

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

JULY 18, 1997

GRAZ, AUSTRIA

**IEEE/PES TRANSFORMERS COMMITTEE MEETING
GRAZ, AUSTRIA
JULY 18,1997**

ATTENDANCE SUMMARY

MEMBERS PRESENT

D. J. Allan	R. Allustiarti	J. Arteaga	R. L. Barker
W. B. Binder, Jr.	D. J. Cash	D. Chu	J. L. Corkran
V. Dahinden	R. C. Degeneff	R. F. Dudley	F. E. Elliott
D. J. Fallon	D. L. Galloway	R. L. Grubb	R. L. Grunert
E.G. Hager, Jr.	E. Hanique	K. S. Hanus	J. H. Harlow
R. R. Hayes	W. R. Henning	P. J. Hopkinson	C. W. Johnson, Jr.
A. J. Jonnatti	L. E. Juhlin	J. J. Kelly	S. P. Kennedy
S. R. Lindgren	R. P. Marek	J. W. Matthews	J. W. McGill
C. P. McShane	R. McTaggart	S. P. Mehta	M. I. Mitelman
H. R. Moore	W. E. Morehart	D. H. Mulkey	R. J. Musil
C. G. Niemann	P. E. Orehek	K. Papp	B. K. Patel
W. F. Patterson, Jr.	J. M. Patton	P. A. Payne	D. Perco
R. L. Plaster	D. W. Platts	B. Poulin	T. A. Prevost
J. Puri	P. Riffon	P. G. Risse	C. A. Robbins
H. J. Sim	P. Singh	K. R. Skinger	J. E. Smith
S. D. Smith	L. R. Stensland	E. R. Trummer	S. C. Tuli
R. A. Veitch	L. B. Wagenaar	A. L. Wilks	

MEMBERS ABSENT

E. J. Adolphson	M. S. Altman	G. Andersen	J. C. Arnold, Jr.
J. Aubin	R. A. Bancroft	D. A. Barnard	S. Bennon
E. A. Bertolini	J. H. Bishop	W. E. Boettger	J. V. Bonucchi
J. D. Borst	C. V. Brown	D. S. Brucker	M. Cambre, Jr.
T. F. Clark	O. R. Compton	D. W. Crofts	J. C. Crouse
J. N. Davis	T. Diamantis	L. E. Dix	J. K. Easley
J. A. Ebert	K. D. Edwards	P. T. Feghali	J. A. Fleeman
S. L. Foster	M. A. Franchek	J. M. Frank	A. A. Ghafourian
D. A. Gillies	R. S. Girgis	R. D. Graham	F. J. Gryszkiewicz
M. E. Haas	G. H. Hall	N. W. Hansen	F. W. Heinrichs
K. R. Highton	P. J. Hoefler	T. L. Holdway	C. C. Honey
E. Howells	J. Hunt	P. Iijima	V. C. Honsa
D. C. Johnson	R. D. Jordan	E. Kallaur	C. P. Kappeler
W. N. Kennedy	A. D. Kline	E. Koenig	J. G. Lackey
M. Y. Lau	J. P. Lazar	F. A. Lewis	T. D. Lewis
H. F. Light	L. W. Long	M. C. Loveless	L. A. Lowdermilk
D. L. Lowe	R. I. Lowe	J. Ma	W. A. Maguire
K. T. Massouda	A. D. McCain	C. J. McMillen	N. P. McQuin
C. K. Miller	R. E. Minkwitz, Sr.	C. R. Murray	W. H. Mutschler, Jr.
E. T. Norton	G. A. Paiva	H. A. Pearce	L. C. Pearson
T. J. Pekarek	M. D. Perkins	V. Q. Pham	L. W. Pierce
D. R. Purohit	V. Raff	C. T. Raymond	S.M.A. Rizvi
R. B. Robertson	A. L. Robinson	J. R. Rossetti	G. W. Rowe
M. P. Sampat	V.S.N. Sankar	L. J. Savio	W. E. Saxon
R. W. Scheu	D. N. Sharma	V. Shenoy	J. E. Smith
J. W. Smith	L. R. Smith	R. J. Stahara	W. W. Stein
R. W. Stoner	J. C. Sullivan	D. W. Sundin	J. B. Templeton
V. Thenappan	R. C. Thomas	J. A. Thompson	R. W. Thompson
T. P. Traub	G. H. Vaillancourt	B. H. Ward	F. N. Weffer
R. J. Whearty	D. W. Whitley	C. W. Williams, Jr.	W. G. Wimmer
D. J. Woodcock	W. E. Wrenn		

GUESTS PRESENT

T. M. Adams	I. J. Addison	D. Aho	S. Antosz
K. Atout	O. M. Bello	E. Betancourt	T. E. Blackburn III
J. Bosiger	B. CHIU	C. A. Colopy	D. Corsi
A. M. Delgado	D. Dohnal	K. P. Ellis	R.H. Fausch
B. I. Forsyth	R. Fox	J. A. Gauthier	A. C. Hall
J. W. Harley	R. H. Hartgrove	T. Huff	M. Iman
B. Jensen	V. KARIUS	C.J. Kalra	V. M. Khalin
L. A. Kirchner	T. LUNDQUIST	D. MacMillan	A. Molden
T. N Nelson	A. F. O'Neill	S.Y. PATEL	F. PERRI
G. Preininger	J.L. Progar	R. L. Provost	G. J. Reitter
J. C. Riboud	D. J. Rolling	W. SEITLINGER	W. W. Schwartz
R. W. Simpson, Jr.	S. L. Snyder	B. Sparling	C. L. Stiegemeier
J. Tuohy	R. D. Wakeam	M. YOUSUFF	

Contents

CLAUSE	PAGE
1.0 Chairman's Report - W. B. Binder	1
1.1 Report on the Technical Council Meeting, February 4, 1997 in New York	1
1.2 Transformers Committee Report to Technical Council	2
1.3 Transformer Committee Goals	5
2.0 Approval of Minutes of October 30, 1996 - W. B. Binder	5
3.0 Vice Chair's Report - J. W. Matthews	6
3.1 PES Technical Council Committees	6
3.2 Technical Paper Reviews	7
3.3 1997 IEEE/PES Summer Power Meeting Panel Session	8
3.4 Future Meeting Schedule:	8
4.0 Administrative Subcommittee - W. B. Binder	9
4.1 Introduction of Members and Guests	9
4.2 Approval of the Burlington Meeting Minutes	9
4.3 Additions to and/or Approval of the Agenda	9
4.4 Committee Finances and Meeting Arrangements	9
4.5 Chair's Report - W. B. Binder	10
4.6 Standards Subcommittee - T. A. Prevost	10
4.7 Status of IEEE Standards - D. Ramsden	10
4.8 Status of ANSI C57 Committee - J. D. Borst	10
4.9 Subcommittee Activities - Subcommittee Chairs	11
4.10 Recognition and Awards Subcommittee - J. H. Harlow	12
4.11 Vice Chair's Report - J. W. Matthews	12
4.12 Secretary's Report - B. K. Patel	13
4.13 Old Business	14
4.14 New Business	15
4.15 Adjournment	15
5.0 Transformers Standards - T. A. Prevost	17
5.1 Transformers Standards and Coordination Activities	17
5.2 Documents Submitted to the Standards Board	17
5.3 Standards Due for Reaffirmation, Revision or Withdrawal Before December 31, 1997	18
5.4 Projects Being Balloted or Ready to Ballot (Balloting Group Formed)	18
5.5 PAR Submittals	18
5.6 Transformer Committee Projects to be Balloted in Next 12 Months	19
5.7 Next Standards Board Meetings and Submittal Deadlines	20
5.8 PES Standards Coordinating Committee Meeting	20
5.9 Standards Subcommittee Meeting	22
6.0 Recognition and Awards - J. H. Harlow	25
6.1 Certificates of Appreciation	25
6.2 Technical Council Awards	25

Contents (cont'd)	PAGE
7.0 Reports of Technical Subcommittees	27
7.1 Audible Sound and Vibration - J. Puri, Chair.....	27
7.2 Bushings - F. E. Elliott, Chair	29
7.3 Dielectric Test - L.B. Wagenaar - Chair	43
7.4 Distribution Transformers - K. S. Hanus, Chair	52
7.5 Dry-Type Transformers - W. F. Patterson, Chair.....	58
7.6 HVDC Converter Transformers & Smoothing Reactors S.C. - W. N. Kennedy, Chair.....	67
7.7 Instrument Transformers - J. E. Smith, Chair	70
7.8 Insulating Fluids - F. J. Gryzkiewicz, Chair.....	73
7.9 Insulation Life - L. W. Pierce, Chair.....	76
7.10 Performance Characteristics - H. Jin Sim, Chair	81
7.11 Underground Transformers & Network Protectors - P. E. Orehek, Chair.....	92
7.12 West Coast - E. G. Hager, Chair.....	95
8.0 Reports of Liaison Representatives	98
8.1 EPRI - S. R. Lindgren	98
8.2 SCC4 - P. A. Payne	101
8.3 CIGRE SC12 - W. N. Kennedy	101
8.4 TC 14 TAG - P. J. Hopkinson	101
9.0 Old Business	103
9.1 Bob's Proposal	103
10.0 New Business	112
11.0 Adjournment	112
Attachment 1 - Committee Standards Status - Numerical Listing	113
Attachment 2 - Committee Coordination Activities.....	131
Attachment 3 - Committee Liaison Representatives	137
Attachment 4 - Committee Attendance Statistics	139

IEEE PES TRANSFORMERS COMMITTEE MEETING
FRIDAY, JULY 18, 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 Edgar Trummer and his associates for the excellent meeting arrangements. The Committee thanked the Host Committee with a round of applause. This was the first committee meeting ever outside North America.

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

Mr. Binder highlighted the discussions held during the Administrative Subcommittee on July 15, 1997. See the Administrative Subcommittee Meeting Minutes in Clause 4.0 for details.

1.1 Report on the Technical Council Meeting, February 4, 1997 in New York

Technical Committee delegates met to deal with policy matters, approve the recommendations of the standing committees, set goals for the committees, and plan the technical operation of PES. Goals have been established to keep PES, as an international organization, at the forefront of electrotechnology standards development and dissemination of technical information. To achieve these ends, the Governing Board of PES has selected two non-North American sites for the Summer Power Meetings and have recommended changes in the publication policies of PES. These are the current topics of discussion at Technical Council, and have been for several years. Developing interfaces with our peers in the international arena (IEC Standards and CIGRE) is becoming a way of achieving the scope of PES. Recognizing the world class electro-technologies, their benefits and their limitations, is becoming a way of achieving the scope of PES. Both are part of the value it brings to its members and the community.

1.1.1 Trade Show Booth

The Technical Council decided in 1996 that an information effort on "what we do", on "who we are," and on our current projects is called for, especially for our foreign visitors. A "Trade Show" was set up to describe the efforts of the Technical Committees about technical papers and education and in standards. The Transformers Committee was one of the most visible and well prepared of these "Trade Show booths."

1.1.2 Poster Session on General Topics

The new publication policy, first implemented at this meeting, no longer requires presentation before publication. For those authors who wished to make a presentation, the poster session was arranged for general viewing and participation. The three papers approved by the Transformers Committee were presented.

1.1.3 1997 Summer Power Meeting in Berlin

PES plans a "Mini Trade Show" for the Berlin Summer Meeting. PES has enlisted the aid of an ad agency to prepare a world class presentation. At this "Trade Show," each Technical Committee of PES will present brochures or examples of what the committee does. They will aim this at our counterparts in Europe to help them understand our activities better.

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 last week (July 15-18, 1997) in Graz, Austria. Mr. Edgar Trummer of Elin Transformers was our host. A respectable turnout of 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

Fall '97:

November 16-19, 1997, Adams Mark Hotel, St. Louis, MO, USA. Contact Jerry Bishop, host @ Union Electric +(314) 554-2311, fax +(314)554-3268, jerry_h_bishop@ue.com or one of the Committee Officers.

Spring '98:

April 26-29, 1998, Excelsior hotel, Little Rock, AR, USA. Contact Ed Smith, host @ Central Moloney +(501) 543-6565, fax +(501)543-6528, esmcmi@soark.net or one of the Committee Officers.

Fall '98:

Guanajuato, Mexico. Contact Gordon Denny, host @ Ferranti Packard de Mexico +(52)(473) 30505, fax +(52)(473) 31415 or one of the Committee Officers.

Spring '99:

April 11-16, 1999, New Orleans, LA, USA during the 1999 April T & D Conference.
Contact Ken Bow @ Dow Chemical +(614)587-4386 or one of the Committee Officers.

Fall '99:

Monterey, Mexico. Contact John C. Crouse, General Electric, Rome, GA, USA @ +(706)291-3469, fax +(706)291-3426 or one of the Committee Officers.

Spring 2000:

OPEN. Contact one of the Committee Officers.

Fall 2000:

Niagara Falls, Ontario, Canada. Contact Roger Hayes, host @ Ferranti-Packard Ltd. +(905)685-6551, fax +(905)685-9783 or one of the Committee Officers.

COMMITTEE OFFICERS

CHAIRMAN

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STANDARDS COORDINATOR

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SUBCOMMITTEES

Audible Sound and Vibration Subcommittee, J. Puri, Chair
Bushings Subcommittee, F. E. Elliott, Chair
Dielectric Tests Subcommittee, L. B. Wagenaar, Chair
Distribution Transformers Subcommittee, K. S. Hanus, Chair
Dry-Type Subcommittee, W. F. Patterson, Chair
HVDC Converter Transformers and Smoothing Reactors Subcommittee, W. N. Kennedy, Chair
Insulating Fluids Subcommittee, F. J. Gryszkiewicz, Chair
Insulation Life Subcommittee, L. W. Pierce, Chair
Instrument Transformers Subcommittee, J. E. Smith, Chair
Performance Characteristics Subcommittee, H. J. Sim, Chair
Standards Subcommittee, T. P. Traub, Chair
Underground Transformers and Network Protectors Subcommittee, P. E. Orehek, Chair
West Coast Subcommittee, E. G. Hager, Jr., Chair.

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 yesterday afternoon July 22, 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, TA for IEC TC38, and two Working Group Chairmen who have recently developed harmonized Transformer standards were 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 P. Traub at (312) 335-8842. 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:

<http://ht.ireq.ca/~ghvaill/transformers.html>

Links to information on our future meeting sites and other information on Transformer Standards can also be found there.

Our WWW site will link you to the IEEE Standards Status Report that contains Titles, Abstracts, and names of contacts for each of the IEEE standards. This report is updated quarterly by the IEEE Standards Department. The status of transformer standards not listed in the IEEE quarterly report, either because they have been withdrawn, or they are not IEEE standards, are also included on the Transformers Committee Web site.

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.

1.3 Transformer Committee Goals

The Committee obligated itself to goals in 1996 and 1997. I will report progress toward their completion.

1.3.1 Transnationalization of Standards

It is our goal to continue research on related standards in IEEE and IEC and identify points of disparity between those standards.

Secondly, meetings of the TC14 TAG will be encouraged with the Transformers Committee meetings. Phil Hopkinson arranged a meeting of the TAG for the meeting in San Francisco and again in Burlington. Another meeting is scheduled for Graz.

1.3.2 Support the 1997 Summer Power Meeting

We completed plans for our panel session and welcome the participation of all members. We want to encourage all members and guests to join us at the Summer Power Meeting in Berlin the week following our meeting.

1.3.3 Promote Committee activities besides standards

We have proposed pursuit of technical and educational activities beyond the traditional emphasis of the Committee. As of this writing only two actions have been taken. The first is to enlist Transformers Committee members as PES Distinguished Lecturers. The second is to encourage hosts of future meetings to make contact with the local PES Chapters and PES Student Chapters at local universities and encourage attendance by these local constituents.

2.0 Approval of Minutes of October 30, 1996 - W. B. Binder

The minutes of the Burlington meeting were approved as written

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 Winter Power Meeting in New York, NY, USA during February 3 - 6, 1997.

3.1.1 Publications Committee

3.1.1.1 Paper Review Process

Bob Dent addressed the Committee to discuss problems with the paper review process for this meeting. Reviews were only completed on 68% of the submitted papers. Reasons given were higher workload of reviewers, papers not being coded as to whether or not the author wanted to present the paper, and some coordinators requesting that papers be held in Piscataway and forwarded in batches. Coordinators were asked to re-enforce the need for reviewers to complete reviews within the requested time frame, new forms in the author's kit will provide a place for the author to indicate desire to present, and Piscataway will suspend holding papers for batch review.

Completion of paper reviews for the 1997 Summer Meeting was extended from March 5 to March 15 to help catch up with this process.

3.1.1.2 Publication

As a result of the incomplete paper reviews, the pages to be published for Transactions papers for 1997 is well under budget.

3.1.1.3 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. He expects to have this completed by June 30, 1997.

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 and Economics Committees reported on the status of their organizations. All of these committees have established subcommittees and have started scheduling meetings.

The Insulated Conductors and Power System Relaying Committees announced that their Committees are undergoing reorganization. The reorganization plan for the Power System Relaying Committee was reviewed and approved by this Committee.

The Stationary Batteries Committee presently has no officers, but will remain as a technical committee pending further action.

3.1.2.2 Revision of the Technical Council Organization and Procedures Manual

The revision of the Technical Council O & P Manual was approved by the Technical Council.

Appropriate changes are being drafted for the Transformers Committee O & P Manual in accordance with the revised Technical Council Manual. Administrative Subcommittee members should be preparing any other required changes for incorporation at that time.

3.1.2.3 Interpretations

Several members raised questions about the 30 day limit posted in the Transformers Committee O & P Manual at the Administrative Subcommittee meeting in Burlington. It was stated that the limit is impractical in light of the preparation and the review required by appropriate working group/subcommittees and the AdSubCom. After some discussion on the practicality of what's involved, a motion was passed to respond to the interpretation requester within 30 days with the schedule of next meeting and providing a written response within 30 days after that meeting. It was determined that the Vice Chair should discuss this 30 day limit issue at next Technical Council O & P Committee meeting for resolution.

This item was discussed at this Committee meeting. The Technical Council O & P Manual as now approved does not state any specific total turnaround time for interpretations. We can, therefore, revise our operating manual as stated above and then request approval by Technical Council. Also note that the Council O & P Manual only requires two Subcommittee members to develop a response to an interpretation request. That procedure would naturally provide a faster turnaround than requiring an entire Working Group meeting. The entire Council procedure for Interpretations will be shown in the draft revision of the Committee O & P Manual for complete review.

3.1.3 Technical Sessions Improvement Committee

This Committee, having just completed revision of all the documents in the PES Publications Guide, discussed other areas which need improvement. One area which can be developed is a guide for committee vice chairs for performing paper reviews and making arrangements for technical sessions. Another area needing improvement is poster sessions. Guidelines for authors and organizers of poster sessions need revisions to enhance the presentations.

3.2 Technical Paper Reviews

3.2.1 1997 IEEE/PES Summer Power Meeting Papers

We received nine papers for review. Requests for reviews were sent out on February 20, 1997 for responses by March 7, 1997. We accepted six of the eight papers for presentation at the Summer Power Meeting. These will be presented in poster session format.

3.2.2 1997 International Symposium on High Voltage Engineering

We received one paper to review for this Conference. It was reviewed and accepted with the papers submitted for the Summer Power Meeting. Unfortunately, it was not submitted in time for presentation at the Conference, but it was accepted for publication in the Transactions.

3.3 1997 IEEE/PES Summer Power Meeting Panel Session

We will be sponsoring a panel session titled "Perspectives On The Transnationalization Of Standards" which will be chaired by Wally Binder. Panelists will be as follows:

Highlighting The Differences Between IEC and IEEE Transformer Standards.

R. S. Girgis, ABB Power T&D Co.

Experience With Bushing Standards.

O. Heyman, ABB Components Co.

Experience With Harmonizing Instrument Transformer Standards.

A. J. Jonnatti, Instrument Transformer, Inc.

How the IEC Process Differs from IEEE.

A. O'Neill, IEEE/PES

Experience With Harmonizing Load Tap-Changer Standards.

J. H. Harlow, Harlow & Associates, Inc.

Closing remarks: The Recent USNC TC-14 Experience.

W. B. Binder for P.J. Hopkinson, Square D Company.

3.4 Future Meeting Schedule:

November 16-19, 1997	St. Louis, MO, USA	Jerry Bishop
April 26-29, 1998	Little Rock, AR, USA	Ed Smith
Fall 1998	Guanajuato, Mexico	Gordon Denny
April 11-16, 1999	New Orleans, LA, USA	Ken Bow
Fall 1999	Monterey, Mexico	John Crouse
Spring 2000	OPEN	Contact Committee Officer
Fall 2000	Niagara Falls, ON, Canada	Roger Hayes

Commitments from hosts are needed for meetings Spring 2000 and beyond. Please solicit future hosts and contact me 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 4:00 p.m. in the Wiesler Room of the Grand Hotel Wiesler.

The following members of the Subcommittee were present:

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

The following guests were present:

Bob Grubb - Representing Linden Pierce
Richard Dudley - Representing Bill Kennedy
E. Trummer - Graz Meeting Host

4.2 Approval of the Burlington Meeting Minutes

The minutes of the previous Administrative Subcommittee meeting in Burlington were approved as published.

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.

4.4.2 Meeting Arrangements

The Graz meeting host, Edgar Trummer, reported the following registration statistics at the main committee meeting:

Members and guests	164
Companions	91
Companions Tours - Wednesday	90
Thursday	78
Thursday Luncheon	108
Thursday Outing	232

Wally reported on Jerry Bishop's behalf that the St. Louis Meeting will be held on November 16-19, 1997 at the Adam's Mark hotel. Subcommittee chairs are requested to provide Jerry their meeting needs by August 15, 1997. He further reported that everything seems in order for spring 1998 meeting to be held in Little Rock, AR.

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.

4.6 Standards Subcommittee - T. A. Prevost

4.6.1 Standards and Coordination Activities

Tom Traub had prepared a status report and communicated to the AdSubCom prior to the meeting. This report 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 Luigi Napoli has been replaced with David Ramsden who was not present at the meeting.

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

John was not present at the meeting but had provided the following report prior to the meeting:

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

Document	Title	Ballot Date	Source	Action
C57.129/d10	Trial Use General Requirements and Test Code for Oil-Immersed HVDC Converter Transformers (Reballot)	1/2/97	IEEE	App.
C57.119/d13.2	Recommended Practice for Performing Temperature Rise Tests on Oil Immersed Power Transformers at Loads Beyond Nameplate Rating	4/16/97	IEEE	App.
C57.12.70	Standard Terminal Markings and	4/16/97	IEEE	Disapp.

4.0 Administrative Subcommittee (cont'd)

Connections for Distribution and Power Transformers

C57.12.80	Standard Terminology for Power and Distribution Transformers	4/16/97	IEEE	Disapp.
C57.12.28	Enclosure Integrity - Above Ground Pad-Mounted Enclosures	6/10/97	NEMA	App.
C57.12.29	Enclosure Integrity - for Coastal Environments	6/10/97	NEMA	App.

4.9 Subcommittee Activities - Subcommittee Chairs

4.9.1 Audible Sound and Vibration - Jeewan Puri

Jeewan discussed his participation in the revision of IEC 551, Standard for Noise Level Measurements for Transformers and Shunt Reactors. He asked for guidance on creating a working group for incorporating this standard in C57.12.90 and C57.12.91 in an effort to harmonize these standards with IEC 551. After much discussion it was agreed to form a task force to prepare a text of this addition and take it to the respective working groups on revision of C57.12.90 and C57.12.91 for inclusion.

4.9.2 Bushings - F. E. Elliott

C57.19.00 and C57.19.01 have been reaffirmed.

4.9.3 Dielectric Tests - L. B. Wagenaar

Loren reported that the working group on revision of dielectric tests has been broken down into 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

As a result of a job change Norvin Mohesky resigned as the co-chair of the working group on padmount single phase deadfront transformers (C57.12.25). Ali Ghafourian was recommended to replace Norvin. Wally approved the change.

4.9.5 Dry-Type Transformers - W. Patterson

No report.

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

Richard mentioned that Bill plans to send C57.127 to IEEE Standards Board for review before November.

4.9.7 Instrument Transformers - J. E. Smith

No report.

4.9.8 Insulating Fluids - F. J. Gryzkiewicz

No report.

4.9.9 Insulation Life - L. W. Pierce

No report.

4.9.10 Performance Characteristics - H. J. Sim

Jin reported that C57.18.10 progressed well in the main committee survey with only one unresolved negative and C57.110 is progressing well also. Which subcommittee is appropriate home for the new working group chaired by Bob Degeneff on switching transients induced by circuit breaker/transformer interaction was discussed. It was agreed that the working group will stay under PCS with a liaison from the Dielectric Test Subcommittee until a clear direction on its scope is defined.

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

No report.

4.9.12 West Coast - E.G. Hager

At Red's request Wally approved Tom Lundquist as a vice-chair to the subcommittee and as a co-chair to the working group on phase shifting transformers.

4.10 Recognition and Awards Subcommittee - J. H. Harlow

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

4.10.1 Committee Service Awards

Due to luggage inconvenience and the fact that some of the recipients will not be attending the meeting Jim reported that the award plaques will be presented at next meeting in St. Louis.

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

By July 1, 1997 correspondence, John distributed proposed changes to the O &P Manual for review. The changes were result of the recent revision of the TC O & P Manual. Comments to this proposal are due September 19,1997. John plans to ballot a final draft at the committee meeting in St. Louis.

4.12 Secretary's Report - B. K. Patel

4.12.1 Membership Review

Voting Members - D. S. Lyon and L. A. Tauber have resigned since the last meeting. J. W. Howard has retired and could not be reached so he has been dropped from the membership due to poor attendance. Six new members were added at the last meeting in Burlington 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:

Voting Members	169		
Emeritus Members -	19		
Voting Classifications:	Producers	76	
	Users	54	
General Interest	39		

Poor Attendance Records - The invitation list has been revised by removing guests with poor attendance record and adding new guests by request. Voting Members who have not attended a committee meeting since Fall of 1994 will be contacted to determine their interest in maintaining membership.

4.12.2 New Member Applications

Two new applications were received from the following individuals for review and both were approved.

<u>Voting Applicant</u>	<u>Company</u>	<u>Classification</u>	<u>Sponsor</u>
Roger Hayes	Ferranti Packard Trans. Ltd.	P	Patterson
Prit Singh	ABB Power T&D Co.	P	Wagenaar

4.12.3 PES Directory Rosters

Diskette copies of the 1997 IEEE Directory listing for the Transformers Committee will be distributed to Subcommittee Chairs at the AdSubCom meeting for 1998 updating. The Chairs are requested to update their respective listings in the same format and details after the Graz meeting. Please provide updated diskettes to Secretary by September 12,1997.

4.12.4 Meeting Minutes

Minutes of the Burlington meeting were reproduced at no cost, again, compliments of Ken Hanus and TU Electric. Postage costs were \$1288.25 for 353 mailings, which averages \$ 3.65 per mailing. The total income from the 287 registrants was \$2870. Note that the net cost of the minutes varies for each meeting and the \$10 portion of the registration fee is a valid nominal fee.

I strongly request the Subcommittee Chairs to submit their minutes by August 29,1997 for this meeting. Note that subcommittee minutes must be received by this date to be included in the published Committee minutes. Due to a shorter period between meetings, the minutes will be published as received without traditional phone calls inquiring about missing minutes. The submittal should include a printed copy and an electronic file on a 3 1/2" 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

Bob Grubb's proposal of June 20, 1997 on the formation of a new subcommittee on power transformers was discussed. The discussion centered on including certain voltage/KVA

classes and parts of the topics on distribution transformers that are not covered anywhere or could overlap power and distribution class transformers. A motion was passed to form the proposed subcommittee. Since the allocated time was running out everybody was requested to review the proposal for further discussion later. John will add some wordings to the O&P Manual revision proposal discussed earlier for review and balloting on the subject.

A related subject was also discussed in light of what was discussed at main committee meeting in Burlington, VT - should the West Coast Subcommittee be replaced with this new subcommittee. One thought raised was that the seismic requirements may not be covered under this new subcommittee. It was mentioned that the Substation Committee is working on IEEE 693-Recommended Practices for Seismic Design of Substations which covers all substation equipment. The guide is expected to be published soon and therefore this requirement should not be an issue. It was pointed out that the West Coast Subcommittee is a minority in the Substation Committee membership. This is another topic that will require further thinking and discussion at next meeting.

Wally reported that a new Meeting Working Group will be formed with an initial scope to search and arrange future committee meetings and revise host document. Meeting hosts will become member of the working group.

Fred discussed a need for bushing requirements for indoor transformer applications, 110KV BIL and higher. In discussion, a possible conflict with deadfront distribution equipment bushings was mentioned. Fred will investigate any potential conflict and provide a revised subcommittee scope proposal to John by September 19,1997.

Wally mentioned that ESMO will be meeting in Orlando, FL in April 1998. The deadline for technical papers for this meeting is October 31, 1997.

4.14 New Business

None discussed.

4.15 Adjournment

Wally adjourned the meeting at 6:32 p.m.

Respectfully submitted,

B. K. Patel, Secretary

IEEE/PES Transformers Committee Meeting Locations

<u>Year</u>	<u>Spring</u>	<u>Fall</u>	<u>Committee Chair</u>
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

5.1 Transformers Standards and Coordination Activities

The transformers standards status is given in the four attachments:

Attachment 1 is a list of all the C57 standards, including ANSI C57 standards, which are being listed under the Standards Subcommittee because they have not yet been found a home in the other Subcommittees. Some standards are listed more than once; this occurs when more than one group is working on the same standard, i.e., C57.12.00 and C57.12.90.

Attachment 2 is a report of coordination activity on standards belonging to other PES Committees. This attachment is sorted by PES Committee names.

Attachment 3 is a list of IEEE Societies or PES Committees that have asked for coordination on the standards for which we are responsible.

Attachment 4 is sorted by Subcommittee names. It contains a listing of the projects for which a Subcommittee is responsible, and coordination activities with other PES Committees. The standards that are not assigned yet, or do not belong to the Transformers committee, are listed under the Standards Subcommittee. For the publication of the Transformers Committee minutes, this attachment will be sorted by Subcommittee names, and each section will accompany the corresponding Subcommittee report.

5.2 Documents Submitted to the Standards Board

NESCOM (PARs)

12/10/96

PC57.100, PAR approved with IA/PSE and IEC TC 14 US TAG added for coordination.

PC57.104, PAR approved with IEC TC 14 TAG added for coordination.

PC57.96, PAR approved with IA/PSE added for coordination.

PC57.119, PAR extended to 10/30/98.

3/19/97

P1350, withdrawn.

P57.127, disapproved, to be resubmitted.

REVCOM (Standards)

12/10/96

C57.16, approved.

C57.96, extended to 12/2000.

P423, withdrawn.

C57.12.01, withdrawn.

C57.12.59, withdrawn.

C57.95, withdrawn.

3/19/97

C57.104, extended to 12/2000.

5.3 Standards Due for Reaffirmation, Revision or Withdrawal Before December 31, 1997

P638, P799, C57.12.23, C57.12.57, C57.13.2, C57.15, C57.12.60, C57.19.00, C57.19.01, C57.100, C57.105, C57.106, C57.110, C57.113, C57.117, C57.120, C57.125

5.4 Projects Being Balloted or Ready to Ballot (Balloting Group Formed)

P259, P638, P1276, C57.18.10, C57.19.01, C57.119, C57.121, C57.120

5.5 PAR Submittals

Following is a list of all PARs that require action as soon as possible or they will be up for administrative withdrawal. Use the PAR form dated 1/96 for all new PAR submittals.

5.5.1 Dielectric Tests Subcommittee

PC 57.127 Submit new PAR

5.5.2 Distribution Transformers Subcommittee

PC57.12.21 Extended to October 1997
PC57.12.25 Submit new PAR

5.5.3 Dry-Type Transformers Subcommittee

PC57.12.58 Request PAR extension
PC57.124 Request PAR to revise
PC57.96 Submit new PAR

5.5.4 HVDC Converter Transformers Subcommittee

PC57.129 Extended to October 1997
P1277 Extended to October 1997

5.5.5 Instrument Transformers Subcommittee

PC57.13.4(P832) Apply for new PAR if wanted

5.5.6 Insulating Fluids Subcommittee

C57.106 Apply for new PAR

5.5.7 Insulation Life Subcommittee

PC57.91 Apply for new PAR
PC57.92 Request PAR withdrawal
PC57.119 Submit new PAR

5.5.8 West Coast Subcommittee

PC 57.128 Apply for new PAR

5.5.9 Performance Characteristics

PC57.123 Extended to October 1997

PC57.18.10 Extended to October 1997

5.5.10 Standards Subcommittee

C57.12.10 ANSI Std. needs a home in IEEE

C57.12.13 ANSI Std. needs a home in IEEE

C57.12.53 Only title exists

C57.12.54 Only title exists

C57.17 ANSI Std. needs a home in IEEE

5.6 Transformer Committee Projects to be Balloted in Next 12 Months

C57.12.00 General Requirements For Liquid-Immersed Distribution, Power, and Regulating Transformers

C57.12.01 IEEE Standard General Requirements For Dry-Type Distribution and Power Transformers Including Those With Solid Cast and/or Resin-Encapsulated Windings

C57.12.21 Standard Requirements For Pad-Mounted, Compartmental-Type, Self-Cooled, Single Phase Distribution Transformers With HV Bushings

C57.12.33 Guide For Evaluation of Losses in Distribution Transformers

C57.12.50 Requirements For Ventilated Dry-Type Distribution Transformers

C57.12.51 Requirements For Ventilated Dry-Type Power Transformers

C57.12.52 Requirements For Sealed Dry-Type Power Transformers

C57.12.55 Conformance Standard For Dry-Type Transformers Used in Unit Installations, Including Substations

C57.12.57 Requirements For Ventilated Dry-Type Network Transformers

C57.12.60 IEEE Trial-Use Standard Test Procedures For Thermal Evaluation of Insulation Systems For Solid-Cast and Resin-Encapsulated Power and Distribution Transformers

C57.12.90 Standard Test Code For Liquid-Immersed Distribution, Power, and Regulating Transformers

C57.13.2 Conformance Test Procedures For Instrument Transformers

C57.13.3 Guide For The Grounding of Instrument Transformer Secondary Circuits and Cases

- C57.15 Requirements, Terminology, and Test Code For Step-Voltage Regulators
- C57.19.01 IEEE Standard Performance Characteristics and Dimensions For Outdoor Apparatus Bushings (For Revision, Current Ballot Is For Reaffirmation)
- C57.98 IEEE Guide For Transformer Impulse Tests
- C57.100 Test Procedure For Thermal Evaluation of Oil-Immersed Distribution Transformers
- 57.110 Recommended Practice For Establishing Transformer Capability When Supplying Nonsinusoidal Load Current
- C57.113 Guide For Partial Discharge Measurement in Liquid-Filled Power Transformers and Shunt Reactors
- C57.125 Guide For Failure Investigation, Documentation and Analysis For Power Transformers and Shunt Reactors
- C57.127 Guide For The Detection of Acoustic Emissions From Partial Discharges in Oil-Immersed Power Transformers
- P259 Standard Test Procedure For Evaluation of Systems of Insulation For Specialty Transformers
- P638 IEEE Standard For Qualification of Class 1E Transformers For Nuclear Power Generating Stations
- P1388 Standard For The Electronic Reporting of Transformer Test Data

5.7 Next Standards Board Meetings and Submittal Deadlines

<u>Meeting date</u>	<u>Deadline for PAR(1)</u>	<u>Deadline for STD (2)</u>
September 16, 1997	June 1, 1997	August 1, 1997
December 9, 1997	August 31, 1997	October 31, 1997

- (1) A PAR must be sent to the Standards Subcommittee Chair before the stated deadline because the SC Chair must then circulate the PAR to all the other PES Committees before it can be submitted to the IEEE Standards Department. This requires two extra months.
- (2) Standards must be submitted directly to the IEEE Standards Department by the Working Group Chair before the stated deadline to be considered at the next Standards board Meeting.

5.8 PES Standards Coordinating Committee Meeting

The Standards Coordinating Committee met on Monday, February 3, 1997. Following are excerpts from the minutes of that meeting.

R. E. Howell, Secretary of SCC, called the meeting to order and the attendance roster was circulated to all attendees.

R. E. Howell read Chairman Bal Gupta's report including his regrets regarding his inability to attend the meeting.

Luigi Napoli provided a progress report regarding the open balloting process. He reported that all of the committees have now established an open ballot process. The problems identified to date are:

1. The individuals that were sent invitations to ballot did not realize that they had to return the invitation providing confirmation of their interest in order to receive a ballot.
2. Difficulty in getting 75% return on ballots One of the possible causes was that the procedure was attracting balloters with low interest.
3. The invitation to ballot does not currently include a line which requests why the person wants to join the balloting group.
4. A problem has occurred where members of the open voting list were viewed as not technically qualified (as viewed by the SCC of the sponsoring committee), but was unable to remove them from the list of voters.

After some discussion regarding items 2, 3, and 4 the SCC voted to ask the Organization and Procedure Committee, to revise the open balloting procedure to specify that failure to return two consecutive ballots will cause the person to be removed from the balloting pool. In closing, Luigi requested all committees to keep him informed of any changes in the committee rosters so he can revise the invitation to ballot list for each committee accordingly.

Anne O'Neill covered three items:

1. Results of 1996 implementation of goals for international harmonization.
2. Streamlining reporting on international Harmonization of Standards. Anne reported on the SCC response to her three proposals for streamlining the report on international harmonization. After some discussion a vote was taken on the three proposals. The first proposal to include goals in the information packet that NesCom Secretary mails to working group chairs and the third proposal to graph progress for goals were approved. The second proposal to incorporate the goal reminder in the Style Manual was rejected.
3. Anne made a presentation on the subject of Web page support.

The commitment that the PES SCC secretary send the list of IEEE delegates to ANSI Accredited Standards Committees to the Standards Board was completed by Gary Engmann.

John Posey followed up on the action item to investigate the issue of NesCom revising project titles after the projects were submitted. The NesCom Secretary has provided the following procedure which a sponsoring committee should follow if they want NesCom to reconsider the title change. The procedure is as follows:

"If a NesCom initiated PAR title is not acceptable to the sponsor the sponsor may submit a letter to the NesCom Secretary requesting that NesCom reconsider the title change at its next meeting. The letter, which should be submitted by the PAR submission deadline should include an

explanation of why the NesCom approved title is not acceptable to the sponsor, and propose on or more acceptable alternatives to the title approved by NesCom.

The next meeting will be held at the 1997 SPM to be held in Berlin, Germany.

The meeting adjourned at 3:50 p.m.

5.9 Standards Subcommittee Meeting

The Standards Subcommittee met on Thursday, July 17, 1997, at 8:00 AM with seven members and two guests. The minutes of the Burlington meeting were approved.

This meeting was chaired by Tom Prevost who is taking over as chairman for Tom Traub whom has retired.

Anne O'Neill joined us from IEEE. She reviewed the PES Standards balloting process. She also discussed the formation of a new association by IEEE which is the Standards Association whose primary purpose will be to prepare and publish standards which cannot find a home with any existing committees such as our Transformer Committee. There will be an invitation to join this association mailed out sometime this year by IEEE. The dues for this Association will be \$10. As an added incentive if you join this year then you will receive a CD ROM of the IEEE dictionary.

We have a new Staff Engineer at IEEE. David Ramsden has replaced Luigi Napoli. His phone number is (908) 562-3931 and his e-mail Address is D.RAMSDEN@IEEE.ORG

The status of a standard can be found in the IEEE Web site. The status is updated quarterly.

Next were the Working Group reports.

WG on Continuous Revision of C57.12.00 - Subash Tuli

Subash reported that he has submitted draft 2 of C57.12.00 to Rochelle Stern of the IEEE editorial staff for editorial review. As soon as he gets it back from the editorial staff he plans to send the standard out for ballot.

WG on Continuous Revision to C57.12.90 - Steve Smith

Steve reported that draft 4 of C57.12.90 is currently out for ballot. The ballot is due back on July 28th. Steve will attempt to resolve comments and negatives and turn it around to reballot this fall prior to the meeting in St. Louis.

For new business there was discussion about coordinating the balloting of C57.12.00 and C57.12.90. In the future we will attempt to coordinate this so the two standards can be balloted together to avoid conflicts. A question was raised as to the status of C57.12.70 and C57.12.80. These were being handled by Tom Traub. We need to find the status of these standards from Tom. Anne O'Neill mentioned that we must continue to harmonize IEEE standards with IEC. When a Working Group is formed one of the first tasks should be to review the IEC standards to determine what relationship exists for harmonization. A reference to the appropriate IEC standard should be in a IEEE standard which gives advice concerning the relationship of this IEEE standard to the IEC standard. This fits easily into the forward. Any new or revised standard needs to conform to the IEEE Standards Style manual. A draft of the standard should be sent as early as

possible in the process to Rochelle Stern of the IEEE editorial staff so that she can comment on the style of the standard.

The meeting was adjourned at 9:10 AM

NOTE: All attachments of Clause 5.0 are included at the end of the minutes except Attachment 4 which is included with each subcommittee report as appropriate.

ATTACHMENT 4 STATUS REPORT OF STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
SUBCOMMITTEE: STANDARDS					
CHAIR:	T. P. TRAUB				
PHONE:	(312)394-2704				
C57.12.00	GENERAL REQUIREMENTS FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS	TULLS (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	TABLE 5 - CORRECTION OF TYPO ERRORS	TULLS (414)547-0121			CORRECTIONS BEING DONE
PC57.12.00					
C57.12.10	TRANSFORMERS 230kV AND BELOW - 8333/10417kVA 1 PH. - 1000000 KVA 3 PH w/6 LTC. - 100000KVA w/ LTC - SAFETY REQUIREMENTS	(312)394-2704		6/4/87 1993	ANSI STANDARD NEEDS A HOME, DUE FOR REAF.
C57.12.13	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	REQUIREMENTS FOR DRY-TYPE, UNDERGROUND, SINGLE-PHASE WITH SEPARABLE INSULATED II-V 24940 grdy/14400 V AND < LV 240-120 V			0	ONLY TITLE EXIST (NO PAR) IS IT REQUIRED?
C57.12.54	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	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 BALLOTTED
C57.12.80	TERMINOLOGY FOR POWER & DISTRIBUTION TRANSFORMERS	TRAUB T. P. (312)394-2704	T&D SUBS	5/1/92 6/14/95 1997	BEING BALLOTTED
C57.12.90	STANDARD TEST CODE FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS & GUIDE FOR TESTING OF...	SMITH S. D. (606)879-2757	T&D PSRC SWG	3/16/93 6/15/95 1998	MAKING RUNNING CHANGE LIST WG COLLECTING CHANGES
C57.17	REQUIREMENTS FOR ARC FURNACE TRANSFORMERS			1986	LAST REVISED IN 1986 ANSI DOCUMENT

6.0 Recognition and Awards - J. H. Harlow

6.1 Certificates of Appreciation

Transformers Committee Certificates of Appreciation are due to the following persons. The presentation of the plaques will be held until the St. Louis meeting, November 19, 1997.

<u>Name</u>	<u>Service Rendered</u>
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

6.2 Technical Council Awards

6.2.1 The paper *Investigations of an EHV Autotransformer Tested with Open and Arrester Terminated Terminals* was designated for the 1996 Transformers Committee prize paper award. Plaques in recognition of this will be presented to the authors, W. P. Seitlinger, H. Foschum, L. B. Wagenaar and J. A. Fleeman at the Graz meeting.

6.2.2 The 1996 Transformers Committee Distinguished Service Award was presented to William J. McNutt. As Bill has resigned from the Transformers Committee, the award was presented to Bill at his home by Bob Degeneff on behalf of the Committee.

6.2.3 The 1996 Transformers Committee Working Group Recognition Award went to the Working Group on C57.12.44: *Standard Requirements for Network Protectors*, R. B. Robertson, Chair. As R. B. has resigned, I was able to present his plaque to him at a PES Section meeting in Tampa, FL. WG members who will receive an award at St. Louis are: D. H. Mulkey (Secretary), 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 and A. L. Robinson.

6.3 We were privileged to be able to make the IEEE Fellow Grade presentation to Transformers Committee member Harold Moore at the Graz meeting. Only about 0.1% of all PES members are selected for this distinction each year.

6.4 It was announced that the IEEE Charles Proteus Steinmetz Award for 1998 will be presented to our long time member, William J. McNutt. The Steinmetz is one of IEEE's very prestigious awards, it being "presented annually to an individual for major contributions to the development of standards in the field of electrical and electronics engineering".

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 2 p.m. Seven members and two guests were present. The minutes of the Burlington meeting were approved as submitted.

The following items were discussed:

7.1.1 WG Report - Transformer Siting Guide C57.136 - Mr. Jack McGill, WG Chair

Mr. McGill reported on Draft 5a of this Guide. All of the input for this document has come from manufacturers. There is a need for obtaining input from transformer users and consultants who are going to be the main users of this document. This document will be submitted for a user review for enhancing its technical content with their input.

Mr. McGill announced that he has decided to retire and that he would not be participating in the future meetings of this Subcommittee. We wish him a long and healthy retirement. His participation and guidance have indeed been very valuable for this group. We will miss him. Dr. Karen Weissman has accepted to chair this working group and will continue the further development of this Guide.

7.1.2 Chairman's Report on the Revision of IEC 551 / WG14 Activities

J. Puri reported that his activities in the IEC Working Group 14 responsible for the revision of Noise Measurement Standard IEC 551. He is writing an introduction to this standard. This introduction will describe how noise is produced in transformers, why it is necessary to measure it, what is the relationship between noise intensity and noise pressure measurements and will include standard noise levels for transformers per NEMA Table TR 1.

It was agreed that a task force should be formed to harmonize the final draft of IEC 551 with C57.12.90 and C57.12.91. J. Puri pointed out that we need a Far Field Noise Level Calculation formula. We do have a proposal but it has to be evaluated against field measurement data. A tutorial will be arranged on this subject in our next meeting.

There being no new business, the meeting adjourned at 3:00 p.m.

Jeewan Puri
Chairman

ATTACHMENT 4 STATUS REPORT OF STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE

25-Sep-97

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 PC57.12.90A	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

7.0 Reports of Technical Subcommittees (cont'd)

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 16 members and 16 guests. See Attachment - 1.

7.2.2 Chairman's Remarks

Mr. Elliott, after attending the Administrative Subcommittee meeting reported the schedule for future meetings (see Clause 3.0).

7.2.3 Approval of Minutes of The Last Meeting Held in Burlington, VT

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 July 16, 1997 with 16 members and 10 guests present. One guest requested membership to the WG. He reported on the following:

1. Approval of October 28, 1996 Meeting minutes

The minutes were approved as written.

2. PC57.19.01 Draft 4 Ballot Status

The current status of the ballot returns is as follows:

Eligible	Affirmative	Negative	Abstentions	Not returned
109	44 (92%)	4	3	58

3. Discussion of partial comments received on Draft 4 ballot

3a. Table 1

- A note will be added to explain the use of 102 kV as the maximum line-to-ground voltage for the 650 kV BIL level. The 102 kV level is as per the existing standard and is based on the practice of using bushings on reduced BIL transformers.
- The title for the table will be modified from "Nominal System Voltage 34.5 kV through 765 kV" to "Nominal System Voltage through 765 kV."
- P. Singh will communicate with Nigel McQuin and explain the method used to calculate the creepage distances.

7.0 Reports of Technical Subcommittees (cont'd)

- Note 2 was discussed and it was explained that this note does not imply that a dry SWS test is required. It was also indicated that C57.19.00 does not require this as a design test and that this test is done by transformer manufacturers as per C57.12.00.
- A proposal to include the 2 microsecond CW requirement was not accepted as the new draft is consistent with C57.12.00 that specifies 3 microseconds.

3b. Table 2

- The title for the table will be modified from “Nominal System Voltage 34.5 kV through 69 kV” to “Nominal System Voltage Through 69 kV”
- In column 8, it was agreed to change Figure 3 to Figure 4 for 3000 A rating. This changes from a 2 hole bladed terminal to a 4 hole terminal. It was also agreed to change the width of the blade to 3” for 3000 A bushings. The blade will remain 4” for 5000 A bushings. The heading for column 8 will be revised to change “Usable Thread” to “Usable Thread or Lower Terminal Blade Details.”
- In column 9, “Fig 3 or 4” will be changed to “--” as Figure numbers do not apply to this column.
- In Figure 3, the reference to 3000 A will be removed but the other dimensions will remain unchanged.
- Figure 4 will be revised to indicate 3 inch wide blade for 3000 A and 4 inch wide blade for 5000A ratings.
- A comment to standardize top end dimensions was discussed. It was decided not to include a requirement like this as different manufacturers have different lengths for the same voltage class. This is based on their individual designs.
- A comment to standardize the draw-lead terminal size and location was discussed. It was decided to refer this to TF on draw-leads. This also applies to Table 3.
- A comment to change the top terminal sizes back to the sizes as per the existing standard was discussed. Based on the agreements made in the last WG meeting, it was decided to maintain the new sizes as proposed in the Draft 4. This comment also applies to Table 3.
- After a lot of discussions on draw-lead ratings, it was decided to add the following note in Tables 2 & 3:
- “For draw-lead application, the continuous current rating is minimum and is limited by the draw-lead terminal rating stated on the bushing nameplate and/or by the size of the draw-lead cable/conductor applied to the bushing.”
- A proposal to reduce the flange BCD from 10.88 to 9.25 inch for 69 kV rating was not accepted as the change was not supported by the bushing manufacturers. The dimension in Draft 4 is as per the existing standard.

3c. Table 3

- The title for the table will be modified from “Nominal System Voltage 138 kV through 765 kV” to “Nominal System Voltage above 69 kV”
- In column 4, the “L” dimension for 765 kV rating will be changed from 80.375 to 85. A proposal to change the L dimension for 345 kV and 500 kV was not accepted as the values in Draft 4 are as per the existing standard.
- A proposal to change the D dimension and the BCD for 500 kV rating was not accepted as the values in Draft 4 are as per the existing standard.
- After a discussion on the D dimensions in column 6, it was decided that Lapp and ABB/Alamo will look into the possibility of using 8” for 138 kV and 12” for 230 kV. The other dimensions for these rating will remain unchanged.
- In column 7, the inside tube diameter for the 230 kV rating will be changed from 1.625 to 2 as this was a typographical error.
- The subject of lower terminal configuration was again discussed and it was decided to retain the existing configurations as there are many bushings in the field and would affect interchangeability. In addition this would require extensive design changes which the manufacturers are unable to support at this time.

3d. Table 4

A suggestion to round off metric values for the cantilever test force column was discussed. The WG decided that the present values should be maintained. This was done to maintain the test levels when the inch-lb. units are eliminated.

3e. Table 5

The requirement of picocoulombs and microvolts was again discussed and it was decided to maintain both these requirements as per the present table. At the present time some of the bushing manufacturers are unable to switch over exclusively to picocoulombs. It was however indicated by the manufacturers that if a customer wants picocoulombs measurements the requirement will be fulfilled.

3f. Table 6

- A comment to change “C1 or C” to “C1 or C2” was discussed. Since the definition of C is included in the C57.19.00, it was decided not to make the above change. As for C2, C57.19.00 explains the requirement of C2 PF testing as applicable only to bushings with voltage tap. The requirement of C2 PF measurement on bushings with test tap was discussed and it was decided not to require this test as there are wide variation in power factor values because of design. As per Doble very few utilities do this test on low voltage bushings.
- 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

7.0 Reports of Technical Subcommittees (cont'd)

different values. It was indicated that these values are covered in the Doble Power Factor Test Set Field Instructions.

- A proposal to change the PF change limit for OIP bushings to +/- 0.02 was not accepted as the bushing manufacturers are unable to support this change. It was agreed to retain the +0.02, -0.04 value in Draft 4. This requirement is stringent than the existing values of +0.02, -0.06 in C57.19.00

3g. Appendix - A

- Following Fred Elliott's suggestion, P. Singh will check the IEEE Style Manual and change the title from Appendix to Annex if required.
- A note in the Appendix - A or a paragraph in the introduction will be added to explain the reason for dropping certain voltage classes from this draft standard. Keith Ellis and P. Singh will work on the wording of this note/paragraph.
- A note will be add as follows:
"The above ratings are not a part of the main standard but are in included in this Appendix for information on bushings for replacement purpose only."

3h. Editorial Comments

Appropriate editorial/typographical suggestions will be incorporated in Draft 5.

3i. Figures

The Working Group discussed the suggestion of having sequential figure numbers. It was decided to consult the IEEE Style Manual and make necessary changes. If no guidance is given in the Style Manual, the format followed in C57.12.00 will be used.

- 3j. Members with negative votes were asked to review their votes in view of the above discussions and send their feed back.

4. New Business

A proposal to consider (1) Short time current ratings (2) Temporary over voltages was discussed. It was decided to refer these to Bushing Subcommittee for consideration in C57.19.00.

5. Comments From RevCom Committee

- Two members suggested that the PF acceptance limit for OIP bushings in Table 10 be changed from 0.55 % to 0.5 %. This has already been addressed in Draft 4
- One member suggested that the minimum conductor tube ID's for 196 kV and 362 kV draw-lead ratings are larger than necessary. This was discussed and it was decided to maintain the present tube ID's to avoid any future bushing interchangeability problems in older transformers where the draw-leads may not fit if the tube ID's are reduced.

6. Adjournment

The meeting was adjourned at 2:37 PM after three sessions.

Attachment 1

Draft for Adding OIL-SF6 BUSHINGS to IEEE C57.19.00 Standard

Subject Proposed revision of IEEE/ANSI Standard C57.19.00 (First Draft)

To: Fred Elliott, chair, IEEE Bushing SC

March 7, 1997

Dear Fred:

Keith Ellis and Russ Nordman were assigned task of proposing a new scope for the first draft of C57.19.00 revision. It was to include the application of Oil-SF6 bushing installations. This proposal was to be submitted to Fred Elliott (SC Chair) for inclusion in draft.

After many discussions and letters between Keith and I, we found subject bushings to exhibit a uniqueness of design and application. We have agreed it may be appropriate for a new standard specifically for Oil-SF6 bushings. This was result of identifying many differences between these and apparatus bushings. In order to obtain additional input from members of the Bushing SC, we feel this should be added to the Bushing SC agenda at the next meeting.

I have used at least two manufactures of these type bushings on transformers manufactured in Waukesha in recent years. Each of these required extensive information gathering and qualifying of bushing designs, special transformer design and testing procedure to complete the installation.

Oil-SF6 bushings and transformers will not use same construction as used with Oil-Air type bushings. The upper SF6 end will, in general, be smaller than those designed for air insulation. Location and mounting of Oil-SF6 bushings will, by definition, be very close and may not allow proper Phase-Phase spacing needed for test. Many other features and requirements will need to be satisfied to complete the installation, consider the following:

- Double flanges for scaling to Oil and SF6 compartments
- Expansion/compensator bellows are required to allow for GIS connection
- May require vertical mounting with small centerline-centerline dimensions
- Small creep and strike distance over porcelain
- Oil expansion control within bushing
- Metric hardware, fittings, dimensions, connections
- Mechanical loading and sealing
- Gas pressure monitoring Systems
- Provisions for checking oil level in bushings
- Special transformer tank construction for Oil-SF6 bushings
- Terminal shielding and connections to bushing, top & bottom
- Electrical testing beyond routine bushing tests
- Dielectric testing of transformer with Oil-Air type bushings

Because Oil-SF6 bushings are not commonly available from US domestic manufactures it may become necessary to purchase from foreign manufactures. This opens many new possibilities of suppliers. They may not provide bushings made to IEEE/ANSI specifications and design practices. Thus a quantity of questions and design problems evolve;

- Language barriers
- Non standard dimensions for mounting
- Sealing (gaskets/O-rings) consideration
- Voltage & current ratings
- Testing considerations
- Terminal connections (top & bottom) Terminal shielding
- CT provisions
- Ordering, information, lead time, costs

All of the above items will need resolution. How who and when situations exist for each. These responsibilities must be established. It is felt that some problems are severe and should become part of our standards. This does not infer that all items be added. Perhaps a Task Force can be appointed or it may be considered that we have completed that function and we shall proceed from here.

Additionally, bushings used in switchgear applications will present another set of differences and should be added to appropriate standards for switchgear. This' can be discussed in next meeting.

Thank you for your attention in this matter.

Sincerely,

Russ Nordman

Attachment 2

R. J. MUSIL

90 Hansell Rd., New Providence, N. J. 07974

Tel. 908-665-0668, Fax 908-665-8418

To:

Fred Elliott

BPA, Portland

Comments concerning PC57.19.00 /D1

IEEE Standard General Requirements and Test Procedure for
Power Apparatus Bushings.

By R. J. Musil

96-12-04

- 1) Abstract and §1.1 (Scope) - Standard 19.01 (Table 1) except for the appendix, is going to cover bushings of 200 kV BIL and above only. In principle 19.00 could still start at 110 kV BIL, but this would be of no particular advantage and possibly confusing.
- 2) Foreword, pg. III - The last but one sentence "The latter is still under consideration" should be deleted since 19.100-95 is published.
- 3) § 1.2 6.2 - Physical requirements resp. characteristics would read better than Mechanical. For instance the voltage or test taps are not mechanical, nor is pressure or vacuum.
- 4) § 3, page 3, line 13 - should read ".....of a capacitance graded bushing" as in line 15.
- 5) § 3, page 4, line 12 - "insulating material" should be replaced by" internal insulation."
- 6) § 3, page 5 - Since table 5 of 19.01 lists partial- discharge limits in pC a definition should be added (to RIV) like: Apparent Charge (pC). The apparent charge as a result of internal partial discharge is that charge which if injected instantaneously between the terminals of the test object, would momentarily change the voltage between its terminals by the same amount as the partial discharge itself.
- 7) § 4.2, bottom of page 6 -eliminate the footnote # 7; the application guide in § 9.2 actually refers back to 19.00 (Table 1) and 19.100 does not really address the question of higher ambients.
- 8) § 5.3, page 7, line 30 -should be changed to "(shown in Table 1 of 19.01)" if we consider the current draft of19.01.
- 9) § 5.3.1 - According to IEEE # 4 the test voltage frequency should be "generally" in the range of 40 to 62 Hz; which could be called "low-frequency." But 19.01 in Table 1 calls for 60 Hz and 12.90 for applied voltage test for "a normal power frequency, such as 60 Hz."

(2)

- 10) § 5.4.1 - If we are going to adopt a 75°C hot spot rise, we might as well put the thermal basis of rating - and the temperature rise test on a new footing. As the hot spot rise -for bushings- is defined over the 24hr average ambient temperature, we should add to § 4.1(1) ".... nor exceeds 30°C averaged over any 24 hr period". After all the temperature of the air surrounding the air end of the bushing also could be of influence. Since in 19.01 a revised resp. new line of standardized bushings is going to be introduced, this might be the time to make the temperature rise test more realistic by raising the oil level to, or near to flange level. After all large and medium power transformers increasingly are of the conservator type. If we accept the 65°C top oil rise in the first sentence on page 8, the following text on page 9 becomes redundant. In any case the statement about the thermal basis of rating being equivalent to the conditions used in the temperature rise test is misleading, since few tests are run with the oil temperature at 95°C for 24 hrs.
- 11) § 5.4.2 -The question might be resolved by changing the first sentence to something like "During the draw-lead applicationthe current rating of the draw- lead is not directly associated with the bushing current rating, but with the internal diameter of the central tube."
- 12) § 6 - The introduction just repeats § 1.2 and the listing of requirements is incomplete, omitting for instance thermal tests. It might be desirable to reorganize § 6 by calling it "Other general requirements" and limit it to:
 - Bushings that have oil volumes separate from the transformer shall be designed to withstand full vacuum at the inboard-end.
 - Bushing voltage tap Incidentally the normally ungrounded tap is being eliminated from the revision of 19.01.
 - Bushing test tap
- 13) § 6.3 - Considering § 5(2), we probably should add "Rated frequency." Also to conform to the definition in § 3, sub6 (4) would better read "Length of inboard (oil side) end."
- 14) § 7.1.2 (5) - should be amended "For partial discharge testscorona at the bushing terminals." See the first footnote to table 5 of 19.01 /D3.
- 15) § 7.2.1 (4)-To conform to 12.00 and 19.01, should be changed to (on nominal system voltage 345 kV and above).A corresponding change should be made in § 7.2.1.4.
- 16) § 7.2.1.1 - For the same reason change to "for use at nominal system voltages of 230 kV or less."
- 17) § 7.2.1.3 - could be amended by "..... shall be applied to the bushing in accordance with IEEE Std 4-1978 with a 3 msec time to flashover."
- 18) § 7.2.1.5 - Amend the second sentence "..... intervals, with limits specified in Table 5 of IEEE C 57.19.01."

(3)

19) § 7.2.2 - As proposed in 3.) the title "Physical (or Other)" test would be more appropriate. The lines 10 and 11 on-page 15 are redundant.

20) § 7.2.2.2 - If we take into account the current D3 of 19.01 the permissible deflection becomes 0.060" or 1.52mm and the table # 4.

21) § 7.4.1 - Since table 10 (now 6) of 19.01 lists a limit for the change of capacitance C - but not of C2 - this § should be reconsidered.

22) § 7.4.3, page 18 - According to D3 of 19.01 the tables on lines 18 and 19 become 1 and 5 respectively and on line 26 # 5.

23) § 7.4 5 - As mentioned before could be called "Physical."

R. J. M.

ATTACHMENT 3

DATE: February 20, 1997
TO: Fred Elliott
Bonneville Power Administration
FAX: (503) 230-4390
FROM: W. A. Young
Lapp Insulator Company
PHONE: (716) 768-6814
FAX: (716) 768-5054

Fred:

This is the Front-of-Wave information from the old IEEE transformer standards. I suggest the following text for the bushing standard, it should precede the Thermal Stability Test under the Special Test section.

Front-of-Wave lightning Impulse Test. This is a special design test to be performed on one bushing of a particular design when required by contract. The bushing is to be given two impulses of negative polarity with a minimum crest voltage and a time to sparkover as shown in Table XX. A negative tolerance of 0.1 μ s is permitted. Since the test is more severe with duration, a positive tolerance of 0.3 μ s is permitted. If the negative tolerance is exceeded, the test conditions are considered to have been met if the crest voltage attained equals or exceeds the voltage determined from the following equation:

Voltage = Minimum Crest Voltage (from table XX)

$$\times \left(1 + \frac{(T - 0.1) - T_1}{A T_1} \right)$$

where T = specified time to sparkover (from table XX) in μ s

T₁ = actual time to sparkover in μ s

A = 4 for 350kV BIL and above

3 for 250kV BIL and below

The Capacitance, Power Factor, and Partial Discharge level of the bushing shall remain unchanged within the limits specified in Tables 9 and 10 of IEEE C57.19.01-1991.

The values from Table 4 of CS7.12.00-1980 should be included with the bushing standard. I noticed that there are no values for ratings above 1175kV BIL I am not sure why this is, we will need to get input from the transformer people. I think this is a good place to start let me know if there is anything else I can do.

ANSI/IEEE
C57.1200-1980

IEEE STANDARD GENERAL REQUIREMENTS FOR LIQUID

5.10.5 Other Insulation Levels. Additional information regarding other insulation levels associated with the various BILs is shown in Table 4. The lowest BIL, 30 kV, applies down to and including 120 V windings.

5.10.6 Dielectric Test Capability Requirements. Transformers shall be designed to withstand low frequency, lightning impulse and switching impulse tests, as described in Section 8; except as noted in 5.10.6.2 and 5.10.6.4. When specified, they shall be designed to withstand front-of-wave impulse tests at levels shown in Table 4. For test procedures, see ANSI/IEEE C57.12-90-1980.

5.10.6.1 Low-Frequency Voltage Tests—General

(1) A voltage-to-ground (not necessarily to neutral) shall be developed at each terminal in accordance with Table 4. For ungraded windings, this voltage shall be maintained throughout the winding.

(2) A phase-to-phase voltage shall be developed between line terminals of each three-phase winding in accordance with Table 4, or Table 6, where applicable.

(3) Two times rated turn-to-turn voltage shall be developed in each winding.

5.10.6.2 Low-Frequency Voltage Tests—Exceptions

(1) Subject to the limitation that the voltage-to-ground test must be performed as specified in 5.10.6.1(1) on the line terminals of the winding with the lowest ratio of test voltage to minimum turns; the test levels may otherwise be reduced such that none of the three tests required in 5.10.6.1 need be exceeded in order to meet the requirements of the other two, or such that no winding need be tested above its specified level in order to meet the test requirements of another winding.

(2) For Δ windings, the voltage-to-ground developed at each terminal shall be in accordance with Table 4 for the BIL specified; however, the voltage within the winding may be reduced to 87% of the voltage developed at the terminals, and may be further reduced to 67% when specified by the user and where the transformer is intended for application on an effectively grounded system (X_o/X_f less than three and R_o/X_f less than one).

5.10.6.3 Lightning Impulse Voltage Tests—General

(1) *Lightning Impulse Tests.* When specified, the lightning impulse test shall include reduced full wave, chopped-wave, and full-wave tests.

(2) *Front-of-Wave Lightning Impulse Tests.* When specified, front-of-wave lightning impulse tests shall be performed in addition to the tests of 5.10.6.3(1) above.

5.10.6.4 Lightning Impulse Voltage Tests — Exceptions

(1) Impulse tests shall not be made on windings that do not have terminals brought out through the tank or cover.

(2) Front-of-wave tests are not recommended on low-voltage or tertiary windings that are not exposed to lightning and that are connected directly to user equipment having low impulse strengths. This includes low-voltage windings of generator transformers, and transformer windings that operate at 5000 V or less.

(3) *Front-of-wave lightning impulse test tolerances.* In order to provide some tolerance in practical testing, a negative tolerance of 0.1 μ s to the tabulated times in Table 4 shall be permitted. Since the test is more severe with duration, a permissible limit shall be a positive tolerance of 0.3 μ s. If in making any front-of-wave test, the negative tolerance of -0.1 μ s is exceeded, the test may be considered as having been met provided the crest voltage attained in such test shall have equalled or exceeded the voltage determined by the following equation:

Voltage = Specified Minimum Crest Voltage

$$\times \left(1 + \frac{(T - 0.1) - T_1}{A T_1} \right)$$

where

T = specified time to sparkover in μ s

T₁ = actual time measured in μ s

A = 4 for 69 kV nominal system voltage and above

= 3 for 46 kV nominal system voltage and below

NOTE: For minimum test voltages, see Table 4.

5.10.6.5 Switching Impulse Voltage Tests — General. When specified, switching impulse voltage tests shall be performed.

NOTE: Since this test is a turns ratio test, the specification of two or more switching surge values, if not coordinated, will result in over-insulating windings. The selection of the highest voltage winding switching surge level only is recommended with the other windings being checked by turns ratio for the adequacy of the resulting switching surge at these terminals.

Table 4
Interrelationships of Dielectric Insulation
Levels for Transformers Used on Systems with
BILs 2425 kV and Below

Application	BIL kV	Low Frequency Voltage Insulation Level (kV rms)	*Impulse Levels				*Switching Surge Level (line-to- ground) (kV Crest)		
			Full Wave (kV Crest)	Chopped Wave		†Front-of-Wave Impulse Levels			
				(kV Crest)	Minimum Time to Flashover (μ s)	Minimum Crest Voltage (kV)		Specific Time to Sparkover (μ s)	
Distribution	30	10	30	36	1.0	—	—	—	
	45	15	45	54	1.5	-	-	—	
	60	19	60	69	1.5	-	-	—	
	75	26	75	88	1.6	-	-	—	
	95	34	95	110	1.8	-	-	—	
	125	40	125	145	2.25	-	-	—	
	150	50	150	175	3.0	-	-	—	
	200	70	200	230	3.0	-	-	—	
	250	95	250	290	3.0	-	-	—	
	350	140	350	400	3.0	-	-	—	
	Power	45	10	45	54	1.5	—	—	‡20
		60	15	60	69	1.5	—	—	‡35
		75	19	75	88	1.6	—	—	‡38
95		26	95	110	1.8	165	0.5	‡55	
110		34	110	130	2.0	195	0.5	‡75	
150		50	150	175	3.0	260	0.5	‡100	
200		70	200	230	3.0	345	0.5	‡140	
250		95	250	290	3.0	435	0.5	‡190	
350		140	350	400	3.0	580	0.58	‡280	
450		185	450	520	3.0	710	0.71	375	
550		230	550	630	3.0	825	0.825	460	
650		275	650	750	3.0	960	0.96	540	
750		325	750	865	3.0	1070	1.07	620	
825		360	825	950	3.0	1150	1.15	685	
900		395	900	1035	3.0	1240	1.24	745	
975		430	975	1120	3.0	-	-	810	
1050		460	1050	1210	3.0	1400	1.40	870	
1175		520	1175	1350	3.0	1530	1.53	975	
1300		575	1300	1500	3.0	-	-	1080	
1425		630	1425	1640	3.0	-	-	1180	
1550	690	1550	1780	3.0	-	-	1290		
1675	750	1675	1925	3.0	-	-	1390		
1800	800	1800	2070	3.0	-	-	1500		
1925	860	1925	2220	3.0	-	-	1600		
2050	920	2050	2360	3.0	-	-	1700		
2175	980	2175	2500	3.0	-	-	1800		
2300	1040	2300	2650	3.0	-	-	1900		
2425	1090	2425	2800	3.0	-	-	2010		

*Test made only when specified.

†Must be specified prior to transformer design.

‡When specified, switching surge tests are normally specified only on one winding of 450 kV BIL and higher.

These voltage values shall be used to establish the limiting induced switching surge voltage in low-voltage windings when a high-voltage winding is tested.

test gap shall occur.

10.5.1.4 Front-of-Wave Tests

(1) In front-of-wave tests the voltage shall be chopped on the rising front before the normal crest of the wave by a suitable air gap.

(2) When front-of-wave tests are also specified, impulse tests are generally applied in the following order: one reduced full-wave, two front-of-waves, two chopped-waves, and one full-wave.

(3) The order of the chopped-wave and front-of-wave tests is not mandatory, but a reduced full-wave must precede all the impulse tests, and the full-wave must be the last wave applied to the terminal under test. Another reduced full-wave may be applied following the two front-of-waves.

(4) Test waves shall have a crest value and time to sparkover in accordance with values listed for front-of-wave tests in ANSI/IEEE C57.12.00-1980, Table 4.

(5) In general, front-of-wave tests shall be applied only to line terminals and not to neutral or other terminals.

(6) Front-of-wave tests are not recommended on low-voltage or tertiary windings which will not be exposed to lightning and which are connected directly to user equipment having low impulse strengths. This includes low-voltage windings of generator transformers and transformer windings that operate at 5000 V or less.

(7) See ANSI/IEEE C57.98-1968 for test values, gap settings, and minimum and maximum times to flashover for front-of-wave tests.

(8) The time to sparkover for front-of-wave impulse tests shall be the time from virtual time zero to the time of sparkover.

The effective rate-of-rise shall be calculated by dividing 60% of the crest voltage by the difference in time between points at which the voltage is 30% and 90% of the crest.

(9) When testing windings that have large capacitance such as high kVA and low voltage, it may not be practical to obtain times-to-flashover down to 0.5 μ s.

(10) When transformers receiving front-of-wave impulse tests require reports which include oscillograms, those of the first reduced full wave voltage and current, the last two front-of-waves, the last two chopped-waves, and the last full-wave of voltage and current shall represent a record of the successful application of the front-of-wave impulse test to the transformer. See ANSI/IEEE C57.98-1968.

10.5.2 Wave To Be Used for Impulse Tests.

A 1.2 X 50 μ s wave shall be used for full-wave and reduced full-wave impulse tests.

Positive or negative waves may be used, except as follows: Unless otherwise specified, lightning impulse tests on transformers immersed in mineral oil shall be made with impulse waves of negative polarity.

The front-of-wave test, when specified, shall be negative polarity.

If in testing liquid-immersed transformers the atmospheric conditions at the time of test are such that the bushings will not withstand the specified polarity wave, then a wave of the opposite polarity may be used on the particular terminal involved.

10.5.2.1 The time to crest shall not exceed 2.5 μ s except for windings of large impulse capacitance (low voltage, high kVA and some high voltage, high kVA windings).

To demonstrate that the large capacitance of the winding causes the long front, the impulse generator series resistance may be reduced, which should cause superimposed oscillations. Only the inherent generator and lead inductances should be in the circuit.

For convenience in measurement, the time to crest may be considered as 1.67 times the actual time between points on the front of the wave at 30% and 90% of the crest value.

10.5.2.2 The virtual time zero can be determined by locating points on the front of the wave at which the voltage is, respectively, 30% and 90% of the crest value and then drawing a straight line through these points. The intersection of this line with the time axis (zero-voltage line) is the virtual time zero.

10.5.2.3 The time on the tail to the point of half-crest voltage of the applied wave shall be not less than 40 μ s from the virtual time zero, unless the winding is of low inductance. This is within the—20% tolerance provided for a nominal 1.2 X 50 μ s wave.

10.5.2.4 When there are high-frequency oscillations on the crest of the wave, the crest value shall be determined from a smooth wave sketched through the oscillations. If the period of these oscillations is 2 μ s or more, the actual crest value shall be used.

If there are oscillations on the front of the waves, the 30% and 90% points shall be determined from the average, smooth wave front

ATTACHMENT J STATUS REPORT OF STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE						
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	GENERAL REQUIREMENTS AND TEST PROCEDURES FOR OUTDOOR APPARATUS BUSHINGS (IEEE 24)	ELLIOTT F. E. (614)223-2259	FSIM IEC SC.16 IATPE ICC	7/23/91 6/20/96 1996	BEING BALLOTTED FOR REAFFIRMATION REVISE/REAFFIRM BEFORE 10/31/97	
C57.19.01	STANDARD PERFORMANCE CHARACTERISTICS AND DIMENSIONS FOR OUTDOOR APPARATUS BUSHINGS (IEEE 24)	SINGH PRITPAL (901)696-5228	ICC IATPE IEC SC36A	8/5/91 6/20/96 1996	BEING BALLOTTED REVISE/REAFFIRM BEFORE 10/31/97	
C57.19.03	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	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	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	
N1W	TASK FORCE TO STUDY APPLICATION AND PROBLEMS OF DRAW LEADS FOR BUSHINGS	NORDMAN RUSSELL (414)547-0121			NEW TASK FORCE	

7.3 Dielectric Test - L. B. Wagenaar - Chair

The Dielectric Test Subcommittee met on July 17, 1997 in Graz, Austria with 29 members and 29 guest present. The minutes of the last subcommittee meeting in Burlington, Vermont were approved with no changes.

The Chairman covered the key points of the Administrative Subcommittee meeting held on July 15, 1997. See Clause 4.0 for details.

7.3.1 Working Group on Revisions of Dielectric Test - Bertrand Poulin

The Working Group met on July 16 at 1:20 p.m. with 17 members and 23 guests. The minutes of the Burlington meeting were approved as written. M. Perkins presented his report for the meeting of the task force on revision of the induced test. (see report attached)

Nothing new was reported on the issue of waveshape correction factors since the last meeting. The discussion on the status of table 5 and 17 of C.57.12.00 was postponed to the Dielectric Test Sub-Committee meeting at the request of Subhash Tuli who is taking care of the task.

The process for revising the "Guide for Transformer Impulse Test" has started, led by Subhash Tuli. A survey has been sent out recently and Mr. Tuli is presently collecting the responses from the members. A report will be presented at the next meeting in St. Louis, based on the comments received, it will then be decided if a separate task force is needed. If only minor changes are required to the guide, no task force will be set up.

The last topic on the agenda is the revision of the standard test levels for 765kV transformers. Loren Wagenaar showed a list of the utilities operating 765kV transformers in the Western hemisphere and none of them uses the currently listed test levels. It is proposed to replace the present lines for 765kV transformers by 3 lines, all under 765kV classification, to reflect the test levels in use today.

	BIL	CW	SIL	Enhance	1 Hour
765kV	1950kV	2145kV	1550kV	850kV	750kV
	1950kV	2145kV	1620kV	883kV	795kV
	2050kV	2255kV	1700kV	883kV	795kV

A question was raised by Mark Perkins concerning table 3 of C57.12.00. No maximum voltage for systems operating below 46kV. Mark proposes to fill in the table in order to clarify the test levels of low voltage windings at these voltage levels.

The meeting was adjourned at 2:15pm.

7.3.1.1 Task Force on Revisions of the Induced Tests - Mark Perkins, Chair

The task force met on Wednesday July 16, 1997 at 8am with 8 members and 16 guests. After the usual introductions, the minutes of the previous meeting in Burlington, Vermont were approved as written.

The ballot / survey of the Dielectric Test Subcommittee on Draft 3 of C57.113 and C57.12.90 was then reviewed. There were 47 of 97 ballots returned for a rate of 48.5%. Thirty-five approved and six approved with comments. Three voted negative and three obtained. Summary of comments is attached.

Bob Veitch voted negative because he felt that a 150 PC increase during the one hour was too much and only 100 PC should be allowed. Harold Moore voted negative because he felt that a 500 PC maximum was too great a limit and that the limit should be 300 PC. He also indicated that the latest draft of the IEC Standard has the limit of 300 PC for a 1 hour test at 1.5 times voltage.

Donald Platts voted negative on C57.113 because he felt that the wording on section 5.2.6, first sentence was unclear. The chairman will work with Don to modify the sentence to satisfy his objection.

Comments by Charles Brown, to change "pd" to "partial discharge (pd)" were accepted.

Comment by Sabhash Tuli to change section 10.8.5, last paragraph were labeled for further discussion.

Comments (editorial in nature) by John W. Matthews will be reviewed by the chairman and John to resolve.

Comments by Rick Young:

- a. C57.113 to be revised in total were not accepted. Task force agreed to modify C57.113 sections per Draft 3 as modified by negative ballots and comments and submit to IEEE for Committee ballot.
- b. Editorial comments will be addressed by Chairman.

Comments by R. J. Musil that Annex A1.2 item C, should be dropped was accepted by task force.

Comments by Bertrand Poulin were accepted and appropriate wording will be worked out by chairman and Bertrand.

Finally, the task force agreed to put together a survey asking for specific pd test data in order to compile a statistical analysis of micro voltage PC test data. The survey will list the specific information regarding the transformer tested and the test results in order to provide complete information needed for the analysis of the results. The Chairman agreed to distribute a draft of the survey before the next meeting in order to quickly begin collecting data.

The Chairman recommended delaying discussion of old business. The tests on transformers with series and parallel connections until the next meeting.

The task force adjourned at 9:20am

7.3.2 Working Group on Partial Discharge Tests - J. W. Harley, Chair

The Working Group met at 10:55am on July 16 and was attended by 5 members and 32 guests.

Attendees introduced themselves. Minutes of the previous meeting October 28, 1996 in Burlington, Vermont 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. A request will be made for this to be balloted without further revision. This Guide had been previously balloted and approved by the Transformers Committee. It was submitted for publication and, after some delays, the Transformer Committee was informed it would be necessary to re-ballot because the paperwork for Standards Board approval could not be found.

The Standards Board has recommended that we ballot and, hopefully, pass the "Detection" guide and then add the "Location" guide to it instead of having two guides so closely related. We are pursuing this path.

The first draft of the Trial Use Guide for Location of Acoustic Discharges in Oil-immersed Power Transformers and Reactors was reviewed. A number of comments were received that will broaden the scope of the guide to include the many levels of acoustic equipment users. A limited survey of manufacturers and utility users will be conducted to add more shop and field experience to the operation procedure and to provide depth to the interpretation section. The target is to have the next draft of the guide sent out to Working Group attendees before the November meeting in St. Louis.

7.3.3 Working Group on Diagnostic Field Testing and Monitoring - Donald Chu

The Working Group on Diagnostic Field Testing and Monitoring of Liquid Filled Power Transformers, Regulators and Reactors met on Thursday, July 17, 1997 at 8am. There were 29 members and 41 guests in attendance. Donald Chu chaired the session for Rick Young who was unable to attend. The meeting minutes of the Burlington meeting were approved as written.

At the last working group meeting it was agreed to form a task force to prepare a Guide for on-line monitoring of liquid filled power transformers. Donald Chu - Con Edison will be the chairman and Andre Lux - ABB-ETI the secretary. The task force did not meet at this meeting.

A panel session was held with transformer manufacturers giving their perspective on the on-line monitoring. The panel list were:

Ramsis Girgis - ABB, Muncie, IN

Thomas Leibfried - Siemens, Nuremberg, Germany

Walter Seitlinger - ELIN, Weiz, Austria

The presentation topics included:

1. Why transformer monitoring
 - Early detection of incipient faults

7.0 Reports of Technical Subcommittees (cont'd)

- Optimize equipment efficiency and maintenance (condition monitoring)
- 2. Transformer parameters to monitor
- 3. Existing sensor availability and future sensor development
- 4. Diagnostic tools for data reduction and analysis
 - Transformer transfer function
 - Thermohydraulic model for loading

7.3.3.1 Task Force for On-Line Monitoring Communications - J. H. Harlow

The task force for on-line communication met on Thursday, July 17, 1997 at 9:30am with 27 attendees. Fifteen of those are, or requested to become members. The task force will prepare the communication requirements for other aspects of the transformer, including the main tank, LTC compartment, fans, pumps and bushings.

The meeting started with the Chair giving an update of the inquiry status of UGA, especially the MMS protocol implementation. The first system is in operation at United Power Association; the second will be field tested in the next four months at City Public Service. Both of these incorporate only the LTC control pertains to the overall transformer operation.

The objective of the task force is to expand on the LTC control to all aspects of the power transformer. The TF identified the main tank, the load tap changer, the heat exchanger including pumps and fans, the bushings, the energized tap changer and the controls enclosures for this purpose.

The task force was successful in identifying many attributes which are candidates for reporting. Future meetings will refine and expand this list as required.

The meeting was adjourned at 9:20am

Liaison Report: IEEE PES Substations Committee, Subcommittee CO, WG2, TF4
"Communication Between Intelligent Electronic Devices" - J. H. Harlow

Points of note:

1. Most of the work involving communication between intelligent electronic devices has been organized and conducted by EPRI under project 3599 for Utility Communication Architecture (UCA). The IEEE Standards Board established a new Standards Coordinating Committee (SCC 36) at its meeting March 16, 1997. With this, the coordination of UCA activities will move from EPRI and IEEE. Specifically, SCC 36 will:

Review and approve new IEEE UCA protocols and standards

Submit the IEEE standards to ANSI, ISO and IEC

Note the SCC 36 will not actually develop the standards. This activity will remain with the various IEEE PES committees as in the past.

2. In the previous report (October 29, 1997) it was noted that until recently clearly preferred application layer protocol for UCA, MMS (Manufacturing Message Specification), was being challenged by FMS to not meet all of the requirements for speed of the Utility Initiative. That group is now also concentrating on MMS. This seems to mean that there is a good chance of having just one defined protocol emerge for use with UCA.
3. The principal UCA demonstration project now in development and nearing installation is that for San Antonio City Public Service. This will involve substation and feeder apparatus including control of load tap changers on power transformers and step-voltage regulators. The communication for these products and others in the CPS demonstration are now well defined.
4. The next major emphasis for UCA is on the requirements for protection, some 20+ devices. This includes the differential protection 87 device as is commonly used for transformer protection.
5. The Diagnostic Field Testing and Monitoring WG has constituted a TF for Transformer On-Line Monitor Communication. This TF will meet for the first time in Graz. This TF will write the communications requirements for other aspects of the transformer, including the main tank, LTC compartment, fans, pumps and bushings. The appropriate persons of the Substations Committee have been advised of this and are anticipating input from us. Those persons with knowledge of the communications available with these aspects of power transformers are invited to participate in the Task Force.

The Working Group meeting was adjourned at 9:20am

7.3.4 Working Group on Recommended Practice for Routine Impulse Tests for Distribution - J. Rossetti Chair

The Task Force for writing the Recommended Practice for Routine Impulse Tests for Distribution Transformers Submitted Draft 6 for balloting to the Working Group and Dielectric Test Subcommittee. A total of 113 ballots were sent out with the following results: 67 affirmative, 5 with comments, 10 abstentions and 0 negatives. The needed changes will be made and a ballot group will be formed so that the document can be balloted before the next Transformer Committee meeting in St. Louis, MO.

7.3.5 Liaison Reports

7.3.5.1 Insulation Coordination - J. Crouse

A meeting was held in Phoenix on February 10-11, 1997 to review and revise Draft 3 of IEEE Standard for INSULATION COORDINATION -Part 2 - Application Guide. Draft 4 was prepared and sent out to the committee members for comments.

7.3.5.2 Surge Protection Devices - R. Degeneff

The IEEE Guide for Gapped Silica - Carbide Arrestor (C62.2.2 - 1987) shows a curve of operation for these devices. This discontinuous curve will now be replaced with a smoothed

curve using 5 points. The original and smoothed (continuous) curves were discussed and compared.

B. Degeneff also reported that a new Working Group had been formed for the interaction between breakers and transformers. They will create a guide for this application.

7.3.6 Old Business

7.3.6.1 Induced Voltage Test Levels for 735 kV and 765kV Transformers.

L. B. Wagenaar had written a letter to the members of the Dielectric Test Subcommittee on the subject of 735kV and 765kV test levels. This issue was covered in the Working Group on the Revision of Dielectric Tests, section 7.3.1

7.3.6.2 Power Factor Temperature Correction Factors Table 5, C57.12.90.

At the last meeting in Burlington, Vermont, J. Corkran volunteered to submit a power factor temperature correction curve for distribution transformers. He was not able to obtain a suitable curve for recommendation, the following is the contents of the letter he wrote to the Subcommittee Chair.

Power Factor Measurements on Distribution Transformers - Jerry Corkran

Letter to Subcommittee Chair.

Under new business at the last Dielectric Test Subcommittee meeting, I volunteered to conduct power factor tests regarding the variation of the power factor measurement with temperature and to recommend a curve which would apply to Distribution Transformers.

I did not obtain a suitable curve for recommendation. Additional review of the subject leads me to wonder if a "standard" curve should be included in the revisions of C57.12.90. I doubt that there is one curve that fits all transformers or even all distribution transformers.

Suggestion - When the standard is revised, the notes as listed below from Table 4 of C57.12.90 should be emphasized:

- 1. While the real significance that can be attached to the power factor of liquid-immersed transformers is still a matter of opinion, experience has shown that power factor is helpful in assessing the probable condition of the insulation when good judgment is used.*
- 2. In interpreting the results of power-factor test values, the comparative values of tests taken at periodic intervals are useful in identifying potential problems rather than an absolute value of power factor.*
- 3. A factory power-factor test will be of value for comparison with field power-factor measurements to assess the probable condition of the insulation. It has not been feasible to establish standard power-factor values for liquid-immersed transformers for the following reasons:*

7.0 Reports of Technical Subcommittees (cont'd)

- a. *Experience has indicated that little or no relation exists between power factor and the ability of the transformer to withstand the prescribed dielectric tests.*
- b. *Experience has shown that the variation in power factor with temperature is substantial and erratic so that no single correction curve will fit all cases*
- c. *The various liquids and insulation materials used in transformers result in large variations in insulation power-factor values.*

Concerning the same subject, IEEE P62:Guide for Diagnostic Field Testing of Power Apparatus Part 1:Oil Filled Power Transformers, Regulators, and Reactors in section 6.1.7.2 under "Interpretation" lists an acceptance criteria of less than 0.5% power factor. This standard should be modified to include the notes listed above rather than an arbitrary power factor value.

The Chairman questioned the distribution manufactures as to what they currently used for correction of power factor vs. temperature. J. Corkran indicated that they used the correction factors currently in the standard.

The Chairman stated that he would find a volunteer to: 1.) write a letter to the Distribution Transformer manufactures to request information on Power Factor Correction, and 2.) find the appropriate place in the text where the notes of table 4 should be placed

7.3.6.3 Factory Dielectric Test of Repair Transformers

(Comments on Mark Perkins' Proposal)

M. Perkins received one comment which he will incorporate and send out a new ballot.

7.3.6.4 Induced Tests for Series o Multiple Connections

(Comments on Bruce Forsyth's proposal)

No discussion

7.3.6.5 Reorganization of Dielectric Test Subcommittee

As was discussed at the last Subcommittee meeting in Burlington, Vermont the reorganization of the Subcommittee was approved by the Administrative Subcommittee and will be in force at the next meeting in St. Louis, MO. The following four Working Groups will be established and maintained:

1. WG on Revision of Impulse Tests
2. WG on Revision of Low Frequency Tests
3. WG on Field Monitoring
4. WG on Revision of Partial Discharge Measurement on Transformers

7.3.6.6 Revision of Table 5 and 17 of IEEE Std. C57.12.00 - 1993 - S. Tuli

After the Burlington, Vermont meeting Subhash Tuli mailed a survey letter on the revisions of Table 5 and 17 in C57.12.00-1993. He discussed the following results of this survey:

Table 5: Dielectric Insulation for Class II Power Transformers

Proposed revisions will be made to the table. A few editorial comments will be incorporated into table.

Table 17: Routine, Design and Other Tests for Liquid-Immersed Transformers

The following areas of revision were proposed in bold.

- Single phase excitation test on the rated voltage connection, note (8) added.
- Control (auxiliary) losses, note (9) added
- Low frequency - on winding terminals brought out
- Low frequency - on auxiliary devices, controls and CT circuits.
- Radio influence voltage / partial discharge
- Core insulation resistance (see note 11)

Some negative votes were received on the core insulation resistance at least 500 volts DC. Negatives will be resolved.

7.3.6.7 Oil-Filled Regulators

The Chair was asked at the last meeting if Oil-Filled Regulators are in the scope of the Subcommittee. This question was asked at the Administrative Subcommittee and these apparatus are covered under C57.15, Standard Requirements, Terminology, and Test Code for Step-Voltage and Induction-Voltage Regulators.

7.3.7 New Business

7.3.7.1 IEC Standards

Loren Wagenaar reported that as a member of IEC/TC 14/WG 24 to revise IEC 76-3 he has compared several parts of C57.12.90 and C57.98 with the revision of IEC 76-3. In doing this, several differences came to light which should be considered by the IEEE, and these differences will be reported to the appropriate person in IEEE for future consideration.

7.3.7.2 Low Frequency Test Voltage

Phil Hopkinson has raised the point that the low frequency test voltages for some of the lower system voltages are excessively high if Table 3 and 4 of C57.12.00 are followed. This item will be pursued in future meetings.

7.3.7.3 Insulation Resistance Temperature Correction Factor

Mark Perkins would like a curve added for insulation resistance corrected for temperature. The Chairman will discuss with some members and will consider the request at a future meeting of the Subcommittee.

Respectfully Submitted,
Michael A Franchek
Dielectric Test Subcommittee, Secretary

ATTACHMENT 4 STATUS REPORT OF STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE

25-Sep-97

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE REV DUE	STATUS AND COMMENTS
SUBCOMMITTEE: DIELECTRIC TESTS					
CHAIR: L. B. WAGENAR					
PHONE: (614)223-2259					
C57.113	GUIDE FOR PARTIAL DISCHARGE MEASUREMENT IN LIQUID-FILLED POWER TRANSFORMERS AND SHUNT REACTOR	POULIN B (408)57-8326	PSIM IAS/SE IEC TC14 U	12/5/91 6/20/96 1996	PAR APPROVED 6/20/96 REVISE/REAFFIRM BEFORE: 10/31/97
C57.12.00	SECTION 5.10.7.1 - LIGHTNING IMPULSE TESTS	MINKWITZ R E (617)828-3241			APPROVED BY MAIN COMMITTEE
C57.12.00	TABLE 17 - SWITCHING IMPULSE TESTS - NOT IN ADD'D	POULIN B (408)57-8326			APPROVED BY SUBCOMMITTEE
C57.12.00	TABLE 3 AND 5 - HARMONIZE VALUES	POULIN B (408)57-8326			UNDER DEVELOPMENT
C57.12.90	REVISE INDUCED TESTS FOR CLASS II POWER TRANSFORMERS	PERKINS M. (317)286-9334			DI BALOTTED IN TF
C57.12.90	CLAUSE 10 - ADD HI-POT TEST FOR CONTROL WIRING	ITUL S. (414)547-0121			DI BALOTTED IN SUBCOM
C57.12.90	CLAUSE 10.4 - IMPULSE TESTS FOR DISTRIBUTION TRANSFORMERS	ROSSETTI J (901)528-4743			APPROVED BY SUBCOM
C57.12.90	REVISION OF THE INDUCED TEST	POULIN B (408)57-8326		9/28/90 0	INCLUDE IN C57.12.90 COORDINATE WITH STEVE SMITH
C57.127	GUIDE FOR THE DETECTION OF ACOUSTIC EMISSIONS FROM PARTIAL DISCHARGES IN OIL-FILLED POWER TRANSFORMERS	J W HARLEY (216)425-1838	ICC PSIM IEC TC14 U	6/26/97 0	PAR APPROVED ON 6/26/97
C57.138	RECOMMENDED PRACTICE FOR ROUTINE IMPULSE TEST FOR DISTRIBUTION TRANSFORMERS	ROSSETTI J (901)528-4743	T&D IA PSI FSIM	9/19/96	

ATTACHMENT 4 STATUS REPORT OF STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE						
25-Sep-97 STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS	
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	
C57.98 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	
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	
IEEE 1350 P1350	GUIDE FOR PROTECTION OF DISTRIBUTION TRANSFORMERS WITH EMPHASIS ON SECONDARY (LOW VOLTAGE SIDE) SURGES	ROSSETTI J. (901)528-4743	SPD I&D IC	0	PAR WITHDRAWN ON 3/20/97, COVERED BY C62.22	
NEW NO PAR YET	GUIDE FOR THE LOCATION OF ACOUSTIC EMISSIONS FROM PARTIAL DISCHARGES IN OIL- IMMERSED POWER TRANSFORMERS	HOWELLS E. (414)835-1500		0	BALLOTING WORKING GROUP SUBMIT PAR AS SOON AS POSSIBLE	

7.4 Distribution Transformers - K. S. Hanus, Chair

7.4.1 Chair's Remarks & Announcements

The meeting convened at 9:25 am in the Wiesler Hotel, Salon 9 with the introduction of the members and guests and signing of the attendance roster. There were 7 members and 4 guests in attendance.

The chairman covered key points of the ADCOM meeting from earlier in the week. See Clause 4.0 for details.

7.4.2 Working Group Reports

7.4.2.1 C57.15 Step-Voltage Regulators

The WG discussed & reviewed Draft 7 which is a result of work by a task force put together in Burlington. The WG agreed to several minor changes relating to :

- Single phase units with a liquid level indicator
- Wording relating to composition of NL losses
- Methodology of performing impulse testing

Draft 8 will be produced and sent out for review before the St. Louis meeting. The goal is to begin the balloting process after the St. Louis meeting.

7.4.2.2 C57.12.20 Polemount Transformers

The status of the previously approved Draft 4 was discussed. The document is in the publication department at NEMA awaiting a blue line proof with a 1997 publication expected.

Draft 3 of the current document revision was handed out and several editorial changes were pointed out.

Old business that was discussed included:

- Work to simplify the figures
- EEI survey on eliminating type C hanger brackets

New business that was discussed included:

- Specifying requirement of, position & spacing of surge arrester mounting pads
- Include functional requirements of gaskets

7.4.2.3 P1388 Electronic Data Transmittal

The working group discussed a review of draft II by several WG members. The review was focused on:

7.0 Reports of Technical Subcommittees (cont'd)

- Data element definitions should be the same as in C57.12.00 nameplate requirements
- Final disposition of data elements
 - Standard Data Set
 - Extended Data Set
 - Data not reported because it can be calculated from other elements
 - Extraneous Data not required

The working group discussed data set formats and the following was agreed upon:

- Comma delimited format
- Flat file format
- 256 character maximum file length
- Use of extra file space for user defined fields

Draft II along with the changes reviewed by members will be made into draft 3 and mailed to working group members before the St. Louis meeting for review. The goal is to ballot the document next year.

7.4.3 New Business

The subcommittee discussed the development of a guide for WG chairs for use in the balloting process for documents, which are from the group of documents of which NEMA maintains copyright. These documents require additional balloting outside IEEE to become ANSI documents. The guide would cover the steps to be taken to ensure documents are approved in a timely manner. Several members volunteered to develop the guide.

7.4.4 Working Group Assignments

The current assignments are as follows:

- .20 Glenn Andersen / Allen Wilks
- .21 Ali Ghafourian
- .22 Ken Hanus
- .23 OPEN
- .25 John Lazar / Ali Ghafourian
- .26 Gerry Paiva
- P1388** David Rolling/Angie McCain
- .35 Ron Jordan / Ed Smith
- .33 Tom Pekarek/Don Duckett
- .34 Clyde Pearson/Ron Stahara
- 57.15** Tom Diamantis/Craig Colopy

The meeting adjourned at 10:00 am.

ATTACHMENT 4 STATUS REPORT OF STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE

25-Sep-9

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
SUBCOMMITTEE: DISTRIBUTION TRANSFORMERS					
CHAIR: K. S. HANUS					
PHONE: (817)882-6020					
C57.12.20	OVERHEAD-TYPE DISTRIBUTION TRANSFORMERS, 500 KVA AND SMALLER 11 V 34500 VOLTS AND BELOW, 1. V 79700/13800Y &	ANDERSON G. W. (911)339-2911		6/20/96	
PC57.12.20				2001	
C57.12.21	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
PC57.12.21					
C57.12.22	PAD-MOUNTED, COMPARTMENTAL-TYPE SELF-COOLED, 3-PHASE DIST. TR WITH HV BUSHINGS, 2500KVA AND	HANUS K. (817)882-6025	T&D IAS/REPC IAS/PSEC	1/9/95 6/27/91 1999	AWAITING PUB. BY NEMA
PC57.12.22					
C57.12.23	UNDERGROUND-TYPE, SELF-COOLED, 1-PHASE DISTRIBUTION TR WITH SEPARABLE INSULATED HV CONNECT HV 249.40GrdV, 1.V, 240...167KVA.	SCHEU R. W. (704) 462-3164	T&D IC IAS/REPC	9/19/85 6/27/91 1996	ANSI APPROVED 02/18/94 REVISE/REAFFIRM BEFORE 10/31/97
PC57.12.23					
C57.12.25	REQUIREMENTS FOR PAD-MOUNTED COMP. TYPE, SELF-COOLED, 1-PHASE DISTRIBUTION TR W-SELF INS HV CONN, HV 34500GrdV...167KVA.	MOHESKY N. (314)239-6783	T&D IC IAS/REPC	5/11/90 6/27/91 1995	PAR WITHDRAWN SUBMIT NEW PAR
PC57.12.25					
C57.12.26	PAD-MOUNTED COMPARTMENTAL-TYPE SELF-COOLED, 3-PHASE DIST TR for USE W/ SEPARABLE INSULATED HV CONN, HV 34500GrdV, 2500KVA.	PEARSON L. C. (817)882-6025	T&D IC IAS/REPC	6/17/92 12/5/91 1997	TO BE PUBLISHED BY NEMA
PC57.12.26					
C57.12.27	STANDARD FOR TRANSFORMERS - LIQUID FILLED DISTRIBUTION TRANSFORMERS USED IN PAD-MOUNTED INSTALLATIONS, INCLUD. UNII SUHS	MILLER J. R. (314) 634-2111		6/27/91 0	PAR WITHDRAWN SUBMIT NEW PAR
PC57.12.27					
C57.12.28	PAD-MOUNTED EQUIPMENT - ENCLOSURE INTEGRITY	MARTIN J		6/24/87 1994	JOINT C37/C37 PROJECT AWAITING PUBLICATION
ANSI					
C57.12.29	PAD-MOUNTED EQUIPMENT - ENCLOSURE INTEGRITY IN COASTAL ENVIRONMENTS	MARTIN J		1996	PUBLISHED IN 1992 NOT TRANSFORMERS COMM.
ANSI					
C57.12.30	SUBMERSIBLE EQUIPMENT - ENCLOSURE INTEGRITY	MARTIN J		1994	TO BE BALLOTTED NUMBER TO BE CHANGED
ANSI					

ATTACHMENT 4 STATUS REPORT OF STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE						
STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS	
25 Sep-97 C57.12.31 ANSI	COATING STANDARD FOR POLE MOUNTED TRANSFORMERS	MARTIN J		1994	JOINT C37/C57 PROJECT AWAITING PUBLICATION	
C57.12.32 ANSI	ENCLOSURE INTEGRITY OF SUBMERSIBLE EQUIPMENT	ILANUS K. (817)882-6020			AWAITING PUBLICATION BY NEMA	
C57.12.33 PC 57.12.33	GUIDE FOR EVALUATION OF LOSSES IN DISTRIBUTION TRANSFORMERS	PEKAREK T. (216)479-3400	FSIM		PAR DISSAPPROVED 03/21/96 NESCOM WANTS CLARIFICATION	
C57.12.34 PC 57.12.34	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 2001	APPROVED BY STANDARDS BOARD 6/20/96 PREVIOUSLY P1265	
C57.15 NONE	REQUIREMENTS, TERMINOLOGY, & TEST CODE FOR STEP-VOLTAGE REGULATORS	DIAMANTIS T. (315)428-5688	SUBS LAST/SE	3/18/87 9/21/95 1997	REVISE/REAFFIRM BEFORE 10/31/97	
IEEE1388 P1388	STANDARD FOR THE ELECTRONIC REPORTING OF TRANSFORMER TEST DATA	McCAIN A. (410)291-3231	EEL NEMA ASC X12	PSR CS SAI 0	PREPARING DI NO. CHANGED FROM C57.132	

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 a.m. on July 17, 1997 with 13 members and 8 guests present. Introductions were made and the attendance roster was circulated. Minutes from the previous meeting were reviewed and approved. Two working groups did not meet during this session.

- Dry-Type Test Code C57.12.91
- Cast Coil Loading Guide C57.96

These working groups will have session at St. Louis.

7.5.1.1 Announcements and New Business

Following the reports of the working group chairs, there was a discussion on the timing of the U.S. Tag Meeting (TC-14). Numerous members had conflicts with their IEEE commitment. P. Hopkinson was requested to move the IEC meeting outside the envelope of time covered by the IEEE work group meetings.

David Ramsden has replaced Luigi Napoli as the IEEE PES Coordinating Engineer. His telephone number is (732) 562-3931 and his E-mail address is d.ramsden@ieee.org.

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 sections for the individual reports.

7.5.2.1 C57.16 Dry-Type Reactor - Richard F. Dudley, Chair

On July 16, 1997, the Dry-Type Reactor working group met from 8:00 a.m.–8:15 a.m. in the Forstner Room of the Wiesler Hotel and from 2:45 p.m.–4:00 p.m. in Salon 5 of the Weitzer Hotel in Graz, Austria. There were 7 members and 1 guest present. The following are the highlights.

1. The Chairman informed the working group that C57.16-1996 was to be published in June 1997.
2. Pierre Riffon expressed, in writing, some concerns regarding the positive polarity chopped wave test included in C57.16; if a more triggered gap is used the gap may fail to fire resulting in an excessive crest voltage being applied to the reactor under test. The working group decided to take his comments under advisement and address the issue during the next revision of C57.16.
3. The remainder of the working group's time was spent in reviewing D5 of the HVDC smoothing reactor standard. Pierre Riffon's written comments were circulated and formed part of the discussion. The key points are as follows:

7.0 Reports of Technical Subcommittees (cont'd)

- (i) References will be updated
- (ii) Subclauses will be eliminated from the table of contents; the IEEE style manual will be consulted.
- (iii) References (21), (7), (20), (28), (29) & (30) will be eliminated as being non-applicable to HVDC SMRs. The new DC bushing standard C57.19.03 will be added. References (A), (18), (19) cover LA's for AC power systems. LA's for HVDC are special designs and thus the LA standards are not directly applicable. A recent CIGRE paper dealing with LAs for HVDC will be included. LEJ will provide the details for inclusion in the bibliography.
- (iv) A statement will be included at the beginning of the reference section stating that the newest version of the referenced standard should be used when applicable. The wording in IBC standards will be checked.
- (v) Section 3.1 will have the final sentence modified; "oil immersed smoothing reactors utilize magnetic core materials."
- (vi) Section 3. will include definition for inductance (re SMR application), incremental inductance, rated DC current, ripple current (harmonics), ambient temperature.
- (vii) Section 3.1 include an additional purpose of a SMR to limit the discharge current of a DC cable.
- (viii) In Section 5.1.2 the ambient temperature of the cooling air will be emphasized as the ambient temperature of interest. Should the 24 hour average be 35°C vs 30°C to be in line with IEC? All IEEE standards use 30°C.
- (ix) In Section 5.2.2.1 and Table 2 there should be more differentiation between oil and dry SMRs as to what part of the respective insulation systems depend on air.
- (x) In Section 5.2.2.2 and elsewhere in the standard metric units will be given preference vs British or U.S. eg 1000 m. (3300 ft). Since this standard will not be completed until 1999 should all units be metric only?
- (xi) In Section 5.2.4 unusual service conditions will be quantified where possible eg. number of line faults (1 per year per 100 km), number of commutation failures (30 per year), acid rain (conductivity), installation indoors at a high ambient.
- (xii) In Section 5.1.1 installation outdoors will be specified as the usual service condition.
- (xiii) In Section 7.3.2.2.2 C57.13.1978 should not be referenced as the transducers used in oil SMR's are special devices; not multi-ratio and no taps.
- (xiv) In Section 7.3.2.2.1 the new DC bushing standard C57.19.03-1996 should be referenced.
- (xv) Section 7.3.2.4.6; the power supply voltage level should be specified by the purchaser.

7.0 Reports of Technical Subcommittees (cont'd)

- (xvi) Fig #4 should be eliminated if a similar drawing is not included in the converter transformer standard.
- (xviii) The following changes should be made to Table 5a:
 - AC Power Test with pd (1 hour)
 - DC Power Test is OTHER
 - Mechanical (eliminate lifting & moving devices and vibration)
 - Pressure
 - Leak
 - Note (6) should be modified; the DC Power Test is not expensive for all SMRs since DC current is applied during testing for oil filtration purposes.
- (xviii) In Table 5b eliminate note (2) since such dielectric tests may be required for SMRs installed on the material.
- (xix) In Section 9.1.1 it should be emphasized that losses are primarily DC with significantly smaller AC losses due to harmonic currents. Notes (1) - (4) should be reduced to 2 notes dealing with DC losses and harmonic losses. Note (7) should be modified to stress that induced losses in adjacent equipment are not significant.
- (xx) Section 9.2.1.3; tolerances on inductance (not impedance) should be set by those responsible for the system design.
- (xxi) Section 9.2.1.4; tolerances on inductance (not impedance).
- (xxii) Section 9.2.1.2; specify minimum inductance at short circuit and the tolerance on inductance over the full current range from zero % rated.
- (xxiii) In Table 6 the average temperature rise limits for Class (H) and (C) should be checked vs those in C57.21-1990 and C57.16-1996. Note (51) should be modified to state how temperature rise limits are applied for continuous overload, short time overload, full load rated current.
- (xxiv) Section 11.1.2; the switching impulse test for Dry-Type SMRs is a test of the winding as well as the support insulators.
- (xxv) Section 11.1.3; the chopped wave test is a test of the windings for both oil and Dry-Type SMRs.
- (xxvi) Section 11.1.1 should be titled Full Wave Impulse Test.
- (xxvii) In Table 5a the Full Wave Impulse is ROUTING, chopped wave is OTHER and switching is ROUTINE.

The chairman asked for other input from working group members as soon as possible so that he could produce Draft 6 prior to the St. Louis meeting. The second half of the meeting of the Dry-Type Reactor Work Group adjourned at 4:15 p.m.

7.5.2.2 Thermal Evaluation of Insulation Systems of Dry-Type Power and Distribution Transformers - Richard L. Provost, Chair

The working group met at 10:55 a.m. on Wednesday, July 16, 1997 at the Weitzer Hotel in Graz Austria. There were 8 members and 4 guests present. The minutes of the last meeting were approved as written.

Last Fall, the revised document for C57.12.60, the "IEEE Guide for Test Procedures for Thermal Evaluation of Insulation Systems for "Solid-Cast and Resin-Encapsulated Power and Distribution Transformers: was approved by ballot of the Dry-Type Subcommittee. In January, the document was sent to IEEE to be submitted for ballot of the Main Committee voting pool. The invitation to vote was sent out, but worded as a vote to re-affirm the original document, which was a "Trail-Use Standard". After discussions with IEEE headquarters, the chairman was informed that the PAR needed to be updated to reflect the change in scope of the document.

As a result, the chairman requested that the invitation to vote be withdrawn, and a new PAR was submitted, through Tom Traub. We were informed on March 1 that the new PAR would be submitted to the Standards Board meeting, which was not until June 26. On July 7 the chairman received word that the new PAR had been approved. With the new PAR in hand, the revised document C57.12.60 will be included in the next voting pool invitation. The chairman asked that Wes Patterson inquire why this process was delayed so long at the next ADCOM meeting.

In addition, the chairman has been informed that C57.12.56, the sister document for Open Ventilated Dry-Type Transformers will be due for re-affirmation or withdrawal by the end of 1998. The working group voted to submit the document for re-affirmation as soon as possible, with the intent to combine this document with C57.12.60 in future work by the working groups.

During our revision and combination of these documents, the working group will address the proposal to use partial discharge as a future alternate end point criteria.

Opening the discussion to new business, two new proposals were made by Jeewan Puri. The first was a proposal to establish design principles for the model coil based on the thickness of the insulation used for testing, in order to provide guidelines for scaling down the insulation for voltage stresses that are less than the maximum required to test the model coils. Discussion revolved around the fact that users of this document were required to first run a transient voltage analysis to determine the highest stressed point in the coil to be used for the model design. The test coils should not be design specific. Good engineering practice should be used in the design of the actual coils used for commercial purposes.

Consensus was reached that these design practices should be included in the document as a tutorial, and added as an informative index, rather than be part of the main document. Jeewan Puri agreed to write a sample tutorial, and the chairman agreed to help him.

The second issue involved the substitution of materials, once the final testing was completed to determine the thermal index of the insulation system. The working group agreed that this should not be part of the test guide, but we would refer to the IEC document which was being drafted on this subject by the new TC-98 SEC 61858. This way it would not be part of the document, but it would give manufacturers a reference upon which to make changes in the future. Although this document is only in draft form, it would likely be a CDV document by the time the new combined C57.12.56 and C57.12.60 was ready for balloting. The working group felt strongly that the

testing of insulation systems should be separated from the substitution of materials, and this was the best approach.

Finally, the chairman suggested that the final combined document should be submitted to IEC TC-98 to be considered as an IEC document for medium voltage transformers. To date TC-98 has only addressed insulation systems testing for low voltage equipment of 1000 volts and below.

The working group agreed that this was the correct approach. The chairman, who along with Bill Simpson, is a member of TC-98, requested that any members of this working group who would be interested should request membership of the U.S. Technical Advisory Group for IEC TC-98, since we are looking for representation from manufacturers of transformers. Today, the TAG is heavily weighted with materials suppliers and rotating equipment manufacturers. Chuck Johnson and Jeewan Puri expressed interest in joining the U.S. TAG for TC-98. The chairman agreed to provide reference to the U.S. Technical Advisor (Dick Weedleton of Westinghouse) for their support.

The last subject regarded the task force on flammability and toxicity issues. There has been little interest expressed in this subject over the last two or three year. However, Wes Patterson suggested that we continue to provide an outlet on the subject within this working group to monitor the ongoing issues in the industry, which will allow us to address any issues that affect us in the future. The working group chairman would like to solicit any new information which members may have on the subject.

With no further business, the meeting adjourned at 12:05 p.m.

7.5.2.3 Evaluation of Systems of Insulation for Dry-Type Specialty and General Purpose Transformers - P259

Working Group 259 met at 1:20 p.m. on July 16, 1997 in the Forstner Room of the Hotel Wiesler in Graz, Austria. There were four members and one guest present.

Introductions were made and the minutes of the October 28, 1996 meeting in Burlington, Vermont were approved as read.

Final ballot results on P259/D2(10/9/96) for the Dry-Type Subcommittee was 26 affirmative out of 38 issued; per last meeting's agreement, since no negative ballots were received, P259/D2 was prepared for general ballot.

A balloting pool was generated through the IEEE Standards Committee; P259/D2 was put into proper IEEE format and submitted for ballot as Draft2, Revision 1 (3/31/97).

IEC/TC-98 "Electrical Insulation Systems" met in May, 1997 and discussed the following items.

- IEC Stds. 505-1 and 505-2 will be combined into a single document, "Guide for the Evaluation and Qualification of EIS."
- IEC 61857, "Test Procedures for Thermal Evaluation of EIS," was revised and will be circulated as a CDV. WG259 recommends proposing a "part" for addition to IEC 61857 with specific requirements for dry-type specialty and general-purpose transformers to be submitted through the U.S. TAG to IEC/TC-14.

7.0 Reports of Technical Subcommittees (cont'd)

- IEC 61858, "Additions and Modifications to an Established EIS," is to be completely rewritten and circulated as a CD.
- An Ad Hoc working group was formed to address the issue of electrical stresses produced by periodic impulses in electrical equipment.
- As there was no new business, the meeting adjourned at 1:50 p.m.

7.5.2.4 Hot Spot Differentials Dry-Type Subcommittee - Paulette A. Payne, Chair

The working group met at 8:05 a.m. on July 17, 1997 with 6 members and 13 guests in attendance. Minutes of October 29, 1996 were approved as written.

Wes Schwartz - Presentation "Hot Spot Temperature Rise 600 volt class 75 KVA transformers" of rectangular core design. Thermocouple located 20% below the top of winding was hottest spot location; a hot spot rise of 29.3°C was observed.

Richard Dudley - "Experience with temperature measurement of Reactors." Found all devices (thermometers, thermocouples, temperature stickers and fiber optics) to give accurate results in measurement of surface temperature.

Chuck Johnson - Graphs on hot spot location were explained for various winding constructions. For disc windings found hot spot to be approximately 25% below top of coil. On a split strip winding, the hottest spot was observed to be on the end of the coil near the lead. The hottest spot temperature rise was typically in the range of 35% greater than average winding rise.

Summary:

1. The guide will not specify hot spot location as this varies with winding construction.
2. The guide will include application of thermometers, thermocouples, temperature stickers and fiber optics for temperature measurement.
3. The membership was asked to review Section 6.0 "Determination of Hottest Spot Temperature," supporting data from Lin Pierce and to provide any comments to the chair.
4. The chair will revise the Draft Guide per meeting discussion and any other input received.

The meeting adjourned at 9:12 a.m.

7.5.2.5 Dry-Type - General Requirements C57.12.01 - Anthony J. Jonnatti, Chair; Timothy L. Holdway, Secretary

This working group met on July 16, 1997 at 9:30 a.m. in the Salon 11 room of the Weitzer Hotel in Graz, Austria. Present were 6 members and 9 guests.

After the introductions, the minutes of the Burlington, Vermont meeting were approved and seconded.

Following the approval of the minutes of the Burlington, Vermont meeting, the first item on the agenda was discussed. This item was the status of the revision of C57.12.01 currently being submitted for printing. The chairman indicated the IEEE rejected the submittal because the date

of the approved PAR was after the ballot was taken. Although the IEEE rejected our submittal, an effort is being made to resolve this issue without a new ballot.

The second item discussed was the interrelationship of dielectric insulation levels with Bil's 200 kV and below in Table 3A. Several handouts were distributed to illustrate the difference that exists. A proposal was made to revise this Table 3A to eliminate the confusion on the table. Mr. Phil Hopkinson agreed to address this problem and construct a new table and submit this to the working group for revision.

The next topic was partial discharge guide in the standard. Presently the revised standard contains only 2 paragraphs on partial discharge. It has been recommended that more detailed information be included with corresponding magnifier for different voltage levels be include in the standard. Mr. Chuck Johnson agreed to submit a proposal for review of the working group.

The next item was on the status of including 600 volt class dry-type units in the proposed future standard. Some discussion resulted. A conclusion was reached by suggesting that a PAR be submitted on this issue to determine if this class of transformers can be included in this standard.

With no new business, the meeting was adjourned at 10:25 a.m.

7.5.2.6 Dry-Type Test Code - C57.12.91 - Mr. Dave Barnard, Chair: - Mr. Tim Lewis, Secretary

No Report.

ATTACHMENT 4 STATUS REPORT OF STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE						
STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS	
SUBCOMMITTEE: DRY-TYPE TRANSFORMERS						
CHAIR: W. PATTERSON						
PHONE: (919)848-1860						
C57.12.01	GENERAL REQUIREMENTS FOR DRY-TYPE DIST. AND POWER TR INCL. THOSE WITH SOLID CAST & or RESIN-ENCAPSULATED WINDINGS	JONATTI A. (813)442-0414	NEMA U.L. ANSI	2/2/89 6/26/97 1996	PAR APPROVED ON 6/26/97	
C57.12.50	REQ. FOR VENTILATED DRY-TYPE DISTRIBUTION TR, 1-500KVA, 1 PHASE, AND 15-500KVA, 3-PHASE. WITH HV 601-34500VOLTS, LV 120-600V.	PATTERSON W. (919)848-1860		6/12/89 1994	COPYRIGHT NOT RELEASED BALLOT REAFFIRMATION	
C57.12.51	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 1994	COPYRIGHT NOT RELEASED BALLOT REAFFIRMATION	
C57.12.52	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 1994	COPYRIGHT NOT RELEASED BALLOT REAFFIRMATION	
C57.12.55	CONFORMANCE STANDARD FOR TR-DRY-TYPE TRANSFORMERS USED IN UNIT INSTALLATIONS, INCL. UNIT SUBSTATIONS	PATTERSON W. (919)848-1860		4/7/86 1992	COPYRIGHT NOT RELEASED BALLOT REAFFIRMATION	
C57.12.56	TEST PROCEDURE FOR THERMAL EVALUATION OF INSULATION SYST FOR VENTILATED DRY-TYPE POWER & DISTRIBUTION TRANSFORMERS	PROVOST R. L. (302)999-2225		8/27/84 1995	TO BE PUBLISHED ANSI APPROVED 01/04/94	
C57.12.58	GUIDE FOR CONDUCTING TRANSIENT VOLTAGE ANALYSIS OF A DRY-TYPE TRANSFORMER COIL.	KLINE, A. D. (404)762-1642	IEC IAS	6/27/91 6/28/78 2001	REAFFIRMED 9/19/96	
C57.12.59	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	TEST PROCEDURES FOR THERMAL EVALUATION OF INSULATION SYSTEMS FOR SOLID-CAST & RESIN ENCAP POWER & DIST TRANSFORMER	PROVOST R. L. (302)999-2225	IEC IEC ISE NEMA	10/25/92 6/26/97 1994	PAR APPROVED ON 6/26/97 REVISE/REAFFIRM BEFORE 10/31/97	
C57.12.91	TEST CODE FOR DRY-TYPE DISTRIBUTION AND POWER TRANSFORMERS	BARNARD D. (919)738-4251	SPD EM T&D	6/14/95 6/26/97 2000	PAR APPROVED ON 6/26/97	

ATTACHMENT 4 STATUS REPORT OF STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
25-Sep-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
C57.134 PC57.134	GUIDE FOR THE DETERMINATION OF HOTTEST SPOT TEMPERATURE IN DRY TYPE TRANSFORMERS	PAYNE P. (202)388-2138		9/21/95	PAR APPROVED
C57.16 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
C57.94 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 BALLOTING REAFFIRMATION
C57.96 PC57.96	GUIDE FOR LOADING DRY-TYPE DISTRIBUTION AND POWER TRANSFORMERS	PIERCE L. (706)291-3166	T&D SCC14 SCC10	4/26/89 12/10/96 2000	
C57.99 P711	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 SPICUALTY TRANSFORMERS	SIMPSON R. W. JR. (603)284-1362		6/22/72 3/21/96 1979	BALLOTING GROUP BEING FORMED

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

The HVDC Converter Transformer and Smoothing Reactor S. C. met in the Forstner Room of the Wiesler Hotel on July 16, '97 from 10:55 a.m. - 12:10 p.m. in Graz, Austria. There were 4 members and 4 guests present. The following are the highlights by acting Chairman, Richard Dudley.

1. The Chairman informed S. C. members that Bill Kennedy planned to submit the converter transformer standard to the IEEE Standards Board in Aug./Sept. '97.
2. Highlights of the Administrative Subcommittee meeting were presented by the Chairman.
3. The remainder of the meeting was devoted to discussing Draft 5 of the SMR standard. These discussions were essentially a continuation of those carried out during the two meetings of the Dry-Type Reactor W.G. The following are the key points discussed.
 - (i) Section 6.1; add to basis for rating (7) Switching impulse level(s), Short Circuit Current or Surge Current. It should be noted somewhere that lightning impulse levels may be different across the coil and to ground.
 - (ii) Section 6.3; Rated Current includes DC plus harmonics. A separate paragraph will describe the DC peak surge current.
 - (iii) Section 6.4.1; The value of inductance should be defined at rated current and maximum peak surge current. Eliminate "with rated harmonic current surge imposed."
 - (iv) Section 3.1; "oil SMRs have a magnetic circuit as an inherent part of their design"
 - (v) Section 6.4; ".....low frequency (<100 Hz) inductance of the coil in Henries at rated current."
 - (vi) Section 6.6.1; the AC LA standards will be referenced but it will be noted that only some portions of these standards are applicable to LA's used in conjunction with HVDC SMRs. LA's used on DC systems are special designs. Additional information is included in Annex B.2.
 - (vii) Section 6.7 will be eliminated as the information is covered in Section 10.1.1. The following sections will be renumbered accordingly.
 - (viii) Section 6.9.2 will be modified. Noise level is based on the applied current spectrum; DC plus harmonics. If a SMR can be loaded with DC plus major harmonic(s) in a test lab, measured sound levels will be representative of in service levels. Background will be included re DC plus harmonic interaction and the effect on sound level. Sound level limits should be specified by the purchaser.
 - (ix) Connection diagrams in Section 6.9.3 will include monopolar operation. The current Fig. 1b is suitable for this. A new Fig. for "back to back" will be

added; the reactor(s) will be at the neutral with the ground connection at the mid point or between two individual coils.

(x) Change reference in Section 7.1.6.2 from converter transformers to smoothing reactors.

(xi) Section 7.3.1.2 on nameplate information will be moved to the end of the standard in a separate section on nameplates for oil and dry-type SMRs (i.e. after test code). There will be separate subsections for oil and dry-type. Note that a connection diagram is required for oil immersed SMRs but not for dry-type SMRs.

The meeting of the S. C. adjourned at 12:00 p.m. The Chairman requested additional input on Draft #5 as soon as possible and he stated that he would produce Draft #6 for the St. Louis meeting. The Chairman also stated that he is seeking a 2 year extension of the PAR due to the increased work load to produce separate standards for converter transformers and HVDC smoothing reactors vs the original intent to produce one standard. Separate standards are required due to significantly different technologies; especially in the case of dry-type smoothing reactors.

Submitted by Richard Dudley

ATTACHMENT 4 STATUS REPORT OF STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE						
STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS	
SUBCOMMITTEE: HVDC CONVERTER TR & REACTOR						
CHAIR: W. N. KENNEDY						
PHONE: (317)286-9387						
C57.129 P057.129	GENERAL REQUIREMENTS & TEST CODE FOR OIL-IMMERSED HVDC CONVERTER TRANSFORMERS AND SMOOTHING REACTORS FOR DC POWER	KENNEDY W N (317)286-9387	EM 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 OCTOBER 1997	

7.7 Instrument Transformers - J. E. Smith, Chair

7.7.1 Chair's Remarks & Announcements

The subcommittee met on July 17, 1997 with 6 members and 3 guests present..

- The dates and locations for future meetings were announced by J. Smith
- The minutes of the Oct. 29, 1996 meeting were approved as written.

7.7.2 Old Business

- Standard C57.13.2 'Conformance Testing Procedures for Instrument Transformers' is to be balloted for re-affirmation.
- Standards C57.13.1 'IEEE Guide for Field Testing of Relaying Current Transformers' and C57.13.3 'Guide for the Grounding of Instrument Transformer Secondary Circuits and Cases', which belong to the Relay Committee, have been handed over to them with our recommendation for re-affirmation.
- The request from the Bushing Subcommittee C57.12.00 regarding the shielding of current transformers in the bushing pocket was discussed. The consensus was that as long as the CT stack is shorter than the pocket, it is very unlikely that a flashover could occur between the bushing lower end and the bottom CT. Shields are rarely used and need only be provided if specified by the customer. J. Smith agreed to draft a response for discussion at the next meeting.
- The possibility of adopting IEC 270, 'Partial Discharge Test Guide' was discussed. Another option is to ask the C57.113 Subcommittee to include Instrument Transformers in the PD test standard.

7.7.3 New Business

- Should Capacitor Voltage Transformers be included in the next revision of C57.13?

J. Smith will solicit comments on this from the C93.1 Subcommittee.

7.7.4 WG C57.13.5 - Test Requirements for High Voltage Instrument Transformers 115 kV and above - Ross McTaggart

The WG met on July 17 with 4 members and 3 guests present.

The minutes of the Oct. 28 /29, 1996 meetings were approved as written.

Summary of discussion of Pre-Draft dated 11/96:

- 1) P. Riffon pointed out that the partial discharge test levels in the table were too high. It was agreed that the test levels should be 1.5 p.u. of max. L-G voltage, which is in line with IEC. The exception to this is that for 765 kV system voltage, the test level should be 635 kV for type tests and 595 kV for routine tests, both with a pre-stress voltage of 830 kV.

7.0 Reports of Technical Subcommittees (cont'd)

- 2) The need for dissolved gas analysis was discussed. It was agreed that it is an effective method of indicating internal discharge that has occurred during impulse testing which may not be apparent in a PD test. It is also useful as an indicator of overheating if done after a temperature rise test. The guide should state that at least one of these must precede the final DGA for the results to be meaningful. The DGA acceptance criteria for CO and hydrocarbons in the guide were considered acceptable with the understanding that the concentration listed for C_xH_y applies to each hydrocarbon, not to the sum total. It was recommended that each hydrocarbon be listed separately for clarity (eg. is CH₄ included?). The H₂ limits were increased to 10 ppm before test and 20 ppm after.
- 3) The 600 Chopped-wave test acceptance criteria were discussed. It was agreed that the main acceptance criteria would be the measured PD level and the internal inspection. The DGA is for information only and may exceed the values in the table. It does provide an indication as to whether to expect to find internal damage during the tear-down.
- 4) The heading for clause 4.2 should read Optional Routine Tests.
- 5) Notes should be added where applicable re. CT secondary windings to be shorted and grounded.
- 6) The Creepage table should be removed from this guide and addressed by the WG for the revision of C57.13.

- 7) A new SPECIAL TEST was proposed by P. Riffon for low ratio, multi-turn CT's such as those used on capacitor banks. It would consist of an Impulse test across the primary terminals at 1.3 times the protective level of the surge arrester. P. Riffon offered to provide a procedure for discussion at the next meeting.

7.7.5 Working Group on C57.13 Revision - Tom Nelson

The working group met on July 17. There were 6 members and 3 guests present.

J. Smith reminded the standard will need to be approved in 1998, which leaves little time for more changes. The chairman will mail all of the proposed changes to the working group by September for comments and changes which will be discussed at the fall meeting in St. Louis.

7.7.6 WG C57.13.6 Instrument Transformers Used with Electronic Meters and Relays - Chris Ten Haagen

No Report.

ATTACHMENT 4 STATUS REPORT OF STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE					
25-Sep-97 STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
SUBCOMMITTEE: INSTRUMENT TRANSFORMERS					
CHAIR: PHONE:	J. E. SMITH (919)827-3220				
C57.13 P816	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 P816	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 CIRCUITS AND CASES	SMITH J. E. (919-827-2121)		1/23/87 1995	REVISE OR REAF. BY 12/96 R1990
C57.13.4 P812	DEFLECTION 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 P812	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 P812	REQUIREMENTS FOR INSTRUMENT TRANSFORMERS FOR USE WITH ELECTRONIC RELAYING METERS AND RELAYS	TEN-HAAGEN C W (603)749-8433	PSIM PSR TD		REVISED PAR DISSAPPROVED 9/96 MAKE CHANGES AND RESUBMIT PAR

7.8 Insulating Fluids - F. J. Gryzkiewicz, Chair

The Insulating Fluids Subcommittee met in Graz, Austria, on Wednesday and Thursday, July 16 and 17, 1997, with the following (16 members and 17 guest) in attendance.

The subcommittee minutes of the October 28 and 29, 1996 meeting at Burlington, Vermont 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.

Draft 11 has been approved by the sub-committee as written, as all negative votes have been resolved. George Reitter presented additional DGA data from recent heat runs. The draft will be sent to the Main Committee members for re-ballot.

7.8.1.2 P1258 - Trial Use Guide for the Interpretation of Gases Generated in Silicone-Immersed Transformers.

The ballot of Draft 8 failed, being nine votes short of the required 75% return. The document will be re-balloted at the Main Committee.

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

Draft 4 was successfully balloted at the Main Committee level with 52 Affirmative, 1 Abstention, and 0 negatives. Some of the ballots contained editorial comments, all of which were reviewed at the sub-committee meeting in Graz. The majority of the editorial comments will be incorporated prior to forwarding to the IEEE Standards Committee.

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

The subcommittee has determined that this Guide requires revision. The W.G. chair was not present so no formal status report was given. Additional comments on possible revisions within the current Guide was requested by the Chair, Frank Heinrichs.

7.8.1.5 C57.106 - 1991, Guide for Acceptance and Maintenance of Insulating Oil in Equipment.

A PAR request was submitted on May 28, 1997. The subcommittee voted to change the status from task force to working group. The current W.G. membership is:

J. J. Kelly Chair, F. J. Gryzkiewicz, F. Jacobs, E. Kallaur, C. P. McShane, H.R. Moore, T. V. Oommen, G. J. Reitter, and J. A. Thompson.

The W.G. invites suggestions for the revision. Some issues that have been identified are: Remove Classes categories, add % saturation section, add discussion of oil/paper moisture equilibrium, particle influence to dielectric measurements, and harmonization with IEC 422 (and IEC 296).

7.8.1.6 Guide for the Interpretation of Gases Generated in Load Tap Changers (LTC)

The task force Chair, Rick Youngblood, summarized the results of the survey on DGA of LTCs that was sent out since the last meeting. The survey indicated high interest on the part of the industry to develop an interpretation guide. The subcommittee authorized the change in status from Task Force to Working Group. Rick Youngblood has accepted to be the W.G. Chair and will recruit the W.G. prior to the next meeting and will submit a PAR request. Anyone interested in participating should contact the Chair.

7.8.2 Other Business:

Interest was expressed for the inclusion of a panel discussion for the next meeting on the topic of effect on dielectric strength as a function of water dissolved in oil and the influence of particulate, contaminants, and temperature. The panel discussion would address the question: Should the current use of setting absolute ppm acceptance levels be substituted by percent of saturation levels?

A motion was made and seconded to adjourn.

C. P. McShane

Acting Secretary for the Graz Meeting.

ATTACHMENT 4 STATUS REPORT OF STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE

25 Sep-97

STANDARD
PROJECT

TITLE

WORKING GROUP
CHAIR AND PHONE

COMMITTEES
REQUESTING
COORDINATION

PUB DATE
PAR DATE
REV DUE

STATUS AND COMMENTS

SUBCOMMITTEE: INSULATING FLUIDS

CHAIR:
PHONE: F. GRYSZKIEWICZ,
(617)926-4900

C57.104 PC57.104	GUIDE FOR THE DETECTION AND DETERMINATION OF GENERATED GAS IN OIL- IMMERSED TRANSFORMERS & THEIR RELATION	HEINRICH F. W. (412)941-6924	PE/IC PE/SUB PE/T&D	6/7/92 12/10/96 2000	REVIEW DATE EXTENDED TO 12/2000
C57.106 PC57.106	GUIDE FOR ACCEPTANCE AND MAINTENANCE OF INSULATING OIL IN EQUIPMENT	(617)926-4900	NONE	11/20/91 6/19/86 1996	REVISE/REAFFIRM BEFORE 10/31/97 REQUEST PAR EXT. TO JUNE 97
C57.111 NONE	GUIDE FOR ACCEPTANCE OF SILICONE INSULATING FLUID AND ITS MAINTENANCE IN TRANSFORMERS	(617)926-4900	IAS T&D ED&PG	2/2/89 12/10/87 2000	REAFFIRMED 03/15/1995 ASK FOR FOR PAR EXTENSION
C57.121 P954	GUIDE FOR ACCEPTANCE AND MAINTENANCE OF LESS FLAMMABLE HYDROCARBON FLUID IN TRANSFORMERS	McSHANE C. P. (617)926-4900	PSRC T&D IAS	2/2/88 3/21/96 1996	BALLOTING GROUP BEING FORMED ³
C57.130 PC57.130	T-U GUIDE FOR USE OF DISS. GAS ANALYSIS DURING FACTORY THERMAL TESTS FOR THE EVALUATION OF OIL-IMMERSED TRANS. AND	HEINRICH F. W. (412)941-6924	NONE	3/17/93 0	PREPARING D11
C57.137 PC57.137		(617)926-4900			
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 ASKARFELS	(617)926-4900	EIS IAC T&D	11/17/86 9/27/79 1997	REVISE/REAFFIRM BEFORE 10/31/97
IEEE 1258 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	

7.9 **Insulation Life - L. W. Pierce, Chair**

The Insulation Life Subcommittee met July 17 at Graz with 7 members and 11 guests in attendance. Bob Grubb presided in the absence of Linden Pierce. The minutes of the Oct. 29, 1996 meeting in Burlington, Vt. were approved as written.

The reports of the Working Groups and Task Forces were then given.

7.9.1 **Task Force on Hottest Spot Temperature Rise Determinations - Don Platts, Chairman.**

The Task Force met on July 17, 1997 at 8:00 AM in the Weitzer Hotel with 8 members and 26 guests present. The minutes of the Oct. 1996 meeting in Burlington, Vt. were approved. Don Platts explained that Draft 5 of the addition to C57.12.00 was balloted by the Working Group and Insulation Life Subcommittee. The ballot had a 82 % return with 85 % approval and therefore could be sent to the Standards Subcommittee for inclusion in a ballot of C57.12.00. However, most members representing manufacturers of small distribution transformers returned negative ballots. It was apparent that there was a need to address their concerns about requiring detailed calculations for each transformer design. Discussions with Linden Pierce led to his suggestion that the document be converted into a guide for determining the hottest spot temperature, and that only the basic requirements for either calculating or measuring the hottest spot rise be inserted into C57.12.00

Copies of all the comments were sent to members and prior guests for their review prior to the meeting. Don Platts asked for comments from the Task Force, rather than reading through each of the ballot comments and trying to discuss them individually.

Bob Grubb restated the concern of the distribution transformer producers that for large volume production detailed calculations are not as practical as actual testing of a unit. He suggested that the approach we had considered using design families would help resolve the issue.

Some of the other topics that were discussed were:

- IEC Factor: Each transformer design is going to require a different factor so it will be nearly impossible to choose one value for the standard.
- Users of power transformers require a value for the hottest spot temperature to apply the loading guide. They expect to get an accurate number and they will use it. Many users of distribution transformers have little, or no interest in knowing that value.
- Some repair shops are rebuilding transformers and finding that the original design could not possibly have met the 80 °C limit. So we know that past practices were not sufficiently accurate.
- Some distribution transformer manufacturers have done extensive testing with direct reading thermocouples. They believe that if we require them to develop a thermal model to locate the hottest spot and calculate it would be a step backwards.
- Should we survey the industry to determine the range of predicted hot spot rises from current manufacturers, and then establish an upper limit on the gradient rather than a limit on temperature? Although they don't have that data we know that there is a wide range. It would

be less desirable to cap the gradient and require manufacturers to change their designs than to determine the hottest spot temperature.

- Since harmonics cause heating then with harmonics the location as well as the value of the hottest spot temperature will change. Michael Bedard asked if the temperature limits adequately address harmonics. Jin Sim pointed out that under C57.12.00 loading is limited to a .05 harmonic factor.

The Task Force then discussed Linden Pierce's proposal to add wording to C57.12.00 that would require testing with direct reading sensors or calculations utilizing a proven thermal model. That proposal also requires development of a guide for hottest spot determination that would provide the details for complying with the requirements. After some discussion about the wording in the proposal, there was a vote 21 to 0 to follow that approach. Don Platts will collect any suggested wording changes for the addition to C57.12.00 and ballot the Task Force. When Linden Pierce completes a first draft attempt to convert Draft 5 into a guide, it will also be sent to the Task Force.

Donald Chu asked if a standardized test procedure for distribution transformers could be developed. If a specific procedure could be developed utilizing the direct reading sensors, then calculated values would not be needed and that range of transformers could be removed from consideration. This is still an open item.

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

The Working Group met at 9:30 AM on July 16, 1997 with 14 members and 11 guests present After introductions, and a discussion of the agenda the minutes of the October 28, 1996 meeting in Burlington were approved as written.

The Chairman reviewed the outcome of the successful IEEE ballot, which was sent to a ballot pool of 167. Of this number, 124 (81 %) approved, 12 (8 %) abstained and there were no negative ballots. With the 136 submitted ballots, there were a number of comments of editorial nature only, which were incorporated into the document. This document was submitted to the IEEE Standards Board as Draft 6.0, and the document was approved as a Trail-Use Standard. The Chairman briefly reviewed IEEE's letter outlining the process for such a trial use document, including the need to solicit input on the document during the trial use period.

The Chairman then raised the issue related to this requirement as to what work the Working Group thought should be conducted next. Input from the floor discussed the continued need to solicit input for additional DGA samples, and methods to do this were discussed. Interest in submitting the document for consideration as an IEC document was voiced, and it was agreed that the document would be sent by the Chairman to the US TAG to formally ask them to consider submitting this document as a new work project within IEC. In summing up this discussion, the Chairman agreed to communicate with the Working Group in writing on a periodic basis during the trial use period, to solicit input on DGA, as well as new applications or insulation systems to be incorporated into the trial use standard. The Chairman believed that the Working Group would not need to meet during the upcoming meeting in St. Louis, but that we would meet when there was sufficient new input to warrant such a meeting. The Working Group agreed with this approach. The Chairman will determine if a new Par is required for this work.

For old business, the Chairman thanked the members for submitting their comments with their ballots, since these revisions made for a better trial use standard. He also asked the committee members to continue submitting DGA results for transformers insulated with high temperature insulation.

7.9.3 Working Group on Thermal Tests - R. L. Grubb, Chairman, D. L. Fallon Secretary

The Working Group report was given by Don Fallon, Secretary.

The Working Group on Thermal Test met at 4:15 P.M. on Wednesday July 16, 1997 with 9 members and 10 guests in attendance. After the normal introductions, the minutes of the previous meeting in Burlington, Vermont were approved as mailed. The remainder of this short meeting was taken up with a review of the status of PC57.119.

Chairman Bob Grubb was very pleased to report the results of the balloting process for Draft 13, as forwarded by the Standards office. The ballot was closed on January 10, 1997. Of the 115 people in the Ballot Group, 97 ballots were submitted including 93 affirmative, 2 negative and 2 abstentions. This was an 84 % return rate with 97 % affirmative. The ballot was therefore successful.

Jerry Corkran's negative ballot was resolved prior to the meeting, and discussion continued at the meeting resulting in the resolution of the final negative ballot from Mark Perkins. Mark thought changes were necessary in two areas: (1) clarification of the time scale on Figure 1 (page 26) to indicate that it is a "time of day" representation of a load cycle as opposed to an exact sequence of loadings for test. Chairman Grubb pointed out that time T_1 identifies the conclusion of the test sequence and agreed to relabel the time axis as "time of day". (2) Clarification of the reference note in clause 9.8.3.3 (page 22) related to the IEC method of winding hottest spot temperature rise calculation. Mark provided revised wording for the note directly from IEC Standard 76-2-1993, and suggested use of this wording would be more correct than the paraphrasing of the IEC Loading Guide 354 presently in our document, in particular because the Standard reference wording distinguishes between medium and large power transformers and points out the need for consultation with the manufacturer for large transformers due to the possibility of considerable variation depending on design. The group accepted the changes proposed by Mark and his negative ballot was resolved.

At long last, due to the persistent effort of the Chairman, it appears that an approved document is ready for publication. The Chairman is hopeful that the clarifications resolving the negative ballots will be considered to be primarily editorial when submitted to the Standards Board, and that a re-ballot will not be necessary. As it is unlikely that the modifications can be submitted to IEEE by August 1, the deadline for the September meeting, it is expected that Standards Board review of the document will be scheduled for the following meeting in early December.

There were no other items of old business and no new business brought up. Chairman Grubb indicated that unless other new business was brought to the group by the Committee or Insulation Life Subcommittee the Working Group may not meet in St. Louis and may be disbanded.

7.9.4 Task Force on Definition of Thermal Duplicate,

Task Force on Revision of Temperature Test Code (Section 11 of C57.12.90),

Working Group on Thermal Evaluation of Liquid Immersed Power & Distribution Transformers.

The above Working Group and Task Forces did not meet at Graz. They are scheduled to meet at St. Louis in November 1997.

7.9.5 Task Force on Winding Temperature Indicators, V. S. N. Sankar, Chairman

This Task Force conducted business by correspondence. The Chairman submitted the following written report which was read at the Subcommittee meeting.

This Task Force was formed in October 1996 in Burlington, Vermont. The Task Force has nine (9) members. In February 1997 the Task Force Members were requested to send their views on the scope and direction of the Task Force Work. Six (6) members have replied to date and the summary is listed below.

- Time response characteristics of WTI should be determined soon (in a year or two); as to our knowledge, this is not specified in other International/National standards.
- Sample calculations show that on a typical 50/117 MVA, ONAN/ODAF transformer, when load is suddenly increased from 50 MVA to 234 MVA (2 PU of ODAF rating) and no pumps and fans come on in 15 minutes, then winding temperature reaches 210 °C at the end of these 15 minutes.
- Experiments conducted recently by two (2) transformer manufacturers show that the response time for widely used "well type" WTI is very slow compared to that of the windings.
- For simplicity, the WTI characteristic can be stated that the pumps should be activated within 5 minutes after the load exceeds a set value.
- For economic reasons it is desirable to specify a fixed short time constant for WTI's for lower MVA transformers and a sophisticated (ex. PLC controlled) WTI's with adjustable time constant to match winding time constant from heat-run data and the type of cooling (directed/non-directed oil flow) for larger MVA transformers.
- Better methods of activating pumps & fans, like from direct hotspot measurement (ex. fiber optics) should be considered.
- Simple devices like overload current relay, fixed time operation relay etc. to activate pumps and fans do not take ambient temperature into account. For 60/100 MVA transformer at 100 MVA load, no need for the cooling to be on at -30 °C ambient temperature, whereas all cooling should be on at +30 °C ambient temperature.
- Scope of this Task Force should be limited to work on the response characteristics for WTI; it is preferable not to extend the scope to include limitations/recommendations of any type of WTI.

7.9.6 New Business

There were no items of new business

Respectfully Submitted by:

Linden W. Pierce

Insulation Life Subcommittee Chair

ATTACHMENT 4 STATUS REPORT OF STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE

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. A. (704)462-3113	PE/PSR IAS PSE PE/T&D	3/18/92 12/10/96 1997	REVISE/REAFFIRM BEFORE 10/31/97
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
C57 119	RECOMMENDED PRACTICE FOR PERFORMING TEMP RISE TESTS ON OIL-IMMERSED POWER TRANSFORMER AT LOADS BEYOND NP RATING	GRUBB R. L. (414)547-0121	SWGR SUBS SCC4	9/17/92 0	BEING BALLOTTED PAR EXTENDED TO 10/30/98
C57.12.00	DEFINITION OF THERMAL DUPLICATE	GRUBB R. L. (414)547-0121	EM IAS I&CPS	5/31/90 1997	PAR WITHDRAWN WORK INCLUDED IN C57.12.00
C57.12.90	STANDARD TEST CODE FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS	HENRY G. (501)534-5332		1998	WILL START REVISING SECT. 11
C57.12.90	REVISION OF TEMPERATURE RISE TESTS	HENRY G. (501)543-6546			TO BALLOT D3 IN TF, WG, SC
C57 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	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	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
IEEE1276	TRIAL-USE GENERAL REQUIREMENTS FOR LIQUID-FILLED DISTRIBUTION AND POWER TR UTILIZING HIGH TEMP SOLID INSULATING	FRANCHEK M. A. (802)748-3936	T&D	3/21/96 0	BEING BALLOTTED

7.10 Performance Characteristics - H. Jin Sim, Chair

7.10.1 Introduction/Attendance

The Performance Characteristics Subcommittee (PCS) met at 2:10 p.m. on Thursday, July 17, 1997, with 31 members and 18 guests attending.

7.10.2 Approval of Meeting Minutes

The minutes of the October 29, 1996, PCS Meeting in Burlington, VT 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 July 15, 1997 Administrative Subcommittee meeting were highlighted. See Clause 4.0 for details.

7.10.3.2 Membership

New Members, Craig Colopy (Cooper Power Systems), Sanjay Patel (SMIT Transformers Inc.), Bob Degeneff (RPI), and Roger Hayes (Ferranti-Packard Transformers) were added to the roster. Membership now stands at 102.

7.10.4 Agenda Changes

None

7.10.5 Working Group Reports

7.10.5.1 Revisions to C57.12.90 - Pierre Feghali

C57.133 Guide for Short Circuit Testing - Nigel McQuin (Reported by P. Feghali)

The WG on Performance Characteristics Subcommittee Revision of C57.12.90 and WG for Guide for Short Circuit Testing met on Wednesday, July 16, 1997, at 9:25 a.m. with 12 members and 17 guests attending.

The discussion was concentrated around the LTC sequence test at the transformer factory after it is mounted on a transformer. This subject had been brought up by Devki Sharma a few years ago. Subhash Tuli suggested this test be done at the maximum rating of the transformer under Load Loss measurement set up and at 110 % of the rated excitation under No-load Loss measurement set up. Pierre Riffon pointed out that IEC 76-1 includes a requirement for LTC sequence testing. (He later gave the WG chair a copy of the wording in IEC.)

Users were asked for comments and Bipin Patel said that Southern Company Services has such a requirement in their specification. The chair suggested that he develops a wording after researching the above mentioned sources. The proposal will be sent to all

present at the meeting. The proposal and any comments on it from members will be discussed at the next meeting in St. Louis, MO. There was no new business on the C57.12.90 part of the meeting.

The second portion of this meeting was about the WG for Guide for Short Circuit Testing. Nigel McQuin was not present and the meeting was conducted by Jin Sim. Jin discussed the issue of C57.12.90 Part 2 as a new guide under the new number C57.133.

There was a discussion by Dennis Allen and Jin Sim about adding impedance variation as a part of pass/fail criteria and eliminate the visual inspection. Pierre Riffon expressed a concern about removing visual inspection citing that a problem could still exist even if there were no impedance variations and the transformer passed dielectric tests. Some European manufacturers and users proposed to include FRA (Frequency Response Analysis) as a terminal measurement. These will be a lengthy process and will be included in the future revisions.

It was decided to reaffirm C57.12.90 Part 2 as a new document called C57.133 as soon as possible. Then the WG will start the work on it's revision.

There was no new business in this section and the meeting was adjourned at 10:00 a.m.

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

The Working Group for revision of the IEEE Recommended Practice for Establishing Transformer Capability When Supplying Nonsinusoidal Load Currents met at 2:45 P.M., July 16, 1997 in room Klimt at the Hotel Wiesler, in Graz, Austria. There were 13 members and 9 guests present.

The Chair reported the results of the Summer Working Group Survey on Draft 5. The following table summarizes the results of the 38 surveys sent out:

Response	21	55%
Affirmative	15	71%
Abstain	1	5%
Negative	5	24%

The overall response was very favorable and supportive of the latest draft. Of the 5 negative returns, 4 appeared to be easily resolved requiring no major revisions. The comments from these negative returns were read and then discussed.

The first negative response by Jerry Corkran, noted math errors for the liquid example on page 22. The discussion focused on the new values, which exceeded the limits of a 55 degree rise unit. One suggestion was to illustrate the process of re-iterating the calculation by showing a series of calculations. Each change in the anticipated load would be calculated until the temperature rises were below the limits. Another suggestion was to add a comment noting that the limits were exceeded and that the load

should be reduced. The final resolution was to add to the description in the example indicating the unit was rated at 65 degree rise.

Jerry also pointed out that the subscript 1 was used in reference to the LV in one place and subscript 2 was used in another. His preference was to use 1 for the LV and 2 for the HV, but in either case the notation should at least be consistent throughout the document. Phil Hopkinson proposed aligning with the new IEC converter standard and he speculated that subscript 1 was used for the LV. Mr. Richter, a guest familiar with the IEC documents noted that subscript 1 was assigned to the HV. The group agreed to follow the conventions found in the IEC 76 series for standard transformers rather than the converter standard and the Chair will verify and correct for the next draft.

Bryce Hesterman submitted a negative response, objecting to the wording "The eddy current losses are proportional to the current in the conductors", and suggested changing the wording to "proportional to the square of the current". The group did not agree and felt the statement was intended to be a general statement and the details appear in the formulas. Dudley Galloway suggested the phrase be changed to "The eddy current losses are a function of the current", which was accepted by all.

Bryce noted a number of editorial corrections and commented on the tutorial in the Annex. He felt the parenthetical comment in the second paragraph, "it is conservative to assume that the eddy-current loss, P_{EC} is proportional to the square of the harmonic current magnitude." should be either changed or deleted. He noted that since the eddy-current losses are always proportional to the square of the current at any harmonic, the statement should not be labeled as conservative. However, the eddy-current losses are not always proportional to the square of the frequency. After some discussion, it was agreed that the word "magnitude" should be changed to "frequency". While discussing this section, the group also agreed to change the phrase "rated 60 Hz" to rated frequency, in two places.

The negative response from Subhas Sankar requested a change to the Scope which would elaborate on the application for this document. The group rejected the change on the basis that the Scope was sufficiently clear. The group also felt that the change in the Scope at this stage of the document was not warranted considering the potential delays, since a change in the Scope requires submittal and approval of a PAR revision.

Jerome Frank also submitted a negative return. He re-iterated his previous objections concerning the letter "K", the insufficient warning note and misleading examples. The Working Group disagreed and recommended no changes.

The chair then requested comments on the next step for the Working Group. It was noted that the standard will be withdrawn by the Standards Board, if it is not revised or reaffirmed. A request for a one year extension must be submitted by October 31. The chair also noted that he has received the open ballot roster and the document could be balloted as the next step. Alternatively, the group could survey the PC Subcommittee and the Committee as an intermediate step. Since the response to the Working Group survey was very favorable and in general the group felt the document was complete, the

chair recommended moving directly to the ballot. The group agreed, but also felt an extension was prudent, due to the close timing.

The meeting adjourned at 4:00 P.M.

7.10.5.3 Loss Tolerance and Measurement - Ramsis Girgis

The WG on Loss Tolerances and Measurement met on Wednesday, July 16, 1997 with 12 members and 15 guests attending.

Draft 1 of the compiled guide of "No-load Loss and Load Loss Measurement" was presented. In this draft, all input from previous performance Characteristics Subcommittee survey was implemented and two negative responses resolved. The guide will now be reproduced to the IEEE standard format and sent out for the official ballot.

The report by Eddy So on the "Low Power Factor Power Measurement" TF included a review of the material to be presented at the "Transformer and Reactor Losses" panel session in the upcoming IEEE Power Meeting in Berlin.

Bill Henning reported that the proposed draft 3 of the revision of "tolerances of losses" included in clause 9.3 of C57.12.00 (Table 19) was sent out to survey by members of Performance Characteristics SC with all positive returns of the 29 returns he received up till the meeting date.

A new business was brought to the floor regarding a proposal to include measurement of auxiliary losses in the C57.12.00 and/or C57.12.90. Mr. Musil of the ELIN will provide a proposal for an outline of this proposed addition.

The meeting was adjourned on time.

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

The Working Group met on Wednesday, July 16, 1997, at 8:00 a.m. There were 14 members and 4 guests present. Introductions were made. Minutes of the October 28, 1996, meeting in Burlington, VT were approved.

The chair reported that the WG and PCS surveys were successful obtaining 97 and 96 % approval respectively. The one unresolved negative response was Jerry Frank's issue of K-Factor. C57.18.10 uses the term F_{HL} , Harmonic Loss Factor which differs from K-Factor mathematically and also harmonizes with IEC and the IEEE HVDC converter transformer standard.

The IEEE balloting pool was formed. The draft 12 is now under ballot with IEEE. The ballot deadline is July 25, 1997.

The chair also announced that IEEE discovered that the title of the standard did not exactly match the original PAR. A new PAR has been submitted. It will be reviewed at NESCOM in November. Hopefully we will also have an approved standard to submit.

There were no issues to discuss on the current draft 12 by those present.

Phil Hopkinson reported on the IEC status of the Converter Transformer Draft, 1378 Part 1. It has been approved, but issues still remain. The next IEC TC14 meeting is in London, September 9 - 12. A new work will begin to resolve the problems in this standard.

There was no other old or new business. The meeting adjourned at 9:15 a.m.

7.10.5.5 Revisions to C57.12.00 - Donald W. Platts

The Working Group met on Wednesday, July 16, 1997 at 1:20 PM. We had 12 members and 11 guests in attendance.

The minutes of the October 1996 Burlington meeting approved.

All changes that we have previously approved are included in the present draft 2 assembled by Subhash Tuli in the Standards Subcommittee. It will be out for ballot this fall.

At a previous meeting, Leon Plaster presented a proposal for changes to Table 17 and note 8. It was approved by the WG and should have been sent to the PCS. It will be sent out in August or September.

In October, Lin Pierce suggested that clause 6.6.1 be revised to remove Askarel and add less flammable hydrocarbon fluids and silicone fluids as insulating liquids. His proposal was distributed and discussed by the WG. Joe Kelly suggested that we address other fluids now offered. After discussion, we agreed to add a statement that other fluids are commercially available, they will not be listed because they do not have ASTM specification and coordinating IEEE guides for use.

Carl Niemann raised the topic of tank rupture due to pressure from an inadequate gas space above the oil during the October meeting. He did not attend this meeting, so we had no further input on the concern and do not know if an issue with the standards even exists.

There was no new business. The meeting adjourned early.

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

This was the first meeting of this WG. There were 30 present. 15 requested membership in the Working Group.

Bob Degeneff presented an agenda for the meeting and then provided an overview of the problem.

Jeewan Puri presented detailed information into the failure of two transformers felt to be attributed to this adverse interaction. The first was a disk winding and a vacuum breaker. The second was a layer winding and SF6 breaker. Both failed from the center of the winding to ground. Jeewan also discussed mitigation for the first example in the form of a snubber.

Bob Veitch presented information relating to the failure of several furnace transformers. He mentioned that failures were observed not only on interruption but on pre-ignition also. Successful mitigation methods were in the form of pre-insertion resistors on the breakers and snubber circuit. (R and C of an appropriate size.) Considerable discussion followed and several other members related similar failure histories.

It was mentioned that the Switchgear Committee and its HV Circuit Breaker Subcommittee is aware of this problem. They formed a task force a year ago and recommended adding a paragraph to C37.10, clause 5.17 and released it for ballot. Additionally, a draft paper was prepared by Dave Swindler. The TF has since been disbanded. Attached to these minutes are a copy of the proposed paragraph and Dave Swindlers paper.

It was pointed out that IEC 1233-1994 High Voltage Alternating Current Circuit Breaker Induction Load Switching deals with this general area. Apparently the document addresses the breaker "performance" and points out arrangements to be concerned with but does not address problem mitigation. This document will be secured and reported on at the St. Louis meeting.

The next topic of discussion was the specific working group goal. It was agreed that the final product of the WG should be a guide addressing this issue.

In preparation for the next meeting, it was requested that members and guests that have information on failures of this type send that information to Bob Degeneff.

Phil Hopkinson requested that some discussion take place on what would be a reasonable position for the WG to assume prior to completing its assigned task. It was agreed that the paragraph suggested by the Switchgear Committee is a reasonable approach until more complete information is at hand.

There was no old or new business. The meeting adjourned at 5:30 p.m.

7.10.6 Project Reports

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

Task force did not meet at this meeting. Committee Vice Chair John Matthews reported the following on this project as a part of his report. "The Editing of the Survey of Generator Step-Up Transformer has been completed. It will be issued as a PES Special Publication.

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

Ron Barker reported that the Power System Relay Committee is close to final balloting of this guide. He will give a final report after the revised C37.91 Draft 5 receives approval for publication.

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

Don Cash reported on the results of the two ballots for C57.125 reaffirmation.

The first ballot had 3 negatives, 2 resolved and 1 not resolved. The second reaffirmation ballot generated 5 negative returns as follow.

163 Eligible voters / 136 returned

125 Affirmative votes / 5 Negative votes / 6 Abstention / Total 136 Votes/ 83 % returned

125 Affirmative votes / 5 Negative votes / Total 130 Votes / 96 % Affirmative votes

The ballot is successful and therefore the document has been reaffirmed. Don Cash will notify the negative balloters that their concerns will be addressed when the Failure Analysis WG is reconvened.

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 reaffirmations of C57.105 and IEEE 638 are in process.

7.10.7 Old Business

Need for LTC application guide: Bill Henning reported that his WG will have the first meeting in St. Louis.

7.10.8 New Business

C57.117, Guide for Reporting Failure Data needs to be reaffirmed and Don Cash will take care of this.

C57.109, Guide for Through Fault Current Duration and C57.116, Guide for Transformers Directly Connected to Generators need to be reaffirmed or revised by 1998. All PCS members were encouraged to review these documents and notify the chair if there are any needs for revision before the St. Louis meeting.

Pierre Riffon suggested that we review the Fast Transient problems within GIS. After a brief discussion, it was decided that this item should be added to Bob Degeneff's new WG.

There was a suggestion that we address other frequencies (such as 50 Hertz) in IEEE Transformer standards. After a brief discussion, we decided that the most of our standards are intended for only 60 Hertz and therefore the treatment of other frequencies would be beyond the scope of our work. (PCS Chair's note: There was a panel session on "Perspectives on the Transnationalization of Standards" during the PES Summer meeting in Berlin and PCS Chair brought up this subject for discussion. There was a strong preference that we address this subject in our standards. One of the panelist, Ramsis Girgis, our WG Chair for Loss Tolerance and Measurement, agreed to bring this up as a new business during our St. Louis meeting. Issues we need to address are

primarily on no-load and load losses, impedance, and sound level. Ramsis will address the first three and by sending a copy of this minutes to Jeewan Puri, I recommend that the Audible Sound and Vibration Subcommittee to address the sound level issue associated with "other" frequencies.)

7.10.9 Next Meeting

The next meeting will be held on November 18, 1997, in St. Louis, MO.

The meeting adjourned at 3:15 p.m.

Respectfully submitted,
H. Jin Sim

ATTACHMENT 4 STATUS REPORT OF STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE						
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 REAFFIRM 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 PSR NEMA	12/3/92 9/19/96 1997	BALLOTING GROUP BEING FORMED REVISE/REAFFIRM BEFORE 10/31/97	
C57.116 NONE	GUIDE FOR TRANSFORMERS DIRECTLY 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 8 - TESTING OF LTC CONNECTIONS	PLATTS D. (610)774-4686			BALLOTING	
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	TABLE 9 - PCB STATEMENT ON NAMEPLATE	PLATTS D. (610)774-4686			APPROVED BY SUBCOMMITTEE	
C57.12.00 PC57.12.00	9.3 TABLE 19 - TOLERANCE FOR LOSSES	HENNING W. (414)547-0121			TO BE BALLOTTED	
C57.12.00 PC57.12.00	SECTION 8 - DIELECTRIC TESTING OF SECONDARY CONTROL WIRING	TULLS. (414)547-0121			BALLOTING	

ATTACHMENT 4 STATUS REPORT OF STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE

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	SECTION 5.9 - AUXILIARY LOSSES ON CLASS I AND CLASS II POWER TRANSFORMERS	TULLI S. (414)547-0121			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	TABLE 9 - DATE OF MANUFACTURE ON NAMEPLATE	PLATTS D. (610)774-4686			APPROVED BY SUBCOMMITTEE
C57.12.00 PC57.12.00(m)	GENERAL REQUIREMENTS FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS	PLATTS D. (610)774-4686			INCLUDE IN NEXT REVISION COORDINATE WITH S. TULLI
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 AUXILIARY LOSSES	TULLI S. (414)547-0121			DI BALLOTTED IN PCS
C57.123 F1098	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	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	9/21/95	PAR APPROVED PART II OF C57.12.90

ATTACHMENT 4 STATUS REPORT OF STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE

25 Sep-97

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
C57.18.10 PC57.18.10	REQUIREMENTS FOR SEMICONDUCTOR RECTIFIER TRANSFORMERS	KENNEDY S. P. (716)896-6500	NONE	12/28/81 0	PAR EXTENDED TO OCTOBER 97 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 FSR	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	3/19/92 10/29/90 1997	BALLOTING GROUP FORMED TO REAFFIRM REVISE/REAFFIRM BEFORE 10/31/97

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

Meeting Minutes - Graz, Austria

7.11.1 Introduction/Attendance

The Underground Transformers and Network Protectors Subcommittee met at 9:30 a.m. on July 17, 1997, with six members present.

7.11.2 Approval of Minutes

The minutes of the October 29, 1997 meeting in Burlington, Vermont were approved as submitted.

7.11.3 Membership

Roger Hayes of Ferranti-Packard resigned from the Subcommittee and Brian Klaponski of Carte International became a new member of the Subcommittee. Membership remains at 16.

7.11.4 Chairman's Remarks

Several items of the discussion held at the Administrative Subcommittee meeting held on July 15, 1997 were highlighted. See Clause 4.0 for details.

7.11.5 Working Group Reports

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

Meeting was called to order at 10:55 a.m. with five members in attendance.

The minutes of the meeting on October 28, 1996 in Burlington, Vermont were approved as submitted.

The working Group started the review process for revising the present 1994 Standard. At this meeting, the first six sections were reviewed in detail and minor revisions were proposed. It was noted that the revision dates of the referenced standards in Section 2 need to be checked to ensure no changes were made that may effect this standard.

A. L. Robinson will be requested to convert the measurements in this standard to metric as he is doing in the C57.12.44 standard.

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, July 16, 1997 at 9:30 a.m. with six members in attendance.

The minutes of the October 28, 1996 meeting in Burlington, Vermont were approved as submitted.

NEMA made the corrections to the Standard that was published in 1992 and recently published the new document with a 1994 date.

A new PAR for the revision of the 1994 Standard was approved on June 26, 1997.

Issues discussed for inclusion in the next revision were as follows:

- A. Standard temperature rise.
- B. Wording for tank withstand pressure.
- C. Reference to the basic documents for Routine Test Requirements.
- D. Addition of requirements for hardware corrosion protection.
- E. Including requirements for insulated neutral bushings.
- F. Reorganization of the document.

There being no additional business the meeting was adjourned at 10:46 a.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, July 16, 1997 with four members and one guest present.

The minutes of the October 28, 1997 meeting in Burlington, Vermont were approved as submitted.

Pictures of fuses were added to the draft revision and some are still missing. The Chairman requested all to check their supplies at their Company to see if any are available.

A. L. Robinson is converting measurements to metric but was not in attendance to discuss the status.

The pictures in Annex A do not match up with the related curves in Annex A. This discrepancy needs to be resolved. Also, curves for the 4000 and 5000 ampere fuses need to be included.

Review of the Standard from Section 10.5 through the Annex A was completed and minor changes were proposed.

Jock Moffat is to check the enclosure types in Section 11 to determine that the types listed are still manufactured.

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.

7.11.6 Future Meetings

The location and dates for future meetings were reported. See Clause 3.0 for details.

The Subcommittee meeting adjourned at 10:45 a.m.

ATTACHMENT 4 STATUS REPORT OF STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE						
STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS	
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;	NIEMANN C. (708)410-5307	T&D IAS/PSEC IC IFC TC 14 IAS/REPC	5/10/88 6/20/96 1993	PAR APPROVED 6/20/96	
PC57.12.24	IV, 34500Grdy. & BELOW, LV, 480 V AND BELOW					
C57.12.40	REQUIREMENTS FOR SECONDARY NETWORK TRANSFORMERS, SURWAY & VAULT TYPES (LIQUID IMMERSED)	BERTOLINI E. A. (212)460-4913	T&D IAS/PSEC ICC IFC TC14 IAS/REPC	3/19/92 6/26/97 1997	PAR APPROVED ON 6/26/97 PUBLISHED JAN 1996	
PC57.12.40						
C57.12.44	STANDARD REQUIREMENTS FOR SECONDARY NETWORK PROTECTORS	MULKEY D H (415)973-4699	T&D IAS/PSEC SWGR EEI IAS/REPC NEMA	12/20/94 9/21/95 1999	PUBLISHED DEC 94 PAR APPROVED 09/21/95	
PC57.12.44						
C57.12.57	REQUIREMENTS FOR VENTILATED DRY-TYPE NETWORK TRANSFORMERS 2500KVA AND BELOW, W/IV 34500V AND BELOW, LV 216V...AND	NUTT B. (214)698-7447	T&D EEI/T&D SCC14	3/18/92 12/5/91 1997	REVISE/REAFFIRM BEFORE 10/31/97 APPLY FOR NEW PAR	
PC57.12.57						

7.12 West Coast - E. G. Hager, Chair

The meeting was opened at 08:33, Wednesday, May 7, 1997 in Scottsdale, AZ by Red Hager, Chairman. There were 8 members and 7 guests present.

There were 9 members and 10 guests in attendance at the Working Group meeting on Tuesday, May 6, 1997.

The Minutes of the meeting on November 7, 1996 in Las Vegas were approved as corrected. Chuck Todd, Tacoma Public Utilities, committee Member, was added to the attendance list.

7.12.1 Old Business

Tom Lundquist volunteered to serve as Vice Chair for the W. C. Transformer Subcommittee.

Chairman, Hager discussed the main committee meeting to be held in Graz, Austria, July 15 - 18, 1997. He passed out copies of the registration forms, hotel reservation forms, technical tour information for the visit to Reinhausen in Regensburg, Germany, plus the tentative meeting agenda for the Transformer Committee meeting in Graz. Future meeting dates and locations of the Transformer Committee were also discussed.

Red Hager also discussed the Invitation to Balloting procedure where notices are sent by mail to interested individuals wishing to ballot on specific standards, guides, etc.

A brief discussion was held regarding the new working group being established for considering revisions to the Installation Guide for Liquid Immersed Transformers. This group is currently on hold until we can get together with Jim Gillies, who chaired the original Working Group.

Replacement options for GSU Transformers. This working group is chaired by Bob Stewart, BC Hydro. Bob reported on the W. G. progress on Tuesday. He presented copies of the work that had been completed to date and requested comments be returned to him within 30 (thirty) days.

Tom Lundquist, co-chairman for the Phase Shifting Transformer Guide W.G., reported on discussions from the previous days meeting, during which he handed out copies of the subject guide. He said he had already received some comments but requested any other comments back ASAP in order to send a revised copy to the W. G. Secretary for subsequent balloting by members of the W. G. and the West Coast Transformer Subcommittee. Tom said he and Edgar Trummer desire to have balloting completed prior to the meeting in Graz on July 15-18, 1997.

7.12.2 New Business

The Chairman regretfully announced that Dave Brucker had withdrawn his membership from the Committee due to increasing work assignments. Dave's hard work, leadership and friendship will be missed by all of us.

7.12.3 Call For New Members

John Irvine, Montana Power Company, and Eric Pisila, ABB Power T & D Co., Muncie, Indiana, were unanimously elected as new members of the West Coast Transformer Subcommittee. John will be replacing Bob Clark, who is retiring from Montana Power Co.

The next meeting for the Subcommittee is scheduled for October 20 & 21, 1997 in Westminster, California.

Submitted by

Red Hager and Acting Secretary Bob Stewart

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

The Working Group met on Wednesday, July 16, 1997 at 2:50pm with 17 members and 14 guests. After introductions, the minutes of the October 28, 1996 meeting were approved as written.

Draft #5a had previously been sent to the Working Group for survey. Comments were scheduled to be returned by July 18, 1997.

At this meeting, discussions were held on the comments which had been received.

1. Editorial comments were discussed and will be included in the next draft.
2. Section 5.0 - Theory and application of Phase Shifting Transformers: Reorganization of the section for consistency and standardization of figures is required. Gustav Preininger and Dieter Dohnal will review.
3. A new paragraph will be prepared by Dan Perco to discuss the overload requirements for phase shifting transformers. The overload requirements in a transformer are directly proportional to the current. The overload capability of a PST is effected by the current plus the impedance voltage across the load tap changer.
4. Section 6.4 - Protection was found to be difficult to understand. It was agreed that a sketch should be prepared illustrating the simplified relay protective scheme for PST. Don Cash, Tom Lundquist and Bipin Patel will work on the sketch.
5. Sections of the guide will be deleted if the material is covered in existing standards.
6. External Clearance: Requirements determination:
Phase-to-phase: ANSI C57.12.00
Source-to-load: Maximum voltage difference Across PST and Impulse i.e. impulse one set of terminals with other sides open circuited.
7. Following a lengthy discussion, the general impression of the document appears to be that the wording of the Guide is leaning toward a standard (i.e. shall versus may and should, and the referencing of other standards). It was agreed to continue work on the document to include all material pertinent to PST's. When the content is agreed upon, the document will be edited to meet the requirements of a Guide.

Meeting adjourned at 5:30pm.

Donald Chu, Working Group Secretary

ATTACHMENT 4 STATUS REPORT OF STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE						
STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS	
SUBCOMMITTEE: WEST COAST						
CHAIR: F. G. HAGER						
PHONE: (619)789-3022						
C57.114 P513	SEISMIC GUIDE FOR POWER TRANSFORMERS AND REACTORS	OKLU S. (213)481-4823	NPE SUFS.	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	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	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.	

8.0 Reports of Liaison Representatives

8.1 EPRI - S. R. Lindgren

EPRI

Electric Power

Research Institute _____ *Powering Progress through Innovative Solutions*

July 8, 1997

TO: Mr. Bipin Patel
Secretary, IEEE Transformers Committee
Southern Company Services
P. O. 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 July 18, 1997, meeting in Graz.

1. EHV Converter Transformer:
 - Test results confirmed 25% or greater major insulation size reduction can be attained with some further work.
 - Final report will be published pending patent filing actions.
2. Advanced Power Transformer:
 - Reduced total owning cost has been demonstrated. Core-form winding development and transformer demonstrations have been completed.
 - Development of shell form insulation, winding and physical models is completed. 1425 BIL dielectric models have been tested successfully. A 25 MVA single phase. 161 kV model testing program including short circuit has been completed.
3. Static Electrification in Power transformers:
 - This is the suspected failure mechanism in over 24 core form and shell form FOA transformers worldwide. Recent failures involve 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. A project continues to monitor a large FOA transformer in the field. Data is being collected and monitored at a remote location that shows increased static electrification activity at low oil temperatures with pumps running. Phase I of a comprehensive test program was completed on a 333 MVA single phase 500 kV autotransformer that is 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.

Mr. Bipin Patel

7/8/97

Page 2

- 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.

4. 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 detect 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 studied. Phase II has been initiated to study the correlation between moisture-in-oil with moisture-in-paper for a range of conditions and temperature cycles.

5. High Voltage Instrument Transformers

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

6. 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.

Mr. Bipin Patel

7/8/97

Page 3

7. 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 is completed 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.

8. 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 re-clamping 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.

9. Transformer Expert System

A project is in process 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 will be done in 1997.

10. Guidelines for Life Extension of Substations

These guidelines, now published in Final Report TR-105070, include a large section on transformer inspection, condition assessment, testing, and maintenance practices. These guidelines will be updated on an ongoing basis.

11. 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. An EPRI project is underway to improve understanding of contact coking, oil filtration effectiveness and monitoring concepts. Additional projects are anticipated.

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

8.2 SCC4 - F. A. Payne

**IEEE PES TRANSFORMERS COMMITTEE
LIAISON REPORT
SCC4 - ELECTRICAL INSULATION**

SCC4, Coordinating Committee No. 4 - Electrical Insulation met at the IEEE PES Winter Meeting in New York City on February 3, 1997.

Project Authorization Requests are being prepared for Standards IEEE 1, 98 and 99.

Consideration is being given to whether Part 3, *Temperature Measurement* should remain in IEEE 1. I volunteered to coordinate revision of IEEE 1, *General Principles for Temperature Limits in the Rating of Electric Equipment and for the Evaluation of Electrical Insulation*.

The U.S. Technical Advisory Group to IEC TC 98 Electrical Insulation Systems (EIS) met following the SCC4 meeting. Status of three Working Group draft documents for IEC 505, *Guide for Evaluation and Identification of Insulation Systems for Electrical Equipment* was given.

A working draft has been prepared for Project 1857 - *Addition/Substitution of Materials in an Established EIS* by Working Group 3. An investigation of electrical stress induced by periodic impulse for low voltage devices with electronic switching has been proposed. Voltage spikes to motors occur in seconds damaging insulation and resulting in subsequent failure. The wavefront has almost a zero percent rise time and cannot be duplicated for normal voltage as it is very brief, aperiodic and difficult to measure. The problem is considered to be a system design issue and not one of EIS qualification/evaluation.

Please note that I am chair of the Working Group for Revision of IEEE 1 - comments/suggestions for the Transformer Committee membership are welcome. SCC4 meets at the PES Winter Power Meeting on Monday for those interested in the committee activities.

Respectfully submitted,

Paulette A. Payne

8.3 CIGRE SC12 - W. N. Kennedy

No Report.

8.4 TC 14 TAG - P. J. Hopkinson

The IEC TC 14 TAG met at 10:55 a.m. on July 16, 1997. A total of 13 members and 8 guests were in attendance.

Topics covered were:

TAG Membership

Working Group Membership

Key document status*

Preparations for London TC 14 meeting (Sept. 9-11, 1997)

Difference between ANSI C57 and IEC TC 14

<u>IEC Document #</u>	<u>Category</u>	<u>Issues</u>
76-5	* Short Circuit	Clarifications/ Requirements
76-3	Dielectrics/Insulation	Clarifications/ Requirements
1378- Parts 1 & 2	Converter Transformers	RMS vs Fundamental Power
214	Tap Changers	Reactive vs Resistance
551	Audible Sound	Measurement method and Table

The meeting adjourned at 12:10 p.m.

Respectfully Submitted,

P.J. Hopkinson

9.0 Old Business

Bob Grubb read his following June 20, 1997 proposal for forming a new subcommittee on power transformers. This was discussed at last meeting in Burlington. There were few comments made on the scope of the new subcommittee but over all sense of acceptance was evident. Examples of the standard that could fall under this subcommittee are ANSI C57. 10, .11,.116, .117, .125, .127, installation guides for power transformers, etc. Wally requested members to review the proposal and send comments/suggestions to Bob or the committee officers.

9.1 Bob's Proposal

GS WAUKESHA ELECTRIC SYSTEMS

A UNIT OF GENERAL SIGNAL

July 7, 1997

To: J. D. Borst
F. E. Elliott
F. J. Gryzkiewicz
E.G. Hager, Jr.
K. S. Hanus
W. N. Kennedy
P. E. Orehek
W.F. Patterson
J. Puri
J. E. Smith

From: Robert L. Grubb

Subject: Proposed Subcommittee - Power Transformers.

Enclosed is a copy of the proposed wording for the Scope for the proposed Subcommittee - Power Transformers which I was assigned to prepare at the last Transformers Committee meeting. W. Binder asked me to forward copies of this and the supporting information to all member of the Administrative Subcommittee for your re view.

Robert L. Grubb

400 S. PRAIRIE AVENUE · WAUKESHA, WI 59186-5937
[414] 547-0121 • FAX [414] 521-0196 [-0190-0190[PURCHASING] -0198 [TRANSFORMERS]]

GS WAUKESHA ELECTRIC SYSTEMS

A UNIT OF GENERAL SIGNAL

June 20, 1997

To: Linden Pierce cc. W. Binder, Jr.
Loren Wagenaar B. K. Patel
Jin Sim J. H. Harlow
 J. W. Matthews
 T. Traub

RE. Task Force for Proposal of forming a SC Power Transformers.

At the October 30, 1996 meeting of the Transformers Committee in Burlington, Vt., I proposed from the floor that the Transformers Committee should form a subcommittee to deal with activities specifically related to Power Transformers equipment, much as the SC Distribution Transformers deals with equipment standards specifically related to distribution transformer, and the SC Dry-Type Transformers deals with equipment standards specifically related to dry-type transformers. I was prompted to make this proposal after hearing discussions at subcommittee meetings the prior day regarding which subcommittee should be responsible for some proposed new tasks. These proposed tasks dealt with subjects unique to power transformers and I realized we did not have a group whose scope specifically related to power transformer design, construction and problems.

I was appointed by Wally Binder to head the Task Force to formulate a scope statement for this proposed new committee, and I have your names from the Secretary as having volunteered to serve on this Ad Hoc Task Force. Attachment 1 is the first draft of a proposed wording for the Scope of the proposed SC Power Transformers for your approval or modification. It was modeled after the scopes of other "equipment related" subcommittees listed in the PES 1997 Organization Manual and Committee Directory. As written, it shouldn't encroach on the scopes of the other subcommittees, but I suggest you review the scopes (see attachment 2) of the other subcommittees before you approve or recommend changes. Per discussions with W. Binder, tentative plans are to submit a draft scope to the AdCom at Graz, for their review and then bring it up for action at the next meeting in St. Louis.

The purpose of my proposal was to form a subcommittee which would fill a void, not just increase the complexity of our organization. With the objective of determining if there was a need for the proposed SC Power Transformer in mind, I reviewed the list of standards presently published in the 1997 C57 Book of Standards, and found the following list of standards which could fall under the proposed scope of a SC Power Transformers.

IEEE Std. 638- 1992 Standard for Qualification of Class 1E Transformers for Nuclear Power Generating Stations.

ANSI/IEEE C57.12.10 -1988 American National Standard for Transformers, Safety Requirements for 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 3750/4686 through 60 000/80 000/100 000 kVA with Load Tap Changing.

ANSI/IEEE C57.12.11-1980 IEEE Guide for Installation of Oil-Immersed Transformers (10 mVA and Larger, 69-287 kV Rating).

ANSI/IEEE C57.12.12-1980 IEEE Guide for Installation of Oil-Immersed EHV Transformers 345 kV and Above

ANSI/IEEE C57.116-1989 Guide for Transformers Directly Connected to Generators.

ANSI/IEEE C57.117-1986(Reaff 1992) Guide for Reporting Failure Data for Power Transformers and Shunt Reactors on Electric Utility Power Systems.

ANSI/IEEE C57.120-1991 Loss Evaluation Guide for Power Transformers and Reactors.

ANSI/IEEE C57.125-1991 Guide for Failure Investigation, Documentation, and Analysis for Power Transformers and Shunt Reactors.

Reviewing the list of activities published in the Transformers Committee Minutes of the Burlington meeting October 30, 1996, I find the following situations which would support forming a SC Power Transformers.

- 1) Standard C57.12.10, the "equipment standard" for power transformers, presently has no "home" within our subcommittee scopes as does other "equipment standards" for example, C57.12.20 (SC Distribution transformers) and C57.12.01 (SC Dry-Type Transformers).
- 2) According to the minutes of the SC West Coast, C57.12.11 and C57.12.12 are scheduled to be replaced on a new document they are working on C57.93 Guide for the Installation of Liquid-Immersed Power Transformers. The SC West Coast should be commended for their work to prepare this document. However, in my opinion, this document has more than a regional interest, and people from the East Coast and Midwest could have participated more easily had the work been performed under the jurisdiction of a SC Power Transformer which met at our regular meetings, not just on the West Coast. Future work on this document should be done in meeting convenient to the whole transformers committee membership, not just west coast members.
- 3) Similarly, SC West Coast is working on a revision to C57.120 which has interest and usage across the country, not just the west coast. Some of the new documents the SC West Coast reported to be working on would seem to be of general interest to other transformer committee members other than *member* from the west coast.

- 4) The task force formed under the SC Insulation Life at the last meeting to work on a problem associated with the time constant of Winding Temperature Indicators, could have been assigned under a SC Power Transformer, as the devices are not normally used on distribution transformers, and it's a stretch to fit this problem into the scope of SC Insulation Life. It's my understanding this problem was passed back and forth between SC Performance Characteristics and SC Insulation Life because neither group felt it was under their scope.
- 5) The WG being formed under SC Performance Characteristics to update the LTC certification requirements could also be logically placed under a SC Power Transformers, since these devices are normally only used on power transformers 3750 kVA and larger. This would reduce one of the WG's in the SC Performance Characteristic which has a rather large agenda.
- 6) IEEE 63 8, listed above, which appeared to be due for reaffirmation could fall under the scope as written.

I believe that a SC Power Transformers needs to be added to our organization. The scope of the Transformers Committee covers "transmission transformers" specifically (see scope attachment 2) which is a type of power transformer, however, no subcommittee with the exception of the SC West Coast lists power transformers (or transmission transformers) as their primary focus. Over twenty years ago when I joined the transformers committee, the main focus of the Transformers Committee was power transformers. The distribution, dry-type, and Instrument Transformers were small groups who met by themselves to address their unique problems. Discussions and activities in the SC Insulation Life and SC Performance Characteristics were so power transformer focused, they had to occasionally be reminded of the needs of distribution transformers. Today, our organization has changed with the addition of the many "equipment related" standards such that the technology related subcommittees must focus more on technology applicable to both distribution and power transformer and the focus on power transformers has been diminished. The formation of a SC Power Transformers would reestablish a group to focus specifically on problems unique to power transformers.

Robert L. Grubb, Chair

WG Thermal Test

IEEE Transformer Committee

Ad Hoc Task Force to Propose a Scope for a (Proposed) Power Transformer Subcommittee.

To: H. Jin Sim
Linden Pierce FAX 706 235 6508
Loren Wagenaar

(Proposed) Scope:

Study and review engineering aspects of liquid filled power transformers, including transmission transformers, primary unit substation transformers, generator step-ups transformers, phase angle regulating transformers and related products. Develop and maintain standards, recommended practices, and guides related to power transformers, rated over 500 kVA with high voltage winding of 36 kV class and higher, and low voltage winding greater than 5 kV class. Provide coordination to others technical groups developing or maintaining standards which affect the design and application of Power Transformers.

_____ Approve proposed scope

_____ Change proposed scope to read as follows:

Please return response me at any of the following:

Bob.Grubb@WES.Gensig.COM
or
Robert L. Grubb at FAX 414 521 0196
or
Robert L. Grubb
Waukesha Electric System
400 S. Prairie Ave.
Waukesha. WI. 53186-5940

TRANSFORMERS COMMITTEE

Scope: Treatment of all matters in which the dominant factors are the application, design, construction, testing, and operation of transformers, reactors and other similar equipment. Included is treatment of the following:

Transmission and Distribution Transformers

Voltage Regulators (Step and Induction Regulators)
Reactors and Grounding Transformers.

HVDC Converter Transformers and Smoothing Reactors

Power Semi-Conductor Rectifier Transformers

Instrument Transformers (Voltage Transformers and Current Transformers)

Insulation and Dielectric Problems Relating To Transformers

Outdoor Apparatus Bushings

Insulating Fluids

Underground Transformers and Network Protectors

Phase Regulating Transformers

Matters relating to transformers and regulators specifically designed for applications covered by certain other technical committees, such as Relays, Electronics, Surge Protective Devices, Communications, may be treated jointly with that committee if emphasis is on general principles, or exclusively by the application committee if emphasis is on the particular requirements of the application.

SUBCOMMITTEES RESPONSIBLE FOR ITEMS UNDER SCOPE

SC Distribution Transformers
Proposed) SC Power Transformers
? No obvious SC responsible for this
SC HVDC Converter Transformers and Smoothing Reactors
WG under SC Performance Characteristics
SC Instrument Transformers
SC Insulation Life SC Dielectric Tests
SC Bushings
SC Insulating Fluids
SC Underground Transformers and Network Protectors.
SC West Coast (?? Why - they are of general interest) (not just the West Coast.)

G & A Focused Subcommittees

ADMINISTRATIVE SUBCOMMITTEE

Scope: Plan and coordinate the activities of the main committee and its subcommittees; Oversee through the Standards Subcommittee the development and approval of committee sponsored standards, recommended practices, guides and position documents; Oversee through the Recognition and Awards Subcommittee the nomination and presentation of awards; Maintain liaison with other technical committees, societies, groups and associations; Plan, coordinate and sponsor technical sessions and special technical conferences in the field of power transformers, distribution transformers and reactors.

STANDARDS SUBCOMMITTEE

Scope: Responsible for cognizance of current status of standards sponsored by the Committee; Coordinate revision work of base standards by maintaining a list of requested changes and assigning them to the appropriate Technical Subcommittees. Coordinate inputs into a complete and logical document for submission to the Standards Board; Insure that the terminology and units used in standards developed by the Committee correspond to what is internationally accepted; Coordinate activities with EKE Standards Board and Standards Coordinators of other Technical Committees.

Regional Focused Subcommittee

WEST COAST SUBCOMMITTEE

Scopes: Study and review power Transformers and reactors with particular attention to service requirements of installations in the western United States and Canada; Develop and maintain related standards, recommended practices and guides for such products; Coordinate with other technical committees, groups societies and associations as required.

Technology Focused Subcommittees

AUDIBLE SOUND AND VIBRATION SUBCOMMITTEE

Scope: Study and review engineering aspects of the requirements and methods of measurements (testing) of matters relating to audible sound and vibration of products within the scope of the Committee; Develop and maintain related standards, recommended practices and guides for such criteria Coordinate with other technical committees, groups, societies and associations as required.

BUSHING SUBCOMMITTEE

Scope: Study and review engineering aspects of outdoor apparatus bushings having BIL of 110 KV or above and used as components of power transformers, reactors and oil circuit breakers; Develop and maintain related standards, recommended practices and guides for such products; Coordinate with other technical committees, groups, societies and associations as required.

DIELECTRIC TESTS SUBCOMMITTEE

Scope: Study and review engineering aspects of test voltage requirements for service conditions, or conversely, voltage tests that will determine that service requirements are met for liquid filled transformers and reactors; Develop and maintain related standards, recommended practices and guides for such criteria; Coordinate with other technical committees, groups, societies and associations as required.

INSULATING FLUIDS SUBCOMMITTEE

Scope: Study and review the engineering aspects of electrical insulating fluid properties for use in transformers and other electrical apparatus. Consider matters pertaining to acceptance maintenance and handling of such fluids. Determine the effect of various treatments, aging in service, gas evaluation and other phenomena on the fluids properties and to determine the criteria for serviceability of the equipment; Develop and maintain related standards, recommended practices, and guides for such criteria; Coordinate with other technical communities, groups societies and associations as required.

INSULATION LIFE SUBCOMMITTEE

Scope: Study and review methods to determine maximum safe insulation temperatures, ambient temperatures, ambient temperatures, insulation aging characteristics, safe duration of loads in excess of nameplate (including short circuits) and also to determine methods of calculating or measuring temperatures reached during both transient and steady state loads; Develop and maintain related standards, recommended practices, and guides for such criteria; Coordinate with other technical committees, groups, societies and associations as required.

PERFORMANCE CHARACTERISTICS SUBCOMMITTEE

Scope: Study and review the treatment of loss, impedance, exciting current, inrush current and other performance characteristics and their methods of application measurement or test for liquid filled transformers and reactors; Develop and maintain related standards, recommended practices and guides for such criteria; Coordinate with other technical committees, groups, societies and associations as required.

**DISTRIBUTION TRANSFORMERS
SUBCOMMITTEE**

Scope: Study and review engineering aspects of overhead padmounted and certain underground type distribution transformers rated 2500 kVA and smaller, high voltage 38,000 volts and below, low voltage 15,000 volts and below. Evaluation to include enclosure integrity and surface coatings; Develop and maintain related standards, recommended practices and guides for such products; Coordinate with other technical committees, groups, societies and associations as required.

**DRY-TYPE TRANSFORMER
SUBCOMMITTEE**

Scope: Study and review engineering aspects of those transformers and reactors in which a significant component of the internal insulation is air or other insulating gas; Develop and maintain related standards, recommended practices and guides for such products; Coordinate with other technical committees, groups, societies and associations as required.

**HVDC CONVERTER
TRANSFORMERS AND
SMOOTHING REACTOR
SUBCOMMITTEE**

Scope: Study and review engineering aspects of the specification, design, testing, installation, operation, and maintenance of HVDC converter transformers and smoothing reactors; Develop and maintain related standards, recommended practices, and guides for such products; Coordinate with other technical committees, groups, societies and associations as required.

**INSTRUMENT TRANSFORMERS
SUBCOMMITTEE**

Scope: Study and review the engineering aspects of instrument current transformers and inductively coupled instrument voltage transformers; Develop and maintain related standards, recommended practices and guides for such products; Coordinate with other technical committees, groups, societies and associations as required.

**UNDERGROUND TRANSFORMERS
AND NETWORK PROTECTORS
SUBCOMMITTEE**

Scope: Study and review aspects of secondary network protectors and secondary network transformers (liquid filled and dry-type) and three-phase underground type distribution transformers rated 2500 kVA and smaller, with a high voltage of 35,000 volts and below, and a low voltage of 480 volts and below; Develop and maintain related standards, recommended practices and guides for such products; Coordinate with other technical committees, groups, societies and associations as required.

SC Power Transformers (Proposed)

(Proposed) *Scope:*

Study and review engineering aspects of liquid filled power transformers, including transmission transformers, primary unit substation transformers, generator step-up transformers, phase angle regulating transformers and related products. Develop and maintain standards, recommended practices, and guides related to power transformers, rated over 500 kVA with high voltage winding of 36 kV class and higher, and low voltage winding greater than 5 kV class. Provide coordination to others technical groups developing or maintaining standards which affect the design and application of Power Transformers.

10.0 New Business

There was no new business discussed.

11.0 Adjournment

The meeting was adjourned at 11:01 AM.

Respectfully submitted,
Bipin K. Patel, Secretary

STATUS REPORT ON STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE

Attachment 1

17-Sep-97

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

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE	WG CHAIR AND PHONE NO.	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	SC CHAIR DIELECTRIC TESTS L. B. WAGENAAR	TF CHAIR FOULIN B. (408)157-8326	PSIM IAS/PSE IEC TC14 U	12/5/91 PAR APPROVED 6/20/96 6/20/96 1996 10/31/97	REVISION/REAFFIRM BEFORE
C57.114 P513	SEISMIC GUIDE FOR POWER TRANSFORMERS AND REACTORS	WEST COAST E. G. HAGER	OKLU S. (213)181-4821	NPE SUBS	2/15/90 STANDARD WITHDRAWN	
C57.115 P736	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 DIRECTLY CONNECTED TO GENERATORS	PERFORMANCE CHARACTERISTICS H. J. SIM	REITTER G. (415)508-2864		1/3/89 REAFFIRMED 6/28/79 1999	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 REVISION/REAFFIRM BEFORE 10/31/97 1997	
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 SUBS SCC4 PSRC IAS II	9/17/92 0	BEING BALLOTTED PAR EXTENDED TO 10/30/98
C57.12.00 VARIOUS	GENERAL REQUIREMENTS FOR LIQUID- IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS	STANDARDS T. P. TRAUB	TULL S. (414)547-0121	T&D PSRC SWG SUBS IAS IEC-TC14 U	6/16/93 FORMING BALOTTING GROUP 6/15/95 1998	EDITING REVISION
C57.12.00 PC57.12.00	AUDIBLE SOUND LEVEL REQUIREMENTS	AUDIBLE SOUND & VIBRATION J. PURI	PURI J. (704)282-7413			UNDER DEVELOPMENT

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	TABLE 17 - MECHANICAL LIFTING REQUIREMENTS CLARIFICATION	PERFORMANCE CHARACTERISTICS H. J. SIM	PLATTS D. (610)774-4686			UNDER DEVELOPMENT
C57.12.00 PC57.12.00	SECTION 5.10.7.1 - LIGHTNING IMPULSE TESTS	DIELECTRIC TESTS L. H. WAGENAAR	MINKWITZ R. F. (617)828-3241			APPROVED BY MAIN COMMITTEE
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 8 - DIELECTRIC TESTING OF SECONDARY CONTROL WIRING	PERFORMANCE CHARACTERISTICS H. J. SIM	TULLS (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	TABLE 9 - PCB STATEMENT 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	9.3 TABLE 19 - TOLERANCE FOR LOSSES	PERFORMANCE CHARACTERISTICS H. J. SIM	HENNING W. (414)547-0121			TO BE BALLOTTED

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE	WG CHAIR AND PHONE NO.	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	LATEST STATUS/ COMMENTS
		SC CHAIR	TF CHAIR			
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. F. TRAUB	TULLIS (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 PC57.12.00	SECTION 5.9 - AUXILIARY LOSSES ON CLASS I AND CLASS II POWER TRANSFORMERS	PERFORMANCE CHARACTERISTICS H. J. SIMI	TULLIS (414)547-0121			BALLOTING
C57.12.00 PC57.12.001	DEFINITION OF THERMAL DUPLICATE	INSULATION LIFE L. W. PIERCE	GRUBB R. L. (414)547-0121 BARRY BEASTER	EM IAS I&CFS 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. SIMI	PLATTS D. (610)774-4686			INCLUDE IN NEXT REVISION COORDINATE WITH S. TULLI
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	JONATHAN A. (813)442-0414	NEMA ANSI UL I&CFS	2.2.89 6/26.97 1996	PAR APPROVED ON 6/26/97
C57.12.10 ANSI	TRANSFORMERS 230kV AND BELOW - 8333/10417kVA I PH. - 100000 kVA 3 PH w/o LTC, - 100000kVA w/ LTC - SAFETY REQUIREMENTS	STANDARDS T. F. TRAUB	(312)994-2704		6/4/87 1993	ANSI STANDARD NEEDS A HOME, DUE FOR REAF.

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE	WG CHAIR AND PHONE NO.	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	LATEST STATUS/ COMMENTS
C57.12.11 PC57.91	GUIDE FOR INSTALLATION OF OIL-IMMERSED TRANSFORMERS (10MVA & LARGER, 69-287KV RATING)	WEST COAST SC CHAIR E. G. HAGER	GILLIES D. A. (503)622-4847 TF CHAIR		5/9/80	TO BE REPLACED BY C57.93
C57.12.12 PC57.91	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	ASSIGN TO SUBCOMMITTEE NEMA STANDARD 1987
C57.12.20 PC57.12.20	OVERHEAD-TYPE DISTRIBUTION TRANSFORMERS, 500 KVA AND SMALLER; 11 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 DISTRIBUTION 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 DISTRIBUTION TRANSFORMERS WITH HV BUSHINGS 2500KVA AND SMALLER... REQUIREMENTS	DISTRIBUTION TRANSFORMERS K. S. HANUS	HANUS K. (817)882-6025	T&D IAS/PSEC	1/9/95 6/27/91 1999	AWAITING PUB. BY NEMA
C57.12.23 PC57.12.23	UNDERGROUND-TYPE SELF-COOLED, 1-PHASE DISTRIBUTION TRANSFORMERS WITH SEPERABLE INSULATED HV CONNECT HV 249400vDy 1.V.240...167kVA	DISTRIBUTION TRANSFORMERS K. S. HANUS	SCHEUR W. (704) 462-3164	T&D IC IAS/REPC 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, 1.V.480 V AND BELOW	UG TR & NETWORK PROTECTORS P. E. OREHEK	NIEMANN C. (708)410-5307	T&D IC IAS/REPC IAS/PSEC IEC TC 14	5/10/88 6/20/96 1993	PAR APPROVED 6/20/96

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE	WG CHAIR AND PHONE NO.	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	LATEST STATUS/ COMMENTS
		SC CHAIR	TF CHAIR			
C57.12.25	REQUIREMENTS FOR PAD-MOUNTED COMP- TYPE SELF-COOLED, 1-PHASE DISTRIBUTION TR W/SEPARATE HV CONN, HV 34500kVdY, 167kVA..	DISTRIBUTION TRANSFORMERS K. S. HANUS	MOHESKY N. (314)239-6783	T&D IC IAS/REPC IAS/PSEC	5/11/90 PAR WITHDRAWN 6/27/91 1995	PAR WITHDRAWN SUBMIT NEW PAR
C57.12.26	PAD-MOUNTED COMPARTMENTAL-TYPE SELF- COOLED, 3-PHASE DIST TR for USE W/ SEPARABLE INSULATED HV CONN, HV 34500kVdY, 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	PAR WITHDRAWN TO BE PUBLISHED BY NEMA
C57.12.27	STANDARD FOR TRANSFORMERS - LIQUID FILLED DISTRIBUTION TRANSFORMERS USED IN PAD-MOUNTED INSTALLATIONS, INCLUD. UNIT SUBS	DISTRIBUTION TRANSFORMERS K. S. HANUS	MILLER J. R. (314) 614-2111		6 27 91 0	PAR WITHDRAWN SUBMIT NEW PAR
C57.12.28	PAD-MOUNTED EQUIPMENT - ENCLOSURE INTEGRITY	DISTRIBUTION TRANSFORMERS K. S. HANUS	MARTIN J.		6/24/87	JOINT C37/C57 PROJECT AWAITING PUBLICATION
C57.12.29	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	SUBMERSIBLE EQUIPMENT - ENCLOSURE INTEGRITY	DISTRIBUTION TRANSFORMERS K. S. HANUS	MARTIN J.		1994	TO BE BALLOTTED NUMBER TO BE CHANGED
C57.12.31	COATING STANDARD FOR POLE MOUNTED TRANSFORMERS	DISTRIBUTION TRANSFORMERS K. S. HANUS	MARTIN J.		1994	JOINT C37/C57 PROJECT AWAITING PUBLICATION
C57.12.32	ENCLOSURE INTEGRITY OF SUBMERSIBLE EQUIPMENT	DISTRIBUTION TRANSFORMERS K. S. HANUS	HANUS K. (817)882-6020		1994	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 DISAPPROVED 03/21/96	
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	NESCOM WANTS CLARIFICATION
C57.12.35 PI265	STANDARD FOR BAR CODING FOR DISTRIBUTION TRANSFORMERS (POLE- MOUNTED PAD-MOUNTED AND UNDERGROUND)	DISTRIBUTION TRANSFORMERS K. S. HANUS	JORDAN RON (619) 482-4239		6/20/96 APPROVED BY STANDARDS BOARD 6/20/96 PREVIOUSLY PI265 2001	
C57.12.40 PC57.12.40	REQUIREMENTS FOR SECONDARY NETWORK TRANSFORMERS, SUBWAY & VAULT TYPES (LIQUID IMMERSED)	UG TR & NETWORK PROTECTORS P. E. ORHEK	BERTOLINI A. (212) 460-4913	T&D IAS/RE/PC ICC/TC14U	3/19/92 PAR APPROVED ON 6/26/97 6/26/97 1997	PUBLISHED JAN 1996
C57.12.44 PC57.12.44	STANDARD REQUIREMENTS FOR SECONDARY NETWORK PROTECTORS	UG TR & NETWORK PROTECTORS P. E. ORHEK	MULKEY D. H. (415) 973-4699	T&D IAS/RE/PC LEI	12/20/94 PUBLISHED DEC 94 9/21/95 1999	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 601-34500 VOLTS, 1 V 120- 600V	DRY-TYPE TRANSFORMERS W. PATTERSON	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, 1 V 208Y/120 TO 4160 VOLTS	DRY-TYPE TRANSFORMERS W. PATTERSON	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, 1 V 208Y/120 TO 4160 VOLTS	DRY-TYPE TRANSFORMERS W. PATTERSON	PATTERSON W. (919) 848-1860		6/12/89 COPYRIGHT NOT RELEASED 1994	BALLOT REAFFIRMATION

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE	WG CHAIR AND PHONE NO.	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 gdy/14400 V AND I_V 240/120 V	STANDARDS T. P. TRAUH	TF CHAIR			ONLY TITLE EXIST (NO PAR) IS IT REQUIRED? 0
C57.12.54 ANSI	REQUIREMENTS FOR DRY-TYPE, UNDERGROUND 3 PHASE DISTRIBUTION TRANSFORMERS 2500 KVA OR I_V 24940 gdy/14400 OR I_V 480V	STANDARDS T. P. TRAUH				ONLY TITLE EXISTS IS IT REQUIRED? 0
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 I_V 216V AND 480V.	UG TR & NETWORK PROTECTORS P. E. OREHLK	NIITT B. (214)698-7447	T&D SCC14	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	IFC 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	IFC 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 SUBS ICC	6/18/92 6/14/95 1997	6/18/92 BEING BALLOTTED
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	5/1/92 BEING BALLOTTED
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	3/16/93 6/15/95 1998	3/16/93 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			WILL START REVISING SECT. 11
C57.12.90 PC57.12.90	CLAUSE 9 - ADD MEASUREMENT OF AUXILIARY LOSSES	PERFORMANCE CHARACTERISTICS H. J. SIM	TULLI S. (414)547-0121			D1 BALLOTTED IN PCS
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 15 - NEW CLAUSE FOR CERTIFICATION TEST DATA	PERFORMANCE CHARACTERISTICS H. J. SIM	JIN S. (919)580-3234			APPROVED BY PCS
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

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE	WG CHAIR AND PHONE NO.	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	SC CHAIR DIELECTRIC TESTS	TULLS (414)547-0121			DI BALOTTED IN SUBCOM
C57.12.90 PC57.12.90	REVISE INDUCED TESTS FOR CLASS II POWER TRANSFORMERS	L. B. WAGENAAR DIELECTRIC TESTS	PERKINS M. (317)286-9314			DI BALOTTED IN TF
C57.12.90 PC57.12.90	REVISION OF TEMPERATURE RISE TESTS	L. B. WAGENAAR INSULATION LIFE	HENRY G. (501)543-6546			TO BALLOT D3 IN TF, WG, SC
C57.12.90 PC57.12.90d	REVISION OF THE INDUCED TEST	L. B. WAGENAAR DIELECTRIC TESTS	POULIN B. (408)957-8326		9/28/90	INCLUDE IN C57.12.90
C57.12.90 PC57.12.90x	CLAUSE 13 - ADD TEST PROCEDURE FOR MEASURING SOUND INTENSITY	J PURI AUDIBLE SOUND & VIBRATION	M PERKINS (317)286-9532		0	COORDINATE WITH STEVE SMITH
C57.12.91 PC57.12.91	TEST CODE FOR DRY-TYPE DISTRIBUTION AND POWER TRANSFORMERS	W PATTERSON DRY-TYPE TRANSFORMERS	BARNARD D. (919)738-4251	SPD T&D IEC TC14 U	6/14/95 6/26/97 2000	DI BEING PREPARED COORDINATE WITH STEVE SMITH
C57.120 P842	LOSS EVALUATION GUIDE FOR POWER TRANSFORMERS AND REACTORS	E. G. HAGER WEST COAST	JACOBSEN R. (617)926-4900	SUB ED&PG IEC	12/3/91 5/1/80 1996	BALLOTING GROUP FORMED TO REAFFIRM REVISE/RE-AFFIRM BEFORE 10/31/97
C57.121 P954	GUIDE FOR ACCEPTANCE AND MAINTENANCE OF LESS FLAMMABLE HYDROCARBON FLUID IN TRANSFORMERS	F. GRYSKIEWICZ INSULATING FLUIDS	MCSHANE C. P. (617)926-4900	PSRC IAS IEC	2/22/88 3/21/96 1996	BALLOTING GROUP BEING FORMED

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE	WG CHAIR AND PHONE NO.	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	LATEST STATUS/ COMMENTS
		SC CHAIR	TF CHAIR			
C57.123 P1098	GUIDE FOR TRANSFORMER LOSS MEASUREMENT	PERFORMANCE CHARACTERISTICS	HIENNING W. R. (414)547-0121		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	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	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
C57.127 PC57.127	GUIDE FOR THE DETECTION OF ACOUSTIC EMISSIONS FROM PARTIAL DISCHARGES IN OIL-IMMERSED POWER TRANSFORMERS	DIELECTRIC TESTS	J. W. HARLEY (216)425-1838	ICC IEC TC14 U IEC TC42 U	6/26/97 0	PAR APPROVED ON 6/26/97
C57.128 PC57.128	FIRE PROTECTION OF OUTDOOR LIQUID- IMMERSED POWER TRANSFORMERS	WEST COAST	HAGER R. NORBERG J.	NPE PSR	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	KENNEDY W. N. (317)286-9387	EM PSIM	9/26/91 0	PAR EXTENDED TO OCTOBER 97
C57.13 P546	REQUIREMENTS FOR INSTRUMENT TRANSFORMERS	INSTRUMENT TRANSFORMERS	NELSON T. (301)975-2956	PSIM 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	INSTRUMENT TRANSFORMERS	SMITH J. E. (919-827-2121)		8/25/87 1997	R1992 RELAY COMM. DOCUMENT

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE	WG CHAIR AND PHONE NO.	COMMITTEES REQUESTING COORDINATION	PUB DATE	LATEST STATUS/ COMMENTS
		SC CHAIR	TF CHAIR		PAR DATE REV DUE	
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 CIRCUITS AND CASES	INSTRUMENT TRANSFORMERS J. E. SMITH	SMITH J. E. (919-827-2121)		1/23-87	REVISE OR REAF. BY 12/96
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	1995 5/28/80	PAR WITHDR.AWN 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	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 TD PSC	9/96	REVISED PAR DISSAPPROVED 9/96 MAKE CHANGES AND RESUBMIT PAR
C57.130 PC57.130	T-U GUIDE FOR USE OF DISS. GAS ANALYSIS DURING FACTORY THERMAL TESTS FOR THE EVALUATION OF OIL-IMMERSED TRANS. AND REACT.	INSULATING FLUIDS F. GRYSZKIEWICZ	HEINRICH 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 IECTC14 IAS/PSE IAS/REP	9/21/95	PAR APPROVED PART II OF C57.12.90

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE	WG CHAIR AND PHONE NO.	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	SC CHAIR DRY-TYPE TRANSFORMERS W. PATTERSON	TF CHAIR 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 CHIU (WG SEC)	PSRC IAS/PSP IFC TC14 U	6/20/96	PAR Approved 6/20/96
C57.136 PC57.136	GUIDE FOR SOUND LEVEL ABATEMENT AND DETERMINATION IN OIL-FILLED TRANSFORMERS	AUDIBILE 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)976-4900			
C57.138 NEW	RECOMMENDED PRACTICE FOR ROUTINE IMPULSE TEST FOR DISTRIBUTION TRANSFORMERS	DILECTRIC TESTS L. B. WAGENAAR	ROSSETTI J. (901)528-4743	T&D PSIM	9/19/96	
C57.15 NONE	REQUIREMENTS, TERMINOLOGY, & TEST CODE FOR STEP-VOLTAGE REGULATORS	DISTRIBUTION TRANSFORMERS K. S. ILANUS	DIAMANTIS T. (315)428-5688	SURS IAS/TSE	3/18/87 9/21/95 1997	REVISE/REAFFIRM BEFORE 10/31/97
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	12/10/96	APPROVED BY STANDARDS BOARD ON 12/10/96
C57.17 ANSI	REQUIREMENTS FOR ARC FURNACE TRANSFORMERS	STANDARDS T. P. TRAUB			2001	LAST REVISED IN 1986 ANSI DOCUMENT 1986

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)896-6300	NONE	12/28/81 0	PAR EXTENDED TO OCTOBER 97 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	7/23/91 6/20/96	BEING BALLOTTED FOR REAFFIRMATION REVISE/REAFFIRM BEFORE 1996 10/31/97
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	8/5/91 6/20/96	BEING BALLOTTED REVISE/REAFFIRM BEFORE 1996 10/31/97
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	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	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	DRY-TYPE TRANSFORMERS W. PATTERSON	DUDLEY R. (416)298-8108		4/2/91	PAR MORE THAN 4 YEAR OLD ACTION NEEDED ON PAR 1995
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	4/2/91 6/9/88 2000	APPLY FOR PAR EXTENSION R1995

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE	WG CHAIR AND PHONE NO.	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	LATEST STATUS/ COMMENTS
		SC CHAIR	TF CHAIR			
C57.21 PC57.21*	REQUIREMENTS, TERMINOLOGY AND TEST CODE FOR SHI REACTORS OVER 500kVA	DILECTRIC 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 BALLOTING 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 SCC10	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	WG CHAIR AND PHONE NO.	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	LATEST STATUS/ COMMENTS
		SC CHAIR	TF CHAIR			
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	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	6/4/84 REAFFIRMED 03/18/92
IEEE 638 P638	QUALIFICATION OF CLASS I ETR FOR NUCLEAR POWER GENERATING STATIONS	PERFORMANCE CHARACTERISTICS H. J. SIMI	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
IEEE1238 P1238	TRIAL-USE GUIDE FOR INTERPRETATION OF GASES GENERATED IN SILICONE-IMMERSED TRANSFORMERS	INSULATING FLUIDS F. GRYSZKIEWICZ	GRYSZKIEWICZ F. (617) 926-4900	T&D IAC	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	BEING BALLOTTED

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 OCTOBER 1997
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 IC T&D	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 ASC X12 CS SAB NEMA PSR	9/15/93 0	NO. CHANGED FROM C57.132
NEW NEW	TASK FORCE TO STUDY APPLICATION AND PROBLEMS OF DRAW-LEADS FOR BUSHINGS	BUSHING F. E. ELLIOTT	NORDMAN RUSS (414)547-0121 R. NORDMAN			NEW TASK FORCE
NEW NO PAR YET	GUIDE FOR THE LOCATION OF ACOUSTIC EMISSIONS FROM PARTIAL DISCHARGES IN OIL-IMMERSED POWER TRANSFORMERS	DIELECTRIC TESTS L. B. WAGENAAR	HOWELLS E. (414)835-1500		0	BALLOTING WORKING GROUP SUBMIT PAR AS SOON AS POSSIBLE

Attachment 2 COORDINATION ACTIVITIES OF THE IEEE/PES TRANSFORMERS COMMITTEE

17-Sep-97

PROJECT DATE	TITLE	COMMITTEE CONTACT	COORDINATOR	TR SUBCOMM	STATUS
10/14/96	GUIDE FOR LIFE MANAGEMENT OF ELECTRICAL EQUIPMENT IN GENERATING STATIONS	DEREK M. SAWYER 416-592-5445	F. N. YOUNG	DIELECTRIC TESTS	
8/15/96	HARMONIC LIMITS FOR SINGLE-PHASE EQUIPMENT	DANIEL J. WARD 804-775-5328	DON CASH	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	DIELECTRIC TESTS	
NEW	MEASUREMENT OF POWER AT LOW POWER FACTOR				
2/15/94	PSIM	EDDY SO	W. R. HENNING	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	STANDARDS	
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	STANDARDS	
P 4	STANDARD TECHNIQUES FOR HIGH-VOLTAGE TESTING				JUST PUBLISHED
2/2/89	PSIM	TERRY McCOMB 613-990-5826	G. VAILLANCOURT	DIELECTRIC TESTS	
P 62	GUIDE FOR DIAGNOSTIC OF POWER APPARATUS				DRAFT PUBLISHED IN COLL.
3/17/94	PSIM	DAVID TRAIN 617-926-4900	R. A. VEITCH	STANDARDS	
P 454	PARTIAL DISCHARGE MEASUREMENTS				WILL. ADOPT IEC-270
3/31/94	PSIM	BARRY WARD 215-646-9200	G. H. VAILLANCOURT	STANDARDS	

PROJECT DATE	TITLE	COMMITTEE	CONTACT	COORDINATOR	TR SUBCOMM	STATUS
P 656 3/8/91	STANDARD FOR THE MEASUREMENT OF AUDIBLE NOISE FROM OVERHEAD TRANSMISSION LINES T&D	JAMES R. STEWART	518-395-5025	ALAN MI TEPLITSKY	212-460-4859	COMPLETED 12/92
P 693 9/18/90	RECOMMENDED PRACTICE FOR SEISMIC DESIGN OF SUBSTATIONS SUBS	RULON FRONK	213-481-3327	DAVID BRUCKER	415-692-4431	NEW PAR 12/93
P 957 9/17/92	GUIDE FOR CLEANING INSULATORS T&D	WILLIAM L. GIBSON	415-973-3747	L. B. WAGENAAR	614-223-2259	OLD GUIDE EXTENDED TO 12/94
P 979 6/18/92	GUIDE FOR SUBSTATION FIRE PROTECTION SUBS	A. J. BOLGER	604-663-2879	D. W. SUNDIN	414-524-3221	MUST COMPLETE IN 1994
P 980 9/17/92	GUIDE FOR THE CONTAINMENT AND CONTROL OF OIL SPILLS IN SUBSTATIONS SUBS	RICHARD G. COTTREL	517-788-0817	F. GRYSZAKIEWICZ	617-926-4900	GUIDE EXTENDED TO 12/94
P1030 12/5/91	GUIDE FOR SPECIFICATION OF HVDC PERFORMANCE - PART III, DYNAMIC PERFORMANCE T&D	LEWIS VAUGHAN	514-652-8457	WILLIAM N. KENNEDY	317-286-9387	DISCUSSING DRAFT IN WG
P1122 12/3/92	DIGITAL RECORDERS FOR MEASUREMENTS IN HIGH VOLTAGE IMPULSE TESTS PSIM	T. R. McCOMB	613-990-5826	BERTRAND POULIN	408-957-8326	APPROVED BY SB 03/17/94
P1205 6/2/96	GUIDE FOR ASSESSING, MONITORING, AND MITIGATING AGING EFFECTS ON CLASS IIE EQUIPMENT USED IN NUCLEAR POWER GEN STATIONS NPEC	JERALD L. EDSON	208-526-6253	L. W. PIERCE	706-291-3166	INSULATION LIFE
P1223 8/17/89	POWER SYSTEM DIGITAL TESTING TECHNIQUES PSIM	T. R. McCOMB	613-990-5826	R. MINKWITZ, SR.	617-828-3241	DIELECTRIC TESTS
P1248 12/6/90	GUIDE FOR THE COMMISSIONING OF ELECTRICAL SYSTEMS IN HYDROELECTRIC POWER PLANTS ED&PG	LOUIS A. TAUBER	503-326-2323	D. A. GILLIES	503-672-4847	WEST COAST

PROJECT DATE	TITLE COMMITTEE CONTACT	COORDINATOR	IR SUBCOMMI	STATUS
P1268 3/30/91	GUIDE FOR INSTALLING TEMPORARY SUBSTATIONS SUBS SHASHI G. PATEL 404-362-5386	D. A. GILLIES	503-622-4847 WEST COAST	DI READY FOR WG COMMENTS
P1291 10/22/91	GUIDE FOR PARTIAL DISCHARGE MEASUREMENTS IN POWER SWITCHGEAR SWGR E. F. VEVERKA 414-835-1544	G. H. VAILLANCOURT	514-652-8515 STANDARDS	ANSI APPROVED 08/30/93
P1303 9/17/92	GUIDE FOR STATIC VAR COMPENSATOR FIELD TESTS SUBS PHILIP R. NANNERY 914-577-2591	R. F. DUDLEY	416-298-8108 DRY TYPE	APPROVED BY SR 06/94
P1304 6/18/92	CURRENT MEASURING SYSTEMS WHICH USE OPTICAL TECHNIQUES PSIM T. R. McCOMB 613-990-5826	J. E. SMITH	919-827-3220 INSTRUMENT TRANSFORMERS	
P1325 3/17/92	RECOMMENDED PRACTICE FOR REPORTING FIELD TROUBLE DATA FOR POWER CIRCUIT BREAKERS SWGR D. M. LARSON 203-634-5739	G. H. VAILLANCOURT	514-652-8515 STANDARDS	INFORMATION COPY REQUESTED
P1459 11/5/94	STD DEF. FOR THE MEAS. OF ELECTRIC POWER QUANTITIES UNDER SINUSOIDAL, NON-SIN, BALANCED OR UNBALANCED CONDITIONS PSIM A. E. EMMANUEL 508-831-5239	EDDIE SO	613-993-2660 PERFORMANCE CHARACTERISTICS	APPLYING FOR PAR
P420 11/5/94	STANDARD FOR THE DESIGN AND QUALIFICATION OF CLASS I.E CONTROL BOARDS, PANELS, AND RACKS USED IN NUCLEAR GENERATING STN NPE M. S. ZAR 312-269-2222	L. W. PIERCE	706-291-3166 INSULATION LIFE	INFORMATION COPY
PC 37 104 7/19/96	GUIDE FOR AUTOMATIC RECLOSING PSRC WILLIAM STRANG 618-288-9211	H. J. SIM	702-227-2316 PERFORMANCE CHARACTERISTICS	
PC37 10 5/1/91	GUIDE FOR DIAGNOSTICS AND FAILURE INVESTIGATION OF POWER CIRCUIT BREAKERS SWGR L. ROLANDO SAAVED 504-363-8765	WALLACE B. BINDER JR.	216-384-5625 PERFORMANCE CHARACTERISTICS	DRAFT IN REVISION IN WG
PC37 107 12/28/85	STANDARD FOR DIGITAL PROTECTIVE RELAY INTERFACES PSR STIG L. NILSSON 408-335-9061	G. H. VAILLANCOURT	514-652-8515 STANDARDS	EVALUATING BALLOT RESULTS

PROJECT DATE	TITLE	COMMITTEE CONTACT	COORDINATOR	TR SUBCOMM	STATUS
PC37 108 9/28/84	GUIDE FOR THE PROTECTION OF NETWORK TRANSFORMERS PSR	THOMAS E. WIEDMAN 312-394-2393	VACANT	STANDARDS	RE AFFIRMED 1994
PC37 109 3/28/85	GUIDE FOR THE PROTECTION OF SHUNT REACTORS PSR	LAVERN L. DVORAK 303-231-1616	MIKE ALJMAN	407-694-4975 PERFORMANCE CHARACTERISTICS	RE AFFIRMED 1993
PC37 110 5/31/90	GUIDE FOR THE APPLICATION OF CURRENT TRANSFORMERS USED FOR PROTECTIVE RELAYING PURPOSES PSR	GRAHAM CLOUGH 206-737-6912	J. E. SMITH	919-827-3220 INSTRUMENT TRANSFORMERS	REVISION (D21) REV 01/11/91 IN PSR
PC37 122 3/20/97	STANDARD FOR GAS-INSULATED SUBSTATIONS SUBS	ARUN ARORA 303-674-7973	J. E. SMITH	919-827-3220 INSTRUMENT TRANSFORMERS	
PC37 91 3/19/92	GUIDE FOR PROTECTIVE RELAY APPLICATION TO POWER TRANSFORMERS PSR	MIRIAM SANDERS 919-856-2457	RON BARKER	804-257-4671 PERFORMANCE CHARACTERISTICS	
PC37 97 12/10/87	GUIDE FOR PROTECTIVE RELAY APPLICATION TO POWER SYSTEM BUSES PSR	STEVE CONRAD 505-848-2642	J. E. SMITH	919-827-3220 INSTRUMENT TRANSFORMERS	ANSI APPROVED 05/20/91
PC57 13.1 12/31/80	GUIDE FOR FIELD TESTING OF RELAYING CURRENT TRANSFORMERS PSR	ARUN G. PHADKE 703-231-7029	J. E. SMITH	919-827-3220 INSTRUMENT TRANSFORMERS	RE AFFIRMED 1992
PC62 11 6/14/94	STANDARD FOR METAL-OXIDE SURGE ARRESTERS FOR AC POWER CIRCUITS SPD	R. M. SIMPSON 919-836-7059	W. A. MAGUIRE	501-377-4273 DIELECTRIC TESTS	NEW PAR 6/14/94
PC62 2.01 6/1/84	APPLICATION GUIDE FOR SURGE PROTECTION OF ELECTRIC GENERATING PLANTS SPD	G. L. GAIBROIS 313-237-9332	VACANT	DIELECTRIC TESTS	
PC62 22 12/29/93	GUIDE FOR APPLICATION OF METAL OXIDE SURGE ARRESTERS FOR AC SYSTEMS SPD	J. WOODWORTH 716-375-7270	ROBERT DEGENEFF	518-276-6367 DIELECTRIC TESTS	INCLUDE DIST TRANSFORMER

Attachment 2

PROJECT DATE	TITLE	COMMITTEE	CONTACT	COORDINATOR	TR SUBCOMM	STATUS
7/18/94	PC62 42	SPD	R. DAVIDSON JR.	MAHESH P. SAMPAT	704-462-3226	REVISED PAR 9/22/94
					DIELECTRIC TESTS	

Attachment 3

17-Sep-97

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	C. A. LENNON JR.	(702) 293-8817
ED&PG	ENERGY DEVELOPMENT AND POWER GENERATION	VACANT	
EEl	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. PELO	(604) 528-3034
T&D	TRANSMISSION AND DISTRIBUTION COMMITTEE	C. KRISHNAYA	(514) 652-8342
TC	TRANSFORMERS COMMITTEE	T. P. TRAUB	(312) 394-2704
TSC	TECHNICAL SYMBOLOLOGY COMMITTEE (PART OF AIM)		

IEEE/PES TRANSFORMERS COMMITTEE ATTENDANCE STATISTICS

Committee Registration Members	St. Paul Nov. 21	Dallas Mar. 24	Milwaukee Sep. 24	Knoxville Apr. 25	San Jose Nov. 25	Portland Oct. 26	Great Fall 97	Max	Avg
Committee Registration Members	283	247	275	286	272	301	287	301	264
Special Events	97	43	55	45	51	64	67	91	64
Administrative	21	125	149	158	165	167	148	108	146
SC ADMINISTRATION		20	22	22	20	21	19	17	20
SC AUDIBLE NOISE AND VIBRATION		29	32	18	26	34	23	9	24
SC BUSHINGS	18	39	36	35	32	32	29	32	32
WG Bushing Application Guide	19	22	23						21
TF Draw Lead Bushings				18	25		17		20
WG DC Applications of Bushings	13	17	19	21	19	19		21	18
WG Revision C57.19.01	13	22	23	32	30	30	28	26	26
SC DIELECTRIC TESTS	98	79	84	99	71	88	91	58	84
WG Revision of Dielectric Tests	60	53	56	40	39	50	49	40	48
TF on Revision of the Induced Test	33	38	30	48	28	32	41	24	34
TF Metal Oxide Surge Arrester Coordination	35	25	35	31	14	22		35	27
WG Rev. Dielectric Tests on Distr. Transf.			16	15	14	16	13	16	15
TF Rev. Distr. Impulse Guide			17	19	18	16	13	19	17
WG Diagnostic Field Testing & Monitoring					64	89	94	70	79
TF On-line Monitoring								27	27
WG Partial Discharge Tests	28	23	27		27	35	44	37	32
SC DISTRIBUTION TRANSFORMERS	52	47	49	48	44	37	45	11	42
WG Overhead Type Distr. Transf. C57.12.20	35	34	34	30	30		23	35	31
WG Single-Phase Submersible C57.12.23			15	30	23			30	23
WG Single-Phase Deadfront Padmount C57.12.25	28	30	28	30	29		28	30	29
WG Bar Coding		22	30	35	29			35	29
WG Loss Evaluation		44	57	40	47			57	47
WG Electronic Data Transmittal		27	36	35	33			36	33
WG Combination of C57.12.22 and .26		27	28	30	28			30	28
WG Step-Voltage and Induction Reqs C57.15			25	40	33			40	33
SC DRY TYPE TRANSFORMERS	38	33	41	45	37		33	21	35
WG Test Code C57.91	27	24	28		27		18	28	25
WG Dry-Type Reactors	7	7	12	13	10		8	14	10
WG Dry-Type Reactors - II/DC Smoothing	8	5	10	6	7		6	12	7
WG Dry-Type Thermal Eval. and Flammability	20	21	21	20	21		27	15	21
WG Dry-Type General Requirements C57.12.01	31	21	21	36	27		27	5	24
WG Insulation Req. for Specialty Transf.	11	8	10	10	9		17	17	11
WG Cast Coil Loading Guide	17	17	16	24	21		19	19	19
WG Hot Spot Differentials	27	16	31	38	28		32	38	29
SC SPECIAL CONDUCTORS	17		15	13			9	8	12

NOTE: Data maintained for four years only. * - estimated

IEEE/PES TRANSFORMERS COMMITTEE ATTENDANCE STATISTICS

	St. Louis Nov 95	Dallas May 96	Milwaukee Sep 96	Kenn. City Apr 97	Boston Nov 95	San Jose Apr 96	Portland Oct 96	Clear July 97	MAX	AVG
SC INSTRUMENT TRANSFORMER GROUP	28	21	13	13	18		26	9	28	18
WG Test Req Instr Transf > 115 kVA			22	30	22	16		7	30	19
WG Revision of C57.13			11	13	20	20		9	20	15
SC INSULATING OILS	62	50	44	61	58	68	69	33	69	56
WG Gas Analysis During Factory Tests	62		44	61	58				62	56
WG Gas Analysis Silicone Transformers			44	61	58				61	54
SC INSTALLATION	60	63	45	49	57	65	60	18	65	52
WG Guides for Loading	73	61				32			73	67
WG Thermal Eval. of Distr. and Power Transf.	35	11				33			35	26
WG Thermal Tests	39	30	58	34	21	33	32	19	58	33
TF Revision of Temperature Test Code			20	22	19	37			37	25
TF Thermal Duplicate		27	31	26	26	20			37	28
TF Hottest Spot Temp. Rise		31	36	44	52	51			52	42
WG High Temperature Insulation	58	52	48	50	46	48	41	25	58	46
SC PERFORMANCE CHARACTERISTICS	97	83	93	88	99	106	108	49	108	90
WG Loss Tolerance and Measurement	32	35	45	36	34	37	30	27	45	35
TF Loss Measurement Guide			16						16	16
TF Low Power Factor Measurements			33						33	33
WG LTC Performance Requirements	37	37	41	38	29	34	46	23	41	38
WG PCS Rev. C57.12.00		20	21	15	23		49		49	26
WG PCS Rev. C57.12.90 Part I		15	19		5			29	29	17
WG PCS Rev. Short circuit Testing	32	35	30	39	40	34	42	22	42	34
WG Revision C57.110	23	23	22	29	33	28	26	18	33	25
WG Semi-Conductor Rectifier Transformers			16	18	33				33	22
TF Survey GSU Transf Failures								30	30	30
WG Switching Transients										
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 UNDERGROUND TRANSFORMERS	19	20	19	15	12	12	13	6	20	15
WG Three-Phase Underground Transfs.	16	16	16	10	13	10	12	5	16	12
WG Liquid-Filled Sec. Network Transfs.	15	16	15	15	15	12	13	6	16	13
WG Secondary Network Protectors	20	17	13	13	13	11	13	5	20	13
WG Dry-Type Network Transfs.	12	10	12	6	9	9	12	15	12	10
SC WEST COAST				26		9	12		26	16
WG Consolidation of Installation Guides				15	18	36	38	31	38	28
WG Phase Shifting Transformers									0	0
WG Seismic Guide									0	0
WG Loss Evaluation Guide									0	0
WG Fire Protection									0	0

file name = tcattend.xls

NOTE: Data maintained for four years only.

* - estimated