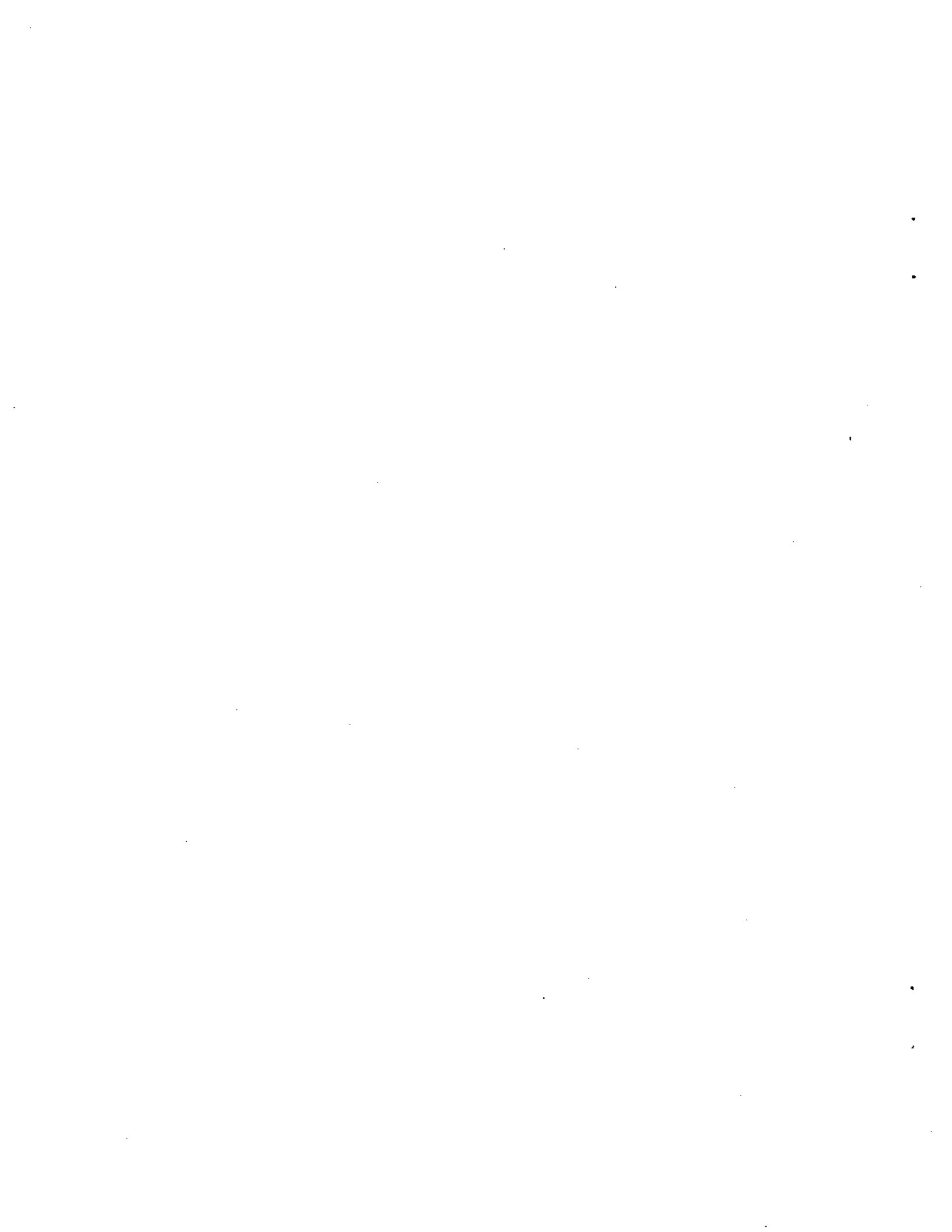


***IEEE/PES TRANSFORMERS COMMITTEE
MEETING***

MARCH 23, 1994

DALLAS, TEXAS



**IEEE/PES TRANSFORMERS COMMITTEE MEETING
DALLAS, TEXAS
MARCH 23, 1994**

ATTENDANCE SUMMARY

MEMBERS PRESENT

M. S. ALTMAN	E. KALLAUR	V. Q. PHAM
J. C. ARNOLD	J. J. KELLY	L. W. PIERCE
D. E. AYERS	S. P. KENNEDY	R. L. PLASTER
W. B. BINDER, JR	W. N. KENNEDY	D. W. PLATTS
J. H. BISHOP	J. P. KINNEY, JR	J. PURI
W. E. BOETTGER	A. D. KLINE	C. T. RAYMOND
J. V. BONUCCHI	J. G. LACKEY	P. RIFFON
C. V. BROWN	F. A. LEWIS	S.M.A RIZVI
D. S. BRUCKER	H. F. LIGHT	R. B. ROBERTSON
D. J. CASH	S. LINDGREN	J. R. ROSSETTI
D. CHU	W. A MAGUIRE	G. W. ROWE
J. L. CORKRAN	J. W. MATTHEWS	W. E. SAXON
J. C. CROUSE	S. P. MEHTA	D. N. SHARMA
R. F. DUDLEY	C. K. MILLER	V. SHENOY
K. EDWARDS	M. C. MINGOIA	H. J. SIM
F. E. ELLIOTT	H. R. MOORE	J. E. SMITH
P. T. FEGHALI	D. H. MULKEY	J. E. SMITH
S. L. FOSTER	C. R. MURRAY	S. D. SMITH
R. L. GRUBB	W. H. MUTSCHLER, JR.	R. J. STAHARA
F. J. GRYSKIEWICZ	J. W. MCGILL	W. W. STEIN
G. H. HALL	C. J. McMILLEN	R.W. STONER
N. W. HANSEN	R. McTAGGART	J. C. SULLIVAN
K. S. HANUS	C. G. NIEMANN	J. B. TEMPLETON
J. H. HARLOW	P. E. OREHEK	V. THENAPPAN
W. R. HENNING	G. A. PAIVA	T. P. TRAUB
K. R. HIGHTON	K. PAPP	G. H. VAILLANCOURT
P. J. HOPKINSON	B. K. PATEL	R. A. VEITCH
J. W. HOWARD	W. F. PATTERSON	L. B. WAGENAAR
E. HOWELLS	J. M. PATTON	B. H. WARD
J. HUNT	P. A. PAYNE	D. W. WHITLEY
P. IJIMA	L. C. PEARSON	H. J. WINDISCH
A. J. JONNATTI	T. J. PEKAREK	W. E. WRENN
R. D. JORDAN	D. PERCO	

MEMBERS ABSENT

E. J. ADOLPHSON	H. E. GABEL, JR.	A. D. McCAIN
D. J. ALLAN	D. L. GALLOWAY	W. J. McNUTT
B. F. ALLEN	D. W. GERLACH	C. P. McSHANE
R. ALLUSTIARTI	A. A. GHAFOURIAN	E. T. NORTON
J. AUBIN	D. A. GILLIES	S. H. OSBORN
R. A. BANCROFT	R. S. GIRGIS	H. A. PEARCE
R. L. BARKER	F. W. HEINRICHS	M. D. PERKINS
D. A. BARNARD	P.J. HOEFLER	V. RAFF
S. BENNON	C. C. HONEY	J. D. RAMBOZ
E. A. BERTOLINI	G. W. ILIFF	C. A. ROBBINS
J. D. BORST	D. C. JOHNSON	M. P. SAMPAT

M. CAMBRE
O. R. COMPTON
D. W. CROFTS
V. DAHINDEN
J. N. DAVIS
R. C. DEGENEFF
T. DIAMANTIS
L. E. DIX
D. H. DOUGLAS
J. C. DUTTON
J. K. EASLEY
J. A. EBERT
D. J. FALLON
H. G. FISCHER
J. A. FLEEMAN
J. M. FRANK

C. P. KAPPELER
R. B. KAUFMAN
E. KOENIG
J. P. LAZAR
L. W. LONG
L. A. LOWDERMILK
D. L. LOWE
R. I. LOWE
D. S. LYON
J. MA
K. T. MASSOUDA
C. MILLIAN
R. E. MINKWITZ, SR.
M. I. MITELMAN
W. E. MOREHART
R. J. MUSIL

L. J. SAVIO
R. W. SCHEU
L. R. SMITH
L. R. STENSLAND
D. W. SUNDIN
D. S. TAKACH
L. A. TAUBER
A. M. TEPLITZKY
R. C. THOMAS
J. A. THOMPSON
R. W. THOMPSON
D. E. TRUAX
R. J. WHEARTY
A. L. WILKS
C. W. WILLIAMS, JR.

GUESTS PRESENT

S. AGUIRRE
G. ANDERSEN
G. W. ANDERSON
R. ANDERSON
J. ANTWEILER
J. ARTEAGA
O. M. BELLO
P. I. BISBEE
T. E. BLACKBURN III
A. BOLLIGER
J. L. BROWN
W. E. CARTER
A. C. CHAN
J. M. CHRISTINI
F. COSTA
F. DAVID
D. DE LA CRUZ
K. P. ELLIS
J. FOLDI
G. E. FORREST
R. FOX
M. A. FRANCKEK
M. L. FRAZIER
J. FROST
R. GARCIA
J. S. GARZA
J. A. GAUTHIER
R. D. GRAHAM

M. E. HAAS
E. HANIQUE
R. R. HAYES
G. E. HENRY III
O. HEYMAN
T. L. HOLDWAY
J. HOLLAND
E. W. HUTTER
V. C. JHONSA
C. W. JOHNSON
V. M. KHALIN
G. D. KING
M. Y. LAU
M. J. LEE
T. LEWIS
J. E. LONG
R. P. MAREK
S. P. MOORE
B. McCONNELL
A. McNEILL
N. P. McQUIN
L. NAPOLI
V. G. NEUMANN
L. NICHOLAS
R. C. NORDMAN
D. E. ORTEN
J. T. PHIPPS
B. POULIN

G. PREININGER
R. I. PSYCK
M. RAJADHYAKSHA
G. J. REITTER
P. G. RISSE
D. J. ROLLING
V. S. N. SANKAR
W. SCHWARTZ
P. T. SCULLY
T. SIEBERT
R. W. SIMPSON, JR.
P. SINGH
T. SINGH
J. W. SMITH
G. SPARAGOWSKI
A. A. SPEEGLE
R. STERN
T. H. STEWART
A. TRAUT
E. R. TRUMMER
S. C. TULI
C. E. VALENCIA
R. D. WAKEAM
F. N. WEFER
K. WEIDMANN
R. C. WICKS
D. J. WOODCOCK

M. CAMBRE
O. R. COMPTON
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T. L. HOLDWAY
J. HOLLAND
E. W. HUTTER
V. C. JHONSA
C. W. JOHNSON
V. M. KHALIN
G. D. KING
M. Y. LAU
M. J. LEE
T. LEWIS
J. E. LONG
R. P. MAREK
S. P. MOORE
B. McCONNELL
A. McNEILL
N. P. McQUIN
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P. G. RISSE
D. J. ROLLING
V. S. N. SANKAR
W. SCHWARTZ
P. T. SCULLY
T. SIEBERT
R. W. SIMPSON, JR.
P. SINGH
T. SINGH
J. W. SMITH
G. SPARAGOWSKI
A. A. SPEEGLE
R. STERN
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A. TRAUT
E. R. TRUMMER
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R. D. WAKEAM
F. N. WEEFER
K. WEIDMANN
R. C. WICKS
D. J. WOODCOCK

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IEEE PES TRANSFORMERS COMMITTEE MEETING
WEDNESDAY, MARCH 23, 1994

Chair: J. H. Harlow Vice Chair: W. B. Binder, Jr.

Secretary: J. W. Matthews

1.0 Chair's Remarks and announcements - J. H. Harlow

J. H. Harlow called the meeting to order at 8:04 am.

K. S. Hanus, Meeting Host, reported on attendance (see Attachment 1), after which the committee thanked Ken with a round of applause. Mr. Harlow also recognized the fine presentation given by the Tuesday Luncheon speaker, Dr. Paul Zweiacker.

The attendees were reminded that the next Committee meeting will be held in Milwaukee during September 25-28. Sam Mehta will host the meeting at the Pfister Hotel. The room rates will be \$85 single and \$105 double.

The Chair proceeded with the reports on the Technical Council and Administrative Subcommittee meetings.

1.1 Report of Meeting of Technical Council Task Force on Acceptance of IEEE Standards Worldwide, January 31, 1994.

This was the first meeting of this task force.

There was an extensive write-up in the IEEE PES Review for December 1993, "Developing of IEEE Standards for the Global Marketplace," the report of a panel session at the 1993 SPM. The report is the composite of presentations of eight panelists representing different countries who presented their perspective on the possible role for IEEE in the international standards arena. This is a lengthy article (19 pages). I suggest that a reading of the document will give the perspective that most regional standards writing bodies respect and often consult IEEE Standards, but are very satisfied with their regional involvement and they do not encourage any change to give extra influence to IEEE.

It appears to me that there is no regional body serving North America or the Western Hemisphere in the way such as CENELEC serves Europe. Apparently most major industrialized nations in turn have their own standards bodies, e.g., the Italian Electrotechnical Committee is a member of CENELEC. I proposed that the IEEE may find a role in the Western Hemisphere in a manner analogous to CENELEC in Europe. It is interesting to note that a figure in the report reveals that of CENELEC European Standards:

- 72% are identical to IEC results
- 17% are based on IEC results
- 11% are purely European, i.e., "home-grown"

1.0 Chair's Remarks and Announcements(cont'd)

It would be interesting to know similar data for IEEE and especially IEEE PES Standards, but evidently the results would overwhelmingly tend to the "home-grown" category.

A significant first step forward the "transnationalization" of IEEE PES standards could be to boost the percentage which are based on IEC results.

In the meantime, our mission is to write standards acceptable to the United States which will be acceptable as international standards. For the present, "acceptable as international standards" means simply that we rigidly adhere to the IEEE Style Manual for format considerations.

1.2 Report of the Meeting of the Technical Council, February 1, 1994.

1.2.1 Coordination of PES developed standards with other standards writing bodies.

The IEEE Standards Department has established a full time position, the purpose for which is the coordination of PES developed standards with other standards writing bodies, most notably with IEC. Ms. Anne O'Neil is filling the position. Ms. O'Neil most recently performed a similar role for the Computer Society.

The first principal objective is to identify IEEE standards which are candidates to advance to IEC.

- Decide which standards apply
- Decide why they should be advanced
- Propose the work
- Follow-up and monitor voting and changes

1.2.2 Policy for cooperation between CIGRE and PES (see also PES Review, Jan. 1994, p.7).

PES Technical Committees are urged to strengthen relationships with CIGRE via:

- At Chair level, correspondence to exchange meeting dates and invite participation of the other organizations of the meetings of the various technical committees.
- Exchange of membership lists.
- Establish, where appropriate, liaison and exchange of information between the corresponding committees.
- Establish, where appropriate, joint WG or TF to prepare a required common publication.

1.2.3 IEEE Consideration for Withdrawal from standards agreements

In a message from Wally Read, IEEE Vice President, Standards, of December 9, 1993, notice was given that "IEEE has decided to withdraw as co-secretariat of C37/C57 Committees and withdraw our delegation from these committees effective March 2, 1994."

1.0 Chair's Remarks and Announcements(cont'd)

The letter also states that a task force has been appointed to hopefully "salvage" the relationship by March 2. At this time, (February 1, 1994) there is optimism expressed by Task Force member John Pope and Staff Director of Standards, Andy Salem that some agreement can be worked with NEMA staff to continue the relationship in some manner.

1.2.4 Standards Vision for the Future. (See also PES Review Jan. 1994, p. 9).

Former Technical Council Chair Jerry Hagge is proceeding to formulate ideas and draw comments from the PES membership on ways to restructure or otherwise shift emphasis of the PES.

Note that presently proposed organizational changes affect only Power System Relaying Committee, Power System Communications Committee, Substations Committee and Power Systems Engineering Committee. The Transformers Committee structure would not be affected by changes proposed at this time.

1.2.5 1997 Summer Power Meeting

The membership is reminded that the 1997 SPM will be held in Berlin. Based on 1994 costs, it is estimated that airfare from Chicago (example) may be \$500-\$700, if we work through a coordinating international travel agency. Hotel expense is about the same as New York.

1.3 Follow-up to topic 1.2.3, IEEE Consideration for Withdrawal from Standards agreements. Update

The IEEE Standards Board met March 17, 1994, at which time the board formally endorsed a Memorandum of Understanding reaffirming the IEEE and NEMA as co-secretariat of C37 and C57.

The MOU is the result of a task force effort to resolve the contentious issues of the past several years regarding the administration of the C37 and C57 committees.

Particular points in the MOU will be discussed in the Transformers Committee and in a C57 main committee meeting scheduled for March 23, 1994 at 1:00 p.m., following the Transformers Committee meeting.

Respectfully submitted,
J. H. Harlow, Chair

2.0 Approval of Minutes of November 3, 1993 - J. H. Harlow

The minutes of the St. Petersburg Beach meeting were approved as published.

3.0 Vice Chair's Report - W. B. Binder, Jr.

3.1 PES Committees on which the Vice Chair serves as Committee representative.

The following are reports on activities of PES Committees on which the Vice Chair serves as Committee representative. All of the meetings reported were held at the 1994 Winter Power Meeting in New York, NY on January 31-February 3, 1994.

3.1.1 Publications Committee (Meeting held Monday, January 31, 1994, 2:00 pm)

3.1.1.1 1994 Paper Budget.

The 500 page increase in the publication budget has been approved. However over 500 papers have been submitted for the SPM. The 44-45% quota remains in effect for all committees. Application of the new six page limit will be flexible for the SPM however the target quota is based upon six pages per paper. All future meetings will impose the \$110 per page in excess of six pages.

3.1.1.2 Paper Review Form.

A newly revised form was to be used for grading SPM papers, however, the old form was mailed from PES Special Services and was distributed to all reviewers.

The new form allows for only three grades:

- Accept
- Accept with Mandatory Changes
- Reject

Reject grade allows for one resubmission at a later conference. All papers reviewed for the SPM were converted to this grading method.

3.1.1.3 Revised Publication Guide.

Dated January, 1994, the Publication Guide is being continually revised via electronic publishing and printed on a copy machine. It is part of the Author's Kit.

3.1.1.4 Sessions Problems.

There were problems with panel sessions at the WPM having no information on discussions or panelists at the time of program publication. All future sessions must have a complete form including authors, paper titles, etc. by the submission deadline or the session will not be scheduled. March 1, 1994 was the deadline for SPM panel sessions. The deadline for panel sessions for the 1995 WPM is September 1, 1994.

3.0 Vice Chair's Report(cont'd)

Paper decisions were late by some committees. The call for papers will go out with a submission date of January 1 for all summer meetings and a submission date of August 1 for all winter meetings. Paper acceptance deadlines will typically be March 15 for summer meetings and October 15 for winter meetings. These deadlines are PES imposed and will be firm.

3.1.1.5 1994 Summer Power Meeting Panel Sessions

As stated above, the deadline for panel sessions for the SPM was March 1, 1994. The Transformers Committee will not sponsor any Panel Sessions at the 1994 SPM.

3.1.2 Organization and Procedures Committee (Meeting held Tuesday, Feb. 1, 1994, 8:00 am)

3.1.2.1 Transformers Committee Organization and Procedures Manual

The Transformers Committee Organization and Procedures Manual is revised. It was submitted to the O&P committee for review. Chair Edmonds will ballot approval by mail.

3.1.2.2 Standards Interpretations

Several Technical committees have formal procedures for standards interpretation. The O&P Committee will consider adopting a common procedure.

3.1.2.3 Streamlining PES Activities

A proposal will be introduced at the General Membership Meeting (held Wednesday, February 2, 1994) to reorganize Technical Council.

3.1.2.4 Revision of IEEE 62

Electric Machinery discussed their approach to review of the revised standard. I reported on the liaison membership the Transformers Committee has established with PSIM. PSIM was not represented at the meeting.

3.1.3 Technical Sessions Improvement Committee (Meeting held Tuesday, Feb. 1, 1994, 2:00 pm)

3.1.3.1 Sessions Evaluation

The 1993 Summer Meeting sessions were generally viewed as average to good. The efforts of this committee are focused on the 10% that were unsatisfactory.

We discussed the anonymous review. The consensus reached was to try the program again. Both Transformer Committee Technical Sessions used the anonymous critique form at the 1994 WPM.

3.1.3.2 Improving Foreign Papers

PES Chapter Representatives in Regions 8, 9, and 10 were contacted to set up grammatical review of foreign papers. A suggestion was also made by Chapters Council to conduct such review in the

3.0 Vice Chair's Report(cont'd)

Piscataway area. After discussion of both approaches, the TSI Committee recommended that a list of services be provided, but that the cost be borne by the authors.

3.1.2.3 Technical Sessions Guides

Both the "Guidelines for Slides or Overheads" and the "Technical Sessions Guide for the Session Chair" have been revised. Technical Paper Coordinators will need to provide these documents to the Session Chairmen well in advance of the meeting.

3.1.2.4 Guidelines for Paper Coordinators

PSRC has developed a guide for paper coordinators which was discussed at the meeting.

3.2 1994 T & D Conference, April 10-15, 1994

3.2.1 Panel Sessions

The Transformers Committee will sponsor three panel sessions in Chicago:

Ferroresonance - M. P. Sampat
Underground Transformers and Network Protectors - P. E. Orehek
Transformer Tapchanging Under Load - T. P. Traub

3.2.2 Technical Sessions

The Transformers Committee will sponsor one session in Chicago. There will be two conference papers and one transaction paper presented. One accepted paper was withdrawn. Ken Hamus will chair the Technical Session.

3.3 Future Meeting Schedule

September 24-28, 1994	Milwaukee, WI	Sam Mehta
April 23-26, 1995	Kansas City, MO	Henry Windisch
November 5-9, 1995	Boston, MA	Ken Skinger
Spring, 1996	San Francisco	Dan delaCruz

Hosts are needed for meetings Fall, 1996 and beyond.

Respectfully submitted,
W. B. Binder, Vice Chair

4.0 Administrative Subcommittee(cont'd)

4.0 Administrative Subcommittee - J. H. Harlow

**ADMINISTRATIVE SUBCOMMITTEE MEETING MINUTES
MARCH 21, 1994
DALLAS, TEXAS**

4.1 Introduction of Members and Guests

Chair Harlow called the meeting to order at 6:45 p.m. in the Lalique II Room of the Grand Kempinski Hotel.

The following members of the Subcommittee were present:

- | | | |
|--------------------|----------------------------------|--------------------|
| W. B. Binder, Jr. | C. W. Johnson(rep. W. Patterson) | J. Puri |
| J. D. Borst | W. N. Kennedy | J. E. Smith |
| D. S. Brucker | J. W. Matthews | J. B. Templeton |
| F. J. Gryszkiewicz | P. E. Orehek | G. H. Vaillancourt |
| K. S. Hanus | B. K. Patel | L. B. Wagenaar |
| J. H. Harlow | L. W. Pierce | |

K. S. Hanus succeeds Mr. J. C. Thompson as Chair of the Distribution Transformers Subcommittee.

The following guests were present:

- S. P. Mehta - Milwaukee Meeting Host
- Luigi Napoli - Staff Engineer, IEEE Standards Office
- Rochelle Stern - Project Editor, IEEE Standards Office

4.2 Approval of the St. Petersburg Beach Meeting Minutes

There were no additions or corrections to the minutes. They were approved as published.

4.3 Additions to and/or Approval of the Agenda

There were no changes to the published agenda.

4.4 Committee Finances and Meeting Arrangements

There was no discussion on finances.

The Dallas meeting host, Mr. Ken Hanus, reported that 247 members and guests, and 43 spouses were registered as of Monday. 125 were registered for the Tuesday Luncheon, 37 signed up for the Spouses Tour, and 153 for the Tuesday Outing.

Mr. Sam Mehta, host for the next Committee meeting in Milwaukee, announced that the meetings will be held at the Pfister Hotel on September 25 - 28, 1994. The room rates will be \$85 single

4.0 Administrative Subcommittee(cont'd)

and \$105 double plus tax. He also announced that a reunion is planned for the former employees of Allis-Chalmers.

The Spring 1995 meeting will be hosted by Mr. Henry Windisch in Kansas City during April 23 - 26.

4.5 Standards Subcommittee - G. H. Vaillancourt

4.5.1 Standards and Coordination Activities

Mr. Vaillancourt presented his status report on transformer standards and coordination activities. The complete report is shown as part of the Committee minutes.

He began discussion of these activities with a review of the attachments to this report. The attachments were presented in the same format previously used. Attachment 1 will be separated and incorporated in the report from each subcommittee to which those standards are assigned. The remaining attachments will be included as attachments to the Minutes.

4.5.2 New Standards Subcommittee Working Groups

Discussion then proceeded to three new working groups within the Standards Subcommittee. Working groups have been created to administer revisions to the C57.12.00 and C57.12.90 on a continuous basis. Mr. J. D. Borst is Chair of the WG for Revisions to C57.12.00 and Mr. S. D. Smith is Chair of the WG for Revisions to C57.12.90. All of the technical subcommittees will coordinate their individual projects on these standards with these two Working Groups. The technical subcommittees will manage the balloting of projects through the subcommittee level. The Standards WG will manage balloting of all projects on these two standards at the Committee level.

A third WG has been formed to coordinate with the PSIM Committee on the IEEE 62 project concerning Diagnostic Field Testing and Monitoring of Transformers. Mr. R. A. Veitch is Chair of this WG which is presently reviewing Draft 6 of this project.

4.5.3 Documents Submitted to the Standards Board

Review of the documents submitted to the Standards Board led to much discussion on the requirement to change the PAR number from C57.98 to C57.98a for the Guide for Performing Routine Impulse Tests on Distribution Transformers. It was determined that only one PAR can be submitted on any, and all, work on a particular document, regardless of the number of groups actually performing work on that document. It was also noted that once a document is approved by the Standards Board, the PAR is no longer valid. A new PAR must then be submitted for approval to begin additional work.

Mr. Vaillancourt reminded the subcommittee chairmen that all PARs must be sent to him two months prior to the scheduled Deadline for Submittal to the Standards Board in order for him to have time to complete the required coordination with other committees.

4.0 Administrative Subcommittee(cont'd)

4.5.4 PES Standards Coordinating Committee

Mr. Vaillancourt reported that a large part of the last PES Standards Coordinating Committee meeting was devoted to discussions on the internationalization of IEEE Standards. PES has appointed Ms. Anne O'Neil to the position of International Program Engineer in the IEEE Standards Department. Note that Attachment 5 is a listing of IEC Standards pertaining to transformers and Attachment 6 is a form for requesting copies of IEC Standards for harmonization efforts. Mr. Harlow stressed that the efforts by IEEE toward harmonization of standards cannot be overemphasized.

4.6 Status of IEEE Standards - L. Napoli

4.6.1 Status of IEEE and NEMA Co-Secretariat of ANSI C37 and C57 Committees

As stated in Mr. Harlow's report, IEEE endorsed a Memorandum of Understanding (MOU) on March 17, 1994, which had been developed by a task force to preserve this Co-Secretariat. NEMA endorsed this same MOU on March 16, 1994. The task force is expected to finalize the MOU and issue a report by March 30, 1994.

Mr. Napoli (for IEEE) and Mr. John Gautier (for NEMA) will then work on ironing out the finer details of the arrangements and will hopefully have most settled by the September meeting of the Transformers Committee. In the meantime, our Committee will continue operating in the present mode.

4.6.2 Project Editing Presentation

Ms. Rochele Stern was introduced. She will be making a presentation at the main Committee meeting on Wednesday, explaining her role as Project Editor in the standards development process.

4.7 Status of ANSI C57 Committee - L. Savio

Mr. Savio did not attend this meeting. Note that the C57 Committee will meet on Wednesday afternoon.

4.8 Review of the PES Awards Committee - J. D. Borst

Mr. Borst announced five members will receive Committee service awards at the Wednesday meeting. They are:

Michael Altman
John Borst
Heinz Fischer
Henry Pearce
Bob Veitch

Jerry Thompson has been identified to receive an award at the next meeting. The subcommittee chairmen were requested to identify any others deserving an award.

4.0 Administrative Subcommittee(cont'd)

Mr. Borst's full report will be shown in the Committee minutes.

4.9 Review of Technical Council Activities - J. H. Harlow

Mr. Harlow presented his report which will be included in the Committee meeting minutes.

4.9.1 Task Force on Acceptance of IEEE Standards Worldwide

Mr. Harlow pointed out that the Performance Characteristics Subcommittee project to develop an IEEE Standard for Load Tap Changers is an excellent example of transnationalization of standards. The development is based on an IEC Standard and it is planned to present the fully developed IEEE Standard for acceptance by IEC.

4.9.2 Policy for Cooperation between CIGRE and PES

The PES technical committees have been urged to strengthen relationships with CIGRE. Mr. Harlow noted that he extended an invitation to the chair of CIGRE Study Committee 12 to attend this meeting and membership lists have been exchanged between the two groups.

4.9.3 Standards Vision for the Future

It was noted that the Transformers Committee is not affected by any of the proposed organizational changes by the Technical Council at this time.

A reminder was given that the 1997 Summer Power Meeting will be held in Berlin.

4.10 Subcommittee Activities - Subcommittee Chairs

4.10.1 Performance Characteristics - B. K. Patel

Two working groups had been formed to handle the technical issues within the scope of PCS for C57.12.00 (chaired by Peter Krause) and C57.12.90 (chaired by Nigel McQuin). We have been inform that C57.12.90 Parts I and II must be separated because Part I is a standard and Part II is a guide. A new working group will be formed to handle revision of Part II - Guide for Short Circuit Testing, chaired by Nigel McQuin. PCS is looking for a new chair for the working group for revision of Part I - Test Code.

Mr. Vaillancourt added that the Guide for Short Circuit Testing will be handled completely by PCS and will not be managed by the Standards Subcommittee as is the Test Code.

4.10.2 Distribution Transformers - K. S. Hanus

An issue was made of the fact that the UIG group was developing an EDI document for utility use in all areas of utility products and that this may be a duplication of the work of the Bar Coding Working Group. Several members of the working group decided that the UIG document was not going to be ready anytime soon and also that it will not address some of the user's requirements which will be addressed by the Bar Coding document.

4.0 Administrative Subcommittee(cont'd)

A new working group will start meeting concerning the development of a Loss Evaluation Guide for Distribution Transformers. The guide is being developed because of the Energy Policy Act of 1992. The act requires the DOE to develop an energy conservation standard. This document will help serve this purpose.

Clyde Pearson will be replacing Ken Hanus as co-chair of the Working Group on Three Phase Padmount Transformers C57.12.22/26.

4.10.3 Underground Transformers and Network Protectors - P. E. Orehek

No administrative activities to report. A note was made that the Subcommittee will sponsor a panel session at the IEEE T&D Conference, Chicago - April 12, 1994 related to Maintenance, Reconditioning Practices, Reliability and Design of Network Transformers and Protectors.

4.10.4 Insulation Life - L. W. Pierce

Various Transformer Committee documents have been using conflicting symbols for time, temperature, and temperature rise. This came to light during balloting of the Guide for Loading Liquid Immersed Transformers. Lin Pierce presented comments on this conflict which are shown in an attachment to these minutes. After much discussion, it was the consensus of the Administrative Subcommittee that the symbols shown as Choice 2 on page 2 of the attachment should be used in Committee documents. This decision is based on agreement with symbols used by IEC unless there are strong reasons to do otherwise.

4.10.5 Dry Type Transformers - W. Patterson

Mr. Chuck Johnson attended this meeting representing Wes Patterson.

Mr. Johnson reported that Paulette Payne had submitted a PAR for work on Hot Spot Differentials and had been told that a PAR was not required for this project. Mr. Vaillancourt explained that the scope on the PAR covered five standards. A PAR can only apply to work on one standard. It is permissible to work on this project without a PAR, or the project can be worked on a PAR which applies to one standard (such as C57.12.01) and then be applied to other standards.

4.10.6 Insulating Fluids - F. J. Gryzkiewicz

Two Guides were successfully balloted for reaffirmation in the Committee. Work will likely begin on revising one of these because some suggestions were made immediately following the ballot.

4.10.7 Dielectric Tests - J. B. Templeton

No administrative activities to report.

4.10.8 HVDC Converter Transformers & Reactors - W. N. Kennedy

Fred Elliott has volunteered for the new position of Secretary.

4.0 Administrative Subcommittee(cont'd)

4.10.9 Bushings - L. B. Wagenaar

No administrative activities to report.

4.10.10 Audible Sound and Vibration - Jeewan Puri

A working group chaired by Jack McGill has been formed to write a siting guide for transformers. A PAR will be applied for as soon as the scope of this document has been finalized. We also plan to initiate work on a) reviewing standard noise levels for power transformers and b) developing noise intensity measurements for siting transformers.

4.10.11 West Coast - D. S. Brucker

Joe Watson, Chair of the Working Group on Fire Protection Guide for Power Transformers and Reactors, has left Los Angeles and joined Smit Transformers in Ladson, SC. He has not resigned his chair, but may have to due to his new location. We expect to have a determination by the next West Coast meeting in May.

The Subcommittee is planning to prepare a PAR for a Guide for Phase Shifting Power Transformers In Excess of 10 MVA, 65°C Rise.

Mr. Brucker also announced that he is acting as liaison to the Substations Committee project on rewriting the Seismic Guide for Substations.

4.10.12 Instrument Transformers - J. E. Smith

No administrative activities to report.

4.11 Vice Chair's Report - W. B. Binder, Jr.

Mr. Binder submitted his report on the activities of the PES Committees on which he serves as representative for the Transformers Committee. This report is included in the Committee minutes.

He also announced that the Transformers Committee will have two sessions for paper presentations at the PES Summer Power Meeting in San Francisco. He offered the Subcommittee chairmen the opportunity of chairing a session. Lin Pierce accepted the offer to chair one session, and David Brucker offered to act as back-up if another person could not take the other session.

4.12 Secretary's Report - J. W. Matthews

4.12.1 Membership Review

One letter of resignation has been received since the last meeting. Henry Pearce resigned from the voting membership and requested to remain on the role as an Emeritus Member.

4.0 Administrative Subcommittee(cont'd)

Following this change, and prior to the addition of new members at this meeting, membership stands at:

Voting Members -	154
Emeritus Members -	16
Voting Classifications:	
Producers -	63
Users -	54
General Interest -	37

4.12.2 New Member Applications

The Administrative Subcommittee reviewed and accepted new member applications from the following persons:

- Donald Ayers - Smit Transformers (producer)
- Edward A. Bertolini - Consolidated Edison (user)
- Jerry Bishop - Union Electric (user)
- David S. Brucker - Cooper Power Systems (producer)
- Joseph K. Ma - Ritz Instrument Transformers (producer)
- Angelynn McCain - Baltimore Gas & Electric (user)
- Ross McTaggart - Trench Electric (producer)
- Larry Pearson - Texas Utilities (user)
- Thomas J. Pekarek - Centerior Energy (user)
- Vadim Raff - Square D Company (producer)
- John D. Ramboz - RAMTech Engineering (general interest)
- Aslam Rizvi - Magnetek Electric (producer)
- Gerald Rowe - Consumers Power (user)

Following these additions, membership stands at 167 voting members, with 69 producers, 60 users, and 38 general interest.

Mr. Harlow reviewed the membership application requirements and emphasized that it is the Subcommittee Chair's responsibility to review the applicant's eligibility, and particularly to assess participation, not just attendance.

4.13 Old Business

4.13.1 Stationery

Mr. Wagenaar expressed the need for either a new supply of Committee stationery or the availability of the IEEE logo in a graphics file. No one present was able to reply on the graphics file. Ken Hanus volunteered to furnish each Subcommittee Chair with new stationery.

4.13.2 Meeting Scheduling

This subject was discussed, and tabled again with no resolution to conflicts at this time.

4.0 Administrative Subcommittee(cont'd)

4.14 New Business

4.14.1 Fellows Nominations Coordinator

Mr. Harlow announced that Bob Degeneff, himself a Fellows member, has been named as Fellows Nominations Coordinator for the Transformers Committee.

4.15 Adjournment

There being no further business, Mr. Harlow adjourned the meeting at 10:44 p.m.

Respectfully submitted,
John W. Matthews, Secretary

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5.0 Transformers Standards - G. H. Vaillancourt

5.1 Transformers Standards and Coordination Activities

The status of all transformer standards or projects sorted by responsible subcommittees is reported in attachment 1. A box format is used in the report to make it clearer. For an existing standard, the field labelled REV_DUE_YEAR should be checked to verify that the revision work will be completed on time, otherwise an extension will have to be requested from the IEEE Standards Department to allow sufficient time to complete the project. A digit 0 in this field indicates a new standard. The working group chair phone number is listed in the field labelled WG_PHONE. The sheets in Attachment 1 are sorted according to the subcommittee name. These sheets will be placed at the end of the corresponding subcommittee report section and published with it in the Transformers Committee minutes. C57 standards that are not under the responsibility of the Transformers Committee, or have not been yet assigned to a subcommittee, are listed under the Standards Subcommittee. The chair of each subcommittee is responsible for checking that the information in his part of this attachment is correct. If he finds incorrect information, he should notify the Standards Subcommittee Chair as soon as possible and before the final version of the attachment is handed over to the IEEE Transformers Committee Secretary for publication in the minutes. This usually occurs one to two months after the meeting. Also listed in Attachment 1 is the coordination activity with other PES committees.

About roughly the same information as in Attachment 1 can be found in Attachment 2, but the standards are listed in numerical order instead of being grouped according to the subcommittee names.

Attachment 3 is a report on coordination activity for documents that are sponsored by other PES committees and for which the Transformers Committee has in the past requested coordination. That listing is sorted by PES committee names.

Attachment 4 is a list of the acronyms of the committees or societies that have requested coordination from the Transformers Committee, and that are listed in attachments 1 and 2. Also included is the name of one contact for each committee or society. By calling these persons it should be possible to find out who, in each committee, has been appointed to look after coordination for each individual standard sponsored by the Transformers Committee. The original information on who requested coordination is normally listed in the approved PAR which is on file at the IEEE Standards Department with copy in the Transformers Committee standards coordinator files.

5.2 New Working Groups Of The Standards Subcommittee

The 1993 revision of Standards C57.12.00 and C57.12.90 have now been published and work must begin to prepare the next revision. The IEEE Standards Department has informed us that they will no longer permit to open many PAR's at once on the same standard. Therefore, a new procedure to handle revision of our two mother standards needed to be established.

At the Administrative Subcommittee Meeting in St. Petersburg, it has been decided to form two new working groups on continuous revision of these standards in order to coordinate individual revision projects. It will be one responsibility of each one of these working groups chairmen to

5.0 Transformer Standards(cont'd)

submit and obtain a single PAR for his respective document. From now on, any new requirement for revision will need to be submitted in writing to the chair of the appropriate working group. It will then be another responsibility of this chair to delegate the task to the appropriate subcommittee(s) of the Transformers Committee and subsequently keep track of the progress. The two people that have been appointed to chair these working groups are as follows: Mr. John D. Borst of ABB Power T&D Co., will chair the Working Group on Continuous Revision of C57.12.00 and Mr. Steve D. Smith of Kuhlman Electric Corporation will chair the Working Group on Continuous Revision of C57.12.90.

The Standards Subcommittee met on Monday March 21, 1994 with 13 people in attendance. The purpose of the meeting was to define the scopes of the two new working groups, on continuous revision of C57.12.00 and C57.12.90, and establish an operating procedure to revise these two standards. The scope that was agreed upon reads as follows: To coordinate administratively the continuous revision process of C57.12.XX, where XX= 00 or XX= 90.

A revision cycle was also established. It will have a two-year duration and a cut-off date. All changes not completed at the cut-off date will be carried over to the next cycle. This revision cycle will include the following steps:

1. The chair of the Working Group on Continuous Revision of C57.12.XX applies for a PAR.
2. Acting in consultation with the subcommittee chairs, he makes a list of what changes are needed to the document. He next establishes priorities and assigns the revision work. The subcommittee chairs then form working groups as needed, to perform the revision work.
3. The chair of the Working Group on Continuous Revision follows the work progress at all times and he makes a progress report to the Standards Subcommittee at every meeting. That report will be included in the Standards Activities Report and published in the Minutes of the Transformers Committee.
4. When one of the working groups working on the changes, finishes its work, it will ballot it at the subcommittee level and coordinate with other subcommittees and PES committees, as necessary. If the ballot is successful, the chair of the Working Group on Continuous Revision will then incorporate the change into the draft of the complete document.
5. Every two years at the cut-off date, the chair of the Working Group on Continuous Revision will ballot the draft containing all the then approved changes, through the main committee. At that time, a survey will also be made to determine what changes will need to be made at the next cycle.
6. After a successful Transformers Committee ballot, the chair of the Working Group on Continuous Revision will submit the draft for approval to the Standards Board.

The next cut-off date has been set for the spring meeting of 1995. This is to allow to complete the Transformer Committee Ballot on time to submit the document to the Standards Board for their meeting of September, 1995. This would allow the revision to be included in the next edition of the C57 Collection that will come out in the spring of 1996. The two-year duration for the revision cycle was selected to match the publication cycle of the C57 Collection.

5.0 Transformer Standards(cont'd)

The next topic on the agenda was maintenance of the orphan standards. The orphan standards are those that either do not belong to IEEE or have not found a home in any of the subcommittees. Not counting C57.12.00 and C57.12.90, there are presently nine of those. Five are ANSI standards and are under the responsibility of NEMA, these are C57.12.10, C57.12.13, C57.12.53, C57.12.54, and C57.17. They are listed in the Standards Activities Report for completeness because they are C57 standards but they were not considered because they belong to NEMA.

Of the four that are left, C57.99 is a guide on current limiting reactors that was due for revision or reaffirmation in 1990. Mr. Richard Dudley of the Dry-Type Subcommittee has accepted to look after this one because he is presently revising C57.16 which is also on reactors.

Another one C57.15 is titled: "Requirements, Terminology, and Test Code for Step-Voltage and Induction Voltage Regulators". It has been reaffirmed in 1992 and needs revision. Nobody has volunteered to take it over and it will have to be assigned to one of the subcommittees. The Performance Characteristics Subcommittee may be the home it needs since this standard contains the requirements and test code. On the other hand, the Insulation Life Subcommittee is presently working on C57.95 which is the only other standard on voltage regulators, may be, it would be the logical place for it? If nobody volunteers to take it, the Administrative Subcommittee will need to assign it at the next meeting.

The last two standards C57.70 and C57.80 are on terminal markings and terminology and being not primarily technical, they can be handled by the Standards Subcommittee. A working group will be formed to revise them and a chair is required to volunteer.

Following the agreement reached with the PSIM Committee on the revision of IEEE 62 "Guide for Diagnostic Field Testing of Power Apparatus (Part I)", a third working group under the purview of the Standards Subcommittee has also been formed. It is the Working Group on Diagnostic Field Testing and Monitoring of Transformers, which is chaired by Mr. Robert A. Veitch of Ferranti-Packard Transformers Ltd. The scope of this working group is to review the work done by PSIM on IEEE 62 and also to prepare a guide on continuous monitoring of transformers in service. This working group has met for the first time at the Dallas Meeting, at one point during the meeting, there were about 40 people in attendance.

Draft 6 of the document had been circulated prior to the meeting, to the membership of the working group and many comments had been made. The purpose of the meeting was to discuss these comments. There were so many comments that only about half of them could be addressed during the meeting that extended into a second session. The modification to the draft that were agreed upon will be sent to Mr. David Train of PSIM who will hold another meeting in San Diego on April 25.

The phone and FAX numbers of the three working group chairs in the Standards Subcommittee are as listed below:

Mr. Borst can be reached by phone at (314)659-6119 and by FAX at (314) 634-7823.

Mr. Smith can be reached by phone at (606)879-2757 and by FAX at (606) 873-6126.

Mr. Veitch can be reached by phone at (416)798-5914 and by FAX at (416) 674-8776.

5.0 Transformer Standards(cont'd)

5.3 Documents Submitted to Standards Board

5.3.1 NESCOM 12/01/93 (PAR's)

C57.132 Standard for the Electronic Reporting of Transformer Test Data. Project number changed to P1388

C57.98a Guide for Performing Routine Impulse Tests on Distribution Transformers. NESCOM ruled that the PAR must be modified to change the number from C57.98 to C57.98a and the Target Completion Date must be changed to early 1995. Luigi Napoli has offered to inquire to clarify this point, maybe a completely new PAR on C57.98 is needed as the PAR on the main document has been cancelled by the approval of the Guide for Transformer Impulse Tests by REVCOM as shown below.

5.3.2 REVCOM 12/01/93 (Standards)

C57.12.40 Standard Requirements for Secondary Transformers - Subway and Vault Types (Liquid-Immersed), revision approved.

C57.98 Guide for Transformer Impulse Tests, revision approved.

5.3.3 REVCOM 03/16/94 (Standards)

C57.12.24 Standard for Underground-Type, Three Phase Distribution Transformers 2500 kVA and Smaller; High-Voltage, etc. Submitted for revision.

C57.12.44 Standard Requirements for Secondary Network Protectors. New standard submitted for approval.

5.4 Next Standards Board Meetings

Standards submittals must be made directly to the IEEE Standards Department before the deadline shown below:

<u>Deadline for Submittal</u>	<u>Standards Board Meeting Date</u>
May 6, 1994	June 14, 1994
August 12, 1994	September 22, 1994
November 4, 1994	December 13, 1994

PAR submittals must be made via the Standards Coordinator (Standards Subcommittee Chair) before the deadline shown below:

<u>Deadline for Submittal</u>	<u>Standards Board Meeting Date</u>
June 12, 1994	September 22, 1994
September 4, 1994	December 13, 1994

5.5 Coordination Offers From Other PES Committees

<u>Committee</u>	<u>Title</u>
SPD	PC62.11 - Standard Metal-Oxide Surge Arresters for Alternating-Current Power Circuits
Substations	ANSI/IEEE 80 (R1991) - Guide for Safety in AC Substation Grounding
PSIM	New - Measurement of Power at Low Power Factor
PSIM	IEEE 454 - Partial Discharge Measurements (Revision)
PSIM	New - Guide for Voltage and Phasing Detectors for Use in High Voltage Systems in Electric Power Utilities.
Switchgear	New - Standard for AC High Voltage Circuit Switchers

5.6 IEEE Standards Board Documentation Update

Both the **IEEE Standards Operation Manual** and the **IEEE Standards Board Bylaws** have been revised and approved by the Standards Board as per December 1993. Copies may be obtained by contacting Terry deCourcelle at the IEEE Standards Department by phone at (908) 562-3807, by FAX at (908) 562-1571 or via e-mail to t.decourcelle@ieee.org.

5.7 PES Standards Coordinating Committee Meeting

The Standards Coordinating Committee met, Monday, January 31, 1994 in New York. Once again a large part of the time allotted for the meeting was spent discussing the internationalization efforts of IEEE standards. The PES has appointed an international program engineer, Anne O'Neill, to the IEEE Standards Department and she gave a presentation on the implementation of the program. The main steps are:

Familiarization with IEC

- IEEE/PES will provide seminars on the IEC organization
- IEEE/PES will develop and distribute matrices comparing the standard development units of IEEE/PES with those in IEC.
- IEEE/PES will develop and distribute matrices that relate IEEE/PES standards and standards projects to those of IEC.

Harmonization/Coordination of Standards with IEC

- Each PES Committee is asked to compare the contents of existing IEC standards with those of IEEE (A list of IEC standards pertaining to transformers provided by Anne

5.0 Transformer Standards(cont'd)

O'Neill is appended as Attachment 5. Anyone who would like to volunteer to compare any of these standards with its counterpart from IEEE may obtain a copy or other information from Anne by contacting her at (908)562-3852 or via e-mail to a.oneill@ieee.org. You need to specify that the standard is required for harmonization work. You may also FAX her the form which is included as Attachment 6 to (908)562-1571.

- PES is funding the work of a full-time person (Anne O'Neill) to act as coordinator of IEEE/PES international standards efforts in the IEEE Standards Department.
- Each committee should take steps to expand participation in their work by participants from elsewhere in the world.
- The Technical Council will work with the Standards Board on the guide for coordinating with other standards organizations.

Improved Procedure

- The Technical Council will select a few projects to begin using the Standards Process Automation System on a pilot basis.
- The Technical Council will set up a task force to study procedures, technology and project management techniques that can help simplify and accelerate the standards development process.

Respectfully submitted by:
Georges H. Vaillancourt
Standards Subcommittee Chair

5.0 Transformer Standards(cont'd)

DATE: 03-11-94

STATUS REPORT ON STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE
ATTACHMENT 1

SUBCOMMITTEE: (STANDARDS) / CHAIRPERSON: G. VAILLANCOURT / PHONE: (514)652-8515 / FAX: (514)652-8555

STANDARD NO. PROJECT NO.	TITLE OF DOCUMENT WORKING GROUP	WG CHAIRPERSON	TF CHAIRPERSON	COMMITTEES REQUESTING COORDINATION PUB_DATE PAR_DATE REV_DUE_YEAR	WG_PHONE	LATEST STATUS COMMENTS
C57.12.10 NONE	TRANSFORMERS 230KV AND BELOW -8333/10417KVA 1 PH, -100000 KVA 3 PH w/o LTC, -100000KVA w/ LTC - SAFETY REQUIREMENTS ANSI C57.12.1			06-04-87 - - 1993		TRANSFERRED TO IEEE NEEDS A HOME, DUE FOR REAF.
C57.12.13 NONE	CONFORMANCE REQUIREMENTS FOR LIQUID-FILLED TRANSFORMERS USED IN UNIT INSTALLATIONS INCL. UNIT SUBSTATIONS HVACC ON HIGH VOLTAGE TRANSFO			09-02-81 - - 1987		ASSIGN TO SUBCOMMITTEE COPYRIGHT WITHHELD BY NEMA
C57.12.53 NONE	REQUIREMENTS FOR DRY-TYPE, UNDERGROUND, SINGLE-PHASE WITH SEPARABLE INSULATED H-V 24940 9r-dY/14400 V AND <; LV 240/120 V			- - - - 0		NEW STANDARD NOBODY IS WORKING ON IT
C57.12.54 NONE	REQUIREMENTS FOR DRY-TYPE, UNDERGROUND 3 PHASE DISTRIBUTION TRANSFORMERS, 2500 KVA OR <, HV 24940 9r-dY/14400 OR <, LV 480V			- - - - 0		NEED TRANSFER TO IEEE
C57.12.70 NONE	TERMINAL MARKINGS AND CONNECTIONS FOR DIST. & POWER TRANSFORMERS			06-18-92 - - 1997		ANSI APPROVED 07/09/93 REAF BY SB ON 06/17/92
C57.12.80 NONE	TERMINOLOGY FOR POWER & DISTRIBUTION TRANSFORMERS			05-01-92 - - 1997		REAFFIRMED 05/01/92 APPROVED BY ANSI 12/02/92
C57.15 NONE	REQUIREMENTS, TERMINOLOGY, & TEST CODE FOR STEP-VOLTAGE AND INDUCTION VOLTAGE REGULATORS NONE ASSIGNED			03-18-87 06-19-86 1997		REAFFIRMED 05/01/92 APPROVED BY ANSI 12/02/92
C57.17 NONE	REQUIREMENTS FOR ARC FURNACE TRANSFORMERS ANSI DOCUMENT			- - - - 1986		LAST REVISED IN 1986 ANSI DOCUMENT
C57.99 P731	GUIDE FOR LOADING DRY-TYPE AND OIL-IMMERSED CURRENT-LIMITING REACTORS			- - - - 03-28-78 1990		NEEDS REVISION

DATE: 03-11-94

STATUS REPORT ON STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE
ATTACHMENT 1

SUBCOMMITTEE: (STANDARDS) / CHAIRPERSON: G. VAILLANCOURT / PHONE: (514)652-8515 / FAX: (514)652-8555

STANDARD NO. PROJECT NO.	TITLE OF DOCUMENT WORKING GROUP	WG CHAIRPERSON	TF CHAIRPERSON	COMMITTEES REQUESTING COORDINATION PUB_DATE PAR_DATE REV_YEAR	WG_PHONE	LATEST STATUS COMMENTS
C57.12.00	GENERAL REQUIREMENTS FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS					APPROVED BY ANSI 08/04/93
VARIOUS	CONTINUOUS REV. OF C57.12.00	BORST J. D.		06-16-93	(314)659-6119	1998 NEW WORKING GROUP FORMED
C57.12.90	STANDARD TEST CODE FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS & GUIDE FOR SC TESTING OF					NEW WORKING GROUP FORMED
VARIOUS	CONTINUOUS REV. OF C57.12.90	SMITH S. D.		03-16-93	(606)879-2757	1998 APPROVED BY ANSI 08/19/94

COORDINATION ACTIVITY OF STANDARDS SUBCOMMITTEE AS PER: 03-11-94

*PROJECT NO. DATE	TITLE PES COMMITTEE	CONTACT PHONE NO.	TRANSFORMER COMMITTEE COORDINATOR	TRANSFORMERS COMMITTEE SUBCOMMITTEE	COORDINATOR PHONE NO.
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*P62	GUIDE FOR DIAGNOSTIC OF POWER APPARATUS PSIM DAVID TRAIN	617-926-4900	R. A. VEITCH	STANDARDS	905-731-9178
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COORDINATION ACTIVITY OF STANDARDS (INFORMATION) SUBCOMMITTEE AS PER: 03-11-94

*PROJECT NO. DATE	TITLE PES COMMITTEE	CONTACT PHONE NO.	TRANSFORMER COMMITTEE COORDINATOR	TRANSFORMERS COMMITTEE SUBCOMMITTEE	COORDINATOR PHONE NO.
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*P1325	RECOMMENDED PRACTICE FOR REPORTING FIELD TROUBLE DATA FOR POWER CIRCUIT BREAKERS	203-634-5739	G. VAILLANCOURT	STANDARDS (INFORMATION)	514-652-8515
03-17-92	SMGR D. H. LARSON				

6.0 STANDARDS STYLE - R. STERN

Rochele Stern, IEEE Project Editor, made a brief presentation on the editorial aspects of preparing an IEEE standards document.

Rochele stated that the editorial goal is to have 75% of the IEEE documents published within 3 months after Standards Board approval. Presently, about 50% of the documents are published within 3 months and 75% are published within 6 months.

The editing process can be greatly facilitated by working groups communicating with the editor early in the development process. The editor can give global advice on drafts and pinpoint the appropriate time for rigorous editing.

Rochele is available to participate in working group meetings, as she has done here, to provide advice on IEEE policy such as adopting the international style, metric conversion, etc. She can also provide electronic files for beginning the revision process.

After approval by the Standards Board, documents go through a final copy edit during which the editor is careful to maintain the technical content. The text is then formatted into proofs for review by the working group.

Rochele also presented examples of the present IEEE Style, which is the International Style, and information on the Standards Process Automation System.

After the presentation, Mr. Harlow added that the Administrative Subcommittee had decided that all Transformers Committee documents would be sent to the editor at the time of full Committee balloting, if not before.

Mr. Harlow thanked Rochele for her presentation and participation during this meeting.

7.0 Recognition and Awards - J. D. Borst

7.1 Certificates of Appreciation

Certificates of Appreciation will be presented to the following individuals at the Transformers Committee meeting on March 23, 1994:

Henry Pearce	Former Chair, Insulating Fluids Subcommittee
Michael Altman	Former Chair, Failure Analysis Working Group
Heinz Fischer	Former Chair, High Temperature Insulation Working Group
Robert Veitch	Former Chair, Awards Subcommittee
John Borst	Former Chair, Transformers Committee

We congratulate these individuals for their contributions and leadership.

7.2 IEEE PES Awards Committee

The Awards Committee met January 31, 1994 at the Winter Power Meeting to confirm selections for publication awards; the results are as follows:

Prize Technical Papers (Committee)

A New Sensor for Detecting Partial Discharges in Operating Turbine Generators (EM)
Report on Bus Transfer, Part III, Full Scale Testing and Evaluation (ED&PG)
Real-Time Reactive Security Monitoring (PSE)

Working Group Technical Report (Committee)

Adjustable Speed Drives (EM)

Standard or Guide (Committee)

IEEE Design Guide for Electric Power Service Systems for Generating Stations
(ED&PG)

The IEEE Standards Office has confirmed an 80% price discount on standards and guides submitted by a technical committee for the purpose of PES prize evaluations; the technical committee would be responsible for the remaining 20%.

John D. Borst
Chair, Awards Subcommittee

8.0 Reports of Technical Subcommittees

The following reports are those of the technical subcommittees of the Transformers Committee. In most cases they are the complete minutes of meetings held earlier and they are identified as minutes. Some are summary reports of the Subcommittee activities during the previous week.

Secretary's Note: The subcommittee reports have been edited to the format of the IEEE Style Manual. No changes have been made to the content of these reports except removal of attendance lists.

Following each report is a listing of the current status of each of the subcommittee's assigned standards.

8.0 Reports of Technical Subcommittees(cont'd)

8.1 Audible Sound and Vibration - J. Puri

March 22, 1994 Meeting Minutes

The Audible Noise and Vibration Subcommittee met at 2:00 pm. Nine members and 20 guests were present. Six new members were welcomed to this Subcommittee.

This Subcommittee decided to initiate work in three areas:

-The first area of activity will be to write a Transformer Siting Guide. The purpose and scope of this Guide were finalized. Mr. Jack McGill will chair the Working Group responsible for writing this guide. This document will provide valuable information on noise abatement techniques, their cost and their relative effectiveness for oil filled power transformers that are already in service.

Additional information on this subject in IEC Standards will also be researched for inclusion in this document. A proposed draft for this Guide will be discussed in our next meeting prior to submitting a PAR for this project.

-The second area of activity will involve revising the standard noise levels for oil filled transformers. Jeewan Puri reported that the present Standard Noise Level Tables have been reaffirmed in NEMA TR1 standard. This committee reported to develop a new noise level table for inclusion in IEEE Standard C75.12.00. Transformer manufacturers and users will be requested to provide realistic noise level data for this effort. Mr. George Reitter will prepare a format for collecting the noise level information. A task force will be formed in our next meeting to continue this activity.

-The third area of activity will be to evaluate the merits of noise intensity measurements as compared to the presently used noise pressure measurements.

It was agreed that even though this is a complex measurement, yet it represents an advancement in technology that should be further investigated. Mr. Hanique (Netherlands) will give us a tutorial on the noise intensity measurements at our next meeting.

There being no new business, the meeting adjourned at 3:15 PM

8.0 Reports of Technical Subcommittees(cont'd)

DATE: 03-11-94 STATUS REPORT ON STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE ATTACHMENT 1

SUBCOMMITTEE: AUDIBLE SOUND & VIBRATION / CHAIRPERSON: JEEVAN PURI / PHONE: (704)282-7413 / FAX: (704)282-7425

STANDARD NO. PROJECT NO.	TITLE OF DOCUMENT WORKING GROUP	WG CHAIRPERSON	TF CHAIRPERSON	COMMITTEES REQUESTING COORDINATION PUB_DATE PAR_DATE REV_DUE_YEAR	WG_PHONE	LATEST STATUS COMMENTS
C57.112 P523	GUIDE FOR THE CONTROL OF TRANSFORMER SOUND SUBCOMMITTEE PURI J.			NONE - - 12-28-73 0 (704)282-7413		NEW TASK FORCE TO START WORK CHECK FILES FOR NEWER PAR
C57.12.90 PC57.12.90x	STANDARD ON SOUND INTENSITY MEASUREMENT SUBCOMMITTEE TULLI S.			- - - - 0		NEW TASK FORCE TO DRAFT STD ON MEASURING SOUND INTENSITY
NEW NEW	TRANSFORMER SITTING GUIDE	McGILL J.		- - - - 0 (414)475-3422		NEW GUIDE NEW WG FORMED

COORDINATION ACTIVITY OF AUDIBLE SOUND AND VIBRATION SUBCOMMITTEE AS PER: 03-11-94

*PROJECT NO. DATE	TITLE PES COMMITTEE	CONTACT PHONE NO.	TRANSFORMER COMMITTEE COORDINATOR	TRANSFORMERS COMMITTEE SUBCOMMITTEE	COORDINATOR PHONE NO.
*P656 03-08-91	STANDARD FOR THE MEASUREMENT OF AUDIBLE NOISE FROM OVERHEAD TRANSMISSION LINES T&D JAMES R. STEWART	518-395-5025	ALAN M. TEPLITSKY	AUDIBLE SOUND AND VIBRATION	212-460-4859

8.0 Reports of Technical Subcommittees(cont'd)

8.2 Bushing - L. B. Wagenaar

Dallas, Texas

March 22, 1994

Chair L.B. Wagenaar opened the meeting at 2:00 PM and welcomed the attendees. The meeting was attended by sixteen members and twenty three guests. After the introduction of members and guests, the subcommittee addressed the following:

8.2.1 Chair's Remarks

Mr. Wagenaar made the following announcement after attending the Administrative Subcommittee meeting.

- Next meeting to be held in Milwaukee, WI, Sept. 24 to 28th
- The following Working Groups have been established in the Transformer Committee to revise these standards.

C57.12.00 - Main Transformer Standard
C57.12.90 - Test Code
- Adm. Subcommittee emphasizes on harmony with IEC standards when new standards are created.
- IEEE Editors will review the documents for styling when drafts are balloted within the committees

8.2.2 Approval of Nov. 2, 1993 Minutes of Meeting held in St. Petersburg Beach, Florida

The minutes were approved as written.

8.2.3 Working Group Reports

8.2.3.1 Working Group on Performance Characteristics and Dimensions for Outdoor Apparatus Bushings (PC57.19.01)

Chair P. Singh reported that his working group met on March 21, with nine members and thirteen guests present. The working group discussed the following:

1. Transformer-Breaker Interchangeable Bushings

The results of the Doble Client's Survey indicated that a small percentage of the users specify TBI bushings on breakers indicating that these bushings can not totally be eliminated. In order to further define these ratings, Mr. Harold Moore and Mr. Wayne Hansen offered to get details about current and voltage ratings of these bushings.

2. Specific Creepage

Although most of the Doble clients who responded to this question, preferred the existing 28 mm(1.1 inch)/kV L-G specific creep value, the WG members felt the need for higher creep bushings. It was therefore agreed to standardize on the following two creepage values.

<u>mm/kV</u>	<u>Inch/kV</u>
28	1.1 *
44	1.73

Where: kV is L-G Voltage

* Std. creep as per existing C57.19.01 standard

3. Current and Voltage Ratings

Most of the Doble clients who responded (26 %) agreed to the proposed current and voltage ratings, but in order to achieve general agreement and at the same time reduce the number of ratings, the WG agreed to standardize the following transformer bushing ratings.

<u>kV</u> <u>class</u>	<u>Transformer Bushing Current Rating</u>					
	<u>400</u>	<u>800</u>	<u>1200</u>	<u>2000</u>	<u>3000</u>	<u>5000</u>
34.5	x	-	x	x	x	x
69	x	-	x	-	x	x
138	-	x	-	x	x	-
230	-	x	-	x	x	-
345	-	x	-	x	x	-
500	-	x	-	x	x	-
765	-	x	-	x	x	-

Mr. Dan De La Cruz from P G & E requested membership to the working group.

8.2.3.2 Working Group on Bushings for DC Applications (PC57.19.03)

Chair Olof Heyman reported that his working group met on March 22, 1994 with eight members and nine guests present. He reported that:

DC system experts at ABB and Siemens are not in favor of establishing standard ratings and test levels. Based on this feedback, the wording in the draft will be changed to select the impulse test levels as per C57.92.1.

The results from the ballot on draft 9 indicated the following:

Sent	13
Returned	9
Approved	2

8.0 Reports of Technical Subcommittees(cont'd)

Approved with Comments	4
Not Approved	3

Olof Heyman would consult the IEEE dictionary and other sources to check the validity of using the word "rated" for overload and short term current ratings.

Section 5.4 would be revised to add an explanation to distinguish between the current definitions based on the bushing application. The AC overload will be given as a percentage of the continuous AC current.

Fred Elliot, Jens Frost, and Olof Heyman will work on a proposal for defining the base voltage for creepage distance.

The proposal to start the counting of PD pulses immediately after the polarity reversal was discussed and it was agreed to wait for HVDC Converter Transformer SC decision on this subject.

The permissible permanent deflection during a cantilever test was changed from 0.78 mm to 1.52 mm.

The text for the uneven rain test will be replaced with a warning to indicate the presence of uneven wetting as well as the lack of experience on this type of test. A recommendation to use a test level of 1.25 times the maximum continuous DC voltage will be included.

The next draft will be balloted simultaneously within the Bushing SC, HVDC Converter Transformer SC, and the WG on Bushings for DC Application.

8.2.3.3 Working Group on Bushing Application Guide (PC57.19.100)

Chair Fred Elliott reported that his working group met on March 22, 1993 with ten members and twelve guests present. He reported the following:

Five guests requested membership to the working group.

Draft 10 was balloted within the transformer committee with the following results.

Sent	144
Returned	131
Approved	115
Not Approved	3
Abstain	13

The comments on a negative ballot requested the WG to include short circuit rating of the bushing. It was agreed to refer this matter to the bushing subcommittee for including this information in C57.19.00 and C57.19.01.

For Section 4.1.1.2, Mike Altman agreed to submit wording on degree of polymerization for loss of life in place of 50 % loss of tensile strength.

8.0 Reports of Technical Subcommittees(cont'd)

A paragraph will be added to Section 10 referring the user to the bushing manufacturer for instructions on bushing storage.

For Section 10.1.1, P. Singh agreed to coordinate with Keith Ellis and Jens Frost and come up with a draft on guidance for repair of external porcelains.

For Section 10.1.4, an addition will be considered to emphasize that gaskets should not be exposed to light if UV related deterioration is a problem in a particular location.

In addition to the above, other minor and editorial changes were agreed.

Draft 11 will prepared to include the changes and balloted within the Transformer Committee before the next meeting.

8.2.4 Report of Technical Advisor to IEC/SC 36A

Technical Advisor P. Singh reported the following:

The last meeting was held in Kista Sweden. The following highlight were reported.

A suggestion to include in the nameplate, the values of factory tan delta was not accepted as the field measurements are different due to the effect of stray capacitance.

A suggestion to include RIV measurements was not accepted as it is generally not requested for bushings.

Ambient temperature during test was changed from "15 to 35 C" to " 10 to 40 C" in the latest draft.

The convener of the WG 2 on Seismic Qualification of Bushings has requested comments/helpful information for completing this document. Members are requested to pass on the information to P. Singh.

A WG 3 on Interpretation Of Dissolved Gas Analysis in Bushings has been established. Members are requested to pass on any helpful information to P. Singh.

A new organization called "CANENA" has been formed. The purpose of this Organization is to facilitate and promote the development of harmonized tri-national (Canada, Mexico, and the U.S) electrotechnical codes and standards and uniform assessment methods. The registered office of this organization is in Washington. For additional information please see attached.

Chair Wagenaar announced that Bill Saxon has agreed to take up the responsibilities of the Technical Advisor to IEC/SC 36A.

8.2.5 Old Business

8.2.5.1 Definition of CT Pocket

Chair Wagenaar reported the following:

Two ballots on this topic were circulated within the bushing subcommittee. Both received only 30 % response so neither is valid at this time. The SC discussed the comments received so far and resolved the negative ballots on C57.19.00, the main bushing standard. However the two negative ballots on shielding of CT, Section 6.3 of C57.12.00 were on the opposite sides of the issue. Chair L.B. Wagenaar will decide the next course of action.

8.2.5.2 Drawlead Loading

Based on the discussions on this topic in St Petersburg meeting, Dr. Jurgen Jeske discussed the results of a drawlead thermal test on a 900 BIL bushing using 220 sq mm and 600 sq mm cross section area. These tests indicate the following:

- The oil level in the tube has a significant effect on the temperature of the drawlead and the bushing tube. With increasing oil level, the maximum temperature decreases on the cable and increases on the bushing tube.
- The hottest spot in the drawlead is always in the portion that is exposed to the air whereas the hottest spot in the bushing tube is below the oil level.
- The limitation in the system was due to the temperature of the insulation on the drawlead and not due to the bushing insulation. Current rating of the drawlead can be increased by using class F insulation.

Tests on other bushings are continuing. Members of the SC expressed their thanks to Dr. Jeske.

8.2.6 New Business

The following topics will be added to the agenda for future discussions.

Indoor Bushings
Short time thermal rating

8.2.7 Adjournment

The meeting was adjourned at 4:53 PM

Minutes by:
Pritpal Singh, Secretary
Bushing Subcommittee

8.0 Reports of Technical Subcommittees(cont'd)

DATE: 03-11-94

STATUS REPORT ON STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE
ATTACHMENT 1

SUBCOMMITTEE

BUSHING / CHAIRPERSON: L. B. WAGENAAR / PHONE: (614)223-2259 / FAX: (614)223-2205

STANDARD NO. PROJECT NO.	TITLE OF DOCUMENT WORKING GROUP	WG CHAIRPERSON	TF CHAIRPERSON	COMMITTEES REQUESTING COORDINATION PUB_DATE	PAR_DATE	REV_YEAR	WG_PHONE	LATEST STATUS COMMENTS
C57.19.00	GENERAL REQUIREMENTS AND TEST PROCEDURES FOR OUTDOOR APPARATUS BUSHINGS (IEEE 21) SUBCOMMITTEE	HAGENAAR L. B.		T&D	PSR	IC	SHGR	PUBLISHED 1992
PC57.19.00				07-23-76	04-01-79	1997	(614)223-2259	APPROVED BY ANSI 03/31/92
C57.19.01	STANDARD PERFORMANCE CHARACTERISTICS AND DIMENSIONS FOR OUTDOOR APPARATUS BUSHINGS (IEEE 24) REVISION TO C57.19.01	SINGH PRITPAL		SPD	IAS	IC	SHGR	PUBLISHED 1992
PC57.19.01				08-05-83	11-01-89	1997	(901)696-5228	APPROVED BY ANSI 03/20/92
C57.19.03	STANDARD REQUIREMENTS, TERMINOLOGY AND TEST CODE FOR BUSHINGS FOR DC APPLICATIONS	HEYMAN OLOF		SPD	IC	SHGR		WORKING ON DRAFT
PC57.19.03						11-09-89	0	SF6 BUSHINGS NOT INCLUDED
C57.19.100 PB00	GUIDE FOR APPLICATION OF APPARATUS BUSHINGS. BUSHING APPLICATION GUIDE	ELLIOTT F. E.		SHGR	SUB	PSR	(503)230-3900	BALLOT COMPLETED IN TC SUBMIT TO REVCOM
C57.19.101 P757	GUIDE FOR LOADING POWER APPARATUS BUSHINGS BUSHING APPLICATION GUIDE	ELLIOTT F. E.		10-20-88		1997	(503)230-3900	APPROVED AS FULL-USE 06/17/92 ANSI APPROVED 7/93

COORDINATION ACTIVITY OF BUSHINGS SUBCOMMITTEE AS PER: 03-11-94

PROJECT NO.	TITLE	CONTACT	TRANSFORMER COMMITTEE COORDINATOR	TRANSFORMERS COMMITTEE SUBCOMMITTEE	COORDINATOR PHONE NO.
*PC37.04h 01-07-91	MECHANICAL LOADING REQUIREMENTS OF CIRCUIT BREAKER TERMINALS SHGR	GEORGE R. HANKS 615-751-4020	LOREN B. WAGENAAR	BUSHINGS	614-223-2259
*P957 04-01-92	GUIDE FOR CLEANING INSULATORS T&D	WILLIAM L. GIBSON 415-973-3747	L. B. WAGENAAR	BUSHINGS	614-223-2259

8.0 Reports of Technical Subcommittees(cont'd)

8.3 Dielectric Tests - J. B. Templeton

March 22, 1994 - Dallas, TX

The Subcommittee met at 10:55 A.M. on March 22, 1994 with 40 members and 39 guests present.

The minutes of the November 2, 1993 meeting in St. Petersburg, FL were approved as submitted.

8.3.1 Chair's Comments

Several items from the ADCOM meeting were discussed. The Working Groups for C57.12.00 and C57.12.90 have been established and the process of using these Working Group's are as follows:

1. Technical subcommittees will develop and/or modify sections in these two documents. The technical subcommittees will ballot up through the subcommittee level and the Working Group's above will combine input from subcommittees and ballot the main committee.
2. The objective is to update C57.12.00 and C57.12.90 every two years to coincide with the publication of the "phone book" of transformer standards.
3. The next publication of the "phone book" is in the spring of 1996, therefore, changes need to be submitted to IEEE for approval by September, 1995.

It was also reported that C57.98 was approved. Also, the next meeting of the Transformers Committee will be in Milwaukee from September 25-28, 1994.

8.3.2 Working Group Reports

8.3.2.1 Working Group on Revision of Dielectric Tests - Bertrand Poulin, Chair

The Working Group met at 4:15 P.M. on March 21, 1994 with 24 members and 29 guests present. The minutes of the St. Petersburg meeting were approved as submitted. The Task Force reports were as follows:

8.3.2.1.1 Task Force on Metal Oxide Surge Arrester Coordination with Power Transformer Insulation - R. Degeneff, Chair

Loren Wagenaar chaired the meeting since R. Degeneff was not able to attend this meeting. The Task Force met at 10:55 A.M. on March 21, 1994 with 25 persons in attendance.

Dr. Preininger presented results of a study of a 765/345 kV autotransformer. This study was updated from one presented in St. Petersburg by considering the effects of an improved arrester model as proposed by the IEEE SPD committee. As before, the conclusion for this particular transformer analysis was that the factory applied impulse and switching surge tests produce voltages within the transformer at or above the levels expected in service. This analysis dealt with one design and the results may not apply to all transformers.

8.0 Reports of Technical Subcommittees(cont'd)

Loren Wagenaar presented calculations completed by Dr. Degeneff to define the peak-to-peak excursion when a switching surge is superimposed on the opposite polarity peak of the 60 Hz waveform. It was shown that the worst condition occurs at 765 kV where the peak-to-peak excursion exceeds the factory switching surge level by 8%. However, the apparent margin between factory test levels and the arrester clamping voltage at 3 kA is 40%. The calculations done for lower system voltages resulted in increasing margin with lower system voltages.

Loren Wagenaar then presented an example of a reverse polarity impulse which was captured on the terminals of a 765/138 kV autotransformer. The significant observation was that the voltage across the series winding exceeded the voltage at the high voltage terminal by 8%.

Harold Moore reported on some unpublished data that indicated that breakdown levels of insulation subjected to a 60 Hz voltage with a reverse polarity impulse superimposed were lower than with 60 Hz voltages with same polarity impulse superimposed. He then asked that if anyone had data from this type of test if they could share it with the group.

The Task Force adjourned at 12:10 P.M.

8.3.2.1.2 Task Force on Revision of the Induced Test - M. Perkins, Chair

The Task Force met at 8:00 A.M. on March 21, 1994 with 13 members and 25 guests present. The minutes of the St. Petersburg meeting were accepted as submitted.

Subhash Tuli presented induced test results from several transformers whereby microvolt and apparent charge data were collected. The results indicated that all units were less than 100 microvolts but that some exceeded 500 pC. As such, he suggested that the proposed acceptance criteria of 500 pC may not be appropriate.

Mark Perkins led a discussion of proposed modifications to the induced test as it presently exists in ANSI standards. A group consisting of L. Wagenaar, Subhash Tuli, and Mark met after the St. Petersburg meeting to develop the proposed modifications. The following items were considered:

1. The voltage to be held at the 150% level a minimum of one minute prior to the enhancement.
2. Enhancement time to be 3600 cycles. The Task Force agreed to consider this element with other acceptance criteria as a single element.
3. Operating oil circulating pumps during the induced test; the Task Force discussed technical as well as practical issues involved with this. The majority felt there was not technical basis to require pumps operating and that it could be a significant practical problem, therefore, this element was dropped.
4. The next item involved the requirement to have terminals solidly grounded during test that are normally grounded during service, i.e., this applies to terminals of a buried delta winding. Through discussion, it was determined not to require this element since some test facilities may not have power supplies appropriate to conduct the test in this manner.

8.0 Reports of Technical Subcommittees(cont'd)

5. There was considerable discussion on enhancement time and acceptance criteria without being able to reach consensus. Therefore, the Task Force will be surveyed for suggestions as to enhancement time, when the reference measurement is to be taken, and for acceptance criteria of apparent charge.

The Task Force adjourned at 9:15 A.M.

Bertrand Poulin then informed the Working Group that a new revision of IEEE 1122 will soon be approved and published. This document deals with the use of digitizers in high voltage measurements.

The next item discussed was a subject carried forward from the St. Petersburg meeting; proposed modifications to the required dielectric tests for EHV transformers. Loren Wagenaar presented some information supporting his proposal for fast front switching impulse tests and special termination lightning impulse tests. The chair distributed a questionnaire on these subjects so as to obtain broad opinions about the proposals.

The meeting adjourned at 5:00 P.M.

8.3.2.2 Working Group on Revision of Dielectric Tests for Distribution Transformers - J. R. Rossetti, Chair

The Working Group met at 1:20 P.M. on March 21, 1994.

8.3.2.2.1 Task Force on the Routine Impulse Test Guide for Distribution Transformers. - Don Ballard

A draft of Section 5 of this document had been prepared prior to the meeting and was discussed at length. The result of the discussion was that the Task Force made the following suggestions for expansion and clarification of the document:

Use oscillograms to demonstrate fault detection sensitivity for various transformer connections.

Provide additional information for testing both windings of single and three phase intertie transformers.

Provide rules for determining the resistance and voltage rating of the resistor to be connected to the induced winding.

It was suggested that core loss after impulse test be used in conjunction with induced test results to aid in fault detection.

Expand the information to include testing of T connected and autotransformers.

Expand information on testing delta connected windings to include the option of grounding two terminals of the delta. It was suggested that information be included describing the advantages and disadvantages of this test connection.

8.0 Reports of Technical Subcommittees(cont'd)

An alternate method of testing Y connected transformers was proposed in which all terminals except that being tested are grounded.

The Task Force then discussed the test connection necessary for transformers with a two bushing primary. It was decided that the test standard should not be changed for this particular winding type but that the test system must detect a fault in both single bushing and two bushing windings.

The next subject dealt with the tolerances on waveshape. There is a possible need to accept wider tolerances and change the standard accordingly. However, it was decided to include a discussion in the guide concerning the need for wider tolerances with the intent to modify the document in the future.

The Task Force then adjourned at 9:15 A.M.

The Working Group then discussed the proposed outline for the Guide for Protection of Distribution Transformers.

Copies of the outline had been sent previously to Working Group members as well as the Standards Coordinator for the Surge Protection Devices Subcommittee. John Rossetti also contacted the chair of the Working Group for the Application of Surge Arresters for Distribution Protection. In this discussion it was proposed that the information developed in John Rossetti's working group could be included in the appropriate section of the guide for the Application of Surge Arresters for Distribution Protection.

John's working group will develop the information and coordinate with SPD.

The Working Group adjourned at 2:00 P.M.

8.3.2.3 Working Group on Partial Discharge Tests for Transformers - E. Howells, Chair

The Working Group met at 11:00 A.M. on March 21, 1994 with 10 members and 13 guests in attendance. The minutes of the St. Petersburg meeting were approved as submitted.

The majority of the meeting was spent discussing the Trial Use Guide for the Location of Acoustic Emissions From Partial Discharges. It was necessary to resolve objections to modifications proposed at the last meeting. Resolutions were developed and the document will be submitted to the subcommittee for ballot.

The next item of business dealt with the database being developed covering transformers in the field with an acoustic sensor installed. Jack Harley presented an expanded version of the database covering 30 installations with information relative to:

1. Transformer rating
2. Type of acoustic system utilized
3. Location of sensors, inside or outside of unit
4. Geographic location

8.0 Reports of Technical Subcommittees(cont'd)

The group decided to include experience and performance details when available.

It was also decided to start a database of information from units with single channel acoustic detectors. The traceability of all units with this type of device does not exist, however, as many known installations as possible will be used.

The Working Group adjourned at 12:00 P.M.

8.3.3 Liaison Activities

John Crouse submitted minutes of the Working Group meeting on Insulation Coordination which is revising C92.1-1982, Standard for Power Systems-Insulation Coordination. Part 1 of the document has been revised and will be sent to the Standards Board. Assignments have been made for revising the other parts of the document.

8.3.4 Old Business

8.3.4.1 LTC Dielectric Tests

Tom Traub presented results of the ballot of the dielectric test portion of the proposed new LTC standard. The ballots were sent to the Dielectric Test Subcommittee with 84 sent and 46 were returned. Of those ballots returned, 33 were approved, 10 approved with comments, one abstained and two were not approved. The majority of the meeting of the LTC Performance Requirements Working Group dealt with resolving the negative ballots and those with comments. The differences were resolved by modifying the document. The members of the Dielectric Test Subcommittee who returned approved ballots will be informed by letter of the changes agreed upon at the Working Group meeting. The subcommittee members will be asked to respond within 30 days if the changes would cause them to change their vote. If additional negative ballots are received, the change causing the negative ballot will be rejected. If no negative ballots are received, the changes will be incorporated in a new draft and submitted to the main committee for approval.

8.3.4.2 LV Wiring and CT Circuit Test Requirements

At the St. Petersburg meeting a request was made to identify a guide or standard covering dielectric test requirements for LV control circuits and CT circuits on power transformers. The Chair reported that he could not find an applicable document. Subhash Tuli volunteered to investigate this issue between now and the September meeting.

8.3.4.3 Switching Impulse Test on EHV Transformers

Bertrand Poulin will ballot the subcommittee as to whether the switching impulse test should become a routine test for EHV transformers.

8.3.5 New Business

The Chair reported that a review of the documents for which the subcommittee is responsible resulted in determining that C57.21 is due for revision or reaffirmation in 1995. This document is Requirements,

8.0 Reports of Technical Subcommittees(cont'd)

Terminology and Test Code for Shunt Reactors over 500 kVA. The Chair will review further as to what action the subcommittee should take.

The meeting adjourned at 11:50 am.

**Respectfully Submitted,
James B. Templeton**

8.0 Reports of Technical Subcommittees(cont'd)

DATE: 03-11-94

STATUS REPORT ON STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE

ATTACHMENT 1

SUBCOMMITTEE

DIELECTRIC TESTS / CHAIRPERSON: J. B. TEMPLETON / PHONE: (317)289-1211 / FAX: (317)286-9352

STANDARD NO. PROJECT NO.	TITLE OF DOCUMENT WORKING GROUP	WG CHAIRPERSON	TF CHAIRPERSON	COMMITTEES REQUESTING COORDINATION PUB_DATE PAR_DATE REV_DUE_YEAR	WG_PHONE	LATEST STATUS COMMENTS
C57.113	GUIDE FOR PARTIAL DISCHARGE MEASUREMENT IN LIQUID-FILLED POWER TRANSFORMERS AND SHUNT REACTOR					PUBLISHED AS FULL-USE 1992
P545	P. D. TESTS FOR TRANSFORMERS	HOMELLS E.		12-05-91 09-25-91 1996	(414)835-1500	
C57.127	GUIDE FOR THE DETECTION OF ACOUSTIC EMISSIONS FROM PARTIAL DISCHARGES IN OIL-IMMERSED POWER TRANSFORMERS					REBALLOT MAIN COMMITTEE
PC57.127	P. D. TESTS FOR TRANSFORMERS	HOMELLS E.		- - 03-10-88 0	(414)835-1500	WAITING FOR BALLOT
C57.12.90	REVISION OF THE INDUCED TEST					
PC57.12.90d	REVISION OF DIELECTRIC TESTS	POULIN B.	M. PERKINS	- - 09-28-90 0	(408)957-8326	DRAFT 1 BEING PREPARED NEW WORKING GP TO WORK ON THIS
C57.21	REQUIREMENTS, TERMINOLOGY AND TEST CODE FOR SH. REACTORS OVER 500KVA					COMPLETE
PC57.21a	DIELECTRIC TESTS OF SHUNT REACTORS	KENNEDY W. M.		04-02-91 12-11-86 1995	(317)286-9387	ANSI APPROVED 08/09/91
C57.98	IEEE GUIDE FOR TRANSFORMER IMPULSE TESTS					REVISION APP. BY SB 12/02/93
PC57.98	REVISION OF DIELECTRIC TESTS	POULIN B.	R. E. MINKWITZ, SR.	06-01-86 02-01-86 1992	(408)957-8326	WAITING PUBLICATION
C57.98a	GUIDE FOR PERFORMING ROUTINE LIGHTNING IMPULSE TESTS ON DIST. TRANSFO					TARGET COMPLETION DATE 1995
PC57.98a	REV. DIELECTRIC TESTS DIST TR	ROSSETTI J.	D. E. BALLARD	- - 04-30-91 0	(901)528-4743	SUPPLEMENT TO C57.98
IEEE1350	GUIDE FOR PROTECTION OF DISTRIBUTION TRANSFORMERS WITH EMPHASIS ON SECONDARY (LOW VOLTAGE SIDE) SURGES					PAR APPROVED BY SB 03/17/93
P1350	REV. DIELECTRIC TESTS DIST TR	ROSSETTI J.		- - 03-17-93 0	(901)528-4743	JOINT PROJECT WITH SPD
NEW	GUIDE FOR THE LOCATION OF ACOUSTIC EMISSIONS FROM PARTIAL DISCHARGES IN OIL-IMMERSED POWER TRANSFORMERS					BALLOTING WORKING GROUP
NO PAR YET	P. D. TESTS FOR TRANSFORMERS	HOMELLS E.		- - - - 0	(414)835-1500	SUBMIT PAR AS SOON AS POSSIBLE

8.0 Reports of Technical Subcommittees(cont'd)

COORDINATION ACTIVITY OF DIELECTRIC TESTS SUBCOMMITTEE AS PER: 03-11-94

*PROJECT NO.	TITLE	CONTACT	TRANSFORMER COMMITTEE	TRANSFORMERS COMMITTEE	COORDINATOR
DATE	PES COMMITTEE	PHONE NO.	COORDINATOR	SUBCOMMITTEE	PHONE NO.
*P1038 12-03-90	STANDARD TEST SPECIFICATION FOR SURGE PROTECTIVE DEVICES FOR LOW VOLTAGE AC POWER CIRCUITS SPD LEWIS DOUGLAS SNEENEY	602-834-9372	MAHESH P. SAMPAT	DIELECTRIC TESTS	704-462-3226
*PC62.42 01-21-91	GUIDE FOR THE APPLICATION OF LOW-VOLTAGE SURGE PROTECTIVE DEVICES SPD MICHEAL M. FLACK	404-551-4904	MAHESH P. SAMPAT	DIELECTRIC TESTS	704-462-3226
*P1223	POWER SYSTEM DIGITAL TESTING TECHNIQUES PSIM T. R. McCOMB	613-990-5826	R. MINKWITZ, SR.	DIELECTRIC TESTS	617-828-3241
*PC37.107 12-28-85	STANDARD FOR DIGITAL PROTECTION SYSTEM DESIGN PSR STIG L. NILSSON	415-855-2314	BERTRAND POULIN	DIELECTRIC TESTS	408-957-8326
*PC62.11	STANDARD FOR METAL-OXIDE SURGE ARRESTERS FOR AC POWER CIRCUITS SPD R. M. SIMPSON	919-836-7059	V. A. MAGUIRE	DIELECTRIC TESTS	501-377-4273
*C37.112 10-22-91	GUIDE FOR PARTIAL DISCHARGE MEASUREMENTS IN POWER SWITCHGEAR SMGR E. F. VEVERKA	414-835-1544	GEORGES VAILLANCOURT	DIELECTRIC TESTS	514-652-8515
*P1122 08-05-92	DIGITAL RECORDERS FOR MEASUREMENTS IN HIGH VOLTAGE IMPULSE TESTS PSIM T. R. McCOMB	613-990-5826	BERTRAND POULIN	DIELECTRIC TESTS	408-957-8326
*PC62.22	GUIDE FOR APPLICATION OF METAL OXIDE SURGE ARRESTERS FOR AC SYSTEMS SPD S. S. KERSHAH	716-375-7296	ROBERT DEGENEFF	DIELECTRIC TESTS	518-276-6367

8.0 Reports of Technical Subcommittees(cont'd)

8.4 Distribution Transformers - K. S. Hanus

Dallas, Texas

Tuesday, March 22, 1994

8.4.1 Chair's Remarks & Announcements

The meeting convened at 2:00 PM in the Laliq II Ballroom with the introduction of the members and guests and signing of the attendance roster.

Jerry Thompson of Duke Power, because of EEI and EPRI commitments has resigned the subcommittee chair. Ken Hanus of Texas Utilities has been appointed to replace Jerry Thompson.

Ken Hanus's chair position on the 3 phase padmount transformer committee will be taken by Clyde Pearson of Texas Utilities.

Minutes of the last meeting in St. Petersburg, FL were approved with no changes.

The chair covered key points of the ADCOM meeting from the evening before. These key points were:

Future meeting dates:

Spring 1995-April 23-26	Kansas City
Fall 1995-Nov. 5-9	Boston
Spring 1996	San Francisco

The fall 1994 meeting will take place on September 25-28 at the Pfister hotel in Milwaukee.

The submission of PARS and approved documents to the standards board was reviewed. Approved standards should be submitted to the standards board by the submission date and can be sent directly to Luigi Napoli of IEEE staff. PARS need to be sent to George Vallaincourt first so he may route the proposed PARS for coordination among the other groups. George will then submit the PAR to IEEE for consideration by the standards board, therefore for George to get PARS to IEEE by the submission date you must send them to George 2 months prior to the IEEE standards board submission date. Future IEEE standards board dates are:

<u>Deadline for Submittal</u>	<u>Meeting Date</u>
August 12, 1994	September 22, 1994
November 4, 1994	December 13, 1994

NEMA and IEEE have agreed to provide co-secretariat services for C57 and C37 documents. A draft agreement to this end has been accepted by the IEEE and acceptance is expected by NEMA. This agreement will remove the log jam in effect due to previous copywrite restrictions.

8.0 Reports of Technical Subcommittees(cont'd)

The "IEEE Transformer Collection" of all C57 documents has been published and will be available. It is commonly known as the "Telephone" book because of its size.

8.4.2 A report from each of the working group chair was given.

- .20 The C57 12.20 document, which has a 1988 date, should have been published in 1993. Administrative difficulties are holding up the scheduled publication.
- .21 The C57 12.21 document has been submitted to the IEEE Standards board, but has not reached John Gauthier at NEMA.
- .22 The C57 12.22 document requires resolution of 2 negative ballots prior to submittal to the Standards Board. Negative votes on the C57 12.22 document need to be resolved concerning the 125 kV BIL and 150 kV BIL issues.
- .23 The C57 12.23 was submitted for publication 2 years ago. Administrative difficulties are holding up the scheduled publication.
- .25 The C57 12.25 has negative votes which are being handled by a task force to determine acceptable openings and live part spacings. A mockup will be created and video taped for presentation to the working group. Early review of the mockup will take place on Saturday and Sunday prior to the Milwaukee meeting. Consolidation of live front and dead front standards will be held up until publication of the .25 document.

Combination of .22 & .26

Consolidation of the C57 12.22 and .26 documents is co-chaired by Ron Stahara and Clyde Pearson. A task force has been created to review section V by the next meeting in Milwaukee.

New document numbers are recommended for the combining of Live front and dead front standards for single and three phase transformers.

- .26 The C57 12.26 document has been two years in the administrative process towards publication.

8.4.3 Bar Coding

The bar coding standard was balloted with 19 approvals and 2 negative votes. Draft V will handle the negative votes and the document will be submitted to the transformers committee and NEMA.

8.4.4 Electronic Data Transmittal

A task force will issue a questionnaire to 120 utilities through EEI to determine utility needs for the reporting of electronic data. A similar document will be submitted to NEMA to query manufacturers. A draft of this standard is anticipated by the Milwaukee meeting and a PAR is required.

8.0 Reports of Technical Subcommittees(cont'd)

8.4.5 Coating Integrity Documents (.28, .29, .30 & .31)

The coastal environment enclosure integrity standards has been published. The standard for submersible transformers has reached the C57 main committee. The standard for padmount transformers is nearing completion and work on the overhead transformer is well along towards balloting and publication. The next meeting will take place in Atlanta at a date to be determined in May, 1994.

8.4.6 Loss Evaluation Guide

33 members and 9 guests attended the loss evaluation working group meeting. ANSI C57.120 covers the Total Owning Cost (TOC) aspects of Power Transformers. However, a comparable document does not exist as an ANSI standard for distribution transformers. A draft document for distribution transformers is planned before the Milwaukee meeting. The creation of this group was in response to the Energy Conservation Act of 1992 whereby the DOE has 30 months to report to Congress. This act requires examination of the efficient use of HID lighting, electric motors and transformers. Most utilities utilize the 1981 EEI methodology. Oak Ridge National Laboratories, acting as a consultant to both DOE and the Environmental Protection Agency (EPA) has been pursuing these issues. HID lighting is being pursued by Linda Latham of the EPA. (John Gauthier of NEMA gave me Kyle Piston's number at NEMA (202) 457-8448 in Washington, DC to gather information concerning progress on the HID lighting issue.

8.4.7 New Business

5 new members have been accepted into the Transformers committee. There is a need to Standardize form and function across all transformer specifications and accordingly, a Task Force has been organized.

A new co-chair is required for electronic data reporting with the Dave Lyon changing jobs. Angelynn McCain of BG&E has been nominated to co-chair the working group.

The status of C57.12.00 and C57.12.90 was discussed and both documents will be published in the next few months. IEEE has stated only one PAR will be approved for a particular standard by the standards board, therefore the revision of these two documents will be coordinated by George Vallaincourt who will submit one PAR for each document. Internal PARS for the individual task forces within the subcommittee will be used to coordinate each task forces project. These internal PARS will then be combined into one for submission to IEEE.

8.4.8 Working group assignments

The current assignments are as follows:

- .20 Glenn Andersen / Allen Wilks
- .21 Ali Ghafourian
- .22 Ken Hanus
- .23 Bob Scheu
- .25 John Lazar / Norvin Mohesky
- .26 Gerry Paiva

8.0 Reports of Technical Subcommittees(cont'd)

EDT David Rollins

Bar Coding Ron Jordan / Ed Smith

Loss Evaluation Guide Tom Pekarek/Don Duckett

Combination .22&.26 Clyde Pearson/Ron Stahara

8.0 Reports of Technical Subcommittees(cont'd)

DATE: 03-11-94

STATUS REPORT ON STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE
ATTACHMENT 1

SUBCOMMITTEE: DISTRIBUTION TRANSFORMERS / CHAIRPERSON: J. C. THOMPSON / PHONE: (704)373-5139 / FAX: (704)382-2579

STANDARD NO. PROJECT NO.	TITLE OF DOCUMENT WORKING GROUP	WG CHAIRPERSON	IF CHAIRPERSON	COMMITTEES REQUESTING COORDINATION PUB_DATE PAR_DATE REV_DUE_YEAR	WG_PHONE	LATEST STATUS COMMENTS
C57.12.20	OVERHEAD-TYPE DISTRIBUTION TRANSFORMERS, 500 KVA AND SMALLER: N V 34500 VOLTS AND BELOW, L V 7970/13800V & BELOW			T&D IAS/REP SCC14		PAR APPROVED BY RESCOM
PC57.12.20	POLE MOUNTED DISTRIBUTION TR	THOMPSON J. C.		01-11-88 12-05-91	1993 (704)373-5139	BALLOTING SUBCOMM.
C57.12.21	STANDARD REQUIREMENTS FOR PAD-MOUNTED, COMPARTMENTAL-TYPE, SELF-COOLED, SINGLE-PHASE DIST TRANSFORMERS WITH HV BUSHINGS			T&D IAS/REP		BALLOTING TC CLOSING 12/30/93
PC57.12.21	3-PHASE PADMOUNT TR LIVE FRONT	GHAFOURIAN A.		10-22-79 06-27-91	1985 (601)796-4255	COPYRIGHT NOT RELEASED
C57.12.22	PAD-MOUNTED, COMPARTMENTAL-TYPE SELF-COOLED, 3-PHASE DIST. TR WITH HV BUSHINGS, 2500KVA AND SMALLER:...REQUIREMENTS.			T&D IAS/REP IAS/PSE		AWAITING ANSI APPROVAL
PC57.12.22	3 PHASE PADMOUNT TR LIVE FRONT	MANUS K.		05-10-89 06-27-91	1994 (214)954-5930	COPYRIGHT NOT RELEASED
C57.12.23	UNDERGROUND-TYPE, SELF-COOLED, 1-PHASE DISTRIBUTION TR WITH SEPERABLE INSULATED HV CONNECT HV 24940Grdy...LV, 240...;167KVA.			T&D IC IAS/REP IAS/PSE		BALLOTING C57
PC57.12.23	1-PHASE SUBMERSIBLE TR	PAIVA G.		09-19-85 06-27-91	1996 (818)302-8409	HELD FROM DIST. UNTIL BAL.C57
C57.12.25	REQUIREMENTS FOR PAD-MOUNTED COMP-TYPE, SELF-COOLED, 1-PHASE DISTRIBUTION TR W/SEP IHS HV CONN, HV 34500Grdy...167KVA...			T&D IC IAS/REP IAS/PSE		WORKING ON DRAFT 1
PC57.12.25	1-PHASE PADMOUNT TR DEADFRONT	MONESKY M.		05-11-90 06-27-91	1995 (314)239-6783	COPYRIGHT NOT RELEASED
C57.12.26	PAD-MOUNTED COMPARTMENTAL-TYPE SELF-COOLED, 3-PHASE DIST TR for USE W/ SEPERABLE INSULATED HV CONN., HV 34500Grdy...2500KVA			T&D IC IAS/REP IAS/PSE SEC14		REV. APP. BY ANSI 07/09/93
PC57.12.26	3-PHASE PADMOUNT TR DEADFRONT	PAIVA G.		06-17-92 12-05-91	1997 (818)302-8409	HELD FROM DIST PENDING C57 APP
C57.12.28	PAD-MOUNTED EQUIPMENT - ENCLOSURE INTEGRITY			06-24-87	1994	EXTENSION TO BE REQUESTED NOT TRANSFERED TO TC YET
PC57.12.28	JOINT WG ON CABINET INTEGRITY	MARTIN J.				
C57.12.29	PAD-MOUNTED EQUIPMENT - ENCLOSURE INTEGRITY IN COASTAL ENVIRONMENTS				1996	PUBLISHED IN 1992 NOT TRANSFERED TO TC YET
PC57.12.29	JOINT WG ON CABINET INTEGRITY	MARTIN J.				
C57.12.30	SUBMERSIBLE EQUIPMENT - ENCLOSURE INTEGRITY				1994	TO BE BALLOTTED NOT TRANSFERED TO TC YET
PC57.12.30	JOINT WG ON CABINET INTEGRITY	MARTIN J.				

8.0 Reports of Technical Subcommittees(cont'd)

DATE: 03-11-94

STATUS REPORT ON STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE

ATTACHMENT 1

SUBCOMMITTEE----- DISTRIBUTION TRANSFORMERS / CHAIRPERSON: J. C. THOMPSON / PHONE: (704)373-5139 / FAX: (704)382-2579

STANDARD NO. PROJECT NO.	TITLE OF DOCUMENT WORKING GROUP	WG CHAIRPERSON	TF CHAIRPERSON	COMMITTEES REQUESTING COORDINATION PUB_DATE PAR_DATE REV_DUE_YEAR	WG_PHONE	LATEST STATUS COMMENTS
C57.12.31 PC57.12.31	COATING STANDARD FOR POLE MOUNTED TRANSFORMERS JOINT WG ON CABINET INTEGRITY MARTIN J.			- - - 1994		PAR TO BE SUBMITTED NOT TRANSFERRED TO TC YET
IEEE1265 P1265	STANDARD FOR BAR CODING FOR DISTRIBUTION TRANSFORMERS (POLE-MOUNTED, PAD-MOUNTED AND UNDERGROUND) BAR CODE STANDARD JORDAN ROM			- - 06-27-91 1994	(619)482-3239	PAR APPROVED 06/27/91
IEEE1388 P1388	STANDARD FOR THE ELECTRONIC REPORTING OF TRANSFORMER TEST DATA ELECTRONIC TEST DATA LYON D. S.			EEI MEMA ASC X12 PSR 0 - - 09-15-93	CS SAB (414)221-2398	APPROVED BY NESCOM 09/15/93 NO. CHANGED FROM C57.132

8.0 Reports of Technical Subcommittees(cont'd)

8.5 Dry-Type Transformers - W. F. Patterson

8.5.1 Chair Remarks and Announcements

Introductions were made and the attendance roster was circulated.

First order of business was approval of the minutes from November 2, 1993. Comment: Dallas reference to Portland. Motion was made to approve them as changed; seconded and passed.

The purpose of this committee meeting was discussed and the importance of returning completed ballots.

Chuck Johnson gave a report on what happened at the administrative subcommittee meeting on Monday night. Next meeting will be September 25 - 28 in Milwaukee at the Pfister Hotel. Issue came up about PAR submittals. Scope was missing. The scope should be on the PAR when you turn it in; it should be the same as the scope in the standards. There is now an editor to handle all the Power Engineering Society standards. Recommending that we submit draft before submitting to main committee for balloting so that it can be reviewed editorially and any changes that need to be made can then be addressed. Regarding Symbols, there is sometimes a conflict the way the symbols in the IEEE standards are used; not so much used but which symbol is used to address certain constants such as temperature and time. It was recommended that proper use of the symbols should be attempted by all the working groups and will probably require some type of coordination amongst the working groups. We should try to harmonize with the IEC with regards to the use of symbols. IEEE 280 is the document with all preferred symbols.

Regarding the issue of harmonization for the internationalization of IEEE standards, the Power Engineering Society has appointed a international program engineer - Ann O'Neill, to IEEE Standards Department. She will coordinate standards between IEEE and IEC. Plan is to provide seminars on IEC organization and IEC PES will develop and distribute matrixes comparing the standard development units of IEEE PES and the IEC. Regarding harmonization coordination of the standards, each PES committee is being asked to compare the contents of existing IEC standards to those of the IEEE. A list of the standards is available from Ann. They're asking for volunteers from working committees. Also discussion about when working with IEC standards for inclusion of information in IEEE standards, we should always try to conform to the IEEE styles manual. Trying to convey viewpoint that we should work to try and incorporate IEC material into the standards but not to harmonize standards simply for harmonization sake.

C57.12.00 & 12.90 will be revised on a fairly regular basis.

The next order of business was the presentation of the reports of the various working groups.

8.5.2 Working Group Reports

8.5.2.1 Working Group on Cast Coil Resin Transformers Loading Guide

Chair: Mr. Linden Pierce

8.0 Reports of Technical Subcommittees(cont'd)

L. Pierce started with his report for the Cast Coil Loading Guide Working Group. He gave his report and no questions were asked.

This working group was created to investigate loading guide criteria unique to cast coils for inclusion in the Dry Type Loading Guide C57.96.

The Working Group met at 9:30 a.m. on March 22, with 9 members and 8 guests in attendance.

The minutes of the November 2, 1993 meeting in St. Petersburg were approved.

The Chair reviewed data and a proposed equation for the time constant based on imbedded thermocouple data from 9 2000 Kva cast resin transformer. The loading guide draft is now complete and ready to ballot.

Winding weights are required to calculate the time constant. It is suggested that they be shown on the nameplate, in a proposed rev. of C57.12.01. This additional data would also improve the accuracy of the time constant calculation for ventilated dry units. This was discussed in detail. It was also proposed that time constants be shown on test reports.

The meeting adjourned at 10:30 AM

8.5.2.2 Working Group on Dry Type Reactors - HVDC Smoothing Reactors

Chair: Mr. Richard Dudley

Ref: Dry Type HVDC Smoothing Reactors

R. Dudley reported for the Dry Type Reactors - HVDC Smoothing group. No questions were asked.

The Dry Type Air Core HVDC Smoothing Reactor Task Force met on March 21, 1994 at 8:00 a.m. in the Laliq Ballroom I of the Grand Kempinski Hotel in Dallas, Texas. There were 4 members and 1 guest present. The following are the highlights of the meeting:

The attendance list was circulated.

The minutes of the previous meeting were approved.

The ANNEX; "Construction and Installations of Dry Type Air Core Smoothing Reactors for HVDC Application" was discussed. The following was discussed.

- (i) The concept of including this application guide in an ANNEX of the HVDC smoothing reactor standard was approved and deemed valuable.
- (ii) Smoothing reactors used in back to back schemes should be included. Voltage levels are lower and the effects on foundation design, safety requirements etc. should be included.

8.0 Reports of Technical Subcommittees(cont'd)

- (iii) Pollution considerations should be expanded to include more information on insulator requirements. The HQ-NE project, where support insulators were placed outside the outer diameters of the reactor, and the NZ project, where rain sheds were used, were discussed. The Chair agreed to research where these requirements originated from. Were they based on experience with bushings? For the majority of HVDC projects support insulators for dry type smoothing reactors were selected based on project associated creepage requirements and mounting structure design was based on standard practice.
- (iv) Surge arresters were discussed. Pierre Riffon pointed out that very low protective margins vs. those for a.c. systems are used i.e. 15% vs. over 30%. This appears to be the case for all equipment. What is the impact if retesting (after time in service) of equipment is carried out based on the usual practice of reduced BIL, e.g. 80%. Retesting, when required, should be carried out at least at 10% above the LA protective margin. The main text of the standard should also address this issue.

Draft 3 of the oil-immersed and dry-type smoothing reactor standard was discussed and the key topics are as follows:

- (i) Pollution testing should be included as an OTHER (or special) test. It should be a wet D.C. withstand test with salt concentration as specified by the end user. Table 4 and section 11.6.8 should be modified accordingly.
- (ii) D3 should be reviewed in light of Pierre Riffon's letter of April 14, 1993 as most of his comments have not been addressed.
- (iii) Pierre Riffon stated that the test code for dry type smoothing reactors was well developed and that many of the tests were also applicable to oil-immersed smoothing reactors e.g. D.C. power tests, A.C. power tests, etc.
- (iv) A capacitor discharge test to simulate a converter side fault and a short circuit test to simulate a line side fault were discussed. The capacitor discharge test should be carried out at a frequency on the order of 300 Hz where as the short circuit test should be at power frequency or lower. Do international test labs have sufficient power to carry out the S.C. test? These tests should be listed as OTHER. Note in the case of oil-immersed reactors the S.C. test is listed as ROUTINE in Table 4A and should be listed as OTHER. The Chair and other T.F. members said they would continue to investigate this fault test issue with regards to equipment requirements and test procedures.
- (v) Section 8.2.1.2 should include a tolerance on inductance up to short circuit level, i.e. degree of linearity up to S.C. level.

In section 6.4 dealing with rated inductance, linearity should be defined and tolerances should be extended to include short circuit levels.

- (vi) Section 6.6 should be expanded to include protective margins of LA's used in conjunction with smoothing reactors.

8.0 Reports of Technical Subcommittees(cont'd)

The Chair agreed to follow up on all issues discussed.

The meeting adjourned at 9:15 a.m.

8.5.2.3 Working Group on Dry Type Reactors

Chair: Mr. Richard Dudley

R. Dudley gave his report from the Working Group on Dry Type Reactors. The Chair asked for a show of hands for those in favor of balloting the transformers committee directly and bypassing this group. Nobody wanted to do that. He then asked for a show of hands for those that would prefer to ballot this group prior to balloting the transformers committee. Four people raised their hands. The options are to ballot the main transformers committee, bypassing the ballot of the transformer subcommittee or ballot the transformer committee and then ballot the main transformer committee. Normal practice is to ballot the subcommittee from which it came from. Both groups could be balloted simultaneously. Another vote was taken. 16 voted for balloting subcommittee. A decision was made to ballot the subcommittee. R. Dudley discussed harmonization with IEC. Wes Patterson noted that there is not much US influence in IEC. IEEE testing and IEC testing is not the same.

The Dry-Type Reactor WG met on March 21, 1994 at 2:50 PM in the Colonnade A Room of the Grand Kempinski Hotel in Dallas, Texas. There were 6 members present and 1 guest present. The following are the highlights of the meeting:

The attendance list was circulated.

The minutes of the St. Petersburg meeting were approved.

Draft 7 of the revision of C57.16 was discussed. The following are the key points:

The chair repeated that response of W.G. members to D6 was positive and that all received comments were included in D7.

A recently received comment from T. Clark suggesting that the impulse test be classified as OTHER VS ROUTINE was discussed. The proposal would have left it as a DESIGN test. WG. members felt the impulse test was a valuable quality check and should be a ROUTINE test.

TABLE 4 was discussed. Again it was emphasized that the difference between hot spot rise and average rise is not intended to imply a hot spot allowance. It was also agreed that although temperature rise limits differ from those in dry type transformer standards they are applicable to dry type series reactors based on experience and are in line with those in the ANSI line trap standard. Dry type air core series reactors are far more closely related to line traps than dry type transformers. Input from all W.G. members has been positive regarding the current contents of Table 4.

Editorial comments were noted and made in D8 by the Chair.

8.0 Reports of Technical Subcommittees(cont'd)

Section 7.2.4 should be clarified. The tolerance on voltage drop includes mutual couplency effects as opposed to the tolerance on self impedance in 7.2.2 and 7.2.3.

Where is the time factor in Section 10.3.2 used? The top temperature calculation is necessary.

What is the rationale behind the ambient air temperature correction factor in Section 11.5.7.1? It differs from that used in C57.21-1990.

Section 11.6.4 covering acceptance criteria for short circuit testing was reviewed. Visual inspection criteria should also be included. Wording should be added to the effect: "Following the short circuit test a visual inspection should be compared with the results of an inspection carried out prior to the test. There should be no significant or progressive change in mechanical integrity that will impair the function of the reactor. Additional shots can be done to ensure any movement etc. is not progressive. C57.12.90 and C57.12.91 will be consulted as references.

Section 11.6.3 on guidelines for short circuit testing was discussed. It was agreed to modify point 2. Three phase stacked units should be tested so that each phase is successively subjected to a full offset over a period of 3 shots. Single phase units will be subjected to 2 shots of full offset.

The temperature range for carrying out tests should be addressed in the standard. C57.21-1990 will be consulted. What is reasonable? 10°C - 40°C? Testing may be conducted outside e.g. short circuit testing or loss measurement (to obtain sufficient magnetic clearance for large units). In cold climates it is difficult to maintain test lab temperatures of even 10°C. What is the maximum temperature under which a heat run is performed. Avoidance of high temperature in summer may be difficult especially in view of the requirement for a draft free environment which precludes air conditioning etc.
Reasonableness

The Chair agreed to produce Draft 7 with all the above included. The next stage will be to ballot the Dry Type Transformers Subcommittee or perhaps the Transformers Committee. This will be discussed at the Dry Type transformers Subcommittee meeting and common sense must prevail.

The meeting adjourned at 5:30 P.M.

8.5.2.4 Working Group on Dry Type Test Code C57.12.91

Chair: Mr. David Barnard

Secretary: Mr. Henry Windisch

Ref: C57.12.91 - Test Code for Dry Type Transformers

Henry Windisch gave the report on the Working Group on Dry Type Test Code C57.12.91 for Mr. Barnard who could not be there for the meeting. No questions or additions to the report occurred. The Chair stated that sections 8 & 9 from C57 12.90 will be circulated. If no negative

8.0 Reports of Technical Subcommittees(cont'd)

comments are received within a certain time period (30 - 45 days?) it will be incorporated into the standards.

This working group is pursuing the revision/reaffirmation of the Dry Type Test Code - C57.12.91.

The meeting was called to order at 10:55 AM Monday, March 21, 1994 in the Colonnade B Room at the Grand Kempinske Hotel in Dallas, Texas. Seventeen (17) members and seven (7) guests were in attendance.

Introductions of those attending were made and the St. Petersburg minutes were approved.

Chair Barnard announced the results of the Transformers Committee ballot on Draft # 6 as follows:

127 of 147 ballots returned. 86%

105 of 108 affirmed ballots. 97%

3 negative ballots.

Chuck Murray's negative was primarily editorial and was resolved prior to the meeting. S.H. Osborn's negative dealt with the power factor test. Much discussion centered around the purpose and value of the test since dry type transformers are more subject to environmental conditions than liquid filled transformers. It was pointed out that power factor is not a reliable indicator of the condition of the transformer. After much discussion on test procedure a motion was made and seconded that the negative ballot be voted down and comments added in the forward to indicate that the next revision to this standard will address updated information on power factor tests. The motion carried unanimously. Wayne Hansen indicated that he believed this action would satisfy Mr. Osborn. The negative ballot was considered as resolved.

The negative ballot of Bill Henning was introduced. Bill presented a discussion on why he cast a negative ballot. Bill proposed that sections 8 and 9 from the Liquid Filled Transformer Standard C57.12.90 replace sections 8 and 9 in the Dry Type Standard. These sections deal with loss measurements. Bill also indicated that figure 20 is technically incorrect.

After a spirited discussion it was moved, seconded and passed that sections 8 and 9 would be recirculated to the full Transformers Committee for inclusion in C57-12.91. That way a full ballot of C57.12.91 would not be required. The Chair will prepare the necessary paperwork to proceed with the letter of recirculation. The circulation of change letter will address Mr. Henning's negative ballot.

It was moved, seconded and passed that the Chair review other editorial comments and include them as he sees fit.

Because of time limits, the last three items on the agenda were not discussed.

Michael Haas again requested that his name be included in the Membership List. His name was included at the last meeting but was inadvertently left off this time. Jeewan Puri, Subhash Sarkar and Nigel McQuin requested membership in the working group.

8.0 Reports of Technical Subcommittees(cont'd)

The meeting was adjourned at 12:10 P.M.

8.5.2.5 Working Group on Specialty Transformers

Chair: Mr. R. W. Simpson, Jr.

Ref: IEEE Std 259 - Standard Test Procedures for Evaluation of Systems of Insulation for Specialty Transformers

Mr. Simpson reported on the Working Group on Specialty Transformers - P259. He added that there is a new technical committee being formed through NEMA.

This WG is charged with the revision of IEEE 259-1979. This standard relates to evaluating the thermal and environmental degradation of small, low voltage, dry type transformers.

The Working Group met on 3/21/94 at 1:20 PM with 1 member and 7 guests present. Four guests requested membership in the WG. Following introductions, the minutes of the 11/01/93 meeting in St. Petersburg, Florida were approved as written.

Chair Simpson reported that IEEE Std. 259, Draft 8, having been reviewed and approved by all necessary coordinating committees, has been submitted to REVCOM for formal approval. The next REVCOM meeting will be in June, 1994.

A new Draft of 259 designated draft #9 dated 3/9/94 with "Shall/Should" statements revised for correctness was reviewed by the working group.

The WG began to review the comments received on the negative ballots on P259/D8 from SCC4.0.

Per Mr. Mierendorf's comments, Chair Simpson will attempt to determine what IEC and ISO publications may be relevant for inclusion in the Bibliography. Also, IEC 664 will be reviewed to consider addressing the influence of non-electric field conditions.

After discussion in the WG, it was agreed that the comments by Mr. Weddleton are adequately addressed in the present standard.

Mr. Flaherty had several excellent comments primarily focusing on clarification of the present document, not on changing it. Sections addressing mechanical vibration, moisture effects and thermal aging cycles were discussed by the WG and the suggested revisions will be noted in the next draft of the standard. It was also suggested that paragraph 4.2.2 "Alternate Procedures for Oven-Aged Energized Samples" be dropped as it produces unnecessary loading on the samples that can yield premature failure.

At this point we ran out of time and agreed to resume the discussion at the next meeting. The meeting was adjourned at 2:35 p.m.

8.0 Reports of Technical Subcommittees(cont'd)

8.5.2.6 Working Group on Hot Spot Differentials

Chair: Ms. Paulette Payne

This WG was formed to investigate hot spot differential criteria in dry type transformers standards and develop modifications to existing standards if needed.

Paulette Payne gave her report from the Working Group on Hot Spot Differentials.

The WG for Dry Type Hot Spot Differentials met March 21, 1994 in Waterford A of the Grand Kempinski Hotel in Dallas, Texas. The meeting was called to order at 4:15 p.m. There were ten (10) members and six (6) guests present.

Following introductions, the minutes of the November 1, 1993 meeting in St. Petersburg, Florida as amended March 7, 1994 were approved.

Chuck Johnson presented hot spot temperature limits from IEC standards. For the 20°C average annual temperature, the hot spot ratio is 1.33; at 30°C, the ratio is 1.26; and at the maximum ambient of 40°C the ratio is 1.2.

Chuck Johnson also presented data of Hot Spot Differentials for Dry Type Strip and Disc load levels using the Short Circuit Method defined in C57.12.91. A constant hot spot ratio was observed. Indication is for strip windings that the 30°C hot spot allowance for average winding temperature of 150°C is adequate. Linden Pierce suggested that the ratio would be higher if core loss was included. A higher hot spot ratio was observed for disc windings. The constant hot spot ratio is consistent with results presented by Linden Pierce. Manufacturers were encouraged to perform similar testing and present results as there is limited data for the WG to analyze.

The approach to Temperature Limitations of the Dry Type Reactor Working Group was explained. No hot spot allowance is applied. Maximum hottest spot and average winding temperature rises are given for each insulation temperature class.

Linden Pierce made comments for consideration of the Working Group:

The standard should clearly demonstrate hot spot temperature as a performance criteria.

C57.12.01-1989 Table 4A should be revised to include a column with Hottest Spot Temperature rises similar to Table 4A C57.12.01-1979.

There should be a Table for ventilated dry type transformer with 220°C class insulation, designed for 80°C and 115°C average winding temperature rise.

The hot spot ratio should be constant.

Linden Pierce's analysis and Whitman's data indicate the ratio increases as winding height increases.

8.0 Reports of Technical Subcommittees(cont'd)

Apply the same ratio for cast resin and ventilated dry units as some cast resin designs are similar to ventilated dry units.

Sealed units have a smaller ratio as they operate on hotter gas.

It was decided to develop a Table which would revise the C57.12.01-1989 Table 4A to include hot spot limits similar to the 1979 revision and to include temperature limits based on hot spot ratio. Linden Pierce will prepare the Table for Working Group review prior to the next scheduled meeting.

A Project Authorization Request (PAR), per Georges Vaillancourt is not required. There should be coordination with the Chairs responsible for dry type transformer standards. These chairs will need PARs to revise standards to include the Working Group recommendations on temperature limits.

As the time for this meeting was expended, the meeting was adjourned at 5:35 p.m.

8.5.2.7 Working Group on Dry Type General Requirements

Chair: Mr. Anthony J. Jonnatti

This working group is preparing revisions for General Requirements for Dry Type Distribution, Power, and Regulating Transformers Standard C57.12.01.

Tony Jonnatti was the last working group report on Dry Type General Requirements. A comment was made that Table A2 was to be deleted.

This working group met on March 22, 1994 at 10:55 a.m. in the Colonnade A room of the Grand Kempinski Hotel in Dallas, Texas. The group contained 15 members and 6 guests. One attending guest requested membership.

The first item of business was the approval of the minutes of the St. Petersburg meeting. The minutes were approved.

The approach in the revising to be undertaken are several items that will be addressed and approved within the 1 year remaining on the life of this standard.

The first item was sound level. A proposal was suggested on a table of noise levels that will be balloted to the working group. In the discussion of this table positive response was received indicating the ballot should be well received; however since the table was relatively new, some thinking about the proposal will be necessary.

The second item that was proposed at St. Petersburg was Table 3-B-Dielectric Insulation Level. No comments or proposals were submitted on this subject.

The third item was a de-rating factor for altitude (thermal). After some brief discussion it was agreed to eliminate this table and the entire section in the Appendix which referred to density at higher altitudes.

8.0 Reports of Technical Subcommittees(cont'd)

The fourth item was temperature during short circuit. A proposal was submitted for some changes of the present form on the standard. The suggested changes will be submitted as a ballot to the working group at the next meeting.

The fifth item was Partial Discharge Tests. A discussion was held on what should be included in this proposal. At present, in the standard, it is the only OTHER test requirement. A proposal was suggested by Bill Mutschler that some more detailed Partial Discharge requirements should be submitted for review by the working group. Bill Mutschler agreed to write up this proposal which will be mailed to members and discussed at the next meeting or by mail if necessary.

The sixth item was hot spot. The subject of hot spot is in the process of 2 proposals being generated by Linden Pierce. His proposal will be submitted to the working group on Hot Spot differentials and eventually included in C57.12.01.

This concluded the discussion on "Old Business".

One "New Business" item was suggested; in section 5.12.3 nameplate information was to require in item 7 a breakdown on weights for core and for winding. No objection to this proposal was noted; therefore it will be included in the revisions.

With the work completed on the items recommended, the meeting adjourned at 12:00 p.m.

8.5.2.8 Working Group on Thermal Evaluation of Dry Type Transformers and Working Group on Flammability Issues

Chair: Mr. Richard Provost

Report on Thermal Evaluation & Flammability group: Dick Provost's meeting was not held. He was ill. However, he did send Chair Patterson a fax. Primary emphasis was working on C57.12.60 he sent out a ballot to 12 members of his working group to which he received only 5 responses. Three questions were on the ballot. The first should the document 12.60 be submitted for reaffirmation to buy more time for evaluation. Of the five responses five voted in favor. Next questions was should the trial use standard be changed to a guide. Four yes, one no. The last requesting participation to work on this 12.60. One affirmative; four no. Chair Patterson requested the seven people that did not get their ballots back to Mr. Provost do so.

8.5.3 New Business

Next order of business: Don Kline has asked for time to discuss safety issue. He's writing a letter regarding gross discrepancies in a IEC standard.

One other item. Chair Patterson dropped the ball on a couple of things with respect to this committee meeting for this particular session. Mike Iman didn't show up as a member of the subcommittee which didn't show up in printing (taken care of.) A number of other individuals requested membership into subcommittee. Policy is the same as used for the transformers main committee. Two years of active participation or attendance at subcommittee meeting. Once he has established the two years and has a history of working group activity, then he grants membership.

8.0 Reports of Technical Subcommittees(cont'd)

Motion was made to adjourn meeting and was seconded.

Future Meetings:

1994, 09/24-09/28	Milwaukee, WI
1995, 04/23-04/26	Kansas City, MO
1995, 11/05-11/09	Boston, MA
1996, Spring	San Francisco, CA

DATE: 03-11-94

STATUS REPORT ON STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE
ATTACHMENT 1

SUBCOMMITTEE: DRY-TYPE TRANSFORMERS / CHAIRPERSON: W. PATTERSON / PHONE: (703)688-3325 / FAX: (703)688-4588

STANDARD NO. PROJECT NO.	TITLE OF DOCUMENT WORKING GROUP	WG CHAIRPERSON	IF CHAIRPERSON	COMMITTEES REQUESTING COORDINATION PUB_DATE PAR_DATE REV_DUE_YEAR	WG_PHONE	LATEST STATUS COMMENTS
C57.124	RECOMMENDED PRACTICE FOR THE DETECTION OF PD AND THE MEASUREMENT OF APPARENT CHARGE IN DRY-TYPE TRANSFORMERS	NONE				PUBLISHED 1992
PC57.124	DRY TYPE DIELECTRIC PROBLEMS	KLINE A. D.		06-29-91 06-27-91	(404)762-1642	ANSI APPROVED 10/11/91
C57.12.01	GENERAL REQUIREMENTS FOR DRY-TYPE DIST. AND POWER TR INCL THOSE WITH SOLID CAST &/OR RESIN-ENCAPSULATED WINDINGS NOT SPECIFIED	JONATTI A.		02-02-89		ONE YEAR EXTENSION REQUESTED APP. BY SB 02/02/89
C57.12.50	REQ. FOR VENTILATED DRY-TYPE DISTRIBUTION TR, 1-500KVA, 3 PHASE, AND 15-500KVA, 3-PHASE HV 601-34500VOLTS, LV 120-600V	NONE ASSIGNED		06-12-89		COPYRIGHT NOT RELEASED REAFFIRMED 06/12/89
C57.12.51	REQ. FOR VENTILATED DRY-TYPE POWER TR, 501KVA & LARGER, 3 PHASE, WITH HV 601-34500V, LV 208Y/120 TO 4160 VOLTS	NONE ASSIGNED		06-12-89		COPYRIGHT NOT RELEASED REAFFIRM 06/12/89
C57.12.52	REQ. FOR SEALED DRY-TYPE POWER TRANSFORMERS, 501KVA & LARGER, 3 PHASE, WITH HV 601-34500V, LV 208Y/120 TO 4160 VOLTS	NONE ASSIGNED		06-12-89		COPYRIGHT NOT RELEASED REAFFIRMED 06/12/89
C57.12.55	CONFORMANCE STANDARD FOR TR- DRY-TYPE TRANSFORMERS USED IN UNIT INSTALLATIONS, INCL. UNIT SUBSTATIONS			04-07-86		COPYRIGHT NOT RELEASED BALLOT REAFFIRMATION
C57.12.56	TEST PROCEDURE FOR THERMAL EVALUATION OF INSULATION SYST FOR VENTILATED DRY-TYPE POWER & DISTRIBUTION TRANSFORMERS			08-27-84	(302)999-2225	REAFFIRMED BY SB 06/16/93 SUBMIT TO ANSI
PC57.12.56	THERMAL EVALUATION OF DRY-TYPE PROVOST R. L.			08-27-84		
C57.12.58	GUIDE FOR CONDUCTING TRANSIENT VOLTAGE ANALYSIS OF A DRY-TYPE TRANSFORMER COIL	IEC	IAS			PUBLISHED 1992
P745	DRY TYPE DIELECTRIC PROBLEMS	KLINE A. D.		06-27-91 06-28-78	(404)762-1642	ANSI APPROVED 10/11/91
C57.12.59	GUIDE FOR DRY-TYPE TRANSFORMER THROUGH-FAULT CURRENT DURATION			01-01-89 09-13-84		BALLOT FOR REAF. REQUESTED ANSI APPROVED 08/09/91
NONE	DRY-TYPE THRU FAULT DUR GUIDE	NONE				

8.0 Reports of Technical Subcommittees(cont'd)

DATE: 03-11-94

STATUS REPORT ON STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE
ATTACHMENT 1

SUBCOMMITTEE: DRY-TYPE TRANSFORMERS / CHAIRPERSON: W. PATTERSON / PHONE: (703)688-3325 / FAX: (703)688-4588

STANDARD NO. PROJECT NO.	TITLE OF DOCUMENT WORKING GROUP	MG CHAIRPERSON IF CHAIRPERSON	COMMITTEES REQUESTING COORDINATION PUB_DATE PAR_DATE REV_DUE_YEAR	MG_PHONE	LATEST STATUS COMMENTS
C57.12.60	TEST PROCEDURES FOR THERMAL EVALUATION OF INSULATION SYSTEMS FOR SOLID-CAST & RESIN ENCAP POWER & DIST TRANSFORMER	IAS	MEMA IEC 10-25-92 08-17-89	1994 (302)999-2225	APPROVED BY SB 10/25/92 BEING BALLOTTED IN C57
PC57.12.60	THERMAL EVALUATION OF DRY-TYPE PROVOST R. L.				
C57.12.91	TEST CODE FOR DRY-TYPE DISTRIBUTION AND POWER TRANSFORMERS	SPD EM	11-29-78 06-01-89	1984 (919)738-4251	BALLOT COMPLETE RESOLVING NEGATIVES
PC57.12.91	TEST CODE FOR DRY TYPE TR BARNARD D.				
C57.16	REQUIREMENTS FOR CURRENT LIMITING REACTORS	MEMA IAS T&D	09-19-58 03-21-91	1976 (416)298-8108	PREPARING DRAFT 6 INCLUDES ONLY DRY TYPE REACTOR
PC57.16	DRY TYPE REACTORS DUDLEY R.				
C57.21	REQUIREMENTS TERMINOLOGY, AND TEST CODE FOR SHUNT REACTORS RATED OVER 500KVA				COMPLETE
PC57.21	DRY TYPE REACTORS DUDLEY R.		04-02-91	1995 (416)298-8108	ANSI APPROVED 08/09/91
C57.94	RECOMMENDED PRACTICE FOR INSTALLATION, APPLICATION, OPERATION & MAINTENANCE OF DRY-TYPE GEN PURPOSE DIST & POWER TR				PUB. 1982, REAFFIRMED 1987
NONE	APPLICATION OF DRY-TYPE TR		12-09-87	1987	BALLOTTING REAFFIRMATION
C57.96	GUIDE FOR LOADING DRY-TYPE DISTRIBUTION AND POWER TRANSFORMERS	SCC14	04-26-89 04-26-89	1994 (706)291-3166	MUST REAF. OR REV. BY DEC 94
NONE	GUIDE FOR LOADING DRY-TYPE TR PIERCE L.				
C57.96	GUIDE FOR LOADING DRY-TYPE DISTRIBUTION AND POWER TRANSFORMERS	T&D SCC14 SCC10	04-26-89 05-06-91	1994 (706)291-3166	INCRP CAST COIL IN C57.96 COMPLETE BY 10/93
PC57.96	CAST COIL LOADING GUIDE PIERCE L.				
IEEE 259	TEST PROCEDURE FOR EVALUATION OF SYSTEMS OF INSULATION FOR SPECIALTY TRANSFORMERS				TO SUBMIT TO REVCOM
P259	SPECIALTY TRANSFORMERS SIMPSON R. W. JR.		06-22-72 09-26-91	1979 (603)284-4362	LIFE EXTENDED TO 12/92 100%

COORDINATION ACTIVITY OF DRY TYPE SUBCOMMITTEE AS PER: 03-11-94

PROJECT NO. DATE	TITLE PES COMMITTEE	CONTACT PHONE NO.	TRANSFORMER COMMITTEE COORDINATOR	TRANSFORMERS COMMITTEE SUBCOMMITTEE	COORDINATOR PHONE NO.
*P1303 01-10-92	GUIDE FOR STATIC VAR COMPENSATOR FIELD TESTS SUBS	PHILIP R. NANNERY 914-577-2591	R. F. DUDLEY	DRY TYPE	416-298-8108

8.6 HVDC Converter Transformers & Reactors - W. N. KENNEDY

Meeting Minutes - Addison, TX - March 22, 1994

8.6.1 Introduction

Subcommittee Chair Bill Kennedy opened the meeting at 3:30 PM. An attendance list was routed around the group.

The following guest requested working group membership on the attendance list:

Pete Iijima Bonneville Power Administration Portland, OR

8.6.2 PC57.129/D7 General Requirements and Test Code for Oil-Immersed Converter Transformers for DC Power Transmission

Eighteen ballots were mailed to members of the subcommittee. Fifteen ballots (83%) were returned by subcommittee members with the following results:

Affirmative	12
Negative	3
Total	15

The summary of ballot comments is attached. The negative ballot comments were discussed in the meeting. The content of the comments is summarized in the discussion below. See the ballot summary for the full text of the comments. The comments are followed by the resolution discussed in the meeting. Editorial comments were not discussed in the meeting but will be addressed by the chair in preparation of the next draft.

Section 6 Rating Data

6.10 Total Losses

- Page 15: This section should be broken up into three parts dealing with no-load losses, load losses and harmonic corrections for the temperature rise test. (Negative Ballot #2)
- Page 15: The 4th sentence has to be changed, because the load losses are not measured using the rated transformer voltage. Simply delete the voltage. (Negative Ballot #3)

This section will be rewritten to break up the discussion of losses as suggested by #2. This will also resolve #3. The rated current will be as defined in 6.5.

6.11.2 DC-Side Windings of Converter Transformers

- Page 19 Last Paragraph: Because of the wide tap changer range on converter transformers, extra insulation is required on the dc side if switching surge testing on the extreme ac side taps is required. This results in extra cost for the converter transformer without any added benefit under service conditions. Switching surge testing should only

8.0 Reports of Technical Subcommittees(cont'd)

be required on the ac side tap that results in dc side stress closest to the rated dc side switching surge level. (Negative Ballot #1)

The subcommittee agreed to accept the proposed change. It was pointed out in discussion that dc-side margins are usually smaller than ac side margins. The worst case for this situation is a low voltage ac-side and a high voltage dc-side (i.e. 230 kV ac system and 500 kV dc system).

6.11.7 DC Polarity Reversal Test with Partial Discharge Measurements

- Page 21: Change the second sentence following equation 2 to require that polarity reversals be completed without delay and not to exceed one minute. (Negative Ballot #2)

"Without delay" will be added, but the not to exceed time will be left as two minutes.

Section 9 Test Code

9.6 Impedance and Load Losses

- Pages 27-29: Should test currents for guaranteed losses be based on the rated nameplate of the transformer or the transformer current under the rated conditions of the converter terminal since converter transformers are usually purchased as component of a terminal? (Negative Ballot #2)

The subcommittee decided that the current practice of specifying transformer losses at nameplate rating is the appropriate approach. Any losses at other conditions can be calculated or measured as a special test agreed to by the manufacturer and purchaser.

9.7.4.4 Failure Detection

- Page 33: Concerned that 30 Pulses in 30 minutes is less severe than 10 pulses in the last 10 minutes. Recommends less than 10 pulses in any 10 minute period. (Negative Ballot #2)

The subcommittee decided to use a dual requirement of not more than 30 pulses in the last 30 minutes and not more than 10 pulses in the last 10 minutes.

9.7.5.3 Failure Detection

- Page 34: Concerned that 29 Pulses in 29 minutes is less severe than 10 pulses in the last 10 minutes. Recommends less than 10 pulses in any 10 minute period. (Negative Ballot #2)

The subcommittee decided to use a dual requirement of not more than 29 pulses in the last 29 minutes and not more than 10 pulses in the last 10 minutes.

- Page 34: Pulses must be counted during the first minute after the polarity reversal because much damage can be done to the equipment during this time. (Negative Ballot #3)

8.0 Reports of Technical Subcommittees(cont'd)

This comment appears reasonable. Olof Heyman will check with the converter transformer designers at ABB Ludvika and report to the subcommittee chair. If they are in agreement with this comment, it will be included in the next draft. If they are not in agreement, the chair will attempt resolution by letter before the next subcommittee meeting.

The goal of the subcommittee chair is to go to transformers committee ballot with the next draft of this standard.

8.6.3 P1277/D3 General Requirements and Test Code for Dry-Type and Oil-Immersed smoothing Reactors for DC Power Transmission

The subcommittee chair requested that members read this draft before the next meeting and be prepared to comment on it.

8.6.4 PC57.19.03 General Requirements and Test Code for Bushings for DC Application

Mr. Olof Heyman, the chair of the Working Group on Bushings for DC Applications, was given approval to include the Subcommittee along with the Bushing Subcommittee and the Working Group on Bushings for DC Applications in a joint ballot of the next draft of this proposed standard.

Respectfully Submitted,
William Kennedy, Subcommittee Chair

8.0 Reports of Technical Subcommittees(cont'd)

DATE: 03-11-94

STATUS REPORT ON STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE
ATTACHMENT 1

SUBCOMMITTEE: HVDC CONVERTER TR & REACTOR / CHAIRPERSON: W. M. KENNEDY / PHONE: (317)286-9387 / FAX: (317)286-9549

STANDARD NO. PROJECT NO.	TITLE OF DOCUMENT WORKING GROUP	WG CHAIRPERSON	IF CHAIRPERSON	COMMITTEES REQUESTING COORDINATION PUB_DATE PAR_DATE REV_DUE_YEAR	WG_PHONE	LATEST STATUS COMMENTS
C57.129	GENERAL REQUIREMENTS & TEST CODE FOR OIL-IMMERSED HVDC CONVERTER TRANSFORMERS AND SMOOTHING REACTORS FOR DC POWER TRANSMISSION	KENNEDY W. M.		EM T&D PSIM SUB 09-26-91 0 (317)286-9387		BALLOTING 07 IN SUBCOM. BALLOT CLOSING MARCH 1, 1994
IEEE1277	GENERAL REQUIREMENTS & TEST CODE FOR OIL-IMMERSED AND DRY-TYPE HVDC SMOOTHING REACTORS			SUB 09-25-91 0		FIRST TF MEETING TOOK PLACE PAR APPROVED 09/26/91

COORDINATION ACTIVITY OF HVDC CONV. TR & SMOOTHING REAC SUBCOMMITTEE AS PER: 03-11-94

*PROJECT NO. DATE	TITLE PES COMMITTEE	CONTACT PHONE NO.	TRANSFORMER COMMITTEE COORDINATOR	TRANSFORMERS COMMITTEE SUBCOMMITTEE	COORDINATOR PHONE NO.
*P1030.3 08-19-91	GUIDE FOR SPECIFICATION OF HVDC PERFORMANCE - PART III, DYNAMIC PERFORMANCE	CLIFFORD C. DIERHOUD 503-222-2109	WILLIAM M. KENNEDY	HVDC CONV. TR & SMOOTHING REAC	317-286-9387

8.0 Reports of Technical Subcommittees(cont'd)

8.7 Instrument Transformers - J. E. Smith

March 22, 1994, Dallas, Texas

The Subcommittee meeting was open at 8:00 a.m. by Chair Jim Smith. Twelve members and nine guests attended.

The minutes of the March 22, 1993 meeting at the Tradewinds in St. Petersburg, Florida were approved as written.

The following announcements were made:

The Fall meeting will be held September 24 to September 28 in Milwaukee, WI.

Future Meetings

March 23 - 26, 1995 Kansas City, MO.

November 5 - 9, 1995 Boston, MA.

Spring, 1996 San Francisco, CA.

8.7.1 Status Reports

C57.13 to be available in April, 1994.

Three pars have been sent to the Administrative Subcommittee for approval.

8.7.2 Old Business:

Joe Ma reported that the working group for Test Requirements For HV Instrument Transformer is developing values for Power Factor measurements.

8.7.3 New Business:

Mr. Vadim Raff, Mr. Joe Ma and Mr. Vladimir Khalin agreed to compare the IEC Standards to the ANSI Standard.

Two new working groups were setup.

Working Group on C57.13 Revision with the following members:

Tom Nelson, Chair

Chris TenHaagen

Loren Wagenaar

Vladimir Khalin

Vadim Raff

8.0 Reports of Technical Subcommittees(cont'd)

Working Group on Instrument Transformers Used with Electronic Meters and Relays with the following members:

**Chris TenHaagen, Chair
Ross McTaggart
Vadim Raff
Jim Smith**

It was agreed to hold the three working groups and the subcommittee meeting on the same day. The Working Group on Test Requirements for High Voltage Instrument Transformers will meet from 8:00 am to 10:45 am. The Working Group on C57.13 Revision will meet from 10:55 am to 12:10 pm. The Working Group on Instrument Transformers Used with Electronic Meters and Relays will meet from 2:00 pm to 3:15 pm. The Instrument Transformer Subcommittee will meet from 3:30 pm to 4:45 pm.

Meeting adjourned at 9:30 am

8.0 Reports of Technical Subcommittees(cont'd)

DATE: 03-11-94

STATUS REPORT ON STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE
ATTACHMENT 1

SUBCOMMITTEE: INSTRUMENT TRANSFORMERS / CHAIRPERSON: J. E. SMITH / PHONE: (919)827-2121 / FAX: (919)827-2121

STANDARD NO. PROJECT NO.	TITLE OF DOCUMENT WORKING GROUP	WG CHAIRPERSON	IF CHAIRPERSON	COMMITTEES REQUESTING COORDINATION PUB_DATE PAR_DATE REV_DUE_YEAR	WG_PHONE	LATEST STATUS COMMENTS
C57.13 P546	REQUIREMENTS FOR INSTRUMENT TRANSFORMERS SUBCOMMITTEE	PSM	PSR	SPD 03-30-78 05-29-80 1992		WAITING ANSI APPROVAL APPROVED BY SB 06/16/93
C57.13.1 NONE	GUIDE FOR FIELD TESTING OF RELAYING CURRENT TRANSFORMERS SUBCOMMITTEE			08-25-87 - - 1992		APPROVED BY ANSI 12/02/92 REAFFIRMED 03/18/92
C57.13.2 NONE	CONFORMANCE TEST PROCEDURES FOR INSTRUMENT TRANSFORMERS SUBCOMMITTEE			04-16-86 09-26-91 1996		PUBLISHED 1992 RECOGNIZED BY ANSI 12/23/92
C57.13.3 NONE	GUIDE FOR THE GROUNDING OF INSTRUMENT TR SECONDARY CIRCUITS AND CASES SUBCOMMITTEE			01-23-87 - - 1991		TRANSFER FROM PSRC COMMITTEE
C57.13.4 P832	DETECTION OF PARTIAL DISCHARGE AND MEASUREMENT OF APPARENT CHARGE WITHIN INSTRUMENT TRANSFORMERS	JONNATTI A. J.	T&D	- - 05-28-80 0 (813)785-2788		D6 BEING BALLOTTED IN TC RESOLVING 3 NEGATIVES

COORDINATION ACTIVITY OF INSTRUMENT TRANSFORMERS SUBCOMMITTEE AS PER: 03-11-94

*PROJECT NO. DATE	TITLE PES COMMITTEE	CONTACT PHONE NO.	COORDINATOR SUBCOMMITTEE	TRANSFORMERS COMMITTEE SUBCOMMITTEE	COORDINATOR PHONE NO.
*PC37.97 12-10-87	GUIDE FOR PROTECTIVE RELAY APPLICATION TO POWER SYSTEM BUSES PSR	505-848-2642	JOHN N. DAVIS	INSTRUMENT TRANSFORMERS	404-393-9831
*PC37.110 05-31-90	GUIDE FOR THE APPLICATION OF CURRENT TRANSFORMERS USED FOR PROTECTIVE RELAYING PURPOSES PSR	312-255-5760	JOHN N. DAVIS	INSTRUMENT TRANSFORMERS	404-393-9831
*PC37.13.1 -	GUIDE FOR FIELD TESTING OF RELAYING CURRENT TRANSFORMERS PSR	414-221-2750	JOHN N. DAVIS	INSTRUMENT TRANSFORMERS	404-393-9831
*P1304 01-31-92	CURRENT MEASURING SYSTEMS WHICH USE OPTICAL TECHNIQUES PSM	613-990-5826	J. N. DAVIS	INSTRUMENT TRANSFORMERS	404-393-9831

8.8 Insulating Fluids - F. J. Gryzkiewicz

The Insulating Fluids Subcommittee met in Dallas, Texas on Monday, March 21 and Tuesday, March 22, 1994 with 22 members and 28 guests in attendance. Of the 28 guests in attendance, 10 requested membership on the Subcommittee.

The Minutes of the meeting held in St. Petersburg, Florida (November 1 and 2, 1993) were approved as submitted.

8.8.1 Current Subcommittee Projects:

8.8.1.1 C57.130 - Trial Use Guide for the Use of Dissolved Gas Analysis During Factory Thermal Tests for the Evaluation of Oil Immersed Transformers and Reactors

Draft 7 was reviewed by the Working Group on Monday, March 21. Previously, difficulties were encountered when limits for the individual combustible gases were discussed. As a result, Draft 7 incorporated a gas generation rate procedure currently used by the Canadian Electric Association (CEA) which was derived from IEC Standard 1181 dated 1993.

Draft 8 will be prepared and balloted by the Subcommittee prior to the next meeting in Milwaukee.

8.8.1.2 P1258 - Guide for the Interpretation of Gases Generated in Silicone-Immersed Transformers

Draft 4 was reviewed by the Working Group on Tuesday, March 22. Numerous changes were recommended. Draft 5 will be prepared and balloted by the Subcommittee prior to the next meeting in Milwaukee.

Although the Working Group has DGA data for silicone-immersed transformers, it was pointed out that very little (or none) exists for units which have failed. In view of this, the Working Group is considering to change the status of this as a Guide to a publication entitled Emerging Practices and Technology (a new entity just conceived by IEEE Headquarters).

8.8.2 Other Business

At our last meeting in St. Petersburg, the Subcommittee requested that the Chair contact the National Institute of Standards and Technology (NIST) and ASTM Committee D 27 for assistance with developing a gas-in-oil standard and improved extraction procedures for both mineral oil and silicone fluid. To date, we have not received replies to our letters. The Chair will present a status report at our next meeting in Milwaukee.

At the last meeting in St. Petersburg, the Subcommittee voted to reaffirm the following Guides:

- A. C57.111 - Guide for Acceptance of Silicone Insulating Fluid and its Maintenance in Transformers
- B. C57.121 - Guide for Acceptance and Maintenance of Less Flammable Hydrocarbon Fluid in Transformers

8.0 Reports of Technical Subcommittees(cont'd)

These Guides were also balloted at the Main Committee level. The results were not available until after our meeting and are as follows:

A. C57.111 - Silicone Guide

143 Eligible
115 Affirmative
0 Negative
6 Abstentions for 84% Response

B. C57.121 - Hydrocarbon Guide

143 Eligible
108 Affirmative
2 Negative
8 Abstentions for 82% Response

The negatives will be resolved and minor editorial changes made. We will then request approval by the Standards Board.

8.8.2.1 Water-in-Oil and Water-in-Paper Insulation

The Subcommittee currently has a Task Force looking into water-in-oil and water-in-paper insulation. This Task Force, which is Chaired by Frank Heinrichs, met on Tuesday morning, March 22.

At the meeting, Harold Moore presented a discussion on the dynamics of water-in-oil and water-in-paper and the effect of temperature on each. There was also a considerable amount of floor discussion. The Task Force will prepare a bibliography of papers dealing with these subjects prior to the next meeting in Milwaukee. This material will be reviewed a course of action will be adopted by the Subcommittee.

Frank J. Gryszkiewicz, Chair
Gene Kallaur, Secretary

8.0 Reports of Technical Subcommittees(cont'd)

DATE: 03-11-94

STATUS REPORT ON STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE
ATTACHMENT 1

SUBCOMMITTEE: INSULATING FLUIDS / CHAIRPERSON: F. GRYSZKIEWICZ / PHONE: (617)926-4900 / FAX: (617)926-0528

STANDARD NO. PROJECT NO.	TITLE OF DOCUMENT WORKING GROUP	WG CHAIRPERSON	IF CHAIRPERSON	COMMITTEES REQUESTING COORDINATION PUB_DATE PAR_DATE REV_DUE_YEAR	WG_PHONE	LATEST STATUS COMMENTS
C57.104 P57.104	GUIDE FOR THE DETECTION AND DETERMINATION OF GENERATED GAS IN OIL-IMMERSED TRANSFORMERS & THEIR RELATION TO SERVICEABILITY. HEINRICH F. W.	PSR T&D		06-07-92 05-31-90 1996	(412)941-6924	STARTED REVISING PUBLISHED 1992
C57.106 P57.106	GUIDE FOR ACCEPTANCE AND MAINTENANCE OF INSULATING OIL IN EQUIPMENT SUBCOMMITTEE	NONE		11-20-91 06-19-86 1995		PUBLISHED 1992 ANSI APPROVED 11/20/91
C57.111 NONE	GUIDE FOR ACCEPTANCE OF SILICONE INSULATING FLUID AND ITS MAINTENANCE IN TRANSFORMERS SUBCOMMITTEE	IAS T&D ED&PG IEC		02-02-89 12-10-87 1994		BALLOTING REAF. IN MAIN COMM. BALLOT CLOSES MARCH 25, 1994
C57.121 P954	GUIDE FOR ACCEPTANCE AND MAINTENANCE OF LESS FLAMMABLE HYDROCARBON FLUID IN TRANSFORMERS SUBCOMMITTEE	PSRC T&D IAS IEC		02-22-88 04-12-82 1994		BALLOTING REAF. IN MAIN COMM. BALLOT CLOSES MARCH 25, 1994
C57.130 P57.130	GUIDE FOR USE OF DISSOLVED GAS ANALYSIS DURING FACTORY THERMAL TESTS FOR THE EVALUATION OF OIL-IMMERSED TRANS. AND REACT. GAS ANALYSIS DURING FACT. TESTS KINNEY J. P. HEINRICH F. W.	NONE		03-17-93 0	(706)291-3163	NEW PAR APP. BY SB 03/17/93 CHANGE IN TITLE AND SCOPE
IEEE 637 P637	GUIDE FOR THE RECLAMATION OF INSULATING OIL AND CRITERIA FOR ITS USE SUBCOMMITTEE	06-04-84		1997		REAFFIRMED 03/18/92
IEEE 799 P799	GUIDE FOR HANDLING AND DISPOSING OF ASKARELS SUBCOMMITTEE	EIS IAC T&D		11-17-86 09-27-79 1997		REAFFIRMED 03/18/92
IEEE1258 P1258	GUIDE FOR INTERPRETATION OF GASES IN SILICONE LIQUID-FILLED TRANSFORMERS GUIDE FOR GAS ANALYSIS-SILICON GUIDIE JIM	T&D SCC14		12-05-91 0	(517)496-6826	PAR APPROVED BY SB 12/05/91 PREPARING D02

COORDINATION ACTIVITY OF INSULATING FLUIDS SUBCOMMITTEE AS PER: 03-11-94

PROJECT NO. DATE	TITLE PES COMMITTEE	CONTACT PHONE NO.	TRANSFORMER COMMITTEE COORDINATOR	TRANSFORMERS COMMITTEE SUBCOMMITTEE	COORDINATOR PHONE NO.
*P980 06-15-92	GUIDE FOR THE CONTAINMENT AND CONTROL OF OIL-SPILLS IN SUBSTATIONS SUBS	RICHARD G. COTTRELL 517-788-0817	F. GRYSZKIEWICZ	INSULATING FLUIDS	617-926-4900

8.0 Reports of Technical Subcommittees(cont'd)

8.9 Insulation Life - L. W. Pierce

The Insulation Life Subcommittee met on Tuesday March 22, 1994 at the Grand Kempinski Hotel, Dallas, Texas with 31 members and 32 guests in attendance. The minutes of the November 2, 1993 meeting in St. Petersburg Beach, Florida were approved as written. Michael Franchek was added as a subcommittee member.

The reports from the 4 Working Groups and 4 Task Force were then given.

8.9.1 Working Group on Guides for Loading, L. W. Pierce, Chair

The Chair of the Working Group on Guides for Loading, reported that they met on Monday March 21 with 33 Members and 29 Guests in attendance. The minutes of the Nov. 1, 1993 meeting in St. Petersburg Beach, Florida were approved.

Balloting of the Transformers Committee of Draft 11.2 of the Loading Guide was completed by the IEEE Standards Board. Ballot results were as follows:

Mailed	164 with 144 eligible to vote
Returned	129 (89%, met required 75 % return)
abstained	7
Affirmative	118 (96 % of those voting)
Negative	4

Negative ballots were reviewed as follows:

1. Frank Heinrichs. The reason pertained to one paragraph. Frank proposed a new paragraph to replace the one in the Loading Guide. This was adopted by the Working Group.
2. Two negative ballots were received from Fred Elliott and Loren Wagenaar and pertained to the set of symbols used in the Guide. In 1988 a task Force agreed on a set of thermal symbols to be used in transformer loading guides and associated guides. This system of symbols is being used for the Bushing Application and Loading Guide and the two negative voters believed that the system should be used in the Transformer Loading Guide also. Briefly the 1988 symbols were.

time	t
temperature, °C	θ
temperature rise	$\Delta\theta$

with a set of subscripts.

In developing an alternate system of loading equations described in Annex G of the draft loading guide the Chair needed more symbols than used in the 1988 list and also used symbols in common use in heat transfer literature. The symbols in the other sections were also changed to conform to this system.

8.0 Reports of Technical Subcommittees(cont'd)

The system of symbols used in Draft 11.2 was:

time	t
temperature, °C	T
temperature rise over ambient	⊕
temperature difference	ΔT

The IEEE standards manual requires that the symbols conform to IEEE Std. 280-1985 (Reaffirmed 1991) "IEEE Standard Letter Symbols for Quantities Used in Electrical Science and Electrical Engineering". This document requires a consistent set of symbols within a document.

Symbols use required of this standard are:

time	t
absolute temperature, K	T...⊕
Celsius temperature, °C	t...θ

When two symbols are separated by three dots the second is a reserve symbol and is to be used only when there is specific need to avoid conflict. Many of our transformer committee documents have time as a quantity and t is used. Thus t cannot be used for Celsius Temperature. For Celsius temperature IEEE 280 gives two choices t and θ. IEEE 280 also states that when conflicts occur because different quantities are assigned identical symbols in the symbols lists than one method of resolving the conflict is by use of uppercase letters as variants for lower case letters and vice versa, but only if no ambiguity results. Thus T (uppercase) could be selected for temperature Celsius which was used in C57.12.00-1993 and C57.12.90-1993. Then the symbol θ may be used for temperature rise over ambient and this is the second choice from the symbol table for temperature in Celsius. For temperature differences within the transformer (i.e. bushing hot spot rise over top oil) then ΔT is used with appropriate subscripts.

Another choice for Celsius temperature per IEEE 280 is θ. It should be noted that there are differences between the lower case θ and the upper case ⊕. The Chair was willing to change the symbols in the loading guide to conform to those used in other loading documents but this might generate negative ballots by others because T for temperature is used in the 1993 General Requirements and 1993 Test Code. The choices are,

	<u>Choice 1</u>	<u>Choice 2</u>
temperature, °C	T	θ
temperature rise over ambient	θ	Δθ
temperature difference	ΔT	Δθ

Since several other documents are involved this was reviewed at the Administrative Subcommittee that night. Choice 2 was selected because it more closely conforms to IEC practice.

The last negative ballot was from Bob Grubb. Many of the comments were editorial and the negative ballot will be resolved by adopting the changes. One issue involved terminology in the paragraph and equation for calculating duct oil rise for non-directed forced oil units in Annex G,

8.0 Reports of Technical Subcommittees(cont'd)

Alternate Temperature Calculations. Proposed wording changes were proposed by the Chair and adopted by the Working Group and were acceptable to Bob Grubb.

The voting members of the Transformers Committee will receive notification of the changes to resolve the negative ballots with a form they can submit if they wish to change their affirmative ballot due to these changes. If acceptable the revised draft will be submitted to the IEEE Standards Board.

A letter from L. B. Wagenaar on Loading of Draw Lead Bushings was mailed to the membership. This issue will not be included in the present Loading Guide but will be investigated further in the Bushing and/or Insulation Life Subcommittee Working Groups or Task Forces.

A one time Task Force was created at the last meeting to investigate top oil temperature rise limits. The report follows:

8.9.1.1 Task Force on Top Oil Rise - Tom Traub

The Task Force on Top Oil Rise met at 3:00 P. M. on Sunday, March 20, 1994 with 9 members and 11 guests in attendance. The Chair explained that the Task Force was formed to investigate the reasons for IEC having a top oil temperature limit of 115 °C for power and distribution transformers while the IEEE limit is 110 °C for power transformers and 120 °C for distribution transformers, and to attempt to reconcile the differences.

A review was made of the potential consequences of increasing the 110 °C limit to something higher, either 115 °C or 120 °C. To determine these consequences, potential problems with ancillary equipment, such as bushings, current transformers, load tap changers and the oil itself would have to be investigated.

It was pointed out that the Guide for Loading Mineral Oil Immersed Transformers (C57.91) and the Guide for Application of Power Apparatus Bushings (C57.12.100) are moving through the balloting process at the Transformer Committee level, and that a change in the recommended top oil temperature limit at this time would likely generate negative ballots.

After further discussion, it was agreed that the Task Force Chair would do the following:

- Contact IEC to determine the basis for the 115 °C top oil limit.
- Inform by letter the Chairs of the Subcommittees on Bushings, Instrument Transformers, and Insulating Fluids that an increase in the recommended top oil temperature limit is being considered, and to request their comments.

The Task Force meeting adjourned at 3:45.

8.9.2 Working Group on Thermal Tests - R. L. Grubb, Chair, D. L Fallon Secretary

The second report was given by Bob Grubb, Chair of the Working Group on Thermal Tests. They met at 1:20 PM on March 21, 1994 with 20 members, 3 member representatives, and 7 guests in attendance. Frank David of Schneider Canada requested membership and was welcomed to the

8.0 Reports of Technical Subcommittees(cont'd)

Working Group. After the normal introductions, the minutes of the previous meeting in St. Petersburg Beach were approved as mailed.

The first order of business was a status report and discussion of Project P838/ANSI PC57.119, "Recommended Procedures for Performing Temperature Rise Tests on Oil Immersed Power Transformers at Loads Beyond Nameplate Rating". Chair Bob Grubb indicated that the large number of editorial comments and difficulty in finding available time had prevented completion of Draft 13 prior to this meeting. He also noted that in the interim his company, Magnetek, had performed several temperature rise tests using the recommended procedure of this document. Together with Potomac Electric, a joint paper reviewing the results of some of these tests has been approved by the IEEE for the Summer Power Meeting. Among the conclusions discussed in the paper, related to these particular tests were:

- a) The time required to perform the test did not seem unreasonable (about 28 hours).
- b) Dissolved gas analysis (which had been included because of comments on an earlier draft), did not provide any indication of difficulty during the overload tests.
- c) Whether cooling fans were running or not during resistance measurement had little impact on the average winding rise calculation.
- d) The tests showed that the calculated temperature rises using experimentally determined values of "n" and "m" were reasonably accurate, and temperature rises calculated with standard values of "n" and "m" to be conservative.

The Chair will continue efforts to incorporate the changes necessary from comments to the ballot of Draft 12, and will work towards sending out a ballot of Draft 13 (listing only the changes from Draft 12, which had a successful ballot) within the next two months. The ballot will be at the Transformer Committee level.

8.9.2.1 Project PC57.12.00L Definition of Thermal Duplicate - Chair Barry Beaster.

The meeting of the Task Force on Definition of Thermal Duplicate opened at 10:55 AM on March 21, 1994. The meeting was attended by 7 members and 20 guests. Requests for membership were received from George Henry of Central Moloney and Felipe Weffer of Commonwealth Edison. The Task Force met again using available time during the Thermal Tests Working Group time slot. On the most recent ballot mailed to eight members six were returned with four negative, one approved with comment and one approved. The negative ballots were discussed and suggestions on possible modifications for the next draft. A summary of the discussions is as follows:

- 1) In table 16 of C57.12.00 changes should be made to include only those selections where a thermal tests is to be made, not to specify when calculations can be permitted.
- 2) Specific points are to be identified where calculated versus test data can be used, and under what circumstances.

8.0 Reports of Technical Subcommittees(cont'd)

- 3) The first use of the term "coils" should be eliminated and substituted with the term "windings". This implies the entire winding system is included in the description of a winding.
- 4) Equations 8.7.1 and 8.7.2 were discussed to determine whether the external cooling dissipation rate and measured thermal losses effectively canceled out, leaving a unity multiplier. Proposed alternatives by Linden Pierce will be examined with numerical examples and presented to the Task Force Membership in the next ballot.
- 5) Discussion was held on the significance of the exponents "n" and "m" in equations 8.7.1 and 8.7.2. A sensitivity analysis on the impact of these exponents will be undertaken to judge their importance to accuracy.
- 6) Discussion started on the thermal characteristics identified in Table 8 of Draft 2. The first several basic characteristics were accepted without comment, but considerable discussion was forthcoming on the "pumps/Fans (Size/Rating)" characteristic. The concerns were focused on whether the net effect of pumps and fans should be used or whether the specific effects of individual factors such as oil flow rates and air flow rates need to be included.
- 7) A question was raised whether the MVA categories of the table referred to base rating or maximum nameplate rating. After discussion, the consensus was that it should apply to the OA or base rating (in the case of single rated FOA transformers, it was noted that the rating is both the base and maximum rating).
- 8) In line 10, the term "winding" will be added. The thermal characteristic will now "HV, LV, and TV winding Insulation Level (BIL)". Tolerance will be Plus or minus one BIL level.
- 9) Considerable discussion then proceeded on the issue of whether thermal test loss tolerances should be for calculated or tested losses. The text clearly points out that measured, or tested, losses are to be used. The concern expressed was that this would create difficulty in determining during the proposal stage whether costs for thermal tests should be included. That difficulty was understood, but it was pointed out that users would most likely require a test if the tested losses were out of tolerance, regardless of whether the calculated losses were in tolerance or not. The consensus of the group was to leave the tolerance in terms of tested losses, but to increase the tolerance for 100 MVA and up to plus or minus 15 % as a form of compromise.
- 10) There was a question raised regarding the intent of the Task Force work, as it appeared to one attendee that the Table 8 tolerances were so restrictive as to require thermal tests on anything except exact duplicate designs. It was pointed out that the intent rather was to uniformly define the means of determining whether calculations can be made from a transformer with similar thermal characteristics, rather than rely on individual methods determined by each manufacturer. The effectiveness of this effort will be measured as it moves through the balloting process.

Draft 3 of the Definition of Thermal Duplicate will be prepared and submitted to the Task Force for ballot.

8.9.2.2 New Business

Linden Pierce brought up one item of new business related to the need for editorial revision of Section 11 of the Test Code C57.12.90. Revision of the test code should be ready for publication in 1998, and it was therefore suggested that serious effort should begin within the next year. The following individuals responded to a request for volunteers for a Task Force on revision of Section 11 of C57.12.90:

George Henry (Chair)
Javier Arteaga
Paulette Payne
Jin Sim
Subhash Tuli.

The Working Group meeting adjourned at 2:35 PM.

8.9.3 Task Force on Hottest Spot Temperature Rise Determinations - Don Platts, Chair

Due to the schedule, this Task Force met after the Thermal Test Working Group. The Task Force held its first meeting on Monday, March 21, 1994 with 13 members and 18 guests, 10 of whom requested membership.

The Chair began by reviewing the objective. In C57.12.00, there is a requirement that the limit for the hottest spot temperature rise is 80 °C for rated load. There is no explanation, however, of how it is to be determined. The Task Force function is to establish a recommendation, with justification, for establishing a preferred method, or methods, and to forward it to the Working Group for Thermal Tests.

The Chair asked the manufacturers how they presently comply with the requirement, and how they demonstrate it when asked. One response was that for large power units fiber optic sensors are used in a sample transformer and the test results are used to verify, or fine tune, the calculated values. Another stated that small units are usually verified by building a transformer equipped with sensors and thermocouples, and then performing type tests to develop or refine the calculation method. The tested transformer is then disposed of, making this an expensive procedure not suitable for production testing.

A member asked for clarification of the scope of the Task Force work. Specifically, would it include leads? During brief discussion, it was agreed that we must establish the hottest spot in contact with insulation on a current carrying component.

The Chair read a letter from Bill McNutt, who could not attend the meeting. He had reviewed the four methods of determining the hottest spot that were listed in the proposed procedure for temperature rise tests under overload conditions. His conclusions were that direct measurement, and then calculation using the manufacturer's thermal models, are the preferred methods. He included a CIGRE working group paper which showed that the multiplier used in the IEC method is a variable dependent on the winding design.

Ed Norton presented test results for two transformers built recently using fiber optic sensors to monitor temperatures. This led to discussion of loading practices, and of the hottest spot location and

8.0 Reports of Technical Subcommittees(cont'd)

temperature. The data showed that, for one unit, the hottest spot was in a lead, and that the simplest calculation methods for determining hottest spot rise as a multiplied factor of the average winding temperature rise is not highly accurate. Open discussion followed.

To conclude the meeting, the Chair asked for volunteers to document the major topics discussed.

Ed Norton will prepare a proposal for using direct measurement of the hottest spot in large power transformers, where the costs and benefits of the system are practical as the solution to meeting the requirements.

Bob Grubb will document the idea that by performing type tests on small power units and calculating temperatures for lower loss thermal duplicates, the requirement of being less than 80 °C rise can be met and demonstrated. This method will not necessarily provide an accurate hot spot temperature. Discussion of that concept led to the conclusion that some users who want to do dynamic loading will want highly accurate hot spot temperature data. Others will want reasonably accurate data for calculating loading capabilities, and a third group will be satisfied with the assurance that the hottest spot meets the requirement of the 80 °C limit. That discussion will be continued.

Harold Moore will expand upon the comments provided by Bill McNutt to document the minimum requirements for a manufacturer's thermal models used to demonstrate compliance with the limits when calculating the hottest spot temperature rise.

8.9.4 Working Group on Thermal Evaluation of Liquid Immersed Power & Distribution Transformers - Chuck McMillan, Acting Chair.

The working group met on Monday, March 21, 1994 with 5 members and 6 guests. The Chair of the Working Group, Larry Lowdermilk was unable to attend and Chuck McMillan served as Acting Chair.

The Working Group discussed results of the balloting of Draft 3 of the revised ANSI/IEEE Test Procedure for Thermal Evaluation of Liquid Immersed Distribution and power Transformers Project PC57.12.100.

The balloting participants were Insulation Life Subcommittee and the Thermal Evaluation Working Group. Two negative ballots and 2 conditionally affirmative with acceptance of comments were received.

The first negative ballot was from Jerry Corkran who noted that Section 11 titled "Test Results Clauses (2) and (3) stated that no failures of life tests should occur at less than five times the life expectancy indicated by the assumed relationship for distribution transformers, and two times for tests performed on power transformer models. For instance if you performed tests to qualify a new insulation to be used in the present 65 °C insulation system where the assumed minimum life expectancy is 180,000 hours (20 years) at rated 110 °C hottest spot temperatures you need only to have no failures on the test pieces at less than 5 times the life expectancy assumed extrapolating along the slope of the Arrhenius Curve anchored at the 180,000 hours at 110 °C if it is a distribution transformer tested, but only 2 times if you are testing a power transformer mode.

Jerry felt that the distribution transformer margin was excessive and should like the power transformer need only demonstrate the 2 to 1 ratio. However, the reason the lower 2 to 1 ratio was assigned for

8.0 Reports of Technical Subcommittees(cont'd)

power transformers was that the EPRI sponsored thermal evaluation tests of power transformer models only demonstrated a 2 to 1 ratio over the 180,000 hours because those tests in the early 1980's were based on meeting a 5 to 1 ratio to the existing life expectancy curve specified in ANSI/IEEE C57.92 Power Transformer Loading Guide.

The new C57.91 Loading Guide for Transformers (Distribution and Power) recommends the single minimum life expectancy of 180,000 hours at 110 °C for both distribution and power transformers. Therefore it was felt we should not require a margin for distribution transformers or power transformers that have not been demonstrated by test experience.

Jerry accepted this reasoning and changed his ballot to affirmative.

The other negative ballot arose from confusion over the "c" subscript on the Symbol for Celsius temperature of the hottest spot temperature in the Arrhenius equation for the life expectancy. The subscript was eliminated to avoid confusion.

The conditionally affirmative ballots were resolved by accepting the wording suggested by the voters.

The revised draft will next be balloted in the Transformer Committee.

8.9.5 Working Group on High Temperature Insulation for Liquid-Immersed Power Transformers Michael A. Franchek, Chair, David J. Woodcock, Acting Secretary.

The Working Group met at 9:30 AM on March 21, 1994 with 24 members and 28 guests present. Two guests requested membership, which increases the Working Group to 44 members.

The new Chair thanked the previous Chair Heinz Fischer for his work in the Working group and the IEEE Transformers Committee. Heinz has retired, but will be at the Fall meeting in Milwaukee.

After introductions, the minutes of the Nov. 1, 1993 meeting in St. Petersburg Beach, Florida were approved.

The Chair reported that the Working Group paper "Background Information on High Temperature Insulation for Liquid-Immersed Power Transformers" was presented at the 1994 IEEE Winter Power Meeting. Copies were distributed to the membership.

The Chair then reviewed Linden Pierce's discussion of the Background paper, as well as the Working Group's closure responding to his discussion. Each discussion point was read and discussed. As a result of this Working Group discussion, modifications will be made to the closure and then the closure will be voted on by the Working Group.

At the end of the closure comments dealing with item 1 of Linden's discussion, a sentence will be added which addresses the fact that the purpose of the background paper was to provide public information available at the time of the paper. A second sentence will point out that additional testing addressing aging of a hybrid system is underway, and that data will be given to the committee upon completion. The background paper includes information on this aging experiment in section D4.

8.0 Reports of Technical Subcommittees(cont'd)

The Chair agreed with Linden that the Table V is somewhat confusing, and that the table and the closure comments regarding it will be clarified.

The Chair thanked Linden Pierce for his work and comments on the Background Paper.

Voting on the closure was postponed until the modifications are completed.

The Chair reported that a second draft of "IEEE Guide for the Application of High Temperature Insulation Materials in Liquid-Immersed Power Transformers" was prepared and has been balloted by Working Group. Results were as follows:

Mailed	40
Returned	38
Approved	27
Approved with Comments	6
Not Approved	5

Three of these negative ballots were resolved. The Chair then reviewed the negative ballots, and the resolution of them, as follows:

1. Data in the guide should use aging of high temperature materials in oil, not air. This has been resolved, by incorporating data from the ESEERCO report, with their permission.
2. The guide needs a discussion on how to select the temperature limits for a new system and how to qualify new systems of high temperature materials. It was agreed to provide a draft of these items as a part of Draft 3. A Task Force will use C57.100 as a reference, and list within this guide the areas where testing will be different than this reference document.
3. The guide is not specific to aging of aramid materials in the discussion of off gassing. It was agreed to provide a draft proposal of a method for testing of high temperature materials, using C57.104 as a reference. This document will list the areas where the testing would be different than the reference document.
4. Wire enamel tests as presented in this guide based on the work in C57.100 appear to be in conflict with tests specified in NEMA MW-1000 and ASTM D2307. Discussion in the meeting suggested that the requirements listed in our guide (and C57.100) are appropriate, and will remain in the document.
5. Ratings of a transformer must be based on the temperature rises, not the maximum absolute temperatures. This negative will be resolved, and incorporated into Draft 3.
6. A comment regarding the use of the term "transformerboard" was discussed. Changes were made as a part of Draft 2, Revision 1, and these have resolved the negative.

The Working Group then discussed Draft 2, Revision 1, and the Chair solicited additional comments to be forwarded to him for inclusion in Draft 3. Draft 3 will be produced and balloted prior to the Milwaukee meeting.

8.0 Reports of Technical Subcommittees(cont'd)

It was the feeling of the Working Group, that it is important to get the Trial Use Guide completed and in use as soon as possible. There is a need for this document to be finalized, in order to gather information needed to help develop a future standard.

The meeting adjourned at 10:45 AM.

8.9.6 Task Force on Combined Effects of Thermal and Dielectric Stresses on Insulation Life - Mike Mitelman, Chair.

This Task Force did not meet. It will meet next on September 1994 in Milwaukee.

The Insulation Life Subcommittee meeting was then adjourned.

Respectfully Submitted by:
Linden W. Pierce
Insulation Life Subcommittee Chair

DATE: 03-11-94

STATUS REPORT ON STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE
ATTACHMENT 1

SUBCOMMITTEE: INSULATION LIFE / CHAIRPERSON: L. W. PIERCE / PHONE: (706)291-3166 / FAX: (706)291-3167

STANDARD NO. PROJECT NO.	TITLE OF DOCUMENT WORKING GROUP	WG CHAIRPERSON TF CHAIRPERSON	COMMITTEES REQUESTING COORDINATION PUB_DATE PAR_DATE REV_DUE_YEAR	WG_PHONE	LATEST STATUS COMMENTS
C57.100	TEST PROCEDURE FOR THERMAL EVALUATION OF OIL-IMMERSED DISTRIBUTION TRANSFORMERS		NPE EM T&D SPD		APPROVED BY ANSI 12/02/92
C57.100	THERMAL EVALUATION	LODERMILK L. A.	03-18-92 10-20-88 1997	(706)462-3113	REAFFIRMED 03/18/92
C57.115	GUIDE FOR LOADING MINERAL-OIL-IMMERSED POWER TRANSFORMERS RATED IN EXCESS OF 100MVA (65 C WINDING RISE)				BEING REVISED
P756	GUIDES FOR LOADING	PIERCE L. W.	03-21-91 - - 1996	(706)291-3166	ANSI APPROVED 01/13/92
C57.119	RECOMMENDED PRACTICE FOR PERFORMING TEMP. RISE TESTS ON OIL-IMMERSED POWER TRANSFORMER AT LOADS BEYOND MP RATING (P838)		SHGR SUBS SCC4 PSRC IAS EI		NEW PAR APPROVED 09/17/92
PC57.119	THERMAL TESTS	GRUBB R. L.	- - 09-17-92 0	(414)547-0121	REVISED PAR (TITLE & SCOPE)
C57.12.00	DEFINITION OF THERMAL DUPLICATE		EM IAS		
PC57.12.001	THERMAL TESTS	GRUBB R. L. R. L. GRUBB	- - 05-31-90 1997	(414)547-0121	
C57.91	GUIDE FOR LOADING MINERAL OIL-IMMERSED TRANSFORMERS		SUB T&D PSE		PUB. 1/12/81, REAFFIRMED 1991
PC57.91	GUIDES FOR LOADING	PIERCE L.	03-21-91 06-13-85 1997	(706)291-3166	APPROVED BY ANSI 01/13/92
C57.92	GUIDE FOR LOADING MINERAL OIL-IMMERSED POWER TRANSFORMERS UP TO & INCL 100 MVA WITH 55 C OR 65 C AVE. WINDING RISE		T&D SUB PSE		PUB. 1/12/81, REAFFIRMED 1991
PC57.91	GUIDES FOR LOADING	PIERCE L.	03-21-91 06-28-85 1997	(706)291-3166	TO BE COMBINED INTO C57.91
C57.95	GUIDE FOR LOADING LIQUID-IMMERSED STEP-VOLTAGE AND INDUCTION-VOLTAGE REGULATORS				PUB. 08/19/85, REAFFIRMED 1991
NONE	GUIDES FOR LOADING	TAKACH D. S.	03-21-91 - - 1997	(314)554-3097	BALLOT FOR REAF. REQUESTED
IEEE1276	TRIAL-USE GENERAL REQUIREMENTS FOR LIQUID-FILLED DISTRIBUTION AND POWER TR UTILIZING HIGH TEMP SOLID INSULATING MATERIAL		T&D		SUBMITTING PAR
P1276	HIGH TEMPERATURE INSULATION	FISCHER H.	- - 09-25-91 0	(802)740-8106	WILL CONDUCT SURVEY ON N1-T M.

8.0 Reports of Technical Subcommittees(cont'd)

8.10 Performance Characteristics - B. K. Patel

Dallas, Texas

8.10.1 Introduction/Attendance

The Performance Characteristics Subcommittee (PCS) met at 9:30 a.m. on Tuesday March 22, 1994 with 49 members and 34 guests present. The members included three new members who signed up at the meeting.

8.10.2 Approval of Meeting Minutes

The minutes of the November 2, 1993 PCS Meeting were approved as written.

8.10.3 Chair's Remarks

8.10.3.1 Administrative Subcommittee Notes

The following items of the discussion at the March 21, 1994 Administrative Subcommittee meeting were shared:

1. The next Transformers Committee meeting will be held in Milwaukee, WI at the Pfister Hotel on September 25 - 28, 1994. Shirish (Sam) Mehta will host the meeting.
2. PAR ceases when the Standard Board approves the final draft. Only one PAR is allowed per standard.
3. PAR scope statement must match the scope of the final document.
4. Harmonization with IEC documents is an IEEE's long term objective and not a mandate. Working Group (WG) chairmen need to keep this objective in mind in the formulation of new or revised document. Please use your judgment in its application.
5. IEEE staff will review the drafts balloted in the main committee for editorial/format conformance to the IEEE style manual. The review is intended to reduce delays during the Standards Board approval process. WG chairmen can request earlier review(s) prior to the balloting in the main committee if so desired.
6. West Coast Committee is planning to set up a new WG to prepare a guide on phase regulating transformers. The West Coast Utilities have several such transformers in operation and the guide is expected to provide needed guidance on application, specification, operation and maintenance of phase regulating transformers. Fewer manufactures for these transformers and limited available expertise were cited the main reasons for preparation of the guide.
7. The members were reminded of their obligations to attend meetings regularly and to participate actively.

8.0 Reports of Technical Subcommittees(cont'd)

8.10.3.2 Membership

D. E. Ayers (Smit), John Bosiger (ABB), R. L. Grunert (ERMG), and Subhash Tuli (Maynetek) were added to the roster. Membership now stands at 85.

8.10.4 Agenda Changes - None

8.10.5 Working Group Reports

8.10.5.1 Revision of C57.110 - R. P. (Rick) Marek

The meeting was held on Monday, March 21, 1994, at 2:50 p.m. in Dallas, TX with 20 members and 15 guests present.

The first order of business was the approval of the St. Petersburg, FL minutes. They were approved without comment.

The chair welcomed two new members, Jin Sim of Hevi-Duty Electric and Roger Hayes of Ferranti Packard.

The chair then asked the Task Force members to give a summary of the meetings that were held the previous day. Larry Kirchner gave the summary for the New Transformer Specification Task Force. This summary discussed whether C57.110 or C57.18.10 should have the calculations for harmonic losses. The decision was made that both groups will address this issue, so as not to delay any approval process. The work will be coordinated and at a later time, it will be determined where the harmonic calculations should reside. The second issue addressed, concerned the wording on the use of electrostatic shields. Currently the first draft implies that electrostatic shields should be used on all transformers designed for harmonic loading. It was suggested that the wording be changed so that all units would not require electrostatic shields.

Nigel McQuin gave a summary for the Test Procedure Task Force. There was a discussion whether average winding temperature rise by resistance is sufficient. Adding additional thermocouples was suggested. Also a discussion of core temperature rise and the option of adding some performance criteria was discussed. Electrical loading conditions were reviewed, and currently one testing method is suggested. It was stated that this would limit some manufacturers and may be a problem. Nigel requested that any other members who have alternative tests submit these methods for review. This will be discussed further in future task force meetings.

The third Task Force summary on Derating of Existing Transformers was given by Chuck Johnson. A request for manufacture's certified test reports for existing transformers was presented. This information would be used as examples of derating existing transformers. This Information will be collected by Mike Butkiewicz of American Power Technologies Inc. James Deffenbaugh submitted written comments to help clarify this section. His comments concerned simplifying the format to make the section easier to use. These comments will be reviewed and discussed by the Task Force. Don Kline suggested a model that would improve the estimates for eddy loss distribution for various types and sizes of transformers. The percent of eddy loss would be compared as a function of total stray losses. The data is to be taken from "normal" 60 Hz

8.0 Reports of Technical Subcommittees(cont'd)

transformers. A survey would be required to properly develop this model. Manufactures were requested to submit the following items for manufactured transformers:

- 1) Type of transformer (dry or liquid)
- 2) KVA
- 3) 1 phase or 3 phase
- 4) L.V. rating & H.V. rating
- 5) Total reported impedance losses
- 6) I^2R loss from test report
- 7) Stray Loss
- 8) Percent of coil eddy loss as a function of total stray loss, on the highest eddy loss winding.

The form will be created by Don Kline and the results from the manufacturers should be submitted to Mike Butkiewicz for analysis. It was also noted that examples of "real life" current harmonic profiles as well as the classical profiles should be included in this section for derating existing transformers.

A list of comments was submitted to the chair by Linden Pierce. These comments were distributed for review.

The meeting was then adjourned at 4:10 p.m.

8.10.5.2 Loss Tolerance and Measurement - W. R.(Bill) Henning

The WG on Loss Tolerances and Measurement met on Monday, March 21, 1994 at 9:30 a.m. with 19 members and 16 guests attending. After introductions and approval of the minutes, there were two task force reports. The first report was given by Ramsis Girgis, who chairs the Task Force on Loss Measurement Guide for Transformers. This guide, which provides background material that supports Sections 8 and 9 of C57.12.90, covers the measurement of transformer no-load and load losses. It is ready for a working group ballot. The second task force, chaired by Eddy So, covers the instrumentation aspect of power frequency power measurement at low power factor. This document is actually sponsored by the Power System Instrumentation and Measurement Committee, and will be balloted within that group and not the Transformers Committee. Eddy's task force meets four times a year, twice at Transformers Committee meetings and twice at PES general meetings. One year from now, Eddy expects to have a complete guide.

The rest of the meeting was devoted to the subject of the National Energy Policy Act of 1992 and its effect on testing requirements for distribution transformers, including utility distribution transformers, and ultimately as our discussion indicated it might affect power transformers eventually. Our guest speaker was Oskars Petersons of NIST, who is preparing an assessment of technology, industry practices, and voluntary consensus standards that influence the testing of distribution transformers for their efficiency, the reporting of test results, and specifying transformer efficiencies. His purpose is to provide background material to the Department of Energy (DOE). Oskars is collecting the following information:

8.0 Reports of Technical Subcommittees(cont'd)

1. Major issues, past and present, in preparation of standards.
2. Ambiguities in standards.
3. Agreement among parties on test results.
4. Types of test equipment and organizational test practices.
5. Difficulties encountered in testing.
6. "Round Robins" or equivalent.

His project plan timing is for a draft report between August and September. Oskars is in an information - gathering mode, and you can contact him at the Electrical Measurements Section at NIST in Gaithersburg, Maryland. The meeting adjourned at 10:45 a.m.

8.10.5.3 Semi-Conductor Rectifier Transformers - S. P. (Sheldon) Kennedy

The Working Group met on Monday, March 21, 1994 at 8:00 a.m. and 9:30 a.m. There were 15 members and 8 guests present.

Minutes on the November 1, 1993 meeting in St. Petersburg Beach, Florida were approved.

Don Kline performed some analysis of the use of fundamental kVA versus RMS kVA. A response from Inevan Hareland, convener of IEC TC 14/WG 21, on several items was mailed to the working group members. Don's analysis was with regard to transformer kVA rating. ANSI/IEEE has traditionally used the RMS current to define the kVA. This has been true since about 1932. IEC has made a change on this rating. IEC uses the fundamental current to establish the transformer kVA. The RMS current is approximately 2.5% higher than the fundamental current. A change of this nature would affect all the tables in this standard as well as C34.2. Any retrofit transformers would be affected as well as new units.

Don used the SPICE program to define RMS and average voltage and currents. Don explained that the old method used the RMS equivalent of a square wave without correction for overlap. Don's square wave analysis verifies that the regulation of a rectifier is 0.955 instead of 1.0. Don's Fourier analysis shows that the actual power transformed is only the fundamental power, not the RMS power. Next Don analyzed a 6-pulse rectifier. The RMS current is reduced to 0.973 PU instead of 1.0. The instantaneous volts times the instantaneous amps is equal to 0.916 pu. The Fourier analysis shows a very slight reduction in fundamental, also. It is 0.950 pu instead of 0.955 pu.

Users measure RMS current for loading. Technically, we now see the theoretical power to be based on the fundamental current. Users kilowatt-hour meters will record the fundamental current. Users kilowatt-hour meters will record the fundamental power while his ammeters will show the RMS currents. If fundamental kVA is specified, the fundamental current must be given at full load. The values of the harmonics must be specified in order to calculate the RMS currents and power.

8.0 Reports of Technical Subcommittees(cont'd)

IEC appears to be technically correct, however the impact of these changes requires further study. Don Kline will chair a task force to investigate loss calculations, regulation calculations, harmonic enhancement exponents for structural stray losses and Bus Bar Eddy Losses. The task force will report to the working group chair at least two months prior to the next meeting. These investigations will be submitted to the working group for re-balloting before the next meeting.

It is recommended that we activate coordination with IAS C34.2. If C34.2 is not brought up to date and activated, the IEC standards will be used. This issue was to be brought up at the administrative meeting, Monday night.

Chair, Sheldon Kennedy, proposed a possible compromise solution. The transformer specification and nameplate could be changed to show both fundamental kVA and RMS kVA. The link to past and present practice as well as ammeter readings would be maintained. The proposed IEC method would also be accommodated. It would also supply a transition rating period if one method or the other were found to be more favorable. This will be included in the new ballot as well.

It was also noted that the IEC information proposed using zero sequence test to measure structural stray losses. This will also be studied.

Don Kline also pointed out that his phase angle calculation gave the power factor angle. In figure 9, if the 164° shown is subtracted from 180° we are given a power factor angle of 16° as seen by the kilowatt-hour meter.

Discussion of the last ballot issue did not involve the IEC document. It had been proposed to remove the table of secondary BIL levels. The BIL should be coordinated with the system. Converters don't necessarily have BIL ratings. Specifying this in a transformer standard imposes a rating on the system. Hi Pot requirements and BIL levels are not coordinated for rectifier windings. The BIL should be for the terminals only, not the windings themselves. Discussion of BIL ratings may be included in the forward. The specifying engineer should establish any required BIL coordination.

In the C57.110 task force meetings a discussion requested direction on whether C57.110 or C57.18.10 should be the home document for both harmonic loss calculations and temperature rise tests. Since neither document is yet approved, it was decided that one document could not refer to the other for this information. Both documents should include the same information, with close coordination, of course. Later on, duplication of effort could be eliminated.

With this decided, the discussion turned to temperature rise test methods. Joe Foldi's proposed alternate method was discussed.

Joe proposed that for larger oil filled transformers the oil rise could be determined by circulating current in the windings sufficient to produce the losses enhanced with Harmonics. It was decided to include this method in the next draft, as well.

If any alternate test methods prove to be sufficiently inaccurate in the future, they should be deleted. The forward should also state that concurrence between manufacturer and user is required in order to utilize the alternate methods.

The meeting adjourned at 10:45 a.m.

At the end of the meeting, Subhash Sarkar requested membership.

8.10.5.4 LTC Performance Requirements - T. P. (Tom) Traub

The LTC Performance Requirements Working Group met at 1:20 p.m. on Monday March 21, 1994 with 20 members and 17 guest in attendance. Introductions were made and the minutes of the previous meeting were approved.

Since the pervious meeting, the dielectric test portion and Annex E of the proposed new LTC standard were balloted by the Performance Characteristic Subcommittee and by the Dielectric Tests Subcommittee. For the Performance Characteristics Subcommittee, 81 ballots were sent out and 62 were returned. 48 were approved without comments, 11 approved with comments, 2 abstained and 1 was not approved. For the Dielectric Tests Subcommittee, 89 ballots were sent out and 46 were returned. 33 were approved with out comment, 10 approved with comments, 1 abstained and 2 were not approved.

The main part of the meeting consisted of an attempt to resolve the negative ballots and to address the approved ballots submitted with comments. The following decisions were made regarding the negative ballots:

1. The proposal to include dielectric testing of a LTC while the moving contacts are temporarily located between stationary contacts was rejected.
2. The proposal to specify the sequence of dielectric testing was accepted. The sequence to be (1) Lighting impulse test, (2) Switching impulse test, (3) Applied voltage test and (4) Partial discharge test.
3. The proposal to add a test voltage of 1.8 kV for one second as an alternate to testing control wiring at 1.5 kV for one minute was rejected.

The following decisions were made regarding approved ballots received with comments:

1. Switching impulse test in the latest draft of the LTC standard were proposed to be a required design test for LTCs located at the line end and with a nominal voltage level of 115 kV and above. This will be changed to 345 kV and above.
2. Partial discharge testing in the latest draft was proposed to be required for line end LTCs with a nominal voltage level of 115 kV and above and installed in an autotransformer operating at a system voltage of 345 kV. To be consistent with transformer standards, it was agreed that this test would be required for all line end LTCs with a nominal voltage level of 115 kV and above, and to drop the qualification about being installed in an autotransformer operation at 345 kV and above.
3. A proposal to change the enhancement voltage level for 3600 cycles, and the extended test level period from 30 minutes to one hour was rejected in order to be consistent with the current IEC standard for LTCs.

8.0 Reports of Technical Subcommittees(cont'd)

4. It was agreed to remove the requirement in the latest draft of the LTC standard that the initial voltage application for the partial discharge test not exceed one-third of the extended period test level.

The members of the Performance Characteristics Subcommittee and the Dielectric Test Subcommittee who returned approved ballots on the latest draft will be informed by letter by the Working Group Chair of the changes agreed upon at the Working Group meeting. The subcommittee members will be asked to respond within 30 days if the changes would cause them to change their vote from approved to not approved. If additional negative ballots are received, the change causing the negative ballots will be rejected. If no negative ballots are received, the changes will be incorporated into a new draft and submitted for Transformer Committee approval.

The meeting adjourned at 2:45 p.m.

8.10.5.5 Revisions to C57.12.00 - P. E. (Peter) Krause

The working Group met at 1:20 p.m. on Monday. This was the first meeting of the new group and was attended by 20 persons of which 6 became charter members.

The Chair discussed the responsibilities of the WG which are to coordinate Performance Characteristics Subcommittee activities taking place in C57.12.00. The WG will be the first group balloted prior to an issue being referred to the PCSC.

Don Platts reported that his Task Force on Clause 5.1, Cooling Class Designations is working on adoption of the International Electrochemical Commission (IEC) designations. The TF's latest ballot yielded several negatives-objections included expense of changing, the fact that the present designations are acceptable and change is not necessary, concern that the change will mean a dual system for many years, and concern that the IEC standard is confusing as written. Don said the TF will seek other opinions before continuing and he expects to try another ballot using the new October, 1993 IEC standard retaining its intent but improving its language and including a cross-reference table for the old and proposed designations.

Chuck Murray reported on his TF on nameplate requirements for PCB content. His recommendation is to add to the nameplate language to the effect that maximum PCB content of the dielectric fluid at time of manufacture was less than 2 ppm. There was some debate. The issue will be balloted.

A letter from Dan Mulkey of PG&E was forwarded to the WG. It contained a request that the month and year of manufacture be required on the nameplate. This issue will be balloted by the WG prior, to the next meeting.

Phil Bisbee of Kuhlman Electric suggested a change to the nameplate requirement so that nameplates of small distribution transformers would not be required to state detailed weight data (core and coils, tank and fittings, etc.). Many distribution transformers are manufactured today with 150 kV high voltage basic impulse levels (BIL). The nameplate standard now requires the weight in detail even for small pole-type transformers. He recommends providing For including small 150 kV BIL transformers in the Nameplate A class rather than Nameplate B.

8.0 Reports of Technical Subcommittees(cont'd)

The meeting adjourned at 2:35 p.m.

8.10.5.6 Revisions to C57.12.90 - Nigel P. McQuin

This new WG met in the Crystal Ballroom VII on Monday, March 21, 1994 at 9:40 a.m. As this was the opening meeting, the roster recorded 15 people in attendance, 6 of whom were registered and interested in being members.

The Chair reported the present status of the source document, reviewing the past revisions that were incorporated in the last publication and those still outstanding. The continued work on loss tolerance and measurement was noted as a specific topic that was being covered by a parallel WG effort.

A procedural change by IEEE was explained, which requires the future splitting of the present service document into two separate standards. Part I would be retained as 12.90, but Part II would have to be revised under a separate PAR and issued a new number. This change will precipitate the need for the present WG to be split to conduct the work on the new two separate documents.

Three items of possible revision work were then outlined for preliminary discussion. New test report data is to be submitted to the WG for ballot by Mid-May, with a possible ballot of this SC before the fall meeting. The second item on surge testing will be referred to the dielectric SC. The third item on LVI test procedure has been the subject of a SC ballot, and a mandate is in place to proceed with this revision.

Overall consensus from meeting was a need for general revision request for Part I of the standard under the 12.90 joint PAR, and a request for a Part II broad revision under a separate PAR. WG requests permission to ballot SC on one Part I revision before fall meeting. The WG recommends that separate WG's are formed for each of the PAR tasks by this SC.

The meeting was adjourned at 10:52 a.m.

8.10.6 Project Reports

8.10.6.1 Survey of GSU Transformer Failures - H. F. Light

Task force meeting held March 23, 1994 at Grand Kempinski Hall in Dallas, Texas. Eleven members and 5 guests were present. The introductions, previous minutes were attended to. Chair review of survey and proposal for possible reports.

Mailing list consisted of 122 utilities and municipalities across the United States. As of March 2, 1994, replies were received from 70 of the 122 for a return of 57%. After this meeting, I plan on sending the 52 remaining organizations one additional letter and follow up with phone calls when possible. For the replies from the 70 organizations, there are 105 reported failures, some just the single page failure form, some with details also included. The following for discussion purposes only is a suggestion for possible reports:

Task Force to Survey Failure of Generator Step-Up Transformers

Possible Reports From Information Received On Generator Step-Up Transformer Failures That Have Failed Since 1980

- Volume I Failures reported on a single failure report form.
- Introduction Short Introduction
- Index List of utilities contacted to conduct survey of GSU transformer failures, units above 100 MVA that failed Since 1980, indicating utility, person contacted, complete address, phone and FAX numbers and information returned indicating failures - yes, no and number of failures and details available.
- Content Single failure form for each failure reported in same order as index. Form indicates if details are available.
- Volume II Details, when available, for reports in Volume I
- Introduction Short Introduction.
- Index See Volume I.
- Contents All details that were reported, same order as index.

Between now and next meeting the chair will send a sample document to task force members of Volume I & II. These will then be items for discussion at next task force meeting.

Chair will contact IEEE to see how a survey is handled by them.

Chair will send one last letter to those not already responding to previous inquiries.

After report is put together, the task force chair will request three meeting allocations from 1:20 p.m. to 2:35 p.m.; 2:50 p.m. to 4:05 p.m., and 4:15 p.m. to 5:30 p.m. on Monday afternoon. That is in the future.

8.10.7 Old Business - None

8.10.8 New Business

The Transformer Protection Guide Revision Working Group (37.91) of the IEEE Relaying Committee has requested liaison coordination from the PCS. Gene Kallaur has agreed to head this activity for the PCS and will report progress at the next meeting.

8.0 Reports of Technical Subcommittees(cont'd)

8.10.9 Next Meeting

The next meeting will be held on Tuesday, September 27, 1994 in Milwaukee, Wisconsin.
The meeting adjourned at 10:35 a.m.

Respectfully submitted,
B. K. Patel
PCS Chair

DATE: 03-11-94

STATUS REPORT ON STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE

ATTACHMENT 1

SUBCOMMITTEE: PERFORMANCE CHARACTERISTICS / CHAIRPERSON: BIPIN PATEL / PHONE: (205)877-7740 / FAX: (205)868-5103

STANDARD NO. PROJECT NO.	TITLE OF DOCUMENT WORKING GROUP	WG CHAIRPERSON	TF CHAIRPERSON	COMMITTEES REQUESTING COORDINATION PUB_DATE PAR_DATE REV_DUE_YEAR	WG_PHONE	LATEST STATUS COMMENTS
C57.105	GUIDE FOR APPLICATION OF TRANSFORMER CONNECTIONS IN THREE-PHASE DISTRIBUTION SYSTEMS					REAFFIRMED BY SB 06/17/92
PC57.105	PROJECT	REITTER G.		06-17-92 1997	(415)591-4463	BEING BALLOTTED IN C57
C57.109	GUIDE FOR THROUGH-FAULT CURRENT DURATION					WILL BALLOT C57
PC57.109	SHORT-CIRCUIT DURATION	PATEL B. K.		03-16-93 06-27-91	(205)877-7740	REV. APPROVED BY SB 03/16/93
C57.110	RECOMMENDED PRACTICE FOR ESTABLISHING TRANSFORMER CAPABILITY WHEN SUPPLYING NONSINUSOIDAL LOAD CURRENTS					REF. ANSI 07/93
PC57.110	REVISION OF C57.110	MARK R. P.	NECA	T&D PSR		
C57.116	GUIDE FOR TRANSFORMERS DIRECTLY CONNECTED TO GENERATORS					PAR APPROVED 09/15/93
NONE	TR DIRECTLY CONNECTED TO GEN	PATEL B. K.		12-03-92 09-15-93	(804)838-8080	
C57.117	GUIDE FOR REPORTING FAILURE DATA FOR POWER TRANSFORMERS AND SHUNT REACTORS					BALLOTTING REF. IN MAIN COMM. BALLOT CLOSES APRIL 11, 1994
P786	TRANSFORMER RELIABILITY	ALTMAN M.		01-03-89 1994	(205)877-7740	
C57.123	GUIDE FOR TRANSFORMER LOSS MEASUREMENT					REAFFIRMED BY SB 06/17/92
P1098	LOSS TOLERANCE AND MEASUREMENT	HENNING W. R.	RANJIS GIRGIS	06-17-92 1997	(407)694-4975	ANSI APPROVED 7/93
C57.125	GUIDE FOR FAILURE INVESTIGATION, DOCUMENTATION AND ANALYSIS FOR POWER TRANSFORMERS AND SHUNT REACTORS					TF WORKING
PC57.125	FAILURE ANALYSIS	ALTMAN M.		06-27-91 06-28-87	(407)694-4975	ANSI APPROVED 11/20/91
C57.131	REQUIREMENTS FOR LOAD TAP CHANGERS					BALLOTTING SUBCOMMITTEE
PC57.131	LTC PERFORMANCE REQUIREMENTS	TRAUB T. P.		EM T&D 08-17-89	(394)294-2704	BALLOT CLOSES MARCH 7, 1994
C57.18.10	REQUIREMENTS FOR SEMICONDUCTOR RECTIFIER TRANSFORMERS					BALLOTTING WG, ONLY 47% RET.
PC57.18.10	SEMI-CONDUCTOR RECT TR	KENNEDY S. P.		NONE 12-28-81	(716)896-6500	PAR HAS BEEN FOUND
C57.21	REQUIREMENTS, TERMINOLOGY, AND TEST CODE FOR SHUNT REACTORS RATED OVER 500KVA					COMPLETE
PC57.21	TEST CODE FOR SHUNT REACTORS	MCGILL J. W.		EM T&D PSR 04-02-91 06-09-88	(414)475-3622	ANSI APPROVED 08/09/91

8.0 Reports of Technical Subcommittees(cont'd)

DATE: 03-11-94 STATUS REPORT ON STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE ATTACHMENT 1

SUBCOMMITTEE — PERFORMANCE CHARACTERISTICS / CHAIRPERSON: BIPIN PATEL / PHONE: (205)877-7740 / FAX: (205)868-5103

STANDARD NO. PROJECT NO.	TITLE OF DOCUMENT WORKING GROUP	WG CHAIRPERSON	IF CHAIRPERSON	COMMITTEES REQUESTING COORDINATION PUB_DATE PAR_DATE REV_DUE_YEAR	WG_PHONE	LATEST STATUS COMMENTS
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IEEE 638 P638	QUALIFICATION OF CLASS 1E TR FOR NUCLEAR POWER GENERATING STATIONS QUALIFICATION OF TR FOR 1E APP PIERCE L. W.			NPE SUB SC2 SCC10 10-29-90 1997 (706)291-3166		APPROVED BY SB 03/18/92 NEW PAR APPROVED 12/04/90
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COORDINATION ACTIVITY OF PERFORMANCE CHARACTERISTICS SUBCOMMITTEE AS PER: 03-11-94

*PROJECT NO. DATE	TITLE PES COMMITTEE CONTACT IN PES COM.	CONTACT PHONE NO.	TRANSFORMER COMMITTEE COORDINATOR	TRANSFORMERS COMMITTEE SUBCOMMITTEE	COORDINATOR PHONE NO.
*PC37.10 05-01-91	GUIDE FOR DIAGNOSTICS AND FAILURE INVESTIGATION OF POWER CIRCUIT BREAKERS SWGR L. ROLANDO SAAVEDRA	504-363-8765	WALLACE B. BINDER JR.	PERFORMANCE CHARACTERISTICS	216-384-5625
*PC37.91	GUIDE FOR PROTECTIVE RELAY APPLICATION TO POWER TRANSFORMERS PSR R. J. FERNANDEZ	215-770-5619	S. K. PATEL	PERFORMANCE CHARACTERISTICS	205-877-7740
*PC37.109	GUIDE FOR THE PROTECTION OF SHUNT REACTORS PSR LAVERN L. DVORAK	303-231-1636	MIKE ALTHAN	PERFORMANCE CHARACTERISTICS	407-694-4975

8.0 Reports of Technical Subcommittees(cont'd)

8.11 Underground Transformers & Network Protectors - P. E. Orehek

Meeting Minutes - Dallas, Texas

8.11.1 Introduction/Attendance

The Underground Transformers and Network Protectors Subcommittee met at 9:30 AM. on March 22, 1994 with 13 members and seven guests present.

8.11.2 Approval of Minutes

The minutes of the November 2, 1993 meeting in St. Petersburg were approved as written.

8.11.3 Membership

Membership has increased to 20 with the addition of the following two new members:

W. Kraght - General Electric Co., Philadelphia, Pa.
W. McCain - General Electric Co., Hickory, N. C.

Application for membership in the Transformers Committee by E. A. Bertolini of Consolidated Edison Company of New York has been approved. Congratulations Ed.

8.11.4 Chair's Remarks

Administrative Subcommittee Notes:

- A. J. C. Thompson of Duke Power Co. has resigned as Chair of the Distribution Transformers Subcommittee and K. Hanus of Texas Utilities has been appointed the new Chair.
- B. C57.12.24 and C57.12.44 were approved by the IEEE Standards Board on March 16, 1994.
- C. Two new Working Groups have been formed on Continuous Revision of C57.12.00 and C57.12.90 in order to coordinate individual revision projects. Only one PAR can now be submitted to revise a Standard and all requests for revision to either of these documents will be submitted to the Chair of the respective Working Group. The persons appointed to Chair these Working Groups are as follows: Mr. John D. Borst of ABB Power T&D Co., Inc. for the Working Group on Continuous Revision of C57.12.00 and Mr. Steven D. Smith of Kuhlman Electric Corp. for the Working Group on Continuous Revision of C57.12.90.
- D. When new or revised Standards are approved by the IEEE Standards Board, new PARs are subsequently required to work on future revisions. The scope of the document should be included under reason for revisions in the PAR.

8.0 Reports of Technical Subcommittees(cont'd)

- E. In December, 1993, notice was given that IEEE would withdraw as co-secretariat of the C37 and C57 Committees and withdraw all delegations from these Committees effective March 2, 1994. A task force was also appointed at this time to hopefully "salvage" the relationship by March 2.**

The IEEE Standards Board met March 17, 1994 and formally endorsed a Memorandum of Understanding (MOU) reaffirming the IEEE and NEMA as co-secretariats of C37 and C57. The MOU was the result of the Task Force to resolve the contentious issues regarding the administration of the Sub-committees the past several years.

The MOU still requires further detail clarification and this will be completed by IEEE/NEMA before the September meeting of the Transformers Committee.

- F. The IEEE Statement of Metric Policy adopted by the IEEE Standards Board on November 21, 1993 is attached for information.**
- G. IEEE is presently reviewing the development of all IEEE Standards for the Global Marketplace. Our mission is to write standards acceptable to the United States which will be acceptable as international standards. For now, "acceptable as international standards" means that we adhere to the Style Manual for format considerations.**
- H. The 1997 Summer Power Meeting will be held in Berlin, Germany.**
- I. The next Transformer Committee Meeting scheduled for September, 1994 will be held at the Hotel Pfister in Milwaukee, Wisconsin with a single room rate of \$85 per night.**

8.11.5 Working Group Reports

8.11.5.1 Three-Phase Underground-Type Transformers (C57.12.24) (J. W. Howard - Chair)

The Working Group met at 1:20 p. m. on March 21, 1994, 11 members and five guests present.

The minutes of the November 1, 1993 meeting were approved as written.

The revised Standard that was balloted last year was approved by the IEEE Standards Board on March 17, 1994.

IEEE Staff Editors have indicated that a number of changes are required to comply with the Style Manual format. The changes recommended were approved by the Working Group with a few modifications and will be incorporated into the revision.

The proposed Forward presented by the Chair was approved without comment by the Working Group.

A presentation was made by Rochelle Stern, an IEEE Staff Editor, indicating the assistance that could be provided to Working Groups in preparing Standards. Members commented that they really appreciated having a member of the IEEE Staff present to discuss these issues.

8.0 Reports of Technical Subcommittees(cont'd)

The meeting adjourned at 2:20 P.M.

8.11.5.2 Secondary Network Transformers - Liquid-Filled (C57.12.40) (E. A. Bertolini - Chair)

The Working Group met at 2:50 P.M. on March 21, 1994, with 15 members and one guest present.

The minutes of the November 1, 1993 meeting were approved as written.

The revised standard was approved by the IEEE Standards Board on December 1, 1993.

The revised Standard is presently out for ANSI public review and the comment period will close on April 19, 1994. It is expected that this Standard will be published in June or July of this year.

All comments that were received during the IEEE ballot process, which were not included in the revised Standard, will be considered for the next revision.

The meeting adjourned at 4:10 P.M.

8.11.5.3 Secondary Network Protectors (C57.12.44) (R. B. Robertson - Chair)

The Working Group met at 8:00 A.M. on March 21, 1994, for three sessions with 15 members and two guests present.

The minutes of the November 1, 1993 meeting were approved as written.

The newly developed Standard was approved by the IEEE Standards Board on March 17, 1994.

The editorial changes recommended by the IEEE Staff Editor were approved by the Working Group and incorporated into the Standard.

The Working Group reviewed new generic network protector fuse curves developed by a Task Group headed by A. L. Robinson. This data will be incorporated into the Information Annex portion of the Standard for Network Protector Fuse Applications.

The Working Group made arrangements for a tour of the Texas Utilities Dallas network area and this was conducted during the afternoon of March 22. The Group expressed their appreciation to Bruce Nutt for making the necessary arrangements.

The Working Group completed review of comments remaining from the Main Committee ballot that required editorial changes only. These changes will be given to the Staff Editor to be included in the Standard.

The Working Group started reviewing the other comments received from the ballot for consideration in the first revision.

The meeting adjourned at 12:05 P.M.

8.0 Reports of Technical Subcommittees(cont'd)

8.11.5.4 Dry-Type Network Transformers (C57.12.57)(B. Nutt - Chair).

The Working Group met at 4:50 p. m. on March 21, 1994, with 10 members present.

The minutes of the November 1, 1993 meeting were approved as written.

Draft #6 of the revised Standard is presently being balloted in the Subcommittee.

The Working Group discussed the format and style changes required to meet the IEEE guidelines and made the necessary changes.

The meeting adjourned at 5:00 p. m.

8.11.5.5 Summary

Three of the four Standards the Subcommittee is responsible for have been revised or newly developed and have been approved by the IEEE Standards Board. The last one is presently being balloted in the Subcommittee.

The Working Group Chairmen were commended for their leadership and efforts in completing these tasks.

8.11.6 Old Business

The Subcommittee will have a panel session at the IEEE T&D Conference and Exposition in Chicago. The session will be on Tuesday, April 12, at 8:30 a. m. The subject matter will be related to Maintenance, Reconditioning Practices, Design and Reliability of Network Transformers and Protectors.

The latest Memorandum of Understanding between IEEE and NEMA was discussed and the members of the Subcommittee all agreed to continue on with the development of standards as presently being done and to let the differences be resolved by the two parties involved.

A recommendation by a Task Group in the Performance Characteristics Subcommittee has been made to include our request into C57.12.00 to have "Maximum PCB content at time of Manufacture" stated on the nameplate of all distribution transformers.

8.11.7 Future Meetings

The location and dates scheduled for future meetings are as follows:

September 24-28, 1994	Milwaukee, Wisconsin
April 23-26, 1995	Kansas City, Missouri
November 5-9, 1995	Boston, Massachusetts
Spring, 1996	San Francisco, California

8.0 Reports of Technical Subcommittees(cont'd)

The meeting adjourned at 10:45 A.M.

**Respectfully submitted,
Paul E. Orehek, Chair**

8.0 Reports of Technical Subcommittees(cont'd)

DATE: 03-11-94

STATUS REPORT ON STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE
ATTACHMENT 1

SUBCOMMITTEE: UG TR & NETWORK PROTECTORS / CHAIRPERSON: PAUL OREHEK / PHONE: (201)430-7743 / FAX: (704)382-2579

STANDARD NO. PROJECT NO.	TITLE OF DOCUMENT WORKING GROUP	WG CHAIRPERSON	IF CHAIRPERSON	COMMITTEES REQUESTING COORDINATION PUB_DATE PAR_DATE REV_DUE_YEAR	WG_PHONE	LATEST STATUS COMMENTS
C57.12.24	UNDERGROUND-TYPE 3-PHASE DIST- RIBUTION TRANSFORMERS, 2500KVA AND SMALLER: HV, 34500GV, .& BELOW, LV, 480 V AND BELOW	T&D IC	IAS/REP IAC/PSE	05-10-88 06-27-91 1993	(215)774-5055	COPYRIGHT NOT RELEASED REBALLOTING TC, CLOSE 11/24/93
PC57.12.24	3-PHASE UG-TYPE TRANSFORMERS	HOWARD J. W.				
C57.12.40	REQUIREMENTS FOR SECONDARY NETWORK TRANSFORMERS, SUBWAY & VAULT TYPES (LIQUID IMMERSED)	SCC14				REVISION APPR. BY SB 12/02/93
PC57.12.40	LIQUID-FILLED NETWORK TRANSFRM BERTOLINI E. A.			03-19-92 12-05-91 1997	(212)460-4913	WAITING PUBLICATION
C57.12.44	STANDARD REQUIREMENTS FOR SECONDARY NETWORK PROTECTORS	T&D	SWGR IAS/REP IAS/PSE EEI			PAR APPROVED BY SB 06/17/92
PC57.12.44	SECONDARY NETWORK PROTECTORS ROBERTSON R. B.			. . 06-27-91 0	(813)228-4111	BALLOTING SUBCOMMITTEE
C57.12.57	REQUIREMENTS FOR VENTILATED DRY-TYPE NETWORK TRANSFORMERS 2500KVA AND BELOW, W/HV 34500V AND BELOW, LV 216V..AND 480V..	T&D	EEI/T&D SCC14			COPYRIGHT NOT RELEASED
PC57.12.57	DRY-TYPE NETWORK TRANSFORMERS MUTT B.			03-18-92 12-05-91 1997	(214)698-7447	REAFFIRMED 03/18/92

COORDINATION ACTIVITY OF UG TR & NETWORK PROTECTORS SUBCOMMITTEE AS PER: 03-11-94

*PROJECT NO. DATE	TITLE PES COMMITTEE CONTACT IN PES COM.	CONTACT PHONE NO.	TRANSFORMER COMMITTEE COORDINATOR	TRANSFORMERS COMMITTEE SUBCOMMITTEE	COORDINATOR PHONE NO.
*PC37.108	GUIDE FOR THE PROTECTION OF NETWORK TRANSFORMERS PSR THOMAS E. WIEDMAN	312-294-2810	R. B. ROBERTSON	UG TR & NETWORK PROTECTORS	813-228-4081
*PC62.2.01 06-01-84	APPLICATION GUIDE FOR SURGE PROTECTION OF ELECTRIC GENERATING PLANTS SPD G. L. GAIBROIS	313-897-0485	R. B. ROBERTSON	UG TR & NETWORK PROTECTORS	813-228-4081

8.0 Reports of Technical Subcommittees(cont'd)

8.12 West Coast - D. S. Brucker

8.12.1 Old Business

The West Coast Subcommittee is presently working on two guides. C57.93, Guide for Installation of Liquid Immersed Power Transformers, is out for balloting. Jim Gillies, formerly of Bonneville Power Administration, did an admirable job in accommodating all of the comments on the initial ballot. When the guide is approved it will replace C57.12.11 and C57.12.12. These guides covered transformers larger than 10MVA with ratings from 69KV to 287KV and transformers 345KV and above respectively.

The Committee is also working on a guide for fire protection of outdoor liquid immersed power transformers, C57.128. This working group is chaired by Joe Watson and is making good progress with the formation of the guide. We expect to have a working group meeting during the next main committee meeting in Milwaukee. The guide should be out for balloting during 1995.

8.12.2 New Business

By far the most earth shaking - no pun intended - activities that the West Coast Committee is now involved in is coordination with the rewrite of IEEE Guide 693 (Recommended Practices for Seismic Design of Substations). The Substations Committee is the main sponsor of this activity. I am the coordinator and liaison with this activity working in my capacity as chair of the West Coast Committee.

We are in need of volunteers to work with the working group in formulating these standards. A meeting will be held in the fall of this year probably in Las Vegas, Nevada. Those interested should contact me concerning participation.

The Subcommittee intends to submit a PAR for either a guide, recommended practice, or perhaps a standard covering the requirements, terminology, and test code for phase angle regulating transformers. Anyone that wants to join this effort should contact me. We plan to start work later this year upon approval of the PAR. We plan to hold a working group meeting in Milwaukee.

8.0 Reports of Technical Subcommittees(cont'd)

DATE: 03-11-94

STATUS REPORT ON STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE
ATTACHMENT 1

SUBCOMMITTEE: WEST COAST / CHAIRPERSON: DAVID BRUCKER / PHONE: (415)692-4431 / FAX: (415)692-0483

STANDARD NO. PROJECT NO.	TITLE OF DOCUMENT WORKING GROUP	WG CHAIRPERSON	TF CHAIRPERSON	COMMITTEES REQUESTING COORDINATION PUB_DATE PAR_DATE REV_DUE_YEAR	WG_PHONE	LATEST STATUS COMMENTS
C57.114 P513	SEISMIC GUIDE FOR POWER TRANSFORMERS AND REACTORS SEISMIC GUIDE	OKLU S.		NPE SUBS. 02-15-90 09-06-73 1995 (213)481-4823		APP BY SB 02/15/90 ANSI APPROVED 08/09/91
C57.120 P842	LOSS EVALUATION GUIDE FOR POWER TRANSFORMERS AND REACTORS LOSS EVALUATION GUIDE	JACOBSEN R.		SUB EN ED&PG IAS IEC 12-03-91 05-01-80 1996		PUBLISHED 1992 APPROVED BY ANSI 02/28/92
C57.128 PC57.128	FIRE PROTECTION OF OUTDOOR LIQUID-IMMERSED POWER TRANSFORMERS FIRE PROTECTION	SUNDIN D.		NPE SUB PSR 06-01-89 0 (414)796-0220		DRAFT BEING PREPARED
C57.12.11	GUIDE FOR INSTALLATION OF OIL-IMMERSED TRANSFORMERS (10MVA & LARGER, 69-287KV RATING)					TO BE REPLACED BY C57.93
PC57.93	CON. INSTALLATION GUIDES	GILLIES D. A.		05-09-80 - - 1992 (503)622-4847		LIFE EXTENSION TO 12/92
C57.12.12 PC57.93	GUIDE FOR INSTALLATION OF OIL-IMMERSED TRANSFORMERS 345KV AND ABOVE CON. INSTALLATION GUIDES	GILLIES D. A.		05-09-80 - - 1992 (503)622-4847		TO BE REPLACED BY C57.93 LIFE EXTENSION TO 12/92
C57.93 PC57.93	GUIDE FOR INSTALLATION OF LIQUID-IMMERSED POWER TRANSFORMERS. CONSOLIDATION OF INST. GUIDES	GILLIES D. A.		NONE 06-01-89 0 (503)622-4847		BALLOTING REVISION IN TC WITHDRAW 12.11/12.12 WHEN APP.

COORDINATION ACTIVITY OF WEST COAST SUBCOMMITTEE AS PER: 03-11-94

PROJECT NO. DATE	TITLE	PES COMMITTEE	CONTACT PHONE NO.	TRANSFORMER COMMITTEE COORDINATOR	TRANSFORMERS COMMITTEE SUBCOMMITTEE	COORDINATOR PHONE NO.
*P1248 07-26-90	GUIDE FOR THE COMMISSIONING OF ELECTRICAL SYSTEMS IN HYDROELECTRIC POWER PLANTS ED&PG	LOUIS A. TAUBER	503-326-2323	D. A. GILLIES	WEST COAST	503-622-4847
*P1268 03-30-91	GUIDE FOR INSTALLING TEMPORARY SUBSTATIONS SUBS	SHASHI G. PATEL	404-362-5386	D. A. GILLIES	WEST COAST	503-622-4847
*P979 01-10-92	GUIDE FOR SUBSTATION FIRE PROTECTION SUBS	A. J. BOLGER	604-663-2879	D. W. SUNDIN	WEST COAST	414-524-3221
*P693	RECOMMENDED PRACTICE FOR SEISMIC DESIGN OF SUBSTATIONS SUBS	RULON FRONK	213-481-3327	L. A. TAUBER	WEST COAST	503-230-3829




Electric Power
Research Institute

Leadership in Science and Technology

MEMORANDUM

March 17, 1994

TO: Mr. Wallace B. Binder, Jr.
Secretary, IEEE Transformers Committee
Transmission & Distribution Engrg. Dept.
Ohio Edison Co.
76 South Main Street
Akron, Ohio 44308

FROM: Stan Lindgren, Project Manager 

SUBJECT: EPRI LIAISON REPORT

The following report is for inclusion in your minutes for the March 23, 1994, meeting.

1. EHV Converter Transformer:

- Test results confirmed 25% or greater major insulation size reduction can be attained with some further work.
- Final report will be published pending patent filing.

2. Advanced Power Transformer:

- Reduced load loss feasibility has been demonstrated.
- Detailed analytical studies exploring individual design aspects has been completed.
- As a part of Phase II a 47 MVA three phase core form prototype was built and successfully short circuit tested March, 1991 delivered to HL&P and is now in service.
- Development of shell form insulation, winding and physical models continues. A 1425 BIL dielectric model was tested successfully. A 25MVA single phase, 161 kV model is under construction. Tests will include short circuit.

3. Static Electrification in Power Transformers:

- This is the suspected failure mechanism in over 24 core form and shell form FOA transformers worldwide. Recent failures involve 20 year old transformers. One unit had been recently reprocessed after oil was removed for maintenance. The "installed spare" unit subsequently failed January 1992 with original oil that had not been touched.
- Current work is focused on the effects of temperature and moisture transients. Tests on representative transformer cooling components have been completed. A project is in process monitoring a large FOA transformer in the field. Data is being collected and monitored at a remote location.

4. Bubble Evolution in Overloaded Transformers:

- Very rapid load changes can cause bubble formulation under some conditions and reduce 60 Hz and impulse dielectric strength. This has been demonstrated in models with rapid/high O.L.
- A project to better identify moisture conditions associated with bubbles and verify GE mathematical model was completed (Interim Report EL6761) but raised questions about nitrogen blanketed transformers.
- A final report (EL7291) covering more complete test data is published. A computer program covering bubble evolution plus the ANSI Loading Guide formulas has been developed as an EPRIGEMS, AP-102649, available as of July, 1993.
- Additional work is being initiated to experimentally study moisture dynamics associated with rapid overloads and cooldown cycles plus detect inception of partial discharges caused by bubble evolution.

5. Active Transformer Noise Cancellation System:

- Only noise reduction in one direction has been pursued.
- An initial evaluation on a substation transformer was completed that demonstrated over 10 decibel reduction of 120 Hz with a small trial system.
- Two systems are being linked together to handle a larger transformer and improve reduction of higher frequencies.
- A field demonstration in process and another is being considered.

6. High Voltage Instrument Transformers

EPRI sponsored a workshop 9/90 to provide a forum to compare and categorize failure information, failure modes and potential mitigation measures. This was an outgrowth of the roundtable in Washington DC 4/88. Proceedings, TR 100205, are published. A Project was completed to study fast disconnect switching transient effects on HVCTs. Mathematical modeling was checked experimentally through laboratory tests and switching tests in a 500 kV substation with very high speed instrumentation. Effects of switching resistors during disconnect switching are now being studied.

7. Power Transformer Tank Rupture - Risk Assessment and Mitigation

This project has been completed except for final report which will be published pending patent applications. Over 20 well documented cases have been collected from which several were selected for detailed study.

8. Geomagnetic Induced Currents (GIC)

EPRI has three projects.

- A feasibility demonstration has been completed for detection of transformer core saturation at twenty-five locations reporting to a central location. Useful data was collected from

several GIC events. GIC activity in 1993 has been low, however NOAA predicts higher activity in 1994. A dozen or so locations will continue on a routine monitoring basis.

- Two transformer neutral GIC blocking devices were installed in 1991 and preliminary field trials were performed with good results in June, 1991. The systems were moved to active transmission line locations and have bypassed successfully during the past one and one half years.
- A project to evaluate the response of protective relaying systems to GIC has been completed. A final report is in process.

9. Thermal Models for Real-Time Monitoring

This project involves all transmission components including power transformers regarding software development and a field test involving two substations on a utility system. The field test has been completed. A final report is in process.

10. Microelectronic Fault Gas Analyzer

This project is a continuation of earlier EPRI efforts to develop an on-line low cost gas analyzer that were abandoned because of baseline drift of the sensors. The new project utilizes a different type of sensor to monitor multiple gases. A field demonstration program is underway.

11. Furaldehyde in Transformer Oil

A new project has been initiated to develop a correlation between furaldehydes in oil samples with degree of polymerization found in paper insulation samples taken from a significant number of transformers in service.

cc: Ralph Samm
Jim Harlow

9.2 Standards Coordinating Committee No. 4 - P. A. Payne

IEEE PES TRANSFORMER COMMITTEE LIAISON REPORT
STANDARDS COORDINATING COMMITTEE NO. 4

IEEE/PES Winter Power Meeting
United Engineering Center
New York City, NY
January 31, 1994

The SCC-4 meeting was devoted to reviewing status of IEEE Standards within the committee's scope of responsibility: 1, 96, 97, 98, 99 and 943. If there is no usage of IEEE 96 *General Principles for Rating Electrical Apparatus for Short Term, Intermittent or Varying Duty* identified, withdrawal will be considered. IEEE 97 *Recommended Procedure for Specifying Service Conditions in Electrical Standards* requires harmonization with IEC 721 *Classification of Environmental Conditions* for resolution of a negative ballot during the call for reaffirmation.

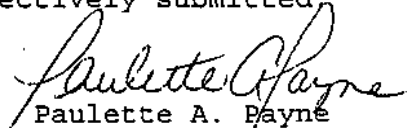
Standards prepared by TC-63 and approved by the IEC include IEC 962-2 *Maintenance and Use Guide for Petroleum Lubricating Oils for Steam Turbines* and IEC 727-2 *Evaluation of Electrical Endurance of Electrical Insulation Systems - Evaluation Procedure Based on Extreme Value Distributions*.

SCC4.1 was the Technical Advisory Group to IEC Technical Committee 63 - Insulation Systems (TC-63), which has been disbanded. TC-98 has been formed and empowered with a broader scope than TC-63 for standardization of electrical insulation systems (EIS) evaluation:

- * To utilize existing test methods, wherever possible, in developing standards for EIS testing
- * To develop EIS test specifications to establish thermal classes
- * To coordinate with User TCs, the development of specific standards for the functional testing, characterization and identification of EIS
- * To formulate principles and test methods for the evaluation of EIS.

The SCC4.1 meeting focused on establishment of a US position in preparation of a formal proposal for the TC-98 preparatory meeting with SCC4.1 as the Technical Advisory Group. The focal points were procedures for development of new standards, completion of TC-63 work, and coordination of activities with equipment Technical Committees.

Respectively submitted,


Paulette A. Payne

/wp:scc4ieee

9.3 CIGRE SC12 - W. N. Kennedy

CIGRE STUDY COMMITTEE 12 (TRANSFORMERS)
LIAISON REPORT TO IEEE TRANSFORMERS COMMITTEE

March 23, 1994

1. Description of CIGRE

The functions that are performed by IEEE's Power Engineering Society in the United States are handled by two groups in Europe: CIGRE (Conference Internationale des Grands Reseaux Electriques) roughly corresponds to the technical paper and power meeting aspect of IEEE while the responsibility for international standards is covered by IEC (International Electrotechnical Commission). For technical subjects CIGRE is divided into many individual study committees, each of which addresses a particular aspect of power systems. Study Committee 12 has the responsibility for transformers, and has several working groups and task forces which report to it.

2. Organization and Meetings

On even numbered years (1992, 1994, etc.) CIGRE has general meetings in Paris, France. These last for approximately one week with all the study committees generally meeting for one day. Any CIGRE member can register for the conference and attend the study committee meetings. Task forces and working groups also use this opportunity to hold meetings during this period. A listing of the current working groups reporting to SC 12 (Transformers) is given in Appendix 1.

Approximately one year before the annual meetings invitations are solicited for technical papers. Abstracts are submitted based on one or more preferential subjects. The abstracts are reviewed and several are selected for preparation into papers that are distributed to registered participants of the annual meeting. Unlike IEEE Summer and Winter Power Meetings, the papers themselves are not presented at the meeting. Instead, the meetings concentrate on discussions regarding questions that have been distributed ahead of time and are related to the preferential subjects.

On odd numbered years each study committee conducts its own meeting (called a colloquium) at a location determined by its members. These meetings consist of informal discussions of selected topics. In order to keep these meetings to manageable size attendance is restricted to invitation only. Last year SC 12 held its colloquium in Madrid, Spain, and the

9.3 CIGRE SC12 - W. N. Kennedy

United States was represented by Stan Lindgren (EPRI), Leo Savio (Consolidated Edison), Jack Harley (J. W. Harley Inc.), and Harold Moore (consultant). Two topics that received considerable attention at the colloquium were diagnostic methods and transformer life evaluation and extension. Users are obviously very interested in extending the life of their existing equipment as far as practically possible! Other topics discussed at the colloquium were:

- a) Installation of Power Transformers on Site
- b) Tank Rupture, Environmental and Safety Aspects of Transformers (including gas insulated transformers)
- c) PCB Contamination Problems in Transformers

3. Membership

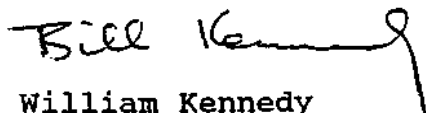
Individuals interested in the activities of CIGRE, and in particular that of the working groups, are encouraged to join. For those who may encounter travel restrictions, most working groups permit corresponding memberships which allow members to participate without actually attending the meetings.

Individual memberships are \$70.00 per year and are available through the national committees. In the US people should contact:

Mr. Andrew Corry
General Manager, US National Committee, CIGRE
P.O. Box 310
W. Hyannisport, MA 02672
Telephone: (508) 771-0488

For more information on the activities of SC12 and/or its working groups, please contact me directly.

Respectfully Submitted,



William Kennedy
US Representative to SC 12 (Transformers)

Telephone: (317) 286-9387
Fax: (317) 286-9549.

9.3 CIGRE SC12 - W. N. Kennedy

SUMMARY OF WORKING GROUP ACTIVITIES
RELATED TO SC 12 (TRANSFORMERS)

- 1) 12.09 Thermal Aspects. This working group held its final meeting in Madrid. The group has issued four reports published in ELECTRA and has four more in final stages of preparation. Articles include direct measurement of hot-spot temperature, heat-run test procedure for power transformers, maximum allowable hot-spot temperature, life evaluation of transformers, analytical determination of the hot-spot factor, survey of transformer thermal characteristics, dissolved gas analysis during heat run tests, and a survey of overload field practices. Bill McNutt was the United States representative on this working group.
- 2) 12/14.10 HVDC Converter Transformers. One paper on HVDC specification data has been published in ELECTRA, and two more - on HVDC dielectric testing and a survey on converter transformer and smoothing reactor reliability - have been approved for publication. Two additional surveys are underway covering noise reduction and variation on transformer impedances. US membership includes Bill Kennedy, Ed Yasuda, and Ed Norton.
- 3) 12.11: Fast Transients. No new activity pending appointment of new covenor.
- 4) 12.12: Sound Measurements. This working group is completing its activities.
- 5) 12/15.13: Static Electrification. Stan Lindgren from EPRI is the covenor of this working group. US members include Leo Savio, Harold Moore, Jack Harley and J. Keith Nelson. Two task forces are underway -one to study incidents with actual transformers and the other investigation fundamental behavior regarding static electrification.
- 6) 12.14: Reliability Survey. A computer program has been developed to tabulate transformer failure statistics.
- 7) 12.15: Specifications. This new working group held its first meeting during the 1992 General Meeting.

9.3 CIGRE SC12 - W. N. Kennedy

Several new working groups are being started, including:

- 8) 12.16: Instrument Transformers.
- 9) 12.XX: Impact of Accessories on Transformer Reliability
- 10) 12.XX: Particles in Oil.
- 11) 12.XX: Life Management.

In addition, there are several working groups in other subcommittees performing work of interest to transformer manufacturers and users. These include:

- 1) 15.01: Transformer Oils
- 2) 23.09: Substation Maintenance and Component Reliability
- 3) 15.XX: Estimation of Life of Aged Insulation
- 4) 15.XX: PD Characterization

10.0 New Business

No new business was brought forward.

The meeting was adjourned at 11:15 am.

IEEE/PES TRANSFORMERS COMMITTEE ATTENDANCE STATISTICS

GROUPS	Phoenix	Baltimore	Birmingham	Cleveland	Portland	St. Paul	Dallas	MAX	AVG
	May 1991	Nov. 1991	Apr. 1992	Oct. 1992	Mar. 1993	Nov. 1993	Mar. 1994		
Committee Registration: Members and Guests	237	247	285	245	213	283	247	285	251
Spouses	63	59	45	40	48	97	43	97	56
Liaison	140	117	138	120	112		125	140	125
SC ADMINISTRATIVE	19	21	18	18	16	21	20	21	19
SC AUDIBLE NOISE AND VIBRATION	0	25	36	0	26		29	36	19
SC BUSHINGS	26	37	31	22	17	18	39	39	27
WG Bushing Application Guide	25	19	21	27	21	19	22	27	22
WG DC Applications of Bushings	13	14	15	12	17	13	17	17	14
WG Revision C57.19.01		11	15	13	12	13	22	22	14
SC DIELECTRIC TESTS	78	72	93	104	88	98	79	104	87
WG Revision of Dielectric Tests	48	53	56	58	40	60	53	60	53
TF on Revision of the Induced Test	22	25			25	33	38	38	29
TF Metal Oxide Surge Arrester Coordination					27	35	25	35	29
WG Rev. Dielectric Tests on Distr. Transf.	27	21	29	19	17			29	19
TF Rev. Distr. Impulse Guide		25						25	25
WG Partial Discharge Tests	42	67	46	40	66	28	23	67	45
SC DISTRIBUTION TRANSFORMERS		34	28	35	35	52	47	52	39
WG Overhead Type Distr. Transfs. C57.12.20			23	23	23	35		35	26
WG Single-Phase Live Front Padmount C57.12.21			14	14	14	14		14	14
WG Three-Phase Live Front Padmount C57.12.22			15	15	15	15		15	15
WG Single-Phase Submersible C57.12.23			28	28	28	28		28	28
WG Single-Phase Deadfront Padmount C57.12.25								0	0
WG Three-Phase Deadfront Padmount C57.12.26								0	0
WG Bar Coding								0	0
WG Loss Evaluation								0	0
WG Electronic Data Transmittal							42	42	8
SC DRY-TYPE TRANSFORMERS	32	29	42	26	39	38	33	42	34
WG Test Code C57.91	28	22	31	25	31	27	24	31	27
WG Dry-Type Reactors	9	12	15	9	12	7	7	15	10
WG Dry-Type Reactors - HVDC Smoothing						8	5	8	7
WG Dry-Type Thermal Eval. and Flammability	28	0	27	16	26	20	0	28	17
WG Dry-Type General Requirements C57.12.01						31	21	31	26
WG Insulation Req. for Specialty Transf.	19	12	20	11	6	11	8	20	12
WG Cast Coil Loading Guide	30	22	25	19	30	17	17	30	23
WG Hot Spot Differentials						27	16	27	22

* = estimated

NOTE: Data maintained for four years only.

IEEE/PES TRANSFORMERS COMMITTEE ATTENDANCE STATISTICS

GROUPS	Preeds	Baltimore	Birmingham	St. Paul	Portland	St. Paul	Ballas	MAX	AVG
	Mar 1991	Nov 1991	Apr 1992	Oct 1992	Mar 1993	Nov 1993	Mar 1994		
SC HVDC CONVERTER TRANSFORMERS AND REACTORS	11	9	11	13	19	17		19	11
SC INSTRUMENT TRANSFORMERS	13	22	23	26	21	28	21	28	22
SC INSULATING FLUIDS	36	54	68	61	57	62	50	68	55
WG Gas Analysis During Factory Tests	72				57	62		72	48
WG Gas Analysis Silicone Transformers								0	0
SC INSULATION LIFE	81	91	71	138	83	60	63	138	84
WG Guides for Loading	51	62	74	70	69	73	61	74	66
WG Thermal Eval. of Distr. and Power Transf.	56	35	40	32	38	35	11	56	35
WG Thermal Tests	30	54	48	32	34	39	30	54	38
TF Thermal Duplicate							27	27	27
TF Hottest Spot Temp. Rise							31	31	31
WG High Temperature Insulation	46	33	59	60	55	58	52	60	52
SC PERFORMANCE CHARACTERISTICS	77	85	86	69	60	97	83	97	80
WG Loss Tolerance and Measurement	35	37	26	38	39	32	35	39	35
TF Loss Measurement Guide								0	0
TF Low Power Factor Measurements								0	0
WG LTC Performance Requirements	31	30	25	37	38	37	37	38	34
WG PCS Rev. C57.12.00							20	20	20
WG PCS Rev. C57.12.90							15	15	15
WG Revision C57.110							35	35	35
WG Semi-Conductor Rectifier Transformers	0	23	30	23	31	23	23	31	22
SC STANDARDS							13	13	13
WG Continuous Rev. C57.12.00							13	13	13
WG Continuous Rev. C57.12.90							13	13	13
SC UNDERGROUND TRANSFORMERS AND NETWORK PROTECTORS		25	21	17	17	19	20	25	20
WG Three-Phase Underground Transfs.		19	16	14	9	16	16	19	15
WG Liquid-Filled Sec. Network Transfs.		19	21	17	16	15	16	21	17
WG Secondary Network Protectors		17	16	19	13	20	17	20	17
WG Dry-Type Network Transfs.		31	29	15	18	12	10	31	19
SC WEST COAST	18	0	10	14	0			18	7
WG Consolidation of Installation Guides		0		0	0			0	0
WG Seismic Guide		0		0	0			0	0
WG Loss Evaluation Guide		0		0	0			0	0
WG Fire Protection		0		0	0			0	0

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NOTE: Data maintained for four years only.

* = estimated

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C57.12.00	GENERAL REQUIREMENTS FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS (STANDARDS)	G. VAILLANCOURT	BORST J. D.	06-16-93 - - 1998	(514)652-8515	APPROVED BY ANSI 08/04/93 NEW WORKING GROUP FORMED
C57.12.00 PC57.12.001	DEFINITION OF THERMAL DUPLICATE INSULATION LIFE	L. W. PIERCE	GRUBB R. L.	EM IAS - - 05-31-90	(706)291-3166	
C57.12.01	GENERAL REQUIREMENTS FOR DRY-TYPE DIST. AND POWER TR INCL THOSE WITH SOLID CAST &/OR RESIN-ENCAPSULATED WINDINGS	W. PATTERSON	JONATTI A.	02-02-89 - - 1994	(703)688-3325	ONE YEAR EXTENSION REQUESTED APP. BY SB 02/02/89
C57.12.11	GUIDE FOR INSTALLATION OF OIL-IMMERSED TRANSFORMERS (10MVA & LARGER, 69-287KV RATING)	DAVID BRUCKER	GILLIES D. A.	05-09-80 - - 1992	(415)692-4431	TO BE REPLACED BY C57.93 LIFE EXTENSION TO 12/92
PC57.93	BEST COAST	DAVID BRUCKER	GILLIES D. A.	05-09-80 - - 1992	(415)692-4431	TO BE REPLACED BY C57.93 LIFE EXTENSION TO 12/92
C57.12.13	CONFORMANCE REQUIREMENTS FOR LIQUID-FILLED TRANSFORMERS USED IN UNIT INSTALLATIONS INCL. UNIT SUBSTATIONS (STANDARDS)	G. VAILLANCOURT		09-02-81 - - 1987	(514)652-8515	ASSIGN TO SUBCOMMITTEE COPYRIGHT WITHHELD BY NEMA
C57.12.20	OVERHEAD-TYPE DISTRIBUTION TRANSFORMERS, 500 KVA AND SMALLER: H V 34500 VOLTS AND BELOW, L V 7970/13800V & BELOW	J. C. THOMPSON	THOMPSON J. C.	T&D IAS/REP SCC14 01-11-88 12-05-91	(704)373-5139	PAR APPROVED BY NESCOM BALLOTING SUBCOMM.
PC57.12.20	DISTRIBUTION TRANSFORMERS	J. C. THOMPSON	THOMPSON J. C.	01-11-88 12-05-91	(704)373-5139	BALLOTING TC CLOSING 12/30/93
C57.12.21	STANDARD REQUIREMENTS FOR PAD-MOUNTED, COMPARTMENTAL-TYPE, SELF-COOLED, SINGLE-PHASE DIST TRANSFORMERS WITH HV BUSHINGS	J. C. THOMPSON	GRAFOURIAN A.	T&D IAS/REP 10-22-79 06-27-91	(704)373-5139	BALLOTING TC CLOSING 12/30/93 COPYRIGHT NOT RELEASED
PC57.12.21	DISTRIBUTION TRANSFORMERS	J. C. THOMPSON	GRAFOURIAN A.	10-22-79 06-27-91	(704)373-5139	COPYRIGHT NOT RELEASED
C57.12.22	PAD-MOUNTED, COMPARTMENTAL-TYPE SELF-COOLED, 3-PHASE DIST. TR WITH HV BUSHINGS, 2500KVA AND SMALLER...REQUIREMENTS.	J. C. THOMPSON	HANUS K.	T&D IAS/REP IAS/PSE 05-10-89 06-27-91	(704)373-5139	AWAITING ANSI APPROVAL COPYRIGHT NOT RELEASED
PC57.12.22	DISTRIBUTION TRANSFORMERS	J. C. THOMPSON	HANUS K.	05-10-89 06-27-91	(704)373-5139	COPYRIGHT NOT RELEASED
C57.12.23	UNDERGROUND-TYPE, SELF-COOLED, 1-PHASE DISTRIBUTION TR WITH SEPERABLE INSULATED HV CONNECT HV 24940Grdy., LV, 240...;167KVA.	J. C. THOMPSON	PATVA G.	T&D IC IAS/REP IAS/PSE 09-19-85 06-27-91	(704)373-5139	BALLOTING C57 HELD FROM DIST. UNTIL BAL.C57
PC57.12.23	DISTRIBUTION TRANSFORMERS	J. C. THOMPSON	PATVA G.	09-19-85 06-27-91	(704)373-5139	BALLOTING C57 HELD FROM DIST. UNTIL BAL.C57

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C57.12.24	UNDERGROUND-TYPE 3-PHASE DIST- RIBUTION TRANSFORMERS, 2500KVA AND SMALLER: HV, 34500GdY.. & BELOW, LV, 480 V AND BELOW	PAUL OREHEK	HOWARD J. W.	T&D IC IAS/REP IAC/PSE 05-10-88 06-27-91 1993 (201)430-7743	COPYRIGHT NOT RELEASED REBALLOTING TC, CLOSE 11/24/93
PC57.12.24	UG TR & NETWORK PROTECTORS				
C57.12.25	REQUIREMENTS FOR PAD-MOUNTED COMP-TYPE, SELF-COOLED, 1-PHASE DISTRIBUTION TR W/SEP INS HV COHN, HV 34500GdY...167kVA...	J. C. THOMPSON	MOHESKY M.	T&D IC IAS/REP IAS/PSE 05-11-90 06-27-91 1995 (704)373-5139	WORKING ON DRAFT 1 COPYRIGHT NOT RELEASED
PC57.12.25	DISTRIBUTION TRANSFORMERS				
C57.12.26	PAD-MOUNTED COMPARTMENTAL-TYPE SELF-COOLED 3-PHASE DIST TR FOR USE W/ SEPERABLE INSULATED HV COHN., HV 34500GdY.. 2500KVA	J. C. THOMPSON	PAIVA G.	T&D IC IAS/REP IAS/PSE SCC14 06-17-92 12-05-91 1997 (704)373-5139	REV. APP. BY ANSI 07/09/93 HELD FROM DIST PENDING C57 APP
PC57.12.26	DISTRIBUTION TRANSFORMERS				
C57.12.28	PAD-MOUNTED EQUIPMENT - ENCLOSURE INTEGRITY	J. C. THOMPSON	MARTIN J.	06-24-87 - - 1994 (704)373-5139	EXTENSION TO BE REQUESTED NOT TRANSFERRED TO TC YET
PC57.12.28	DISTRIBUTION TRANSFORMERS				
C57.12.29	PAD-MOUNTED EQUIPMENT - ENCLOSURE INTEGRITY IN COASTAL ENVIRONMENTS	J. C. THOMPSON	MARTIN J.	- - - - 1996 (704)373-5139	PUBLISHED IN 1992 NOT TRANSFERRED TO TC YET
PC57.12.29	DISTRIBUTION TRANSFORMERS				
C57.12.30	SUBMERSTIBLE EQUIPMENT - ENCLOSURE INTEGRITY	J. C. THOMPSON	MARTIN J.	- - - - 1994 (704)373-5139	TO BE BALLOTTED NOT TRANSFERRED TO TC YET
PC57.12.30	DISTRIBUTION TRANSFORMERS				
C57.12.31	COATING STANDARD FOR POLE MOUNTED TRANSFORMERS	J. C. THOMPSON	MARTIN J.	- - - - 1994 (704)373-5139	PAR TO BE SUBMITTED NOT TRANSFERRED TO TC YET
PC57.12.31	DISTRIBUTION TRANSFORMERS				
C57.12.40	REQUIREMENTS FOR SECONDARY NETWORK TRANSFORMERS, SUBWAY & VAULT TYPES (LIQUID IMMERSED)	PAUL OREHEK	BERTOLINI E. A.	SCCT14 03-19-92 12-05-91 1997 (201)430-7743	REVISION APPR. BY SB 12/02/93 WAITING PUBLICATION
PC57.12.40	UG TR & NETWORK PROTECTORS				
C57.12.44	STANDARD REQUIREMENTS FOR SECONDARY NETWORK PROTECTORS	PAUL OREHEK	ROBERTSON R. B.	T&D SWGR IAS/REP IAS/PSE EE1 06-27-91 0 (201)430-7743	PAR APPROVED BY SB 06/17/92 BALLOTTING SUBCOMMITTEE
PC57.12.44	UG TR & NETWORK PROTECTORS				
C57.12.50	REQ. FOR VENTILATED DRY-TYPE DISTRIBUTION TR, 1-500KVA, 1 PHASE, AND 15-500KVA, 3-PHASE HV 601-34500VOLTS, LV 120-600V	W. PATTERSON		06-12-89 - - 1994 (703)688-3325	COPYRIGHT NOT RELEASED REAFFIRMED 06/12/89
NONE	DRY-TYPE TRANSFORMERS				
C57.12.51	REQ. FOR VENTILATED DRY-TYPE POWER TR, 501KVA & LARGER, 3 PHASE, WITH HV 601-34500V, LV 208Y/120 TO 4160 VOLTS	W. PATTERSON		06-12-89 - - 1994 (703)688-3325	COPYRIGHT NOT RELEASED REAFFIRM 06/12/89
NONE	DRY-TYPE TRANSFORMERS				

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C57.12.52 NONE	REQ. FOR SEALED DRY-TYPE POWER TRANSFORMERS, 501KVA & LARGER, 3 PHASE, WITH HV 601-34500V, LV 208Y/120 TO 4160 VOLTS DRY-TYPE TRANSFORMERS	W. PATTERSON		06-12-89 - - 1994	(703)688-3325	COPYRIGHT NOT RELEASED REAFFIRMED 06/12/89
C57.12.53 NONE	REQUIREMENTS FOR DRY-TYPE, UNDERGROUND, SINGLE-PHASE WITH SEPARABLE INSULATED H-V 24940 grdy/14400 V AND <; LV 240/120 V (STANDARDS) G. VAILLANCOURT			- - - - 0	(514)652-8515	NEW STANDARD NOBODY IS WORKING ON IT
C57.12.54 NONE	REQUIREMENTS FOR DRY-TYPE, UNDERGROUND 3 PHASE DISTRIBUTION TRANSFORMERS, 2500 KVA OR <, HV 24940 grdy/14400 OR <, LV 480V (STANDARDS) G. VAILLANCOURT			- - - - 0	(514)652-8515	NEED TRANSFER TO IEEE
C57.12.55 NONE	CONFORMANCE STANDARD FOR TR- DRY-TYPE TRANSFORMERS USED IN UNIT INSTALLATIONS, INCL. UNIT SUBSTATIONS D. PATTERSON			04-07-86 - - 1992	(703)688-3325	COPYRIGHT NOT RELEASED BALLOT REAFFIRMATION
C57.12.56 PC57.12.56	TEST PROCEDURE FOR THERMAL EVALUATION OF INSULATION SYST FOR VENTILATED DRY-TYPE POWER & DISTRIBUTION TRANSFORMERS D. PATTERSON		PROVOST R. L.	08-27-84 - - 1995	(703)688-3325	REAFFIRMED BY SB 06/16/93 SUBMIT TO ANSI
C57.12.57 PC57.12.57	REQUIREMENTS FOR VENTILATED DRY-TYPE NETWORK TRANSFORMERS 2500KVA AND BELOW, W/HV 34500V AND BELOW, LV 216Y...AND 480Y... UG TR & NETWORK PROTECTORS PAUL DREHEK		MUTT B.	03-18-92 12-05-91 1997	(201)430-7743	COPYRIGHT NOT RELEASED REAFFIRMED 03/18/92
C57.12.58 P745	GUIDE FOR CONDUCTING TRANSIENT VOLTAGE ANALYSIS OF A DRY-TYPE TRANSFORMER COIL D. PATTERSON		KLINE A. D.	IEC IAS 06-27-91 06-28-78 1996	(703)688-3325	PUBLISHED 1992 ANSI APPROVED 10/11/91
C57.12.59 NONE	GUIDE FOR DRY-TYPE TRANSFORMER THROUGH-FAULT CURRENT DURATION D. PATTERSON		NONE	01-01-89 09-13-84 1994	(703)688-3325	BALLOT FOR REAF. REQUESTED ANSI APPROVED 08/09/91
C57.12.60 PC57.12.60	TEST PROCEDURES FOR THERMAL EVALUATION OF INSULATION SYSTEMS FOR SOLID-CAST & RESIN ENCAP POWER & DIST TRANSFORMER D. PATTERSON		PROVOST R. L.	IAS NEMA IEC 10-25-92 08-17-89 1994	(703)688-3325	APPROVED BY SB 10/25/92 BEING BALLOTTED IN C57
C57.12.70 NONE	TERMINAL MARKINGS AND CONNECTIONS FOR DIST. & POWER TRANSFORMERS (STANDARDS) G. VAILLANCOURT			06-18-92 - - 1997	(514)652-8515	ANSI APPROVED 07/09/93 REAF BY SB ON 06/17/92

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C57.12.80 NONE	TERMINOLOGY FOR POWER & DISTRIBUTION TRANSFORMERS (STANDARDS)	G. VAILLANCOURT		05-01-92 . . . 1997	(514)652-8515	REAFFIRMED 05/01/92 APPROVED BY ANSI 12/02/92
C57.12.90	STANDARD TEST CODE FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS & GUIDE FOR SC TESTING OF (STANDARDS)	G. VAILLANCOURT	SMITH S. D.	03-16-93 . . . 1998	(514)652-8515	NEW WORKING GROUP FORMED APPROVED BY ANSI 08/19/94
C57.12.90 PC57.12.90d	REVISION OF THE INDUCED TEST DIELECTRIC TESTS	J. B. TEMPLETON	POOLIN B.	. . . 09-28-90 0	(317)289-1211	DRAFT 1 BEING PREPARED NEW WORKING GP TO WORK ON THIS
C57.12.90 PC57.12.90x	STANDARD ON SOUND INTENSITY MEASUREMENT AUDIBLE SOUND & VIBRATION	JEewan PURI	 0	(704)282-7413	NEW TASK FORCE TO DRAFT STD ON MEASURING SOUND INTENSITY
C57.12.91 PC57.12.91	TEST CODE FOR DRY-TYPE DISTRIBUTION AND POWER TRANSFORMERS DRY-TYPE TRANSFORMERS	W. PATTERSON	BARNARD D.	SPD EM 11-29-78 06-01-89	(703)688-3325	BALLOT COMPLETE RESOLVING NEGATIVES
C57.13 P546	REQUIREMENTS FOR INSTRUMENT TRANSFORMERS INSTRUMENT TRANSFORMERS	J. E. SMITH		PSIM PSR SPD 03-30-78 05-29-80	(919)827-2121	WAITING ANSI APPROVAL APPROVED BY SB 06/16/93
C57.13.1 NONE	GUIDE FOR FIELD TESTING OF RELAYING CURRENT TRANSFORMERS INSTRUMENT TRANSFORMERS	J. E. SMITH		08-25-87 . . . 1992	(919)827-2121	APPROVED BY ANSI 12/02/92 REAFFIRMED 03/18/92
C57.13.2 NONE	CONFORMANCE TEST PROCEDURES FOR INSTRUMENT TRANSFORMERS INSTRUMENT TRANSFORMERS	J. E. SMITH		04-16-86 09-26-91	(919)827-2121	PUBLISHED 1992 RECOGNIZED BY ANSI 12/23/92
C57.13.3 NONE	GUIDE FOR THE GROUNDING OF INSTRUMENT TR SECONDARY CIRCUITS AND CASES INSTRUMENT TRANSFORMERS	J. E. SMITH		01-23-87 . . . 1991	(919)827-2121	TRANSFER FROM PSRC COMMITTEE
C57.13.4 P832	DETECTION OF PARTIAL DISCHARGE AND MEASUREMENT OF APPARENT CHARGE WITHIN INSTRUMENT TRANSFORMERS INSTRUMENT TRANSFORMERS	J. E. SMITH	JOHNATTI A. J.	. . . 05-28-80 0	(919)827-2121	D6 BEING BALLOTTED IN TC RESOLVING 3 NEGATIVES
C57.15 NONE	REQUIREMENTS, TERMINOLOGY, & TEST CODE FOR STEP-VOLTAGE AND INDUCTION VOLTAGE REGULATORS (STANDARDS)	G. VAILLANCOURT		03-18-87 06-19-86 1997	(514)652-8515	REAFFIRMED 05/01/92 APPROVED BY ANSI 12/02/92
C57.16 PC57.16	REQUIREMENTS FOR CURRENT LIMITING REACTORS DRY-TYPE TRANSFORMERS	W. PATTERSON	DUDLEY R.	NEHA 1AS T&D 09-19-58 03-21-91 1976	(703)688-3325	PREPARING DRAFT 6 INCLUDES ONLY DRY TYPE REACTOR

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C57.17 NONE	REQUIREMENTS FOR ARC FURNACE TRANSFORMERS (STANDARDS)	G. VAILLANCOURT		1986 (514)652-8515	LAST REVISED IN 1986 ANSI DOCUMENT
C57.18.10 PC57.18.10	REQUIREMENTS FOR SEMICONDUCTOR RECTIFIER TRANSFORMERS PERFORMANCE CHARACTERISTICS	BIPIN PATEL	KENNEDY S. P.	NONE 12-28-81 0 (205)877-7740	BALLOTTING WG, ONLY 47% RET. PAR HAS BEEN FOUND
C57.19.00 PC57.19.00	GENERAL REQUIREMENTS AND TEST PROCEDURES FOR OUTDOOR APPARATUS BUSHINGS (IEEE 21)	L. B. WAGENAAR	WAGENAAR L. B.	T&D PSR IC SHGR 07-23-76 04-01-79 1997 (614)223-2259	PUBLISHED 1992 APPROVED BY ANSI 03/31/92
C57.19.01 PC57.19.01	STANDARD PERFORMANCE CHARACTERISTICS AND DIMENSIONS FOR OUTDOOR APPARATUS BUSHINGS (IEEE 24)	L. B. WAGENAAR	SINGH PRITPAL	SPD IAS IC SHGR 08-05-83 11-01-89 1997 (614)223-2259	PUBLISHED 1992 APPROVED BY ANSI 03/20/92
C57.19.03 PC57.19.03	STANDARD REQUIREMENTS, TERMINOLOGY AND TEST CODE FOR BUSHINGS FOR DC APPLICATIONS	L. B. WAGENAAR	HEYMAN OLOF	SPD IC SHGR 11-09-89 0 (614)223-2259	WORKING ON DRAFT SF6 BUSHINGS NOT INCLUDED
C57.19.100 P800	GUIDE FOR APPLICATION OF APPARATUS BUSHINGS. BUSHING	L. B. WAGENAAR	ELLIOTT F. E.	SHGR SUB PSR 09-27-79 0 (614)223-2259	BALLOT COMPLETED IN TC SUBMIT TO REVCOM
C57.19.101 P757	GUIDE FOR LOADING POWER APPARATUS BUSHINGS BUSHING	L. B. WAGENAAR	ELLIOTT F. E.	10-20-88 1997 (614)223-2259	APPROVED AS FULL-USE 06/17/92 ANSI APPROVED 7/93
C57.21 PC57.21	REQUIREMENTS, TERMINOLOGY, AND TEST CODE FOR SHUNT REACTORS RATED OVER 500KVA	BIPIN PATEL	MCGILL J. W.	EH T&D PSR 04-02-91 06-09-88 1995 (205)877-7740	COMPLETE ANSI APPROVED 08/09/91
C57.21 PC57.21a	REQUIREMENTS, TERMINOLOGY, AND TEST CODE FOR SHUNT REACTORS RATED OVER 500KVA	W. PATTERSON	DUDLEY R.	04-02-91 1995 (703)688-3325	COMPLETE ANSI APPROVED 08/09/91
C57.21 PC57.21a	REQUIREMENTS, TERMINOLOGY AND TEST CODE FOR SH. REACTORS OVER 500KVA DIELECTRIC TESTS	J. B. TEMPLETON	KENNEDY W. H.	NONE 04-02-91 12-11-86 1995 (317)289-1211	COMPLETE ANSI APPROVED 08/09/91
C57.91 PC57.91	GUIDE FOR LOADING MINERAL OIL-IMMERSED TRANSFORMERS INSULATION LIFE	L. W. PIERCE	PIERCE L.	SUB T&D PSE 03-21-91 06-13-85 1997 (706)291-3166	PUB. 1/12/81, REAFFIRMED 1991 APPROVED BY ANSI 01/13/92

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C57.92	GUIDE FOR LOADING MINERAL OIL-IMMERSED POWER TRANSFORMERS UP TO & INCL 100 MVA WITH 55 C OR 65 C AVE. WINDING RISE INSULATION LIFE	L. V. PIERCE	PIERCE L.	T&D 03-21-91 06-28-85 1997	(706)291-3166	PUB. 1/12/81, REAFFIRMED 1991 TO BE COMBINED INTO C57.91
C57.93	GUIDE FOR INSTALLATION OF LIQUID-IMMERSED POWER TRANSFORMERS.	DAVID BRUCKER	GILLIES D. A.	NONE - - 06-01-89 0	(415)692-4431	BALLOTING REVISION IN TC WITHDRAWN 12.11/12.12 WHEN APP.
C57.94	RECOMMENDED PRACTICE FOR INSTALLATION, APPLICATION, OPERATION & MAINTENANCE OF DRY-TYPE GEN PURPOSE DIST & POWER TR DRY-TYPE TRANSFORMERS	V. PATTERSON	V. PATTERSON	12-09-87 - - 1987	(703)688-3325	PUB. 1982, REAFFIRMED 1987 BALLOTING REAFFIRMATION
C57.95	GUIDE FOR LOADING LIQUID-IMMERSED STEP-VOLTAGE AND INDUCTION-VOLTAGE REGULATORS	L. V. PIERCE	TAKACH D. S.	03-21-91 - - 1997	(706)291-3166	PUB. 08/19/85, REAFFIRMED 1991 BALLOT FOR REAF. REQUESTED
C57.96	GUIDE FOR LOADING DRY-TYPE DISTRIBUTION AND POWER TRANSFORMERS DRY-TYPE TRANSFORMERS	V. PATTERSON	PIERCE L.	SCC14 04-26-89 04-26-89 1994	(703)688-3325	MUST REAF. OR REV. BY DEC 94
C57.96	GUIDE FOR LOADING DRY-TYPE DISTRIBUTION AND POWER TRANSFORMERS DRY-TYPE TRANSFORMERS	V. PATTERSON	PIERCE L.	T&D 04-26-89 05-06-91 1994	(703)688-3325	INCOMP CAST COIL IN C57.96 COMPLETE BY 10/93
C57.98	IEEE GUIDE FOR TRANSFORMER IMPULSE TESTS DIELECTRIC TESTS	J. B. TEMPLETON	POULIN B.	NONE 06-01-86 02-01-86 1992	(317)289-1211	REVISION APP. BY SB 12/02/93 WAITING PUBLICATION
C57.98	GUIDE FOR PERFORMING ROUTINE LIGHTNING IMPULSE TESTS ON DIST. TRANSFO DIELECTRIC TESTS	J. B. TEMPLETON	ROSSETTI J.	T&D - - 04-30-91 0	ASC 62 EM (317)289-1211	TARGET COMPLETION DATE 1995 SUPPLEMENT TO C57.98
C57.99	GUIDE FOR LOADING DRY-TYPE AND OIL-IMMERSED CURRENT-LIMITING REACTORS (STANDARDS)	G. VAILLANCOURT	G. VAILLANCOURT	- - 03-28-78 1990	(514)652-8515	NEEDS REVISION

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STANDARD NO PROJECT NO	TITLE OF DOCUMENT SUBCOMMITTEE	SC CHAIRPERSON	WG CHAIRPERSON	COMMITTEES REQUESTING COORDINATION PUB_DATE PAR_DATE REV_DUE_YEAR	SC_CH_PHONE	LATEST STATUS COMMENTS
C57.100	TEST PROCEDURE FOR THERMAL EVALUATION OF OIL-IMMERSED DISTRIBUTION TRANSFORMERS			MPE EH T&D SPD		APPROVED BY ANSI 12/02/92
C57.100	INSULATION LIFE	L. W. PIERCE	LOWDERHILK L. A.	03-18-92 10-20-88	(706)291-3166	REAFFIRMED 03/18/92
C57.104	GUIDE FOR THE DETECTION AND DETERMINATION OF GENERATED GAS IN OIL-IMMERSED TRANSFORMERS & THEIR RELATION TO SERVICEABILITY.			PSR T&D		STARTED REVISING
PC57.104	INSULATING FLUIDS	F. GRYSZKIEWICZ	HEINRICH F. W.	06-07-92 05-31-90	(617)926-4900	PUBLISHED 1992
C57.105	GUIDE FOR APPLICATION OF TRANSFORMER CONNECTIONS IN THREE-PHASE DISTRIBUTION SYSTEMS					REAFFIRMED BY SB 06/17/92
PC57.105	PERFORMANCE CHARACTERISTICS	BIPIN PATEL	REITNER G.	06-17-92	(205)877-7740	BEING BALLOTTED IN C57
C57.106	GUIDE FOR ACCEPTANCE AND MAINTENANCE OF INSULATING OIL IN EQUIPMENT			NONE		PUBLISHED 1992
PC57.106	INSULATING FLUIDS	F. GRYSZKIEWICZ		11-20-91 06-19-86	(617)926-4900	ANSI APPROVED 11/20/91
C57.109	GUIDE FOR THROUGH-FAULT CURRENT DURATION			PSR		WILL BALLOT C57
PC57.109	PERFORMANCE CHARACTERISTICS	BIPIN PATEL	PATEL B. K.	03-16-93 06-27-91	(205)877-7740	REV. APPROVED BY SB 03/16/93
C57.110	RECOMMENDED PRACTICE FOR ESTABLISHING TRANSFORMER CAPABILITY WHEN SUPPLYING NONSINUSOIDAL LOAD CURRENTS			T&D PSR NEMA		REF. ANSI 07/93
PC57.110	PERFORMANCE CHARACTERISTICS	BIPIN PATEL	MAREX R. P.	12-03-92 09-15-93	(205)877-7740	PAR APPROVED 09/15/93
C57.111	GUIDE FOR ACCEPTANCE OF SILICONE INSULATING FLUID AND ITS MAINTENANCE IN TRANSFORMERS			IAS T&D ED&PG IEC		BALLOTTING REF. IN MAIN COMM.
NONE	INSULATING FLUIDS	F. GRYSZKIEWICZ		02-02-89 12-10-87	(617)926-4900	BALLOT CLOSES MARCH 25, 1994
C57.112	GUIDE FOR THE CONTROL OF TRANSFORMER SOUND			NONE		NEW TASK FORCE TO START WORK
P523	AUDIBLE SOUND & VIBRATION	JEEVAN PURI	PURI J.	12-28-73	(704)282-7413	CHECK FILES FOR NEWER PAR
C57.113	GUIDE FOR PARTIAL DISCHARGE MEASUREMENT IN LIQUID-FILLED POWER TRANSFORMERS AND SHUNT REACTOR					PUBLISHED AS FULL-USE 1992
P545	DIELECTRIC TESTS	J. B. TEMPLETON	HOWELLS E.	12-05-91 09-25-91	(317)289-1211	
C57.114	SEISMIC GUIDE FOR POWER TRANSFORMERS AND REACTORS			NPE SUBS.		APP BY SB 02/15/90
P513	WEST COAST	DAVID BRUCKER	OKLU S.	02-15-90 09-06-73	(415)692-4431	ANSI APPROVED 08/09/91

DATE: 03-11-94

STATUS REPORT ON STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE
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STANDARD NO PROJECT NO	TITLE OF DOCUMENT SUBCOMMITTEE	SC CHAIRPERSON	WG CHAIRPERSON	COMMITTEES REQUESTING COORDINATION PUB_DATE PAR_DATE REV_DUE_YEAR	SC_CH_PHONE	LATEST STATUS COMMENTS
C57.115 P756	GUIDE FOR LOADING MINERAL-OIL-IMMERSED POWER TRANSFORMERS RATED IN EXCESS OF 100MVA (65 C WINDING RISE) INSULATION LIFE	L. V. PIERCE	PIERCE L. V.	03-21-91 - - 1996	(706)291-3166	BEING REVISED ANSI APPROVED 01/13/92
C57.116 NONE	GUIDE FOR TRANSFORMERS DIRECTLY CONNECTED TO GENERATORS PERFORMANCE CHARACTERISTICS	BIPIIN PATEL	PATEL B. K.	01-03-89 - - 1994	(205)877-7740	BALLOTING REAF. IN MAIN COMM. BALLOT CLOSES APRIL 11, 1994
C57.117 P786	GUIDE FOR REPORTING FAILURE DATA FOR POWER TRANSFORMERS AND SHUNT REACTORS PERFORMANCE CHARACTERISTICS	BIPIIN PATEL	ALTHAN M.	06-17-92 - - 1997	(205)877-7740	REAFFIRMED BY SB 06/17/92 ANSI APPROVED 7/93
C57.119 PC57.119	RECOMMENDED PRACTICE FOR PERFORMING TEMP. RISE TESTS ON OIL-IMMERSED POWER TRANSFORMER AT LOADS BEYOND NP RATING (PB38) INSULATION LIFE	L. V. PIERCE	GRUBB R. L.	- - 09-17-92	0 (706)291-3166	NEW PAR APPROVED 09/17/92 REVISED PAR (TITLE & SCOPE)
C57.120 PB42	LOSS EVALUATION GUIDE FOR POWER TRANSFORMERS AND REACTORS WEST COAST	DAVID BRUCKER	JACOBSEN R.	SUB EM ED&PG 12-03-91 05-01-80	IAS IEC 1996 (415)692-4431	PUBLISHED 1992 APPROVED BY ANSI 02/28/92
C57.121 P954	GUIDE FOR ACCEPTANCE AND MAINTENANCE OF LESS FLAMMABLE HYDROCARBON FLUID IN TRANSFORMERS INSULATING FLUIDS	F. GRYSZKIEWICZ		PSRC T&D IAS IEC 02-22-88 04-12-82	1994 (617)926-4900	BALLOTING REAF. IN MAIN COMM. BALLOT CLOSES MARCH 25, 1994
C57.123 P1098	GUIDE FOR TRANSFORMER LOSS MEASUREMENT PERFORMANCE CHARACTERISTICS	BIPIIN PATEL	HENNING W. R.	- - 06-13-85	0 (205)877-7740	Tf WORKING
C57.124 PC57.124	RECOMMENDED PRACTICE FOR THE DETECTION OF PD AND THE MEASUREMENT OF APPARENT CHARGE IN DRY-TYPE TRANSFORMERS DRY-TYPE TRANSFORMERS	W. PATTERSON	KLINE A. D.	06-29-91 06-27-91	1996 (703)688-3325	PUBLISHED 1992 ANSI APPROVED 10/11/91
C57.125 PC57.125	GUIDE FOR FAILURE INVESTIGATION, DOCUMENTATION AND ANALYSIS FOR POWER TRANSFORMERS AND SHUNT REACTORS PERFORMANCE CHARACTERISTICS	BIPIIN PATEL	ALTHAN M.	T&D ED&PG PSE SUGR 06-27-91 06-28-87	1996 (205)877-7740	ANSI APPROVED 11/20/91
C57.127 PC57.127	GUIDE FOR THE DETECTION OF ACOUSTIC EMISSIONS FROM PARTIAL DISCHARGES IN OIL-IMMERSED POWER TRANSFORMERS DIELECTRIC TESTS	J. B. TEMPLETON	HOWELLS E.	T&D ED&PG CIGRE IEC - - 03-10-88	0 (317)289-1211	REBALLOT MAIN COMMITTEE WAITING FOR BALLOT

STATUS REPORT ON STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE
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STANDARD NO PROJECT NO	TITLE OF DOCUMENT SUBCOMMITTEE	SC CHAIRPERSON	WG CHAIRPERSON	COMMITTEES REQUESTING COORDINATION PUB_DATE PAR_DATE REV_DUE_YEAR SC_CH_PHONE	LATEST STATUS COMMENTS
C57.128 PC57.128	FIRE PROTECTION OF OUTDOOR LIQUID-IMMERSED POWER TRANSFORMERS WEST COAST	DAVID BRUCKER	SUNDIN D.	NPE SUB PSR - - 06-01-89 0 (415)692-4431	DRAFT BEING PREPARED
C57.129 PC57.129	GENERAL REQUIREMENTS & TEST CODE FOR OIL-IMMERSED HVDC CONVERTER TRANSFORMERS AND SMOOTHING REACTORS FOR DC POWER TRANSM HVDC CONVERTER TR & REACTOR	W. N. KENNEDY KENNEDY W. N.		EM T&D PSIM SUB - - 09-26-91 0 (317)286-9387	BALLOTING D7 IN SUBCOM. BALLOT CLOSING MARCH 1, 1994
C57.130 PC57.130	GUIDE FOR USE OF DISSOLVED GAZ ANALYSIS DURING FACTORY THERMAL TESTS FOR THE EVALUATION OF OIL-IMMERSED TRANS. AND REACT. INSULATING FLUIDS	F. GRYSKIEWICZ KINNEY J. P.		NONE - - 03-17-93 0 (617)926-4900	NEW PAR APP. BY SB 03/17/93 CHANGE IN TITLE AND SCOPE
C57.131 PC57.131	REQUIREMENTS FOR LOAD TAP CHANGERS PERFORMANCE CHARACTERISTICS	BIPIN PATEL TRAUB I. P.		EM T&D - - 08-17-89 0 (205)877-7740	BALLOTING SUBCOMMITTEE BALLOT CLOSES MARCH 7, 1994
IEEE 637 P637	GUIDE FOR THE RECLAMATION OF INSULATING OIL AND CRITERIA FOR ITS USE INSULATING FLUIDS	F. GRYSKIEWICZ		06-04-84 - - 1997 (617)926-4900	REAFFIRMED 03/18/92
IEEE 638 P638	QUALIFICATION OF CLASS 1E TR FOR NUCLEAR POWER GENERATING STATIONS PERFORMANCE CHARACTERISTICS	BIPIN PATEL PIERCE L. W.		NPE SUB SEC2 - - 10-29-90 1997 (205)877-7740	APPROVED BY SB 03/18/92 NEW PAR APPROVED 12/04/90
IEEE 799 P799	GUIDE FOR HANDLING AND DISPOSING OF ASKARELS INSULATING FLUIDS	F. GRYSKIEWICZ		EIS IAC T&D 11-17-86 09-27-79 1997 (617)926-4900	REAFFIRMED 03/18/92
IEEE1258 P1258	GUIDE FOR INTERPRETATION OF GASES IN SILICONE LIQUID-FILLED TRANSFORMERS INSULATING FLUIDS	F. GRYSKIEWICZ GONDIE JIM		T&D SCC14 - - 12-05-91 0 (617)926-4900	PAR APPROVED BY SB 12/05/91 PREPARING D02
IEEE1265 P1265	STANDARD FOR BAR CODING FOR DISTRIBUTION TRANSFORMERS (POLE-MOUNTED, PAD-MOUNTED AND UNDERGROUND) DISTRIBUTION TRANSFORMERS	J. C. THOMPSON JORDAN ROW		AIM/TSC IAS/REP - - 06-27-91 1994 (704)373-5139	PAR APPROVED 06/27/91
IEEE1276 P1276	TRIAL-USE GENERAL REQUIREMENTS FOR LIQUID-FILLED DISTRIBUTION AND POWER TR UTILIZING HIGH TEMP SOLID INSULATING MATERIAL INSULATION LIFE	L. W. PIERCE FISCHER H.		T&D - - 09-25-91 0 (706)291-3166	SUBMITTING PAR WILL CONDUCT SURVEY ON N.E.T.M.

DATE: 03-11-94

STATUS REPORT ON STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE
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IEEE1277 P1277	GENERAL REQUIREMENTS & TEST CODE FOR OIL-IMMERSED AND DRY-TYPE HVDC SMOOTHING REACTORS HVDC CONVERTER TR & REACTOR	V. W. KENNEDY			09-25-91	0	(317)286-9387	FIRST TF MEETING TOOK PLACE PAR APPROVED 09/26/91
IEEE1350 P1350	GUIDE FOR PROTECTION OF DISTRIBUTION TRANSFORMERS WITH EMPHASIS ON SECONDARY (LOW VOLTAGE SIDE) SURGES DIELECTRIC TESTS	J. B. TEMPLETON	ROSSETTI J.		03-17-93	0	(317)289-1211	PAR APPROVED BY SB 03/17/93 JOINT PROJECT WITH SPD
IEEE1388 P1388	STANDARD FOR THE ELECTRONIC REPORTING OF TRANSFORMER TEST DATA DISTRIBUTION TRANSFORMERS	J. C. THOMPSON	LYON D. S.	EEI	NEHA	ASC X12 PSR	CS SAB (704)373-5139	APPROVED BY NESC0M 09/15/93 NO. CHANGED FROM C57.132
NEW NEW	GUIDE FOR THE LOCATION OF ACOUSTIC EMISSIONS FROM PARTIAL DISCHARGES IN OIL-IMMERSED POWER TRANSFORMERS DIELECTRIC TESTS	J. B. TEMPLETON	MONNELLS E.			0	(317)289-1211	BALLOTING WORKING GROUP SUBMIT PAR AS SOON AS POSSIBLE
NEW NEW	TRANSFORMER SITTING GUIDE AUDIBLE SOUND & VIBRATION	JEEVAN PURI	MCGILL J.			0	(704)282-7413	NEW GUIDE NEW WG FORMED

COORDINATION ACTIVITIES OF THE IEEE/PES TRANSFORMERS COMMITTEE
ATTACHMENT 3

PROJECT NUMBER AND TITLE	RESPONSIBLE COMMITTEE	CONTACT NAME	CONTACT PHONE NO.	TRANSFORMERS COMMITTEE COORDINATOR	TRANSFORMERS COMMITTEE SUBCOMMITTEE	COORDINATOR PHONE NO.
*P1246	GUIDE FOR THE COMMISSIONING OF ELECTRICAL SYSTEMS IN HYDROELECTRIC POWER PLANTS	ED&PG	LOUIS A. TAUBER	503-526-2323	D. A. GILLIES	WEST COAST 503-622-4847
*P1122	DIGITAL RECORDERS FOR MEASUREMENTS IN HIGH VOLTAGE IMPULSE TESTS	PSIM	T. R. MCCOMB	613-990-5826	BERTRAND POULIN	DIELECTRIC TESTS 408-957-8326
*P1223	POWER SYSTEM DIGITAL TESTING TECHNIQUES	PSIM	T. R. MCCOMB	613-990-5826	R. HINKWITZ, SR.	DIELECTRIC TESTS 617-828-3241
*P1304	CURRENT MEASURING SYSTEMS WHICH USE OPTICAL TECHNIQUES	PSIM	T. R. MCCOMB	613-990-5826	J. M. DAVIS	INSTRUMENT TRANSFORMERS 404-393-9831
*P62	GUIDE FOR DIAGNOSTIC OF POWER APPARATUS	PSIM	DAVID TRAIN	617-926-4900	R. A. VEITCH	STANDARDS 905-731-9178
*PC37.107	STANDARD FOR DIGITAL PROTECTION SYSTEM DESIGN	PSR	STIG L. NILSSON	415-853-2314	BERTRAND POULIN	DIELECTRIC TESTS 408-957-8326
*PC37.108	GUIDE FOR THE PROTECTION OF NETWORK TRANSFORMERS	PSR	THOMAS E. WIEDMAN	312-294-2810	R. B. ROBERTSON	UG TR & NETWORK PROTECTORS 813-228-4081
*PC37.109	GUIDE FOR THE PROTECTION OF SHUNT REACTORS	PSR	LAVERN L. DVORAK	303-231-1636	MIKE ALTMAN	PERFORMANCE CHARACTERISTICS 407-694-4975
*PC37.110	GUIDE FOR THE APPLICATION OF CURRENT TRANSFORMERS USED FOR PROTECTIVE RELAYING PURPOSES	PSR	L. J. SHULZE	312-253-5760	JOHN N. DAVIS	INSTRUMENT TRANSFORMERS 404-393-9831
*PC37.91	GUIDE FOR PROTECTIVE RELAY APPLICATION TO POWER TRANSFORMERS	PSR	R. J. FERNANDEZ	215-770-5619	S. K. PATEL	PERFORMANCE CHARACTERISTICS 205-877-7740
*PC37.97	GUIDE FOR PROTECTIVE RELAY APPLICATION TO POWER SYSTEM BUSES	PSR	STEVE CONRAD	505-848-2642	JOHN N. DAVIS	INSTRUMENT TRANSFORMERS 404-393-9831

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*PROJECT NUMBER AND TITLE

DATE	RESPONSIBLE COMMITTEE	CONTACT IN RESP. COMM.	CONTACT PHONE NO.	TRANSFORMERS COMMITTEE COORDINATOR	TRANSFORMERS COMMITTEE SUBCOMMITTEE	COORDINATOR PHONE NO.
*PC57.13.1	PSR	D. R. VOLZKA	414-221-2750	JOHN H. DAVIS	INSTRUMENT TRANSFORMERS	404-393-9831
*P1038	SPD	LEWIS DOUGLAS SWEENEY	602-834-9372	MAHESH P. SAMPAT	DIELECTRIC TESTS	704-462-3226
*PC62.11	SPD	R. M. SIMPSON	919-836-7059	V. A. MAGUIRE	DIELECTRIC TESTS	501-377-4273
*PC62.22	SPD	S. S. KERSHAW	716-375-7296	ROBERT DEGENEHEFF	DIELECTRIC TESTS	518-276-6367
*PC62.2.01	SPD	G. L. GAIBROIS	313-897-0485	R. B. ROBERTSON	UG IR & NETWORK PROTECTORS	813-228-4081
*PC62.42	SPD	MICHAEL M. FLACK	404-551-4904	MAHESH P. SAMPAT	DIELECTRIC TESTS	704-462-3226
*P1268	SUBS	SHASHI G. PATEL	404-362-5386	D. A. GILLIES	WEST COAST	503-822-4847
*P1303	SUBS	PHILIP R. MANNERY	914-577-2591	R. F. DUDLEY	DRY TYPE	416-298-8108
*P693	SUBS	RULON FRONK	213-481-3327	L. A. TAUBER	WEST COAST	503-230-3829
*P979	SUBS	A. J. BOLGER	604-663-2879	D. W. SUNDIN	WEST COAST	414-524-3221
*P980	SUBS	RICHARD G. COTRELL	517-786-0817	F. GRYSZKIEWICZ	INSULATING FLUIDS	617-926-4900
*C37.112	SWGR	E. F. VEVERKA	414-835-1544	GEORGES VAILLANCOURT	DIELECTRIC TESTS	514-652-8515

COORDINATION ACTIVITIES OF THE IEEE/PES TRANSFORMERS COMMITTEE
ATTACHMENT 3

PROJECT NUMBER AND TITLE	RESPONSIBLE COMMITTEE	CONTACT IN RESP. COMM.	CONTACT PHONE NO.	TRANSFORMERS COMMITTEE COORDINATOR	TRANSFORMERS COMMITTEE SUBCOMMITTEE	COORDINATOR PHONE NO.
03-11-94						
*P1325	RECOMMENDED PRACTICE FOR REPORTING FIELD TROUBLE DATA FOR POWER CIRCUIT BREAKERS	D. H. LARSON	203-634-5739	G. VAILLANCOURT	STANDARDS (INFORMATION)	514-652-8515
*PC37.04h	MECHANICAL LOADING REQUIREMENTS OF CIRCUIT BREAKER TERMINALS	GEORGE R. HAWKS	615-751-4020	LOREN B. WAGENAAR	BUSHINGS	614-223-2259
*PC37.10	GUIDE FOR DIAGNOSTICS AND FAILURE INVESTIGATION OF POWER CIRCUIT BREAKERS	L. ROLANDO SAAVEDRA	504-363-8765	WALLACE B. BINDER JR.	PERFORMANCE CHARACTERISTICS	216-384-5625
*P1030.3	GUIDE FOR SPECIFICATION OF HVDC PERFORMANCE - PART III, DYNAMIC PERFORMANCE	CLIFFORD C. DIEMOND	503-222-2109	WILLIAM H. KENNEDY	HVDC CORV. TR & SMOOTHING REAC	317-286-9387
*P656	STANDARD FOR THE MEASUREMENT OF AUDIBLE NOISE FROM OVERHEAD TRANSMISSION LINES	JAMES R. STEWART	518-395-5025	ALAN M. TEPLITSKY	AUDIBLE SOUND AND VIBRATION	212-660-4859
*P957	GUIDE FOR CLEANING INSULATORS	WILLIAM L. GIBSON	415-973-3747	L. B. WAGENAAR	BUSHINGS	614-223-2259

03-11-94

COORDINATION ACTIVITY OF IEEE/PES TRANSFORMERS COMMITTEE
LIST OF LIAISON REPRESENTATIVES
ATTACHMENT 4

ACRONYM	SOCIETY/COMMITTEE	LIAISON REPRESENTATIVE	PHONE NUMBER
AIM/TSC	AUTOMATIC IDENTIFICATION MANUFACTURERS (TSC COMM.)		
CS	COMPUTER SOCIETY	G. S. ROBINSON	(508) 442-0248
ED&PG	ENERGY DEVELOPMENT AND POWER GENERATION COMMITTEE	C. A. LENNON JR.	(702) 293-8817
EEI	EDISON ELECTRIC INSTITUTE (T&D COMM.)	M. C. MINGOIA	(202) 508-5177
EI	ELECTRICAL INSULATIONS	E. A. BOULTER	(508) 546-3009
EM	ELECTRIC MACHINERY COMMITTEE	B. GUPTA	(416) 231-4111
IAS	INDUSTRY APPLICATION SOCIETY	B. C. JOHNSON	(512) 396-5880
IAS/PSE	IAS/POWER SYSTEM ENGINEERING COMMITTEE	R. W. INGHAM	(313) 236-0130
IAS/REP	IAS/RURAL ELECTRIC POWER COMMITTEE	C. HERTZ	(217) 563-8333
IC	INSULATED CONDUCTORS COMMITTEE	F. E. KIMSEY	(704) 373-6562
IEC	INTERNATIONAL ELECTROTECHNICAL COMMISSION	R. S. GIRGIS	(317) 286-9532
INEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION	J. GAUTHIER	(202) 457-8400
NPE	NUCLEAR POWER ENGINEERING COMMITTEE	J. D. LAHONT	(803) 725-1649
PSC	POWER SYSTEM COMMUNICATIONS COMMITTEE	G. Y. ALLEN	(416) 259-7986
PSE	POWER SYSTEM ENGINEERING COMMITTEE	R. BEDNARIK	(212) 580-6675
PSJM	POWER SYSTEM INSTRUMENTATION MEASUREMENT COMMITTEE	T. R. MC COMB	(613) 990-5826
PSRC	POWER SYSTEM RELAYING COMMITTEE	R. W. HAAS	(513) 231-2584
SCCT4	COORD. COM. ON QUANTITIES UNITS AND LETTER SYMBOLS	B. BARROW	(703) 285-5444
SCC4	COORDINATING COMMITTEE ON THERMAL RATING	P. E. ALEXANDER	(219) 458-4576
SPD	SURGE PROTECTIVE DEVICES COMMITTEE	J. B. POSEY	(216) 887-5129
SUBS	SUBSTATIONS COMMITTEE	J. E. HOLLADAY	(615) 689-5781
SWGR	SWITCHGEAR COMMITTEE	D. F. PEELO	(604) 528-3034
TC	TRANSFORMERS COMMITTEE	G. H. VAILLANCOURT	(514) 652-8515
TSC	TECHNICAL SYMBOLOGY COMMITTEE (PART OF AIM)		
T&D	TRANSMISSION AND DISTRIBUTION COMMITTEE	F. D. MYERS	(314) 682-8401

Attachment 5

TC 10 FLUIDS FOR ELECTROTECHNICAL APPLICATIONS

Chairman: Dr. E. Serena (Italy).
Secretariat: Belgium (Mr. M. Randoux).

Last meeting: Madrid, 1991.
Next meeting: 1994.

Publications issued

- 156 (1963) Method for the determination of the electric strength of insulating oils.
- 247 (1978) Measurement of relative permittivity, dielectric dissipation factor and d.c. resistivity of insulating liquids.
- 296 (1982) Specification for unused mineral insulating oils for transformers and switchgear.
Amendment No. 1 (1986).
- 376 (1971) Specification and acceptance of new sulphur hexafluoride.
- 376A (1973) First supplement: Section Thirteen: Mineral oil content.
- 376B (1974) Second supplement: Clause 26.
- 422 (1989) Supervision and maintenance guide for insulating mineral insulating oils in electrical equipment.
- 465 (1988) Specification for unused insulating mineral oils for cables with oil ducts.
- 475 (1974) Method of sampling liquid dielectrics.
- 480 (1974) Guide to the checking of sulphur hexafluoride (SF₆) taken from electrical equipment.
- 567 (1992) Guide for the sampling of gases and of oil from oil-filled electrical equipment and for the analysis of free and dissolved gases.
- 588-1 (1977) Askarels for transformers and capacitors. Part 1: General.
- 588-2 (1978) Askarels for transformers and capacitors. Part 2: Test methods.
- 588-3 (1977) Askarels for transformers and capacitors. Part 3: Specifications for new askarels.
- 588-4 (1979) Askarels for transformers and capacitors. Part 4: Guide for maintenance of transformer askarels in equipment.
- 588-5 (1979) Askarels for transformers and capacitors. Part 5: Screening test for compatibility of materials and transformer askarels.
- 588-6 (1979) Askarels for transformers and capacitors. Part 6: Screening test for effects of materials on capacitor askarels.
- 590 (1977) Determination of the aromatic hydrocarbon content of new mineral insulating oils.
- 599 (1978) Interpretation of the analysis of gases in transformers and other oil-filled electrical equipment in service.
- 628 (1985) Gassing of insulating liquids under electrical stress and ionization.
- 666 (1979) Detection and determination of specified anti-oxidant additives in insulating oils.
- 733 (1982) Determination of water in insulating oils, and in oil-impregnated paper and pressboard.
- 814 (1985) Determination of water in insulating liquids by automatic coulometric Karl Fischer titration.
- 836 (1988) Specifications for silicone liquids for electrical purposes.
- 867 (1986) Specifications for unused insulating liquids based on synthetic aromatic hydrocarbons.
- 897 (1987) Methods for the determination of the lightning breakdown voltage of insulating liquids.
- 944 (1988) Guide for the maintenance of silicone transformer liquids.
- 962 (1988) Maintenance and use guide for petroleum lubricating oils for steam turbines.
- 963 (1988) Specification for unused polybutenes.
- 970 (1989) Methods for counting and sizing particles in insulating liquids.
- 978 (1989) Maintenance and use guide for triaryl phosphate ester turbine control fluids.
- 997 (1989) Determination of polychlorinated biphenyls (PCBs) in mineral insulating oils by packed column gas chromatography (GC).
- 1039 (1990) General classification of insulating liquids.
- 1065 (1991) Method for evaluating the low temperature flow properties of mineral insulating oils after ageing.
- 1099 (1992) Specifications for unused synthetic organic esters for electrical purposes.
- 1100 (1992) Classification of insulating liquids according to fire-point and net calorific value.
- 1125 (1992) Unused hydrocarbon based insulating liquids - Test methods for evaluating the oxidation stability.
- 1144 (1992) Test method for the determination of oxygen index of insulating liquids.
- 1203 (1992) Synthetic organic esters for electrical purposes - Guide for maintenance of transformer esters in equipment.

Attachment 5

TC 10 FLUIDS FOR ELECTROTECHNICAL APPLICATIONS
(continuation)

Publications issued in 1992

- 567: (Second edition) Guide for the sampling of gases and of oil from oil-filled electrical equipment and for the analysis of free and dissolved gases. - 10(C.O.)260.
- 1099: (First edition) Specifications for unused synthetic organic esters for electrical purposes. - 10(C.O.)259.
- 1100: (First edition) Classification of insulating liquids according to fire-point and net calorific value. - 10(C.O.)261.
- 1125: (First edition) Unused hydrocarbon based insulating liquids - Test methods for evaluating the oxidation stability. - 10(C.O.)263.
- 1144: (First edition) Test method for the determination of oxygen index of insulating liquids. - 10(C.O.)264.
- 1203: (First edition) Synthetic organic esters for electrical purposes - Guide for maintenance of transformer esters in equipment. - 10(C.O.)240.

Publications being printed

- 1221: (First edition) Petroleum products and lubricants - Triaryl phosphate ester turbine control fluids (Category ISO-L-TCD) - Specifications. - 10(Sec.)311.

Draft International Standards circulated

- 10(C.O.)269: Insulating liquids - Specifications for unused liquids based on synthetic aromatic hydrocarbons (Revision of IEC 867).
- 10(C.O.)270: Mineral insulating oils - Methods for the determination of 2-furfural and related compounds.
- 10(C.O.)268: Insulating liquids - Test method for the linear flame propagation of insulating liquids using a glass-fibre tape.
- 10(C.O.)267: Application of dissolved gas analysis to factory tests on oil filled electrical equipment.

Subjects under consideration

- Method of determination of the breakdown voltage of insulated liquids (Revision of IEC 156). - 10(Sec.)294.
- Determination of water in insulating liquids, in oil-impregnated paper and pressboard by automatic coulometric Karl Fischer titration (Revision of IEC 814). - 10(Sec.)299.
- Specification for unused mineral insulating oils for transformers and switchgear (Revision of IEC 296). - 10(Sec.)292.
- Revision of IEC 599: Interpretation of the analysis of gases in transformers and other oil-filled electrical equipment in service. - 10(France)218.
- Report (Type 3) - Behaviour of oils containing pour-point depressant additives and fulfilling the requirements of IEC 296. - 10(Sec.)264 and 264A.
- Test procedure for the determination of the partial discharge inception voltage of insulating liquids (POIV). - 10(Sec.)315.
- Method for the determination of polychlorinated biphenyl (PCB) contamination in insulating liquids by capillary gas chromatography. - 10(Sec.)314.

Attachment 5

TC 14 POWER TRANSFORMERS

Chairman: Mr. F.C. Pratt (United Kingdom).
 Secretariat: United Kingdom (Mr. J.M. Faller).

Last meeting: Toronto, 1992.
 Next meeting: Date not yet fixed.

Publications issued

- 76-1 (1976) Power transformers. Part 1: General.
 76-2 (1976) Power transformers. Part 2: Temperature rise.
 76-3 (1980) Power transformers. Part 3: Insulation levels and dielectric tests.
 Amendment No. 1 (1981).
 76-3-1 (1987) Power transformers. External clearances in air.
 76-4 (1976) Power transformers. Part 4: Tappings and connections.
 76-5 (1976) Power transformers. Part 5: Ability to withstand short-circuit. First edition (1976) incorporating Amendment No. 1 (1979).
 354 (1991) Loading guide for oil-immersed power transformers.
 551 (1987) Determination of transformer and reactor sound levels.
 606 (1978) Application guide for power transformers.
 616 (1978) Terminal and tapping markings for power transformers.
 722 (1982) Guide to the lightning impulse and switching impulse testing of power transformers and reactors.
 726 (1982) Dry-type power transformers. Amendment No. 1 (1986).
 905 (1987) Loading guide for dry-type power transformers.

Publications under Systematic Review

- Systematic review of IEC 76-3 (1980). Power transformers. Part 3: Insulation levels and dielectric tests. - 14(C.O.)80.
 Systematic review of IEC 76-3, Amend. 1 (1981). Power transformers. Part 3: Insulation levels and dielectric tests. - 14(C.O.)81.
 Systematic review of IEC 76-5 (1976). Power transformers. Part 5: Ability to withstand short-circuit. First edition (1976) incorporating Amendment No. 1 (1979). - 14(C.O.)82.
 Systematic review of IEC 722 (1982). Guide to the lightning impulse and switching impulse testing of power transformers and reactors. - 14(C.O.)83.
 Systematic review of IEC 726 (1982). Dry-type power transformers. - 14(C.O.)84.

Systematic review of IEC 905 (1987). Loading guide for dry-type power transformers. - 14(C.O.)85.

Publications being printed

- 76-1: (Second edition) Power transformers - Part 1: General. - 14(C.O.)75.
 76-2: (Second edition) Power transformers - Part 2: Temperature rise. - 14(C.O.)76.

Drafts approved for circulation as Draft International Standards

Amendment to Sub-clauses 2.1.4 and 2.1.5, Table IV of IEC 76-5. - 14(Sec.)198.

Subjects under consideration

- Amendment to Annex B of IEC 551 - Measurement of sound power level using intensity. - 14(Sec.)190.
 Amendment to IEC 551 - Annex C: Determination of current sound level. - 14(Sec.)194.
 Application guide for power transformers (Revision of IEC 606). - 14(Sec.)192.

Transformers for static convertors. - 14(Sec.)195 and 195A.

Direct connections between power transformers and gas-insulated metal-enclosed switchgear for rated voltages of 72,5 kV and above. - 14(Sec.)214.

Attachment 5

SC 14B ON-LOAD TAP CHANGERS

Chairman: Mr. D.A. Peck (United Kingdom).
Secretariat: United Kingdom (Mr. J.M. Faller).

Last meeting: Wiesbaden, 1985.
Next meeting: Date not yet fixed.

Chairman

TC 14 appointed Mr. D.A. Peck (United Kingdom),
as Chairman of SC 14B, in succession to Mr.
A.J. Wakeling (United Kingdom).

Publications issued

214 (1989) On-load tap-changers.
542 (1976) Application guide for on-load
tap-changers.
Amendment No. 1 (1988).

SC 14C REACTORS

Chairman: To be appointed.
Secretariat: Germany (Dipl.-Ing. J. Gerth).

Last meeting: Tokyo, 1983.
Next meeting: Date not yet fixed.

Publications issued

289 (1988) Reactors.

Attachment 5

SC 14D SMALL POWER TRANSFORMERS AND REACTORS
AND SPECIAL TRANSFORMERS AND REACTORS

Publications issued

- 742 (1983) Isolating transformers and safety isolating transformers. Requirements. Amendment No. 1 (1992).
989 (1991) Separating transformers, autotransformers, variable transformers and reactors.

Publications issued in 1992

Amendment No. 1 to IEC 742. - 140(C.O.)34.

Drafts approved for publication

- 140(C.O.)23: Amendment to IEC 742: Isolating transformers and safety isolating transformers - Chapter III, Section Two: Transformers for toys, Sub-clause 19.3.
140(C.O.)25: New Sub-clause 4.9 of Chapter I of IEC 742.

Chairman: Mr. B.I. Folcker (Sweden).
Secretariat: France (Mr. L. Jacquemin).

Last meeting: Dubrovnik, 1989.
Next meeting: 1993.

Subjects under consideration

- Revision of IEC 742 for a new structure. - 140(Sec.)21.
Additional requirements with regard to the concepts of impregnation and potting in IEC 742. - 140(Netherlands)13.
New structure of IEC 742 (Revision of IEC 742). - 140(Germany)25.
Amendment to Chapter 1, Clauses 2.39, 7.1, 18.8, 25 Table XV, Chapter 2, Clauses 15.101.2, 15.101.3 and Chapter 3, Clause 24 of IEC 742. - 140(United Kingdom)27.
Appendix 1F - Testing of a series of transformers of IEC 742. - 140(Sec.)26.
Electronic safety isolating transformers and power filter transformers. - 140(United Kingdom)25.

TC 38 INSTRUMENT TRANSFORMERS

Chairman: Prof. G. Zingales (Italy)
Secretariat: Italy (Mr. G. Perina).

Last meeting: Kista, 1992.
Next meeting: Brussels, 1993.

Publications issued

- 44-3 (1980) Instrument transformers. Part 3: Combined transformers.
44-4 (1980) Instrument transformers. Part 4: Measurement of partial discharges.
44-6 (1992) Instrument transformers - Part 6: Requirements for protective current transformers for transient performance.
185 (1987) Current transformers. Amendment No. 1 (1990).
186 (1987) Voltage transformers. Amendment No. 1 (1988).

Publications issued in 1992

- 44-6: (First edition) Instrument transformers - Part 6: Requirements for protective current transformers for transient performance. - 38(C.O.)78 (83).

Subjects under consideration

- Current transformers (IEC 44-1). - 38(Sec.)87.
Amendment to Document 38(Sec.)87 - Sections 2, 3 and 6. - 38(Sec.)105.
Inductive type voltage transformers (IEC 44-2). - 38(Sec.)88.
Amendment to Document 38(Sec.)88 - Sections 2, 3 and 6. - 38(Sec.)106.
Capacitor voltage transformers (IEC 44-5). - 38/WG 26.
Revision of IEC 185 (Clause 40 and Annex A6). - 38(Spain)10.
Revision of clauses of IEC 185 related to insulation requirements and dielectric tests - Section Two: Rating and performance requirements applicable to all current transformers. - 38(Sec.)103.
Electronic voltage transformers. - 38/WG 23.
Revision of IEC 186 (Clauses 9, 12 and 25). - 38(Spain)10.
Revision of clauses of IEC 186 related to insulation requirements and dielectric tests - Section Two: Rating and performance requirements applicable to all inductive voltage transformers. - 38(Sec.)104.
Three-phase voltage transformers for voltage levels less than 52 kV - Chapter 1: General requirements applicable to all three-phase voltage transformers. - 38(Sec.)102.

Review IEC TC work for overlap with IEEE PES standards effort.

Use these types of responses to guide the review. Respond to Anne O'Neill in the IEEE Standards Department. Your response is preferred by March 17, 1994 but there is no time limit to the support of the the IEEE Standards department, for either partial or complete review of IEC projects.

1. Detailed review needed

Send me copies of IEC #____, #____, #____, #____, for our working group to review.

2. IEC Projects in development

We are interested in the IEC project# _____ in development.

2a. Tell us how to get on distribution of minutes and drafts.

2b. _____ is already acting as liaison.

3. IEC holes in program

There is no IEC standard comparable to IEEE Std. # _____. We would like to propose it to IEC. How do we begin?

4. Topics for harmonization

IEC # _____ and IEEE Std. # _____ are similar but not identical.

4a. There is an effort underway to harmonize the IEEE standards chaired by _____.

4b. After evaluation our working group has concluded there is no interest in harmonizing the IEEE standard.

Respond to:

IEC TC standards and projects reviewed by

Anne O'Neill

name _____

IEEE Standards Department

address _____

P.O. Box 1331

Piscataway, NJ 08855

908/562-3852 FAX -1571

phone/fax _____

a.oneill@ieee.org

Email _____

COMMENTS ON TEMPERATURE SYMBOLS FOR IEEE TRANSFORMERS COMMITTEE
STANDARDS AND LOADING GUIDES

The IEEE standards manual requires that the symbols conform to IEEE Std. 280-1985 (Reaffirmed 1991) "IEEE Standard Letter Symbols for Quantities Used in Electrical Science and Electrical Engineering". This document requires a consistent set of symbols within a document. Symbols use required of this standard are;

time	t
absolute temperature, K	T... θ
Celsius temperature, °C	t... θ

When two symbols are separated by three dots the second is a reserve symbol and is to be used only when there is specific need to avoid conflict. Many of our transformer committee documents have time as a quantity and t is used. Thus t cannot be used for Celsius Temperature. For Celsius temperature IEEE 280 gives two choices t and θ . Since t is used for time it cannot be used for temperature. IEEE 280 also states that when conflicts occur because different quantities are assigned identical symbols in the symbols lists than one method of resolving the conflict is by use of uppercase letters as variants for lower case letters and vice versa, but only if no ambiguity results. Thus T (uppercase) could be selected for temperature Celsius which was used in C57.12.00-1993 and C57.12.90-1993. Then the symbol θ may be used for temperature rise over ambient and this is the second choice from the symbol table for temperature in Celsius. For temperature differences within the transformer (i.e. bushing hot spot rise over top oil) then ΔT is used with appropriate subscripts.

Another choice for Celsius temperature per IEEE 280 is θ . It should be noted that there are differences between the lower case θ and the upper case Θ .

In 1988 a task Force agreed on a set of thermal symbols to be used in transformer loading guides and associated guides. It was published in the Nov. 1988 minutes but not in the Transformers Committee Operating Procedures. Briefly it uses,

time	t
temperature, °C	θ
temperature rise	$\Delta\theta$

with no distinction between temperature rise over ambient and temperature rise over top oil. In developing an alternate system of loading equations described in Annex G of the new loading guide I needed more symbols than used in the list and also used symbols in common use in heat transfer papers (since I presented an IEEE paper first). The symbols in the other sections were also changed to conform to this system. I was aware of the 1988 symbol list but thought it applied to the Insulation Life Subcommittee documents only.

(continued page 2)

-2-

The system of symbols used was,

time	t
temperature, °C	T
temperature rise over ambient	θ
temperature difference	ΔT

This generated two negative votes on the most recent Transformer Committee ballot of the Loading Guide. I am willing to change the symbols in the loading guide to conform to those used in other loading documents but I don't want to generate negative ballots by others because T for temperature is used in the 1993 General Requirements and 1993 Test Code. The choice is,

	Choice 1	Choice 2
temperature, °C	T	θ
temperature rise over ambient	θ	$\Delta\theta$
temperature difference	ΔT	$\Delta\theta$

Symbology used in recent standards and drafts under development are tabulated below

Document	Temperature, °C	Temperature Rise	Temperature Difference
C57.12.00-1993	T		
C57.12.90-1993	T		
Rev. of C57.12.00 Thermal Duplicate draft	θ	$\Delta\theta$	
C57.19-101-1989 (Bush Load.)		θ	
C57.96-1989 (dry loading guide)	θ	$\Delta\theta$ and θ	
C57.96 revision for Cast Coil draft	T	θ	
Rev. of C57.91 and C57.92 Loading Guide draft	T	θ	ΔT
Overload heat run guide draft	θ	$\Delta\theta$	
Bushing application guide draft	θ	$\Delta\theta$	

Linden W. Pierce

Linden W. Pierce
3-18-1993 4

ATTACH.
11/88-E
Pl of 2

POWER
ENGINEERING
SOCIETY



IEEE

TRANSFORMERS COMMITTEE

Please Reply To:

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Grayland
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Richmond, VA 23281

October 12, 1988

VICE CHAIRMAN
Robert A. Veitch
Ferranti-Packard Transformer
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Toronto, Ont. Can M6M 4M3

To: Subcommittee Chairmen

SECRETARY
John J. Bergeron
Louisiana Power and Light
P.O. Box 50340
New Orleans, LA 70140

Subject: New Standardized Thermal Equation Symbols

SUBCOMMITTEE CHAIRMEN:

Gentlemen:

AUDIBLE SOUND and VIBRATION
Allan M. Teplitsky
Consolidated Edison
4 Irving Place Rm. 306 S
New York, New York 10003

In February of 1988 the following Joint Task Force was formed to finalize a new set of standardized symbols for use in transformer loading guides and associated guides:

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- John Borst
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DRY TYPE TRANSFORMERS
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INSTRUMENT TRANSFORMERS
Ramon B. Stetson
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30 Main St.
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This completes the assignment given to me in the Fall of 1986 by Dean Yannucci, while chairman of the Transformer Committee.

INSULATION LIFE
Dave H. Douglas
Centacor Energy Corp.
P.O. Box 5000
Cleveland, OH 44101

Very truly yours,

David H. Douglas
Chairman
Insulation Life Subcommittee

INSULATING FLUIDS
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Attachment

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NEW STANDARDIZED THERMAL EQUATION SYMBOLS
IEEE TRANSFORMER COMMITTEE
OCTOBER 1988 - D. H. DOUGLAS

○ Indicates a Non Standard Symbol

Current Loading Guide Symbols

Quantity	Current Loading Guide Symbols						New IEC 354 Draft #6	New Standard
	C57.92	IEEE 756	C57.91	C57.96 Dry Type	IEC Dry Type	IEC 354		
Temperature	θ°C	θ°C	θ°C	θ°C	θ°C	θ°C	θ°C	θ°C
Temperature Rise	θ	θ	θ	θ°K	θ	θ	Δθ°K	Δθ
Ambient Temp.	θ _a	θ _a	θ _a	θ _a	θ _a	θ _a	θ _a	θ _a
Hottest Spot Winding Temp.	θ _{hs}	θ _{hs}	θ _{hs}	θ _h	θ _{wh}	θ _c	θ _h	θ _h
Hottest Spot Winding Rise Over Top Oil	θ _s	θ _s	θ _s	-	-	Δθ _c	Δθ _h °K	Δθ _h
Average Winding Rise Over Amb.	-	-	θ _v	θ _c °K	Δθ _v	Δθ _R	Δθ _v °K	Δθ _v
Average Winding Rise Over Ave. Oil	-	-	-	-	-	θ _{wo}	θ	-
Bottom Oil Temp. Rise Over Amb.	-	-	-	-	-	-	Δθ _o °K	Δθ _o
Top Oil Temp. Rise Over Amb.	θ _o	θ _o	θ _o	-	-	Δθ _o	Δθ _o °K	Δθ _o
<u>Other Subscripts</u>								
Rated	fl	fl	r	o	r	r	r	r
Ultimate	u	u	u	u	-	-	-	u
Initial	i	i	i	i	-	-	-	i
Winding	-	-	w	w	-	-	-	w
Oil	-	-	-	-	-	-	-	o
Hot Spot Stray Flux Factor	-	-	-	-	-	-	H	H
Transformer Thermal Capacity	C	C	C	C	-	-	-	C
Ratio of Load Current to Rated Load Current	K	K	K	-	K	Ⓚ	K	K
Ratio of Load Loss at Rated to No Load Loss	R	R	R	-	-	Ⓡ	R	R
Duration of Load in Hours	t	t	Ⓣ	Ⓣ	t	t	t	t
Time Constant	τ	τ	Ⓣ	Ⓣ	τ	τ	τ	τ
Change in Total Loss Due to Change in Voltage Load	P	ΔP	-	-	-	-	-	ΔP
Total Loss	P	P	P	-	-	-	-	P
Oil Exponent	n	n	n 136	-	-	Ⓝ	Ⓝ	n

