APPROVAL OF MINUTES

The Minutes of the October 16, 1984, PCS Meeting were approved as submitted.

III. CHAIRMAN'S REMARKS

Dave Smith submitted a written liaison report concerning the development of a "Guide for the Protection of Network Transformers" by the Power Systems Relaying Committee. His report is attached.

A PAR has been submitted to begin development of a Loss Measurement Guide by a Task Force within the Loss Tolerance and Measurement W.G.

A response to the Northeast Underground Committee on the issue of the lower limit of operating temperature was submitted by the Chairman stating the PCS position. A copy of the letter is attached.

The PCS has been notified of a typographical error in C57.105-1978 (Guide for Application of Transformer Connections in Three-Phase Distribution Systems). This will be held pending notification from IEEE of a need to revise or reaffirm C57.105.

The PCS received a request to consider standardization of LTC position indication. This was discussed later under New Business.

ASEA and the National Bureau of Standards have recently completed a joint study of transformer loss measurement. A seminar on this study will be presented at the Fall meeting of the Transformers Committee by S. Mehta and Dr. O. Petersons of NBS.

Due to the addition of a Tuesday morning W.G. session planned for the Fall meeting, several PCS W.G. sessions will be shifted into different time slots.

Following the meeting, Wallace B. Binder, Jr., Ohio Edison was added as a PCS member. Bill Griffard of Commonwealth Associates has retired. With these changes, the PCS membership remains at 50.

IV. AGENDA

The agenda was accepted as proposed.



## V. WORKING GROUP (W.G.) REPORTS

### 1. Qualification of Transformers for Class 1E Application in Nuclear Power Stations - L. B. Stensland, Chairman.

The working group met at 10:05 a.m., on Monday, April 15, 1985, with 4 members present. Since the previous meeting, Draft 13.3 has been sent out to the working group members. The draft includes clarifications to resolve previous negative ballots from the majority of NPEC-SC-2 members. Some additional editorial comments were also made at the meeting.

It is expected that Draft 14 will be sent out to SC-2 members after we have received comments from those who have not yet been contacted directly.

### 2. Transformers Directly Connected to Generators - B. K. Patel, Chairman.

The W.G. met at 1:00 p.m. on Monday, April 15, 1985 with 8 members and 7 guests present.

Draft #6 was reviewed. Several editorial comments were made. The next revision to the draft is expected by mid July. W.G. members feel that the next revision should be balloted at the Subcommittee level before the next meeting in Toronto. Input from the Subcommittee should help the W.G. in finalizing the direction of the guide.

The Chairman will discuss this balloting possibility with the absent members for their agreement.

The meeting adjourned at 3:00 p.m.

### 3. Failure Analysis - H.F. Light reporting for D. J. Cash, Chairman.

The working group on Transformer Failure Analysis met from 3:00 to 4:45 p.m. on Monday, April 15, 1985, in St. Louis, MO. with 19 members and 12 guests present. After introduction of members and guests, the minutes of the previous Working Group meeting in Boston, MA. were accepted without comment.

Between the Boston, MA. meeting and this meeting, a Task Force meeting was held in Detroit, MI. on March 28 and 29 at which time Draft #1 was developed for this meeting. At this Working Group meeting, Draft #1 was reviewed in the Working Group for additional suggestions. These comments will be incorporated into this document before the Working Group is balloted. The comments will be integrated, a new draft produced and the Working Group balloted for the first time. This ballot will give the Task Force information from which to develop Draft #2. This will all be accomplished before the October meeting in Toronto. In Toronto, Draft #2 will be presented along with the ballots of Draft #1. There is still some information to be put into some of the sections by volunteers which has not yet been received. These individuals will be contacted. The document is on its way.

4. Loss Tolerance and Measurement - W. R. Henning, Chairman

The W.G. on Loss Tolerance and Measurement met at 8:00 a.m., on Monday, April 15, 1985, with 15 members and 18 guests attending. Minutes of the previous meeting were approved as written.

The results of a simultaneous Main Committee/PCS ballot on "Corrections to Load Losses" and "Voltmeter Connections for No-Load Losses" were discussed. There were two negative votes. It is believed that the basis for these negative votes will be satisfied by a project proposed by the Working Group: A task force to develop a transformer loss measurement guide with a complete rewrite of Sections 8 and 9 of the Test Code C57.12.90. The W.G. will proceed to try to resolve the negative votes on the basis that the two objections will be covered by this future work. Remaining editorial changes will be handled by a circulation of change.

The second subject discussed was temperature correction and a reference temperature for no-load losses. The W.G. will survey core loss temperature correction data from manufacturers who have developed methods of their own.

A format and data sheet for this purpose was agreed to. The data survey forms will be mailed to all PCS members representing transformer manufacturers, who will be asked to return the form by June 30. This data will be used to evaluate and develop a practical correction method for use when the temperature is not within the specified range.

The third subject discussed was a new project to be undertaken by a task force now being formed to develop a loss measurement guide. Sam Mehta presented a proposed outline for this guide and a description of the specific work required to complete this effort. It will be a comprehensive project and will require a lot of work shared among task force members. We are currently recruiting members for this task force with a special invitation to users who may be involved in loss testing.

There being no further business, the meeting was adjourned at 9:18 a.m.

At the PCS Meeting, Bill McNutt questioned the status of agreement on a no-load loss reference temperature. Bill Henning responded that such agreement has not yet been achieved and will likely be dependent on development of the correction method.

An additional plea was made for user involvement in the development of the new Loss Measurement Guide.

5. Harmonic Load Current Heating - W. J. McNutt, Chairman

The W.G. met on Monday, April 15, with 7 members and 17 guests present.

Bill McNutt reviewed the results of the balloting on Draft 6 of the Recommended Practice For Establishing Transformer Capability When Supplying Non-Sinusoidal Load Currents. There was a 79% return of ballots to the W.G. and Performance Characteristics Subcommittee, all affirmative, with 4 having attached comments. Bill distributed non-substantive changes to respond to the comments and these were reviewed in the meeting. The changes will be incorporated into Draft 7 for balloting in the main Transformers Committee before the next meeting.

George Bryant reported that there were 3 members and 3 guests present for the meeting of his Task Force on Semi-Conductor Rectifier Power Transformers on Monday. George had distributed a Draft 1 Standard to his Task Force for discussion and the returns were reviewed at the meeting. Many suggestions were made for changes and these will be incorporated into a Draft 2 document to ballot in the Task Force before the next meeting.

The next W.G. meeting in Toronto will allow time for the W.G. to participate in discussion of the Draft 2 Standard.

6. Transformer Reliability - H. F. Light, Chairman

The Working Group met on Monday, April 15, 1985, with 12 members and 10 guests attending from 1:00 to 2:30 p.m. After introduction of members and guests, the Minutes of the previous meeting in Boston, MA. were accepted without comment.

The Chairman reviewed the results of Draft #7 balloted in the Main Committee. It was recommended then that the single negative ballot (other than the (W) legal negative) might be changed with what could be considered an editorial modification. In the meantime this has been deemed not possible, after discussion with Dr. Wolfgang Lampe, and changes will be necessary with an additional ballot in the Main Committee. In the meantime an additional negative ballot has also been received which will require additional review. Therefore, a Draft #8 will be prepared and balloted in the Main Committee. This will be accomplished before the October 1985 meeting in Toronto.

VI. PROJECT REPORTS

1. Ratio Tolerance (P462D) - M. Mitelman

A summary of disapprovals and comments on the Draft 5 Main Committee ballot was presented (copy attached). After discussion, direction for Draft 6 was determined; it will be balloted prior to the Fall meeting.

2. Telephone Influence Factor (TIF) Test - C. P. Kappeler

The only objection raised during Main Committee ballot was to clarify that the test be limited to 50 KVA and below. By voice vote, the PCS approved adding a note to that effect. By similar voice vote, the Main Committee added its approval. The approved change will be forwarded to the Standards Subcommittee for processing.

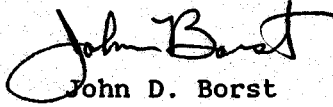
VII. OLD BUSINESS - None

VIII. NEW BUSINESS

The request to consider standardization of LTC position indication was discussed. This was submitted by C. J. Blattner of Niagara Mohawk (see attached). Bob Veitch offered the opinion that LTC indications tended to be unique to the specific application requirements. There being little other response from the members present, Dean Yannucci suggested that several PCS user members be polled for their input/interest in this topic.

IX. NEXT MEETING

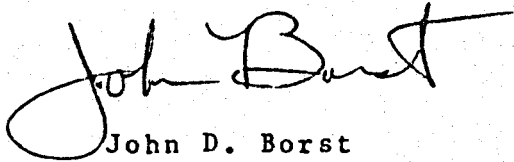
The next meeting will be held on Tuesday, October 29, 1985, in Toronto. The meeting was adjourned at 11:15 a.m.

  
John D. Borst  
Chairman

- (1) The limit should remain at -20 degrees C.
- (2) Temperatures below -20 degrees C should be considered "unusual".
- (3) Requirements below -20 degrees C should be specified be the user.

Based on this response by the membership, the PCS considers this matter closed.

Sincerely,



John D. Borst  
Chairman  
Performance Characteristics Subcommittee

cc: W. Cole, Niagara Mohawk Power Corp.  
C. Kappeler, Central Maloney  
L. Savio, Consolidated Edison Company

February 27, 1985

Mr. O. R. Compton  
Virginia Electric Power Company, RP1E  
Box 26666  
Richmond, Virginia 23261

Dear Olin:

Subject: LTC Position Indication

Large power transformer and autotransformer LTC position indication has evolved within the industry into a hodge-podge of differing and sometimes conflicting arrangements. This situation needs to be addressed by a standards-making organization and a uniform LTC labeling arrangement established. It is hoped that the IEEE Transformer Committee can review this problem and initiate corrective action.

Attached Sheet #1 shows three different LTC labeling arrangements presently installed on the Niagara Mohawk System. The G.E. and McGraw Edison labeling arrangements, which are installed in parallel at our Edic Station, illustrate the worst situation where the "raise" positions are in the opposite directions. These conflicting labeling arrangements have caused confusion when Power Control personnel request the Area Operators to "raise" or "lower" the 115kV voltage level. For example, to "raise" the 115kV voltage, the G.E. LTC must be moved in the "lower" direction and the McGraw Edison LTC must be moved in the "raise" direction.

It would greatly simplify matters if all of the LTC labeling arrangements could be referenced to the secondary (115kV) voltage. This would place all of the labeling arrangements on a common and consistent basis such as illustrated on attached Sheet #2. We attempted to convert our existing units to this arrangement by requesting new nameplates and LTC position indicators from each of the manufacturers. However, both General Electric and Westinghouse refused to supply these items on the basis that the unit was designed to follow the primary voltage.

We have specified that new units are to be labeled as shown on attached Sheet #2. Nonetheless, our new units are still received with the LTC labeling arrangement referenced to the primary voltage and arbitrarily marked with respect to "raise" and "lower."

ANSI C57.12.30 covers LTC equipment for power transformers rated 230kV and below, and rated 100,000kVA and below. Perhaps this standard could be extended to cover the larger size units.

As a minimum, the "raise" and "lower" directions and the LTC step numbering should be standardized.

If we can provide you with any additional information concerning this problem, please let us know.

Very truly yours,



C. J. Blattner  
Sr. Electric Standards Engineer

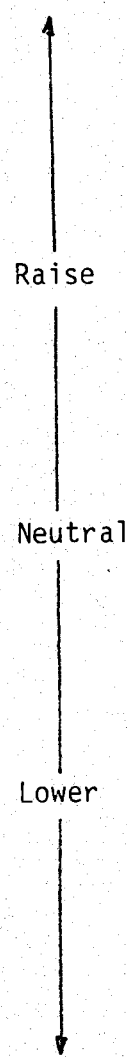
CJB:eao

Attachments

cc: M. J. Bogdan  
W. E. Cole  
H. F. Light  
J. Murphy  
J. P. Stojka, Jr.

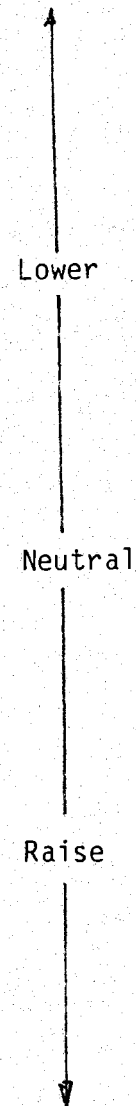
NMPC AUTOTRANSFORMERS  
EXISTING LABELING ON LOAD-TAP-CHANGERS

379500	16
	15
375200	14
	13
370900	12
	11
366550	10
	9
362250	8
	7
357950	6
	5
353650	4
	3
349300	2
	1
345000	N
	1
340700	2
	3
336400	4
	5
332050	6
	7
327750	8
	9
323450	10
	11
319150	12
	13
314800	14
	15
310500	16



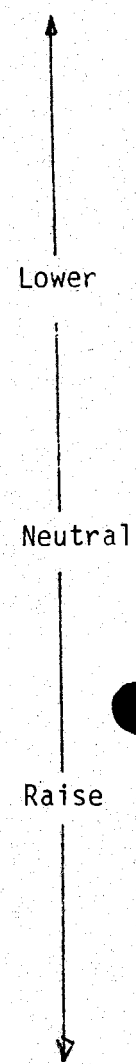
G.E.  
345/120kV  
448 MVA

379500	33L
	32L
375200	31L
	30L
370900	29L
	28L
366550	27L
	26L
362250	25L
	24L
357950	23L
	22L
353650	21L
	20L
349300	19L
	18L
345000	17L
345000	17
345000	17R
	16R
340700	15R
	14R
336400	13R
	12R
332050	11R
	10R
327750	9R
	8R
323450	7R
	6R
319150	5R
	4R
314800	3R
	2R
310500	1R



McGraw Edison  
345kV  
448 MVA

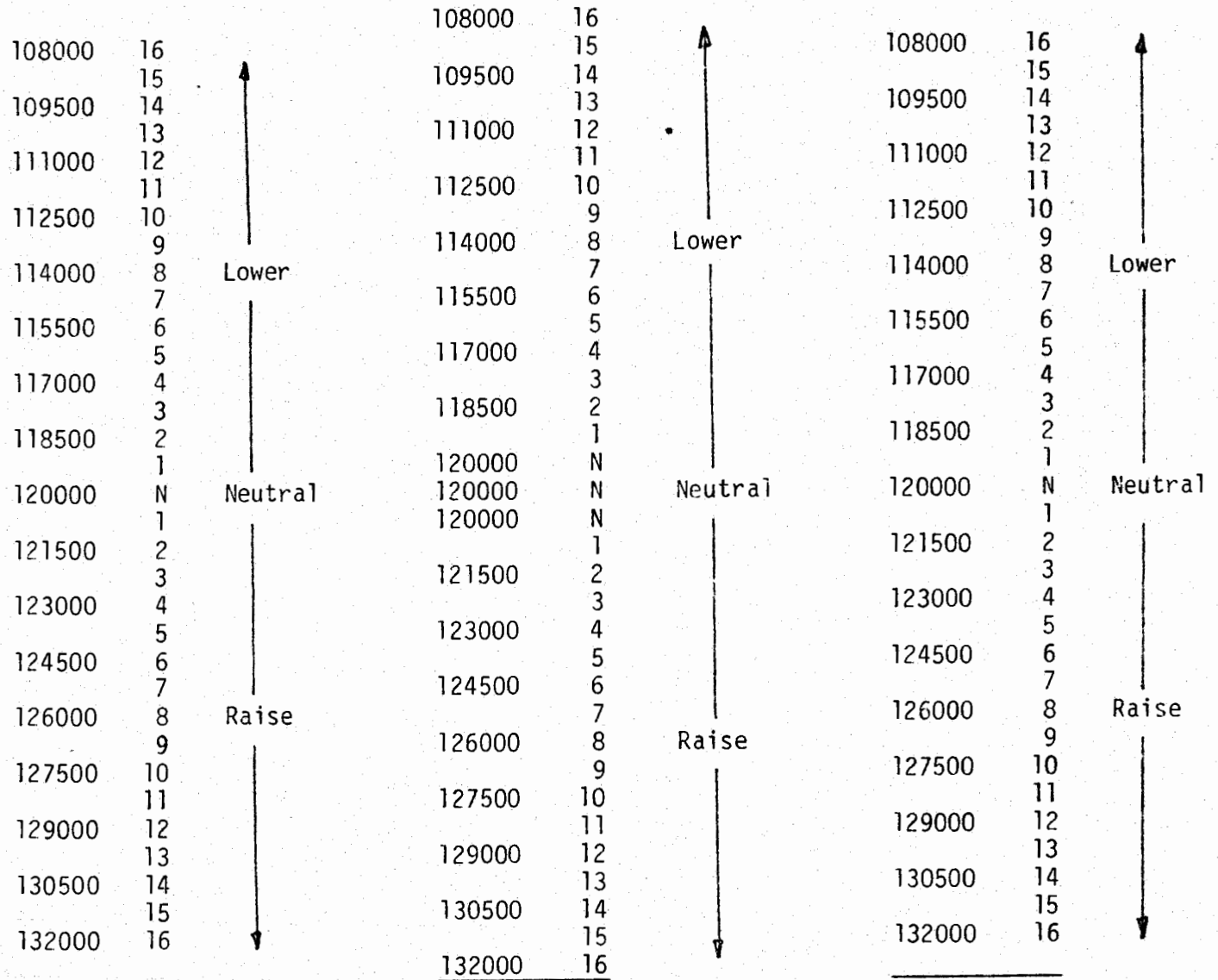
253000	16
	15
250125	14
	13
247250	12
	11
244375	10
	9
241500	8
	7
238625	6
	5
235750	4
	3
232875	2
	1
230000	N
	1
227125	2
	3
224250	4
	5
221375	6
	7
218500	8
	9
215625	10
	11
212750	12
	13
209875	14
	15
207000	16



Westinghouse  
230kV  
349 MVA



NMPC AUTOTRANSFORMERS  
PROPOSED LABELING ON LOAD-TAP-CHANGERS



G.E.  
345/120kV  
448 MVA

McGraw Edison  
345/120kV  
448 MVA

Westinghouse  
230/120kV  
349 MVA

IEEE TRANSFORMER COMMITTEE  
and PERFORMANCE CHARACTERISTICS  
SUBCOMMITTEE  
BALLOT SUMMARY ON

P462D/5 - Revision of wording for Ratio Tolerance Section  
(Paragraph 9.1) of C.57.12.00

Ballots Mailed	•	-	122
Ballots Returned		-	88
Approved		-	76
Approved with Comments		-	3
Not Approved		-	8
Not Voting		-	1
Not Returned		-	34

SUMMARY OF COMMENTS  
AND DISAPPROVALS

TYPE OF VOTE

COMMENTS

(1) Not Approved

"The note concerning agreement of nameplate values by manufacturer and user should be deleted. It should not be a part of the standard. The nameplate values are for future reference when work is to be done or to determine expected values in operation. Therefore, the nameplate should show valid values. If changing taps on one winding changes values on another winding the plate should show it. Enough values should be shown on the plate to give adequate data for use of the transformer."

(2) Not Approved

"We feel the  $\frac{1}{2}\%$  ratio tolerance on line-to-line measurement is sufficient accuracy. The requirement of applying voltage on the winding with least number of turns and measuring phase-to-neutral unnecessarily complicates the testing procedure".

(3) Not Approved

"The second sentence is not clear as punctuated. Suggest second comma be replaced by "in which case".

(4) Not Approved

"What if the rated voltage connection is on an intermediate or highest number of turns connection? Wording is unclear.

(5) Not Approved

"As worded the "nearest turn tolerance" applies only to the tap voltages and not to the nameplate voltage (see marked copy)-

"....The rated voltages of all other winding's will be within  $\frac{1}{2}\%$  of the nameplate voltages,

except in those cases where the volts per turn exceeds  $\frac{1}{2}\%$  of the nameplate voltage. All tap voltages shall also meet this tolerance. For three phase WYE...."

(6, 7) Not Approved

"The phrase "Except in those cases where the volts per turn exceeds  $\frac{1}{2}\%$  of the tap voltage, the turn ratio shall be to the nearest turn," should apply to the rated voltage as well.

I suggest the paragraph be changed to read: "The turn ratios between windings shall be such that, with the transformer at no load and with rated voltage applied to the winding with the least number of turns, the rated voltages of all other windings will be within  $\frac{1}{2}\%$  of the nameplate voltages, except in those cases where the volts per turn exceeds  $\frac{1}{2}\%$  of the nameplate voltage, the turn ratios shall be to the nearest turn. All tap voltages shall also meet this tolerance. For three phase WYE transformers, this tolerance applies to the phase-to-neutral voltage. If not explicitly marked on the nameplate, the phase-to-neutral voltage shall be calculated by dividing the phase-to-phase voltage markings by  $\sqrt{3}$ ."

(8) Not Approved

"Please refer to attached marked-up copy:

The turn ratios between windings shall be such that, with the transformer at no load and with rated voltage applied to the winding with the least number of turns, the measured voltages of all other windings shall be within  $\frac{1}{2}\%$  of the nameplate voltages. All tap voltages shall also meet this tolerance except in those cases where the volts per turn exceeds  $\frac{1}{2}\%$  of the tap voltage. The turn ratios shall then be to the nearest turn. For three phase WYE transformers, this tolerance applies to the phase-to-neutral voltage. If not explicitly marked on the nameplate, the rated phase-to-neutral voltage shall be calculated by dividing the phase-to-phase voltage markings by  $\sqrt{3}$ .

If it is impossible for all rated voltages to meet this tolerance, the nameplate voltages must be agreed to by user and manufacturer.

(9) Approved  
with Comments

Line 5 - "Rated voltages of all other windings will..." should read "Rated voltages of all other windings SHALL" - since this is mandatory.

(10) Approved with  
Comments

"The tolerance on  $\frac{1}{2}\%$  itself is open to different interpretation which can cause disagreement. For this reason the Canadian STD C2 adopted 0.50% as the designation.

(11) Approved  
with Comment

"...The first word of the fifth line... changed from "Rated" to "Induced".

APPENDIX "J" (1)

MINUTES OF WORKING GROUP

P801, Requirements, Terminology and Test Code for  
Step-Voltage and Induction-Voltage Regulators

Clarion Hotel  
St. Louis, Missouri  
April 15, 1985

Members Present

E. C. Edwards  
J. H. Harlow  
W. E. Wrenn  
A. C. Wurdack

Members Absent

R. W. Beckwith  
K. A. Mennerich  
W. F. Sheehan

Guests Present

J. C. Arnold	USDA, REA
C. V. Brown	Florida Power & Light Co.
C. K. Miller	T & R Electric
M. Owens	Union Electric
T. N. Samuel	McGraw-Edison Co.

The meeting was brief, being devoted to a review of correspondence with those who voted in the negative or otherwise offered discussion on Draft #9 of the proposed revision.

Two points relating to the ballot of Mr. James D. Douglass of McGraw-Edison could not be finally resolved due to Mr. Douglass' absence. Mr. Samuel will discuss the points with Mr. Douglass. Final, formal resolution is anticipated quickly permitting the P801/D9a revision to be submitted to the IEEE Standards Review Committee.

Lacking a presently unforeseen situation, the Working Group will not schedule a meeting for the fall meeting in Toronto; however, the group will not be disbanded, pending the need to reassemble in response to any requirements imposed as the standard proceeds through the formal review process.

 4/22/85  
J. H. Harlow

JHH:cb

cc: Members

Guests present at meeting

L. R. Smith, Chairman Standards Subcommittee ✓

APPENDIX "J" (2)

IEEE TRANSFORMERS COMMITTEE

April 16, 1985 - St. Louis, Missouri

Working Group - Revisions to Test Code for Shunt Reactors (C57.21)

This Working Group met at 10:05 a.m. on April 16, 1985, with ten attendees: seven members, three guests. One of the guests, Mr. R. J. Musil, American Elin Corporation, requested membership. This now makes the total membership fourteen.

The minutes of the last meeting in Boston were approved after the customary introductions.

Mr. L. Wagenaar, substituting for Mr. W. Kennedy, then gave a brief summary of the results of the previous task force meeting on the Dielectric Tests for Shunt Reactors.

The Chairman then obtained the following comments, corrections, and suggestions relative to the first draft for Revising the Test Code for Shunt Reactor Standard (C57.21).

- The contents section was reorganized for simplicity and elimination of references to types of cooling equipment.
- There will only be a self-cooled rating for shunt reactors (Class OA). All other cooling means have been eliminated.
- The temperature rise limits for shunt reactors will be only 65° C; the 55° C rise rating was deleted to agree with the present transformer standards.
- Table 3 in C57.21 will have the footnotes modified to be consistent with notes in the transformer standard.
- The term "turn-to-turn potential test" was rephrased to be "low frequency overvoltage test."
- A new table was established which outlines the routine, design and other tests for liquid-immersed shunt reactors (similar to transformer standard table). This new table was discussed in great detail with the following major conclusions.
  1. Lightning impulse tests for units 115 kV and above will be a routine test; below 115 kV, units will be classified as design tests.
  2. Switching surge tests for units 345 kV and above will also be routine tests; units below 345 kV will be listed as other tests.

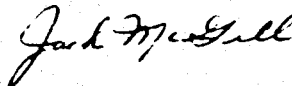
Since the low frequency overvoltage test does not have an enhancement level test, it was necessary to require switching surge tests routinely on the higher kV units.

3. Front-of-wave tests will remain as other tests.
4. The audible sound test will be a routine test for those units rated 115 kV or above or 50 MVAR or above. Units rated under these values will be considered design tests.
5. Vibration tests will be a routine test with the same limitations as outlined for the audible sound test.
6. The "lifting and moving device" line under mechanical tests will be deleted. The Chairman will check if the pressure and leak testing can be combined.

There was considerable discussion on various ways and means of testing a shunt reactor to verify the phase-to-phase voltage levels when making a single phase low frequency overvoltage test on a three phase shunt reactor (both three-legged and five-legged core form designs). The results of this discussion were not conclusive and more information and study is required.

The entire allotted time for this meeting was utilized in reviewing only about one-third of the proposed first draft. The Chairman requested comments from this Working Group on the remaining portion of the draft. All these comments will be discussed at the next meeting along with the entire draft #1.

The meeting was adjourned at 11:50 a.m.



Jack W. McGill  
Chairman

ds

APPENDIX "K"

WEST COAST TRANSFORMER SUBCOMMITTEE MEETING  
IEEE TRANSFORMERS COMMITTEE  
HOTEL VANCOUVER  
JULY 17, 1985 - 1:30 PM  
VANCOUVER, BRITISH COLUMBIA

Attendance

<u>Representative</u>	<u>Company</u>	<u>This Meeting</u>	
		<u>Member</u>	<u>Guest</u>
Herb Johnson	Seattle City Light	X	
Denise Roth	Seattle City Light		X
Samuel Oklu	LADWP	X	
Dan Nix	San Diego Gas & Electric		X
A. McCarthy	B. C. Hydro	X	
Wm. Duncan McEwen	B. C. Hydro		X
Betty Tobin	Seattle City Light		X
Ron Little	The Washington Water Power	X	
Roger Jacobsen	Puget Sound Power & Light	X	
D. A. (Jim) Gillies	Consultant	X	
Fred Huber	IEEE		X
Howard Maddox	Pub. Serv. Co. of N. M.		X
Ray Allustiarti	Pacific Gas and Electric	X	
Don Schafer	Puget Sound Power & Light		X
Bill Isberg	Federal Pacific Electric		X
Olin Compton	Virginia Power (Vice Chairman, Transformer Committee)		X
Robert Young	Seattle City Light		X
Doug Berry	General Electric Co.	X	
Dennis Gerlach	Salt River Project	X	

MINUTES

The meeting was convened at approximately 1:30 PM by Chairman Herb Johnson. The minutes of the February 14, 1985, meeting were reviewed and approved with a correction. The minutes incorrectly reported Mr. Jake Sabath as the previous chairman of the main committee. Mr. Leo Savio was the previous chairman.

Discussion of General Membership

There was discussion of how strictly and in what manor attendance requirements of the WC subcommittee should be enforced. Mr. Olin Compton reported that the main committee sends a letter to a member after that member has missed two consecutive meetings. This letter informs the member that his name will be removed from the roster unless he attends the next meeting. The possibility of allowing corresponding members on the WC subcommittee was also discussed.

Attached to the meeting notes is a copy of the membership list.



## WORKING GROUP REPORTS

### Loss Evaluation Guide

Mr. Roger Jacobsen submitted a marked up copy of Draft 10 of the Loss Evaluation Guide. An informational copy of the guide will be sent to members of the main transformer committee for comment. It was suggested that the guide include information on the formulas used in the guide. General membership was requested to review this marked-up draft. *no to be submitted to T&C Comm for Review & Comment*

### Consolidation of Transformer Installation Guide

Mr. Herb Johnson reported for Mr. Delmar Johnson who was unable to attend. It was requested that individuals who were working on sections of the guide should complete and submit them as soon as possible.

### Siesmic Guide - Project 513

Mr. Sam Oklu reported that he submitted a letter to the standards committee to resolve the previously reported problem with Draft D15. Mr. Olin Compton reported that Mr. Oklu's efforts were apparently successful and that the standard was again moving toward approval.

### Fire Protection

Mr. Herb Johnson announced that a proposed scope had been developed which includes fire prevention protection and response. Mr. Johnson also reported that the next step will be to prepare an outline for the guide and develop a bibliography of related material. He hopes this will be completed by the next meeting.

### Presentation on B. C. Hydro Substation

Mr. W. D. McEwen of B. C. Hydro presented information concerning B. C. Hydro's Cathedral Square Substation, locating in downtown Vancouver. Mr. Ewen's presentation focused on B. C. Hydro's efforts to prevent a secondary transformer explosion in this underground substation. The information he provided included the mechanics of a secondary explosion, the reasoning behind B. C. Hydro chosen solution and some of B. C. Hydro's experience with the installation. The WC subcommittee wishes to thank Mr. McEwen and B. C. Hydro for this very informative presentation.

*-CO2 blanket  
Secondary Tra*

### Discussion

There was a general discussion on transformer cooling methods. It was reported by some members that their companies purchased FOA transformers (no self cooled ratings) exclusively or in most circumstances. Others expressed a preference for transformers which did not use oil pumps. One member reported that his company assesses a 1% penalty against designs that included oil pumps.

Mr. Bill Isberg described some trends in transformer construction. He reported the use of laser etched steel to reduce core losses. The steel is presently imported from Japan but is expected in production in the U. S. later this year.

Mr. Isberg reported that some utilities were eliminating no load tap changer in favor of a larger range in the load tap changer (+15%). He also informed the group that specifying excessively low levels of transformer insulation moisture content could be detrimental. With modern techniques it is possible to make transformer insulation so dry that it becomes brittle.

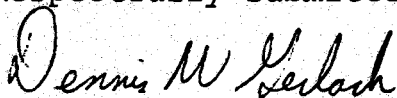
There was also discussion on how to select primary voltage for a GSU. It was reported that standard practice is to set the primary voltage of the GSU 5% below the generator nameplate voltage. Other members commented that specific situations may require selecting GSU primary voltage equal to generator nameplate voltage.

#### Future Meetings

The next subcommittee meeting will be held during the Main Substation Committee meeting in Phoenix, Arizona during the week of April 27, 1986. During that week, meeting times of a half day each will be set for the Fire Protection and Loss Evaluation working groups.

The second meeting of 1986 is tentatively scheduled for September in Anaheim, California. Mr. Olin Compton has requested 15 minutes at the Anaheim meeting to report on main committee activities.

Respectfully submitted,



Dennis W. Gerlach  
Secretary  
West Coast Transformer Subcommittee

APPENDIX "L"

EPRI REPORT

by

Edward T. Norton  
3909B, Middlefield Rd.,  
Palo Alto, CA 94303.  
(415)-494-6393

As many of you know, I have decided to leave EPRI and go into private transformer consulting. I have been particularly pleased to have worked with many of you over the past 10 years and I hope I can continue those relationships in my new venture.

I have been asked to say whatever I would normally say at this meeting if I were still a member of the EPRI staff. Therefore, I will try to summarize the progress on some of the significant projects:

1. Amorphous Metals research is progressing well with G.E. on distribution transformers and Westinghouse on stacked core power transformers. Allied has just completed installation of a million pound rolling mill for compacting several sheets of thin material into a workable thick and wide sheet for use on stacked cores. Westinghouse has successfully tested a 500 kVA, 3-phase, stacked core transformer.
2. Transformer Life project is progressing as planned with Westinghouse and a new project has been initiated with G.E. based on Bill McNutt's paper on a modeling techniques.
3. Another hot spot detector has just been proven successful this past week by Technology Dynamics. It has been hampered by the lack of a satisfactory fiber. A new fiber has successfully passed compatibility and dielectric tests by Westinghouse.
4. The project on Static Electrification is well underway with a great deal of disciplines being employed from several companies and universities.
5. An advanced transformer project by Westinghouse to study the feasibility of advanced windings and insulation systems, to reduce the losses of large power transformers, is progressing well. In the Fall of this year a Request for Proposals will be sent out on a large project for advanced transformers.
6. Improved converter transformer insulation system with G.E. and EHV Weidmann is progressing towards a full scale test in 1985.

A new RFP will also be issued shortly on improved load tap changers.

Again, I sincerely thank all of the people I have worked with on these EPRI projects for their help and hope to be able to work with you again in a different role.

April 17, 1985

APPENDIX "M"

IEEE/PES Transformer Committee  
Liaison Reports  
April 1985

IEEE Joint Committee on Nuclear Power Stations  
L. R. Stensland

1. The Working Group for Qualification of Class 1E Transformers for Nuclear Power Generating Stations will probably issue Draft 14 of P638 within the next several months to the IEEE/NPEC/SC-2 for ballot.
2. I understand that the next committee meeting for the IEEE/NPEC/SC-2 will be in Chicago on the same dates of our meeting in St. Louis (April 15-17, 1985).

ANSI C68  
L. S. McCormick

Dissolved.

Surge Protective Devices Committee  
E. J. Yasuda

No meeting held since last Transformer Committee meeting, therefore, report for October 1984 applies.

Standards Coordinating Committee No. 4  
Dr. M. L. Manning

(Insulating Materials and Systems) E. A. Boulter, Chairman, General Electric Co., Lynn, MA 01910 (14 members), Howard Reymers, Secy. Underwriters Laboratories, 1285 Walt Whitman Road, Manville, NY 1174

This committee met in Hilton Head, SC, November 7-9, 1984 and in New York, NY, February 4, 1985. Revision of IEEE No. 1 (General Principles for Temperature Limits in the Rating of Electrical Equipment and for the Evaluation of Electrical Insulation) has been extensive. Technical Progress, since the revision, influences the life of electrical insulation in material tests and systems for electrical equipment. IEC Technical Committee No. 63 - "Insulation Systems,"

started the development of IEC Publication 595, "Guide for the Evaluation and Identification of Insulation Systems of Electrical Equipment" published in 1974. This document provides philosophical and practical basis for equipment committees to use in devising test procedures for insulation systems exposed in service to aging caused by thermal, electrical, environmental and mechanical stresses. The foreword of IEEE No. 1 denotes these changes. During the revision process, attention was focused on a much needed revision of IEC Publication 85 "Thermal Evaluation of Electrical Insulation." The available 1957 edition of this IEC document was similar to the 1954 version of IEEE No. 1. Contributions of some USA Members of the revision of IEC 85 were also members of SCC No. 4. Experience gained by this diversion makes IEEE No. 1 a better document and in harmony with IEC publications.

IEEE No. 1 now has four parts:

Part I - "General Concepts, Scope and Definitions"

Of importance, there are 16 references which complete and extend concepts of IEEE No. 1. These are: IEEE 96, 97, 98, 99, 101, 853, P775, P943, P1064. The IEC publications are : 85, 216, 493, 505, 610, 611, 727, 791 and 792.

These documents explain: Test Procedures, General Concepts, Basic Consideration in Preparation of Standards, Terms and Definitions.

Part II - "Limiting Temperatures and Their Measurements for Electrical Insulation Systems"

This part contains purpose, scope and derivation of temperature rise.

Part III - "Evaluation of Electrical Insulation Systems"

Coverage includes purpose and scope, temperature classification of insulation systems, acceleration of thermal aging procedures, test procedure outline, multi-factor functional evaluation of insulation systems and procedures for multi-factor functional evaluation on equipment or parts thereof, or on models.

Part IV - "Evaluation of the Thermal Capability of Insulating Materials"

This part covers purpose and scope, thermal aging, temperature designation of insulating materials, determination of temperature index by test, statistical criteria, acceleration of thermal aging, tests and determination of preferred temperature category by experience.

Standards Coordinating Committee No. 4.1

(U.S. Technical Advisory Group for IEC TC-63). E. A. Boulter, Chairman; General Electric Co., Lynn, MA 01910 (26 members). Work by this committee closely interleaves that of SCC 4.0 - same members in both.

Working Group 943, R. J. Flaherty, Chairman (Life Cycle Engineering, Inc., 632 Binsted Road, Glen Burnie, MD 20161) submitted draft of IEEE P943 - "Aging Mechanisms and Diagnostic Procedures in Evaluating Electrical Insulation Systems." for approval. This was prepared for an IEC TC 63 meeting in London. This nine-page document covers scope, aging mechanism and their verification, diagnostic techniques in the evaluation of insulation systems.

Work by these two committees is of great importance in establishing standards for the evaluation of electrical insulation and establishing general principles for temperature limits in the rating of electrical equipment. IEEE No. 1, in its revised form of four parts, will be of great assistance to design engineers, manufacturers, and users of electrical equipment.

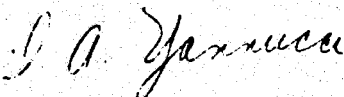
ANSI C57.12.12 Subcommittee  
Calvin P. Kappeler

The subcommittee last met on October 18, 1984 in Boston, and will meet on April 26 and 27, 1985 in San Diego. Revision of C57.12.20 Draft 6 has been balloted, results to be reported. Revision of C57.12.21, C57.12.22 and C57.12.25 are to be reviewed at San Diego, preparatory to balloting.

C57.12.23 and C57.12.26 revisions have been forwarded to ANSI Board of Standards for further action.

C57/37 standard dealing with Cabinet Security has been balloted, results to be reported in San Diego.

The subcommittee desires guidance on use of the term "oil" and "liquid" in standards, both of which appear to be used interchangeably. Which, if either, is proper?

  
D. A. Yannucci

APPENDIX "N"

ANSI C89 REPORT

April 17, 1985

S. J. Antalis

1. No ANSI C89 meeting was held since the last report.
2. ANSI C89.1 - Dry Type Machine Tool and Control Transformers  
This standard is still up for re-affirmation.  
It is awaiting NEMA Council approval before letter balloting.
3. ANSI C89-2 - General Purpose Dry Type Transformers  
This standard is having effort applied for removal of high voltage ( 1.2kV) references to avoid conflict with published ANSI C57 Dry Type Distribution Transformer Standards. No ballot has as yet been issued.
4. The ANSI C89 committee has been transferred to an "Accredited Standards Committee", pursuant to ANSI's new requirements.

S. J. Antalis,  
Liaison Representative.