IEEE/PES TRANSFORMERS COMMITTEE MEETING

NOVEMBER 19, 1997

ST. LOUIS, MISSOURI

IEEE/PES TRANSFORMERS COMMITTEE MEETING
ST. LOUIS, MISSOURI
NOVEMBER 19,1997
ATTENDANCE SUMMARY

MEMBERS PRESENT

E. J. Adolphson
J. C. Arnold, Jr.
W. B. Binder, Jr.
M. Cambre, Jr.
J. C. Crouse
K. D. Edwards
J. M. Frank
R. L. Grubb
E.G. Hager, Jr.
J. H. Harlow
T. L. Holdway
C. W. Johnson, Jr.
E. Kallaur
J. G. Lackey
D. L. Lowe
N. P. McQuin
D. H. Mulkey
K. Papp
T. J. Pekarek
D. W. Platts
D. R. Purohit
A. L. Robinson
P. Singh
R. J. Stahara
V. Thenappan
S. C. Tuli
R. J. Whearty

D. Aho
J. Arteaga
J. H. Bishop
D. J. Cash
T. Diamantis
F. E. Elliott
A. A. Ghafourian
R. L. Grunert
E. Hanique
R. R. Hayes
P. J. Hopkinson
A. J. Jonnatti
J. J. Kelly
M. Y. Lau
W. A. Maguire
R. McTaggart
C. R. Murray
B. K. Patel
M. D. Perkins
B. Poulin
C. T. Raymond
J. R. Rossetti
J. E. Smith
R. W. Stoner
J. A. Thompson
L. B. Wagenaar
A. L. Wilks

M. S. Altman
D. Ayers
W. E. Boettger
D. Chu
L. E. Dix
D. J. Fallon
R. S. Girgis
F. J. Gryszkiewicz
N. W. Hansen
F. W. Heinrichs
J. Hunt
R. D. Jordan
S. P. Kennedy
T. D. Lewis
R. P. Marek
C. K. Miller
P. E. Orehek
W. F. Patterson, Jr.
L. W. Pierce
T. A. Prevost
P. Riffon
G. W. Rowe
J. W. Smith
J. C. Sullivan
T. P. Traub
B. H. Ward
F. N. Young

G. Andersen
D. A. Barnard
J. D. Borst
J. L. Corkran
R. F. Dudley
P. T. Feghali
R. D. Graham
M. E. Haas
K. S. Hanus
W. R. Henning
V. C. Jhonsa
L. E. Juhlin
A. D. Kline
M. C. Loveless
J. W. Matthews
W. E. Morehart
G. A. Paiva
P. A. Payne
R. L. Plaster
J. Puri
P. G. Risse
H. J. Sim
S. D. Smith
J. B. Templeton
E. R. Trummer
F. N. Weffer
P. Zhao

MEMBERS ABSENT

D. J. Allan
R. Allustiarti
J. Aubin
R. A. Bancroft
R. L. Barker
S. Bennon
E. A. Bertolini
J. V. Bonucchi
C. V. Brown
D. S. Brucker
T. F. Clark
O. R. Compton
D. W. Croft
V. Dahinden
J. N. Davis
R. C. Degeneff
J. K. Easley
J. A. Ebert
J. A. Fleeman
S. L. Foster
M. A. Franchek
D. L. Galloway
D. A. Gillies
G. H. Hall
K. R. Highton
P. J. Hoefler
C. C. Honey
E. Howells
D. C. Johnson
C. P. Kappeler
W. N. Kennedy
E. Koenig
J. P. Lazar
F. A. Lewis
H. F. Light
S. R. Lindgren
L. W. Long
L. A. Lowdermilk
R. I. Lowe
T. Lundquist
J. Ma
K. T. Massouda
A. D. McCain
J. W. McGill
C. J. McMillen
C. P. McShane
S. P. Mehta
R. E. Minkwitz, Sr.
M. J. Mitelman
H. R. Moore
R. J. Musil
W. H. Mutschler, Jr.
C. G. Niemann
E. T. Norton
J. M. Patton
H. A. Pearce
L. C. Pearson
D. Perco
V. Raff
S.M.A. Rizvi
C. A. Robbins
M. P. Sampat
V.S.N. Sankar
L. J. Savio
W. E. Saxon
R. W. Scheu
D. N. Sharma
V. Shenoy
K. R. Skinger
J. E. Smith
L. R. Smith
W. W. Stein
L. R. Stensland
D. W. Sundin
R. C. Thomas
R. W. Thompson
G. H. Vaillancourt
R. A. Veitch
D. W. Whitley
C. W. Williams, Jr.
W. G. Wimmer
D. J. Woodcock
W. E. Wrenn

GUESTS PRESENT

S. H. Aguirre
G. W. Anderson
S. Antosz
K. Atout
P. M. BALMA
D. BARNARD
M. BARNES
M. BEDARD
M. F. Barnes
O. M. Bello
J. Bosiger
J. L. Brown
D. CAVERLY
A. Cancino
B. Chiu
C. A. Colopy
D. Corsi
K. DE LA HOUSSAYE
R. M. Delvecchio
D. Dohnal
D. A. Duckett
K. P. Ellis
S. FORREST
G. E. Forrest
B. I. Forsyth
V. GAUKHSHTEYN
J. A. Gauthier
C. Gayton
H. Gianakoyros
M. HARDIN
B. HAYMAN
L. HILLIER
R. HORTON, JR.
A. C. Hall
G. E. Henry III
T. Huff
R. I. JAMES
A. JITTU
R. JORDAN
B. Jensen
D. KEITHLY
C. J. Kalra
V. M. Khalin
L. A. Kirchner
W. LACKEY
R. J. LEE
G. N. MILLER
R. MULLIKIN
D. MacMillan
S. E. Michael
J. R. Moffat
A. Molden
S. P. Moore
R. C. Nordman
S. Y. PATEL
M. PLOURDE
E. PURRA
G. Payerle
P. Pillitteri
G. Pregent
G. Preininger
J. L. Progar
R. L. Provost
G. J. Reitter
J. C. Riboud
D. J. Rolling
I. SHTEYH
J. SOMMA
J. Schneider
W. W. Schwartz
P. T. Scully
S. Searcy
W. Seitlinger
C. Simmons
R. W. Simpson, Jr.
S. L. Snyder
B. Sparling
C. L. Stiegemeier
A. Traut
R. D. Wakeam
J. D. Watson
K. Weidmann
K. Weissman
R. C. Wicks
D. de la Cruz

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IEEE PES TRANSFORMERS COMMITTEE MEETING
WEDNESDAY, NOVEMBER 19, 1997
Chair: W. B. Binder Vice Chair: J. W. Matthews
Secretary: B. K. Patel

1.0 Chairman's Report - W. B. Binder

W. B. Binder called the meeting to order at 8:00 am. Mr. Binder opened the meeting by complimenting Jerry Bishop and his associates for the excellent meeting arrangements. The Committee thanked the Host Committee with a round of applause.

Jerry reported on the attendance and other statistics (see Clause 4.0).

Ed Smith provided details about the next meeting in Little Rock, AK on April 26-29,1998. See Clause 4.0 for the details. Also contact LuAnn Hensley at (870) 543-6568 if you need more information about the meeting.

Mr. Binder highlighted the discussions held during the Administrative Subcommittee on November 17, 1997. See the Administrative Subcommittee Meeting Minutes in Clause 4.0 for details.

1.1 Report on the Technical Council Meeting, July 23, 1997 in Berlin

The minutes of Technical Council reported there were about 1300 registrants at the meeting, about 1000 of whom were from the PES side. In terms of numbers, this is regarded as a successful meeting. There was an excellent program; the local committee did an excellent job. There were 73 to 75 technical sessions; this relative to about 90 sessions at previous Summer meetings. Overall, the technical program was regarded as very high quality. Technical committee participation was disappointing and will need to be addressed. There was rather poor attendance by U. S. utility personnel at the meeting.

1.1.1 Task Force for TC Self-Assessment

Wally Binder will chair a task force which will 1) examine our mission, 2) examine our resources (volunteer and PES staff) and report regarding the adequacy of our resources to accomplish the mission. Given the tenor that our volunteers are overworked, this may include recommendations regarding the redefinition of the mission or of the support resources available. The task force is directed to prepare its report by January 1998. Other task force members now named are Bob Dempsey and Jim Harlow.

1.1.2 Standards Association - Tom Garrity

Mr. Garrity spoke of the formation of the IEEE Standards Association. This will potentially change the structure and the manner of business of the Standards Board. This is driven by the desire for the IEEE standards activities to have a more global focus. There has been a general invitation to all IEEE members, to become Standards Association members. Of concern to members of the Technical Council is that Standards Association members (membership required

in order to vote on a standard) will be charged $10.00 in addition to the IEEE membership dues. On Mr. Garrity's suggestion a motion was made, seconded and approved that the Technical Council asks that the PES Governing Board fund the $10.00 fee for the members who are participating in standards development.

1.1.3 Open Ballot Process

The following was submitted as a motion, seconded and approved. 1) The balloting package will now include the requirement that an IEEE member who wishes to vote on a standard self certify that he understands the subject matter, and is technically competent to ballot on that standard. 2) Failure to return one ballot for which a request to ballot had been submitted removes that person from the balloting pool. The person must be advised that he has been removed. He may be reinstated at the discretion of the Standards Coordinator.

1.2 Transformers Committee Report to Technical Council

I reported the following to Technical Council for the Committee:

1.2.1 Committee Meeting Activities

Our Spring '97 meeting was held July 15-18, 1997 in Graz, Austria. Mr. Edgar Trummer of Elin Transformers was our host. A respectable turnout of 160 members and guests attended the meeting.

Membership of the Transformers Committee currently stands at 174 members and 19 Emeritus members. The regular members consist of 79 producers, 58 users, and 37 general interest. Our invitation list is well over 400 engineers and managers in the transformer and utility industry. Attendance at our semi-annual meetings is typically near 300. Anyone with an interest in furthering the technology is welcome at our meetings. With active participation, an invitation is extended to become a member.

The Committee goals are to encourage open participation in transnationalization of transformer standards; to promote technical and educational endeavors such as panel sessions, peer review of technical literature on cognizant subjects; and to support the efforts of the Power Engineering Society.

Future Meetings

Spring '98:	April 26-29, 1998, Excelsior hotel, Little Rock, AR
Fall '98:	November 8-11, 1998, Guanajuato, Mexico.
Spring '99:	April 11-16, 1999, New Orleans, LA during the 1999 April T & D Conference.
Fall '99:	Monterey, Mexico.

1.2.2 Technical Paper Activities

Seven papers were accepted for presentation at the General Poster Session in Berlin.

1.2.3 Panel Sessions for Berlin

We repeated the panel session on Transnationalization of Standards, July 22, 1997 that was presented to our membership in Boston. Panelists included Committee members who have been involved in IEC activities. The former TA for IEC TC14 to USNC, and two Working Group Chairmen who have recently developed harmonized Transformer standards were represented on the panel.

1.2.4 Transformer Standards and Coordination Activities

A detailed status report on over 100 transformer standards is available from our Committee Standards Coordinator. Anyone wishing to receive a copy should contact Mr. Thomas A. Prevost at (802)748-8106. They can also be accessed on the Transformer Committee Web page.

The Transformers Committee takes responsibility for development and revision of IEEE Standards that fall within its scope. These Subcommittees currently have forty-eight Working Groups and Task Forces preparing proposals for standards projects. Information on these standards and projects can be obtained by visiting our WWW homepage.

Technical Advisor to the USNC of TC-14 (Transformers and Reactors) appointed the Transformer Committee officers and Administrative Subcommittee members to the Technical Advisory Group. We continue to have productive meetings of the TAG at each Committee meeting.

2.0 Approval of Minutes of July 18, 1997 - W. B. Binder

The minutes of the Graz meeting were approved as written.

2.1 Meeting Planning Working Group - G. Anderson, Chair

The first meeting of the new Administrative Subcommittee working group (loosely-named)

"WG Meeting Planning" was held at 3 pm, Sunday, November 16, 1997 at the St. Louis Adam's Mark Hotel. Twelve individuals attended. Greg Anderson was nominated as the Chair of this WG.

The first meeting essentially consisted of determining the need of the WG, initially defining the overall scope of the WG, and setting precedence for future WG meetings.

2.1.1 Scope of the WG (what & why)

This WG was formed to meet a real need within the Committee to:

- plan and publicize upcoming Transformer Committee meetings,
- solicit new meeting hosts,
- guide (educate) & provide support to future meeting hosts,
- provide a uniform appearance (or "symmetry") to each meeting
- enhance the existing meeting registration system,
- further develop and maintain the meeting web-page,
- and develop and maintain the "Meeting Host Guide" document.

At the minimum, the WG meetings will provide an open forum of communication and a place for past and future hosts to exchange "lessons learned" (what worked well and what didn't).

2.1.2 WG Members (who)

A typical "fixed" membership list is not applicable for this WG. Prospective attendees (invitees) for each WG meeting will consist of the WG Chair; and a "moving-window" of hosts of future meetings; hosts of the previous three or four meetings (or any past host who wishes to participate); and the Committee Chair, Vice Chair, and Secretary.

2.1.3 Meeting Timeslot (when)

The WG will meet at each Committee meeting, preferably during the Tuesday afternoon sessions.

2.1.4 Discussion

Future meeting locales and hosts were briefly reviewed. It was noted that the Committee presently has a "healthy backlog" of future meeting sites and willing hosts.

Meeting Date	Location	Hosts
April 26-29, 1998	Little Rock, AR (Excelsior Hotel)	J. Ed Smith
November 8-11, 1998	Guanajuato, Mexico	Gordon Denny
April 11-16, 1999	New Orleans, LA	Roland James (tentative)
(Note: The above meeting will be held during the week of the 1999 April T & D Conference)		
Fall 1999	Monterey, Mexico	Alfonso Delgado
Spring 2000	Nashville, TN (Opryland Hotel)	Alan Wilks
Fall 2000	Niagara Falls, ON, Canada	Roger Hayes
Spring 2001	Amsterdam, The Netherlands	Cor Kroon / Ernest Hanique

Several interesting and worthwhile "lessons learned" were briefly discussed (comments like these will be incorporated into the "Host Procedures" document). A couple of the interesting lessons learned included:

- At each meeting, it is highly encouraged that the host of the next meeting assist with registration check-in.
- Make a Xerox copy of all checks received during pre-registration and bring these copies to the meeting to have a record of actual fees paid during the on-site registration.

2.1.5 Host Guidelines Document

Greg Anderson will continue to create the Host Procedures document. Gordon Denny volunteered to assist. Greg and Gordon will attempt to provide an initial review-issue of this document before the next meeting.

2.1.6 Registration Program

Greg Anderson originally created the registration program which consist of a simple MS-Excel spreadsheet with "links" to several MS-Word documents that prints the nametags, receipts, etc. Greg and Ed Smith will continue to enhance the registration program. Greg also created a large spreadsheet to track all costs of his meeting (down to each cup of coffee) and determine the cost of each attendee. This spreadsheet will be incorporated into the registration program.

2.1.7 Next Meeting

The next WG meeting will be one session during Tuesday afternoon at the Little Rock meeting (Ed Smith, please schedule this meeting and provide a room for approximately 12 individuals).

3.0 Vice Chair's Report - J. W. Matthews

3.1 PES Technical Council Committees

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 1997 Summer Power Meeting in Berlin, Germany during July 21 - 24, 1997.

3.1.1 Publications Committee

3.1.1.1 Paper Review Process

Reviews were only completed on 83% of the papers which were submitted with request by the author for presentation in Berlin. This was an improvement over the 68% completed for the 1997 Winter Power Meeting, but still must be improved further. The following decisions were made as long-term fixes that will be implemented prior to the San Diego meeting:

We are completely divorcing the paper submission dates from PES meetings. All paper submission deadlines will disappear. In their place, we will tell authors that their paper will be reviewed and a decision sent to them within 120 days of submittal

Authors will still be allowed to express a desire to present at a specific meeting; however, we will only allow them to specify this after their paper has been accepted.

Completion of paper reviews for presentations and panel session information for the 1998 Winter Meeting was to be received at IEEE Office by October 20, 1997.

3.1.1.2 Transformers Committee Special Publication

Editing of the Survey of Generator Step-Up Transformer Failures was required by Don Volzka, Technical Council Chair, prior to publication as a PES Special Publication. Ed Cromer is performing this function.

3.1.2 Organization and Procedures Committee

3.1.2.1 Technical Committee Activity Reports

The four new committees; Power System Planning and Implementation, Power System Dynamic Performance, Power Operations, and Power System Analysis, Computing an Economics Committees reported on the status of their organizations. All of these committees have been requested to submit O&P Manuals by the 1998 Winter Power Meeting.

3.1.2.2 Revision of the Technical Council Organization and Procedures Manual

One new revision was proposed for the Technical Council O & P Manual. This proposal was to include notification with the removal of a name from the balloting list for nonperformance in a ballot. The proposal was accepted by this Committee for forwarding to the Technical Council.

Appropriate changes have been drafted for the Transformers Committee O & P Manual in accordance with the revised Technical Council O & P Manual. Administrative Subcommittee members should be prepared to ballot this draft at this meeting.

3.1.3 Technical Sessions Improvement Committee

The following areas were discussed as possible areas for improvements:

- It was the feeling of the committee that some sort of 'handshake' needs to be established for notification and confirmation of paper acceptance and presentation.
- TSIC agrees that paper sales should be reinstituted.
- It was observed that we had a number of sessions in parallel on similar topics. There should be a mechanism for reducing this kind of conflict.
- A set of standards is necessary for conference organizers with respect to poster sessions. In particular, size of poster space, space around the posters and lighting should be considered.
- In IEEE interaction with authors:
  a. Reject "Rejected". We should be able to use a kinder, gentler word.
  b. The line in the submission form asking for which conference a paper is submitted is obsolete, misleading and should be eliminated.

3.2 Technical Paper Reviews

3.2.1 Technical Paper Review Summary

We received ten papers for review. Requests for reviews were sent out on September 4, 1997 for responses by September 25, 1997.

Two papers were submitted with requests for publication only. One of these papers was accepted and one was rejected for publication in the Transactions.

Eight papers were submitted with requests for presentation. One of these papers was accepted as written, four were accepted with mandatory changes, and three were rejected. The five accepted papers will be scheduled for presentation in the General Poster Session at the 1998 Winter Power Meeting.

3.2.2 1998 IEEE/PES Winter Power Meeting Papers

The five accepted papers scheduled for presentation in the General Poster Session at the 1998 Winter Power Meeting are as follows:

- Experimental Investigation Of High Frequency Voltage Oscillation In Transformer Windings. S. FUJITA, N. HOSOKAWA, Y. SHIBUYA, Mitsubishi Electric Corporation, Japan.
- Seismic Qualification Of Transformer High Voltage Bushings. S. BELLORINI, F. BETTINALI, G. ZAFFERANI, ENEL Research; M. SALVETTI, ISMES S. P.A.; Italy.
- An Improved Method For Estimating Temperature Rise Of A Bushing Loaded Above Namplate Rating. D. ZENG, Lapp Insulator Co.
- Investigation Into Effective Methods For Assessing The Condition Of Insulation In Aged Power Transformers. M. DARVENIZA, T. K. SAHA, D.J.T. HILL, T. T. LE, University of Queensland, Australia.
- A Combined ANN And Expert System Tool For Transformer Fault Diagnosis. Z. WANG, Y. LIU, Virginia Tech.; P. J. GRIFFIN, Doble Engineering Co.

Please contact me if you are interested in providing a discussion on one of these papers.

3.3 1998 IEEE/PES Winter Power Meeting - Innovative Product Information Session

We will be sponsoring one of these new technical sessions titled "Active Transformer Quieting" to be presented by Mr. Mark Dietrich of QuietPower Systems, Inc.

These new sessions are similar to tutorials, but less formal, and are expected to be two hours in duration.

3.4 Future Committee Meetings

3.4.1 Meetings Working Group

As discussed in the last Administrative Subcommittee meeting, we have formed a new working group within this subcommittee to manage meeting arrangements. Greg Anderson has accepted the request to chair this working group. Recent meeting hosts and future meeting hosts have been requested to participate. The first meeting was scheduled to take place Sunday, November 16, 1997.

3.4.2 Future Committee Meetings

See Clause 2.1.4 for details on future meetings.

Commitments from hosts are needed for meetings Fall 2001 and beyond. Please solicit future hosts and contact Greg Anderson with any possibilities

Respectfully submitted,

John W. Matthews, Vice Chair

4.0 Administrative Subcommittee - W. B. Binder

4.1 Introduction of Members and Guests

Chair Binder called the meeting to order at 6:30 p.m. in Room # 41 of the Adam 's Mark Hotel.

The following members of the Subcommittee were present:

W. B. Binder, Jr.
J. D. Borst
F. E. Elliott
E. G. Hager
K. S. Hanus
J. H. Harlow
J. W. Matthews
P. E. Orehek
B. K. Patel
L. W. Pierce
W. F. Patterson
T. A. Prevost
J. Puri
H. J. Sim
J. E. Smith
L. B. Wagenaar

The following guests were present:

Don Fallon
Bob Grubb
Jerry Bishop

4.2 Approval of the Graz Meeting Minutes

The minutes of the previous Administrative Subcommittee meeting in Graz were approved with a modification to Loren's subcommittee report as noted in his report in the minutes.

4.3 Additions to and/or Approval of the Agenda

The previously communicated agenda was generally followed.

4.4 Committee Finances and Meeting Arrangements

4.4.1 Finances

Report was not available for this meeting. Edgar Trummer earlier reported that the Graz meeting netted $8663.41 surplus.

4.4.2 Meeting Arrangements

The meeting host Jerry Bishop reported the following registration statistics:

Members and guests	282
Companions	32
Companions Tours	22
Tuesday Luncheon	147
Tuesday Outing	191

John Matthews reported on Ed Smith's behalf that the next meeting in Little Rock, AR will be held at the States Convention Center on April 26-29,1998. The room rates will be $86/97 for single/double occupancy plus tax. March 26,1998 will be the deadline for reservations at the Center.

A historical listing of IEEE/PES Transformers Committee meeting locations is attached at the end of these minutes.

4.5 Chair's Report - W. B. Binder

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

Dress code for the future meetings was discussed. It was approved that the dress code for the future meetings should be casual other than any special requirements requested by the host for events.

John Matthews reported on Greg Anderson's behalf the minutes of the newly formed Meetings WG that met yesterday. See Clause 2.1 for details.

4.6 Standards Subcommittee - T. A. Prevost

4.6.1 Standards and Coordination Activities

Tom Prevost reviewed his report which will be included in the Committee meeting minutes.

4.6.2 Documents Submitted to the Standards Board

See the status report.

4.6.3 Standards Subcommittee

None to report at this time.

4.7 Status of IEEE Standards - D. Ramsden

Wally reported that David Ramsden has resigned and a replacement has not been announced. Contact Terry DeCourcelle at IEEE in the meantime if you need assistance.

4.8 Status of ANSI C57 Committee - J. D. Borst

Actions taken by the IEEE Delegation to the ANS Committee C57 (Transformers, Regulators, Reactors and Bushings) since the Spring (Graz) meeting are as follows:

Document	Title	Ballot Date	Source	Action
C57.12.01/d1	General Requirements for Dry-Type Distribution & Power Transformers Including Those with Solid Cast and/or Resin-Encapsulated Windings (Revision)	8/16/97	IEEE	Approve
C57.121/d4	Guide for Acceptance and Maintenance of Less Hydrocarbon Fluids in Transformers (Revision)	8/16/97	IEEE	Approve
C57.18.10/d12	Practices and Requirements for Semiconductor Rectifier Transformers (Revision)	8/16/97	IEEE	Approve
NEMA TP-1	Guide for Determining Energy Efficiency for Distribution Transformers	8/29/97	NEMA	Disappr.
C57.12.90/d4	Test Code for Liquid-Immersed Distribution, Power and Regulating Transformers	10/13/97	IEEE	Approve
C57.125	Guide for Failure Investigation, Documentation, and Analysis for Power Transformers and Shunt Reactors (Reaffirmation)	10/20/97	IEEE	Approve
C57.12.10	Transformers 230 kV and Below, 833/958 through 8333/10417 kVA, Single-Phase, and 750/862 through 60000/80000/100000 kVA, Three-Phase without Load Tap Changing; and 3750/4687 through 60000/80000/100000 kVA with Load Tap Changing - Safety Requirements	10/26/97	NEMA	Approve with Comments

4.9 Subcommittee Activities - Subcommittee Chairs

4.9.1 Audible Sound and Vibration - Jeewan Puri

Jeewan suggested that the transformer sitting guide should be offered to IEC for harmonizing after its approval by IEEE.

4.9.2 Bushings - F. E. Elliott

No report.

4.9.3 Dielectric Tests - L. B. Wagenaar

This a correction to the minutes of the Graz meeting - - It should have read, "Loren reported that the **subcommittee** on revision of dielectric tests has been **reorganized with** four working groups as follows for better efficiency on discussing the varied issues involved:

Power frequency tests - chaired by M. Perkins

Impulse tests - chaired by B. Poulin

PD measurements - chaired by J. Harley

Monitoring and field testing - chaired by R. Young"

4.9.4 Distribution Transformers - K. S. Hanus

No report.

4.9.5 Dry-Type Transformers - W. Patterson

No report.

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

No report.

4.9.7 Instrument Transformers - J. E. Smith

No report.

4.9.8 Insulating Fluids - F. J. Gryszkiewicz

No representation and no report.

4.9.9 Insulation Life - L. W. Pierce

The AdSubCom approved a request by Linden Pierce, Chair Insulating Life Subcommittee, for a Panel/Technical session at the 1999 T&D Conference in New Orleans. Linden proposed that an announcement be placed in the Power Engineering Review issuing a call for papers and giving "Thermal Issues with Transformers" as a preferential subject. Subjects were suggested in a letter to Linden by Bob Grubb as follows: 1) background on the need for a value of the hottest spot temperature rise, 2) power transformer users needs, 3) power transformer manufacturers' methods of demonstrating compliance, 4) distribution transformer users needs, 5) distribution transformer manufacturers' methods of demonstrating compliance, 6) calculation procedures, both strictly empirical and those based on heat run data.

4.9.10 Performance Characteristics - H. J. Sim

Don Fallon was approved as new PCS chair replacing Jin Sim. Jin reported that C57.18.10 has been successfully balloted and C57.110 had successful ballot with a few negatives which have been addressed.

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

No report.

4.9.12 West Coast - E.G. Hager

Red reviewed the minutes of the subcommittee that met in Westminister, CA on October 21,1997.

4.10 Recognition and Awards Subcommittee - J. H. Harlow

Jim's full report will be shown in the Committee meeting minutes.

Subcommittee Chairs were requested to identify any others deserving an award at the next meeting.

4.11 Vice Chair's Report - J. W. Matthews

John presented his written report which will be included in the Committee meeting minutes.

4.11.1 Revisions to Organization and Procedures Manual

John had distributed Revision 2 of his revised O & P Manual prior to the meeting for review. This was discussed at the meeting under old business.

4.12 Secretary's Report - B. K. Patel

4.12.1 Membership Review

Voting Members - George Illif and R. Robertson have resigned from the membership and Jack McGill and Joe Bonucchi have changed their status to emeritus since last meeting. Two new members were added at the last meeting in Graz as noted in the meeting minutes. Also there were few changes in voting classification for some members.

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

Members -	169
Classifications: Producers -	77
Users -	54
General Interest -	38
Emeritus Members -	20

Poor Attendance Records - The invitation list has been revised by removing guests with poor attendance record and adding new guests by request. Members who have not attended a committee meeting since spring of 1995 will be contacted to determine their interest in maintaining membership.

4.12.2 New Member Applications

Four new applications were received from the following individuals for review and were all approved:

Applicant	Company	Classification	Sponsor
Don Ayers	Delta Star	P	John Matthews
Tom Lundquist	Salt River Project	U	Red Hager
Rick Young	FirstEnergy Corp.	U	Loren Wagenaar
Peter Zhao	Haefely Trench	P	Fred Elliot

4.12.3 PES Directory Rosters

Revised directory information for 1998 IEEE Directory listing for the Transformers Committee was submitted to Secretary of TC on September 12, 1997. The next updating will be discussed at spring 1998 meeting.

4.12.4 Meeting Minutes

Minutes of the Graz meeting were reproduced at no cost, again compliments of Ken Hanus and TU Electric. Postage costs were $1880.15 for 497 mailings, which averages $3.80 per mailing. The total income from 164 registrants was $1640. Generally the $10 portion of the registration fee covers the mailing cost. This was a unique meeting and therefore $10 is still a valid nominal fee.

I request Subcommittee Chairs to submit their minutes by December 31,1997 for this meeting. The submittal should include a printed copy and an electronic file on a 31/2" diskette, formatted in Word 6.0 or WordPerfect 6.0 (or earlier versions). Please indicate total attendance count for each subcommittee, working group, and task force meeting in your minutes. Please do not send me a copy of attendance listing for this attendance count. If someone is preparing minutes for you please let them know these details about submitting the minutes for publication.

4.13 Old Business

John Matthew's proposal on the scope of the working group for West Coast as part of the revision of the O & P Manual was discussed. The following scope has been proposed for the WG:

a. Study and review applications within the scope of the Power Transformers Subcommittee with particular attention to service requirements of installations in the western United States and Canada.

b. Develop and maintain related standards, recommended practices and guides for such products.

c. Coordinate with other technical committees, groups, societies and associations as required.

On a related subject, the present wordings in the scopes of the Power Transformer Subcommittee and other two subcommittees on distribution transformers and underground transformers have transformers categories covered by specific kVA and kV ratings which creates difficulties of excluding some of the ratings from any coverage. Linden made a motion to remove these ratings to avoid the coverage confusion. The motion was passed by a consensus voice vote. By an unanimous voice vote all other proposed changes to the manual were also approved.

John will submit the proposed revision to the TC for approval.

4.14 New Business

None discussed.

4.15 Adjournment

Wally adjourned the meeting at 10:34 p.m.

Respectfully submitted,

B. K. Patel, Secretary

AdSub Attachment 4.4.2-1

IEEE/PES Transformers Committee Meeting Locations

Year	Spring	Fall	Committee Chair
1999	New Orleans, LA	Monterey, Mexico	Matthews
1998	Little Rock, AR	Guanajuato, Mexico	Matthews
1997	Graz, Austria (summer)	St. Louis, MO	Binder
1996	San Francisco, CA	Burlington, VT	Binder
1995	Kansas City, MO	Boston, MA	Harlow
1994	Dallas, TX	Milwaukee, WI	Harlow
1993	Portland, OR	St. Petersburg, FL	Borst
1992	Birmingham, AL	Cleveland, OH	Borst
1991	Phoenix, AZ	Baltimore, MD	Veitch
1990	Denver, CO	Montreal, PQ, Canada	Veitch
1989	Chicago, IL	Charlotte, NC	Veitch
1988	Washington, DC	Long Beach, CA	Compton
1987	Ft. Lauderdale, FL	New Orleans, LA	Compton
1986	Little Rock, AR	Pittsburgh, PA	Yannucci
1985	St. Louis, MO	Toronto, ON, Canada	Yannucci
1984	Vancouver, BC, Canada	Boston, MA	Savio
1983	Atlanta, GA	Detroit, MI	Savio
1982	Los Angeles, CA	Philadelphia, PA	McNutt
1981	Portland, OR	Phoenix, AZ	McNutt
1980	Williamsburg, VA	Milwaukee, WI	Bonucchi
1979	San Diego, CA	Houston, TX	Bonucchi
1978	Miami, FL	Chattanooga, TN	Bennon
1977	Charlotte, NC	Montreal, PQ, Canada	Bennon
1976	New Orleans, LA	San Francisco, CA	Honey
1975	Lakeland, FL	Denver, CO	Honey
1974	Pittsburgh, PA	Scottsdale, AZ	Alexander

5.0 Transformers Standards - T. A. Prevost

The Standards Subcommittee met on Tuesday November 18th at 8:00 AM with six members and two guests. The minutes of the Graz meeting were approved as written.

David Ramsden, the Staff Engineer assigned to the Transformer Committee, has left IEEE. Until a replacement has been found please direct inquiries to Sue Vogel (732) 562-3817.

5.1 Working Group Reports

WG on Continuos Revision of C57.12.00 - Subash Tuli

Draft 2 of C57.12.00 has been submitted to IEEE. This will be going out for ballot in the near future. If the Draft has not gone out for ballot we will add revisions to Table 19. If it has gone out for ballot then we will incorporate this revision into the next draft.

WG on C57.12.70 "Standard Terminal Markings and Connections for Distribution and Power Transformers" and C57.12.80 "Standard Terminology For Power and Distribution Transformers" - Tom Traub

The working group met at 4:15PM on November 17th with four members and four guests in attendance.

C57.12.70 was balloted last winter with the following results:

123 Eligible
96 Returned (78%)
91 Affirmative (96%)
3 Negative
2 Abstentions

The WG discussed resolution of the three negative ballots. The Chair agreed to contact each of the negative balloters and inform them that the WG resolved their comments and which of their comments were accepted and which were rejected. The chair will have a new draft proposal which will be submitted to IEEE for a recirculation ballot.

C57.12.80 was balloted last winter with the following results:

144 Eligible
116 Returned (80%)
108 Affirmative (94%)
6 Negative
2 Abstentions

Similarly to C57.12.70, the WG discussed resolution of the six negative ballots for C57.12.80. The WG was successful in reviewing five of the six negative ballots. It was agreed that one negative ballot that was received after ballot closing and an affirmative ballot with significant

comments would also be reviewed by the WG. Further review of the ballots will be done at the next meeting.

The WG chair, who is now retired, requested that another WG Chair be appointed. The WG meeting concluded at 5:35PM.

WG for Continuous Revision of C57.12.90 - Steve Smith

Draft 4 of C57.12.90 was balloted this year with the following results:

123 Returned
90 Affirmative
20 affirmative with comments
7 Negatives
6 Abstentions

Steve has given back to the respective subcommittee's a list of the negatives for them to reply to. Editorial comments will be addressed by the WG. The WG requests that it receive a resolution to the negative ballots from the Subcommittees by the end of the year. This will allow the WG to compile the comments and prepare a new draft for a resolution ballot by the end of February.

Steve Smith has requested that due to his work load we find a replacement for WG Chair for Continuous revision of C57.12.90. Subash Tuli has kindly volunteered to take over this WG. We will begin his transition as soon as practical. A new PAR for the WG will have to be submitted.

5.2 New Business

Under new business a request was made to ask all of the Subcommittees to have a representative attend the Standards Sub Committee meeting.

To support the intention to have an approved draft of both C57.12.00 and C57.12.90 be ready for publication every time the IEEE "Phone Book" is published we will do the following:

Both C57.12.00 and C57.12.90 will be balloted simultaneously

We will set a two year cycle to incorporate all document revisions.

We will publish deadlines to the Committee as to when document revisions need to be received by the Standards Subcommittee in order to be included in that draft of the standard.

Next Deadline for document revisions is December 31, 1998

A suggestion was made to also put C57.12.80 on a continuous revision cycle such as the two year cycle for C57.12.00 and C57.12.90. As we were running out of time we decided to table this until the next meeting.

The meeting adjourned at 9:15 PM.

6.0 Recognition and Awards - J. H. Harlow

6.1 Working Group Recognition Awards

The Transformers Committee Working Group Recognition Award for 1996 was presented to the members of the Working Group on C57.12.44: *Standard Requirements for Secondary Network Protectors*. Chair: R. B. Robertson, Secretary: D. H. Mulkey, Members: T. R. Balgie, E. A. Bertolini, R. L. Bliss, R. Crowell, R. W. Fisher, R. D. Graham, J. W. Howard, M. C. Mingoia, J. R. Moffat, C. G. Niemann, B. Nutt, P. E. Orehek, R. L. Plaster, P. G. Risse, A. L. Robinson, R. W. Steward.

These awards would normally have been presented at the Spring meeting, but were deferred this time until Fall because of the earlier meeting being out of the country.

6.2 Certificates of Appreciation

Transformers Committee Certificates of Appreciation were presented to the following persons at the Transformers Committee meeting.

Name	Service Rendered
Thomas P. Traub	Chair, Standards Subcommittee
William R. Henning	Chair, WG on Loss Tolerance and Measurements
Thomas P. Traub	Chair, WG on Standard Requirements for Load Tap Changers, C57.131
Edgar Howells	Chair, Guide for the Location of Acoustic Emissions from Partial Discharges in Oil-Immersed Power Transformers
Norvin Mohesky	Co-chair, WG on Pad-Mounted Single-Phase Distribution Transformers, C57.12.25
Jack W. McGill	Chair, WG on Guide for Sound Level Abatement and Determination in Oil-Filled Power Transformers, C57.136
Georges H. Vaillancourt	For Development and Maintenance of the Transformers Committee Web Page

6.3 Transformers Committee Prize Paper Award

The Transformers Committee Prize Paper Award for 1997 was presented to M. V. Thaden, S. C. Tuli, S. P. Mehta and R. L. Grubb for their paper *Temperature Rise Tests on a Forced-Oil-Air Cooled (FOA) (OFAF) Core-Form Transformer, Including Loading Beyond Nameplate*. This paper was published in *IEEE Transactions on Power Delivery*, Vol. 10, No. 2, April, 1995.

6.4 Transformers Committee Distinguished Service Award

A Transformers Committee Distinguished Service Award was presented to John D. Borst for his many years of unfailing and devoted service to the committee.

7.0 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.

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 for typographical errors and obvious improvements (removal of attendance lists and general items covered elsewhere).

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

7.1 Audible Sound and Vibration - J. Puri, Chair

The Subcommittee met at 10:55 am. Ten members and twelve guests were present. The minutes of the Graz meeting were approved as submitted.

The following items were discussed:

1. **WG Report - Transformer Siting Guide C57.136** (Ms. Karen Weissman - The new WG Chairperson): Ms. Wiesman reported on Draft 6. This WG is currently developing Farfiels Sound Level predictions from the measured Nearfield sound level measurements on transformers.

   Mr. Andrew Dicke (Acoustical Engineer from Black and Veatch) made a presentation on the general considerations and the accuracy of Farfield Calculations. Based on this information, a section on the effects of the Nearfield sound level measurement and their Farfield effects will be added to this document.

   Since this guide is now under a new chairperson, a new PAR will be requested for this project. The name of this Guide will be changed to: Transformer Noise Abatement and Siting Guide.

   The User Review of this document will be completed by our next meeting. This input will be incorporated in the final draft of this document.

2. **Chairman's Report on the Revision of IEC 551 / WG14 Activities:** J. Puri reported that he has proposed the IEC 551 should clearly state the following:

   - Recognize that noise intensity and noise pressure measurements yield the same numerical result.
   - Allow the use of Noise Pressure measurements since they yield conservative results.
   - Adopt standard sound levels for transformers per NEMA TR 1 Tables for oil filled and dry type transformers.

- Include Noise Abatement and Siting Guide in an informative Annex of this standard to guide the user on the effects of discrete frequencies on the community noise levels.

By next meeting we should be ready to set the timetable for harmonizing IEC 551 with the IEEE Standards C57.12.90 and C57.12.91.

There being no new business, the meeting adjourned at 11:55 am.

7.2 Bushings - F. E. Elliott, Chair

7.2.1 Introduction and Membership

Chairman Fred Elliott opened the meeting at 10:55 AM and welcomed the members and guests. The meeting was attended by 10 members and 13 guests. Two guests* requested membership to the subcommittee.

7.2.2 Chairman's Remarks

Mr. Elliott reported the following:

- IEEE Standards Activity has developed and created the IEEE Standards Association (IEEE-SA). Standards developers are required to be members of this association.
- In future, only the balloting within the Balloting Pool would be considered as official. Members would be expected to have knowledge of the subject for participating in the balloting process. Members who do not return the ballots will loose the membership to the pool. A reinstatement will require a review by the IEEE. Balloting within the WG and the Subcommittee can continue as a survey.
- Lapp insulators will be presenting a paper (An Improved Method For Estimating The Temperature Rise of a Bushing Loaded above the Nameplate Rating) at the 1998 winter power meeting. A copy of this paper is included in Attachment - 1. Members are encouraged to submit "Discussions".

7.2.3 Approval of Minutes of The Last Meeting Held in Graz, Austria

The minutes were approved as written.

7.2.4 Working Group / Task Force Reports

7.2.4.1 WG on Performance Characteristics and Dimensions for Outdoor Apparatus Bushings (PC57.19.01)

Chairman P. Singh reported that his WG met on November 17, 1997 with 14 members and 10 guests. Two guests requested membership to the WG. He reported the following:

1. Approval of July 16, 1997 Minutes of Meeting Held in Graz, Austria

   The minutes were approved as written.

2. PC57.19.01 Draft 4 Ballot Results

The final results from the Balloting Pool were as follows:

Eligible	Affirmative	Negative	Abstentions	Not returned
110	71 (83.5)	14	6	19

Out of seventeen negative votes received initially, three were resolved through correspondence

3. Discussions on comments received on Draft 4 ballot

The WG members discussed the comments from the Balloting Pool and agreed to make the following changes:

3a. Introduction

Some of the members from the balloting pool felt that the introduction should include more background information explaining the reasoning for selecting the voltage classes in the proposed draft standard. The WG agreed to these comments and in order to address this need, Russ Nordman volunteered to expand the "Introduction" and also consider the proposal written by Keith Ellis to add more background information and explain the voltage selection process. See Attachment - 2 for Keith Ellis's proposal. In addition, the following statement will be added to the introduction.

"At the present time there is no equivalent dimensional standard in the IEC 137 standard for Insulated Bushings for Alternating voltages."

3b. Clause 2, References

The following paragraph will be added to this clause.

"At the time of publication, the editions indicated above were valid. All standards are subject to revisions and parties involved in agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the referenced standards available at the time of the agreement."

3c. Table 1

The following changes were agreed.

- A number of comments were received indicating that we put back into the proposed standard almost all the voltage ratings that were taken out during the preparation of this proposal.

  The WG has discussed this issue before and then again at this meeting and decided once again to maintain the present voltage classes. It was indicated to the members that the criteria for the selection of the voltage classes in this table is based on the feed back from the EEI and Doble. The feed back indicated an overwhelming desire to reduce the number of rating so that in the long run, the end users do not have to keep too many bushings in their inventory. It was indicated by some of the end users that the inventory costs are so high that the they could buy a new bushing every few years. The voltage ratings selected in the present

Draft had more than 81 % approval from the WG, Bushing Subcommittee and now the main committee Balloting Pool. As indicated in Item 3a above, Russ Nordman volunteered to expand the "introduction" and also consider Keith Ellis's proposal to add more background information and explain the voltage classes selection process.

- A comment to include in the Annex, the dimensional information of ratings taken out from the present draft standard was discussed. The WG decided not to include such information in the Annex. It was felt that duplicating such information does not serve a useful purpose as the aim of the proposed standard is to encourage the use of new standardized ratings.

  For the 138 kV voltage class, the maximum line to ground voltage of 102 kV will be changed to 88 kV to reflect the maximum line to ground voltage for the 138 kV system. This will be in line with other voltage classes in this table.

- The creepage distance values will be revised as per P. Singh's proposal # 2 to indicate values in centimeters and rounding off to whole number, thus eliminating the decimal places in both the metric and the inch units. This will be done for both the light and the heavy contamination requirements in columns 4 and 5 respectively. A copy of this proposal will be attached to the minutes of the meeting.

- Note 1 will be rewritten as follows:

  "The nominal system voltage levels in column 2 were selected from Table 5 of C57.12.00 - 1993"

  A revision of this note will clear the confusion where it gave the impression that the nominal system voltage classes are as per the transformer standard C57.12.00

- A proposal to add 685 kV wet switching impulse requirement for the 230 kV 900 BIL rating was discussed at length. The members felt that there is no real need for the wet switching impulse test for the 230 kV rating and in addition adding this requirement will result in significant increase in the cost of the bushing. In view of the above reasons, the WG decided to maintain the 60 HZ wet test for this rating.

- A comment to change the bushing test levels as per IEC practice so that they are above the transformer test levels was discussed. Information presented by P. Singh indicated that 60 HZ test levels in C57.19.01 and the present Draft 4 are higher than the applied voltage test levels specified in the transformer standard C57.12.00. In view of this no changes were made to the 60 HZ test levels.

3d. Table 2

- The oil end lengths in column 4 will be revised to round off the metric values to the nearest whole mm thus eliminating the decimal places. The inch dimensions will remain unchanged. The metric tolerance will be changed from +/- 3.2 to +/- 3 mm

- The CT lengths in column 5 will revised to round off the metric values to the nearest whole mm. The inch dimensions will remain unchanged.

- The D dimensions in column 6 will be revised to round off the metric values to the nearest whole mm thus eliminating the decimal places. The inch dimensions will remain unchanged. The D dimension for 34.5 kV 5000 A rating will be changed (subject to conformation from other bushing manufacturers) to 8.625 inch, 219 mm. This was an error in Draft 4.
- The usable thread dimensions in column 10 will be revised to round off the metric values to the nearest whole mm thus eliminating the decimal places. The inch dimensions will remain unchanged.
- The ID and OD dimensions of gasket space in columns 12 and 13 will be revised to round off the metric values to the nearest whole mm thus eliminating the decimal places. The inch dimensions will remain unchanged.
- The thread class dimensions in columns 9 and 11 and the hole diameter in column 15 will remain in inch units as they are dependent on standard machining tools/dies/hardware.
- The bolt circle diameters in column 16 will be revised (subject to tolerance confirmation from Russ Nordman and Tim Huff) to round off the metric values to the nearest whole mm thus eliminating the decimal places. The inch dimensions will remain unchanged.
- Present Dimension 184.2 276.4

  Proposed Dimension 184 276
- Figure numbers in column 8 and 9 will be given unique numbers so that they are associated with Table 2. IEEE Style manual will be researched to see if there is any information on this subject.

3e. Table 3

- Similar to Table 2, the metric dimensions in columns 4, 5, 6, 9, 10, 12, 13, will be revised to round off the metric values to the nearest whole mm thus eliminating the decimal places. The inch dimensions will remain unchanged.
- The bolt circle diameters in column 16 will be revised (subject to confirmation from Russ Nordman and Tim Huff) to round off the metric values to the nearest whole mm thus eliminating the decimal places. The inch dimensions will remain unchanged.
- Present Dimension 533.4

  Proposed Dimension 533
- The thread class dimensions in column 11 and the hole diameter in column 15 will remain in inch units as they are dependent on standard machining tools/dies/hardware.
- In Detail C Figures 1 and 1A will be eliminated to remove the details of the draw lead application bottom ends. Figures 2 and 3 will be revised so that they are in conformance with the existing standard. The bottom terminal dimensions table will be revised to remove the metric dimensions as most of these dimensions are critical mounting dimensions. Figure numbers in Table 3 will be revised to associate them with the Table 3.

- In column 7, comments to change the inside tube diameter for the 345 to 765 kV bushings from 2 to 1.625 inch was not accepted as this will affect the replacement of bushings in the field.

3f. Table 4

A comment to round off metric values for the cantilever test force in second column was accepted. The values in Newton's will be revised as follows:

Present value	1334	2224	3114	4003
Revised value	1300	2200	3100	4000

3g. Table 6

- A comment to change the % acceptable change for capacitance for condenser bushings having more than 100 conducting layers from +/- 1 % to +/- "1 x 100/number of conducting layers" was not accepted as this might fall below the measurement accuracy of the test equipment.
- A comment to include temperature correction for power factor was discussed. It was decided not to include a table for correction factors as different manufacturers have different correction factors based upon the type of design. It was agreed that such information belongs in Bushing Application Guide. It was indicated that these values are covered in the Doble Power Factor Test Set Field Instructions.
- A question whether the power factor limits are in conformance with Doble,s recommendations was discussed. Mark Rivers from Doble Engineering indicated that the limits are in conformance.

3h. Editorial Comments

Appropriate editorial/typographical suggestions will be incorporated in the next draft.

4. Next Draft

The WG decided to prepare Draft 5 and include all the changes discussed in Graz and at this meeting.

P. Singh will send the revised draft to WG members for comments before the next meeting in Little Rock, Arkansas

5. New Business

No new business could be discussed because of lack of time.

6. Adjournment

The meeting was adjourned at 2:35 PM after three sessions.

7.2.4.2 Task Force on Draw-Lead Bushings

Chairman Russ Nordman reported that his TF meeting was held at 2:50 PM on November 17, 1997 with 9 members and 12 guests present. One guest requested membership to the TF. He reported the following:

1. Minutes from the previous meeting

These were approved as written.

2. Information on Draw -leads

A brief history of this task force was presented for the members and the guests.

We have received little input from the Transformer Committee and no occurrence of draw-lead failures by any user contacted, thus far. A questionnaire was sent to transformer manufacturers and bushing users. Results were reported and discussed. Out of 110 questionnaires sent, only 13 replied. Three of these did not use draw-lead bushings. Only one reported a problem. Apparently an overheating condition occurred at the joint of draw-lead to the terminal. No other problems were reported.

Some users at the meeting felt that more information is needed on draw lead overloading. It was suggested that because of variables in operation it may not be possible to create a new standard, but an addition to Bushing Application Guide is possible. Chungduck Ko volunteered to write a proposal on guide lines. This will be discussed at the next meeting. Russ indicated that he needs more information from the bushing manufacturers.

3. Future Activity

If the task force can not find a significant problem with the current draw-lead practices, the TF may advise Bushing Subcommittee to disband future activities.

Meeting was adjourned at 4:05 PM

7.2.5 Technical Advisor to IEC/SC36

No report was presented as Bill Saxon was unable to attend this meeting.

7.2.6 Old Business

Revision of C57.19.00

Fred Elliott discussed the results of Draft 2 survey. The draft was sent for comments to 47 members of the subcommittee and to 6 coordinating committees. 16 surveys from the members and three from the coordinating committees were returned. Comments were sent by 11 respondents. Following is a summary of discussions on these comments.

- Maintain and update the history/background information in the **Foreword**
- 1.1- Maintain the 110 BIL in the **Scope**

- 1.1- Add DC bushings and Oil Circuit breaker bushings in the **Scope** to indicate that this standard does not apply to these bushings.
- 2 - Discussed IEEE 4 versions. We must reference current version and include other information if needed.
- 3 - A question was raised whether we should include an ASTM number for non mineral oil. P. Singh and Mark Rivers to look into this.

  " Information from P. Singh is as follows:

  After checking with an ASTM member, it is learned that there is no single ASTM number for non mineral oils. Different oils have different numbers."
- 3 - P. Singh to look for the definition of Dissipation Factor.

  "Information from P. Singh is as follows:

  We already have a definition for **Dissipation Factor** in the DC standard C57.19.03 which reads as follows:

  Dissipation Factor: The tangent of the dielectric loss angle

  Note: For small values of dielectric loss angle dissipation factor is virtually equal to the insulation power factor"
- 3 - Capacitance definitions will clarified to indicate that C2 applies to bushings with voltage tap
- 3 - Composite bushing definition will be as per IEC 137
- 3 - Add definition for bottom connected bushing
- Insulating envelop definition will be revised to refer to major insulation in place of internal insulation
- 4.1 - Ambient definition will be revised to follow the Transformer Standard. Proposed information on bushing storage belongs in Bushing Application Guide
- 5.3.1 - It was decided to stay with the low frequency rather than power frequency
- 5.4.1 - Comments on Thermal Basis of Rating were discussed. Keith Ellis and Chungduck Ko to send their proposals/comments to P. Singh for finalizing the wording for this clause
- 7.2.1.4 - A proposal to include wet switching impulse test for 230 kV rating was not accepted
- 7.3 - Keith Ellis to provide information seismic testing
- 7.3.2 - Loren Wagenaar to check the latest draft of "Dielectric Tests" to see if there is any requirement for FOW test. As per Loren there was no discussion in the Dielectric

Subcommittee. Russ Nordman to find out information on transformer customers request and the voltage levels at which the FOW test is requested.

- Discussed moving the work on revision of C57.19.00 to a WG. Fred Elliott will review this need.

Members were requested to send information/comments on assignments to Fred Elliott by mid January 1998

7.2.7 New Business

Bushing Application Guide

A question was raised whether we need to reaffirm the C57.19.100 as this standard is due for reaffirmation in 2000. Possible Issues: Draw Leads; Power Factor Correction; IEC harmonization etc. Mark Rivers and Chungduck Ko volunteered to take a look and give some feed back.

7.2.8 Adjournment

The meeting was adjourned at 3:20 PM

ATTACHMENT - 1

AN IMPROVED METHOD FOR ESTIMATING TEMPERATURE RISE OF A BUSHING LOADED ABOVE NAMEPLATE RATING

Daxiong Zeng
Bushing Division
Lapp Insulator Company
LeRoy, NY 14482

ABSTRACT

We have developed an accurate but simple method to estimate the temperature rise (referred to as "rise" hereafter) of a bushing conductor under any load condition. This method consists of one equation and two predetermined rise profiles $F_1(z)$ and $F_2(z)$. $F_1(z)$ is the incremental rise profile at the rated current and $F_2(z)$ is the normalized rise profile at zero current. $F_1(z)$ and $F_2(z)$ can be obtained from two base thermal tests. The proposed method allows us to estimate the rise profile of the bushing under any given load condition. Therefore the rise and the location of the hottest spot can be determined from this profile. We have successfully applied this method to various bushings, such as bushings with and without oil circulation, bottom connected and draw-lead connected bushings, and some special bushings with two conductors. We examined this method with a thermal circuit model and verified that the thermal model supports the new method.

I. INTRODUCTION

The standard IEEE Guide for Application of Power Apparatus Bushings, IEEE C57.19.100-1995[1] provides a simple equation

$$\Delta\theta_{HS} = K_1 * I^n + K_2 * \Delta\theta_0 \qquad (1)$$

to estimate the hottest spot of the bushings.

Equation (1) is based on W. J. McNutt's paper[2] except for the value of the exponent n. The standard describes a method for calculating the thermal constants K_1, K_2 and n from thermal tests.

However, test results show that K_1, K_2 and n are not constant, but vary from test to test. The hottest spot rise obtained from this equation does not match well with actual thermal test results.

Thermal tests of bushings show that the location of the hottest spot of a bushing migrates with current and oil rise. Because of this migration, K_1, K_2 and n, which we determined based on the hottest-spot at rated load conditions with an overload test, cannot predict the hottest-spot for an arbitrary current and oil rise.

We have developed a simple equation which requires two predetermined rise profiles $F_1(z)$ and $F_2(z)$ to estimate the rise profile under non-standard load conditions. For each bushing, $F_1(z)$ and $F_2(z)$ are the base rise profiles which we obtain from two thermal tests: one at zero current and the other at the rated current. $F_1(z)$ and $F_2(z)$ replace the thermal constants K_1 and K_2 in equation (1). The exponent n in our equation is a constant equal to two, while n in the IEEE Standard is a variable. This method enables us to estimate the rise profile under any load condition and predict the hottest spot rise and its location accurately.

This paper will present the theory behind the simple estimation method, thermal test, actual thermal test results, and analysis. Also discussed is a comparison between the calculated results from an equivalent thermal model and the estimated results from the new method. The thermal model is used to show the accuracy of the simple estimation method. Hereafter, the results from the thermal test will be referred to as the "measured" results, those from the proposed simple estimation method as the "estimated" results and those from the thermal model as the "calculated" results.

II. DEVELOPMENT OF THE THEORY

In a steady-state condition, the heat generated in a bushing without oil circulation transfers to the surface by thermal conduction, then to the surrounding air and oil through convection. As the convection mainly occurs within very thin boundary layers, we can view it as thermal conduction in

these thin layers. Therefore, we can simulate the thermal characteristics of a bushing with a simple thermal conduction model with ohmic loss I^2R as the main heat source.

We can describe the thermal conduction equation for a bushing without oil circulation in a cylindrical coordinate system as

$$k_r(r,z)\frac{\partial^2 T(r,z)}{\partial r^2} + k_z(r,z)\frac{\partial^2 T(r,z)}{\partial z^2} = q(I,r,z) \quad (2)$$

where:

- $T(r,z)$ temperature profile under current I
- r radial coordinate from the bushing center line
- z axial coordinate along the bushing centerline
- $k_r(r,z)$ radial thermal conductance at r,z
- $k_z(r,z)$ axial thermal conductance at r,z
- $q(I,r,z)$ heat generated under current I at r,z
- I current in per-unit referred to as pu.

In the standard, the temperature rise used is defined as the rise over the air ambient temperature. Because the bushing is long and slim, we can rewrite equation (2) in a rise format as

$$k_r(z)*(\Delta\Theta(I,z)-\Delta\Theta_0(z))+k_z(z)*\frac{\partial^2\Delta\Theta(I,z)}{\partial z^2} = R(z)*I^2 \quad (3)$$

where:

- $\Delta\Theta(I,z)$ rise profile of the conductor under current I
- $\Delta\Theta_0(z)$ rise of the surrounding medium at z
- $k_r(z)$ radial thermal conductance from the conductor to the surrounding medium at z
- $k_z(z)$ axial thermal conductance of the conductor at z
- $R(z)$ electrical resistance of the conductor at z.

We can obtain the bushing rise profiles for a given load condition by solving (3) with the corresponding boundary and load conditions.

For a linear system, the solution of (3) is

$$\Delta\Theta(I,z) = \Delta\Theta_p(1,z)*I^2 + \Delta\Theta_h(0,z) \quad (4)$$

where:

- $\Delta\Theta_h(0,z)$ the general solution of the corresponding homogeneous equation, which is the rise profile generated by temperature difference between the boundaries.
- $\Delta\Theta_p(1,z)$ a particular solution of the nonhomogeneous equation, which is the incremental rise profile generated by heat losses at one unit current.

As equation (4) shows, we must obtain $\Delta\Theta_h(0,z)$ and $\Delta\Theta_p(1,z)$ to solve the equation. However, as it is difficult to calculate these, we can determine them from two thermal tests. This is theoretically simple because $\Delta\Theta_h(0,z)$ is rise profile at zero current $\Delta\Theta(0,z)$; and $\Delta\Theta_p(1,z)$ is the difference between the rise profiles $\Delta\Theta(1,z)$ at the rated current and $\Delta\Theta(0,z)$ at zero current.

From this, we develop an equation to estimate the rise profiles of the conductor of a bushing as

$$\Delta\Theta(I,z) = F_1(z)*I^2+F_2(z)*\Delta\theta \quad (5)$$

where:

$$F_1(z) = \Delta\Theta(1,z)-\Delta\Theta(0,z) \quad (6)$$

$$F_2(z) = \Delta\Theta(0,z)/\Delta\theta_0 \quad (7)$$

- $\Delta\Theta(I,z)$ rise profile at current I pu and oil rise $\Delta\theta$
- $F_1(z)$ incremental rise profile of the bushing, which is $\Delta\Theta_p(1,z)$ in equation (4)
- $F_2(z)$ normalized rise profile of the bushing with no current, which is a normalized $\Delta\Theta_h(0,z)$ in equation (4)
- $\Delta\Theta(0,z)$ rise profile at zero current
- $\Delta\Theta(1,z)$ rise profile at the rated current of 1 pu
- $\Delta\theta_0$ the rated oil rise
- $\Delta\theta$ actual oil rise

Equations (6) and (7) assume that the oil rise is precisely the rated value. However, in reality, it is not always possible to get the exact rated oil rise during the lab tests. Therefore, we use the following revised equations to obtain $F_1(z)$ and $F_2(z)$.

$$F_2(z) = \Delta\Theta'(0,z)/\Delta\theta' \quad (8)$$

$$F_1(z) = \Delta\Theta''(1,z) - F_2(z)*\Delta\theta'' \quad (9)$$

where:

- $\Delta\Theta'(0,z)$ rise profile at zero current and the oil rise of $\Delta\theta'$
- $\Delta\Theta(1,z)$ rise profile at the rated current of 1 pu and the oil rise of $\Delta\theta'$

Even though equation (5) takes a similar form to equation (1), their meanings are quite different as stated below.

1. Equation (5) comes from the thermal differential equations but equation (1) is a mixture of

thermal differential equation and a curve fitting technique.

2. Equation (1) estimates the hottest spot rise of a bushing under the assumption that the location of the hottest spot does not migrate with load conditions but equation (5) does not make this assumption.

3. $F_1(z)$ and $F_2(z)$ represent the base thermal characteristics of a bushing on its entire length, but K_1 and K_2 are determined at just one location along a bushing. The exponent n is equal to 2 in equation (5) because the heat generated in the conductor depends on I^2R according to the laws of physics. In equation (1), the value of n is chosen to make equation (1) best fit the thermal test results.

4. The new method we have developed requires only two thermal tests, while the old method requires at least three tests.

5. In the old method, the thermal constants cannot be uniquely determined due to the migration of the hottest spot.

III. THERMAL TEST

To verify the new method, thermal tests were performed on various POC (paper-oil-capacitance) and PRC (paper-resin-capacitance) bushings with BIL from 110kV to 1550kV, the rated current from 400A to 6000A, and bushings with and without oil circulation. Most of the bushings we tested were bottom connected, others were draw lead cable, draw rod and special bushings.

All the bushings were prepared and tested according to the standard IEEE guide for Application of Power Apparatus Bushings, IEEE C57.19.100-1995.

Thermocouples were evenly spaced approximately 5" - 10" apart along the length of the bushing conductor and attached by pinching them into or making contact to the conductor with phosphor bronze thermocouple brushes. The bushing bottom end was immersed in an oil bath with the rated minimum oil level. The bushing was connected to a high current power supply by copper buses. The current was adjusted and stabilized by a electronic device with feedback.

The temperature of the oil bath was measured with a thermocouple immersed approximately 2" below the oil surface and located 6" from the surface of the bushing. The ambient air temperature was determined by taking the average reading of three thermocouples located at heights corresponding to the mounting flange, midpoint, and top end of the bushing. The average temperature of these three locations was used as the ambient air temperature in calculating all temperature rises.

The thermal transients of the bushing were recorded by an OMEGA portable Datalogger at 0.5 hour time intervals. We maintained the same test condition for 8-40 hours or longer until reaching the steady-state temperature rise. For each bushing we took two rise profiles, one with zero current and the other with the rated current. Then F1(z) and F2(Z) were determined by solving equations(6) and (7). Then we estimated the rise profiles of the bushings under different load conditions and compared them to the test results.

IV. TEST RESULTS

This section shows the measured and estimated rise profiles to prove whether the simple estimation method is valid for various magnitudes of currents and oil rise. Furthermore, we also want to prove that this method is valid for different types of bushings, such as POC and PRC bushings, those with and without oil circulation, and those with drawlead cables and drawrods.

1. At different magnitudes of currents

Figure 1 shows the measured and estimated rise profiles of a 350kV BIL 400/1200A bushing at various currents. This bushing is a PRC bushing with a copper conductor and without oil circulation. The bushing is 74 3/8" long. The rated minimum oil level is 21" from the flange mounting surface or 16.5" from the bushing oil end.

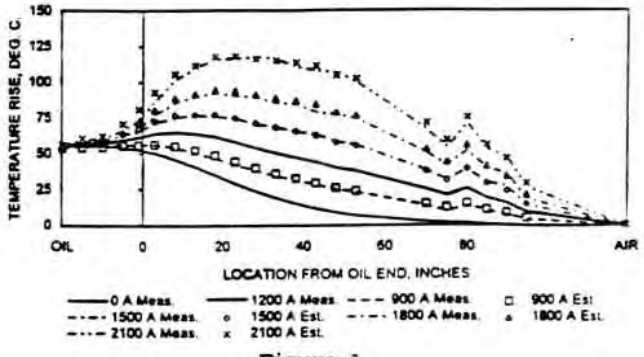

Figure 1
Measured and estimated rise profiles of a 350kV BIL 400/1200A PRC bushing at various currents

The estimated rise profiles of this bushing match the measured rise profiles very well from 0.75 pu to 1.75 pu current at rated oil rise. For

a bushing without oil circulation, the hottest spot migrates towards the center of the bushing with increasing current. We found that the hottest spot is located above the real oil level when the current is high. Two or three peaks may appear in the rise profile. The peaks appearing near the ends of the bushing indicate quality of the bushing connection to the bus.

2. At different oil temperatures

Figure 2 shows the measured and estimated temperature rise profiles of a 550kV BIL 1200/1600A bushing at different oil rises. This bushing is a POC TBI bushing with an aluminum conductor and without oil circulation. The bushing is 100 7/8" long. The rated minimum oil level is 23" from the flange mounting surface or 20" from the bushing oil end.

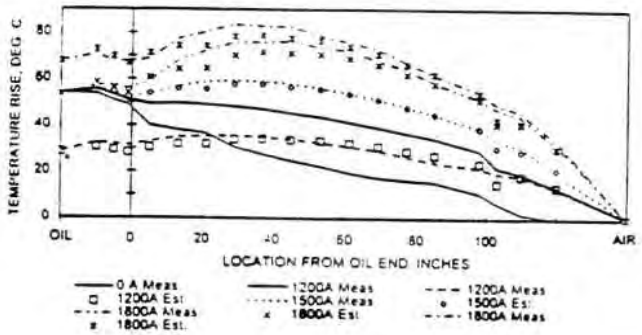

Figure 2
Measured and estimated rise profiles of a 550kV BIL 1200/1600A POC bushing without oil circulation at various oil rises

The estimated rise profiles of this bushing match the measured rise profiles very well for the oil rises from 30°C to 70°C. The hottest spot migrates with the oil rise in the opposite direction compared with that in different currents. When the oil rise increases, the hottest spot migrates toward the oil end of the bushing.

3. Bushing with oil circulation

Although equation (5) is based on the models without oil circulation, we have found that it is valid for bushings with oil circulation. The rise profiles of bushings with oil circulation are quite different from those without oil circulation. With an increase in current, the hottest spot of bushings with oil circulation migrates towards the top of the bushings rather than the center of the bushing.

Figure 3 shows the measured and estimated rise profiles of a 550kV BIL 3000A bushing with copper conductor and with oil circulation. The bushing is 91 1/16" long. The rated minimum oil level is 23" from the flange mounting surface or 20" from the bushing oil end.

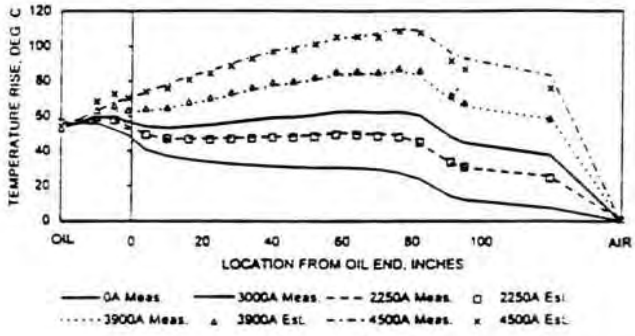

Figure 3.
Measured and estimated rise profiles of a 550kV BIL 3000A POC bushing with oil circulation at various load conditions

4. Bushing with a draw-rod

Tests show that we can use the new method for bushings with drawleads and drawrods.

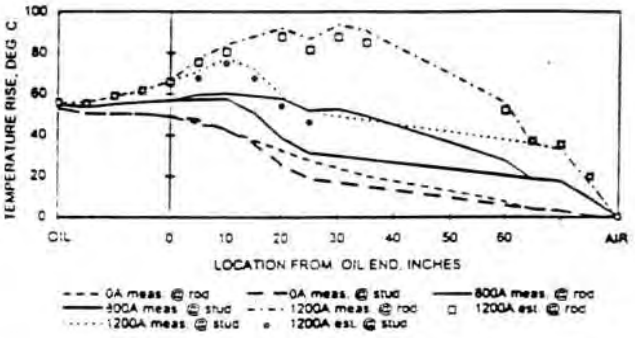

Figure 4
Measured and estimated rise profiles of a 350kV BIL 400A PRC drawlead bushing with ϕ1" drawrod

Figure 4 shows measured and estimated rise profiles of a 350kV BIL 400A PRC bushing with a drawrod. The temperature rise of the bushing hollow stud and the drawrod were measured and recorded. The measured and estimated profiles match well on both the drawrod and the stud. The temperature rise of the drawlead or drawrod may be much higher than the rise of the bushing stud, so the capability of a drawlead bushing to handle the overload depends on the cable or rod used.

V. THERMAL MODEL SIMULATION

Even though we have verified the simple estimation method by measurements, we want to determine the accuracy by using a more detailed thermal model. For this purpose, we have developed a thermal circuit model similar to an electric circuit consisting of daisy-chained π segments as shown in figure 5.

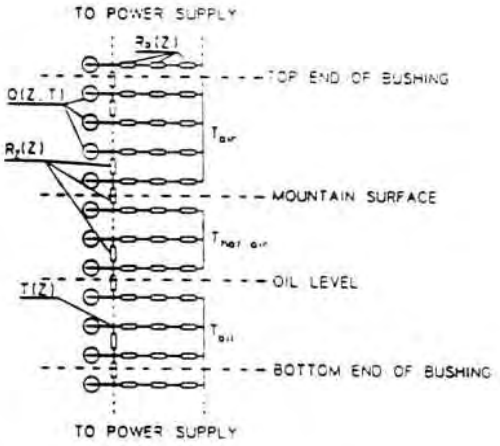

Figure 5
Thermal circuit model of a bushing without oil circulation

The model includes a bushing and connecting buses at the both ends. We have divided the bushing into 100 segments and the each connecting bus into 25 segments along their lengths. These segments are connected by 151 nodes. Each node consists of a heat source Q(Z,T), two axial thermal resistors $R_z(Z)$ and one set of radial thermal resistors $R_R(Z)$.

We calculate the heat source for each node from current, electrical resistance, temperature and skin effect. The thermal resistance of each thermal resistor is based on geometry, material, and the thermal transfer mechanism - conduction or convection. In this calculation, we use the following boundary conditions:

1. The top portion of the bushing above the flange mounting surface is in ambient air with uniform temperature.

2. The bottom portion of the bushing between the flange mounting surface and the oil level is considered to be in the hot air where the temperature is equal to the oil temperature.

3. The bottom portion of the bushing is immersed in the oil with uniform temperature.

4. There is no axial heat transfer at the ends of the buses.

The procedure for using this model to examine the new method is as follows:

1. Calculate the rise profiles at zero current and the rated current from the thermal model and then obtain $F_1(z)$ and $F_2(z)$.

2. Using the thermal model, calculate the rise profiles at various load conditions and use as the calculated profiles.

3. Use equation (3) with $F_1(z)$ and $F_2(z)$ to estimate the rise profiles at the same load conditions as procedure 2. These rise profiles are the estimated rise profiles.

VI. CALCULATED RESULTS

This section shows the calculated and estimated rise profiles to prove whether the simple estimation method is valid for various magnitudes of current, oil rise and oil level for a bushing without oil circulation. The calculation is performed on a 350kV BIL 1200A POC bushing without oil circulation.

1. At different currents:

The results show that equation (3) could estimate the rise profiles at different current accurately if the conductor resistance did not change with temperature.

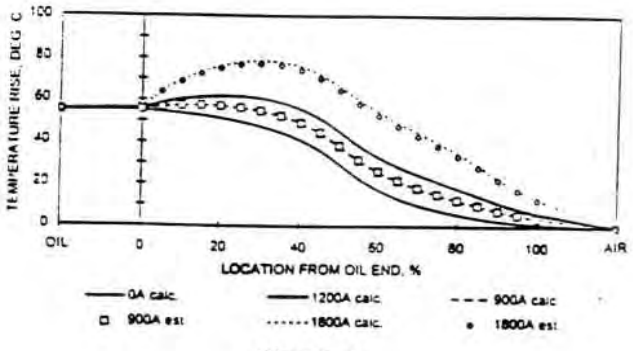

Figure 6
Calculated and estimated rise profiles of a 350kV BIL 1200A PRC bushing at 55°C oil rise, 21" oil level and various currents

Because the resistance does change with temperature, we use an iterative method to calculate the rise profiles from the thermal model. Figure 6 shows the calculated rise profiles and the estimated rise profiles. The estimated profiles are

consistent with the thermal tests. From the thermal model, the deviation is about -0.5% at 125% current and about -3% at 150% current, and it may increase to -8% at 200% load.

2. At different oil temperature rises:

In the simple estimation method, we obtained $F_1(z)$ and $F_2(z)$ at the rated oil rise. However, because the general solution $\Delta\Theta_h(0,z)$ and the particular solution $\Delta\Theta_p(1,z)$ of equation (3) change with the oil rise, $F_1(z)$ and $F_2(z)$ must change with the oil rise. We can expect that the estimation based on $F_1(z)$ and $F_2(z)$ derived from the rated oil rise is no longer precise with the changing oil rise, and a deviation will occur.

Figure 7 presents comparison of the results from the calculation and estimation. The estimated rise profiles are below the calculated profiles when the oil rise is high and vice versa when the oil rise is low due to the changing resistance. The deviation is less than ±0.5% in the range of 35°C. to 75°C oil rise at rated current. We consider this level of deviation negligible.

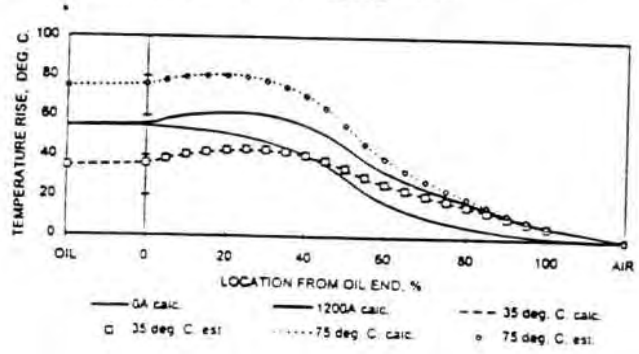

Figure 7
Calculated and estimated rise profiles
of a 350kV BIL 1200A PRC bushing at 1200A,
21" oil level with various oil rises

3. At different oil levels

Although the simple estimation method does not consider the oil level, it does have influence on the rise profile. The thermal calculation shows that when the bushing oil level is increased, the estimated rise profile is slightly higher than the calculated profile due to that the improved cooling from the higher oil level is not considered in the estimation.

The influence of the oil level is negligible when the bushing is working at the rated current, because the hottest spot at the rated current is located below the rated oil level. The calculation results show that the estimated hottest spot rise is only 1% higher than the calculated rise when the oil level is increased from the rated 21" below the mounting flange to 4.1".

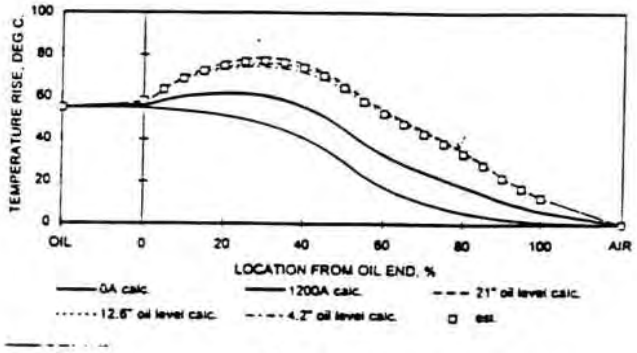

Figure 8
Calculated and estimated rise profiles
of a 350kV BIL 1200A PRC bushing at 1800A,
55°C oil rise and various oil levels

When the overload becomes greater, the influence of the oil level increases because the hottest spot migrates above the rated oil level. In a real application, the oil rise and the oil level go up at the same time. Their combining influence on the estimated rise cancel each other, therefore the deviation error of the estimated rise is less than if only one factor is considered in the estimate. For example, if the bushing is working at 1.5 pu, the estimated hottest spot rise is 77.3°C, the calculated hottest spot rise 78.7°C at rated oil level of 21" and 74.4°C at oil level of 4.1", respectively. Figure 7 compares the estimated rise profile to the calculated rise profiles. The resulting deviation between the estimated hottest spot rise and the calculated rise is about 4% at 1.0±0.5 pu, which is consistent with the test results.

From the thermal model and the test results, we can expect that the accuracy of the estimated hottest spot rises is within 5% in the current range of 1.0±0.5 pu.

VII. DISCUSSION

Because all the estimation is based on two profiles $F_1(z)$ and $F_2(z)$ deduced from two thermal tests, the accuracy of the thermal tests are extremely important in obtaining an accurate hottest spot temperature rise. Some factors influence the accuracy of the tests: bus connection conditions, the method and accuracy of temperature measurements, fluctuations of the ambient temperature and

oil level, current fluctuations and current waveform distortion.

We obtain $F_t(z)$ from the difference of the two base thermal tests. The connections from bushing to power supply influence the test results, especially for high current bushings. So it is very important to maintain very good connection during test.

Thermocouples were used to measure the conductor temperatures at several locations. The thermocouples making contact with the conductor are not electrically isolated from one another. There may be some stray coupling between the thermocouple circuit and the AC high current power supply. Our findings reveal a small erratic swing in the temperature readings immediately following the high current power supply switching off.

Thermally, a bushing with a large mass is an inertial system where the rise profiles lag the changes in the surrounding environment. The error resulting from the lagging effect can be reduced by averaging successive data after steady-state conditions are reached.

VIII. CONCLUSION

The new method requires only two thermal tests and predicts the temperature rise along the entire bushing length accurately. From this profile we can determine the hottest spot temperature and its location. This method also enables us to calculate the overall average temperature of a bushing. The accuracy of the simple estimation method is about ±5% if the load is within 1.0±0.5 pu.

This method is not limited to bushings without oil circulation. We have applied this method successfully to all types of bushings: from 110kV BIL to EHV, from low current to high current, POC and PRC, with and without oil circulation, and bottom connected and draw-lead/draw-rod connected. The test shows we can use this method for air-to-air bushings and special bushings with multiple conductors.

Besides accurately predicting the rise of a loaded bushing, this method provides a correction method for a test which is not run at the exact rated condition. This method can also be used to estimate the temperature rise of some extra high current bushings when the proper test facilities are not available.

We believe that our proposed method can help the IEEE standard committee improve the current standard and simplify the bushing thermal tests.

ACKNOWLEDGMENT

The author appreciates Lapp Insulator Company's permission to publish this paper.

REFERENCES

[1] W. J. McNutt and J. K. Easley, Sr, "Mathematical Modeling - a Basis for Bushing Loading Guides", IEEE Transactions on Power Apparatus and Systems, Vol. PAS-97, No. 6, Nov/Dec 1978

[2] IEEE Guide for Application of Power Apparatus bushings, IEEE C57.19.100-1995

BIOGRAPHY

He received BS in high voltage engineering in 1964, an MS in electrical measurements in 1967 and another MS in high voltage engineering in 1981 all from Tsinghua University, Beijing, China.

From 1968 to 1978 he works at Xi-an Power Rectifier Company in China and developed AC-DC and DC-AC energy conversion systems. From 1981 to 1985 he works at Electrical Engineering Institute of Chinese Academy of Sciences and developed high-voltage impulse generators, as well worked on high-voltage insulation projects.

In the US, he worked as a visiting scientist at Plasma Lab of Stevence Institute of Technology from 1985 to 1990. Since 1990, he has been with Bushing Division of Lapp Insulator Company. His responsibilities include bushing design, bushing development, thermal physics, electrical field analysis and development of measuring method.

APPENDIX A: PROCEDURE TO OBTAIN F1(Z) AND F2(Z) AND TO ESTIMATE TEMPERATURE RISE OF THE HOTTEST SPOT IN A BUSHING

The following is an example. The data were from a 550kV BIL 1200A POC bushing. Calculation repeats in each raw.

I. Obtain F1(Z) and F2(Z) from test data.

Column A. Test data obtained from the thermal test with no current.
Column B. Test data obtained from the thermal test with rated current (1200A).
Column C. The tested temperature rises on the conductor with no current, which are the differences of the data in column A and the air temperature in column A (28.3°C).
Column D. The tested temperature rises on the conductor with rated current, which are the differences of the data in column B and the air temperature in column B (31.8°C).
Column E. Obtain F2(Z) that are the quotients of the data in column A and the oil rise in column A (82.3°C).
Column F. Intermedia for calculating F1(Z), which are the products of the data in column E and the oil rise in column D.
Column G. Obtain F1(Z) that is the differences of data in column F and data in column D.

II. Estimate the hottest spot under overload conditions. For example the overload current is 1800A (1.5 per-unit) and oil rise is 67.8°. The estimation is as the follows.

Column H. Intermedia: A set of the estimated temperature rises on the conductor with no current and 67.8°C oil rise, which are the products of data in column E and the oil rise (67.8°C).
Column I. Intermedia: A set of the estimated incremental rises on the conductor under overload, which are the products of the data in column G and the square of the per-unit overload current ($1.5^2 = 2.25$).
Column J. The estimated temperature rise profile of this bushing with 1500A and 67.8°C oil rise. From this profile, we can find that the hottest spot locates between 29" and 37" from bushing oil end and the temperature rise spot is 79.0°C
Column K. Reference: Test data obtained from 1800A overload for reference. From the test data, the hottest spot locates between 29" and 37" up from bushing oil end and the temperature rise is 83.6°C.

	TEST DATA		TO CALCULATE F1(Z) & F2(Z)					ESTIMATE RISE AT OVERLOAD			TEST DATA
Column	A	B	C	D	E	F	G	H	I	J	K
Location, Z (from oil end)	TEMP. @ 0A	TEMP. @1200A	RISE @ A	RISE @1200A	F2(Z)	inter-media	F1(Z)	inter-media	inter-media	RISE @ 1800A	RISE @1800A
OIL	80.6	79.5	54.0	53.7	1.000	53.7	0.0	67.8	0.0	67.8	67.8
5" UP OIL END	66.6	74.9	40.0	49.1	0.741	39.8	9.3	50.2	20.9	71.1	68.9
13" UP OIL END	64	75.4	37.9	49.6	0.702	37.7	11.9	47.6	26.8	74.4	77.5
21" UP OIL END	63.1	74.8	36.5	49.0	0.676	36.3	12.7	45.8	28.6	74.4	80.6
29" UP OIL END	57.0	73.9	30.4	48.1	0.563	30.3	17.8	38.2	40.1	78.3	83.6
37" UP OIL END	54.0	72.9	27.4	47.1	0.508	27.3	19.8	34.4	44.6	79.0	82.9
45" UP OIL END	51.3	71.2	24.7	45.4	0.458	24.6	20.8	31.1	46.8	77.9	82.7
53" UP OIL END	48.8	69.6	22.2	43.8	0.411	22.1	21.7	27.9	48.8	76.7	78.8
61" UP OIL END	45.9	67.2	19.3	41.4	0.358	19.2	22.2	24.3	50.0	74.3	75.8
69" UP OIL END	43.9	64.9	17.3	39.1	0.321	17.2	21.9	21.8	49.3	71.1	73.1
77" UP OIL END	42.8	62.4	16.2	36.6	0.300	16.1	20.5	20.3	46.1	66.4	67.1
85" UP OIL END	42.0	60.2	15.4	34.4	0.286	15.4	19.0	19.4	42.8	62.2	61.9
Air	26.6	25.8	0.0	0.0	0.000	0.0	0.0	0.0	0.0	0	0

ATTACHMENT - 2

CHANGE THE TITLE OF THIS FROM INTRODUCTION TO FOREWORD

Foreword

(This foreword is not part of IEEE C57.19.01-xxxx, Standard Performance and Dimensions for Outdoor Power Apparatus Bushings)

REPLACE THE FIFTH PARAGRAPH ON PAGE 2 WITH THE FOLLOWING TWO PARAGRAPHS

During the work on the latest revision there was a major change in the requirements for Outdoor Power Apparatus bushings. The requirement for bushings for application on new oil circuit breakers ceased. Because of this, the members of the working group agreed to take advantage of this change and revise the document with the goal of improving bushing characteristics for new power transformers. The members of the working group also agreed that fewer standard bushing ratings would benefit users and transformer manufacturers. The changes made include adding higher current bushings to the tables, fewer voltage classes, uniform CT pocket lengths within groups of bushings, adding information on higher creep bushings to the tables, revised top terminal dimensions, revised bottom terminal configuration for high current bushings, revised cantilever test forces and adding Metric information.

Information on ratings, which are no longer part of the main standard, has been included in the appendices. This information is intended for use when specifying replacement bushings for old apparatus.

7.3 Dielectric Test - L. B. Wagenaar - Chair

Dielectric Test Subcommittee Minutes - L. B. Wagenaar, Chair

St. Louis, MO November 18, 1997

The Dielectric Test Subcommittee met at 9:30 a.m. on November 19, 1997, in St. Louis, MO with 35 members and 36 guests present. A total of 13 guests requested membership to the subcommittee. The minutes of the previous subcommittee meeting in Graz, Austria was approved after correcting the attendance list to include Mr. Don Fallon.

After introductions of members and guest, the chairman covered the key points of the Administrative Subcommittee meeting held on November 17, 1997. The following items were discussed:

- IEEE Standard Association has been formed. Membership is $10 per year. Members receive a copy of IEEE 100 (Standard Definitions) on CD.
- C57.12.00 is currently out for ballot
- C57.12.90 ballot is closed
- The scope of the Power Transformer Subcommittee was approved. It will replace the West Coast Subcommittee. The West Coast Subcommittee will become a working group in the Power Transformer Subcommittee. This group does not include reactors.

*(See Clause 4.0 Administrative Subcommittee for details of the meeting.)

7.3.1 Working Group on Revision of Dielectric Test for Distribution Transformers - Chair, John Rossetti

The Working Group met at 2:30 p.m. with 6 members and 8 guest. The members and guests introduced themselves. Lozan Meadows replaced Tony Thornton on the Working Group.

After asking if there were any questions or corrections from the October 28, 1996 meeting in Burlington, we discussed the response from the IEEE ballot group on C57.138/D7.

Subash Tuli question the grounding shown in the figures. This is covered in Section Clause 5.2 - TRANSFORMER CONNECTIONS. His concern was why we did not ground the non-impulsed terminals on the low-side windings. As explained in 5.2, this enhances the fault detection sensitivity. However, the voltage to ground on any non-tested terminal should not be allowed to exceed 80% of the applicable BIL as explained in the text.

Arthur Molden sent in two comments. The first comment was on the first two paragraphs of Clause 7.3.2 - DIGITAL SYSTEMS. After reading the paragraphs as balloted and Arthur's comments, the WG recommended that the paragraphs remain as balloted. Arthur withdrew his negative on this item.

Arthur commented that the figures 29, 30 and A11 do not provide adequate illustration of their subject matter. As 29 and 30 are digitized figures from copies of a CRT tracing from work that

Don Ballard provided, this is the best that could be obtained from these copies. Figure A11 is a hand sketch that was digitized from a copy. Arthur will try to attempt modification to enhance the figures.

A request was given to John Rossetti by Loren Wagenaar concerning the use of multipliers for temperature conversion in power factor measurement of distribution transformers. This item of new business will be passed on to Mark Perkins' WG on Revision of Low Frequency Test.

Having resolved the three comments from the IEEE balloting group, the WG has completed the project on The Recommended Practice for Routine Impulse Test for Distribution Transformers P57.138.

The negative ballots and how they were resolved will be reviewed in a cover letter to IEEE. The ballot will be recirculated to the Ballot group and on the negative resolutions will be Balloted.

7.3.2 Working Group on Partial Discharge Tests in Transformers -Chair, Jack Harley

The meeting was attended by nine members and thirty four guests.

Attendees introduced themselves. Minutes of the previous meeting, July 16, in Graz, Austria were approved.

PAR C57.127 Trial Use Guide for Detection of Acoustic Discharges in Oil-immersed Power Transformers has been approved by the IEEE Standards Board to be balloted without further revision. Forms have been sent out to members and other interested parties to establish a balloting pool. This Guide had been previously balloted and approved by the Transformers Committee. It was submitted for publication and, after some delays, the Transformers Committee was informed it would be necessary to re-ballot because the paperwork for Standards Board approval could not be found.

The path we are pursuing is to ballot and, hopefully, pass the "Detection" guide and then add the "Location" guide to it instead of having two guides so closely related.

Fred Elliott presented a paper authored by D. L. Berent about Bonneville Power Administration's field experiences with acoustic monitoring. This included a number of case histories, the specifications of the recording systems they use, an overview of their monitoring practices and suggestions of parameters that should be standardized.

The review of the second draft of the Trial Use Guide for Location of Acoustic Discharges in Oil-immersed Power Transformers and Reactors was begun. The next draft of the guide will be sent to Working Group attendees before the April meeting in Little Rock.

7.3.3 Working Group on Low-Frequency Tests - Chair, Mark Perkins

The Working Group on low-frequency tests had its first meeting on Monday, November 17, 1997 at 1:20 p.m. Sixteen attendees requested membership in the Working Group out of the 31 total in attendance at the meeting.

After the usual introduction of members and guests, the minutes of the task force on revision of the induced test from the Graz meeting were approved.

The first order of business was to discuss the negative responses to the subcommittee survey of draft 3 of the proposed changes to C57.113 - Guide for Partial Discharge Measurements and the Induced Test for Class II Transformers Section of C57.12.90. These negative responses had been discussed at the Graz meeting and no resolution was possible at that meeting. On the matter to lower the acceptance criterion from the 500 pc value in the draft 3 to 300 pc, the unanimous opinion of those present was to continue with the 500 pc acceptance limit. Likewise the group also agreed to continue with the proposed limited increase during the one hour run of 150 pc, in spite of one negative vote which requested that the maximum increased be limited to 100 pc.

It was suggested that a task force be formed to collect data from manufactures and analyze the results with the outcome leading to a re-evaluation of the acceptance criterion for future revisions of the standard. It was agreed that this matter would be considered at the next meeting of the Working Group.

The task force then reviewed draft 4 of revisions to C57.113 and C57.12.90 which incorporated changes agreed to at the Graz meeting. The majority of the changes were accepted and a few of the changes were modified. Draft 5 will be prepared based on this input and will be reviewed at the next meeting. It is anticipated that after next meeting, Draft 5 will be incorporated into the latest version of C57.12.90 and in the C57.113 draft document for ballot to the balloting pool. Before C57.113 can be balloted, the PAR must be revised and a balloting pool established. The chairman will work with Tom Prevost to get this work done.

The final order of business was to discuss Bruce Forsyth's proposal on induced tests on transformers with series-multiple or delta-wye switching capability. It was agreed that 2 separate induced tests would be performed with the windings in each of the different connections. If both HV and LV windings have switchable connections, then the connections for both windings would charge between tests. It was also agreed that the test levels and duration (7200 cycle test versus 1 hour test) would depend on the voltage class of the HV winding for the connection being tested. The test on the highest voltage connection would be the last test. These changes will be incorporated into Bruce Forsyth's draft as for review at the next meeting.

The Working Group adjourned at 2:35 p.m.

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

The first meeting of this new Working Group was held on Monday, November 17 at 4:15 p.m. with 29 people present.

The first topic discussed was the revision of C57.98, the Guide for Transformer Impulse Test, work lead by Subhash Tuli. Subhash reported that he had sent 116 copies of the present document to the members of the Dielectric Test Subcommittee and the WG on Revision of Dielectric Tests. Out of those, 17 could not be delivered and 50 were returned, which left only 49 votes returned to Subhash. Several comments were received. Most of them editorial in nature. Two negative votes were received concerning the fact that the in the present guide,

analog oscilloscopes used for measuring the voltage and current traces are well covered with examples, whereas only a small paragraph addresses the digital transient recorders widely used today. It was decided that the WG will proceed with the balloting process of the revised document including the only the editorial comments in order to meet the revision date which is next year. A new section covering the digital transient recorders will be added into the guide in the next revision of the guide. The chairman has agreed to prepare a draft of such a section and distribute it at the next meeting.

The new PAR will be required for the revision of the guide and the Chairman will do the necessary work to have the PAR approved as soon as possible.

The second subject of discussions was the correction factors for improper waveshapes during impulse tests on transformers. No new information was reported on this topic and it was agreed by the WG that unless something new comes in between now and the next meeting in this subject, the topic will be closed and removed from the agenda.

Finally, under new business, it was suggested to revise the section on impulse test in C57.12.90, and look at the opportunity to harmonize our standard test procedure with IEC. In particular, the question of chopped waves tests was raised since these waves are not specified as routine tests in the present IEC document. The WG will address this issue in the near future.

The meeting adjourned at 5:15 p.m.

7.3.5 Working Group on Diagnostic Field Testing & Monitoring - Chair, Rick Young

The Working Group met on Tuesday, November 18 with 48 members and guests in attendance. The meeting consisted of reports and activities associated with the two Working Group Task Forces.

7.3.5.1 Task Force for On-Line Monitor Communication - Chair, Jim Harlow

The Task Force for On-Line monitor Communication met on Monday, November 17 with 28 members and Guests in Attendance. Efforts continued toward developing Object Model Functional Descriptions for the various transformer components which could be monitored. These functional descriptions, which include a name, a range and a description are required for the development of a standard industry communication protocol for all electronic devices presently being pursued by EPRI as part of the UCA (Utility Communications Architecture) system. The listing of transformer parameters which can be monitored will also be valuable for the monitoring guide task force.

7.3.5.2 Task Force for Developing a Guide for On-Line Monitoring of Transformer - Chair, D. Chu

Task Force for developing a guide for on-line monitoring of transformers met as part of the Working Group meeting. An outline for the proposal guide was presented for discussion. The outline included a title, scope and purpose as well as suggested headings for the main sections. The accepted title for the document will be "IEEE Guide for the Application of On-Line Monitoring to Liquid Filled Power Transformers." Discussion of the scope and purpose did not

reveal any major philosophical problems with the initial proposal. The Task Force will begin writing the text to support the scope and purpose so that an expanded draft of the guide can be discussed at the nest Working Group Meeting.

7.3.6 Liaison Reports

7.3.6.1 Insulation Coordination - John Crouse

Draft 4 of the Application Guide is being revised to develop a document that should be close to the final version. This revision will be sent to the subcommittee members for comment.

7.3.6.2 Surge Protection Devices - Bob Degeneff

Mr. Degeneff and Wagenaar met in Columbus, OH with three members of the Surge Protection Device Committee. The explained the curve that was sent to the Committee for review. This committee has additional questions which will be directed to B. Poulin and the WG on Revision of Transient Dielectric Tests.

7.3.6.3 IEC TC14/WG24 - Loren Wagenaar

Dielectric Test and Insulation Coordination

Minutes for this Working Group meeting held in London, UK on September 9-11, 1997 were distributed to the subcommittee membership with the agenda for the St. Louis meeting. Copies are available upon request and will be distributed to new members with the minutes of the November 18, 1997 meeting in St. Louis, MO.

7.3.7 Old Business

7.3.7.1 Induced Voltage Test Levels for 735 kV and 765 kV Transformers - Loren Wagenaar

This issue was discussed at the subcommittee meeting in Graz where changes to the table were made. These changes were forwarded to the 765 kV user group with one comment returned. This comment suggested that the nominal system voltage should be shown as 735 kV/765kV. There were no objections to this change. The table will be re-balloted and referred to Mark Perkins, the Chair, of the WG for Revision of Low Frequency Dielectric Tests.

7.3.7.2 Power Factor Temperature Correction Factors Table 10 of C57.12.00 - Chair, John Rossetti

At the last meeting J. Corkran suggested we look at the issue of power factor temperature correction for distribution transformers. This issue was referred to Mr. J. Rossetti, Chair of the WG for the revision of Dielectric Tests for Distribution Transformers. Mr. Rossetti wrote to Mr. M. Rivers of Doble concerning the subject of curves for power factor correction for distribution transformers. Doble publishes a set of curves for distribution transformers prior to 1950 and after

1950 including silicone fluid. This data is most likely from users and manufactures. Mr. Rivers will try to trace the source of these curves. The difference between prior to 1950 and after 1950 is due to insulation materials used and drying process. One concerned voiced was that insulation construction is different between power and distribution transformers and they may require separate curves.

J. Corkran suggested that the Working Group obtain recent data on power factor correction from various distribution transformer manufactures.

L. Wagenaar related that he had written a letter to the Subcommittee a year ago and he believes the basis of the current IEEE Curve is a 1953 paper by Mr. E. V. Deblue of the G. E. Company. This paper was published in the 1953 Doble Meeting minutes and the data from several large power transformers in the range 25-170 MVA.

- Curve needs to be reviewed
- Does it need to be improved?
- Is it up to date?

The issue was referred to M. Perkins, Chair of the Working Group for the Revision of Low Frequency Dielectric Tests. They will consider curves for both power and distribution transformers.

7.3.7.3 Factory Dielectric Tests on Repaired Transformers - Mark Perkins

This change to C57.12.90 section 10.1.8 was circulated for comment. One negative comment on the original draft was received. This negative suggested that paragraph 2 be removed. Mr. Perkins felt that this paragraph could be removed without changing the technical content or nature of the document.

7.3.7.4 Induced Tests for Series and Multiple Connections - B. Forsyth

This item was covered in the minutes of WG on Revision of Low Frequency Dielectric Tests, Clause 7.3.4.

7.3.7.5 Revision of Tables 5 and 17 of C57.12.00 - Sabash Tuli

Just prior to the July, 1997 meeting at Graz, Austria, Ballot/Survey letter were mailed to all active members of the dielectric tests working group and subcommittee. Out of 116 survey letters sent, 99 were returned (85%). The results were as follows:

Affirmative	67	(5 with comment)
Negative	13	
Abstention	7	
Undeliverable	12	
Total	99	

All affirmative ballots with comments are incorporated into draft 2 of the tables.

Nine (9) negative ballots out of 12 pertained to Table #17 and 3 ballots belong to Table #5. All negative survey responses to Table #17 are accommodated in draft #2 of the table. Negative responses to Table #5 are being forwarded to the Subcommittee Chair for discussion as new business. The negative ballots will be resolved and a full survey of the changes to Table #5 and Table #17 will be made at the Subcommittee level. The changes will then be incorporated into C57.12.00 revision for balloting.

7.3.7.6 Low Frequency Test Voltages - Phil Hopkinson

In a letter to the subcommittee chair, Mr. Hopkison indicated the Tables 3, 4, 5 and 7 in C57.12.01 (Distribution Transformer Test Values) need revision in layout and voltages. A few comments were:

- Induced test voltage based on BIL (Not true for high voltage).
- Applied Voltage Test are required at much higher values.

The chair will ask Mr. Hopkinson to develop the needed revisions to the tables indicated.

7.3.7.7 Insulation Resistance Temperature Correction Factors - Loren Wagenaar

This item was brought up by M. Perkins at the Graz, Austria meeting. The chair was to contract individuals to comment on the factor. He was not able to complete this. This item will be referred to the Working Group on the Revision of Low Frequency Tests.

7.3.7.8 New Business

Mr. Ernst Hanique is on a CIGRE/IEC Working Group which is working on two tasks:

- Establishment of new waveforms for impulse tests
- Building a new TDG program (Test Data Generator)

They had a meeting in Lake George, NY in August with the PSIM where the proposal was presented. This group wanted to know if the Dielectric Test Subcommittee was interested in this proposal and, as experts in this area, add comments.

B. Poulin suggested that we use the liaison report system to stay a breast of this work at the PSIM. He also felt that the issue between analog and digital recording would have to be addressed.

After discussing the merits of a new task force or a joint task force with PSIM, it was decided that a Joint Task Force under the Working Group on the Revision of Transient Dielectric Tests would be formed. The proposal will be presented at the next Working Group meeting. Mr. E. Hanique was asked to report back to the PSIM Working Group on the decision.

The meeting was adjourned at 11:15 a.m. with no other new business.

7.4 Distribution Transformers - K. S. Hanus, Chair

7.4.1 Chair's Remarks & Announcements

The meeting convened at 2:00 PM in the St. Louis B room with the introduction of the members and guests and signing of the attendance roster. There were 26 members and 11 guests in attendance.

Minutes of the meetings in Burlington, VT and Graz Austria were approved with no changes.

The chairman covered key points of the ADCOM meeting from the evening before. See Clause 4.0 for details.

7.4.2 Working Group Reports:

7.4.2.1 C57.15 Step-Voltage Regulators

The working group met with 26 attendees.

The current draft has been approved at the working group level with 15 of 17 votes affirmative. The remaining two votes were affirmative with comments with comments discussed and resolved at the working group meeting. The comments were generally of an editorial nature. The document will now be passed on to IEEE for balloting.

7.4.2.2 .20 Polemount Transformers

The working group reviewed the status of the draft IV dated February 1993 which has been approved. A first galley proof was rejected in August 1997 and the working group is awaiting a second galley proof.

Mark Loveless reported he would have some work done on consolidation of the figures by the next meeting.

Discussion ensued regarding a proposed survey of EEI concerning the continued use of type "C" hanger brackets. It was determined we did not know what questions to ask. A task force was formed to look into the feasibility of going from a type C hanger to a modified style B hanger and survey users to see if this would be acceptable. Task force members are Tom Diamantis, Rich Hollingsworth, Ron Stahara, Al McGuire, John Lazar & Jeff Schneider with Ken Hanus as chairman.

The working group discussed the possibility of specifying the location and spacing of surge arrester mounting bosses on the transformer tank. After much discussion it was decided the users should send to Glenn Andersen each of their requirements so he may develop a proposal.

The working group also discussed the need of functional requirement for transformer gaskets. A vote was taken and was decided to postpone discussion until the next meeting.

Lastly under new business it was suggested the document address transformer cover dielectric strength. Since this is primarily used as wildlife protection it therefore is an accessory. Users, which have a cover dielectric specification, will send their requirements to Glenn Andersen for him to formulate a proposal.

7.4.2.3 .25 Single Phase Deadfront Padmount Transformers

The working group met with 35 guests and members present.

The working group reviewed the results of a working group ballot and the resulting comments. Forty-six items were reviewed and all issues were resolved except two. These two included verbiage relating to tank pressures and cabinet integrity, and the radius for the parking stand in figure 2b. A task force was formed to respond to the first item and manufacturers will provide information to resolve the second issue.

A draft 7 will be produced with changes agreed to in the meeting and sent out for comment before the next meeting.

The current document has a 1990 date and needs to be re-affirmed. Ken Hanus will advise the chairs on what needs to be done.

Also the chair is going to request from IEEE staff guidance on the English & Metric dimensioning for figures 1 & 2.

7.4.2.4 .34 Three Phase Padmount Transformers

The working group met with 32 members and guests present.

Draft 1 of the 12.34 document was handed out. It was noted the second draft of the document would be put into the IEEE format by the next meeting.

The majority of the meeting consisted of discussion surrounding the impedance values for 75-500 Kva units. Some motions were passed but it was decided the issue needed further discussion and resolution at the next meeting.

A draft 2 with agreed upon changes will be produced and sent out to the working group before the next meeting for comment.

It was also brought up to the working group that the document did not address the number of secondary spade holes required for 1500 Kva, 480 volt secondary units. This will be looked into and addressed in draft 2.

7.4.2.5 .35 Bar Coding

The working group met with 25 members and guests present.

The current document has been approved and published. The working group discussed the results of an EEI survey concerning the use of bar code labels on distribution transformers. At this time the working group does see any work that needs to be done for a next revision.

Working group chairs will continue to monitor efforts of other related groups and begin the revision process when needed.

7.4.2.6 .33 Guide for Evaluation of Losses in Distribution Transformers

The working group met with 30 members and 25 guests present.

Draft 4 of the Loss Evaluation Guide had been sent to members for concurrence and comments. Among 21 responses received there were a number of comments received. A summary of the comments was distributed and discussed at the meeting. Draft 5 will incorporate these comments and include a reference to NEMA TP-1 "Guide for Determining Energy Efficiency for Distribution Transformers" which was written to cover users who do not perform a loss evaluation.

Ben McConnell of Oak Ridge National Laboratory provided the working group with an update on their recent work for EPA on the impact of uncertainties associated with parameters used in the loss evaluation process. These included the use of a band of equivalence. A draft report is being reviewed with a final report expected shortly.

Andrew de Laski of the Consortium for Energy Efficiency (CEE) provided a brief presentation on new national and regional programs to build the market for use of energy efficient commercial and industrial transformers. These efforts intend the use of NEMA TP-1 as the basis for defining energy efficiency for C&I customers.

Peter South of EPA gave an update on the Energy Star transformer program. EPA is proposing a new Energy Star program for low voltage dry-type transformers and invited input and participation.

7.4.2.7 P1388 Electronic Data Transmittal

The working group met with 17 members and 3 guests present. Since only 3 working group members were present in Graz a review was done of the work discussed in Graz.

After the discussion of draft 3 was completed, three changes were suggested. These were:

1. Regarding weight, allow reporting either pounds or kilograms as marked on the nameplate.
2. Regarding polarity, report additive or subtractive for single phase; do not attempt to report phase displacement on 3 phase units.
3. Add a paragraph explaining user specification options on test data reporting.

A task force was formed to review draft 3 in detail and report back before Christmas. A draft 4 will be produced and sent out to the working group before the next meeting for review.

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

.29 Padmount Enclosures-Coastal Environments - The document was recently balloted and negative votes were received from C37 switchgear NEMA delegates. Bob Olin has in large part responded to the negative comments. Bob and Tom Diamantis will meet to formulate plans to finally address the negative votes.

.28 Padmount Enclosures- Same report as above for .29.

.31 Polemount - The document has been balloted, approved and released for publication. Due to administrative problems encountered at the NEMA level, the released document is listed as "NA" (Not Available).

7.4.3 New Business

Gerry Paiva reported the impulse tests task force turned there work over to C57.90. He also noted the distribution transformer subcommittee needs to look at the definitions and terminology in C57.12.80 as this is in the process of being looked at. Any comments need to be sent to Gerry.

7.4.4 Working group assignments

The current assignments are as follows:

.20 Glenn Andersen / Alan Wilks

.21 Ali Ghafourian

.22 Ken Hanus

.23 Vacant

.25 John Lazar / Ali Ghafourian

.26 Gerry Paiva

P1388 David Rollins/Angie McCain

.35 Ron Jordan / Ed Smith

.33 Tom Pekarek/Don Duckett

.34 Vacancy/Ron Stahara

57.15 Tom Diamantis/Craig Colopy

The meeting adjourned at 2:50 PM.

7.5 Dry-Type Transformers - W. F. Patterson, Chair

7.5.1 Chair Remarks and Announcements

The Dry Type Transformer Subcommittee met at 10:55 AM on November 18, 1997 with 26 members and 6 guests present. Introductions were made and the attendance roster was circulated. Minutes from the previous meeting were reviewed and approved. Announcements were held until after the working group reports were given.

7.5.2 Working Group Reports

The next order of business was the presentation of the reports of the various working groups. See the following section for the individual reports.

7.5.2.1 Working Group on Thermal Evaluation of Insulation Systems of Dry Type Power and Distribution Transformers - C57.12.56 - Richard L. Provost, Chair

C57.12.56 Chair Remarks and Announcements

The working group met at 10:55 a.m. on Monday, November 17, 1997 at the Adam's Mark Hotel in St. Louis. There were 13 members and 11 guests present. The minutes of the last meeting in Graz were approved as written.

C57.12.56 Announcements and New Business

The ballot for C57.12.60 is now in circulation and the voting closes on December 16. The chairman noted that the 3 figures were omitted from the original mailing, but that IEEE has since mailed these to the voting pool. It was also noted that an editorial error in the average time to failure L_2 was made on page 5 (line 3 & 5) and page 14 d) 1). These should have a "bar" over the letter "L_2" ($\bar{L}_2$). The chairman encouraged any voters to return their ballots ASAP if they had not already.

A request for invitation to ballot has been sent to IEEE regarding reaffirmation of C57.12.56, the sister document for open ventilated dry types. The chairman recommends that voters agree to reaffirm the document so that we can work on a revision beginning next year.

The chairman noted the intention to combine both documents in the next revision, to simplify the documents since they are very similar, and if fact identical in many of the clauses. The major differences are in the design of the models and in the dielectric end-of-life tests.

Lin Pierce raised the issue of whether it was prudent to do this since it creates unnecessary work for the working group. Consensus was that work was needed anyway to upgrade the C57.12.56 document as well as add to the C57.12.60 document. Lin further noted that some users may prefer to have separate documents.

The chairman agreed to send a letter to the work group with a new PAR recommendation for combining the documents and ask for comments/opinions on the merits or concerns of doing so.

A discussion was raised regarding the experiences and known standards regarding flammability issues. There was some discussion about the idea of issuing a technical white paper reviewing subject. The chairman agreed to send a summary or bibliography of the literature on this subject to the working group and ask for comments on the subject, recommended action, merits of a technical paper, etc.

With no further business, the working group adjourned at 11:50 a.m.

7.5.2.2 Working Group on Evaluation of Systems of Insulation for Dry-Type Specialty and General-Purpose Transformers - R. William Simpson Jr., Chair

Working Group 259 met at 1:20 p.m. on November 17, 1997 in Room 48 of the Adam's Mark Hotel in St. Louis, Missouri. There were six members present.

Announcements and New Business

Introductions were made and the minutes of the July 16, 1997 meeting in Graz, Austria were approved as written.

Revision Ballot P259/D2(3/31/97) closed September 12, 1997 with a return of 77%; there were 81 affirmative votes, 10 abstentions, and 0 negative votes for a 100% affirmative vote.

The WG reviewed the editorial comments received and corrected the document as required.

The comment received from Linden Pierce could not be resolved by the WG. The chairman agreed to research the issue and make the appropriate changes.

Revision P259/DS(3/31/1997) will be submitted in RECCOM as soon as possible.

IEC 60505 and IEC 61857 have been circulated as CDV's through the U.S. TAG to IEC/TC98 "Electrical Insulation Systems."

As there was no new business, the meeting as adjourned at 2:10 p.m.

7.5.2.3 Working Group on Dry-Type Transformers General Requirements - C57.12.01 - Anthony Jonnatti, Chair

This working group is preparing revisions for "IEEE Standard General Requirements for Dry Type Distribution and Power Transformers, including those with Solid Cast and/or Resin-Encapsulated Windings", C57.12.01-1929

This working group met on November 17, 1997 at 9:30 a.m. in Room 29 of the Adam's Mark Hotel in St. Louis, MO. Present were 16 members and 14 guests. Max Cambre and Phil Hopkinson requested membership.

After the introductions, the minutes of the Graz meeting were approved by Wes Patterson and seconded by Mike Haas.

The chairman stated the IEEE headquarters will send out a new ballot for the last change. This should be out shortly.

The first topic of discussion was the inclusion of 600 volt general purpose transformers. The chairman has submitted a PAR to include these units. This PAR will also change the scope of the standard. Discussion was on the lower limit for the voltage. The chairman stated he will remove the voltage limits from the standard.

The next discussion, the proposed Table 3 by Phil Hopkinson to replace Tables 3A and 3B. This is a table on the relationship between low frequency Applied Potential Testing and System Voltage. The chairman had made a minor modification and passed out this change. There was a considerable discussion on this proposal concerning the proposed full wave parameters and the low frequency value.

Phil Hopkinson made two statements for the group to consider:

a) For windings rated 1.2 KV and below, and 30 KV and below, a .5 x 1.5 μ sec wave.

b) For windings with reduced neutral insulation, the applied potential test shall be in accordance with the system voltage corresponding to the reduced "S" BIL rating.

Some discussion was made on the higher applied potential test than the existing values. It was decided these values will be considered, digested, and discussed in the next meeting.

The next topic was on partial discharge. The chairman passed out a proposed handout. This is for the group to consider. Wes Patterson stated we should be consistent with the previous handout and use the term "voltage class" for both. Chuck Johnson asked the chairman to send to the members of the working group, the supporting documents for his portion of this handout.

The chairman next discussed other items we may want to consider for the future of this standard:

a) Y - Y transformers

b) Insulation resistance measurements and power factor measurements

c) 3 winding transformers

The question for the group will be "do we want these in the standard?"

Max Cambre went back to the first handout on applied potential values and suggested we change the 1.1 KV rating to 600 volt.

With no new business, the meeting was adjourned at 10:45 a.m.

7.5.2.4 Working Group on the Dry Type Reactor - Richard Dudley, Chair

On Nov. 17, 1997 the Dry Type Reactor W.G. met from 8:00 a.m. to 10:45 a.m. in Room 48 of the Adams Mark Hotel in St. Louis Mo. There were 4 members and 3 guests present; 2 of the guests requested membership. The following are the highlights.

1. The Chairman informed the membership that Bill Kennedy had submitted the converter transformer standard to IEEE and that it would be considered for approval at the Dec. meeting of the IEEE Standards Board.

2. The remainder of the meeting was spent in discussing Pierre Riffon's comments to D5 of the HVDC smoothing reactor standard. The following are the highlights.

(i) Section 11.1.3 will be rewritten since the chopped wave impulse test is a test of the windings, not the support insulators, of dry type SMRs. It is a test of the windings for both dry type and oil immersed SMRs.

(ii) Section 11.3 will be reviewed based on the IEEE converter transformer standard and the corresponding IEC document; polarity reversal test with p.d. measurement for oil immersed SMRs.

(iii) Section 11.4.1 should be modified and expanded to cover two a.c. tests for oil immersed SMRs; applied voltage test to ground with the windings shorted and an a.c. power test across the windings (between terminals) with p.d. measurement. What should the test voltage level be; double maximum ripple voltage? Is the test necessary? What is the typical turn to turn voltage stress in an oil immersed SMR; is p.d. possible? The purpose of the test is to pick up incipient insulation damage resulting from the impulse tests. Lars Erik Juhlin will provide input re test voltage level.

(iv) More background will be supplied in Section 11.5 as to where the "modified turn to turn" test might be applicable. If a digital scope or data acquisition system, with analog to digital conversion is employed plus appropriate software to allow trace comparison, transfer function assessment etc., is employed then the "modified T-T" test is not recommended. The guide for impulse testing C57.98 will be referenced for background information. The test voltage level of the modified T-T test will be clarified; .5 of BIL. The inherent overshoot should not exceed 90% of BIL. The reduced wave should be 50% of .5 BIL.

(v) Substantial discussion took place on Section 12.3.1 covering the measurement of incremental inductance of oil immersed SMRs. One key requirement is the actual value of inductance at short circuit. It cannot be measured directly; what measurements are sufficient so that it can be determined? The test current must be sufficient that values of incremental inductance can be obtained beyond the "knee point" of the core material magnetization cure. Is a charging current of 1.5 times maximum continuous current sufficient? The test should be changed to include the following "The incremental inductance shall be determined as a function of the direct current up to the specified maximum overload current. To obtain this information the reactor shall be "charged up" with a current from a rectifier to a value of current equal to the maximum overload current or higher, if necessary, to ensure the core material saturation characteristic beyond the "knee point" is accounted for. This will ensure that inductance value at any current value, including short circuit, can be determined."

The resistance is not only the resistance of the reactor but of the full test circuit. The resistance should be measured before and after the test to assess heating

effects and, if any, an average value of resistance should be used in the determination of incremental inductance.

(vi) Section 13.3.2.2.; losses in oil immersed smoothing reactors include core losses. I^2R_{DC} losses constitute 95% of total losses; harmonic losses are about 5%. Lars Erik Juhlin will supply typical loss breakdown and this will be used to provide perspective as to level of accuracy required in determining harmonic losses and hence methodology. Should measurements be carried out at a specific frequency to provide calculation verification? Should losses be measured for dry type SMRs or converter transformers or should they be measured with rated d.c. current (to bias the core) plus harmonic current of interest?

(vii) Section 12.4.1; stray losses outside the winding make negligible contribution to winding temperature rise and should be excluded from the determination of thermal equivalent current. The second to last paragraph in Sect. 12.4.1 will be deleted.

(viii) Section 12.4.2 contains common comments on the temperature rise test; dry type and oil immersed. Sections 12.4.2.4, 12.4.2.5, 12.4.2.8 will be moved to Section 12.4.4 as they are applicable to dry type only.

(ix) Section 12.4.2.8; if the thermal time constant is incorrectly estimated and the duration of the temperature rise test is not sufficient (based on 5 times the thermal time constant) then the temperature rise test is to be repeated.

(x) Add to Section 12.4.4.3 a statement that the alternative support structure (based on a minimum of 1.5 times the build) should not have a height greater than that of the contract support structure.

(xi) Section 12.3.1.2.3 should be rewritten and should reference and be based on C57.19.03; the standard for bushings used in D.C. application.

(xii) In Section 12.5.1.4 subclauses (1) and (2) will be eliminated and IEEE Std. 4-1995 will be referenced.

(xiii) Section 12.3.3.1; for oil SMRs 3 full wave tests will be applied to be consistent with IEC.

(xiv) Section 12.5.3.3.1; for the switching impulse test negative polarity is usually used. If positive polarity or both are to be employed the purchaser shall notify the manufacturer at the bid stage.

(xv) Section 12.3.3.3.2; if the waveshape cannot be achieved for the switching impulse the manufacturer shall notify the purchaser at bid stage.

(xvi) Section 12.5.4; the impulse test sequence for oil SMRs shall be as per IEC. i.e. one red. full, one full, one red. chopped, two chopped, two full.

(xvii) Subclause (2) in Section 12.3.4.1.2 should be rewritten; specifically the last sentence. "A minimum available energy (based on generator configuration during the test) of 100k joules is required to ensure an adequate test".

(xviii) In Section 12.5.4.1.4 the 30% limitation on overswing to opposite polarity should be removed and IEEE Std. 4-1995 should be referenced. The characterization of the chopped wave should be as per IEEE Std. 4-1995.

(xix) Section 12.5.4.2.1 will be eliminated.

(xx) Section 12.5.6.3 should be modified to be consistent with the converter transformer standard and IEC. e.g. time voltage of specific polarity is held (60 min., 60 min., 45 min.).

(xxi) Section 12.5.7 should be broken into 2 subsections; 12.5.7.1 for applied voltage test and 12.5.7.2 for a.c. power test. The comments in (iii) on Section 11.4.1 apply. Pierre Riffon's text will be used for Section 12.5.7.2 with the modification that the frequency of the supply should be ≥ 60 Hz.

(xxii) Pierre Riffon proposed to modify Section 12.6.2 re the number of impulse tests for the type test. Because a dry type reactor has both internal and external insulation the number of shots should be 15 of each polarity from each end. This is the case for bushings. However this philosophy is not in line with C57.21 (dry type shunt reactors up to 115 kV) and C57.16 (dry type high voltage series reactors etc.). It is in conflict with IEC 289 (reactors) and IEC 762 (dry type transformers).

The meeting adjourned at 10:45 a.m. The Chairman stated that he would include the above changes plus those discussed at Graz in D6.

7.5.2.5 Working Group on Dry Type Test Code - C57.12.91 - Dave Barnard, Chair

The working group met at 8:00 a.m. on November 17, 1997 in Room 43 of the Adams Mark Hotel.

Introductions were given, minutes were read and approved. There were 15 members and 5 guests present.

New PAR approved in June of 1996.

Insulation Power Factor: Don Kline spoke on the need to continue working on this, to gather more information and the method of taking these measurements. It was noted that the ambient will affect this measurement and at the time Doble is the leader on this test. Today no manufacturer thinks this test is really necessary but some customers still require this test to be made. Some comments were given that this test could be more of a field test than a factory.

Chair read note in article 10.8.4, note then was discussed.

Wayne Hansen to bring NETA specification to next meeting to share with WG.

Don Kline made motion and seconded by Gene Morehart to leave verbiage on insulation PF (power factor) measurement as written today.

After discussion motion did not carry.

Wes Patterson commented that we should delete the last sentence in the note in article 10.8.4 because this should clear up any previous negative votes pertaining to insulation power factor test.

It was mentioned that minutes should be sent to Doble in order to get comments by the next meeting. (Mark Rivers)

Hot Spot Methodology - 12.91 will wait until working group hot spot is finished.

New business -

Chair red letter from Virginia Transformer on hot resistance measurements.

1. Is method in 12.91 a recommendation?
2. Can another sequence be performed?

After discussion, group stated unless a statement has the word "shall" it's only a recommendation.

Comment was given that "should" means that it is a recommended method but not mentioning or excluding other methods.

Wes Patterson and Dave Barnard to respond to Virginia Transformer.

Perf. temp for core loss.

Comments given on what the ambient temp should be: Nema group is presently working on this along with Oscars Peterson of NIST.

Discussion on how government employee's are giving input to Nema working groups. Comments were about a liaison between Nema TP2 & 12.91. Members of Nema TP2 are presently members of C57.12.91 working group.

Gene Morehart stated that from TP2 working group, 25°C is ambient ± 10°C, but not clear of this is the core or air ambient temp.

Group to formulate its own idea of what the ambient temp should be and forward this to Nema TP2 working group.

Dry and oil will be much different because oil is controlled environment and dry is not.

Motion to adjourn at 9:15 a.m.

7.5.2.6 Working Group on Hot Spot Differentials - Paulette Payne, Chair

The Working Group met at 8:00 a.m. in Room 48 of the Adams Mark Hotel with fourteen (14) members and thirteen (13) guests present.

The minutes of the July 17, 1997 meeting were approved as written.

The Working Group discussion focused on Draft 1.3 of the *Guide for Determination of Hottest Spot Temperature*, as revised from the meeting discussion in Graz.

Editorial corrections and revisions were noted. Terminology will be revised for consistency throughout the document, i.e. change "hot spot" to "hottest spot," the latter being the wording in the PAR.

Richard Dudley will prepare for inclusion in the Guide details on correlation of average winding temperature to hottest spot temperature for adjustment to surface temperature measurement. Richard will also prepare a clause in section 4.2 *Accuracy* on how to attach temperature devices.

Linden Pierce recommended inclusion in section 3.0 *Definitions* those thermal terms which were provided the Liquid Hot spot Determination Task Force.

Linden Pierce will provide additional references to Annex A *Bibliography* for testing.

Richard Dudley and Linden Pierce will provide the aforementioned information to the Chair in 2 - 3 weeks.

The Working Group agreed to ballot the Working Group and Subcommittee simultaneously, after revision of the Draft Guide.

Being no other business, the meeting adjourned at 8:20 a.m.

7.5.2.7 Working Group on Dry Type Loading Guide - C57.96 - Michael Haas, Chair

Working Group met at 9:30 a.m. at the Adams Mark Hotel in St. Louis with 11 members and 10 guests present.

After introductions, the minutes of the October 29, 1996 minutes were approved.

A short discussion concerning whether or not Annex A was needed or not. It was decided to leave it in and back fill it later.

Chuck Johnson requested that fig. 4 be rotated 90° for the next draft.

There being no further business, the meeting was adjourned at 9:40 a.m.

7.6 HVDC Converter Transformers & Smoothing Reactors S. C. - W. N. Kennedy, Chair

The HVDC Converter Transformers and Smoothing Reactors S.C. met in Room 46 of the Adams Mark Hotel on Nov. 17, 1997 from 2:50 p.m. to 4:10 p.m. in St. Louis, Mo. There were 4 members and 2 guests present; one of whom requested membership. The following are the highlights.

1. The Chairman informed the S.C. that Bill Kennedy had submitted the converter transformer standard to the IEEE and that it would be considered at the Dec. meeting of the IEEE Standards Board.

2. The minutes of the Graz meeting were approved.

3. The remainder of the meeting was a continuation of the discussions started in the meeting of the Dry Type Reactor W.G. Completion of discussions on Pierre Riffon's comments on D5 was first on the agenda. Highlights are as follows.

   (i) The issue of the number of shots for the lightning and switching impulse type tests on dry type SMRs was discussed. Pierre Riffon will supply references to back his position of 15 shots of each polarity from each end. Input regarding this philosophy is requested; especially from end users. The use of such a large number of shots is not consistent with other dry type reactor standards or dry type transformer standards.

   (ii) Section 12.6.7; should p.d. measurements be made during the 60 Hz power test on oil SMRs? It is justifiable? Should test voltage be at 1.5 or 2.0 times the ripple current voltage drop?

   (iii) Section 12.6.8; should the D.C. voltage wet withstand test be carried out with the coil on the insulators? The coil would be wetted as well as the insulators. A mock-up could be used in place of the coil. This is not the typical way a wet withstand test is carried out on support insulators. Therefore this test methodology can be taken into consideration but should be covered as part of a NOTE. If it is required, it should be stated at bid stage as it will add additional test cost.

   (iv) Section 12.6.10.1; on a 60 Hz basis the two main audible sound tones are 720 Hz and 1440 Hz.

   A NOTE should be added to wit that sound level measurement is an OTHER test and can be carried out to measure sound level at D.C. plus one major harmonic to validate the sound level calculation (model).

   (v) In Annex C.11 a statement will be added re the effect of pollution on the short circuit or impulse withstand of dry type SMRs.

4. The comments of Lars Erik Juhlin were discussed next. The highlights are as follows.

(i) Subclause (2) in the Foreword will be eliminated. Once the standard is complete a better perspective will exist re the noting of significant accomplishments.

(ii) A number of non applicable references will be eliminated.

(iii) Two additions will be made to the Bibliography.

(iv) Section 3.1; in the description of the primary purposes of a SMR, the reduction of harmonics in a d.c. overhead line is a fundamental function. Complying with telephone interference requirements is more closely tied to the d.c. filter design.

(v) Section 5.2.1; SMRs are custom specified and designed for a location and therefore loading vs temperature conditions are the norm. Current rating vs temperature etc. involve a number of considerations proposed by LEJ.

(vi) Section 5.2.2; unusual altitude conditions should be harmonized with IEC 76.2 (Clause 4.3) for oil immersed reactors and IEC 726 (Clause 10.3) for dry type reactors. LEJ has proposed wording plus NOTES.

(vii) Section 5.2.2.1; IEC 726 provides a better approach re the effect of altitude on insulators. Operation at increased altitude is verified by dielectric test of external insulation at increased voltage level. LEJ has proposed a new wording.

(viii) Section 5.2.3; loading of SMRs at other than rated current is a standard part of most d.c. project specs. Examples of overloads should be provided. Section 5.2.3 will be rewritten based on this premise. What has to be provided to fully specify the SMR will be included.

(ix) Section 5.2.4 covers other unusual service conditions. The second sentence in subclause (1) will be rewritten with particular attention to specifying creepage requirements for bushings and insulators. Pollution impact will be discussed especially as related to specifying creepage requirements.

The meeting adjourned at 4:10 p.m. The Chairman stated that he would produce D.6 by the next meeting of the S.C. and will include, as appropriate or discussed, the comments of PR & LEJ.

Richard F. Dudley

7.7 Instrument Transformers - J. E. Smith, Chair

7.7.1 Chair's remarks & Announcements:

The subcommittee met on Nov 18, 1997 with 6 members and 4 guests present.

- Jim Smith was unable to attend this meeting, so it was chaired by Ross McTaggart
- The dates and locations for future meetings were announced
- The minutes of the July 17, 1997 meeting were approved as written.

7.7.2 Working Group Reports

7.7.2.1 WG C57.13.5 - Working Group on Test Requirements for High Voltage Instrument Transformers 115 kV and above – Joe Ma, Chair

- The WG met on Nov 17 and Nov 18 with a total of 13 attendees.
- The subject of these meetings was Routine Tests

  The outstanding points were:

  1) The list of references needs to be updated as some of the referenced documents have been revised or replaced
  2) Since these instrument transformers are used for grounded neutral or essentially grounded neutral, a statement should be included either in the scope or 'General" section to clarify this .
  3) Creepage requirements are to make reference to the IEEE Bushing standard
  4) Partial discharge test voltages are to be reviewed as they appear to be too high
  5) The sealing test on gas-insulated instrument transformers should be similar to IEC 694 for circuit breakers
  6) AC Voltage withstand test frequencies and times are to be tabulated
  7) A flow chart of tests should be included to clarify the test sequence
  8) One additional capacitance and dissipation factor reading should be taken at 10 kV for field test comparisons

- Members expressed their desire to have 2 continuous sessions on the same day
- Member Riffon submitted a type test proposal on CT's for capacitor bank applications

7.7.2.2 Working Group on C57.13 Revision - Tom Nelson, Chair

- The working group met on Nov 18, with 9 members and 1 guest present
- The tolerances for burdens for current transformers was agreed upon to be ± 5% of VA and Power Factor
- There was a discussion on adding partial discharge limits to table 3.The chairman will consult with the Subcommittee Chair on this item.
- The chairman will mail the Draft Standard to the WG members in January, 1998

WG C57.13.6 – Working Group on Instrument Transformers for use with Electronic Meters and Relays - Chris Ten Haagen

7.7.3 Old Business

Approval of minutes, Burlington VT

7.7.4 New Business

As announced at the Burlington Vt. meeting in November 1996, the Chairperson circulated for review a draft guide of C57.13.6. A fax coversheet was provided for members and attendees to provide comments and suggestions. Input received by February will be incorporated for the next meeting and or presented for discussion at the next meeting. Balloting may follow next summer, perhaps as a "Trial Use" guide.

After general review of the document by the working group, key areas of discussion were:

- V. Gaukhshteyn suggested that the accuracy limit on CT's at 5% of rated current be doubled from 0.15% to 0.3% due to difficulty of compensation. It was requested he forward specific proposal for review by group.
- The Chairperson reviewed the history of present tolerance: 1)standard was reflecting commercially available performance, 2)alignment with meter light load test current (1/4A), and 3) agreement with electronic meter performance.
- The Chairperson requested feedback on the E0.02 burden- in particular if it exceeds typical bench burdens. In addition, need for tolerance on the burdens, if any, should be reviewed in light of C57.13 .

7.8 Insulating Fluids - F. J. Gryszkiewicz, Chair

The Insulating Fluids Subcommittee and its Working Groups met in St. Louis, MO on Monday and Tuesday, November 17 and 18, 1997. In attendance were 26 members and 45 guests.

The Subcommittee minutes of the July 16 and 17, 1997 meeting in Graz, Austria were approved as submitted.

7.8.1 Current Subcommittee Projects

7.8.1.1 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 - Frank Heinrichs, Chair

All negative ballots resulting from Draft 11 of this document have been resolved. Draft 12 will be reballoted at the Main Committee Level prior to the next meeting in Little Rock.

7.8.1.2 P1258 - Trial Use Guide for the Interpretation of Gases Generated in Silicone-Immersed Transformers - Jim Goudie, Chair

Draft 8 of this document had been balloted prior to the Graz meeting, and was 9 votes short of the required 75% return. The document will be reballoted at the Main Committee level prior to the Little Rock meeting.

7.8.1.3 C57.106-1991 - IEEE Guide for Acceptance and Maintenance of Insulating Oil in Equipment - Joe Kelly, Chair

The WG Chair gave a brief status report on this project, including a request from Harold Moore to possibly include the topic of water-in-paper/water-in-oil in the revision. Additionally, the question of whether or not the revision should include oil in circuit breakers was discussed. Some felt that since our needs and those of the circuit breaker community for oil quality are so vastly different, perhaps this document should not address circuit breakers at all. Most felt that at the very least, a liaison from C37 should be requested.

The Chair asked WG members to review all 7 sections of the document and prepare comments for detailed discussion at the next meeting. Additionally, he is seeking volunteers to be responsible for the rewriting of each section.

WG members at this time are Frank Gryszkiewicz, Gene Kallaur, Fredi Jakob, Patrick McShane, Harold Moore, T. V. Oommen, George Reitter, J. A. Thompson, Charlie Raymond, Peter Balma, John Lackey and Bob Turcotte.

7.8.1.4 C57.104-1991 - IEEE Guide for the Interpretation of Gases Generated in Oil-Immersed Transformers - Frank Heinrichs, Chair

The WG Chair reviewed the proposed IEC 599's DGA philosophies, and the developmental history of the IEC's and IEEE's DGA standards. He suggested that the WG consider modifying

our document such that our DGA Conditions 1 - 4 are more in line with 599. The Chair's preliminary analysis shows that the TDCG ranges for the both the IEC and his proposed IEEE methods agree closely.

The revision should address database analysis for transformers for which a history is already available. George Forrest volunteered to write a section on statistical analysis for the user's own development of expected 90% norm levels for their own transformers.

The Chair will prepare Draft 1 of this revision for Subcommittee ballot prior to the next meeting.

7.8.1.5 C57.139 - Dissolved Gas Analysis in Load Tap Changers - Rick Youngblood, Chair

The Chair briefly reviewed the history of the use of DGA in assessing the condition of LTC's. A PAR has been issued for this project, and a questionnaire was sent out after the Burlington, VT meeting to solicit information and determine the interest level in such a standard. Results indicated that the majority of respondents felt that the effort would be worthwhile.

It was recommended that an outline of the document be developed, and be initially based upon the contents of C57.104. The Chair will develop this outline and send it out for Subcommittee approval prior to the next meeting. Writing assignments will be handed out at the next meeting.

7.8.1.6 C57.121-1989 - Guide for Acceptance and Maintenance of Less Flammable Hydrocarbon Fluid in Transformers

This document has been successfully balloted at the Main Committee level and will be sent to the IEEE Standards Board for approval.

7.8.2 Other Business

There was no other business for the Subcommittee to discuss. A motion was made and seconded to adjourn.

7.9 Insulation Life - L. W. Pierce, Chair

The Insulation Life Subcommittee met November 18 at St. Louis with 23 members and 32 guests in attendance. The minutes of the July 17, 1997 meeting in Graz were approved as written. The Chair thanked Bob Grubb for presiding at the Graz meeting in his absence. Summaries of the reports of the Working Groups and Task Forces are as follows:

7.9.1 Task Force on Hottest Spot Temperature Rise Determination - Don Platts, Chair

A survey of the Task Force and Insulation Life Subcommittee members was conducted with 49 returns. The survey was of a proposed revision to Clause 5.11.1.1 of C57.12.00-1993 to add the requirements shown below:

"The maximum (hottest spot) winding temperature rise above ambient temperature shall be determined by either,

a) direct measurement during a thermal test in accordance with C57.12.90. A sufficient number of direct reading sensors should be used at expected locations of the maximum temperature rise as indicated by prior testing or loss and heat transfer calculations, or
b) direct measurement on an exact duplicate transformer design per a), or
c) calculations of the temperatures throughout each active winding and leads. The calculation method shall be based on fundamental loss and heat transfer principles and substantiated by tests on production or prototype transformers or windings.

The maximum (hottest spot) winding temperature rise above ambient shall be included on the test report with the other temperature rise data. A note shall indicate which of the above methods was used to determine the value."

This survey was successful with only three negatives and 8 comments. The three negatives were as follows and were discussed by the Task Force.

1. Loren Wagenaar, American Electric Power, voted negative with a request to limit the hot spot rise over average winding rise to a maximum of 15 °C.

2. Subhash Tuli, Waukesha Electric Systems, voted negative and stated, "none of the options, A thru C, are practical to perform. IEC method or 15 degrees celsius adder to hottest average winding rises are better options".

3. William E. Boettger, U. S. Transformer, voted negative stating that except on large transformers the cost of fiber optic sensors cannot be justified and the cost and complexity of developing a calculation method was cost prohibitive for small and repair type units. He also suggested that the IEC equation be used.

Since the proposal was approved by 46 members the negatives were not adopted. The first request was rejected by the Task Force since it would be a fundamental change in the temperature rise requirements. On some transformers it is necessary to reduce the average winding rise considerable below 65 °C to maintain a hottest spot rise below 80 °C. Suggestions 2 and 3 were not adopted.

The IEC method which is an estimating equation in the IEC Loading Guide has been shown in a recent CIGRE Electra article to not be valid.

The proposed change to Clause 5.11.1.1 of C57.12.00-1993 and a revised paragraph for the Forward will be included in the next draft of C57.12.00 for ballot. Draft 1 of a, "Guide for Hottest Spot Determination in Liquid Filled Transformers", was prepared by Linden Pierce. This was handed out at the meeting but not discussed. A survey of the Task Force and Insulation Life Subcommittee will be conducted on this Guide before the Little Rock meeting.

7.9.2 Task Force on Definition of Thermal Duplicate - Barry Beaster, Chair

A survey of the Task Force and Insulation Life Subcommittee was conducted on a proposed revision of Table 17 of C57.12.00 to clarify when thermal tests are required and define thermal duplicate. This survey was successful with 35 approved and 3 negatives. The three negatives were as follows:

1. Don Lowe, Howard Industries
2. Thomas Holifield, Howard Industries
3. R. L. Plaster, ABB

The negative balloters believed that the revised thermal test requirements had not been clarified, especially in regard to distribution transformers. The objections of the negative ballots were considered to be valid. A revised proposal will be prepared incorporating their comments and another survey conducted.

A thermal duplicate analysis of a large auto transformer was presented by Barry Beaster of ABB. Bob Grubb of Waukesha Electric Systems and David Aho of Cooper Power Systems volunteered to submit a thermal duplicate analysis on a medium power and a small power transformers. These examples will be included in a more comprehensive document possibly to be titled, "Guide for Analysis of Thermal Duplicate Transformers".

7.9.3 Task Force on Revision of Temperature Test Code (Section 11 of C57.12.90) - George Henry, Chair

A survey of Draft 4 of proposed revisions to Section 11 of C57.12.90 was conducted with 41 returns including 4 negatives. Negative ballots were received as follows:

1. Steven L. Snyder, Kuhlman Electric Corporation
2. R. L. Plaster, ABB
3. Robert A. Veitch, Veitch Transformer Engineering Services
4. Robert J. Whearty, Dupont

The two major issues to be resolved are, 1. procedures for cooling curve method, and 2. clarify definition of average winding rise. Another draft will be prepared for survey prior to the next meeting.

7.9.4 Task Force on Winding Temperature Indicators - V. S. N. Sankar, Chair

Mike Barnes chaired the meeting for V. S. Sankar who was unable to attend. The objective of this Task Force is, "to define the minimum requirements of the winding temperature indicator to accurately reflect the behavior of the winding." A technical discussion was held concerning WTI requirements. The next meeting will include a presentation of experimental data of direct measurement of time-temperature behavior of the transformer windings versus loading current. This Task Force will then decide on a course of action such as, 1. propose revisions to existing standards, or 2. new standard for the WTI, or 3. Task Force paper.

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

This Working Group did not meet since its document PC57.119, "Guide for Performing Thermal Tests are Loads Above Nameplate", has been successfully balloted. Negatives have been resolved and Bob Grubb is editing the final draft and preparing documentation for submittal to the IEEE Standards Board.

7.9.6 Working Group on High Temperature Insulation for Liquid-Immersed Power Transformers - Michael A. Franchek, Chair

This Working Group did not meet since its work is complete. Its document, "Guide for Application of High Temperature Insulation for Liquid-Immersed Power Transformers", was approved by the IEEE Standards Board. An IEEE project editor is working on the final copy which should be printed early next year.

7.9.7 Announcements by Chair

The Chair reported on two items approved at the Administrative Subcommittee meeting.

1. The following Task Forces are now Working groups: a) Working Group on Hottest Spot Temperature Rise Determination, b) Working Group on Definition of Thermal Duplicate, and c) Working Group on Revision of Temperature Test Code (Section 11 of C57.12.90)
2. A panel session at the 1999 IEEE T&D Conference will be arranged by the Insulation Life Subcommittee. This was based on a suggestion by Bob Grubb after the Graz meeting. The panel session will address thermal issues with transformers such as hottest spot winding temperature measurement and analysis or other work of the Insulation Life Subcommittee.

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

7.10 Performance Characteristics - H. Jin Sim, Chair

7.10.1 Introduction/Attendance

The Performance Characteristics Subcommittee (PCS) met at 8:00 a.m. on Tuesday, November 18, 1997, with 43 members and 31 guests attending.

7.10.2 Approval of Meeting Minutes

The minutes of the July 17, 1997, PCS Meeting in Graz, Austria were approved as written.

7.10.3 Chairman's Remarks

7.10.3.1 Administrative Subcommittee Notes

Several items of the discussions held at the November 17, 1997 Administrative Subcommittee meeting were highlighted as follows:

1. The next Transformers Committee meeting will be held in Little Rock, AR.
2. New PCS chair, Don Fallon of PSE&G, has been appointed and will serve starting on January 1, 1998.
3. The PAR for C57.123, Guide for Loss Measurement has expired and will require a new PAR.
4. Power Transformer Subcommittee has been established and that the West Coast Subcommittee has been re-classified as a new WG within this new subcommittee.

7.10.3.2 Membership

New Members, Rowland James (Entergy Transmission), Donald Ayers (Delta tar, Inc), Dave Keithly (Siemens), Gordon Denny (Ferranti-Packard Transformers LTD), Joe Watson (Florida Power & Light), Dave Aho (Cooper Power Systems), Dan de la Cruz (Pacific Gas & Electric) were added to the roster. Membership now stands at 109.

7.10.4 Agenda Changes

None

7.10.5 Working Group Reports

7.10.5.1 Revisions to C57.12.90 - Pierre Feghali

The working group on PCS revision to C57.12.90 met on Monday November 17, 1997 at 9:30 am with 16 members and 5 guests present. The discussion focused on one topic:

" The addition of LTC tests at the transformer factory". A survey, including a few paragraphs to cover the above subject, had been sent out to everyone present at the previous meeting in Graz, Austria. In the spirit of harmonizing with IEC, the proposed wording was taken from IEC 76-1.

The chairman presented the results of the survey with unanimous approval of the IEC wording. Subhash Tuli suggested 2 changes. One was to change item 3 from doing one complete cycle of LTC operations at rated voltage to doing it at 110% of rated voltage to be in line with C57.12.00. The other change was the addition of another item 5 which states the following: "With one winding short circuited, circulate maximum design MVA current through the other winding and complete one cycle of tap changer operation. This change gained everyone's support. The changes will be added and the revised proposal will be sent in its entirety to all present before the next meeting. There was some new business dealing with short circuit testing, which will be addressed by N. McQuin. The meeting was adjourned at 10:00 am and turned over to the short circuit portion of the meeting conducted by N. McQuin.

New Revised Proposal is as follows:

With the tap changer fully assembled on the transformer, the following sequence of operations shall be performed without failure:

1. With the transformer de-energized, 8 complete cycles of operation (a cycle of operation goes from one end of the tapping range to the other and back again).
2. With the transformer de-energized, and with the auxiliary voltage reduced to 85% of its rated value, one complete cycle of operation.
3. With the transformer energized at 110% of rated voltage, rated frequency, and at no load, one complete cycle of operation.
4. With one winding short circuited, and as far as is practical, rated current in the tap winding, 10 tap change operations across the range of two steps on each side from where a coarse or reversing changeover selector operates, or otherwise from the middle tap.
5. With one winding short circuited, circulate maximum (Design) MVA current through the other winding and complete one cycle of tap changer operation.

7.10.5.2 C57.133 Guide for Short Circuit Testing - Nigel McQuin

The WG met at 9:50 a.m. on Monday, November 17, 1997, 4 existing members, 4 new members, and 11 guests in attendance. A review was made of comments received on Draft 2 of the document, which is intended to be balloted in early 1998. Permission has been gained from a manufacturer to include new diagrams in the document, depicting digital LVI trace capture. The ballot will stress that no substantive changes have been made in the document, and that this establishment of C57.133 is an interim measure pending a major revision. The meeting adjourned at 10:10 a.m

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

The Working Group for the revision of the IEEE Recommended Practice for Establishing Transformer Capability When Supplying Nonsinusoidal load Currents met at 2:50 P.M., November 17th, in the Promenade E room at the Adam's Mark Hotel in St. Louis, MO. There were 22 members and 17 guests present.

The first order of business was approval of minutes from the Graz, Austria meeting. The minutes were approved without comment.

The chair requested and was granted a one year extension of the PAR to complete the revision.

A ballot summary was distributed to all the attendees. The following table summarizes the results of the 179 ballots sent out by the IEEE for draft 6.

Response	136	75%
Affirmative	118	94%
Negative	7	7%
Abstain	11	8%

It was noted that the closing date was extended by 10 days in order to achieve the 75% minimum return.

Coordination verification was given by a number of groups within IEEE. The only non-response was from the IAS.

The chair then distributed the negative comments to the attendees for review and discussion. There were three negative votes for equation (10) in the standard. It was agreed that equation (10) will be revised to reflect the comments made. The remaining editorial comments were discussed and resolved among the attendees.

Jerry Frank then presented a letter warning legal consequences to the voting members if the standard is published. The concern covered in the letter had previously been submitted to the Working Group and was covered by adding a footnote to prevent this issue. It was also noted that if the user read the standard there would be no legal issues. Mr. Frank also presented his concern regarding the term "K" Factor. It was noted that this has been discussed in great length previously. There were also three other negative ballots that had a similar concern. It was again noted that the previous version of C57.110 made no reference to the term "K" factor and "K" factor was only defined by UL Standards.

The Chair then continued with a review of the negative comments received from Mr. Frank. Comments 1, 2, 6, and 10 where a result of the term "K" factor that had just been discussed. Comments 3, 4, and 5 were in reference to the flux density of the core that does not technically apply. Comments 7, 8, 9, and 13 referenced the large kva size of the examples and the lack of third harmonic references. It was noted that this Standard had previously added smaller kva sizes and third harmonic examples to address Mr. Franks concern. The group agreed that the examples

provided adequately represent the scope of this standard. Comment 12 from Mr. Frank would be included in the next revision.

The chair then distributed comments from approved ballots. The comments were discussed and the chair offered resolutions and clarifications for the comments. The attendees agreed that the chair should review the comments and edit the standard as needed. The edits made will be editorial and a re-balloting would not be necessary.

The chair will then re-circulate the revised Draft 6 to the voting body for review along with the negative ballots and comments.

The meeting adjourned at 4:05 P.M.

7.10.5.4 Loss Tolerance and Measurement - Ramsis Girgis

The WG on Loss Tolerances and Measurement met on Monday, November 17, 1997 with 8 members and 10 guests attending.

First, the guide of no-load loss and load loss measurement was presented in its new format according to the IEEE Standards. Three minor editorial items implemented in this draft were also discussed and approved. It was proposed that since the scope of the document includes dry-type transformers, that corresponding standards need to be referenced into the document. The chairman will check the status of these standards and will include the appropriate ones in the guide. The guide will then be ready for balloting.

The second item on the agenda was a discussion of the three negative votes received on the proposed revision of tolerance for losses in standard C57.12.00, table 19. The decision was to stick to the proposed text but add the original purpose of this tolerance as an acceptance criteria. Bill Henning will try to explain to the three members that voted negatively the position of the WG and why the proposed text is satisfactory with the purpose addition. It was then proposed to refer to IEC to check what loss tolerances are specified there. It was also suggested to try to get this item into the voting process of the whole C57.12.00 standard. This will be sought and coordinated with that WG.

The third item was a general discussion of a proposed text for the measurement of auxiliary losses. The chairman asked the members for feedback sent to him in the next few weeks subsequent to this meeting.

The final item was testing conversion from 60 HZ to 50 HZ and vice versa. A paper will be produced by ABB presenting the feasibility of the proposition and the magnitude of possible inaccuracies.

The meeting was adjourned at 5:30 p.m.

7.10.5.5 Semi-Conductor Rectifier Transformers C57.18.10 - S. P. (Sheldon) Kennedy

The Working Group met on Monday, November 17, 1997, at 8:00 a.m. There were 14 members and 5 guests present. Introductions were made. Minutes of the July 16, 1997, meeting in Graz, Austria were approved.

The chair reported on the IEEE ballot. A problem was discovered during the balloting process. The PAR title and standard title did not match. A new PAR was submitted and approved in September by NESCOM. The results of the ballot were successful with no negative votes.

The results were:

IEEE members in Ballot Pool	91	(100 %)
Responses	75	(82 %)
Affirmative	67	(100 %)
Abstain	8	(10 %)
Negative	0	(0 %)

The WG discussed the comments received with the affirmative ballots. Editorial comments were discussed and agreed to, where valid. One comment suggested making the standard a stand alone document instead of referencing other standards. The group disagreed with this and felt that pertinent information was already paraphrased where possible. Including all of the information necessary in this standard would dramatically increase its size, as well as increasing the difficulty we would have in keeping the standard up to date as other standards were revised.

The size of subscripts were noted as being too small at times. This will be noted to the IEEE editorial staff for their review.

Three technical items received comments. It was felt that all three of these comments could be reason for a re-circulation ballot. They were not included in this draft, but will be tabled and noted for consideration in the next revision of this standard.

1. One writer requested discussion on electrostatic ground shields. These are discussed in the new version of C57.110, concurrently under ballot.
2. One writer requested that the location of the core grounding strap, if used, be marked on the nameplate. This may be specified by the user.
3. One writer requested that the standard specify that a hot spot winding temperature gauge be supplied with large liquid immersed transformers. This maybe specified by the user.

It was noted by one of the commenters that the term vector diagram is used. It should be called phasor diagrams. This will be changed.

It was also noted that some of the Zig-Zag phasor diagrams were only 21 degrees instead of 30 degrees. These will be corrected.

Also, note 6 on page 64 will be re-written to clarify the statement. Both times will be shown in hours and minutes.

The IEEE editorial staff also recommended two revisions. Clause 3 will be titled "Definitions" instead of "Terminology", "Annex A" will be renamed as "Informative Annex A"

The chair will make the editorial corrections as noted, The draft will be re-circulated to the working group and commenters, as draft 12-Rev. 1. A 30 day time period will be allowed for review. The document will then be forwarded to REVCOM by February 1998.

Phil Hopkinson gave a report on the IEC meeting in London. HVDC Converter transformers were discussed. The commercial converter transformer standard had passed and is proceeding on as an IEC Standard.

There was no other old business or new business.

The meeting adjourned at 9:15 a.m.

7.10.5.6 Revisions to C57.12.00 - Donald W. Platts

The Working Group met on Monday, Nov. 17, 1997 at 1:20 PM. We had 7 members and 12 guests in attendance.

The minutes of the July 16, 1997 meeting in Graz, Austria were approved.

All changes that we have previously approved are included in the present draft of C57.12.00, assembled by Subhash Tuli in the Standards Subcommittee. It has been sent to IEEE for submission to the balloting pool.

We reviewed the results from the recent WG and Performance Characteristics Subcommittee surveys. The first labeled Draft #2 is a proposal for changes to Table 17 and its Note 8, to define the design test requirements for mechanical lifting and moving devices. We had only one negative, and two approved with comments. Phil Hopkinson requested that we add a statement to say that when demonstrating the adequacy of the lifting devices by calculation a safety factor of 5 is required. We reviewed previous discussions in the WG where for small transformers a safety factor may be appropriate but for very large units a very small factor, or just demonstrating that by lifting the unit in the factory is adequate. After discussion, there was no support for changing the present wording.

The returns with comments questioned the methods used to reference other standards. When combined with the other changes to C57.12.00, the proper procedure, as established in the IEEE Style Manual, will be used.

This draft was approved by the Working Group. This change will be sent to the standards subcommittee.

The proposal in Draft #3 is Clause 6.6.1 should be revised to remove askarel and add less flammable hydrocarbon fluids and silicone fluids as insulating liquids. We had one negative and 11 approved with comments most that address the many typographical errors. One comment asked that we correct the ASTM reference for the silicone fluids. Another comment requested that we ensure that we reference the current revisions of all documents and that we update the List of References and the Bibliography of C57.12.00. This item should have been addressed by the Insulation Fluids Subcommittee, so the chair planned to forward the results of our survey to

them for consideration. Frank Gryszkiewicz, the subcommittee chair, attended our meeting and agreed that the revised wording we developed was adequate, and that there was no need to review it again. It will also be forwarded to the Standards Subcommittee.

We had three items brought to the WG for consideration, but each of them is a testing issue. They will be referred to the Dielectric Test Subcommittee.

There was no other new business.

The meeting adjourned at 1:45.

7.10.5.7 Switching Transient Induced by Transf./Breaker Interaction - Bob Degeneff

The WG met at 4:15 p.m. with 5 members and 17 guests attending. 7 of the guests requested membership in the WG.

Minutes from the last meeting were distributed and the objectives of the working group were summarized.

IEC Standard 1233-1994, High Voltage Alternating Current Circuit Breaker Induction Load Switching, was reviewed and will provide substantial background for development of this guide.

There was a general discussion of transformer/breaker interaction which highlighted the following key items:

- Interaction can occur with SF6 or Vacuum Breakers
- The complete system surrounding the transformer must be considered
- The type of load on a transformer and its configuration can enhance or mitigate interaction problems

Interaction problems can be found with both Dry type and Oil filled transformers

There was general agreement that a guide to highlight potential interaction problems and to provide guidance for their resolution is needed.

A preliminary outline for the guide was presented and the WG members volunteered to draft contents for each section.

Peter Balma agreed to be secretary for the Working Group.

Meeting adjourned at 5:30 p.m.

7.10.5.8 Load Tap Changer Performance - Bill Henning

The Working Group on Load Tap Changer Performance met on Monday, November 17, 1997 at 10:55 a.m. with 7 members and 27 guests. 11 guests requested membership in the WG.

The WG discussed and decided upon a title for the new document. Then a scope and a purpose were discussed.

The title is, "Guide for the Application of Load Tap Changers"

The scope is, "This guide covers the application of load tap changers immersed in transformer mineral oil, but may also be used for other insulation fluids in so far as conditions are applicable."

The purpose statement is, "The purpose of this guide is to aid in the selection, installation, and field servicing of load tap changers."

A discussion followed on the subjects to be included in the guide. The WG chair will send a copy of the IEC guide, Publication 542 to all WG members as a first step in preparing a first draft. Members and guests were requested to send suggestions to the WG chair by January 31, 1998.

The WG meeting was adjourned at approximately 12:00 noon.

7.10.6 Project Reports

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

No report given at the meeting. However, GSU failure survey should either be ready for publication or already published. Its only a matter of time for the publication office to act.

7.10.6.2 C37.91 Guide for Relay Application - R. L. (Ron) Barker

No report

7.10.6.3 Reaffirmation of C57.125, Failure Analysis Guide - Don Cash

Don Cash reported that C57.125, Failure Analysis Guide, has been reaffirmed as was reported in Graz. Some follow-up work will be completed before the Little Rock meeting.

Don Cash also reported that C57.117, Guide for Reporting Failure Data, has been submitted to IEEE for a reaffirmation ballot. A summary report will be given at the next meeting.

7.10.6.4 Single Phase Harmonics Limits

Rick Marek reported that there was no activity in this area.

7.10.6.5 Other projects

George Reitter reported that the reaffirmation of C57.105 and IEEE 638 are in process and the ballot cut-off date is November 25, 1997.

7.10.7 Old Business

Subcommittee members reviewed C57.109, Guide for Through Fault Current Duration and C57.116, Guide for Transformers Directly Connected to Generators to decide if these two

documents need to be revised. There were no revisions needed at this time and it was decided to reaffirm them. George Reitter will submit these two to IEEE for reaffirmation.

7.10.8 New Business

The results of the IEEE ballot on C57.12.00, Draft 4 were successful with 7 negatives and 20 affirmative with comments. PCS Chair will summarize these comments and distribute them to all WG Chairs to resolve them. The target for this work is to get them resolved by early January, 1998, so that we can get the re-circulation started in early February. 1998. It is hoped that we will have the results of it before the next meeting in Little Rock.

7.10.9 Next Meeting

The next meeting will be held on April 28, 1998, in Little Rock, AR.

The meeting adjourned at 9:05 a.m.

Respectfully submitted,
H. Jin Sim
PCS Chair

7.11 Underground Transformers & Network Protectors - P. E. Orehek, Chair

7.11.1 Introduction/Attendance

The Underground Transformers and Network Protectors Subcommittee met at 9:30 a.m. on November 20, 1997, with nine members and four guests present.

7.11.2 Approval of Minutes

The minutes of the July 17, 1997 meeting in Graz, Austria were approved as submitted.

7.11.3 Membership

There were no changes and membership remains at 16.

7.11.4 Chairman's Remarks

Administrative Subcommittee Notes

A. The next meeting will be held in Little Rock, Arkansas at the Excelsior Hotel from April 26-29, 1998.

B. Approval to form the "Power Transformers Subcommittee" was completed. It will include the previous West Coast Subcommittee as a Working Group. Since the scope of this new subcommittee overlaps that of the Distribution Subcommittee and the Underground Transformers and Network Protectors Subcommittee, a motion to eliminate the kVA size and voltage classification from the scope of these two Subcommittees was approved.

C. The IEEE Delegation to the ASC C57 Transformers Committee cast a negative ballot on the NEMA TP-1 Standard on Energy Efficient Transformers becoming an ANSI Standard for editorial reasons.

D. At the IEEE PES Winter Power meeting scheduled for Tampa in February, 1997, there will be an Innovative Product Information Session on "Active Transformer Quieting."

E. Most members have recently received an invitation to join a new IEEE Standards Association. There is still much information unknown about this organization at this time, even though all Transformer Committee members are expected to join.

F. The Technical Council approved the Open Ballot process. This means that any member that indicates they want to receive a ballot for a standard and fails to return the ballot will be removed from the balloting pool for future ballots. They will than have to request reinstatement to get back into the balloting pool.

G. It was indicated that the PAR for C57.12.40 was disapproved by the IEEE Standards Board even though it was indicated previously that it was approved. Subsequent to the meeting, the letter from the IEEE NesCon Secretary indicating approval was transmitted to the Standards Subcommittee Chairman.

7.11.5 Working Group Reports

7.11.5.1 Three-Phase Underground-Type Transformers (C57.12.24) C.G. Niemann - Chairman

The working Group met on Monday, November 17, 1997 at 10:55 a.m. with eight members and five guests in attendance.

The minutes of the meeting on July 16, 1997 in Graz, Austria were approved as submitted.

Since there wasn't a quorum in Graz, the Chairman had a brief overview of the proposed changes to the Standard through Section 7.1 that were discussed in Graz.

A review continued on the standard beginning at Section 7.2 with the following recommended changes:

7.2.1.3 The low-voltage terminal shall consist of a "plated" copper spade....

7.2.2.2 A lengthy discussion ensued on whether or not the low-voltage neutral blade that is welded directly to the tank should extend through the tank. Some felt this would provide a better ground. This discussion will continue at the next meeting.

7.3 Eliminated first sentence.

7.3.2.1 Since the Standard specifies four lifting lugs shall be provided, the words "assuming a two point lift" were added to the sentence.

The revised Standard is to be ready for balloting next year.

There being no additional new or old business, the meeting was adjourned at 12:15 p.m.

7.11.5.2 Liquid Filled Secondary Network Transformers (C57.12.40) R. L. Plaster - Chairman

The Working Group met on Monday, November 17, 1997 at 9:30 a.m. with 10 members and six guests in attendance. It also met at 1:20 for another session.

The minutes of the July 16, 1997 meeting in Graz, Austria were approved as submitted.

The primary focus of the two sessions was to review Draft 1 of the standard. Among the revisions discussed were:

Temperature Rise	The Working Group after much discussion decided to retain the present wording in the Standard which requires a dual 55/65 degree C rating.
Primary Switch	Switches that are capable of interrupting the magnetizing current of the transformer will be included in the standard.
Corrosion	The corrosion resistance requirements were changed to adopt ANSI C57.12.32 as the standard tank finish.

Tank Pressure	The tank pressure withstand capability was changed to require, in addition to no deformation at seven psig, no rupture at 15 psig.
Gauges	The specific size details of the liquid level gauge and thermometer were removed from the Standard. The word "approximate" was substituted.
Low Voltage Neutral	It was requested that C57.12.24 and C57.12.40 Working Groups adopt the same wording for the low-voltage neutral requirements.

There being no additional business the meeting was adjourned at 2:35 p.m.

7.11.5.3 Secondary Network Protectors (C57.12.44) D.H. Mulkey - Chairman

The Working Group met at 8:00 a.m. on Monday, November 17, 1997 with nine members and seven guests present.

The minutes of the July 16, 1997 meeting in Graz, Austria were approved as submitted.

The Working Group completed the review of the entire standard with five items still open. Annex B through G were reviewed at this meeting with some minor corrections. The items still open include the following:

* Review C37.108 versus Annex F.
* Fig. B-5 on Alloy Fuses needs additional pictures.
* Fig. B-7 on Current Limiting Fuses needs additional pictures and rearrangement.
* A draft will be sent to Rochelle Stern of IEEE for editorial and format comments.
* Short Circuit testing has to be reviewed.

A discussion on the differences in the short circuit testing requirements for network protectors versus other low-voltage breakers was held. This still needs further review.

The Subcommittee Chairman thanked the Working Group for being recognized by the Transformers Committee as the outstanding Working Group in 1996 for their work in developing a new Network Protector Standard.

It is expected that the first revision of the Standard will be ready for balloting after the next meeting.

There being no additional business, the meeting was adjourned at 9:10 a.m.

7.11.5.4 Ventilated Dry-Type Network Transformers (C57.12.57) B. Nutt - Chairman

Since the Chairman was absent, no meeting was held.

7.12 West Coast - E. G. Hager, Chair

The meeting was opened at 08:15 by Red Hager, Chairman , in Westminster, CA on October 21,1997. There were ten members and three guests in attendance.

In addition to these attendees there were one member and two guests present at the Working Group Meeting on Monday, October 20, 1997.

The minutes of the meeting held May 7, 1997 in Scottsdale, Az were approved as read.

7.12.1 Main Committee News

Discussed meeting held in Graz, Austria, relative to the Phase Shifting Transformer Guide and the Proposed Subcommittee to be called Power Transformers. Further discussion involved the disbanding of the West Coast Subcommittee if a Power Transformer Subcommittee becomes a reality. Several options were discussed.

Future meetings of the Main Transformer Committee were discussed i.e. St. Louis and Little Rock.

7.12.2 Working Group Reports

1. Replacement Options for Generator Step-Up (GSU) Transformers. Bob Stewart chairs this working group and discussed the progress being made. Repairs, Upgrades versus buying new units. Technical and economical evaluations are necessary.

2. Installation Guide for Liquid Immersed Transformers. Jim Gillies agreed to chair this working group until another chair can be "found". It was suggested that a questionnaire be prepared to help in getting input to determine if this guide needs to be reconfirmed. Question No. 1 - Is this guide necessary? Don't users follow the manufacturer's instructions?

3. Phase Shifting Transformer Guide. This working group is co-chaired by Edgar Trummer and Tom Lundquist. Discussion was held on the progress at this time and input to be expected at the general meeting in St. Louis.

7.12.3 Old Business

Discussion on membership changes due to deregulation and downsizing.

7.12.4 New Business

1. A thank you was expressed to the Southern California Edison Company, the Edison Energy Services, Inc. and especially to Dong Kim, Engineer with Shop Services and Instrumentation Division for hosting the joint meeting of the West Coast Transformer Subcommittee and the West Coast Substation Subcommittee.

2. New member - Dong S. Kim of Southern California Edison was unanimously elected to membership in the West Coast Transformer Committee

3. Best wishes to Chuck Todd, who has retired from Tacoma Public Utilities.

Our next meeting was not scheduled at this time.

Respectfully submitted,
Red Hager, Chairman

Note: Following a buffet lunch provided by our hosts, Energy Services conducted a tour of their facilities, including electrical and mechanical repair shops, and test and instrumentation labs.

7.12.5 Guide For The Application, Specification And Testing Of Phase Shifting Transformers

The meeting was opened at 1:20PM by Edgar Trummer, Co-Chairman of the Phase-Shifting Transformer (PST) Working Group. There were 15 members and 11 guests present. (One guest requested membership in the Working Group). Following introductions by those present, the Minutes of the July 26, 1997 meeting in Graz, Austria, were approved as written. Edgar also stated that Tom Lundquist, with Salt River Project has been appointed to Co-Chair the Working Group.

Donald Chu, Working Group Secretary, reported on the response received resulting from Draft #5A sent to members last July. Of the 73 copies that went out, only 23 were returned.

APPROVED	6
APPROVED WITH COMMENTS	5
NEGATIVE	11
ABSTAINED	1

A revised Section 5.0 - Theory and Application of Phase Shifting Transformers was distributed for comments.

Revisions to Section 10.0 - Control Systems, will be included in the next draft. Jim Harlow has revised the section to be in concurrence with the topics of C57.15 (LTC controls for step-voltage regulators).

Joe Watson and Tom Lundquist requested additional recommendations on jacking pads and "Fall Protection". It was noted that these requirements are not specific to PST's, but apply to all power transformers.

Section 8.0 - Construction for Oil-Immersed Phase-Shifting Transformers will be revised to include requirements specific to PST's. Joe Watson and Tom Lundquist will review the existing section and prepare recommendations of items to be included in C57.12.00 (Don Platts group is responsible for the continuous revision of C57.12.00). Bipen Patel will rewrite the section.

Section 6.2 will include a statement that it may be costly to have a PST meet the overload requirements in C57.12.00. The user should specify the overload requirements for his particular unit(s) and the PST can be designed to meet the requirements specified.

Section 12.3 and 12.4 - Phase Angle and Impedance Tolerances will be in accordance with C57.12.00 for two-winding transformers. In those cases where the circulating current must be minimized or where units will be operated in parallel, the angle and impedance tolerances should be discussed with the supplier.

The Working Group members agreed that the deadline for submitting additional comments would be mid-December 1997. The Working Group will also be asked to review the next draft and provide comments prior to the next Transformer Committee meeting in Little Rock.

The meeting was adjourned at 4:05PM

8.0 Reports of Liaison Representatives

8.1 EPRI - S. R. Lindgren

EPRI

Electric Power
Research Institute *Powering Progress through Innovative Solutions*

MEMORANDUM

November 19,1997

TO: Mr. Bipin Patel
Secretary, IEEE Transformers Committee
Southern Company Services
P. 0. Box 2625
Birmingham, AL 35202

FROM: Stan Lindgren, Manager, Power Transformers

SUBJECT: **EPRI LIAISON REPORT**

The following report is for inclusion in your minutes for the November 19, 1997 meeting in St. Louis.

1. 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 15 year or older transformers worldwide that had just been reprocessed following maintenance work. Failure typically occurs during the first startup or light loading period.

   - Work has focused on the effects of temperature and moisture transients. Phase I of a comprehensive test program was completed on a 333 MVA single phase 500 kV autotransformer that was fully instrumented to monitor static electrification effects during a series of experiments. A broad range of partial discharge activity was produced. A Phase II second round of tests was completed in October, 1996. A broad range of static electrification activity was again produced. Tests and monitoring results are being evaluated. The transformer was disassembled and inspected evidence of static electrification discharges were found at both the bottom and at the top of the unit.

   - Results of the field tests are being reflected in a quarter-scale flow-model experiment that will simulate the 500 kV transformer under laboratory conditions and controls. The model of the major insulation structure and simulated windings is under construction.

2. Bubble Evolution in Overloaded Transformers:

   - Very rapid load changes can cause bubble formation under some conditions and reduce low frequency and impulse dielectric strength by 40%. This has been demonstrated in models with rapid/high overload.

Additional work has recently been completed to experimentally study moisture dynamics associated with rapid overloads and cool-down cycles plus detects inception of partial discharges caused by bubble evolution. Moisture moves away from the hot conductor fast and returns very slowly after cool-down. Distribution of moisture in the solid insulation was found to be very uneven. Phase II is in process to study the correlation between moisture-in-oil with moisture-in-paper for a range of conditions and temperature cycles.

3. 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 Transformers Committee roundtable in Washington, DC, 4/88. Proceedings, TR 100205, are published. A Project was completed to study fast disconnect switching transient effects an 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 has been studied and found to reduce bus transients and stresses by up to 80%. A final report is published, TR-104961.

A new project is in process to monitor a large number of HVCTs and bushings in laboratories and in service, including on-line tan delta, partial discharge and other available monitoring methods. Units are being tested to failure to evaluate failure modes, sensitivity of monitoring and to develop "end-of-life" criteria for interpretation of field monitoring data.

4. 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 published, TR-105421. An IEEE paper, 94 SM 473-9 PWRD, was presented at the IEEE /PES 1994 Summer Meeting in San Francisco. A second paper, "Field Application of a Dynamic Thermal Circuit Rating Method", was presented at the IEEE/PES 1996 Winter Meeting in Baltimore.

5. 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 metal-insulated-semiconductor sensors to monitor multiple gases. A field demonstration program involving 40 prototypes, starting with the first in October 1993, was completed in 1996. The analyzer is designed to monitor individual ppm for hydrogen, acetylene, ethylene and carbon monoxide.

6. Power Transformer Remaining Life Prediction & Extension

- Furaldehydes in Transformer Oil

  A project is in process to develop a correlation between furaldehydes in oil samples with degree of polymerization (DP) found in paper insulation samples taken from a significant number of transformers in service. Additional laboratory experimental work is being added to search for trace chemicals that are an early indication of insulation degradation that can be sensed with on-line monitoring.

- Vibration & Frequency Response Analysis (FRA)

  A project is in process to develop a correlation between existing winding conditions and vibration & FRA tests before and after internal inspection and reclamping of the same transformers. The objective is to develop noninvasive field test methods and criteria that can be used to predict winding condition in the broad variety of existing power transformers without entering the transformer. Over 40 transformers have had the initial FRA and internal inspection, and over 20 have had the follow-up FRA test.

7. Transformer Expert System

   Objective of this project is to capture the knowledge of transformer experts and make it usable in an off-line software tool for evaluation of transformer design questions, condition assessment, problem diagnosis, and identification of maintenance needs. Beta testing started October 1997.

8. Guidelines for Life Extension of Substations

   These guidelines, now published in Final Report TR-105070 dated April 1995, include a large section on transformer inspection, condition assessment, testing, and maintenance practices. An updated version is in process.

9. Maintenance-Free LTC

   A new project has been initiated to identify and categorize specific LTC problems, causes and populations involved; evaluate existing mitigation measures; and identify R&D needed to achieve substantial reduction in LTC maintenance requirements. A workshop was held November, 1996 in Tampa, FL. to provide a forum for discussion of LTC problems / maintenance / and ways to improve reliability and reduce maintenance. Proceedings are published in TR-108398 dated June 1997. An EPRI project is underway to improve understanding of contact coking, oil filtration effectiveness and monitoring concepts. Additional projects are anticipated.

c: W. B. Binder, Chairman
Dr. Robert Schainker

8.2 SCC4 - P. A. Payne

No Report.

8.3 CIGRE SC12 - W. N. Kennedy

No Report.

8.4 TC 14 TAG - P. J. Hopkinson

8.4.1 APPROVAL OF PREVIOUS MINUTES

It was noted that R. Girgis was not listed as present at the meeting and that T Traub was not listed as a member not present. The minutes of the meeting held on October 28, 1996, were approved as amended.

8.4.2 MEMBERSHIP

P. Hopkinson announced that C. Colopy (Cooper Power Systems) was appointed a member of the TAG. The Technical Advisor announced that C. Colopy would be the back-up expert to address tap changer issues and J. Cockran, on short circuit issues. After the meeting, Steve Arlosz from ABB volunteered and was excepted as a backup working group member to WG25 Audible Sound.

Members reviewed the TAG roster and made such changes and corrections as needed.

The Technical Advisor engaged in a brief review of US expert participation in TC14 working groups: S. Kennedy (WG21- MV), F. Elliott (WG21-HV), R. DelVecchio (WG23), L. Wagenaar (WG24), Puri (WG25) and Tom Traub (WG26). P Hopkinson is a member of all Working Groups by correspondence and is monitoring TC activity on EMC until an expert can be identified for this subject matter. It was noted that EEI and NEMA provide some partial reimbursement of expenses for experts from their respective organizations.

8.4.3 OLD BUSINESS

Guided by the Technical Advisor, members of the TAG engaged in a review of the key documents (Pub 76-3, 76-3-3, 76-5, 1378-2 and 551) discussed during the September 1997 meeting of TC 14.

a. HV Converter Transformers - IEC Pub 378-2

The TA noted that the differences between US and IEC deal with the use of fundamental frequency versus RMS power; the US employs both in ratings. A note has been added to the draft IEC document recognizing North American practices.

On the issue of dielectrics, the concerns focus on coordination and margins and test requirement descriptions. Progress has been made for the use of switching impulse on terminal to ground and the use of applied potential.

b. Short Circuit Tests - IEC Pub 76-5

It was noted that ANSI requires 6 single phase tests, two of which are to be asymmetric and worst case tap positions required and extremes recommended while the IEC requires 3 tests, all asymmetric and tap positions minimum, maximum and nominal. ANSI requires one (1) long duration test and five (5) short duration; the IEC has no requirement for long duration test but requires the short duration. The dielectric proof testing and inspection requirements are the same in US and IEC, though France has challenged the inspection requirement.

The TA noted that an acceptable methodology for analytical proof of short circuit strength is needed.

c. On-Load Tap Changers - IEC Pub 60214

Present standards cover only resistance type tap changers. The TA reported that the US has proposed a new work item to include reactance type tap changers, based on C57.131. The chairman of TC14 has urged support for the proposal.

d. Audible Sound Measurement - IEC Pub 551

The TA reported that a complete revision of the standard is in progress. Mr. J. Puri is the US expert who has been working on the issue for the US. It was noted that sound intensity measurement is being adopted as the preferred method and that the sound levels from NEMA standard TR-1 will be included in the IEC standard. It is expected that the sound measurements that are included in the IEC standard will be included in IEEE C57.12.90 in an effort to achieve harmonization.

e. Dielectric Tests - IEC Pub 60076-3

The TA reported that present IEC standards do not require Impulse Tests on units for systems <72.5 kV. An -in some countries" note has been added to the document to address that point. Impulse and Long duration induced tests are required on units for systems >72.5 kV. In addition, a modified table 3 was added to the standard's Annex F to recognize the dielectric test practices in North America for Class I and 11 transformers.

8.4.4 NEW BUSINESS

a. Electromagnetic Compatibility (EMC)

The TA engaged in a brief discussion of electromagnetic compatibility that is under consideration in TC14 noting that a new work proposal identifies transformers as static elements that neither contribute to or are affected by EMC fields in the environment. He said there was a need to investigate the matter. To that end, the US has agreed to support the new work proposal on EMC; a search for a US expert on the matter is underway.

b. Energy Efficiency

The TA reported that the US Department of Energy had issued its determination that mandatory standards are warranted for energy efficiency of distribution transformers and, with that action, a detailed analysis has been

initiated. At the same time, Canada's counterpart to DOE, the Natural Resources Department, has taken steps to develop a similar standard for Canada. Also, it has been learned that Mexico has a comparable document under development. The ballot in C57 to accept TP-1 as an ANSI standard is awaiting resolution of the concerns raised by IEEE and EEI delegations. The TA noted that this activity increases the need for tri- national efforts to harmonize energy efficiency requirement for all of North America; this process is about to be undertaken through the standards harmonization organization CANENA. Members engaged in a brief discussion of a proposal to submit TP-1 to the IEC for consideration as an international standard. The following motion was duly made, seconded and by 10 ayes, 2 nays and 6 abstentees approved:

MOTION: Submit TP-1 to the IEC as a New Work Proposal.

c. IEC Plenary and TC Meetings in Houston, Texas in October 1998

The TA briefly reviewed the meeting schedule noting that there was an opportunity for TAG members to attend the TC14 sessions. He noted that attendance at the US meeting would provide individuals with an opportunity to observe the process. Details on the TC14 will be provided to TAG members as soon as it becomes available to help members make their plans.

The meeting adjourned at 14:45 p.m.

Respectfully Submitted,

P.J. Hopkinson

9.0 Old Business

None.

10.0 New Business

Peter Balma provided the following report for information:

"In October, 1997, CIGRE Study Committee 12 (Transformers) held a colloquium in Sydney, Australia. It was an extremely successful meeting focusing on many aspects of Transformer Life Management. Two interesting working group efforts that are in progress. They have focused on particles in oil and the development of a general transformer specification. The groups have prepared final draft documents soon to be issued, and both contain substantial technical information. An additional item worth noting was an extremely informative and contrversial discussion that took place on the topic of Recovery Voltage Methods, RVM testing. Utilities around the world are making use of this relatively new testing method to understand and predict moisture content in transformer insulation. However, interpretation of the test results is still subject to substantial debate. Manufactuerers expressed a strong concern for application of RVM methods during factory testing of new transformers, many felt results were misleading. Additional information on the colloquium will be available in CIGRE publications."

11.0 Adjournment

The meeting was adjourned at 10:58 AM.

Respectfully submitted,
Bipin K. Patel, Secretary

Attachment 1

STATUS REPORT ON STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE

21-Jan-98

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE SC CHAIR	WG CHAIR AND PHONE NO. TF CHAIR	COMMITTEES REQUESTING COORDINATION		PUB DATE PAR DATE REV DUE	LATEST STATUS/ COMMENTS
C57.100 C57.100	TEST PROCEDURE FOR THERMAL EVALUATION OF OIL-IMMERSED DISTRIBUTION TRANSFORMERS	INSULATION LIFE L. W. PIERCE	LOWDERMILK L. A. (704)462-3113	PE/PSR PE/T&D IEC TC 14 US TAG	IA/PSE PE/SUB	3/18/92 12/10/96 1997	REVISE/REAFFIRM BEFORE 10/31/97 Par Extended to 12/2000
C57.104 PC57.104	GUIDE FOR THE DETECTION AND DETERMINATION OF GENERATED GAS IN OIL-IMMERSED TRANSFORMERS & THEIR RELATION TO SERVICEABIL.	INSULATING FLUIDS F. GRYSZKIEWICZ	HEINRICHS F. W. (412)941-6924	PE/IC PE/T&D	PE/SUB	6/7/92 12/10/96 2000	REVIEW DATE EXTENDED TO 12/2000
C57.105 PC57.105	GUIDE FOR APPLICATION OF TRANSFORMER CONNECTIONS IN THREE-PHASE DISTRIBUTION SYSTEMS	PERFORMANCE CHARACTERISTICS H. J. SIM	REITTER G. (415)591-4463			6/17/92 1997	BALLOTING GROUP BEING FORMED FOR REAFFIRMATION REVISE/REAFFIRM BEFORE 10/31/97
C57.106 PC57.106		INSULATING FLUIDS F. GRYSZKIEWICZ	(617)926-4900	NONE		11/20/91 6/19/86 1996	REVISE/REAFFIRM BEFORE 10/31/97 REQUEST PAR EXT. TO JUNE 97
C57.109 PC57.109	GUIDE FOR THROUGH-FAULT CURRENT DURATION	PERFORMANCE CHARACTERISTICS H. J. SIM	PATEL B. (205)877-7740	PSR		3/16/93 6/27/91 1998	APPLY FOR PAR TO REVISE
C57.110 PC57.110	RECOMMENDED PRACTICE FOR ESTABLISHING TRANSFORMER CAPABILITY WHEN SUPPLYING NONSINUSOIDAL LOAD CURRENTS	PERFORMANCE CHARACTERISTICS H. J. SIM	MAREK R. P. (804)838-8080	T&D NEMA	PSR IA/PSE	12/3/92 9/19/96 1997	BALLOTING GROUP BEING FORMED PAR Extended to 12/2000
C57.111 NONE	GUIDE FOR ACCEPTANCE OF SILICONE INSULATING FLUID AND ITS MAINTENANCE IN TRANSFORMERS	INSULATING FLUIDS F. GRYSZKIEWICZ	(617)926-4900	IAS ED&PG	T&D IEC	2/2/89 12/10/87 2000	REAFFIRMED 03/15/1995 ASK FOR FOR PAR EXTENSION

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE SC CHAIR	WG CHAIR AND PHONE NO. TF CHAIR	COMMITTEES REQUESTING COORDINATION		PUB DATE PAR DATE REV DUE	LATEST STATUS/ COMMENTS
C57.113 P545	GUIDE FOR PARTIAL DISCHARGE MEASUREMENT IN LIQUID-FILLED POWER TRANSFORMERS AND SHUNT REACTOR	DIELECTRIC TESTS L. B. WAGENAAR	POULIN B. [408]157-8326	PSIM IEC TC14 U SNC	IAS/PSE	12/5/91 6/20/96 1996	PAR APPROVED 6/20/96 REVISE/REAFFIRM BEFORE 10/31/97
C57.114 P513	SEISMIC GUIDE FOR POWER TRANSFORMERS AND REACTORS	WEST COAST E. G. HAGER	OKLU S. (213)481-4823	NPE	SUBS.	2/15/90	STANDARD WITHDRAWN
C57.115 P756	GUIDE FOR LOADING MINERAL-OIL-IMMERSED POWER TRANSFORMERS RATED IN EXCESS OF 100MVA (65 C WINDING RISE)	INSULATION LIFE L. W. PIERCE	PIERCE L. W. (706)291-3166			3/21/91	STANDARD WITHDRAWN, COMBINED WITH C57.91
C57.116 NONE	GUIDE FOR TRANSFORMERS DIRECTLTY CONNECTED TO GENERATORS	PERFORMANCE CHARACTERISTICS H. J. SIM	REITTER G. (415)508-2864			1/3/89 6/28/79 1999	REAFFIRMED IS REVISION NEEDED?
C57.117 P786	GUIDE FOR REPORTING FAILURE DATA FOR POWER TRANSFORMERS AND SHUNT REACTORS	PERFORMANCE CHARACTERISTICS H. J. SIM	ALTMAN M. (407)694-4975			6/17/92 1997	REVISE/REAFFIRM BEFORE 10/31/97
C57.119 P838	RECOMMENDED PRACTICE FOR PERFORMING TEMP. RISE TESTS ON OIL-IMMERSED POWER TRANSFORMER AT LOADS BEYOND NP RATING (P838)	INSULATION LIFE L. W. PIERCE	GRUBB R. L. (414)547-0121	SWGR SCC4 IAS	SUBS PSRC EI	9/17/92 0	BEING BALLOTED PAR EXTENDED TO 10/30/98
C57.12.00 VARIOUS	GENERAL REQUIREMENTS FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS	STANDARDS T.A. PREVOST	TULI S. (414)547-0121	T&D SWG IAS	PSRC SUBS IEC-TC14 U SNC	6/16/93 6/15/95 1998	FORMING BALOTTING GROUP EDITING REVISION
C57.12.00 PC57.12.00	SECTION 5.10.7.1 - LIGHTNING IMPULSE TESTS	DIELECTRIC TESTS L. B. WAGENAAR	MINKWITZ R. E. (617)828-3241				APPROVED BY MAIN COMMITTEE

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE SC CHAIR	WG CHAIR AND PHONE NO. TF CHAIR	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	LATEST STATUS/ COMMENTS
C57.12.00 PC57.12.00	AUDIBLE SOUND LEVEL REQUIREMENTS	AUDIBLE SOUND & VIBRATION J. PURI	PURI J. (704)282-7413			UNDER DEVELOPMENT
C57.12.00 PC57.12.00	TABLE 17 - MECHANICAL LIFTING REQUIREMENTS CLARIFICATION	PERFORMANCE CHARACTERISTICS H. J. SIM	PLATTS D. (610)774-4686			UNDER DEVELOPMENT
C57.12.00 PC57.12.00	TABLE 9 - DATE OF MANUFACTURE ON NAMEPLATE	PERFORMANCE CHARACTERISTICS H. J. SIM	PLATTS D. (610)774-4686			APPROVED BY SUBCOMMITTEE
C57.12.00 PC57.12.00	SECTION 5.1 - COOLING CLASS REVISION TO CONFORM TO IEC	PERFORMANCE CHARACTERISTICS H. J. SIM	PLATTS D. W. (610) 774-4686 PLATTS D. W.			BALLOTING
C57.12.00 PC57.12.00	SECTION 5.9 - AUXILIARY LOSSES ON CLAS I AND CLASS II POWER TRANSFORMERS	PERFORMANCE CHARACTERISTICS H. J. SIM	TULI S. (414)547-0121			BALLOTING
C57.12.00 PC57.12.00	SECTION 8 - TESTING OF LTC CONNECTIONS	PERFORMANCE CHARACTERISTICS H. J. SIM	PLATTS D. (610)774-4686			BALLOTING
C57.12.00 PC57.12.00	SECTION 8 - DIELECTRIC TESTING OF SECONDARY CONTROL WIRING	PERFORMANCE CHARACTERISTICS H. J. SIM	TULI S. (414)547-0121			BALLOTING
C57.12.00 PC57.12.00	TABLE 9 - PCB STATEMENT ON NAMEPLATE	PERFORMANCE CHARACTERISTICS H. J. SIM	PLATTS D. (610)774-4686			APPROVED BY SUBCOMMITTEE

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE SC CHAIR	WG CHAIR AND PHONE NO. TF CHAIR	COMMITTEES REQUESTING COORDINATION		PUB DATE PAR DATE REV DUE	LATEST STATUS/ COMMENTS
C57.12.00 PC57.12.00	9.3 TABLE 19 - TOLERANCE FOR LOSSES	PERFORMANCE CHARACTERISTICS H. J. SIM	HENNING W. (414)547-0121				TO BE BALLOTED
C57.12.00 PC57.12.00	TABLE 3 AND 5 - HARMONIZE VALUES	DIELECTRIC TESTS L. B. WAGENAAR	POULIN B. (408)957-8326				UNDER DEVELOPMENT
C57.12.00 PC57.12.00	TABLE 5 - CORRECTION OF TYPO. ERRORS	STANDARDS T.A. PREVOST	TULI S. (414)547-0121				CORRECTIONS BEING DONE
C57.12.00 PC57.12.00	TABLE 17 - SWITCHING IMPULSE TESTS - NOTE 8 ADDED	DIELECTRIC TESTS L. B. WAGENAAR	POULIN B. (408)957-8326				APPROVED BY SUBCOMMITTEE
C57.12.00 PC57.12.001	DEFINITION OF THERMAL DUPLICATE	INSULATION LIFE L. W. PIERCE	GRUBB R. L. (414)547-0121 BARRY BEASTER	EM I&CPS	IAS PESC	5/31/90 1997	PAR WITHDRAWN WORK INCLUDED IN C57.12.00
C57.12.00 PC57.12.00m	GENERAL REQUIREMENTS FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS	PERFORMANCE CHARACTERISTICS H.J. SIM	PLATTS D. (610)774-4686				INCLUDE IN NEXT REVISION COORDINATE WITH S. TULI
C57.12.01 NONE	GENERAL REQUIREMENTS FOR DRY-TYPE DIST. AND POWER TR INCL THOSE WITH SOLID CAST &/or RESIN-ENCAPSULATED WINDINGS	DRY-TYPE TRANSFORMERS W. PATTERSON	JONATTI A. (813)442-0414	NEMA ANSI	U.L. IA/I&CPS	2/2/89 6/26/97 1996	PAR APPROVED ON 6/26/97
C57.12.10 ANSI	TRANSFORMERS 230kV AND BELOW - 8333/10417kVA 1 PH, -100000 kVA 3 PH w/o LTC, 100000kVA w/ LTC - SAFETY REQUIREMENTS	STANDARDS T.A. PREVOST	(312)394-2704			6/4/87 1993	ANSI STANDARD NEEDS A HOME, DUE FOR REAF.

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE SC CHAIR	WG CHAIR AND PHONE NO. TF CHAIR	COMMITTEES REQUESTING COORDINATION		PUB DATE PAR DATE REV DUE	LATEST STATUS/ COMMENTS
C57.12.11 PC57.93	GUIDE FOR INSTALLATION OF OIL-IMMERSED TRANSFORMERS (10MVA & LARGER, 69-287kV RATING)	WEST COAST E. G. HAGER	GILLIES D. A. (503)622-4847			5/9/80	TO BE REPLACED BY C57.93
C57.12.12 PC57.93	GUIDE FOR INSTALLATION OF OIL-IMMERSED TRANSFORMERS 345kV AND ABOVE	WEST COAST E. G. HAGER	GILLIES D. A. (503)622-4847			5/9/80	TO BE REPLACED BY C57.93
C57.12.13 ANSI	CONFORMANCE REQUIREMENTS FOR LIQUID-FILLED TRANSFORMERS USED IN UNIT INSTALLATIONS INCL. UNIT SUBSTATIONS	STANDARDS T. P. TRAUB				9/2/81 1987	ASSIGN TO SUBCOMMITTEE NEMA STANDARD
C57.12.20 PC57.12.20	OVERHEAD-TYPE DISTRIBUTION TRANSFORMERS, 500 kVA AND SMALLER: H V 34500 VOLTS AND BELOW, L V 7970/13800Y & BELOW	DISTRIBUTION TRANSFORMERS K. S. HANUS	ANDERSON G. W. (913)339-2931			6/20/96 2001	
C57.12.21 PC57.12.21	STANDARD REQUIREMENTS FOR PAD-MOUNTED, COMPARTMENTAL-TYPE, SELF-COOLED, SINGLE-PHASE DIST TRANSFORMERS WITH HV BUSHINGS	DISTRIBUTION TRANSFORMERS K. S. HANUS	GHAFOURIAN A. (601)796-4255	T&D	IAS/REPC	10/22/79 6/27/91 1985	PAR EXTENDED TO OCTOBER 97
C57.12.22 PC57.12.22	PAD-MOUNTED,COMPARTMENTAL-TYPE SELF-COOLED,3-PHASE DIST. TR WITH HV BUSHINGS,2500kVA AND SMALLER:...REQUIREMENTS.	DISTRIBUTION TRANSFORMERS K. S. HANUS	HANUS K. (817)882-6025	T&D IAS/PSEC	IAS/REPC	1/9/95 6/27/91 1999	AWAITING PUB. BY NEMA
C57.12.23 PC57.12.23	UNDERGROUND-TYPE,SELF-COOLED, 1-PHASE DISTRIBUTION TR WITH SEPERABLE INSULATED HV CONNECT HV 24940GrdY..LV,240..;167kVA.	DISTRIBUTION TRANSFORMERS K. S. HANUS	SCHEU R. W. (704) 462-3164	T&D IAS/REPC	IC IAS/PSEC	9/19/85 6/27/91 1996	ANSI APPROVED 02/18/94 REVISE/REAFFIRM BEFORE 10/31/97
C57.12.24 PC57.12.24	UNDERGROUND-TYPE 3-PHASE DISTRIBUTION TRANSFORMERS,2500kVA AND SMALLER: HV,34500GrdY..& BELOW,LV,480 V AND BELOW	UG TR & NETWORK PROTECTORS P. E. OREHEK	NIEMANN C. (708)410-5307	T&D IAS/REPC IEC TC 14 USNC	IC IAS/PSEC	5/10/88 6/20/96 1993	PAR APPROVED 6/20/96

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE SC CHAIR	WG CHAIR AND PHONE NO. TF CHAIR	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	LATEST STATUS/ COMMENTS
C57.12.25 PC57.12.25	REQUIREMENTS FOR PAD-MOUNTED COMP-TYPE,SELF-COOLED,1-PHASE DISTRIBUTION TR W/SEP INS HV CONN,HV 34500GrdY...167kVA...	DISTRIBUTION TRANSFORMERS K. S. HANUS	MOHESKY N. (314)239-6783	T&D IC IAS/REPC IAS/PSEC	5/11/90 6/27/91 1995	PAR WITHDRAWN SUBMIT NEW PAR
C57.12.26 PC57.12.26	PAD-MOUNTED COMPARTMENTAL-TYPE SELF-COOLED,3-PHASE DIST TR for USE W/ SEPERABLE INSULATED HV CONN ,HV 34500GrdY..2500kVA	DISTRIBUTION TRANSFORMERS K. S. HANUS	PEARSON L. C. (817)882-6025	T&D IC IAS/REPC IAS/PSEC SCC14	6/17/92 12/5/91 1997	TO BE PUBLISHED BY NEMA
C57.12.27 PC57.12.27	STANDARD FOR TRANSFORMERS - LIQUID FILLED DISTRIBUTION TRANSFORMERS USED IN PAD-MOUNTED INSTALLATIONS, INCLUD. UNIT SUBS	DISTRIBUTION TRANSFORMERS K. S. HANUS	MILLER J. R. (314) 634-2111		6/27/91 0	PAR WITHDRAWN SUBMIT NEW PAR
C57.12.28 ANSI	PAD-MOUNTED EQUIPMENT - ENCLOSURE INTEGRITY	DISTRIBUTION TRANSFORMERS K. S. HANUS	MARTIN J.		6/24/87 1994	JOINT C37/C57 PROJECT AWAITING PUBLICATION
C57.12.29 ANSI	PAD-MOUNTED EQUIPMENT - ENCLOSURE INTEGRITY IN COASTAL ENVIRONMENTS	DISTRIBUTION TRANSFORMERS K. S. HANUS	MARTIN J.		1996	PUBLISHED IN 1992 NOT TRANSFORMERS COMM.
C57.12.30 ANSI	SUBMERSIBLE EQUIPMENT - ENCLOSURE INTEGRITY	DISTRIBUTION TRANSFORMERS K. S. HANUS	MARTIN J.		1994	TO BE BALLOTED NUMBER TO BE CHANGED
C57.12.31 ANSI	COATING STANDARD FOR POLE MOUNTED TRANSFORMERS	DISTRIBUTION TRANSFORMERS K. S. HANUS	MARTIN J.		1994	JOINT C37/C57 PROJECT AWAITING PUBLICATION
C57.12.32 ANSI	ENCLOSURE INTEGRITY OF SUBMERSIBLE EQUIPMENT	DISTRIBUTION TRANSFORMERS K. S. HANUS	HANUS K. (817)882-6020			AWAITING PUBLICATION BY NEMA

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE SC CHAIR	WG CHAIR AND PHONE NO. TF CHAIR	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	LATEST STATUS/ COMMENTS
C57.12.33 PC57.12.33	GUIDE FOR EVALUATION OF LOSSES IN DISTRIBUTION TRANSFORMERS	DISTRIBUTION TRANSFORMERS K. S. HANUS	PEKAREK T. (216) 479-3400	PSIM		PAR DISSAPROVED 03/21/96 NESCOM WANTS CLARIFICATION
C57.12.34 PC57.12.34	REQUIREMENTS FOR THREE PHASE PAD-MOUNTED DISTRIBUTION TRANSFORMERS	DISTRIBUTION TRANSFORMERS K. S. HANUS	PEARSON L. C. (817)882-6025	ICC	9/21/95	
C57.12.35 P1265	STANDARD FOR BAR CODING FOR DISTRIBUTION TRANSFORMERS (POLE-MOUNTED, PAD-MOUNTED AND UNDERGROUND)	DISTRIBUTION TRANSFORMERS K. S. HANUS	JORDAN RON (619)482-3239		6/20/96 2001	APPROVED BY STANDARDS BOARD 6/20/96 PREVIOUSLY P1265
C57.12.40 PC57.12.40	REQUIREMENTS FOR SECONDARY NETWORK TRANSFORMERS, SUBWAY & VAULT TYPES (LIQUID IMMERSED)	UG TR & NETWORK PROTECTORS P. E. OREHEK	BERTOLINI E. A. (212)460-4913	T&D ICC IAS/REPC IAS/PSEC IEC TC14 U S TAG NEMA	3/19/92 6/26/97 1997	PAR APPROVED ON 6/26/97 PUBLISHED JAN 1996
C57.12.44 PC57.12.44	STANDARD REQUIREMENTS FOR SECONDARY NETWORK PROTECTORS	UG TR & NETWORK PROTECTORS P. E. OREHEK	MULKEY D. H. (415)973-4699	T&D SWGR IAS/REPC IAS/PSEC EEI NEMA	12/20/94 9/21/95 1999	PUBLISHED DEC 94 PAR APPROVED 09/21/95
C57.12.50 NONE	REQ. FOR VENTILATED DRY-TYPE DISTRIBUTION TR, 1-500kVA, 1 PHASE, AND 15-500kVA, 3-PHASE HV 601-34500VOLTS,LV 120-600V	DRY-TYPE TRANSFORMERS W. PATTERSON	PATTERSON W. (919)848-1860		6/12/89 1994	COPYRIGHT NOT RELEASED BALLOT REAFFIRMATION
C57.12.51 NONE	REQ. FOR VENTILATED DRY-TYPE POWER TR, 501kVA & LARGER, 3 PHASE, WITH HV 601-34500V, LV 208Y/120 TO 4160 VOLTS	DRY-TYPE TRANSFORMERS W. PATTERSON	PATTERSON W. (919)848-1860		6/12/89 1994	COPYRIGHT NOT RELEASED BALLOT REAFFIRMATION
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	PATTERSON W. (919)848-1860		6/12/89 1994	COPYRIGHT NOT RELEASED BALLOT REAFFIRMATION

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE SC CHAIR	WG CHAIR AND PHONE NO. TF CHAIR	COMMITTEES REQUESTING COORDINATION		PUB DATE PAR DATE REV DUE	LATEST STATUS/ COMMENTS
C57.12.53 ANSI	REQUIREMENTS FOR DRY-TYPE, UNDERGROUND, SINGLE-PHASE WITH SEPARABLE INSULATED H-V 24940 grdY/14400 V AND <; LV 240/120 V	STANDARDS T. P. TRAUB				 0	ONLY TITLE EXIST (NO PAR) IS IT REQUIRED?
C57.12.54 ANSI	REQUIREMENTS FOR DRY-TYPE, UNDERGROUND 3 PHASE DISTRIBUTION TRANSFORMERS,2500 kVA OR <, HV 24940 grdY/14400 OR <,LV 480V	STANDARDS T. P. TRAUB				 0	ONLY TITLE EXISTS IS IT REQUIRED?
C57.12.55 NONE	CONFORMANCE STANDARD FOR TR- DRY-TYPE TRANSFORMERS USED IN UNIT INSTALLATIONS, INCL. UNIT SUBSTATIONS	DRY-TYPE TRANSFORMERS W. PATTERSON	PATTERSON W. (919)848-1860			4/7/86 1992	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	DRY-TYPE TRANSFORMERS W. PATTERSON	PROVOST R. L. (302)999-2225			8/27/84 1995	TO BE PUBLISHED ANSI APPROVED 01/04/94
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 P. E. OREHEK	NUTT B. (214)698-7447	T&D SCC14	EEI/T&D	3/18/92 12/5/91 1997	REVISE/REAFFIRM BEFORE 10/31/97 APPLY FOR NEW PAR
C57.12.58 P745	GUIDE FOR CONDUCTING TRANSIENT VOLTAGE ANALYSIS OF A DRY-TYPE TRANSFORMER COIL	DRY-TYPE TRANSFORMERS W. PATTERSON	KLINE A. D. (404)762-1642	IEC	IAS	6/27/91 6/28/78 2001	REAFFIRMED 9/19/96
C57.12.59 NONE	GUIDE FOR DRY-TYPE TRANSFORMER THROUGH-FAULT CURRENT DURATION	DRY-TYPE TRANSFORMERS W. PATTERSON	PATTERSON W. (919)848-1860			1/1/89 9/13/84 1996	WITHDRAWN BY STANDARDS BOARD ON 12/10/96
C57.12.60 PC57.12.60	TEST PROCEDURES FOR THERMAL EVALUATION OF INSULATION SYSTEMS FOR SOLID-CAST & RESIN ENCAP POWER & DIST TRANSFORMER	DRY-TYPE TRANSFORMERS W. PATTERSON	PROVOST R. L. (302)999-2225	IEC SC15E	NEMA	10/25/92 6/26/97 1994	PAR APPROVED ON 6/26/97 REVISE/REAFFIRM BEFORE 10/31/97

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE SC CHAIR	WG CHAIR AND PHONE NO. TF CHAIR	COMMITTEES REQUESTING COORDINATION		PUB DATE PAR DATE REV DUE	LATEST STATUS/ COMMENTS
C57.12.70 NONE	TERMINAL MARKINGS AND CONNECTIONS FOR DIST. & POWER TRANSFORMERS	STANDARDS T. P. TRAUB	TRAUB T. P. (312)394-2704	T&D ICC	SUBS	6/18/92 6/14/95 1997	BEING BALLOTED
C57.12.80 NONE	TERMINOLOGY FOR POWER & DISTRIBUTION TRANSFORMERS	STANDARDS T. P. TRAUB	TRAUB T. P. (312)394-2704	T&D	SUBS	5/1/92 6/14/95 1997	BEING BALLOTED PAR extended to 6/99
C57.12.90 VARIOUS	STANDARD TEST CODE FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS & GUIDE FOR SC TESTING OF	STANDARDS T. P. TRAUB	SMITH S. D. (606)879-2757	T&D SWG USTAG	PSRC IECTC14	3/16/93 6/15/95 1998	MAKING RUNNING CHANGE LIST WG COLLECTING CHANGES
C57.12.90 NEW	STANDARD TEST CODE FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS	INSULATION LIFE L. W. PIERCE	HENRY G. (501)534-5332			1998	WILL START REVISING SECT. 11
C57.12.90 PC57.12.90	CLAUSE 10.4 - IMPULSE TESTS FOR DISTRIBUTION TRANSFORMERS	DIELECTRIC TESTS L. B. WAGENAAR	ROSSETTI J. (901)528-4743				APPROVED BY SUBCOM
C57.12.90 PC57.12.90	STANDARD TEST CODE FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS	PERFORMANCE CHARACTERISTICS H. J. SIM	SIM JIN (919)580-3234				NEW PAR NESCOM 03/15/95 COORDINATE WITH S. SMITH
C57.12.90 PC57.12.90	CLAUSE 9 - ADD MEASUREMENT OF AUXILARY LOSSES	PERFORMANCE CHARACTERISTICS H. J. SIM	TULI S. (414)547-0121				D1 BALLOTED IN PCS
C57.12.90 PC57.12.90	CLAUSE 15 - NEW CLAUSE FOR CERTIFICATION TEST DATA	PERFORMANCE CHARACTERISTICS H. J. SIM	JIN S. (919)580-3234				APPROVED BY PCS

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE SC CHAIR	WG CHAIR AND PHONE NO. TF CHAIR	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	LATEST STATUS/ COMMENTS
C57.12.90 PC57.12.90	CLAUSE 10 - ADD HI-POT TEST FOR CONTROL WIRING	DIELECTRIC TESTS L. B. WAGENAAR	TULI S. (414)547-0121			D1 BALOTTED IN SUBCOM
C57.12.90 PC57.12.90	REVISE INDUCED TESTS FOR CLASS II POWER TRANSFORMERS	DIELECTRIC TESTS L. B. WAGENAAR	PERKINS M. (317)286-9334			D1 BALOTTED IN TF
C57.12.90 PC57.12.90	REVISION OF TEMPERATURE RISE TESTS	INSULATION LIFE L. W. PIERCE	HENRY G. (501)543-6546			TO BALLOT D3 IN TF, WG, SC
C57.12.90 PC57.12.90d	REVISION OF THE INDUCED TEST	DIELECTRIC TESTS L. B. WAGENAAR	POULIN B. (408)957-8326 M. PERKINS		9/28/90 0	INCLUDE IN C57.12.90 COORDINATE WITH STEVE SMITH
C57.12.90 PC57.12.90x	CLAUSE 13 - ADD TEST PROCEDURE FOR MEASURING SOUND INTENSITY	AUDIBLE SOUND & VIBRATION J. PURI	GIRGIS R. (317)286-9532 TULI S.			D1 BEING PREPARED COORDINATE WITH STEVE SMITH
C57.12.91 PC57.12.91	TEST CODE FOR DRY-TYPE DISTRIBUTION AND POWER TRANSFORMERS	DRY-TYPE TRANSFORMERS W. PATTERSON	BARNARD D. (919)738-4251	SPD EM T&D SUBS IEC TC14 U S TAG	6/14/95 6/26/97 2000	PAR APPROVED ON 6/26/97
C57.120 P842	LOSS EVALUATION GUIDE FOR POWER TRANSFORMERS AND REACTORS	WEST COAST E. G. HAGER	JACOBSEN R.	SUB EM ED&PG IAS IEC	12/3/91 5/1/80 1996	BALLOTING GROUP FORMED TO REAFFIRM REVISE/REAFFIRM BEFORE 10/31/97
C57.121 P954	GUIDE FOR ACCEPTANCE AND MAINTENANCE OF LESS FLAMMABLE HYDROCARBON FLUID IN TRANSFORMERS	INSULATING FLUIDS F. GRYSZKIEWICZ	McSHANE C. P. (617)926-4900	PSRC T&D IAS IEC	2/22/88 3/21/96 1996	BALLOTING GROUP BEING FORMED

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE SC CHAIR	WG CHAIR AND PHONE NO. TF CHAIR	COMMITTEES REQUESTING COORDINATION		PUB DATE PAR DATE REV DUE	LATEST STATUS/ COMMENTS
C57.123 P1098	GUIDE FOR TRANSFORMER LOSS MEASUREMENT	PERFORMANCE CHARACTERISTICS H. J. SIM	HENNING W. R. (414)547-0121 RAMSIS GIRGIS			6/13/85 0	PAR EXTENDED TO OCTOBER 97
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. (404)762-1642	NONE		6/29/91 6/27/91 2001	REAFFIRMED 9/18/96
C57.125 PC57.125	GUIDE FOR FAILURE INVESTIGATION, DOCUMENTATION AND ANALYSIS FOR POWER TRANSFORMERS AND SHUNT REACTORS	PERFORMANCE CHARACTERISTICS H. J. SIM	ALTMAN M. (407)694-4975	T&D PSE	ED&PG SWGR	6/27/91 6/28/87 1996	BALLOTING REAFFIRMATION REVISE/REAFFIRM BEFORE 10/31/97
C57.127 PC57.127	GUIDE FOR THE DETECTION OF ACOUSTIC EMISSIONS FROM PARTIAL DISCHARGES IN OIL-IMMERSED POWER TRANSFORMERS	DIELECTRIC TESTS L. B. WAGENAAR	J. W. HARLEY (216)425-1838	ICC IEC TC14 U S TAG	PSIM IEC TC42 U S TAG	6/26/97 0	PAR APPROVED ON 6/26/97
C57.128 PC57.128	FIRE PROTECTION OF OUTDOOR LIQUID-IMMERSED POWER TRANSFORMERS	WEST COAST E. G. HAGER	HAGER R. NORBERG J.	NPE PSR	SUB	6/1/89 0	APPLY FOR NEW PAR
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. (317)286-9387	EM PSIM	T&D SUB	9/26/91 0	PAR EXTENDED TO OCTOBER 97
C57.13 P546	REQUIREMENTS FOR INSTRUMENT TRANSFORMERS	INSTRUMENT TRANSFORMERS J. E. SMITH	NELSON T. (301)975-2956	PSIM SPD	PSR	3/30/94 6/14/94 1999	WORKING ON CHANGES REV. PAR APPROVED 06/14/94
C57.13.1 PSRC	GUIDE FOR FIELD TESTING OF RELAYING CURRENT TRANSFORMERS	INSTRUMENT TRANSFORMERS J. E. SMITH	SMITH J. E. (919-827-2121			8/25/87 1997	R1992 RELAY COMM. DOCUMENT

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE SC CHAIR	WG CHAIR AND PHONE NO. TF CHAIR	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	LATEST STATUS/ COMMENTS
C57.13.2 NONE	CONFORMANCE TEST PROCEDURES FOR INSTRUMENT TRANSFORMERS	INSTRUMENT TRANSFORMERS J. E. SMITH	SMITH J. E. (919-827-2121		4/16/86 9/26/91 1996	REVISE/REAFFIRM BEFORE 10/31/97 REQUEST PAR EXT. TO JUNE 97
C57.13.3 NONE	GUIDE FOR THE GROUNDING OF INSTRUMENT TR SECONDARY CICUITS AND CASES	INSTRUMENT TRANSFORMERS J. E. SMITH	SMITH J. E. (919-827-2121		1/23/87 1995	REVISE OR REAF. BY 12/96 R1990
C57.13.4 P832	DETECTION OF PARTIAL DISCHARGE AND MEASUREMENT OF APPARENT CHARGE WITHIN INSTRUMENT TRANSFORMERS	INSTRUMENT TRANSFORMERS J. E. SMITH	JONNATTI A. J. (813)785-2788	T&D	5/28/80 0	PAR WITHDRAWN DOCUMENT NEVER SUBMITTED TO SB
C57.13.5 PC57.13.5	TEST REQUIREMENTS FOR INSTRUMENT TRANSFORMERS OF A NOMINAL VOLTAGE OF 115KV AND ABOVE	INSTRUMENT TRANSFORMERS J. E. SMITH	MA J. (706)554-8800	SWGR EM TC 38 US T AG	9/19/96 0	REVISED PAR APPROVED 9/19/96
C57.13.6 PC57.13.6	REQUIREMENTS FOR INSTRUMENT TRANSFORMERS FOR USE WITH ELECTRONIC REVENUE METERS AND RELAYS	INSTRUMENT TRANSFORMERS J. E. SMITH	TEN-HAAGEN C. W. (603)749-8433	PSIM PSR TD PSC		REVISED PAR DISSAPROVED 9 /96 MAKE CHANGES AND RESUBMIT PAR
C57.130 PC57.130	T-U GUIDE FOR USE OF DISS. GAS ANALYSIS DURING FACTORY THERMAL TESTSFOR THE EVALUATION OF OIL-IMMERSED TRANS. AND REACT.	INSULATING FLUIDS F. GRYSZKIEWICZ	HEINRICHS F. W. (412)941-6924	NONE	3/17/93 0	PREPARING D11
C57.131 PC57.131	REQUIREMENTS FOR LOAD TAP CHANGERS	PERFORMANCE CHARACTERISTICS H. J. SIM	TRAUB T. P. (312)394-2704		3/16/95 0	
C57.133 PC57.133	GUIDE FOR SHORT-CIRCUIT TESTING OF DISTRIBUTION AND POWER TRANSFORMERS	PERFORMANCE CHARACTERISTICS H. J. SIM	McQUIN N. (412) 829-1205	T&D,SWG PSR IECTC14 SUBS IAS/PSE IAS/REP	9/21/95	PAR APPROVED PART II OF C57.12.90

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE SC CHAIR	WG CHAIR AND PHONE NO. TF CHAIR	COMMITTEES REQUESTING COORDINATION		PUB DATE PAR DATE REV DUE	LATEST STATUS/ COMMENTS
C57.134 PC57.134	GUIDE FOR THE DETERMINATION OF HOTTEST SPOT TEMPERATURE IN DRY TYPE TRANSFORMERS	DRY-TYPE TRANSFORMERS W. PATTERSON	PAYNE P. (202)388-2138			9/21/95	PAR APPROVED
C57.135 PC57.135	GUIDE FOR APPLICATION, TESTING, INSTALLATION AND OPERATION OF PHASE ANGLE SHIFTING TRANSFORMERS	WEST COAST E. G. HAGER	TRUMMER E. 43-3172-606-404 DON CHU (WG SEC)	PSRC IAS/PSP	EMC IEC TC14 U SNC	6/20/96 0	PAR Approved 6/20/96
C57.136 PC57.136	GUIDE FOR SOUND LEVEL ABATEMENT AND DETERMINATION IN OIL-FILLED TRANSFORMERS	AUDIBLE SOUND & VIBRATION J. PURI	McGILL J. (414)475-3422			3/21/96	DRAFT 1 PRODUCED PAR APPROVED 03/21/96
C57.137 PC57.137		INSULATING FLUIDS F. GRYSZKIEWICZ	(617)926-4900				
C57.138 NEW	RECOMMENDED PRACTICE FOR ROUTINE IMPULSE TEST FOR DISTRIBUTION TRANSFORMERS	DIELECTRIC TESTS L. B. WAGENAAR	ROSSETTI J. (901)528-4743	T&D PSIM	IA/PSE	9/19/96	Being Balloted
C57.15 NONE	REQUIREMENTS, TERMINOLOGY, & TEST CODE FOR STEP-VOLTAGE REGULATORS	DISTRIBUTION TRANSFORMERS K. S. HANUS	DIAMANTIS T. (315)428-5688	SUBS	IAS/PSE	3/18/87 9/21/95 1997	REVISE/REAFFIRM BEFORE 10/31/97 Par extended to 9/99
C57.16 PC57.16	STANDARD REQUIREMENTS, TERMINOLOGY, AND TEST CODE FOR DRY-TYPE AIR-CORE SERIES CONNECTED REACTORS	DRY-TYPE TRANSFORMERS W. PATTERSON	DUDLEY R. (416)298-8108	NEMA T&D	IAS	12/10/96 2001	APPROVED BY STANDARDS BOARD ON 12/10/96
C57.17 ANSI	REQUIREMENTS FOR ARC FURNACE TRANSFORMERS	STANDARDS T. P. TRAUB				1986	LAST REVISED IN 1986 ANSI DOCUMENT

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE SC CHAIR	WG CHAIR AND PHONE NO. TF CHAIR	COMMITTEES REQUESTING COORDINATION		PUB DATE PAR DATE REV DUE	LATEST STATUS/ COMMENTS
C57.18.10 PC57.18.10	REQUIREMENTS FOR SEMICONDUCTOR RECTIFIER TRANSFORMERS	PERFORMANCE CHARACTERISTICS H. J. SIM	KENNEDY S. P. (716)896-6500	NONE		12/28/81 0	PAR approved Sept 16 1997 BALLOTING GROUP BEING FORMED
C57.19.00 PC57.19.00	GENERAL REQUIREMENTS AND TEST PROCEDURES FOR OUTDOOR APPARATUS BUSHINGS (IEEE 21)	BUSHING F. E. ELLIOTT	ELLIOTT F. E. (614)223-2259	PSIM ICC	IA/PSE IEC SC36A USNC	7/23/91 6/20/96 1996	Approved fro Reaffirmation
C57.19.01 PC57.19.01	STANDARD PERFORMANCE CHARACTERISTICS AND DIMENSIONS FOR OUTDOOR APPARATUS BUSHINGS (IEEE 24)	BUSHING F. E. ELLIOTT	SINGH PRITPAL (901)696-5228	ICC IEC SC36A USNC	IA/PSE	8/5/91 6/20/96 1996	Approved for Reaffirmation
C57.19.03 PC57.19.03	STANDARD REQUIREMENTS, TERMINOLOGY AND TEST CODE FOR BUSHINGS FOR DC APPLICATIONS	BUSHING F. E. ELLIOTT	HEYMAN OLOF 46-240-83152			6/20/96 2001	APPROVED BY STANDARDS BOARD 6/20/96
C57.19.100 P800	GUIDE FOR APPLICATION OF APPARATUS BUSHINGS.	BUSHING F. E. ELLIOTT	ELLIOTT F. E. (503)230-3900	SWGR PSR	SUB	9/27/79 1999	PUBLISHED 08/24/95 REPLACES C57.19.101
C57.19.101 P757	GUIDE FOR LOADING POWER APPARATUS BUSHINGS	BUSHING F. E. ELLIOTT	ELLIOTT F. E. (503)230-3900			10/20/88	WITHDRAWN BY REVCOM 12/11/95 REPLACED BY C57.19.100
C57.21 PC57.21	REQUIREMENTS,TERMINOLOGY, AND TEST CODE FOR SHUNT REACTORS RATED OVER 500kVA	PERFORMANCE CHARACTERISTICS H. J. SIM	McGILL J. W. (414)475-3422	EM PSR	T&D	4/2/91 6/9/88 2000	APPLY FOR PAR EXTENSION R1995
C57.21 PC57.21	REQUIREMENTS TERMINOLOGY, AND TEST CODE FOR SHUNT REACTORS RATED OVER 500kVA	DRY-TYPE TRANSFORMERS W. PATTERSON	DUDLEY R. (416)298-8108			4/2/91 1995	PAR MORE THAN 4 YEAR OLD ACTION NEEDED ON PAR

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C57.21 PC57.21a	REQUIREMENTS,TERMINOLOGY AND TEST CODE FOR SH. REACTORS OVER 500kVA	DIELECTRIC TESTS L. B. WAGENAAR	KENNEDY W. N. (317)286-9387	NONE	4/2/91 12/11/86 1995	PAR MORE THAN 4 YEAR OLD PAR WITHDRAWN
C57.91 PC57.91	GUIDE FOR LOADING MINERAL OIL-IMMERSED TRANSFORMERS	INSULATION LIFE L. W. PIERCE	PIERCE L. (706)291-3166	SUB T&D PSE	6/14/95 6/13/85 2000	APPLY FOR NEW PAR
C57.92 PC57.92	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. W. PIERCE	PIERCE L. (706)291-3166	T&D SUB PSE	3/21/91	STANDARD WITHDRAWN, COMBINED WITH C57.91
C57.93 PC57.93	GUIDE FOR INSTALLATION OF LIQUID-IMMERSED POWER TRANSFORMERS.	WEST COAST E. G. HAGER	GILLIES D. A. (503)622-4847	NONE	12/12/95 0	REVISION APPROVED 12/11/95 WITHDRAW 12.11/12.12 WHEN APP.
C57.94 NONE	RECOMMENDED PRACTICE FOR INSTALLATION, APPLICATION,OPERATION & MAINTENANCE OF DRY-TYPE GEN PURPOSE DIST & POWER TR	DRY-TYPE TRANSFORMERS W. PATTERSON	PATTERSON W. (919)848-1860		12/9/87 1992	PUB. 1982, REAFFIRMED 1987 BALLOTTING REAFFIRMATION
C57.95 NONE	GUIDE FOR LOADING LIQUID-IMMERSED STEP VOLTAGE AND INDUCTION-VOLTAGE REGULATORS	INSULATION LIFE L. W. PIERCE	(314)554-3097		3/21/91 1996	WITHDRAWN BY STANDARDS BOARD ON 12/10/96
C57.96 PC57.96	GUIDE FOR LOADING DRY-TYPE DISTRIBUTION AND POWER TRANSFORMERS	DRY-TYPE TRANSFORMERS W. PATTERSON	PIERCE L. (706)291-3166	T&D SCC14 SCC10 IA/PSE	4/26/89 12/10/96 2000	
C57.98 PC57.98	IEEE GUIDE FOR TRANSFORMER IMPULSE TESTS	DIELECTRIC TESTS L. B. WAGENAAR	POULIN B. (408)957-8326 R. E. MINKWITZ, SR.	NONE	6/1/86 12/2/93 1999	PUBLISHED JAN 95 DISCUSS PAR BUSINESS

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE SC CHAIR	WG CHAIR AND PHONE NO. TF CHAIR	COMMITTEES REQUESTING COORDINATION		PUB DATE PAR DATE REV DUE	LATEST STATUS/ COMMENTS
C57.99 P731	GUIDE FOR LOADING DRY-TYPE AND OIL-IMMERSED CURRENT-LIMITING REACTORS	DRY-TYPE TRANSFORMERS W. PATTERSON	DUDLEY R. (416) 298-8108			3/28/78 1990	NEEDS REVISION (PAR TOO OLD) PAR WITHDRAWN
IEEE 259 P259	TEST PROCEDURE FOR EVALUATION OF SYSTEMS OF INSULATION FOR SPECIALTY TRANSFORMERS	DRY-TYPE TRANSFORMERS W. PATTERSON	SIMPSON R. W. JR. (603)284-4362			6/22/72 3/21/96 1979	BALLOTING GROUP BEING FORMED
IEEE 62.1 P 62	GUIDE FOR DIAGNOSTIC FIELD TESTING OF POWER APPARATUS, PART I: OIL-FILLED POWER TRANSFORMERS, REGULATORS AND REACTORS	DIELECTRIC TESTS L. B. WAGENAAR	YOUNG F. N. (216)447-2649			3/17/94	APPROVED BY REVCOM 03/15/95 PUBLISHED
IEEE 637 P637	GUIDE FOR THE RECLAMATION OF INSULATING OIL AND CRITERIA FOR ITS USE	INSULATING FLUIDS F. GRYSZKIEWICZ	(617)926-4900			6/4/84 1997	REAFFIRMED 03/18/92
IEEE 638 P638	QUALIFICATION OF CLASS 1E TR FOR NUCLEAR POWER GENERATING STATIONS	PERFORMANCE CHARACTERISTICS H. J. SIM	PIERCE L. W. (706)291-3166	NPE SC2	SUB SCC10	3/19/92 10/29/90 1997	BALLOTING GROUP FORMED TO REAFFIRM REVISE/REAFFIRM BEFORE 10/31/97
IEEE 799 P799	GUIDE FOR HANDLING AND DISPOSING OF ASKARELS	INSULATING FLUIDS F. GRYSZKIEWICZ	(617)926-4900	EIS T&D	IAC	11/17/86 9/27/79 1997	REVISE/REAFFIRM BEFORE 10/31/97
IEEE1258 P1258	TRIAL-USE GUIDE FOR INTERPRETATION OF GASES GENERATED IN SILICONE-IMMERSED TRANSFORMERS	INSULATING FLUIDS F. GRYSZKIEWICZ	GRYSZKIEWICZ f. (617)926-4900	T&D	ICC	6/15/95 0	
IEEE1276 P1276	TRIAL-USE GENERAL REQUIREMENTS FOR LIQUID-FILLED DISTRIBUTION AND POWER TR UTILIZING HIGH TEMP SOLID INSULATING MATERIAL	INSULATION LIFE L. W. PIERCE	FRANCHEK M. A. (802)748-3936	T&D		3/21/96 0	Approved for publication

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE SC CHAIR	WG CHAIR AND PHONE NO. TF CHAIR	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	LATEST STATUS/ COMMENTS
IEEE1277 P1277	GENERAL REQUIREMENTS & TEST CODE FOR OIL-IMMERSED AND DRY-TYPE HVDC SMOOTHING REACTORS	HVDC CONVERTER TR & REACTOR W. N. KENNEDY	(317)286-9387	SUB	9/25/91 0	PAR EXTENDED TO 31 Oct 1999
IEEE1350 P1350	GUIDE FOR PROTECTION OF DISTRIBUTION TRANSFORMERS WITH EMPHASIS ON SECONDARY (LOW VOLTAGE SIDE) SURGES	DIELECTRIC TESTS L. B. WAGENAAR	ROSSETTI J. (901)528-4743 W. A. MAGUIRE	SPD T&D IC	0	PAR WITHDRAWN ON 3/20/97, COVERED BY C62.22
IEEE1388 P1388	STANDARD FOR THE ELECTRONIC REPORTING OF TRANSFORMER TEST DATA	DISTRIBUTION TRANSFORMERS K. S. HANUS	McCAIN A. (410)291-3231	EEI NEMA ASC X12 PSR CS SAB	9/15/93 0	PREPARING D1 NO. CHANGED FROM C57.132
NEW NEW	TASK FORCE TO STUDY APPLICATON AND PROBLEMS OF DRAW-LEADS FOR BUSHINGS	BUSHING F. E. ELLIOTT	NORDMAN RUSS (414)547-0121 R. NORDMAN			NEW TASK FORCE

Attachment 2 COORDINATION ACTIVITIES OF THE IEEE/PES TRANSFORMERS COMMITTE

21-Jan-98

PROJECT / DATE	TITLE / COMMITTEE	CONTACT		COORDINATOR		TR SUBCOMM	STATUS
	GUIDE FOR LIFE MANAGEMENT OF ELECTRICAL EQUIPMENT IN GENERATING STATIONS						
10/14/96	PSIM	DEREK M. SAWYER	416-592-5445	F. N. YOUNG	216-447-2649	DIELECTRIC TESTS	
	HARMONIC LIMITS FOR SINGLE-PHASE EQUIPMENT						
8/15/96	T&D	DANIEL J. WARD	804-775-5328	DON CASH	804-575-2148	PERFORMANCE CHARACTERISTICS	
C62.62	PERFORMANCE CHARACTERISTICS FOR SURGE PROTECTIVE DEVICES CONNECTED TO LOW VOLTAGE AC POWER CIRCUITS						RESOLVING NEGATIVE BALLOTS
3/21/91	SPD	E. GALLO		MAHESH P. SAMPAT	704-462-3226	DIELECTRIC TESTS	
NEW	GUIDE FOR VOLTAGE AND PHASING DETECTORS FOR USE IN HV SYSTEMS IN ELECTRIC POWER UTILITIES						
3/4/94	PSIM	PETER H. REYNOLDS	215-646-9200	G. H. VAILLANCOURT	514-652-8515	STANDARDS	
NEW	MEASUREMENT OF POWER AT LOW POWER FACTOR						
2/15/94	PSIM	EDDY SO	613-993-2660	W. R. HENNING	414-547-0121	PERFORMANCE CHARACTERISTICS	
NEW	GUIDE FOR RECOMMENDED ELECTRICAL CLEARANCES AND INSULATION LEVELS IN AIR INSULATED SUBSTATIONS						APPLYING FOR PAR
2/20/95	SUBS	RICHARD COTTRELL	517-788-0817	G. VAILLANCOURT	514-652-8515	STANDARDS	
P 4	STANDARD TECHNIQUES FOR HIGH-VOLTAGE TESTING						JUST PUBLISHED
2/2/89	PSIM	TERRY McCOMB	613-990-5826	G. VAILLANCOURT	514-652-8515	DIELECTRIC TESTS	
P 62	GUIDE FOR DIAGNOSTIC OF POWER APPARATUS						DRAFT PUBLISHED IN C57 COLL.
3/17/94	PSIM	DAVID TRAIN	617-926-4900	R. A. VEITCH	905-731-9178	STANDARDS	
P 454	PARTIAL DISCHARGE MEASUREMENTS						WILL ADOPT IEC-270
3/31/94	PSIM	BARRY WARD	215-646-9200	G. H. VAILLANCOURT	514-652-8515	STANDARDS	

PROJECT / DATE	TITLE / COMMITTEE	CONTACT		COORDINATOR		TR SUBCOMM	STATUS
P 656	STANDARD FOR THE MEASUREMENT OF AUDIBLE NOISE FROM OVERHEAD TRANSMISSION LINES						PUBLISHED 12/92
3/8/91	T&D	JAMES R. STEWART	518-395-5025	ALAN M. TEPLITSKY	212-460-4859	AUDIBLE SOUND AND VIBRATION	
P 693	RECOMMENDED PRACTICE FOR SEISMIC DESIGN OF SUBSTATIONS						NEW PAR 12/93
9/18/90	SUBS	RULON FRONK	213-481-3327	DAVID BRUCKER	415-692-4431	WEST COAST	
P 957	GUIDE FOR CLEANING INSULATORS						OLD GUIDE EXTENDED TO 12/94
9/17/92	T&D	WILLIAM L. GIBSON	415-973-3747	L. B. WAGENAAR	614-223-2259	BUSHINGS	
P 979	GUIDE FOR SUBSTATION FIRE PROTECTION						MUST COMPLETE IN 1994
6/18/92	SUBS	A. J. BOLGER	604-663-2879	D. W. SUNDIN	414-524-3221	WEST COAST	
P 980	GUIDE FOR THE CONTAINMENT AND CONTROL OF OIL-SPILLS IN SUBSTATIONS						GUIDE EXTENDED TO 12/94
9/17/92	SUBS	RICHARD G. COTTRELL	517-788-0817	F. GRYSZKIEWICZ	617-926-4900	INSULATING FLUIDS	
P1030.3	GUIDE FOR SPECIFICATION OF HVDC PERFORMANCE - PART III, DYNAMIC PERFORMANCE						DISCUSSING DRAFT IN WG
12/5/91	T&D	LEWIS VAUGHAN	514-652-8457	WILLIAM N. KENNEDY	317-286-9387	HVDC CONV. TR & SMOOTHING REAC	
P1122	DIGITAL RECORDERS FOR MEASUREMENTS IN HIGH VOLTAGE IMPULSE TESTS						APPROVED BY SB 03/17/94
12/3/92	PSIM	T. R. McCOMB	613-990-5826	BERTRAND POULIN	408-957-8326	DIELECTRIC TESTS	
P1205	GUIDE FOR ASSESSING, MONITORING, AND MITIGATING AGING EFFECTS ON CLASS IE EQUIPMENT USED IN NUCLEAR POWER GEN. STATIONS						
6/2/96	NPEC	JERALD L. EDSON	208-526-6253	L. W. PIERCE	706-291-3166	INSULATION LIFE	
P1223	POWER SYSTEM DIGITAL TESTING TECHNIQUES						
8/17/89	PSIM	T. R. McCOMB	613-990-5826	R. MINKWITZ, SR.	617-828-3241	DIELECTRIC TESTS	
P1248	GUIDE FOR THE COMMISSIONING OF ELECTRICAL SYSTEMS IN HYDROELECTRIC POWER PLANTS						
12/6/90	ED&PG	LOUIS A. TAUBER	503-326-2323	D. A. GILLIES	503-622-4847	WEST COAST	

PROJECT / DATE	TITLE / COMMITTEE	CONTACT		COORDINATOR		TR SUBCOMM	STATUS
P1268	GUIDE FOR INSTALLING TEMPORARY SUBSTATIONS						DI READY FOR WG COMMENTS
3/30/91	SUBS	SHASHI G. PATEL	404-362-5386	D. A. GILLIES	503-622-4847	WEST COAST	
P1291	GUIDE FOR PARTIAL DISCHARGE MEASUREMENTS IN POWER SWITCHGEAR						ANSI APPROVED 08/30/93
10/22/91	SWGR	E. F. VEVERKA	414-835-1544	G. H. VAILLANCOURT	514-652-8515	STANDARDS	
P1303	GUIDE FOR STATIC VAR COMPENSATOR FIELD TESTS						APPROVED BY SB 06/94
9/17/92	SUBS	PHILIP R. NANNERY	914-577-2591	R. F. DUDLEY	416-298-8108	DRY TYPE	
P1304	CURRENT MEASURING SYSTEMS WHICH USE OPTICAL TECHNIQUES						
6/18/92	PSIM	T. R. McCOMB	613-990-5826	J. E. SMITH	919-827-3220	INSTRUMENT TRANSFORMERS	
P1325	RECOMMENDED PRACTICE FOR REPORTING FIELD TROUBLE DATA FOR POWER CIRCUIT BREAKERS						INFORMATION COPY REQUESTED
3/17/92	SWGR	D. M. LARSON	203-634-5739	G. H. VAILLANCOURT	514-652-8515	STANDARDS	
P1459	STD DEF. FOR THE MEAS. OF ELECTRIC POWER QUANTITIES UNDER SINUSOIDAL, NON-SIN., BALANCED OR UNBALANCED CONDITIONS						APPLYING FOR PAR
	PSIM	A. E. EMMANUEL	508-831-5239	EDDIE SO	613-993-2660	PERFORMANCE CHARACTERISTICS	
P420	STANDARD FOR THE DESIGN AND QUALIFICATION OF CLASS 1E CONTROL BOARDS, PANELS, AND RACKS USED IN NUCLEAR GENERATING ST N						INFORMATION COPY
11/5/94	NPE	M. S. ZAR	312-269-2222	L. W. PIERCE	706-291-3166	INSULATION LIFE	
PC 37.104	GUIDE FOR AUTOMATIC RECLOSING						
7/19/96	PSRC	WILLIAM STRANG	618-288-9211	H. J. SIM	702-227-2316	PERFORMANCE CHARACTERISTICS	
PC37.10	GUIDE FOR DIAGNOSTICS AND FAILURE INVESTIGATION OF POWER CIRCUIT BREAKERS						DRAFT IN REVISION IN WG
5/1/91	SWGR	L. ROLANDO SAAVEDRA	504-363-8765	WALLACE B. BINDER JR.	216-384-5625	PERFORMANCE CHARACTERISTICS	
PC37.107	STANDARD FOR DIGITAL PROTECTIVE RELAY INTERFACES						EVALUATING BALLOT RESULTS
12/28/85	PSR	STIG L. NILSSON	408-335-9061	G. H. VAILLANCOURT	514-652-8515	STANDARDS	

PROJECT DATE	TITLE COMMITTEE	CONTACT		COORDINATOR		TR SUBCOMM	STATUS
PC37.108	GUIDE FOR THE PROTECTION OF NETWORK TRANSFORMERS						REAFFIRMED 1994
9/28/84	PSR	THOMAS E. WIEDMAN	312-394-2593	VACANT		STANDARDS	
PC37.109	GUIDE FOR THE PROTECTION OF SHUNT REACTORS						REAFFIRMED 1993
3/28/85	PSR	LAVERN L. DVORAK	303-231-1636	MIKE ALTMAN	407-694-4975	PERFORMANCE CHARACTERISTICS	
PC37.110	GUIDE FOR THE APPLICATION OF CURRENT TRANSFORMERS USED FOR PROTECTIVE RELAYING PURPOSES						REVISION (D21) BALOTTED IN PSR
5/31/90	PSR	GRAHAM CLOUGH	206-737-6912	J. E. SMITH	919-827-3220	INSTRUMENT TRANSFORMERS	
PC37.122	STANDARD FOR GAS-INSULATED SUBSTATIONS						
3/20/97	SUBS	ARUN ARORA	303-674-7973	J. E. SMITH	919-827-3220	INSTRUMENT TRANSFORMERS	
PC37.91	GUIDE FOR PROTECTIVE RELAY APPLICATION TO POWER TRANSFORMERS						
3/19/92	PSR	MIRIAM SANDERS	919-856-2457	RON BARKER	804-257-4671	PERFORMANCE CHARACTERISTICS	
PC37.97	GUIDE FOR PROTECTIVE RELAY APPLICATION TO POWER SYSTEM BUSES						ANSI APPROVED 05/20/91
12/10/87	PSR	STEVE CONRAD	505-848-2642	J. E. SMITH	919-827-3220	INSTRUMENT TRANSFORMERS	
PC57.13.1	GUIDE FOR FIELD TESTING OF RELAYING CURRENT TRANSFORMERS						REAFFIRMED 1992
12/31/80	PSR	ARUN G. PHADKE	703-231-7029	J. E. SMITH	919-827-3220	INSTRUMENT TRANSFORMERS	
PC62.11	STANDARD FOR METAL-OXIDE SURGE ARRESTERS FOR AC POWER CIRCUITS						NEW PAR 6/14/94
6/14/94	SPD	R. M. SIMPSON	919-836-7059	W. A. MAGUIRE	501-377-4273	DIELECTRIC TESTS	
PC62.2.01	APPLICATION GUIDE FOR SURGE PROTECTION OF ELECTRIC GENERATING PLANTS						
6/1/84	SPD	G. L. GAIBROIS	313-237-9332	VACANT		DIELECTRIC TESTS	
PC62.22	GUIDE FOR APPLICATION OF METAL OXIDE SURGE ARRESTERS FOR AC SYSTEMS						INCLUDE DIST. TRANSFORMER
12/2/93	SPD	J. WOODWORTH	716-375-7270	ROBERT DEGENEFF	518-276-6367	DIELECTRIC TESTS	

PROJECT / DATE	TITLE / COMMITTEE	CONTACT	COORDINATOR		TR SUBCOMM	STATUS
PC62.42	GUIDE FOR THE APPLICATION OF LOW-VOLTAGE SURGE PROTECTIVE DEVICES					REVISED PAR 9/22/94
7/18/94	SPD	R. DAVIDSON JR.	MAHESH P. SAMPAT	704-462-3226	DIELECTRIC TESTS	

Attachment 3

21-Jan-98

ABREVIATION	COMMITTEE OR SOCIETY	LIASON 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	R.E. Howell	
ED&PG	ENERGY DEVELOPMENT AND POWER GENERATION	VACANT	
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/PSP	IAS/POWER SYSTEM PROTECTION	J. FISCHER	[215] 481-4402
IAS/REP	IAS/RURAL ELECTRIC POWER COMMITTEE	L. E. STETSON	(402) 472-2945
IC	INSULATED CONDUCTORS COMMITTEE	GARY POLHILL	(312) 394-7734
IEC/SC36A	IEC INSULATED BUSHINGS SUBCOMMITTEE 36A	BILL SAXON	(704) 382-6534
IEC/TAG	US TECHNICAL ADVISOR TO IEC TC 14	P. J. HOPKINSON	(704) 282-7469
IEC/TC42	IEC HIGH VOLTAGE TESTING TECHNIQUES COMMITTEE 42	G. H. VAILLANCOURT	(514) 652-8515
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION	J. GAUTHIER	(202) 457-8400
NPE	NUCLEAR POWER ENGINEERING COMMITTEE	M. S. ZAR	(312) 269-2222
PSC	POWER SYSTEM COMMUNICATIONS COMMITTEE	SUKHDEV WALIA	(908) 422-2104
PSE	POWER SYSTEM ENGINEERING COMMITTEE	W. A. JOHNSON	(301) 469-5252
PSIM	POWER SYSTEM INSTRUMENTATION MEASUREMENT COMMITTEE	T. R. MC COMB	(613) 990-5826
PSRC	POWER SYSTEM RELAYING COMMITTEE	R. W. HAAS	(513) 231-2584
SCC14	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	GARY ENGMANN	(407) 419-3521

ABREVIATION	COMMITTEE OR SOCIETY	LIASON REPRESENTATIVE	PHONE NUMBER
SWGR	SWITCHGEAR COMMITTEE	D. F. PEELO	(604) 528-3034
T&D	TRANSMISSION AND DISTRIBUTION COMMITTEE	C. KRISHNAYA	(514) 652-8342
TC	TRANSFORMERS COMMITTEE	T.A. PREVOST	(802) 751-3458
TSC	TECHNICAL SYMBOLOGY COMMITTEE (PART OF AIM)		

ATTACHMENT 4 STATUS REPORT OF STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE

21-Jan-98

STANDARD / PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE / PAR DATE / REV DUE	STATUS AND COMMENTS
SUBCOMMITTEE:	**AUDIBLE SOUND & VIBRATION**				
CHAIR:	**J. PURI**				
PHONE:	**(704)282-7413**				
C57.12.00 PC57.12.00	AUDIBLE SOUND LEVEL REQUIREMENTS	PURI J. (704)282-7413			UNDER DEVELOPMENT
C57.12.90 PC57.12.90x	CLAUSE 13 - ADD TEST PROCEDURE FOR MEASURING SOUND INTENSITY	GIRGIS R. (317)286-9532			D1 BEING PREPARED COORDINATE WITH STEVE SMITH
C57.136 PC57.136	GUIDE FOR SOUND LEVEL ABATEMENT AND DETERMINATION IN OIL-FILLED TRANSFORMERS	McGILL J. (414)475-3422		3/21/96	DRAFT 1 PRODUCED PAR APPROVED 03/21/96

STANDARD / PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE / PAR DATE / REV DUE	STATUS AND COMMENTS
SUBCOMMITTEE:	**BUSHING**				
CHAIR:	**F. E. ELLIOTT**				
PHONE:	**(503)230-3807**				
C57.19.00 PC57.19.00	GENERAL REQUIREMENTS AND TEST PROCEDURES FOR OUTDOOR APPARATUS BUSHINGS (IEEE 21)	ELLIOTT F. E. (614)223-2259	PSIM IEC SC36 IA/PSE ICC	7/23/91 6/20/96 1996	Approved fro Reaffirmation
C57.19.01 PC57.19.01	STANDARD PERFORMANCE CHARACTERISTICS AND DIMENSIONS FOR OUTDOOR APPARATUS BUSHINGS (IEEE 24)	SINGH PRITPAL (901)696-5228	ICC IA/PSE IEC SC36A	8/5/91 6/20/96 1996	Approved for Reaffirmation
C57.19.03 PC57.19.03	STANDARD REQUIREMENTS, TERMINOLOGY AND TEST CODE FOR BUSHINGS FOR DC APPLICATIONS	HEYMAN OLOF 46-240-83152		6/20/96 2001	APPROVED BY STANDARDS BOARD 6/20/96
C57.19.100 P800	GUIDE FOR APPLICATION OF APPARATUS BUSHINGS.	ELLIOTT F. E. (503)230-3900	SWGR SUB PSR	9/27/79 1999	PUBLISHED 08/24/95 REPLACES C57.19.101
C57.19.101 P757	GUIDE FOR LOADING POWER APPARATUS BUSHINGS	ELLIOTT F. E. (503)230-3900		10/20/88	WITHDRAWN BY REVCOM 12/11/95 REPLACED BY C57.19.100
NEW NEW	TASK FORCE TO STUDY APPLICATON AND PROBLEMS OF DRAW-LEADS FOR BUSHINGS	NORDMAN RUSS (414)547-0121			NEW TASK FORCE

STANDARD / PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE / PAR DATE / REV DUE	STATUS AND COMMENTS
SUBCOMMITTEE:	**DIELECTRIC TESTS**				
CHAIR:	**L. B. WAGENAAR**				
PHONE:	**(614)223-2259**				
C57.113 P545	GUIDE FOR PARTIAL DISCHARGE MEASUREMENT IN LIQUID-FILLED POWER TRANSFORMERS AND SHUNT REACTOR	POULIN B. [408]157-8326	PSIM IAS/PSE IEC TC14 U	12/5/91 6/20/96 1996	PAR APPROVED 6/20/96 REVISE/REAFFIRM BEFORE 10/31/97
C57.12.00 PC57.12.00	TABLE 3 AND 5 - HARMONIZE VALUES	POULIN B. (408)957-8326			UNDER DEVELOPMENT
C57.12.00 PC57.12.00	SECTION 5.10.7.1 - LIGHTNING IMPULSE TESTS	MINKWITZ R. E. (617)828-3241			APPROVED BY MAIN COMMITTEE
C57.12.00 PC57.12.00	TABLE 17 - SWITCHING IMPULSE TESTS - NOTE 8 ADDED	POULIN B. (408)957-8326			APPROVED BY SUBCOMMITTEE
C57.12.01 NONE	GENERAL REQUIREMENTS FOR DRY-TYPE DIST. AND POWER TR INCL THOSE WITH SOLID CAST &/or RESIN-ENCAPSULATED WINDINGS	JONATTI A. (813)442-0414	NEMA IA/I&CPS U.L. ANSI	2/2/89 6/26/97 1996	PAR APPROVED ON 6/26/97
C57.12.20 PC57.12.20	OVERHEAD-TYPE DISTRIBUTION TRANSFORMERS, 500 kVA AND SMALLER: H V 34500 VOLTS AND BELOW, L V 7970/13800Y & BELOW	ANDERSON G. W. (913)339-2931		6/20/96 2001	
C57.12.21 PC57.12.21	STANDARD REQUIREMENTS FOR PAD-MOUNTED, COMPARTMENTAL-TYPE, SELF-COOLED, SINGLE-PHASE DIST TRANSFORMERS WITH HV BUSHINGS	GHAFOURIAN A. (601)796-4255	T&D IAS/REPC	10/22/79 6/27/91 1985	PAR EXTENDED TO OCTOBER 97
C57.12.22 PC57.12.22	PAD-MOUNTED,COMPARTMENTAL-TYPE SELF-COOLED,3-PHASE DIST. TR WITH HV BUSHINGS,2500kVA AND SMALLER:...REQUIREMENTS.	HANUS K. (817)882-6025	T&D IAS/REPC IAS/PSEC	1/9/95 6/27/91 1999	AWAITING PUB. BY NEMA

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION		PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
C57.12.23	UNDERGROUND-TYPE,SELF-COOLED, 1-PHASE DISTRIBUTION TR WITH SEPERABLE INSULATED HV CONNECT HV 24940GrdY..LV,240..,167kVA.	SCHEU R. W. (704) 462-3164	T&D	IAS/PSEC	9/19/85	ANSI APPROVED 02/18/94
PC57.12.23			IC		6/27/91	REVISE/REAFFIRM BEFORE 10/31/97
			IAS/REPC		1996	
C57.12.25	REQUIREMENTS FOR PAD-MOUNTED COMP-TYPE,SELF-COOLED,1-PHASE DISTRIBUTION TR W/SEP INS HV CONN,HV 34500GrdY...167kVA...	MOHESKY N. (314)239-6783	T&D	IAS/PSEC	5/11/90	PAR WITHDRAWN
PC57.12.25			IC		6/27/91	SUBMIT NEW PAR
			IAS/REPC		1995	
C57.12.26	PAD-MOUNTED COMPARTMENTAL-TYPE SELF-COOLED,3-PHASE DIST TR for USE W/ SEPERABLE INSULATED HV CONN.,HV 34500GrdY..2500kVA	PEARSON L. C. (817)882-6025	T&D	IAS/PSEC	6/17/92	
PC57.12.26			IC	SCC14	12/5/91	TO BE PUBLISHED BY NEMA
			IAS/REPC		1997	
C57.12.27	STANDARD FOR TRANSFORMERS - LIQUID FILLED DISTRIBUTION TRANSFORMERS USED IN PAD-MOUNTED INSTALLATIONS, INCLUD. UNIT SUBS	MILLER J. R. (314) 634-2111				PAR WITHDRAWN
PC57.12.27					6/27/91	SUBMIT NEW PAR
					0	
C57.12.28	PAD-MOUNTED EQUIPMENT - ENCLOSURE INTEGRITY	MARTIN J.			6/24/87	JOINT C37/C57 PROJECT
ANSI					1994	AWAITING PUBLICATION
C57.12.29	PAD-MOUNTED EQUIPMENT - ENCLOSURE INTEGRITY IN COASTAL ENVIRONMENTS	MARTIN J.				PUBLISHED IN 1992
ANSI					1996	NOT TRANSFORMERS COMM.
C57.12.30	SUBMERSIBLE EQUIPMENT - ENCLOSURE INTEGRITY	MARTIN J.				TO BE BALLOTED
ANSI					1994	NUMBER TO BE CHANGED
C57.12.31	COATING STANDARD FOR POLE MOUNTED TRANSFORMERS	MARTIN J.				JOINT C37/C57 PROJECT
ANSI					1994	AWAITING PUBLICATION
C57.12.32	ENCLOSURE INTEGRITY OF SUBMERSIBLE EQUIPMENT	HANUS K. (817)882-6020				
ANSI						AWAITING PUBLICATION BY NEMA

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
C57.12.33 PC57.12.33	GUIDE FOR EVALUATION OF LOSSES IN DISTRIBUTION TRANSFORMERS	PEKAREK T. (216) 479-3400	PSIM		PAR DISSAPROVED 03/21/96 NESCOM WANTS CLARIFICATION
C57.12.34 PC57.12.34	REQUIREMENTS FOR THREE PHASE PAD-MOUNTED DISTRIBUTION TRANSFORMERS	PEARSON L. C. (817)882-6025	ICC	9/21/95	
C57.12.35 P1265	STANDARD FOR BAR CODING FOR DISTRIBUTION TRANSFORMERS (POLE-MOUNTED, PAD-MOUNTED AND UNDERGROUND)	JORDAN RON (619)482-3239		6/20/96 APPROVED BY STANDARDS BOARD 6/20/96 2001 PREVIOUSLY P1265	
C57.12.50 NONE	REQ. FOR VENTILATED DRY-TYPE DISTRIBUTION TR, 1-500kVA, 1 PHASE, AND 15-500kVA, 3-PHASE HV 601-34500VOLTS,LV 120-600V	PATTERSON W. (919)848-1860		6/12/89 COPYRIGHT NOT RELEASED 1994 BALLOT REAFFIRMATION	
C57.12.51 NONE	REQ. FOR VENTILATED DRY-TYPE POWER TR, 501kVA & LARGER, 3 PHASE, WITH HV 601-34500V, LV 208Y/120 TO 4160 VOLTS	PATTERSON W. (919)848-1860		6/12/89 COPYRIGHT NOT RELEASED 1994 BALLOT REAFFIRMATION	
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	PATTERSON W. (919)848-1860		6/12/89 COPYRIGHT NOT RELEASED 1994 BALLOT REAFFIRMATION	
C57.12.55 NONE	CONFORMANCE STANDARD FOR TR- DRY-TYPE TRANSFORMERS USED IN UNIT INSTALLATIONS, INCL. UNIT SUBSTATIONS	PATTERSON W. (919)848-1860		4/7/86 COPYRIGHT NOT RELEASED 1992 BALLOT REAFFIRMATION	
C57.12.56 PC57.12.56	TEST PROCEDURE FOR THERMAL EVALUATION OF INSULATION SYST FOR VENTILATED DRY-TYPE POWER & DISTRIBUTION TRANSFORMERS	PROVOST R. L. (302)999-2225		8/27/84 TO BE PUBLISHED 1995 ANSI APPROVED 01/04/94	
C57.12.58 P745	GUIDE FOR CONDUCTING TRANSIENT VOLTAGE ANALYSIS OF A DRY-TYPE TRANSFORMER COIL	KLINE A. D. (404)762-1642	IEC IAS	6/27/91 REAFFIRMED 9/19/96 6/28/78 2001	

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
C57.12.59 NONE	GUIDE FOR DRY-TYPE TRANSFORMER THROUGH-FAULT CURRENT DURATION	PATTERSON W. (919)848-1860		1/1/89 9/13/84 1996	WITHDRAWN BY STANDARDS BOARD ON 12/10/96
C57.12.60 PC57.12.60	TEST PROCEDURES FOR THERMAL EVALUATION OF INSULATION SYSTEMS FOR SOLID-CAST & RESIN ENCAP POWER & DIST TRANSFORMER	PROVOST R. L. (302)999-2225	IEC SC15E NEMA	10/25/92 6/26/97 1994	PAR APPROVED ON 6/26/97 REVISE/REAFFIRM BEFORE 10/31/97
C57.12.90 PC57.12.90	CLAUSE 10.4 - IMPULSE TESTS FOR DISTRIBUTION TRANSFORMERS	ROSSETTI J. (901)528-4743			APPROVED BY SUBCOM
C57.12.90 PC57.12.90	REVISE INDUCED TESTS FOR CLASS II POWER TRANSFORMERS	PERKINS M. (317)286-9334			DI BALOTTED IN TF
C57.12.90 PC57.12.90	CLAUSE 10 - ADD HI-POT TEST FOR CONTROL WIRING	TULI S. (414)547-0121			DI BALOTTED IN SUBCOM
C57.12.90 PC57.12.90d	REVISION OF THE INDUCED TEST	POULIN B. (408)957-8326		9/28/90 0	INCLUDE IN C57.12.90 COORDINATE WITH STEVE SMITH
C57.12.91 PC57.12.91	TEST CODE FOR DRY-TYPE DISTRIBUTION AND POWER TRANSFORMERS	BARNARD D. (919)738-4251	SPD EM T&D SUBS IEC TC14	6/14/95 6/26/97 2000	PAR APPROVED ON 6/26/97
C57.124 PC57.124	RECOMMENDED PRACTICE FOR THE DETECTION OF PD AND THE MEASUREMENT OF APPARENT CHARGE IN DRY-TYPE TRANSFORMERS	KLINE A. D. (404)762-1642	NONE	6/29/91 6/27/91 2001	REAFFIRMED 9/18/96
C57.127 PC57.127	GUIDE FOR THE DETECTION OF ACOUSTIC EMISSIONS FROM PARTIAL DISCHARGES IN OIL-IMMERSED POWER TRANSFORMERS	J. W. HARLEY (216)425-1838	ICC PSIM IEC TC14 U IEC TC42	6/26/97 0	PAR APPROVED ON 6/26/97

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
C57.134 PC57.134	GUIDE FOR THE DETERMINATION OF HOTTEST SPOT TEMPERATURE IN DRY TYPE TRANSFORMERS	PAYNE P. (202)388-2138		9/21/95	PAR APPROVED
C57.138 NEW	RECOMMENDED PRACTICE FOR ROUTINE IMPULSE TEST FOR DISTRIBUTION TRANSFORMERS	ROSSETTI J. (901)528-4743	T&D IA/PSE PSIM	9/19/96	Being Balloted
C57.15 NONE	REQUIREMENTS, TERMINOLOGY, & TEST CODE FOR STEP-VOLTAGE REGULATORS	DIAMANTIS T. (315)428-5688	SUBS IAS/PSE	3/18/87 9/21/95 1997	REVISE/REAFFIRM BEFORE 10/31/97 Par extended to 9/99
C57.16 PC57.16	STANDARD REQUIREMENTS, TERMINOLOGY, AND TEST CODE FOR DRY-TYPE AIR-CORE SERIES CONNECTED REACTORS	DUDLEY R. (416)298-8108	NEMA IAS T&D	12/10/96 2001	APPROVED BY STANDARDS BOARD ON 12/10/96
C57.21 PC57.21	REQUIREMENTS TERMINOLOGY, AND TEST CODE FOR SHUNT REACTORS RATED OVER 500kVA	DUDLEY R. (416)298-8108		4/2/91 1995	PAR MORE THAN 4 YEAR OLD ACTION NEEDED ON PAR
C57.21 PC57.21a	REQUIREMENTS,TERMINOLOGY AND TEST CODE FOR SH. REACTORS OVER 500kVA	KENNEDY W. N. (317)286-9387	NONE	4/2/91 12/11/86 1995	PAR MORE THAN 4 YEAR OLD PAR WITHDRAWN
C57.94 NONE	RECOMMENDED PRACTICE FOR INSTALLATION, APPLICATION,OPERATION & MAINTENANCE OF DRY-TYPE GEN PURPOSE DIST & POWER TR	PATTERSON W. (919)848-1860		12/9/87 1992	PUB. 1982, REAFFIRMED 1987 BALLOTTING REAFFIRMATION
C57.96 PC57.96	GUIDE FOR LOADING DRY-TYPE DISTRIBUTION AND POWER TRANSFORMERS	PIERCE L. (706)291-3166	T&D IA/PSE SCC14 SCC10	4/26/89 12/10/96 2000	
C57.98 PC57.98	IEEE GUIDE FOR TRANSFORMER IMPULSE TESTS	POULIN B. (408)957-8326	NONE	6/1/86 12/2/93 1999	PUBLISHED JAN 95 DISCUSS PAR BUSINESS

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
C57.99 P731	GUIDE FOR LOADING DRY-TYPE AND OIL-IMMERSED CURRENT-LIMITING REACTORS	DUDLEY R. (416) 298-8108		3/28/78 1990	NEEDS REVISION (PAR TOO OLD) PAR WITHDRAWN
IEEE 259 P259	TEST PROCEDURE FOR EVALUATION OF SYSTEMS OF INSULATION FOR SPECIALTY TRANSFORMERS	SIMPSON R. W. JR. (603)284-4362		6/22/72 3/21/96 1979	BALLOTING GROUP BEING FORMED
IEEE 62.1 P 62	GUIDE FOR DIAGNOSTIC FIELD TESTING OF POWER APPARATUS, PART I: OIL-FILLED POWER TRANSFORMERS, REGULATORS AND REACTORS	YOUNG F. N. (216)447-2649		3/17/94	APPROVED BY REVCOM 03/15/95 PUBLISHED
IEEE1350 P1350	GUIDE FOR PROTECTION OF DISTRIBUTION TRANSFORMERS WITH EMPHASIS ON SECONDARY (LOW VOLTAGE SIDE) SURGES	ROSSETTI J. (901)528-4743	SPD T&D IC	0	PAR WITHDRAWN ON 3/20/97, COVERED BY C62.22
IEEE1388 P1388	STANDARD FOR THE ELECTRONIC REPORTING OF TRANSFORMER TEST DATA	McCAIN A. (410)291-3231	EEI PSR NEMA CS SAB ASC X12	9/15/93 0	PREPARING DI NO. CHANGED FROM C57.132
SUBCOMMITTEE:	**HVDC CONVERTER TR & REACTOR**				
CHAIR:	**W. N. KENNEDY**				
PHONE:	**(317)286-9387**				
C57.129 PC57.129	GENERAL REQUIREMENTS & TEST CODE FOR OIL IMMERSED HVDC CONVERTER TRANSFORMERS AND SMOOTHING REACTORS FOR DC POWER TRANSM	KENNEDY W. N. (317)286-9387	EM SUB T&D PSIM	9/26/91 0	PAR EXTENDED TO OCTOBER 97
IEEE1277 P1277	GENERAL REQUIREMENTS & TEST CODE FOR OIL IMMERSED AND DRY-TYPE HVDC SMOOTHING REACTORS	(317)286-9387	SUB	9/25/91 0	PAR EXTENDED TO 31 Oct 1999

STANDARD / PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION		PUB DATE / PAR DATE / REV DUE	STATUS AND COMMENTS
SUBCOMMITTEE:	**INSULATION LIFE**					
CHAIR:	**L. W. PIERCE**					
PHONE:	**(706)291-3166**					
C57.100	TEST PROCEDURE FOR THERMAL EVALUATION OF OIL-IMMERSED DISTRIBUTION TRANSFORMERS	LOWDERMILK L. (704)462-3113	PE/PSR	PE/SUB	3/18/92	REVISE/REAFFIRM BEFORE 10/31/97
C57.100			IA/PSE	IEC TC 14	12/10/96	Par Extended to 12/2000
			PE/T&D		1997	
C57.104	GUIDE FOR THE DETECTION AND DETERMINATION OF GENERATED GAS IN OIL-IMMERSED TRANSFORMERS & THEIR RELATION TO SERVICEABIL.	HEINRICHS F. W. (412)941-6924	PE/IC		6/7/92	
PC57.104			PE/SUB		12/10/96	REVIEW DATE EXTENDED TO 12/2000
			PE/T&D		2000	
C57.106			NONE		11/20/91	REVISE/REAFFIRM BEFORE 10/31/97
PC57.106		(617)926-4900			6/19/86	REQUEST PAR EXT. TO JUNE 97
					1996	
C57.111	GUIDE FOR ACCEPTANCE OF SILICONE INSULATING FLUID AND ITS MAINTENANCE IN TRANSFORMERS	(617)926-4900	IAS	IEC	2/2/89	REAFFIRMED 03/15/1995
NONE			T&D		12/10/87	ASK FOR FOR PAR EXTENSION
			ED&PG		2000	
C57.115	GUIDE FOR LOADING MINERAL-OIL-IMMERSED POWER TRANSFORMERS RATED IN EXCESS OF 100MVA (65 C WINDING RISE)	PIERCE L. W. (706)291-3166			3/21/91	STANDARD WITHDRAWN, COMBINED WITH C57.91
P756						
C57.119	RECOMMENDED PRACTICE FOR PERFORMING TEMP. RISE TESTS ON OIL-IMMERSED POWER TRANSFORMER AT LOADS BEYOND NP RATING (P838)	GRUBB R. L. (414)547-0121	SWGR	PSRC		BEING BALLOTED
P838			SUBS	IAS	9/17/92	PAR EXTENDED TO 10/30/98
			SCC4	EI	0	
C57.12.00	DEFINITION OF THERMAL DUPLICATE	GRUBB R. L. (414)547-0121	EM	PESC		PAR WITHDRAWN
PC57.12.001			IAS		5/31/90	WORK INCLUDED IN C57.12.00
			I&CPS		1997	
C57.12.90	STANDARD TEST CODE FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS	HENRY G. (501)534-5332				WILL START REVISING SECT. 11
NEW					1998	

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
C57.12.90 PC57.12.90	REVISION OF TEMPERATURE RISE TESTS	HENRY G. (501)543-6546			TO BALLOT D3 IN TF, WG, SC
C57.121 P954	GUIDE FOR ACCEPTANCE AND MAINTENANCE OF LESS FLAMMABLE HYDROCARBON FLUID IN TRANSFORMERS	McSHANE C. P. (617)926-4900	PSRC IEC T&D IAS	2/22/88 3/21/96 1996	BALLOTING GROUP BEING FORMED
C57.13 P546	REQUIREMENTS FOR INSTRUMENT TRANSFORMERS	NELSON T. (301)975-2956	PSIM PSR SPD	3/30/94 6/14/94 1999	WORKING ON CHANGES REV. PAR APPROVED 06/14/94
C57.13.1 PSRC	GUIDE FOR FIELD TESTING OF RELAYING CURRENT TRANSFORMERS	SMITH J. E. (919-827-2121		8/25/87 1997	R1992 RELAY COMM. DOCUMENT
C57.13.2 NONE	CONFORMANCE TEST PROCEDURES FOR INSTRUMENT TRANSFORMERS	SMITH J. E. (919-827-2121		4/16/86 9/26/91 1996	REVISE/REAFFIRM BEFORE 10/31/97 REQUEST PAR EXT. TO JUNE 97
C57.13.3 NONE	GUIDE FOR THE GROUNDING OF INSTRUMENT TR SECONDARY CICUITS AND CASES	SMITH J. E. (919-827-2121		1/23/87 1995	REVISE OR REAF. BY 12/96 R1990
C57.13.4 P832	DETECTION OF PARTIAL DISCHARGE AND MEASUREMENT OF APPARENT CHARGE WITHIN INSTRUMENT TRANSFORMERS	JONNATTI A. J. (813)785-2788	T&D	5/28/80 0	PAR WITHDRAWN DOCUMENT NEVER SUBMITTED TO SB
C57.13.5 PC57.13.5	TEST REQUIREMENTS FOR INSTRUMENT TRANSFORMERS OF A NOMINAL VOLTAGE OF 115KV AND ABOVE	MA J. (706)554-8800	SWGR EM TC 38 US T	9/19/96 0	REVISED PAR APPROVED 9/19/96
C57.13.6 PC57.13.6	REQUIREMENTS FOR INSTRUMENT TRANSFORMERS FOR USE WITH ELECTRONIC REVENUE METERS AND RELAYS	TEN-HAAGEN C. (603)749-8433	PSIM PSC PSR TD		REVISED PAR DISSAPROVED 9 /96 MAKE CHANGES AND RESUBMIT PAR

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
C57.130 PC57.130	T-U GUIDE FOR USE OF DISS. GAS ANALYSIS DURING FACTORY THERMAL TESTSFOR THE EVALUATION OF OIL-IMMERSED TRANS. AND REACT.	HEINRICHS F. W. (412)941-6924	NONE	3/17/93 0	PREPARING D11
C57.137 PC57.137		(617)926-4900			
C57.91 PC57.91	GUIDE FOR LOADING MINERAL OIL-IMMERSED TRANSFORMERS	PIERCE L. (706)291-3166	SUB T&D PSE	6/14/95 6/13/85 2000	APPLY FOR NEW PAR
C57.92 PC57.92	GUIDE FOR LOADING MINERAL OIL-IMMERSED POWER TRANSFORMERS UP TO & INCL 100 MVA WITH 55 C OR 65 C AVE. WINDING RISE	PIERCE L. (706)291-3166	T&D SUB PSE	3/21/91	STANDARD WITHDRAWN, COMBINED WITH C57.91
C57.95 NONE	GUIDE FOR LOADING LIQUID-IMMERSED STEP-VOLTAGE AND INDUCTION-VOLTAGE REGULATORS	(314)554-3097		3/21/91 1996	WITHDRAWN BY STANDARDS BOARD ON 12/10/96
IEEE 637 P637	GUIDE FOR THE RECLAMATION OF INSULATING OIL AND CRITERIA FOR ITS USE	(617)926-4900		6/4/84 1997	REAFFIRMED 03/18/92
IEEE 799 P799	GUIDE FOR HANDLING AND DISPOSING OF ASKARELS	(617)926-4900	EIS IAC T&D	11/17/86 9/27/79 1997	REVISE/REAFFIRM BEFORE 10/31/97
IEEE1258 P1258	TRIAL-USE GUIDE FOR INTERPRETATION OF GASES GENERATED IN SILICONE-IMMERSED TRANSFORMERS	GRYSZKIEWICZ f. (617)926-4900	T&D ICC	6/15/95 0	
IEEE1276 P1276	TRIAL-USE GENERAL REQUIREMENTS FOR LIQUID-FILLED DISTRIBUTION AND POWER TR UTILIZING HIGH TEMP SOLID INSULATING MATERIAL	FRANCHEK M. A. (802)748-3936	T&D	3/21/96 0	Approved for publication

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
SUBCOMMITTEE:	**PERFORMANCE CHARACTERISTICS**				
CHAIR:	**H. J. SIM**				
PHONE:	**(919)580-3234**				
C57.105 PC57.105	GUIDE FOR APPLICATION OF TRANSFORMER CONNECTIONS IN THREE-PHASE DISTRIBUTION SYSTEMS	REITTER G. (415)591-4463		6/17/92 1997	BALLOTING GROUP BEING FORMED FOR REAFFIR MATION REVISE/REAFFIRM BEFORE 10/31/97
C57.109 PC57.109	GUIDE FOR THROUGH-FAULT CURRENT DURATION	PATEL B. (205)877-7740	PSR	3/16/93 6/27/91 1998	APPLY FOR PAR TO REVISE
C57.110 PC57.110	RECOMMENDED PRACTICE FOR ESTABLISHING TRANSFORMER CAPABILITY WHEN SUPPLYING NONSINUSOIDAL LOAD CURRENTS	MAREK R. P. (804)838-8080	T&D IA/PSE PSR NEMA	12/3/92 9/19/96 1997	BALLOTING GROUP BEING FORMED PAR Extended to 12/2000
C57.116 NONE	GUIDE FOR TRANSFORMERS DIRECTLTY CONNECTED TO GENERATORS	REITTER G. (415)508-2864		1/3/89 6/28/79 1999	REAFFIRMED IS REVISION NEEDED?
C57.117 P786	GUIDE FOR REPORTING FAILURE DATA FOR POWER TRANSFORMERS AND SHUNT REACTORS	ALTMAN M. (407)694-4975		6/17/92 1997	REVISE/REAFFIRM BEFORE 10/31/97
C57.12.00 PC57.12.00	SECTION 5.9 - AUXILIARY LOSSES ON CLAS I AND CLASS II POWER TRANSFORMERS	TULI S. (414)547-0121			BALLOTING
C57.12.00 PC57.12.00	TABLE 9 - DATE OF MANUFACTURE ON NAMEPLATE	PLATTS D. (610)774-4686			APPROVED BY SUBCOMMITTEE
C57.12.00 PC57.12.00	TABLE 9 - PCB STATEMENT ON NAMEPLATE	PLATTS D. (610)774-4686			APPROVED BY SUBCOMMITTEE

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
C57.12.00 PC57.12.00	9.3 TABLE 19 - TOLERANCE FOR LOSSES	HENNING W. (414)547-0121			TO BE BALLOTED
C57.12.00 PC57.12.00	SECTION 5.1 - COOLING CLASS REVISION TO CONFORM TO IEC	PLATTS D. W. (610) 774-4686			BALLOTING
C57.12.00 PC57.12.00	SECTION 8 - TESTING OF LTC CONNECTIONS	PLATTS D. (610)774-4686			BALLOTING
C57.12.00 PC57.12.00	TABLE 17 - MECHANICAL LIFTING REQUIREMENTS CLARIFICATION	PLATTS D. (610)774-4686			UNDER DEVELOPMENT
C57.12.00 PC57.12.00	SECTION 8 - DIELECTRIC TESTING OF SECONDARY CONTROL WIRING	TULI S. (414)547-0121			BALLOTING
C57.12.00 PC57.12.00m	GENERAL REQUIREMENTS FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS	PLATTS D. (610)774-4686			INCLUDE IN NEXT REVISION COORDINATE WITH S. TULI
C57.12.90 PC57.12.90	STANDARD TEST CODE FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS	SIM JIN (919)580-3234			NEW PAR NESCOM 03/15/95 COORDINATE WITH S. SMITH
C57.12.90 PC57.12.90	CLAUSE 15 - NEW CLAUSE FOR CERTIFICATION TEST DATA	JIN S. (919)580-3234			APPROVED BY PCS
C57.12.90 PC57.12.90	CLAUSE 9 - ADD MEASUREMENT OF AUXILARY LOSSES	TULI S. (414)547-0121			DI BALLOTED IN PCS

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION		PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
C57.123 P1098	GUIDE FOR TRANSFORMER LOSS MEASUREMENT	HENNING W. R. (414)547-0121			6/13/85 0	PAR EXTENDED TO OCTOBER 97
C57.125 PC57.125	GUIDE FOR FAILURE INVESTIGATION, DOCUMENTATION AND ANALYSIS FOR POWER TRANSFORMERS AND SHUNT REACTORS	ALTMAN M. (407)694-4975	T&D ED&PG PSE	SWGR	6/27/91 6/28/87 1996	BALLOTING REAFFIRMATION REVISE/REAFFIRM BEFORE 10/31/97
C57.131 PC57.131	REQUIREMENTS FOR LOAD TAP CHANGERS	TRAUB T. P. (312)394-2704			3/16/95 0	
C57.133 PC57.133	GUIDE FOR SHORT-CIRCUIT TESTING OF DISTRIBUTION AND POWER TRANSFORMERS	McQUIN N. (412) 829-1205	T&D,SWG PSR IECTC14	SUBS IAS/PSE IAS/REP	9/21/95	PAR APPROVED PART II OF C57.12.90
C57.18.10 PC57.18.10	REQUIREMENTS FOR SEMICONDUCTOR RECTIFIER TRANSFORMERS	KENNEDY S. P. (716)896-6500	NONE		12/28/81 0	PAR approved Sept 16 1997 BALLOTING GROUP BEING FORMED
C57.21 PC57.21	REQUIREMENTS,TERMINOLOGY, AND TEST CODE FOR SHUNT REACTORS RATED OVER 500kVA	McGILL J. W. (414)475-3422	EM T&D PSR		4/2/91 6/9/88 2000	APPLY FOR PAR EXTENSION R1995
IEEE 638 P638	QUALIFICATION OF CLASS 1E TR FOR NUCLEAR POWER GENERATING STATIONS	PIERCE L. W. (706)291-3166	NPE SUB SC2	SCC10	3/19/92 10/29/90 1997	BALLOTING GROUP FORMED TO REAFFIRM REVISE/REAFFIRM BEFORE 10/31/97

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION		PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
SUBCOMMITTEE:	**STANDARDS**					
CHAIR:	**T.A. PREVOST**					
PHONE:	**(312)394-2704**					
C57.12.00 VARIOUS	GENERAL REQUIREMENTS FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS	TULI S. (414)547-0121	T&D PSRC SWG	SUBS IAS IEC-TC14	6/16/93 6/15/95 1998	FORMING BALOTTING GROUP EDITING REVISION
C57.12.00 PC57.12.00	TABLE 5 - CORRECTION OF TYPO. ERRORS	TULI S. (414)547-0121				CORRECTIONS BEING DONE
C57.12.10 ANSI	TRANSFORMERS 230kV AND BELOW - 8333/10417kVA 1 PH, -100000 kVA 3 PH w/o LTC, -100000kVA w/ LTC - SAFETY REQUIREMENTS	(312)394-2704			6/4/87 1993	ANSI STANDARD NEEDS A HOME, DUE FOR REAF.
C57.12.13 ANSI	CONFORMANCE REQUIREMENTS FOR LIQUID-FILLED TRANSFORMERS USED IN UNIT INSTALLATIONS INCL. UNIT SUBSTATIONS				9/2/81 1987	ASSIGN TO SUBCOMMITTEE NEMA STANDARD
C57.12.53 ANSI	REQUIREMENTS FOR DRY-TYPE, UNDERGROUND, SINGLE-PHASE WITH SEPARABLE INSULATED H-V 24940 grdY/14400 V AND <; LV 240/120 V				0	ONLY TITLE EXIST (NO PAR) IS IT REQUIRED?
C57.12.54 ANSI	REQUIREMENTS FOR DRY-TYPE, UNDERGROUND 3 PHASE DISTRIBUTION TRANSFORMERS,2500 kVA OR <, HV 24940 grdY/14400 OR <,LV 480V				0	ONLY TITLE EXISTS IS IT REQUIRED?
C57.12.70 NONE	TERMINAL MARKINGS AND CONNECTIONS FOR DIST. & POWER TRANSFORMERS	TRAUB T. P. (312)394-2704	T&D SUBS ICC		6/18/92 6/14/95 1997	BEING BALLOTED
C57.12.80 NONE	TERMINOLOGY FOR POWER & DISTRIBUTION TRANSFORMERS	TRAUB T. P. (312)394-2704	T&D SUBS		5/1/92 6/14/95 1997	BEING BALLOTED PAR extended to 6/99

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION		PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
C57.12.90	STANDARD TEST CODE FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS & GUIDE FOR SC TESTING OF ...	SMITH S. D. (606)879-2757	T&D	IECTC14	3/16/93	MAKING RUNNING CHANGE LIST
VARIOUS			PSRC	USTAG	6/15/95	WG COLLECTING CHANGES
			SWG		1998	
C57.17	REQUIREMENTS FOR ARC FURNACE TRANSFORMERS					LAST REVISED IN 1986
ANSI					1986	ANSI DOCUMENT
SUBCOMMITTEE:	**UG TR & NETWORK PROTECTORS**					
CHAIR:	**P. E. OREHEK**					
PHONE:	**(201)430-7743**					
C57.12.24	UNDERGROUND-TYPE 3-PHASE DISTRIBUTION TRANSFORMERS,2500kVA AND SMALLER: HV,34500GrdY..& BELOW,LV,480 V AND BELOW	NIEMANN C. (708)410-5307	T&D	IAS/PSEC	5/10/88	PAR APPROVED 6/20/96
PC57.12.24			IC	IEC TC 14	6/20/96	
			IAS/REPC		1993	
C57.12.40	REQUIREMENTS FOR SECONDARY NETWORK TRANSFORMERS, SUBWAY & VAULT TYPES (LIQUID IMMERSED)	BERTOLINI E. A. (212)460-4913	T&D	IAS/PSEC	3/19/92	PAR APPROVED ON 6/26/97
PC57.12.40			ICC	IEC TC14	6/26/97	PUBLISHED JAN 1996
			IAS/REPC	NEMA	1997	
C57.12.44	STANDARD REQUIREMENTS FOR SECONDARY NETWORK PROTECTORS	MULKEY D. H. (415)973-4699	T&D	IAS/PSEC	12/20/94	PUBLISHED DEC 94
PC57.12.44			SWGR	EEI	9/21/95	PAR APPROVED 09/21/95
			IAS/REPC	NEMA	1999	
C57.12.57	REQUIREMENTS FOR VENTILATED DRY-TYPE NETWORK TRANSFORMERS 2500kVA AND BELOW, W/HV 34500V AND BELOW,LV 216Y..AND 480Y..	NUTT B. (214)698-7447	T&D		3/18/92	REVISE/REAFFIRM BEFORE 10/31/97
PC57.12.57			EEI/T&D		12/5/91	APPLY FOR NEW PAR
			SCC14		1997	

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION		PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
SUBCOMMITTEE:	WEST COAST					
CHAIR:	E. G. HAGER					
PHONE:	(619)789-3022					
C57.114 P513	SEISMIC GUIDE FOR POWER TRANSFORMERS AND REACTORS	OKLU S. (213)481-4823	NPE SUBS		2/15/90	STANDARD WITHDRAWN
C57.12.11 PC57.93	GUIDE FOR INSTALLATION OF OIL-IMMERSED TRANSFORMERS (10MVA & LARGER, 69-287kV RATING)	GILLIES D. A. (503)622-4847			5/9/80	TO BE REPLACED BY C57.93
C57.12.12 PC57.93	GUIDE FOR INSTALLATION OF OIL-IMMERSED TRANSFORMERS 345kV AND ABOVE	GILLIES D. A. (503)622-4847			5/9/80	TO BE REPLACED BY C57.93
C57.120 P842	LOSS EVALUATION GUIDE FOR POWER TRANSFORMERS AND REACTORS	JACOBSEN R.	SUB EM ED&PG	IAS IEC	12/3/91 5/1/80 1996	BALLOTING GROUP FORMED TO REAFFIRM REVISE/REAFFIRM BEFORE 10/31/97
C57.128 PC57.128	FIRE PROTECTION OF OUTDOOR LIQUID-IMMERSED POWER TRANSFORMERS	HAGER R.	NPE SUB PSR		6/1/89 0	APPLY FOR NEW PAR
C57.135 PC57.135	GUIDE FOR APPLICATION, TESTING, INSTALLATION AND OPERATION OF PHASE ANGLE SHIFTING TRANSFORMERS	TRUMMER E. 43-3172-606-404	PSRC EMC IAS/PSP	IEC TC14	6/20/96 0	PAR Approved 6/20/96
C57.93 PC57.93	GUIDE FOR INSTALLATION OF LIQUID-IMMERSED POWER TRANSFORMERS.	GILLIES D. A. (503)622-4847	NONE		12/12/95 0	REVISION APPROVED 12/11/95 WITHDRAW 12.11/12.12 WHEN APP.

IEEE/PES TRANSFORMERS COMMITTEE ATTENDANCE STATISTICS

GROUPS	Dallas Mar. 94	Milw Sep. 94	Kan. City Apr. 95	Boston Nov. 95	San[illegible] Apr.96	[illegible] Oct.96	[illegible] Jul.97	[illegible] Nov.97	[illegible] MAX	[illegible] AVG
Committee Registration: Members and Guests	247	275	286	272	301	287	164	282	301	262
Spouses	43	55	45	51	64	67	91	32	91	59
Luncheon	125	149	158	165	167	148	108	147	167	146
SC ADMINISTRATIVE	20	22	22	20	21	19	17	19	22	20
SC AUDIBLE NOISE AND VIBRATION	29	32	18	26	34	23	9	22	34	24
SC BUSHINGS	39	36	35	32	32	29	32	23	39	34
WG Bushing Application Guide	22	23							23	23
TF Draw Lead Bushings			18	25		17		21	25	20
WG DC Applications of Bushings	17	19	21	19	19				21	19
WG Revision C57.19.01	22	23	32	30	30	28	26	24	32	27
SC DIELECTRIC TESTS	79	84	99	71	88	91	58	71	99	81
WG Low FrequencyTests	53	56	40	39	50	49	40	31	56	47
TF on Revision of the Induced Test	38	30	48	28	32	41	24		48	34
TF Metal Oxide Surge Arrester Coordination	25	35	31	14	22				35	25
WG Rev. Dielectric Tests on Distr. Transf.		16	15	14	16	13		14	16	15
TF Rev. Distr. Impulse Guide		17	19	18	16	13			19	17
WG Diagnostic Field Testing & Monitoring				64	89	94	70	66	94	79
TF On-line Monitor Communication							27	28	27	27
WG Partial Discharge Tests	23	27		27	35	44	37	43	44	32
SC DISTRIBUTION TRANSFORMERS	47	49	48	44	37	45	11	37	49	40
WG Overhead Type Distr. Transfs. C57.12.20	34	34	30	30		23			34	30
WG Single-Phase Submersible C57.12.23		15	30	23					30	23
WG Single-Phase Deadfront Padmount C57.12.25	30	28	30	29		28		35	30	29
WG Bar Coding	22	30	35	29				25	35	29
WG Loss Evaluation	44	57	40	47				55	57	47
WG Electronic Data Transmittal	27	36	35	33				20	36	33
WG Combination of C57.12.22 and .26	27	28	30	28					30	28
WG Step-Voltage and Induction Regs C57.15		25	40	33				26	40	33
SC DRY-TYPE TRANSFORMERS	33	41	45	37		33	21	32	45	35
WG Test Code C57.91	24	28		27		18		20	28	24
WG Dry-Type Reactors	7	12	13	10	14	8	8	7	14	10
WG Dry-Type Reactors - HVDC Smoothing	5	10	6	7	5	6	12		12	7
WG Dry-Type Thermal Eval. and Flammability			20	21		27	15	24	27	21
WG Dry-Type General Requirements C57.12.01	21	21	36	27	20	27	5	30	36	22
WG Insulation Req. for Specialty Transf.	8	10	10	9	11	17		6	17	11
WG Cast Coil Loading Guide	17	16	24	21	19	18	19	21	24	19
WG Hot Spot Diferentials	16	31	38	28	34	32		27	38	30
SC HVDC CONVERTER TRANS. & REACTORS		15	13		11	9	8	6	15	11

NOTE: Data maintained for four years only.

* = estimated

IEEE/PES TRANSFORMERS COMMITTEE ATTENDANCE STATISTICS

GROUPS	Dallas Mar. 94	Milw Sep. 94	Kan. City Apr. 95	Boston Nov. 95	Seal Apr. 96	[illegible] Oct. 96	[illegible] Jul 97	[illegible] Nov. 97	MAX	AVG
SC INSTRUMENT TRANSFORMERS	21	13	13	18		26	9	10	26	17
WG Test Req Instr Transf >115 kVA		22	30	22	16		7	13	30	19
WG Revision of C57.13		11	13	20	20		9	10	20	15
SC INSULATING FLUIDS	50	44	61	58	68	69	33	71	69	55
WG Gas Analysis During Factory Tests		44	61	58					61	54
WG Gas Analysis Silicone Transformers		44	61	58					61	54
SC INSULATION LIFE	63	45	49	57	65	60	18	55	65	51
WG Guides for Loading	61								61	61
WG Thermal Eval. of Distr. and Power Transf.	11				32				32	22
WG Thermal Tests	30	58	34	21	33	32	19		58	32
TF Revision of Temperature Test Code		20	22	19	37				37	25
TF Thermal Duplicate	27	31		26	20	37		30	37	28
TF Hottest Spot Temp. Rise	31	36	44	52	51	40		56	52	42
TF Winding Temperature Indicators	52	48	50	46	48	41	25	26	52	44
SC PERFORMANCE CHARACTERISTICS	83	93	88	99	106	108	49	74	108	89
WG Loss Tolerance and Measurement	35	45	36	34	37	30	27	18	45	35
TF Loss Measurement Guide		16							16	16
TF Low Power Factor Measurements		33							33	33
WG LTC Performance Requirements	37	41						34	41	39
WG PCS Rev. C57.12.00	20	21	38	29		46	23	19	46	30
WG PCS Rev. C57.12.90 Part I	15	19	15	23	34	49		21	49	26
WG PCS Rev. Short circuit Testing				5			29	19	29	17
WG Revision C57.110	35	30	39	40	34	42	22	39	42	35
WG Semi-Conductor Rectifier Transformers	23	22	29	33	28	26	18	19	33	26
WG Switching Transients							30	22	30	30
SC STANDARDS	13	12	17	14	24	19	9		24	15
WG Continuous Revision C57.12.00			15	15					15	15
WG Continuous Revision C57.12.90			15	15					15	15
WG Terminology,Definitions,Units,& Markings		21	37	29					37	29
SC UNDERGRND. TRANF. & NETWK. PROTCR	20	19	15	12	12	13	6	13	20	14
WG Three-Phase Underground Transfs.	16	16	10	13	10	12	5	13	16	12
WG Liquid-Filled Sec. Network Transfs.	16	15	15	15	12	13	6	16	16	13
WG Secondary Network Protectors	17	13	13	13	11	13	5	16	17	12
WG Dry-Type Network Transfs.	10	12	6	9					12	9
SC WEST COAST			26		9	12	15	13	26	16
WG Consolidation of Installation Guides									0	0
WG Phase Shifting Transformers			15	18	36	38	31	26	38	28
WG Seismic Guide									0	0
WG Loss Evaluation Guide									0	0
WG Fire Protection									0	0

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NOTE: Data maintained for four years only.

* = estimated