IEEE/PES TRANSFORMERS COMMITTEE MEETING

OCTOBER 30, 1996

BURLINGTON, VERMONT

IEEE/PES TRANSFORMERS COMMITTEE MEETING
BURLINGTON, VERMONT
OCTOBER 30,1996

ATTENDANCE SUMMARY

MEMBERS PRESENT

E. J. Adolphson
J. Arteaga
J. H. Bishop
D. J. Cash
L. E. Dix
P. T. Feghali
R. D. Graham
E.G. Hager, Jr.
J. H. Harlow
P. J. Hopkinson
C. W. Johnson. Jr.
S. P. Kennedy
J. P. Lazar
R. P. Marek
R. McTaggart
C. R. Murray
G. A. Paiva
P. A. Payne
L. W. Pierce
T. A. Prevost
P. G. Risse
W. E. Saxon
J. E. Smith
W. W. Stein
R. C. Thomas
E. R. Trummer
L. B. Wagenaar
A 1. Wilks

R. Allustiarti
R. L. Barker
W. E. Boettger
D. Chu
R. F. Dudley
M. A. Franchek
R. L. Grubb
E. Hanique
F. W. Heinrichs
J. Hunt
A. J. Jonnatti
A. D. Kline
T. D. Lewis
J. W. Matthews
H. R. Moore
R. J. Musil
B. K. Patel
L. C. Pearson
R. L. Plaster
J. Puri
A. L. Robinson
R. W. Scheu
J. W. Smith
L. R. Stensland
J. A. Thompson
S. C. Tuli
B. H. Ward
W. G. Wimmer

M. S. Altman
D. A. Barnard
J. D. Borst
J. L. Corkran
F. E. Elliott
D. L. Galloway
R. L. Grunert
N. W. Hansen
W. R. Henning
P. Iijima
L. E. Juhlin
J. G. Lackey
M. C. Loveless
J. W. McGill
W. E. Morehart
C. G. Niemann
W. F. Patterson. Jr.
T. J. Pekarek
D. W. Platts
D. R. Purohit
J. R. Rossetti
H. J. Sim
S. D. Smith
R.W. Stoner
R. W. Thompson
G. H. Vaillancourt
F. N. Weffer
D. J. Woodcock

J. C. Arnold, Jr.
W. B. Binder, Jr.
M. Cambre, Jr.
V. Dahinden
D. J. Fallon
A. A. Ghafourian
M. E. Haas
K. S. Hanus
T. L. Holdway
V. C. Jhonsa
E. Kallaur
M. Y. Lau
R. I. Lowe
C. P. McShane
D. H. Mulkey
P. E. Orehek
J. M. Patton
D. Perco
B. Poulin
C. T. Raymond
V.S.N. Sankar
J. E. Smith
R. J. Stahara
J. C. Sullivan
T. P. Traub
R. A. Veitch
R. J. Whearty

MEMBERS ABSENT

D. J. Allan
S. Bennon
D. S. Brucker
J. C. Crouse
J. K. Easley
S. L. Foster
F. J. Gryszkiewicz
C. C. Honey
R. D. Jordan
E. Koenig
L. W. Long
W. A. Maguire
N. P. McQuin
M. I. Mitelman
H. A. Pearce
P. Riffon
G. W. Rowe
V. Shenoy
J. B. Templeton
W. E Wrenn
G. Andersen
E. A. Bertolini
T. F. Clark
J. N. Davis
J. A. Ebert
J. M. Frank
G. H. Hall
E. Howells
C. P. Kappeler
F. A. Lewis
L. A. Lowdermilk
K.T. Massouda
S. P. Mehta
W. H. Mutschler. Jr.
M. D. Perkins
S.M.A. Rizvi
M. P. Sampat
K. R. Skinger
V. Thenappan
J. Aubin
J. V. Bonucchi
0. R. Compton
R. C. Degenefl
K. D. Edwards
D. A. Gillies
K. R. Highton
G. W. Iliff
J. J. Kelly
H. F. Light
D. L. Lowe
A. D. McCain
C. K. Miller
E. T. Norton
V. Q. Pham
C. A. Robbins
L. J. Savio
L. R. Smith
D. W. Whitley
R. A. Bancroft
C. V. Brown
D. W. Crofts
T. Diamantis
J. A. Fleeman
R. S. Girgis
P. J. Hoefler
D. C. Johnson
W. N. Kennedy
S. R. Lindgren
J. Ma
C. J. McMillen
R. E. Minkwitz, Sr.
K. Papp
V. Raff
R. B. Robertson
D. N. Sharma
D. W. Sundin
C. W. Williams, Jr.

GUESTS PRESENT

D. AHO
D. C. Anderegg
D. E. Ballard
R. Begin
E. Brush, Jr.
C. A. Colopy
D. Dohnal
J. Foldi
E. GARCIA
J.D. HALFERTY
J. W. Harley
T. Huff
C. E. Kelly
S. Lee
R. MULLIKIN
G. Olafsson
J.L. Progar
J. C. Riboud
C.L. STIEGEMEIER
R. W. Simpson Jr.
R. D. Wakeam
R. C. Wicks
I. J. Addison
G. W. Anderson
M. F. Barnes
O. M. Bello
A. Cancino
E. Cromer
D. A. Duckett
G. E. Forrest
C. GAYTON
E.J. HANKER. JR.
R. H. Hartgrove
E. W. Hutter
L. A. Kirchner
J. E. Long
J. R. Moffat
T. V. Oommen
D. RISTUCCIA
D. J. Rolling
D. SULLIVAN
P. Singh
J.D. Watson
F. N. Young
P. Ahrens
S. Antosz
A. Bartek
T. E. Blackburn III
A. C. Chan
J. DOUMEN
K. P. Ellis
R. Fox
H. Gianakoyros
B.R. HUGHES
R. R. Hayes
E.T. JAUCH
B. F. Klaponski
D. MACMILLAN
A. Molden
G. Pregent
F. RUELLAND
M. SAMBA
T. SULLIVAN
A. Traut
K. Weidmann
P. Zhao
R. K. Ahuja
J. Antweiler
B. L. Beaster
D. T. Brender
J. M. Christini
R. M. Delvecchio
R. H. Fausch
J. D. Fyvie
J. P. Gibeault
A. C. Hall
A. F. Hueston
B. JENSEN
G.K. Krause
D.J. MALACHECK
R. C. Nordman
G. Preininger
G. J. Reitter
B. SPARLING
W. W. Schwartz
J. Tuohy
E. W. Werner

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IEEE PES TRANSFORMERS COMMITTEE MEETING
WEDNESDAY, OCTOBER 30, 1996

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 Tom Prevost, David Woodcock and their associates for the excellent meeting arrangements. The Committee thanked the Host Committee with a round of applause.

Tom reported on the attendance and other statistics (see Attachment 4).

Edgar Trummer provided an update on the Graz meeting to be held in July 1997. The details can be found in the Administrative Subcommittee Meeting minutes in Section 4.0. A survey sheet was circulated to obtain preliminary travel plan information from potential attendees for the Graz meeting.

Dieter Dohnal of Maschinenfabrik Reinhausen provided information about the invitation to their Regensburg, Germany tour. The details can be found in the Administrative Subcommittee Meeting minutes in Section 4.0.

Bipin Patel reported that at the last meeting in San Francisco three members/guests attended meetings but were not registered. He informed that the meeting expenses are covered by the registration dues. In fairness to all and to keep other attendees' registration cost to minimum all attendees are requested to register.

Mr. Binder highlighted the discussions held during the Administrative Subcommittee on October 28, 1996. See the Administrative Subcommittee Meeting Minutes in Section 4.0 for details.

1.1 Report on the Technical Council Meeting, July 30,1996 in Denver

Three major issues facing PES Technical Council this meeting were again the 1997 Summer meeting in Berlin, the open standards preparation and balloting process, and the revised presentation policy. In addition, the reorganization of the Power System Engineering Committee into four separate committees came to fruition at the Denver Summer Power Meeting. Denver meetings were full of talk about the World Wide Web. IEEE and PES are moving toward these phenomena as a communication tool. The Transformers Committee has a WWW page but we need a volunteer Webmaster to update it and keep it new.

1.1.1 Open Standards Preparation and Balloting Process for PES

Most of what follows was reported to you at the San Francisco meeting. It is worth repeating for emphasis. This procedure represents one of seven Technical Council goals for 1996. Because of the timing of our Transformers Committee meeting in April, the Committee has been the first to establish a schedule of open ballots for 1996. This has involved requesting an invitation to ballot

for standards that they expected to ballot in the next twelve months. One option would have been for each W.G. or SC Chair who planned to ballot during this time to submit the roster of their W.G. and SC members who should be sent an invitation. Another option that we elected to use was for the Standards Coordinator to forward the entire invitation list to IEEE Standards Department for initiation of the invitation to ballot. This process will repeat annually. Tom Traub will report further on progress on this project.

The other aspect of this policy is the invitation to participate. This will affect the way working groups are established. We have not defined a detailed implementation plan. However, the goal is for every standard project that starts after the 1996 Winter Power Meeting to incorporate the invitation to participate and the invitation to ballot. I therefore encourage you and all new Working Group Chairs to become familiar with the *Invitation to Participate* form in the new PES procedure.

1.1.2 Revised PES Paper Presentation Policy

This represents one step of the Technical Council goal for 1996 to establish a new presentation model by the Winter Meeting in 1997. It eliminates the requirement for "presentation before publication" and allows the technical sessions to be structured by the Technical Committees in the best way possible on subjects of current interest. The most direct impact on Transformer Committee members will be the possible continuous flow of papers for review. John Matthews will have more to report on this aspect of the General Meetings.

1.1.3 1997 Summer Power Meeting in Berlin

They plan a "Mini Trade Show" for the Berlin Summer Meeting. PES will enlist the aid of an ad agency to prepare a world class presentation. They plan a rehearsal for the Winter Meeting in New York. 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. We are still seeking volunteers to help with this project.

On Monday, July 21, four days of summer power meeting sessions will begin with a joint plenary. The plenary will be followed in the afternoon by two joint technical sessions which will compliment the plenary theme. Simultaneous translation of all three sessions offered that day will allow the audience to comprehend the presenters whether they speak in German or English.

On Tuesday, July 22, PES and ETG-VDE begin their separate technical sessions. Attendees of both meetings may attend technical sessions of either meeting. The technical sessions will be held in two Berlin hotels, the Hotel Inter-Continental and the Schweizerhof International.

The costs for attending the summer power meeting will depend on the length of your stay. The main reason we have scheduled our next meeting in Graz Wednesday through Friday is to encourage you to stay and take advantage of the reduced airfares resulting from a stay of seven days or more. Currently they estimate that my fare will be $1100 round trip from Pittsburgh. This is still less than the cost of traveling to two separate meetings months apart. Room rates range from 178 to 249 DM per night (US $119 to $166) depending on which hotel you choose. Food is expensive, so they have increased the registration fee to $395 to include a reception Sunday

evening and a dinner Monday evening. The social event Tuesday is a boat tour including dinner on board for $50.

1.2 Transformers Committee Report to Technical Council

I reported the following to Technical Council for the Committee:

1.2.1 Committee Meeting Activities

We held our Spring '96 meeting April 14-17, 1996 at the Ana Hotel in San Francisco, CA. Mr. Dan delaCruz of Pacific Gas & Electric was our host. A record 301 members and guests attended the meeting.

Four new members were added in San Francisco. With resignations, additions, and status changes, membership is currently 171, distributed among 74 producers, 57 users, and 40 general interest classifications. There are also 17 Emeritus members.

Future meetings:

Summer '97	7/15/97	Graz, Austria
Fall '97	11/16/97	St. Louis, MO
Spring '98	4/26/98	Little Rock, AR

We continue to seek a host for the Fall of 1998 and dates beyond.

1.2.2 Organization Changes

Thomas P. Traub is the new Standards Coordinator. Edgar (Red) Hager is the new West Coast Subcommittee Chair.

1.2.3 Technical Paper Activities

We received 10 summer Power Meeting papers from PES. We accepted 5 papers for presentation. We held one paper session at the Denver meeting to present these papers.

We reviewed and graded two papers for the International Conference on Harmonics and Power Quality. We accepted one paper for publication.

Our efforts to start the new PES presentation policy are facing some difficulty. The number of papers being received does not permit organization of a cohesive technical session on a subject of wide interest. We recognize that we will need some time to adjust potential authors' thinking to that of "invited papers" but given some time, it will produce positive results.

1.2.4 Panel Sessions for Berlin

We will repeat the panel session on Transnationalization of Standards presented to our membership in Boston. Panelists included Anne O'Neill and five Committee members who have been involved in IEC activities. The TA's for IEC TC 14 to USNC and the Canadian NC, TA for

IEC TC38, Chair of IEC TCl4, and two Working Group Chairs who have recently developed harmonized Transformer standards were on the panel.

1.3 Transformer Committee Goals

The Committee obligated itself to goals for 1996 and 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. To date, Anne O'Neill has undertaken most of this work. Additional work needs to be completed by November.

Secondly, meetings of the TC 14 TAG will be encouraged with the Transformers Committee meetings. Phil Hopkinson arranged a meeting of the TAG for the meeting in San Francisco. The TAG will meet again in Burlington.

1.3.2 Support the 1997 Summer Power Meeting

We should move ahead with plans for our panel session and welcome the participation of all members. We want to encourage all members and guests to join us in Graz and to arrange their stay to include a side trip to 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. This is another goal that needs some work.

2.0 Approval of Minutes of April 17, 1996 - W. B. Binder

The minutes of the San Francisco 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 1996 Summer Power Meeting in Denver, CO during July 29 - August 1, 1996.

3.1.1 Publications Committee

3.1.1.1 Paper Review Process

It was determined that technical papers should be sent to the technical paper coordinators on a monthly basis. Reviews must be completed within two months so that response to the author can be made within three months from receipt. Papers will be accepted for re-review one time only. Deadlines for submission of a paper requesting presentation at the Winter and Summer Power Meetings will be August 1 and January 1, respectively.

3.1.1.2 Presentation Policy

An author can request that a paper be presented at a particular meeting. In that case, a poster session will be made available. The committee can also ask the author to present the paper at a panel or symposium or at a technical committee meeting, but the author may decline. The author also may opt not to present the paper at all - i.e. only publication is desired.

If a paper is selected for presentation at a Summer or Winter Power Meeting or T&D Conference, preprints will be available for discussion purposes. If a paper is for publication only, preprints will be made available at the first Summer or Winter Power Meeting or T&D Conference which follows (within reason) acceptance of the paper. No written discussion procedure has been established for papers presented at a technical committee meeting.

3.1.1.3 Publication

At present, papers are still limited to six pages, with a charge of $110 per page for each page beyond six. Page allocations for the various committees will be set using the present practice.

3.1.1.4 Transformers Committee Special Publication

The Technical Council Chair, Mr. Don Volzka, has completed reviewing the appropriateness of PES performing the Survey of Generator Step-Up Transformer Failures and reviewing legal concerns with publishing this survey as a PES Special Publication. He has determined that it is appropriate and there should be no legal problems. He has informed us that it does require some editing to put it in camera ready form for printing.

3.1.2 Organization and Procedures Committee

3.1.2.1 New Technical Committee Formations

The Committee reviewed the division of the Power System Engineering Committee into four separate committees; Power System Planning and Implementation, Power System Dynamic Performance, Power Operations, and Power System Analysis, Computing an Economics Committees. The Committee agreed to recommend the formation of these Committees to the Technical Council.

3.1.2.2 Technical Committee Activity Reports

A proposal was made for each Technical Committee to furnish a status report on it's technical paper publications, panel session presentations, and standards activities every five years. This report would be reviewed by the O & P Committee to determine if reorganization of the Technical Committee is required. A draft of general requirements for this proposal will be presented at the next meeting.

3.1.2.3 Revision of the Technical Council Organization and Procedures Manual

The Committee is undertaking the revision of the Technical Council O & P Manual due to the major changes in balloting procedures. The Manual should be ready for Technical Council ballot at the next Council meeting.

Appropriate changes will be drafted for the Transformers Committee O & P Manual when the Technical Council Manual is approved. Administrative Subcommittee members should be preparing any other required changes for incorporation at that time.

3.1.2.4 Revision of the PES Directory

The Committee determined that the present handling of Directory revisions on paper is far too cumbersome and must be replace with electronic file transfers. This will be implemented with the revisions for the 1997 Directory.

3.1.3 Technical Sessions Improvement Committee

This Committee met in two sessions which were devoted entirely to reviewing proposed revisions of documents affected by revision of the paper presentation policy. These documents are: Publications Guide, Technical Sessions Guide for the Author, Technical Sessions Guide for the Session Chair, Guidelines for Slides, Overheads and Posters, Technical Paper Submission Cover Sheet, and Confirmation of Presentation Arrangements. These documents will now be prepared for publication.

3.2 Technical Paper Reviews

3.2.1 1996 International Conference on Harmonics & Quality of Power Papers

We received two papers for review for this Conference. Requests for reviews were sent out on May 21, 1996 for responses by June 14, 1996. We accepted one of the two papers for presentation.

3.2.2 1997 IEEE/PES Winter Power Meeting Papers

We received thirteen papers for review. One paper was returned for forwarding to the T&D Committee. Requests for reviews were sent out on September 6, 1996 for responses by October 2, 1996. We accepted eight of the remaining twelve papers for presentation at the Winter Power Meeting. These will be presented in poster session format.

3.3 1997 IEEE/PES Winter Power Meeting Panel Session

We will be sponsoring a panel session titled "Power Transformer Fault Diagnosis" which will be chaired by Frank Heinrichs. Frank will be presenting an update on the status of revisions to the C57.104 Gas Guide. Three other panelists will be presenting new developments in the analysis and interpretation of dissolved gases in oil.

3.4 Future Meeting Schedule:

July 15-18, 1997	Graz, Austria	Edgar Trummer
November 16-19, 1997	St. Louis, MO	Jerry Bishop
April 26-29, 1998	Little Rock, AR	Ed Smith

This schedule extends for two more years. Commitments from hosts are needed for meetings Fall, 1998 and beyond. The planning should be starting very soon. 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 7:15 p.m. on October 28, 1997, in the Willsboro Room of the Sheraton Burlington Conference Center Hotel.

The following members of the Subcommittee were present:

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

The following guests were present:

Tom Prevost	Burlington Meeting Host
Ed Smith	Little Rock Meeting Host
E. Trummer	Graz Meeting Host

4.2 Approval of the San Francisco Meeting Minutes

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

4.3 Additions to and/or Approval of the Agenda

The previously communicated agenda was followed.

4.4 Committee Finances and Meeting Arrangements

4.4.1 Finances

Tom Prevost indicated that this meeting is expected to report an excess of funds over $2000 after all expenses paid.

4.4.2 Meeting Arrangements

The Burlington meeting host, Tom Prevost, reported the following registration statistics:

Members and guests		287
Companions		67
Companions Tours -	Monday	68
	Tuesday	57
Tuesday Luncheon		148
Tuesday Outing		211

E. Trummer, host for the Graz meeting, provided some details for the meeting. Two hotels, the Das Weitzer and the Grand Hotel, have been contracted for the meeting. The hotels are a short distance apart (50 M) and the plan is to have meeting rooms in both hotels. The room rates will be $120 per night at the Hotel Weitzer (four star hotel) and $150 per night at the Grand Hotel Wiesler (five star hotel) for 14th through 19th of July. The rates are for single or double occupancy and includes applicable taxes. Rates for additional occupants are not known at this time. He is still investigating better air fares with airlines. To help get a better handle on negotiating reduced rates for airlines he plans to make a survey at the main committee meeting on Wednesday for preliminary indication of who will flying to what destinations for the meeting(s). He mentioned that hotel brochures, air fare information and brochures on the hotels including a hotel registration form are available on a table near the registration desk. He has also posted a listing of those who indicated plans of attending the meeting (175 signed up with 121 companions) at the meeting in San Francisco. A TV/video display is also available by the table for viewing about the trip. He advised that those who are planning to attend the meeting should make their hotel reservations as soon as possible using the hotel registration form, no later than March of 1997. The Graz meeting will be held during July 15-18.

On the subject of the Graz meeting, Reinhausen has made an offer to provide hotel accommodations, meals, and ground transportation from Regensburg to Graz to conduct a tour of their facility while the Transformers Committee is in Europe. The general arrangement communicated is that the tour will be conducted on Monday before the Transformers Committee meeting and Reinhausen will provide transportation to Graz that night. There will be day time activities arranged for companions.

Ed Smith, host for the Little Rock meeting, briefly reviewed his plans for the meeting. The meeting will be held at the Excelsior hotel on April 26-29, 1998. The room rates are expected to be $78 (single) and $88 (double) per night. Most of the meeting related arrangements have been made. He indicated on behalf of Jerry Bishop, host for the St. Louis meeting to be held on November 16-19,1997, that most of the arrangements for this meeting have been also done. Wally mentioned that Jerry had made a proposal to move the St. Louis meeting a week earlier due to a possible hotel conflict but later learned that the conflict went away.

On the subject of the future meeting and meeting host Wally asked for comments on pursuing a possibility of having a meeting in New Orleans during the 1999 April T & D Conference (dates unknown). This will help eliminate a trip for some and may offer opportunity for some other to attend the Conference at the same time. Also, the Conference might be able to do the host's duties (meeting room arrangements, registration, etc.). The consensus was for him to pursue the idea. GE-Prolec was also mentioned as having shown interest in hosting a meeting in Mexico. John will make contacts at GE-Prolec and report the findings at next meeting.

4.5 Chair's Report - W. B. Binder

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

Wally acknowledged the Executive meeting that was held yesterday in the Kingsland room. The meeting was a prediscussion of some of the topics discussed at the meeting in effort to regroup the officers' thoughts on key topics and gain efficiency in the Monday meeting time.

The new balloting procedure and a need for having a balloting pool formulated prior to actual balloting was briefly discussed. It was mentioned that it may take up to three months or more for IEEE to form a balloting pool so working groups need to plan their balloting accordingly. Which list IEEE is using to send out invitation for balloting pool is still a mystery. No IEEE representative was present at the meeting for clarification or further discussion.

Wally discussed the pending interpretation requests. By voice vote, interpretations in C57.13 on CT secondary winding impulsing and k factor classification were approved. The interpretations were previously circulated for review. An interpretation draft on amorphous metal cored transformer no-load loss testing was prepared and reviewed in the working group on loss tolerance and measurements. This draft was reviewed at the meeting and was approved with a few editorial comments.

Several members raised questions about the 30 day limit posted in the O & P Manual. 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.

The vice-chair will discuss this 30 day limit issue at next O & P Committee meeting for further review.

4.6 Standards Subcommittee - T.P. Traub

4.6.1 Standards and Coordination Activities

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

The following is a highlight of the discussions during his presentation:

a. An approximately 400 name listing (mainly invitation list of the committee) was sent to IEEE for balloting pool earlier this year.

b. Wants the subcommittee chairs to review their balloting needs in next twelve months. He will include in his report a list he has of standards expected for balloting in next twelve months.

c. After lengthy discussion it was agreed by the AdSubCom not to form a WG under the Standards SC to promote harmonization with IEC Standards at this time.

d. The term "ballot" is only applicable to the balloting in an IEEE balloting pool (an equivalent of what used to be main committee ballot). These ballots should be referred to as "sponsor ballots". All other ballots during the development of draft standards are informal and can be referred to as "SC ballots" or "WG ballots". He further advised that only negative ballots of technical matter will require recirculation and will be referred back to the working group for resolution.

e. Subcommittee chairs were requested to review their respective standards listing in his report and provide him updates and corrections.

4.6.2 Documents Submitted to the Standards Board

Ten PARs were submitted for approval; nine were approved and one was not approved. Five standards were submitted for approval or reaffirmation; all were approved. See the complete report for details.

4.6.3 Standards Subcommittee

None to report at this time.

4.7 Status of IEEE Standards - L. Napoli

Luigi was not present and no report was made.

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

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

Document	Title	Ballot Date	Source	Action
C57.130/d10	Guide for the Use of Dissolved Gas Analysis During Factory Thermal Tests for the Evaluation of Oil Immersed Transformers and Reactors	5/2/96	IEEE	Disapp.
C57.124 (Reaffirm)	IEEE Recommended Practice for the Detection of Partial Discharge and Measurement of Apparent Charge in Dry Type Transformers	8/2/96	IEEE	App.
C57.12.58 (Reaffirm)	IEEE Guide for Conducting a Transient Voltage Analysis of a Dry Type Transformer	8/2/96	IEEE	App.
C57.12.35	Bar Coding for Distribution Transformers	8/27/96	IEEE	App.
C57.16/d2	Std. Requirements, Terminology and Test Code for Dry-type Air-core Series Connected Reactors	9/24/96	IEEE	App.
C57.12.20	Std. for Overhead Type Distribution Transformers, 500 KVA and Smaller; High Voltage, 34500 Volts and Below; Low Voltage, 7970/13800Y Volts and Below	10/25/96	NEMA	App.

In addition, the C57 NEMA Secretariat issued a ballot to determine whether or not C57.12.13 (Conformance Requirements for Liquid-Filled Transformers Used in Unit Installations, Including Unit Substations) served any useful purpose deserving of retention or revision. This was not treated as a delegation ballot but rather as a survey of individual C57 members.

4.9 Subcommittee Activities - Subcommittee Chairs

4.9.1 Audible Sound and Vibration - Jeewan Puri

Reported that the PAR on C57.112 was misplaced and a new PAR has been issued.

4.9.2 Bushings - F. E. Elliott

C57.19.01 will be balloted for reaffirmation. Simultaneously the document is being revised. A revised draft is being surveyed in the subcommittee. An affirmation ballot of C57.19.00-1991 has been requested. Status is unknown. C57.19.03 approved by Standards Board on 20 June, 1996.

4.9.3 Dielectric Tests - L. B. Wagenaar

Ed Howells has retired and Jack Harley will replace him as chair of the working group on partial discharge detection. He reported that C57.127 document was lost by RevCom three years ago and was not reconstructed. A new PAR and balloting will be required to reestablish it.

4.9.4 Distribution Transformers - K. S. Hanus

No report.

4.9.5 Dry Type Transformers - W. Patterson

Expects balloting of C57.12.60 and C57.12.01 in next six months.

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

Bill was not present. No report was presented.

4.9.7 Instrument Transformers - J. E. Smith

Expects reaffirmation balloting of C57.13.2 within next twelve months. He reported that C57.13.1 and C57.13.3 belong to Power system Relaying Committee.

4.9.8 Insulating Fluids - F. J. Gryszkiewicz.

Frank was not present. No report was made.

4.9.9 Insulation Life - L. W. Pierce

No report was made.

4.9.10 Performance Characteristics - H. J. Sim

Ramsis Girgis will replace Bill Henning as new chair of the working group on loss tolerance and measurements. Bill will chair the new working group on LTC Performance requirements. He also reported that Bob Degeneff will head a new project on switching transients induced by circuit breaker/transformer interaction. Jeewan will be Secretary for this project.

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

Edward Bertolini resigned from the Subcommittee and from the chairmanship of the Working Group for Secondary Network Transformers. R. Leon Plaster of ABB Power T&D Company will replace him as the new Chairman of the Working Group.

ANSI C57.12.40 was published in January, 1996 by NEMA after being approved by the IEEE Standards Board in December 1994. The document has many errors and after some discussions with the NEMA secretariat it was agreed that all corrections will be made, the Working Group Chairman will approve the final galley proof and NEMA will republish the standard. The Standard is still not published due to some miscommunications at NEMA. The NEMA Secretariat assured us that they would do everything possible to publish it this year.

4.9.12 West Coast - E.G. Hager

Informed that West Coast Subcommittee and West Coast Substation Subcommittee will be meeting next Wednesday/Thursday (November 6 & 7) at Nevada Power in Las Vegas, NV. A working group of the Substation Subcommittee will be meeting earlier in the week on Monday/Tuesday and work on IEEE Guide 693 - Substation Guide, a seismic design of substation.

4.10 Awards Subcommittee - J. H. Harlow

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

4.10.1 Committee Service Awards

Jim announced that Certificates of Appreciation have been prepared for thirteen members. See Jim's report for details.

The 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

No activity reported at this meeting.

4.12 Secretary's Report - B. K. Patel

4.12.1 Membership Review

Voting Members - Bill McNutt resigned since the last meeting. Chuck McMillen and Ed Howells changed their status from Voting Member to Emeritus Member. Four new members were added at the last meeting in San Francisco as noted in the meeting minutes.

Following these changes and the addition of six new members at this meeting as noted below, membership stands at:

Voting Members -	172	
Emeritus Members -	19	
Voting Classifications:	Producers -	78
	Users -	57
	General Interest -	37

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 Spring 1994 and have poor ballot return record for last two years will be contacted to determine their interest in maintaining membership.

4.12.2 New Member Applications

Six new membership applications were received from the following persons for review at this meeting and all were accepted.

Applicant	Company	Voting Classification	Sponsor
Lars-Erik Juhlin	ABB T & D Company	Producer	Puri
Evertt G. Hager	Smit Transformers Inc.	Producer	Self
Timothy L. Holdway	Federal Pacific Transformer	Producer	Patterson
Thomas A. Prevost	EHV Weidmann	Producer	Sim
Dilip R. Purohit	Square D Co	Producer	Puri
David J. Woodcock	Weidmann Technical Services	Producer	Sim

4.12.3 PES Directory Rosters

Updated Transformers Committee roster has been submitted to Harry Jones, Secretary of TC, for 1997 IEEE Directory publication later this year. Subcommittee Chairs will be given a diskette of this update at the next meeting to update their respective listings. To minimize editorial and typing time the Chairs are requested to provide the future update to Secretary in the same format and details.

4.12.4 Meeting Minutes

Minutes of the San Francisco meeting were reproduced at no cost, compliments of Ken Hanus and TU Electric. Postage costs were $ 1300.85 for 370 mailings, which averages $ 3.52 per mailing. The total income from the 301 registrants was $3010. 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 within 45 days of the meeting (by December 15,1996 for this meeting). Note that subcommittee minutes must be received by this date to be included in the Committee 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. I do not need a copy of attendance listing.

4.13 Old Business

None was presented for discussion.

4.14 New Business

No major discussion.

4.15 Adjournment

Wally adjourned the meeting at 10:45 p.m.

Respectfully submitted,

B.K. Patel, Secretary

5.0 Transformers Standards - T. P. Traub

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 ar being listed under the Standards Subcommittee because they have not yet been found a hon: in the other Subcommittees. Some standards are listed more than once; this occurs when more han 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 is sorted by Subcommittee names, and each section accompanies the corresponding Subcommittee report.

5.2 Documents Submitted to the Standards Board

NESCOM (PARs)

6/20/96

PC 57.135	PAR approved with deletion of "and maintain" from scope and with IA/PSP and IEC TC14 USNC added for coordination.
PC57.19.03	Revised PAR approved.
PC 57.12.24	PAR approved with IEC TC14 USNC added for coordination.
PC57.19.00	PAR approved with IEC SC36A USNC and IA/PSE added for coordination.
PC57.19.01	PAR approved with IEC SC36A USNC and IA/PSE added for coordination.
PC57.113	PAR approved with IEC TC14 USNC and IA/PSE added for coordination.

9/19/96

PC 57.13.5	PAR approved with IEC TC38 US TAG added for coordination.
PC 57.13.6	PAR disapproved, need to address issues in letter of 6/20.
PC57.110	PAR approved with IA/PSE added for coordination.
PC57.138	PAR approved with IA/PSE added for coordination.

REVCOM (Standards)

6/20/96

PC57.12.35 Approved.
PC57.19.03 Approved.
PC57.12.20 Approved.

9/19/96

C57.12.58 Reaffirmed
C57.124 Reaffirmed

5.3 Standards Due for Reaffirmation, Revision or Withdrawal Before December 1996

C57.12.01, C57.12.59, C57.13.2, C57.19.00, C57.95, C57.96, C57.104,

C57.106, C57.113, C57.120, C57.121, C57.125.

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

C57.19.01

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
P1350 Request PAR withdrawal, work to continue in SPD

5.5.2 Distribution Transformers Subcommittee

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 June 1997
P1277 Extended to June 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 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 Next Standards Board Meetings and Submittal Deadlines

Meeting date	Deadline for PAR(1)	Deadline for STD (2)
December 10,1996	September 1, 1996	November 1, 1996
March 20, 1997	December 7, 1996	February 7, 1997
June 26, 1997	March 16, 1997	May 16, 1997
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.

5.7 PES Standards Coordinating Committee Meeting

The Standards Coordinating Committee met on Monday July 29, 1996 in Denver. Following are excerpts from the draft (unapproved) minutes of that meeting:

C. Lennon has resigned as Chair of the Committee and has been replaced by Bal Gupta from Ontario Hydro.

Harry Jones reported that the PES now has a home page on the Internet. The address is: http://www.ieee.org/power/power.htm.

Luigi Napoli provided a status report regarding the five steps of the open balloting process as follows:

1. Each Committee has to establish a balloting pool. The two Committees that have initiated this process used all the members of all Working Groups, Subcommittees, and main Committee.
2. Each Committee should identify the standard projects which are likely to be coming up for ballot in the next 10 to 12 months.
3. The IEEE will send an invitation to ballot to each of the voting pool members along with the projects to be voted on in the next 10 to 12 months.
4. The balloting pool members are to respond back to IEEE and identify the projects that would interest them.
5. The IEEE will then identify for each project a list of individuals that had expressed interest. This list would then form the voting group for the project.

The current status is that two Committees (T&D and Transformers) have initiated this open ballot process and two others are in the process of establishing a voting pool (Switchgear and Substation). The Transformers Committee submitted 25 projects and 400 names. Each Committee is requested to initiate this process as soon as practical.

Anne O'Neill provided a report on international standards. Anne reported that there was a proposal to restructure the Standards Board in order to increase interfunctional participation and input. No decisions have been made as yet regarding this proposal.

Anne identified that there was an "International Joint Standard Activities Tracker" which listed all of the standards that have been offered to the IEC. Anne reported that the process to get an IEEE standard to the IEC was to contact an IEC Technical Committee member, who has the same interest/subject/work scope as ours. Then to utilize that contact for offering the IEEE standard to IEC. Attached is a listing of IEC contacts by Technical Committee, a form for International Submissions Database, and a sample of the International Submissions Tracker.

The requirement for the number of copies of a standard to be included in a submittal to the Standards Board has been reduced from 30 to 20 copies.

Bal Gupta lead a discussion on the Standard Appeal Process (Section 5.8 of the Standards Operation Manual). After the discussion a motion was made to accept the process as written. The motion was seconded and carried by the membership.

Bal Gupta also lead a discussion on the Interpretation Process (Section 5.9 of the Standards Operation Manual). After the discussion a motion was made to accept the process as written. The motion was seconded and carried by the membership.

It was identified that the list of ANSI members was never sent to the Standards Board by the PES Technical Council. The motion was made by John Posey that the Standard Coordinating Committee Secretary be authorized to submit the list of ANSI members to the Standards Board upon receipt. Also, the Secretary was to send a composite list to the Standards Board and copy the Technical Council. This motion was seconded and carried by the membership.

The Switchgear Committee representative raised a concern that two of their standards titles were changed by the Standards Board after they were submitted. A general discussion was held on this item with John Posey providing the general guidelines which NESCOM uses (insures that the title is identical to the title on the par). The discussion on this item concluded with John Posey to investigate this issue and in particular why the two Switchgear Committee standards titles were changed.

The next meeting will be held at the 1996 WPM in New York.

The meeting adjourned at 2:55 p.m.

5.8 Standards Subcommittee Meeting

The Standards Subcommittee met on Tuesday, October 29 at 8:00 A.M. with 16 members and 3 guests present for total attendance of 19. The minutes of the San Francisco Meeting were approved as written.

Next, the Chairman of the Standards Subcommittee Tom Traub reported on the Administrative Committee Meeting held the previous day. Jin Sim the Chairman of the Performance Characteristics Subcommittee reported changes of chairmanship for four working groups. The new Chair for the PCS Working Group on Revision of C57.12.90 will now be Pierre Feghali.

The next item on the agenda was presentation of the working groups reports.

The first report was presented by Steve Smith the Chair of the Working Group on Continuous Revision of C57.12.90. He announced that following the Spring Meeting in San Francisco, all comments, corrections, and additions to C57.12.90-1996 were incorporated into Draft 2. In last August, this draft was sent to Rochelle Stern, Project Editor at the IEEE Standards Department for editorial review. All her editorial comments, as well as comments received from other reviewers, have been incorporated into Draft 3 which is now ready for formal ballot.

Steve gave a list of the revisions that are included in the new draft. This list and a table of the active and pending revisions to C57.12.90 including technical responsibility by clause are appended to this report.

At the end of the presentation of his report, Steve suggested that it may be desirable to wait to ballot both C57.12.00 and C57.12.90 together as this would make easier coordination between both documents. Discussion on this was delayed until after presentation of the next report.

Next Subhash Tuli the Chair of the Working Group on Continuous Revision of C57.12.00, gave a brief report on the progress of his current draft. He announced that the draft should be ready for formal ballot within a month or so. He added that it may be desirable to postpone the ballot until January to also include the change in the loss tolerance table that is currently being balloted in the Performance Characteristics Subcommittee. This would delay submittal of the document to the

Standards Board at least until their June Meeting. A discussion was then started about waiting to ballot C57.12.00 and C57.12.90 together in January. At the end a vote was taken on balloting C57.12.90 as soon as possible or to wait until January. Six were in favor of balloting now and four voted to wait until January. The final decision was to ballot C57.12.90 as soon as possible and to ballot C57.12.00 in January.

The next report was the report of the Working Group on Terminology, Definitions, Units, and Terminal Markings. Tom Traub who currently also chairs this working group reported that he had distributed modified drafts of both C57.12.70 and C57.12.80 to a limited number of people on the Transformers Committee, including the Chairs of all the technical subcommittees and he had gotten back a limited number of comments. He suggested that probably the best way to get additional comments, and to hasten the publication of the two standards, would be to submit both drafts to a formal sponsor ballot. All comments then received would be discussed and when consensus would be achieved, they would be incorporated into the documents that would then go through a recirculation ballot. This was voted on as a motion. Eleven were in favor and one was opposed. The motion was therefore carried and the chairman will arrange ballot of both documents as soon as possible.

The next item on the agenda was the need for the formation of a new working group to promote harmonization of IEEE and IEC standards. The chairman of the Standards Subcommittee announced that this matter had been discussed at the Administrative Subcommittee last night and the final decision was not to form a working group on this as the purpose of this working group was somewhat indeterminate. Jin Sim announced that work to compare IEEE and IEC standards will continue in the Technical Advisory Group headed by Phil Hopkinson. He also remarked that a formal channel to report the results to the Transformers Committee is needed.

Under new business, John Rossetti handed down a correspondence received from Rochelle Stern, Project Editor in the IEEE Standards Department following her review of Draft 5 of C57.138. She had made the following comments:

1. Digitized graphics should be translated into TIFF or PICT format for document submittal to the Standards Board.

2. The copyright date on the title page and subsequent pages should be the current year 1996.

3. The project number and the draft number must appear on every page.

Next the chairman reported that since the San Francisco Meeting, nine PARs and five standards had been approved by the Standards Board, and one PAR was rejected because the working group chair was not a member of IEEE. He has been informed by IEEE that another common reason for PAR rejection by NESCOM is poorly worded scope and purpose. He recommended to read the instructions in the Standards Companion and in the PAR Submittal Guide before completing the PAR form.

Then the chairman reported that he had submitted a list of 400 names as a balloting pool for 25 documents to be balloted within the next year. He had received the list of members of the first balloting group formed by IEEE to ballot C57.19.01, it included 89 people. The chairman was asked to check this list for balance and found out that it contained over 50 % producers. Because some of the names in the list were categorized incorrectly (producer Vs user or general interest),

he made the necessary corrections and achieved the proper balance. It was also reported that a new form dated 10 /96, is now available for standards submittal. Also REVCOM now requires only 20 copies of the draft standard as compared to 30.

Next discussed were the goals that had been developed by Ann O'Neill and given to each standards coordinator for harmonization with IEC. Two standards in the Transformers Committee are actually good candidates for incorporation into IEC standards. These are the standard on voltage regulating transformers, and the load tap changer standard.

The meeting was adjourned at 9:10 A.M.

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

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

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION		PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
SUBCOMMITTE	STANDARDS					
CHAIR:	T. P. TRAUB					
PHONE:	(312)394-2704					
C57.12.00	GENERAL REQUIREMENTS FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS	TULI S. (414)547-0121	T&D	SUBS	6/16/93	FORMING BALOTTING GROUP
VARIOUS			PSRC	IAS	6/15/95	EDITING REVISION
			SWG	IEC-TC14	1998	
C57.12.00	TABLE 5 - CORRECTION OF TYPO. ERRORS	TULI S. (414)547-0121				CORRECTIONS BEING DONE
PC57.12.00						
C57.12.10	TRANSFORMERS 230kV AND BELOW - 8333/10417kVA 1 PH, -100000 kVA 3 PH w/o LTC, - 100000kVA w/ LTC - SAFETY REQUIREMENTS	(312)394-2704			6/4/87	ANSI STANDARD
ANSI					1993	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	ASSIGN TO SUBCOMMITTEE
ANSI					1987	NEMA STANDARD
C57.12.53	REQUIREMENTS FOR DRY-TYPE, UNDERGROUND, SINGLE-PHASE WITH SEPARABLE INSULATED H-V 24940 grdY/14400 V AND <; LV 240/120 V					ONLY TITLE EXIST (NO PAR)
ANSI					0	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					ONLY TITLE EXISTS
ANSI					0	IS IT REQUIRED?
C57.12.70	TERMINAL MARKINGS AND CONNECTIONS FOR DIST. & POWER TRANSFORMERS	TRAUB T. P. (312)394-2704	T&D		6/18/92	REVISING TERMINOLOGY
NONE			SUBS		6/14/95	REVISE OR REAF. BEFORE 12/97
			ICC		1997	
C57.12.80	TERMINOLOGY FOR POWER & DISTRIBUTION TRANSFORMERS	TRAUB T. P. (312)394-2704	T&D		5/1/92	WILL START REVISION
NONE			SUBS		6/14/95	PAR APPROVED 06/14/95
					1997	

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION		PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
C57.12.90	STANDARD TEST CODE FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS & GUIDE FOR SC TESTING OF	SMITH S. D. (606)879-2757	T&D	IECTC14	3/16/93	MAKING RUNNING CHANGE LIST
VARIOUS			PSRC	USTAG	6/15/95	WG COLLECTING CHANGES
			SWG		1998	
C57.17	REQUIREMENTS FOR ARC FURNACE TRANSFORMERS					LAST REVISED IN 1986
ANSI					1986	ANSI DOCUMENT
SUBCOMMITTE	**UG TR & NETWORK PROTECTORS**					
CHAIR:	**P. E. OREHEK**					
PHONE:	**(201)430-7743**					
C57.12.24	UNDERGROUND-TYPE 3-PHASE DISTRIBUTION TRANSFORMERS,2500kVA AND SMALLER: HV,34500GrdY..& BELOW,LV,480 V AND BELOW	NIEMANN C. (708)410-5307	T&D	IAS/PSEC	5/10/88	PAR APPROVED 6/20/96
PC57.12.24			IC	IEC TC 14	6/20/96	
			IAS/REPC		1993	
C57.12.40	REQUIREMENTS FOR SECONDARY NETWORK TRANSFORMERS, SUBWAY & VAULT TYPES (LIQUID IMMERSED)	BERTOLINI E. A. (212)460-4913	SCC14		3/19/92	ANSI APPROVED 02/28/94
PC57.12.40					12/5/91	PUBLISHED JAN 1996
					1997	
C57.12.44	STANDARD REQUIREMENTS FOR SECONDARY NETWORK PROTECTORS	MULKEY D. H. (415)973-4699	T&D	IAS/PSEC	12/20/94	PUBLISHED DEC 94
PC57.12.44			SWGR	EEI	9/21/95	PAR APPROVED 09/21/95
			IAS/REPC	NEMA	1999	
C57.12.57	REQUIREMENTS FOR VENTILATED DRY-TYPE NETWORK TRANSFORMERS 2500kVA AND BELOW, W/HV 34500V AND BELOW,LV 216Y..AND	NUTT B. (214)698-7447	T&D		3/18/92	
PC57.12.57			EEI/T&D		12/5/91	APPLY FOR NEW PAR
			SCC14		1997	

6.0 Recognition and Awards - J. H. Harlow

6.1 Certificates of Appreciation

Transformers Committee Certificates of Appreciation will be presented to the following persons at the Transformers Committee meeting, October 30, 1996:

Name	Service Rendered
Georges H. Vaillancourt	Chair, Standards Subcommittee
Robert C. Degeneff	Chair, TF on Metal Oxide Surge Arrester Coordination with Power Transformer Insulation
John D. Borst	Chair, WG on Continuous Revision of C57.12.00 General Requirements for Liquid-Immersed Distribution, Power and Regulating Transformers
Peter E Krause	Chair, WG on Continuous Revision of C57.12.90 Test Code for Liquid-Immersed Distribution, Power and Regulating Transformers
Olof Heyman	Chair, WG on C57.19.03 Requirements, Terminology and Test Code for Bushings for DC Applications
David A. Barnard	Chair, WG on C57.12.91 Test Code for Dry-Type Distribution and Power Transformers
Ronald D. Jordan	Cochair, WG on C57.12.35 Bar Coding for Distribution Transformers
J. Edward Smith	Cochair, WG on C57.12.35 Bar Coding for Distribution Transformers
Donald A Gillies	Chair, WG on C57.93 Installation of Liquid-Immersed Power Transformers
E. A. Bertolini	Chair, WG on C57.12.40 Secondary Network Transformers, Subway and Vault Types
Carl G. Niemann	Chair, WG on C57.12.24 Underground-Type Three-Phase Distribution Transformers
Leo J. Savio	Chair, IEEE Delegation to C57
Linden W. Pierce	Chair, WG on C57.91 Guide for Loading Mineral Oil Immersed Transformers

These persons are congratulated for their contributions and leadership.

6.2 Technical Council Awards

The following persons will be nominated for the Technical Council awards indicated:

1) Prize Paper Award: Investigations of an EHV Autotransformer Tested with Open and Arrester Terminated Terminals. W. P Seitlinger, H. Foschum, L. B. Wagenaar and J. A. Fleeman.

2) Distinguished Service Award: William J. McNutt.

3) Working Group Recognition Award: Working Group on C57.12.44 Standard Requirements for Secondary Network Protectors. Chair: R. B. Robertson, Secretary: D. H. Mulkey, Members: T. R. Balgie, E. A. Bertolini, R. L. Bliss, R. Crowell, R. W. Fisher, R. D. Graham, J. W. Howard, M. C. Mingoia, J. R. Moffat, C. G. Niemann, B. Nutt, P. E. Orehek, R. L. Plaster, P. G. Risse, A. L. Robinson

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. Some are summary reports of the Subcommittee activities during the previous week.

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

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

7.1 Audible Sound and Vibration - J. Puri, Chair

The Subcommittee met on Tuesday, April 16 at 2:00 PM. Eleven members and twelve guests were present.

After the introduction of guests and members, the minutes of our previous meeting at San Francisco were approved.

The following items were discussed:

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

This WG has now finalized Draft #4 of the Siting Guide which will now be circulated within the Subcommittee for approval and comments.

It was proposed that a Far Field noise level calculation procedure should be added to this document. A seminar will be arranged on this subject by Mr. Greg Anderson of Black and Veach in our next meeting at St. Louis. This information will be added to the Siting Guide before its final balloting.

7.1.2 Chairman's Report - Participation in IEC TC 14 Activities - WG 24

IEC 551 standard on the determination of noise levels in transformers and shunt reactors in presently being revised by WG 24. The chairman will be writing the noise pressure and noise intensity measurement sections for this document before the WG meeting in January next year. This information will also be proposed for inclusion in C57.12.90 and 91 for harmonizing these standards with the IEC 551.

7.1.3 Noise Intensity Measurements

The chairman reported on the comparison of noise intensity and noise pressure measurements published in a CIGRE paper. From this information it appears possible to derive a standard noise intensity levels from NEMA TR 1 Table for noise pressure measurements.

The chairman and Dr. Bob Degeneff will prepare a table for standard noise intensity levels for transformers. This table will be proposed to NEMA for their approval.

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

Jeewan Puri, Chairman

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

10-Jan-97

STANDARD / PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE / PAR DATE / REV DUE	STATUS AND COMMENTS
SUBCOMMITTE	**AUDIBLE SOUND & VIBRATION**				
CHAIR:	**J. PURI**				
PHONE:	**(704)282-7413**				
C57.12.00	AUDIBLE SOUND LEVEL REQUIREMENTS	PURI J.			UNDER DEVELOPMENT
PC57.12.00		(704)282-7413			
C57.12.90	CLAUSE 13 - ADD TEST PROCEDURE FOR MEASURING SOUND INTENSITY	GIRGIS R.			D1 BEING PREPARED
PC57.12.90x		(317)286-9532			COORDINATE WITH STEVE SMITH
C57.136	GUIDE FOR SOUND LEVEL ABATEMENT AND DETERMINATION IN OIL-FILLED TRANSFORMERS	McGILL J.			DRAFT 1 PRODUCED
PC57.136		(414)475-3422		3/21/96	PAR APPROVED 03/21/96

7.2 Bushings - F. E. Elliott

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 20 members and 9 guests. One guest requested membership on the Subcommittee. See Attachment - 1

7.2.2 Chairman's Remarks

Mr. Elliott, after attending the Administrative Subcommittee meeting reported that the Forms for Hotel Reservation for the Graz meeting should be completed ASAP and sent to the hotel.

7.2.3 Approval of Minutes of The Last Meeting Held in San Francisco, CA

The minutes were approved as written.

7.2.4 Working Group / Task Force Reports

7.2.4.1 Working Group Report on Bushing Application Guide(PC57.19.100)

The work in this WG has been completed. The Bushing Application Guide C57.19.100 has been issued.

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

Chairman P. Singh reported that his WG met on October 28, 1996 with 22 members and 6 guests present. He reported on the following:

a) **Approval of April 15, 1996**

The minutes were approved as written.

b) **Approval PAR C57.19.01**

The IEEE Standards Board has approved the PAR

c) **Bushing Subcommittee Draft 3 Ballot Results**

The results of Bushing Subcommittee Ballot were as follows:

Sent	Returned	Affirmative	Negative	Abstain
41	37	30	7	0
	90%	81%	19%	0%

d) Discussions on Bushing Subcommittee Ballot Comments on Draft 3

The WG members discussed the comments and agreed to the following changes.

1. Scope

The paragraph on scope will be modified to indicate that the utilities purchasing replacement bushings for oil circuit breakers should refer to C57.19.01-1991 as the proposed standard does not cover these bushings.

2. Editorial Comments

Several editorial Comments were received. These will be incorporated in the next Draft

3. Table 1

Note 1 will be modified to add the wording " for the corresponding BIL"

after the word "withstand voltage"

The creep distance values will rounded off to the nearest 5 mm

4. Table 2

The heading for column 5 will be modified to change "gasket surface" to "flange mounting surface"

P. Singh/ABB will check the acceptability of the following top terminal threaded stud diameters.

Current (Amps)	1200	2000	3000	5000
Top Terminal Threaded Stud Dia. (Inch)	1.5	1.5	2	4

If yes then these dimensions will be included in the next draft

Figure 1 will be modified to remove the letter "T"

Figure 4 will be modified to change the distance of hole centerline to the end of the blade from 1.125 to 0.625

5. Table 3

This table will be split into two for ease of readability

The heading for column 5 will be modified to change "gasket surface" to "flange mounting surface"

The 230 kV rating dimensions will be changed back to the existing C57.19.01 - 1991 Standard dimensions with the exception of the following:

L Dimension = 50.25

CT length = 23

3000 Amps rating for 765 kV will be eliminated

Detail B for flange will be changed so that it is consistent with Table 2 configuration.

A note (Similar to Table 2) will be added indicate the relative location of the gage, test tap, and the flange mounting holes.

6. Table 4

The middle column "Type" will be deleted

7. Table 5

The column for General purpose bushings will be eliminated

The title will be changed to indicate "Picocoulombs or Microvolts"

8. Table 6

The bushing manufacturers will check to see whether the acceptable power factor change requirement for oil impregnated bushings can be changed from "+.02/-.06" to "+/- .02"

9. Appendix

An Appendix will be added to show the dimensions of the ratings not included in the proposed standard

10. Drawlead location and drawlead stud/connector Standardization

The bushing manufacturers will check and give their feedback to P. Singh on the following for bushings 138 kV and above.

- Distance of the drawlead stud/cable connector joint from the flange mounting surface
- Drawlead stud/cable connector dimensions as per the proposed CSA Standard C88.1-1996

11. Voltage Classes.

Some comments were received as to why some voltage classes (15 kV, 25 kV, 115 kV etc.) were not included in the proposed draft. This was discussed by the WG members in the initial meetings and again in this meeting and it was decided to maintain the ratings included in the proposed draft. It was however mentioned by the bushing manufacturers

that all such ratings would be available when needed for replacement purposes. Information on these ratings would be included in the Appendix.

12. Next Step

The WG members decided to prepare Draft 4 based on the above changes and send it to IEEE Standards Department for balloting within the Transformer Balloting Group.

e) New Business

No new business was discussed

f) Adjournment

After four sessions, the meeting was adjourned at 4:10 PM

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

The work in this WG is complete. The IEEE Standards Board approved the standard in June of 1996.

7.2.4.4 Task Force on Draw Lead Bushings

Chairman Russ Nordman reported that his TF meeting was held at 4:15 PM on October 28, 1996 with 14 members and 3 guests present. Two of the guests requested membership to the TF. He reported the following:

a) Minutes from previous meeting

These were approved as written.

b) Information on Drawleads

The TF is still gathering information and contacting others with interest. A letter was drafted requesting additional concerns. One Hundred Seventy copies were sent to the Transformer Committee members and only two responses were received. Neither of these contained new issues.

A questionnaire for transformer manufacturers and rebuilders was drafted. It contains questions in four categories of bushing issues. This Draft was sent to Mark Rivers for getting feedback from Doble Clients. Also it was suggested that the questionnaire be sent to utility operation personnel. The questionnaire will have a maximum of ten questions for this group, and deal with issues of service and performance.

7.2.5 Technical Advisor to IEC/SC36

Bill Saxon Reported the following:

The IEC Subcommittee 36A has not met since our last meeting. Next meeting is in the spring of 1997 in U.K.

Technical Brochure GT12.09/WG12.09, "Dissolved Gas Analysis During Heat Run Tests on Power Transformers" has been published and copies are available from CIGRE.

IEC Technical Report 1463, "Bushings Seismic Qualification" has been published and copies can be obtained from ANSI's Customer Service Dept.

7.2.6 Old Business

7.2.6.1 Reaffirmation of C57.19.00 - 1991 & C57.19.01 - 1991

Chairman Fred Elliott reported that C57.19.01 is out for balloting. C57.19.00 will sent out shortly

7.2.6.2 Comments on PC57.19.00 Draft 1 (See Attachment - 2)

Based on feedback/comments received on the revision C57.19.00, Fred Elliott prepared Draft 1. The following discussions took place on this draft.

Section 1.1 (Scope) will be modified to indicate that bushings for oil circuit breakers are not included in this standard.

The question whether "Oil to Gas" bushings be included in this standard was discussed. Russ Nordman and Keith Ellis will review the existing standards/information and send a proposal to Fred Elliott before Jan. 97.

The definition of "Composite Bushings" will either be revised or removed.

Section 5.4.2. This paragraph will be revised to indicate that the rating for drawlead application will be limited by the rating specified on the nameplate.

Section 7.2.2.2. It was agreed to test both top and bottom ends for cantilever test as per the present practice.

Section 7.2.2.2. No change was made to test temperature which is specified as "approximately 25 C."

Section 7.2.3. The suggestion to allow for calculations for calculating the hottest spot temperature rise as a design qualification method was not agreed upon. A method similar to IEC 137 was a part of this standard prior to 1976 but was taken out when IEEE Std. 21 was approved in 1976. The present feeling is that a particular calculation method may not be applicable to different designs.

It was agreed to include a drawlead test if the drawlead is supplied by the bushing manufacturer.

A suggestion to allow a different frequency other than the rated frequency for the temperature rise test was discussed but it was agreed to continue the present practice which requires the test to be performed at the rated frequency.

Section 7.3.1. A suggestion to include a calculation method for qualification for thermal stability qualification was not agreed upon.

Section 7.3.1. It was agreed to include some wording similar to IEC 137 to allow for a method using resistors to simulate the I 2 R losses during the Thermal stability Test.

Section 7.4.3. It was agreed to remove the paragraph on PD test/requirements for breakers as this standard will not cover bushings for circuit breakers.

Front of Wave Test: It was agreed that Bill Young will write a proposal for this test.

Fred Elliott asked the members to send their comment on Draft 1 as soon as possible so that he could send the revised draft to bushing subcommittee for balloting.

7.2.6.3 Arcing Distance

This subject was discussed at the last meeting

7.2.6.4 Standard Interpretation

This question has been addressed. See Attachment - 3

7.2.6.5 Business

No other business was discussed

7.2.7 Adjournment

The meeting was adjourned at 2:50 PM

Minutes By
Pritpal Singh, Secretary
Bushing Subcommittee

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
SUBCOMMITTE	BUSHING				
CHAIR:	F. E. ELLIOTT				
PHONE:	(503)230-3807				
C57.19.00 PC57.19.00	GENERAL REQUIREMENTS AND TEST PROCEDURES FOR OUTDOOR APPARATUS BUSHINGS (IEEE 21)	ELLIOTT F. E. (614)223-2259	PSIM IEC SC36 IA/PSE ICC	7/23/91 6/20/96 1996	PAR APPROVED 6/20/96
C57.19.01 PC57.19.01	STANDARD PERFORMANCE CHARACTERISTICS AND DIMENSIONS FOR OUTDOOR APPARATUS BUSHINGS (IEEE 24).	SINGH PRITPAL (901)696-5228	ICC IA/PSE IEC SC36A	8/5/91 6/20/96 1996	BEING BALLOTED
C57.19.03 PC57.19.03	STANDARD REQUIREMENTS, TERMINOLOGY AND TEST CODE FOR BUSHINGS FOR DC APPLICATIONS	HEYMAN OLOF 46-240-83152		6/20/96 2001	APPROVED BY STANDARDS BOARD 6/20/96
C57.19.100 P800	GUIDE FOR APPLICATION OF APPARATUS BUSHINGS.	ELLIOTT F. E. (503)230-3900	SWGR SUB PSR	9/27/79 1999	PUBLISHED 08/24/95 REPLACES C57.19.101
C57.19.101 P757	GUIDE FOR LOADING POWER APPARATUS BUSHINGS	ELLIOTT F. E. (503)230-3900		10/20/88	WITHDRAWN BY REVCOM 12/11/95 REPLACED BY C57.19.100
NEW NEW	TASK FORCE TO STUDY APPLICATON AND PROBLEMS OF DRAW-LEADS FOR BUSHINGS	NORDMAN RUSS (414)547-0121			NEW TASK FORCE

7.3 Dielectric Tests - L. B. Wagenaar

The Dielectric Test Subcommittee met on October 29,1996 with 55 members and 36 guests present. It was first announced that Mike Franchek had volunteered to become the secretary of the subcommittee after the Chairman made a request at the last meeting. It was also announced that Ed Howells had retired from his company and all activities of the Transformers Committee, including Chairman of the WG on Partial Discharge Measurement for Transformers. Jack Harley has taken over that working group. The SC then heard reports from its four working groups.

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

The working group met on Monday, October 28, at 4:15 p.m. with 20 members and 29 guests present. After introductions, M. Perkins, Chairman of the task force on revision of the induced test presented his report.

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

The task force met on Monday, October 28, at 8:00 a.m. with 15 members and 26 guests present. After the usual introductions, the previous meeting minutes were discussed and approved.

The chairman then reported on the work of a small subgroup consisting of Messrs. Perkins, Poulin, Wagenaar, Tuli, Fausch, Ward, and Vaillancourt. This group met Sunday, October 27, at 7:00 p.m. to resolve the wording on Section 5.2.6 of C57.113.

The proposed wording describes the minimum requirements of the discharge meter. It also describes a verification or calibration check of the meter which would be done periodically.

The task force agreed to accept these changes and recommend that the documents and changes go to the next level of survey, the Dielectric Test Subcommittee.

The task force adjourned at 8:45 a.m.

Next, Dr. Bob Degeneff presented his work on waveshape correction factors for lightning impulse test. He is currently studying the effect of changing the front, tail, and amplitude of a full wave at different locations inside a winding. He is currently developing a method for, when an ideal wave cannot be achieved, finding an alternate wave that would develop inside the winding a voltage as close as possible to the one produced by the ideal wave. In other words, he is trying to minimize the difference between the effect of an ideal full wave and the effect of an alternate wave on a transformer winding. From the discussion that followed, it is clear that there was no simple solution to the problem, neither no general solution applicable to every type of transformer winding. The conclusion of the discussion was that Dr. Degeneff would continue his study and present the result of his work at the next meeting.

Next, the chairman distributed a proposal prepared by M. Perkins concerning the factory dielectric tests on repaired or rebuilt transformers. The chairman requested that any discussion on this proposal be sent directly to M. Perkins so that he can prepare a revised proposal and survey the working group and the subcommittee before the next meeting.

Another proposal for an addition to the test code was distributed by the chairman. This one came from Bruce Forsyth. It concerns the induced test on windings for series or multiple connections. In the present standard, there is nothing said about this topic. His proposal is that the standard should include a paragraph on the subject. He is basically proposing that every connection should be tested. The type of test depends on the class of the transformer (class I or class II). There was some brief discussion on the subject, in particular on how to interpret the class of the transformer. As an example, it was suggested that a 69 / 138 kV series / parallel transformer be tested as a class II transformer in the series connection and as a class I in the parallel connection. Another question was raised for the case of mobile transformers which can have two windings with multiple connections. The question was, should such a transformer be tested in every possible combination of connections? It was decided that since the issue is related to the induced test and that the test code is presently revised, all comments or discussion on this topic should be sent to the chairman of the task force for the revision of the induced test (M. Perkins). There will be a proposal on this subject in the next draft of the revised induced test procedure.

Next, Dr. Degeneff distributed a draft for his paper on the work accomplished by the Task Force on Metal-Oxide Surge Arrester Coordination with Power Transformer Insulation System. He requested that any comment on the document be sent to him within the next six weeks.

The next item was the results of a survey on a proposed change to table 5 of C57.12.00 concerning the dielectric test levels of 765 kV transformers. Out of 95 ballots sent out, only 33 were returned. Because of the poor return rate, it was decided to revise the list of the balloting group and to repeat the process. There were some discussions on the reasons for the change and the logic behind it. It was pointed out that the proposed changes are referring to the rated operating voltage of the system as opposed to the rest of the table which refers to the maximum operating voltage. It was decided to revise the table accordingly and to send a new proposal for survey.

Next, the chairman mentioned that the guide for transformer impulse test C57.98 is due for revision and that S. Tuli will lead this work. It has not been decided yet if a task force will be formed but any comment or proposed changes to the guide should be referred to Mr. Tuli.

Finally, S. Tuli proposed that some modifications to table 17 in C57.12.00. A survey will be sent out for this proposal before the next meeting.

The meeting adjourned at 5:25 P.M.

7.3.2 Combined Working Group and Task Force Meeting on Recommended Practice for Routine Impulse Tests for Distribution - J. Rossetti, WG Chair, - D. Ballard, TF Chair

The combined TF & WG met on Monday, October 18, at 1:20 p.m. with 7 members and guests. The meeting started with a review of draft 5 of the document.

Copies of the TF/WG's RECOMMENDED PRACTICE FOR ROUTINE IMPULSE TESTS FOR DISTRIBUTION TRANSFORMERS (PC 57.138/D5) were passed out. A copy was sent prior to the meeting to Rochelle Stern for editorial comment. Rochelle commented that the

copyright date needs to be changed to 1996 and the C57.138 project and draft number added to each page.

Don Ballard then reviewed the comments from the WG ballot of draft 3. The first item reviewed was section 6.2.1 CURRENT TRANSFORMER SELECTION. This section was written to clarify the requirements for a precision wide band type CT. The meaning of the time product rating pertaining to core saturation was added in draft 5.

Figure 22 showing CT CONNECTION FOR IMPULSE TEST referred to in section 6.2 CT CIRCUIT will be revised. The Figure presently shows the currents from the H2, H3, H0, and X0 terminals passing through the CT. The Figure will be redrawn to show only the current form H0 returning through the CT. Only the tank and X0 are grounded. This is the preferred connection for the highest sensitivity.

In sections 5.2.3.2, 5.2.3.3, and 5.2.3.4, the paragraphs refer to phase 1. This will be changed to phase A, and phase A will be labeled on figures 12 through 18.

The meeting continued at the WG's 2:50 time slot with 7 members and 3 guests.

Section 6 NEUTRAL CURRENT DETECTION CIRCUITS will be revised By Author Molden. A paragraph will be added to cover the use of a low impedance shunt. This method is covered as one of two methods in C57.12.90 section 10.4. This is not recommended as the sensitivity is not as good as the R-C shunt and CT methods.

A brief paragraph will be added to the section on GENERAL TEST PROCEDURES. This will direct any questions concerning dielectric test sequences to C57.12.90.

Section 8, VERIFICATION OF DETECTOR SENSITIVITY will be edited by Francois Ruelland. A section will be added covering a method for calculating the inductance for a staged single turn fault. John Rossetti will edit the changes as well as changes submitted by Jerry Corkran and Steve Smith. The edited version can then be balloted as PC57.138/D6 by early 1997.

There being no further business, the meeting was adjourned.

7.3.3 Working Group on Partial Discharge Tests in Transformers - J. Harley, Chair

The meeting was attended by 12 members and 32 guests.

The change in chair was due to the retirement of Ed Howells. A secretary was appointed. Minutes of the previous meeting were approved.

Two PARs will be submitted to follow up previous work. The first PAR will be submitted for the Trial Use Guide for the Detection of Acoustic Emissions from Partial Discharge in Oil-Immersed Power Transformers, C57.127. This will be balloted without further revision. This Guide had been previously successfully balloted by the Transformers Committee, but the paperwork was lost in the IEEE Standards Office.

The second PAR will be submitted for the Guide for the Location of Acoustic Emissions from Partial Discharges in Oil-Immersed Power Transformers and Reactors. This Guide will be

updated to reflect recent activities in system design and signal processing. The target date for the first draft of the revised Guide is at the Graz meeting in July 1997.

7.3.4 Working Group on Diagnostic Field Testing and Monitoring - R. Young, Chair

The working group on Diagnostic Field Testing and Monitoring of Liquid-Filled Power Transformers, Regulators, and Reactors met on Tuesday, October 29,1996 with 32 members and 62 guests present. Five Guests requested membership bringing the Working Group membership to 61.

The minutes of the San Francisco meeting were approved as written. Critique of the panel session on on-line monitoring held at the San Francisco meeting was generally favorable. Suggestions were made to consider additional panel sessions focusing on user needs and additional technologies for monitoring but no action was taken.

Under liaison reports, Andre Lux reported that no additional work is underway within the PSIM Committee on the transformers portion of IEEE 62 for Field Diagnostic Testing. Jim Harlow reported that the PES Substations Committee Subcommittee on Data Acquisition is very active in the area of communication between intelligent electronic devices within substations. This work could seriously impact the design and application of transformer monitoring devices. Accordingly, a task force was established by our working group to address issues associated with communications with and between transformer on-line monitors and to ensure that the needs of transformer users and monitor manufacturers are represented in the Substations Committee. Jim Harlow agreed to serve as the Task Force Chairman and to continue as the liaison to the Substations committee Subcommittee on Data Acquisition.

Under new business, the chairman reported that coordination has been established with the PES Committee on Energy Development and Power Generation which is preparing a "Guide for Life Management of Electrical Equipment in Generating Stations." The coordination is for the circulation of drafts and the chairman will inform the working group of any activity on that project. The chairman also reported that a request for information on infrared testing of transformers was received from the IEEE Standards staff. A response will be made after review of the topic in IEEE 62.

For the upcoming Working Group meeting in Graz, the chairman requested information on monitoring work being done in Europe by IEC, CIGRE, users, and manufacturers. If appropriate, a guest speaker on the European perspective of monitoring will be considered for the WG meeting.

A suggestion was made to change the name of the Working Group to place the emphasis on on-line monitoring. It is felt that the "Diagnostic Field Testing" beginning of the Working Group name is confusing since our main focus is monitoring. The chairman will discuss this with the subcommittee chairman.

Discussion took place on the future direction for the Working Group. After consideration of a technical paper on monitoring and additional monitoring panel sessions, it was decided to form a task force to create a "Guide for On-Line Monitoring of Liquid-filled Power Transformers." The scope and purpose of the guide were discussed and the chairman will submit the necessary PAR.

7.3.5 Liaison Activities - J. H. Harlow, Reporting

IEEE PES Substations Committee

- Subcommittee CO - Data Acquisition, Processing, and Control Systems
  - ◊ Working Group 2 - Application of New Technologies in Substation Monitoring and Control
    - Task Force 4 - Communication Between Intelligent Substation Devices

Mr. John Tengdin, representing the Substations Committee, spoke at the Transformers Committee Panel session in San Francisco, April 16, 1996. John made an excellent presentation on the status of developing industry standards which relate to inter and intra-substation communications.

The principal effort in this regard is assigned to Task Force 4, which is organizationally structured as shown above.

Since our San Francisco meeting C2TF4 met May 7 in Orlando, FL, July 31 in Denver, and September 22 in Los Angeles. I was able to attend all of these meetings.

Points of note:

1. The broad range of this work had been identified in several different ways, perhaps most commonly by the lead EPRI project number involved, i.e. "3599." The work is now to be known by a more suitable name "UCA (Utility Communications Architecture) Substation Automation."

2. The objective of the work is stated: "Define a standard model that respects the installed base of clients without restricting the evolution in device technology.

3. It was an objective to begin field trials in 1996. In fact, the field trial at United Power Association, Elk River, MN, was first demonstrated at the Site Acceptance Test, October 15, 1996.

4. A document issued March 1, 1996: *"Substation Integrated Protection, Control and Data Acquisition - Phase 1, Task 2 - Requirements Specification - Preliminary Report, Version 0.4,"* has been the basis of most of the work of this Task Force. This document defines substation communication requirements using Object Models, with the attendant "Name," "Attributes," and "Methods." Version 0.4 defined Object Models for 1) transformers and 2) step-voltage regulators; most of which pertained to the load tap changing aspect. In my review of version 0.4, I revised the structure to one Object Model for the LTC aspect of transformers and regulators. This is being incorporated into the revised draft. A second Object Model will treat transformer protection. Also, in my review, I identified many changes to be more proper with Transformers Committee preferences, e.g. VT instead of PT.

5. A very significant new effort was initiated in July which will result in a second basic protocol which will conform to UCA. The effort until July was wholly directed to a protocol with the Application Layer identified as "MMS" (Manufacturing Message Specification) operating over several possible data link and physical layers. In July, AEP in concert with several other

utilities and suppliers initiated inclusion of another format known as "FMS" (Fieldbus Message Specification) which will operate over Profibus. Different experts spent considerable time debating the relative merits of the two protocols. The backing which each has makes it certain that both will now be pursued.

7.3.6 Liaison Report - Insulation Coordination - J. Crouse, Reporting

IEEE Std. 1313.1-1996, IEEE Standard for Insulation Coordination - Definitions, Principles, and Rules, was published on October 2, 1996. The Insulation Coordination Working Group is now reviewing draft 3 of 1313.2 - Insulation Coordination Application Guide.

7.3.7 Old Business

Under old business, Subash Tuli reported that the negative votes on the survey of the SC on testing of LV control wiring and associated auxiliary circuits had been resolved. This item will be sent on to the WG on the revision of C57.12.00 and C57.12.90.

7.3.8 New Business

Under new business, Mark Perkins mentioned at the last meeting that table 5 of C57.12.90 is out of date. The table is entitled "Temperature Correction Factor for Insulation Power Factor." Mark had reported that Doble Energy had two curves, one for 750 kV BIL and below and one for above 750 kV BIL. Further research showed that the former curve lines up with the table 5 curve and that both were generated from a 1953 Doble paper by Mr. E. V. DeBlieux of G.E. Since that time processing procedures have improved on all transformers so it was proposed that the above 750 kV BIL curve be put into Table 5. Jerry Corkran also volunteered to submit a corresponding curve for distribution transformers.

In keeping with the present mood of mergers and reorganizations displayed by our employers, the next item of business was a discussion of reorganization of the Dielectric Test SC. It was felt that a realignment of the working groups would level the work load of the WGs and be more efficient. It was decided that the following four WGs would be established or 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

Future projects on distribution transformers will be placed within the above outline. Since the WG on Revision of Dielectric Tests on Distribution Transformers is almost done with the Guide for Routine Impulse Testing, the Chair's feeling is that it should complete this task under this name.

There was discussion about not separating the test requirements of distribution and power transformers. There are differences in the test procedures for the two types of transformers and currently a WG is working on C57.138 which will cover routine tests for distribution

transformers. The other tests for distribution will refer to C57.98. The documents for the two types of transformers need to be coordinated to avoid duplication or conflict.

The Chairman was asked if Oil-Filled Regulators are in the scope of the Subcommittee. He will check and report back.

The following attachments are included for the information of the Subcommittee members. They are proposed changes to existing Standards and comments are welcome.

Attachment 1 - Proposal for Factory Dielectric Test of Repair Transformers.- Mark Perkins

10.1.8 **Factory dielectric tests on repair or rebuilt transformers**

Factory dielectric tests on transformers that have been repaired or rebuilt are dependent on the nature of the repair and the amount, age, and condition of the original insulation that was used in the repair or rebuilt transformer. The tests are also dependent on the original design of the transformer and the applicable test standard at the time of the transformer design. As such, this section only gives general guidelines for selecting tests and test levels, and the actual test and test levels should be mutually determined by the manufacturer and the purchaser.

Due to various design constraints, the transformer may be tested based on the original test levels and limits when the transformer was first manufactured or based on the current test levels and limits from ANSI C57.12.00-199X. The choice between the original tests or the current ANSI tests shall be made by the manufacturer.

Transformers with all new insulation shall be tested at 100% test levels. When all or a portion of the insulation is re-use, the recommended test levels are 75-85% of the full dielectric test levels, with 85% being the preferred test level for transformers with insulation judged to be in the new or near new condition.

In some instances the purchaser may wish to test the transformer at 100% test levels even though original insulation was used in the repair or rebuilding. In this instance, the manufacture and purchaser should carefully consider the higher risk of insulation failure in what might otherwise be an acceptable transformer versus the benefits of testing at the higher level.

Attachment 2 - Proposal for Induced Test for Series or Multiple Connections - Bruce Forsyth

Neither the current or the proposed induced test standards include information regarding the test requirements for transformers with series-multiple or delta-wye connections. Most of the people I have discussed this issue with agree that induced tests should be performed in each connection since the stresses within the windings, between the leads, and at the terminal boards may be different in each connection. In order to clarify the test requirements under such conditions, I propose the addition of clauses under 10.7 and 10.8 of C57.12.90 as follows:

- **For Class I transformers:**

  10.7.5.1 **Windings for series or multiple connections**

  Windings with series or multiple connections shall be tested in all series and multiple connections.

  10.7.5.2 **Windings for delta (Δ) or wye (Y) connections**

  When either connection is 25 kV nominal system voltage or above, the three-phase transformer shall be tested on both Δ and Y connections. The test voltage for each connection shall be that corresponding to the nominal system voltage of the winding for that connection. For nominal system voltages of 15 kV and below, only the Y connection shall be tested unless tests on both connections are specified.

- **For Class II transformer**

  10.8.3.1 **Windings for series or multiple connections**

  Windings with series or multiple connections shall be tested in all series and multiple connections. The test voltage for each connection shall be that corresponding to the nominal system voltage of the winding for that connection.

  10.8.3.2 **Windings for delta (Δ) or wye (Y) connections**

  When either connection is 25 kV nominal system voltage or above, the three-phase transformer shall be tested on both Δ and Y connections. The test voltage for each connection shall be that corresponding to the nominal system voltage of the winding for that connection. For nominal system voltages 15 kV and below, only the Y connection shall be tested unless tests on both connections are specified.

Respectfully Submitted,

Michael A. Franchek

Secretary Dielectric Test Subcommittee

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
SUBCOMMITTE CHAIR: PHONE:	DIELECTRIC TESTS L. B. WAGENAAR (614)223-2259				
C57.113 P545	GUIDE FOR PARTIAL DISCHARGE MEASUREMENT IN LIQUID-FILLED POWER TRANSFORMERS AND SHUNT REACTOR	POULIN B. [408]157-8326	PSIM IAS/PSE IEC TC14 U	12/5/91 6/20/96 1996	PAR APPROVED 6/20/96 REVISE OR REAFF. BY DEC 96
C57.12.00 PC57.12.00	SECTION 5.10.7.1 - LIGHTNING IMPULSE TESTS	MINKWITZ R. E. (617)828-3241			APPROVED BY MAIN COMMITTEE
C57.12.00 PC57.12.00	TABLE 17 - SWITCHING IMPULSE TESTS - NOTE 8 ADDED	POULIN B. (408)957-8326			APPROVED BY SUBCOMMITTEE
C57.12.00 PC57.12.00	TABLE 3 AND 5 - HARMONIZE VALUES	POULIN B. (408)957-8326			UNDER DEVELOPMENT
C57.12.90 PC57.12.90	REVISE INDUCED TESTS FOR CLASS II POWER TRANSFORMERS	PERKINS M. (317)286-9334			D1 BALOTTED IN TF
C57.12.90 PC57.12.90	CLAUSE 10 - ADD HI-POT TEST FOR CONTROL WIRING	TULI S. (414)547-0121			D1 BALOTTED IN SUBCOM
C57.12.90 PC57.12.90	CLAUSE 10.4 - IMPULSE TESTS FOR DISTRIBUTION TRANSFORMERS	ROSSETTI J. (901)528-4743			APPROVED BY SUBCOM
C57.12.90 PC57.12.90d	REVISION OF THE INDUCED TEST	POULIN B. (408)957-8326		9/28/90 0	INCLUDE IN C57.12.90 COORDINATE WITH STEVE SMITH

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
C57.127 PC57.127	GUIDE FOR THE DETECTION OF ACOUSTIC EMISSIONS FROM PARTIAL DISCHARGES IN OIL-IMMERSED POWER TRANSFORMERS	HOWELLS E. (414)835-1500	T&D IEC ED&PG CIGRE	3/10/88 0	PAR WITHDRAWN BY SB APPLY FOR PAR TO REBALLOT
C57.138 NEW	RECOMMENDED PRACTICE FOR ROUTINE IMPULSE TEST FOR DISTRIBUTION TRANSFORMERS	ROSSETTI J. (901)528-4743	T&D IA/PSE PSIM	9/19/96	
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
IEEE1350 P1350	GUIDE FOR PROTECTION OF DISTRIBUTION TRANSFORMERS WITH EMPHASIS ON SECONDARY (LOW VOLTAGE SIDE) SURGES	ROSSETTI J. (901)528-4743	SPD T&D IC	3/17/93 0	CONTINUE WORK IN SPD ASK FOR PAR WITHDRAWAL
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	BALLOTTING WORKING GROUP SUBMIT PAR AS SOON AS POSSIBLE

7.4 Distribution Transformers - K.S. Hanus

7.4.1 Chair's Remarks & Announcements

The meeting convened at 2:00 PM in the Emerald II room with the introduction of the members and guests and signing of the attendance roster. There were 29 members and 16 guests in attendance.

Minutes of the last meeting in San Francisco were approved with no changes.

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

7.4.2 Working Group Reports

7.4.2.1 C57.15 Step-Voltage Regulators

Draft 6 of the document was reviewed and 5 changes by motion were made and 4 task forces were assigned to resolve outstanding issues. The PAR will be revised to remove references in the scope regarding dry type regulators. A great majority of these units were of the induction type which was previously removed from the document.

7.4.2.2 C57.12.20 Polemount Transformers

The working group reviewed the status of the draft IV currently being balloted by the ANSI C57 committee. The ballot closed on October 25 with approval expected. The document after approval will be published by NEMA.

The working group then reviewed a letter from Stan Howell which contained several comments which were of an editorial nature. Other comments were of a more substantial nature and will be considered in future meetings. The working group expressed there gratitude to Stan for taking the time to review the document and provide the working group valuable input.

Co-Chair Glenn Andersen made a suggestion to re-organize the document to make it more user friendly, such as grouping the document into a part A & B for single phase and 3 phase transformers. Mark Loveless volunteered to look at this before the next meeting.

The working group discussed the annex in the document which covers optional mounting brackets available from several sources for transformers with type C hanger lugs. The concern is these brackets do not meet the safety factor of 5 as required in the main document for support lugs. It was suggested to substitute type B lugs for the type C lugs so units could be pole mounted without adapter plates. The working group decided to further discuss the issue in subsequent meetings.

7.4.2.3 C57.12.25 Single Phase Deadfront Padmount Transformers

The working group reviewed draft 5 of the current document. Discussion on several of the air compartment dimensions and methods of showing the dimensions resulted in a few changes and further improvements in the figures.

The working group discussed figure 3 particularly part C and the concern the stud lengths shown are not adequate for the variety of secondary connectors available. Several options were discussed resulting in a wording change in the notes to the figure to properly indicate to users the available stud length.

Lastly the group discussed wording in paragraph 5.2 relating to induced voltage tests and two different proposed wordings. One of the versions slightly modified was chosen to be put in the document.

7.4.2.4 C57.12.34 Three Phase Padmount Transformers

The majority of the meeting was devoted to the discussion of the impedances listed for units 75 thru 500 kVA. Concern was expressed lower impedance values are too low which could result in available fault currents above customers service equipment ratings. Task force chairman Tom Pekarek pointed out there are many variables to consider in developing a minimum impedance for these KVA ranges. After much discussion the working group decided to drop the maximum impedance value and only show a nominal minimum value to be developed by the working group for units in the range of 75-500 KVA.

7.4.2.5 C57.12..35 Bar Coding

The working group did not meet but a report was presented. Draft 5.1 of the document has been approved and is now awaiting publication.

The working group will move forward with a survey of users and manufacturers to help give the working group direction for future revisions.

7.4.2.6 C57.12.33 Guide for Evaluation of Losses in Distribution Transformers

Draft 3 of the document was discussed. Corrections were made in the equations in the example in clause 5.2. The wording covering the no load loss reference temperature (clause 4.2.2) was revised to be consistent with C57.12.00. The existing document can be used for an analysis of less than the transformer life cycle duration recommended in the document. The working group will be balloted on draft 4 before the next meeting.

Ingrid Watson (DOE) and Ben McConnell of the Oakridge National Labs discussed the need for user information on transformer loading to complete their study and make recommendations for compliance with the Energy Act. Ben will be sending out a request to working group members for input on transformer loading. His data indicates that in general transformers are not as heavily loaded as first anticipated.

Phil Hopkinson informed the working group that NEMA standard TP-1 on transformer efficiency has been approved and published.

A handout was distributed covering the status of the EPA's Energy Star Program and the software that is being developed. The software enables a utility to directly enter A & B factors or enter pertinent information for the software to calculate A & B factors and allow the software to evaluate the TOC of transformers. Also coming out in the future will be a software program which will provide utilities and commercial users a method of optimally sizing transformers.

7.4.2.7 P1388 Electronic Data Transmittal

The working group proceeded to complete a final disposition of several data fields to be included in the test report records. The working group also resolved a few items on the latest draft with 6 members volunteering to review the document before the next meeting so the document can be balloted in the near future.

Lastly the working group discussed the reporting of test data via EDI. The working groups data sets were presented to the appropriate ANSI groups to start developing the EDI data sets for future transmitting of the data sets via EDI.

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

C57.12.29 Padmount Enclosures-Coastal Environments - The document is in the process of being revised.
C57.12.28 Padmount Enclosures- The document has been published
C57.12.31 Polemount - The document has been published.
C57.12.32 Submersible Enclosures - The document is in the process of being revised.

A discussion on C57.12.28 centered around the pry tip dimensions of .100" or .065". It was agreed that Dave Rolling and John Borst would write a letter to Tom Diamantis describing their opinion of the procedure of changing the pry tip dimension from .100" that was balloted to the .065" dimension without re-balloting the document.

7.4.3 New Business

Gerry Paiva suggested dropping the reference to a MIL spec on lifting safety factors. C57.12.00 is changing wording relating to this and the distribution working groups need to follow what they do.

Questions relating to a separate spring meeting from the Graz meeting were discussed and it was stated our next meeting will be in Graz and no other meeting is planned.

7.4.4 Working Group Assignments

The current assignments are as follows:

.20 Glenn Andersen / Allen Wilks
.21 Ali Ghafourian
.22 Ken Hanus

.23 Bob Scheu
.25 John Lazar / Norvin Mohesky
.26 Gerry Paiva
P1388 David Rollins/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 2:50 PM.

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION		PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
SUBCOMMITTE	DISTRIBUTION TRANSFORMERS					
CHAIR:	K. S. HANUS					
PHONE:	(817)882-6020					
C57.12.20	OVERHEAD-TYPE DISTRIBUTION TRANSFORMERS, 500 kVA AND SMALLER: H V 34500 VOLTS AND BELOW, L V 7970/13800Y &	ANDERSON G. W. (913)339-2931			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	
PC57.12.21					1985	PAR EXTENDED TO JUNE 97
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
C57.12.23	UNDERGROUND-TYPE,SELF-COOLED, 1-PHASE DISTRIBUTION TR WITH SEPERABLE INSULATED HV CONNECT HV 24940GrdY..LV,240..;167kVA	SCHEU R. W. (704) 462-3164	T&D IC IAS/REPC	IAS/PSEC	9/19/85 6/27/91 1996	ANSI APPROVED 02/18/94 TO BE PUBLISHED BY NEMA
C57.12.25	REQUIREMENTS FOR PAD-MOUNTED COMP-TYPE,SELF-COOLED,1-PHASE DISTRIBUTION TR W/SEP INS HV CONN,HV 34500GrdY...167kVA...	MOHESKY N. (314)239-6783	T&D IC IAS/REPC	IAS/PSEC	5/11/90 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/ SEPERABLE INSULATED HV CONN.,HV 34500GrdY..2500kVA	PEARSON L. C. (817)882-6025	T&D IC IAS/REPC	IAS/PSEC SCC14	6/17/92 12/5/91 1997	TO BE PUBLISHED BY NEMA
C57.12.27	STANDARD FOR TRANSFORMERS - LIQUID FILLED DISTRIBUTION TRANSFORMERS USED IN PAD-MOUNTED INSTALLATIONS, INCLUD. UNIT	MILLER J. R. (314) 634-2111			6/27/91 0	PAR WITHDRAWN SUBMIT NEW PAR
C57.12.28	PAD-MOUNTED EQUIPMENT - ENCLOSURE INTEGRITY	MARTIN J.			6/24/87	JOINT C37/C57 PROJECT
ANSI					1994	AWAITING PUBLICATION

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
C57.12.29 ANSI	PAD-MOUNTED EQUIPMENT - ENCLOSURE INTEGRITY IN COASTAL ENVIRONMENTS	MARTIN J.		1996	PUBLISHED IN 1992 NOT TRANSFORMERS COMM.
C57.12.30 ANSI	SUBMERSIBLE EQUIPMENT - ENCLOSURE INTEGRITY	MARTIN J.		1994	TO BE BALLOTED NUMBER TO BE CHANGED
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	HANUS K. (817)882-6020			AWAITING PUBLICATION BY NEMA
C57.12.33 PC57.12.33	GUIDE FOR EVALUATION OF LOSSES IN DISTRIBUTION TRANSFORMERS	PEKAREK T. (216) 479-3400	PSIM		PAR DISSAPROVED 03/21/96 NESCOM WANTS CLARIFICATION
C57.12.34 PC57.12.34	REQUIREMENTS FOR THREE PHASE PAD-MOUNTED DISTRIBUTION TRANSFORMERS	PEARSON L. C. (817)882-6025	ICC	9/21/95	
C57.12.35 P1265	STANDARD FOR BAR CODING FOR DISTRIBUTION TRANSFORMERS (POLE-MOUNTED, PAD-MOUNTED AND UNDERGROUND)	JORDAN RON (619)482-3239		6/20/96 2001	APPROVED BY STANDARDS BOARD 6/20/96 PREVIOUSLY PJ265
C57.15 NONE	REQUIREMENTS, TERMINOLOGY, & TEST CODE FOR STEP-VOLTAGE REGULATORS	DIAMANTIS T. (315)428-5688	SUBS IAS/PSE	3/18/87 9/21/95 1997	SCOPE REVISED TO ISSUE DRAFT 4
IEEE1388 P1388	STANDARD FOR THE ELECTRONIC REPORTING OF TRANSFORMER TEST DATA	McCAIN A. (410)291-3231	EEI PSR NEMA CS SAB ASC X12	9/15/93 0	PREPARING D1 NO. CHANGED FROM C57.132

7.5 Dry-Type Transformers - W. F. Patterson

7.5.1 Chair Remarks and Announcements

The Dry Type Transformer Subcommittee met at 10:55 AM on October 29, 1996 with 19 members and 14 guests present. Introductions were made and the attendance roster was circulated. Minutes from the previous meeting were reviewed and approved. Announcements were held until after the working group reports were given.

7.5.1.1 Announcements and New Business

After the working group reports, the following announcements were made by the Chair:

The schedule for future meetings was discussed with emphasis on the upcoming meeting in Graz, Austria. The chair stated that early registration by March 1997 will be requested by the main committee.

The chair asked for a show of hands from the attendees indicating their plan to attend the Graz meeting. Seventy-five percent of the meeting attendees indicated their intent to go to Graz.

The new balloting procedure was discussed. Working group and subcommittee ballots will be handled internally. Main Committee ballots should be forwarded to Tom Traub.

The chair discussed the status of each dry type standard.

- C57.12.01: This standard has been revised and is up for ballot. It is presently on hold due to the new balloting process.
- C57.12.50, C57.12,51, C57.12.52, C57.12.55: These standards have not had their copyrights released to IEEE. The chair will contact Tom Traub regarding the balloting of the standards for reaffirmation.
- C57.12.56: Richard Provost stated this Standard was reaffirmed in 1994.
- C57.12.58: Don Kline stated this standard had a reaffirmation ballot and the standard has been approved by the ANSI standards board.
- C57.12.59: Standard was balloted for reaffirmation; no PAR needed.
- C57.12.60: Richard Provost stated the standard is being balloted in the Main Committee.
- C57.12.91: The standard was approved in 1995.
- C57.124: Don Kline stated the standard was reaffirmed by the Standards Board; no PAR needed.
- C57.134: PAR approved September 1995.
- C57.16: The standard was successfully balloted by Main Committee and has gone to the Standards board.

- C57.21: This standard has been reaffirmed in 1996.
- C57.94: This standard needs a reaffirmation ballot. The chair recommended that the standard be balloted.
- C57.96: Mike Haas stated that a new PAR had been submitted.
- C57.99: Richard Dudley recommended no action on this standard effectively withdrawing the standard.
- IEEE 259: The PAR was approved in March 1996.

Being no further new business, the meeting was adjourned at 11:50 AM.

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 Working Group on Dry-Type Thermal Evaluation - C57.12.56/60, and Flammability - Mr. Richard Provost, Chair

The working group met at 10:5 AM on Monday, October 28, 1996 at the Sheraton Hotel in Burlington Vermont. There were 12 members and 15 guests present. The minutes of the last meeting were approved as written. Seven guests requested membership and they are welcome.

In early September, a ballot was sent to the Dry Type Subcommittee on 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".

Since most of the working group had worked on the revisions to the guide, it was decided to ballot the subcommittee instead of the working group to save time. Also, it was decided to delay the inclusion of a new test procedure using partial discharge for an aging end point criterion, since no experience or information is available at this time.

The results of the ballots were as follows: There were 39 ballots sent out, and 32 were returned, for a rate of 82.1%, enough for a legal ballot. Of the returned ballots, there were 27 affirmative, 5 affirmative with comments, and no negatives or abstentions.

The chairman reviewed several of the comments. Most comments were editorial in nature or involved changes in wording for clarification of the procedure or guideline. There were also some errors as a result of a software problem from the IEEE disk version of the document. These were noted and will be corrected in the printed version by IEEE. The proposed modifications were acceptable to the working group, and the changes will be made to the document.

The next step will be to ballot the document with the main Transformers Committee. This will be done after the document is added to the voting list pool for interested parties. In our next meeting, we will discuss the results of the ballot and possibly address the proposal to use partial discharge as a future end point criteria.

In addition, it is our hope to begin reviewing data provided by members who may use or are

using this test Guide for comparison of test methods and verification of the procedures. As soon as data are available, they should be submitted anonymously to an impartial party for compilation and comparison. With no further business, the meeting adjourned at 11:55 AM.

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

The Working Group met at 9:30 AM on Tuesday, October 29 in the Emerald Ballroom of the Sheraton Conference Center with 10 members and 8 guests present. Five of the guests requested membership in the working group.

After the introductions, the minutes of the previous meeting were approved as written.

During a discussion of Draft 1 of the Loading Guide, Chuck Johnson expressed a concern over the availability of data to accurately determine the hot spot of the transformer. It was decided that the guide should refer to the hot-spot table in C57.12.01. Tim Holdway agreed to provide this table for reference.

The chairman then asked for other comments on draft 1 by December 15 in order to incorporate them into draft 2. Draft 2 would also combine the open ventilated loading guide with the cast coil loading guide. This draft is to be balloted through the working group in early 1997.

There being no further business, the group adjourned at approximately 9:55 AM.

7.5.2.3 Working Group on Dry-Type General Requirements - Mr. Anthony Jonnatti, Chair - Mr. Timothy Holdway, Secretary

This working group is preparing revisions for "IEEE Standard General Requirements for Dry Type Distribution and Power Transformers, including those with Solid Cast and/or Resin-Encapsulated Windings", C57.12.01-1989.

This working group met on October 28, 1996 at 9.30 a.m. in the Amphitheater of the Sheraton Hotel in Burlington, Vt. Present were 14 members and 13 guests. Seven guests requested membership.

After the introductions, the minutes of the San Francisco meeting were approved and seconded.

The Chairman stated the revision finished last meeting has been held up for a while, but is back at the standards committee, and is ready to be balloted to the Main Transformer Committee. He feels it should go to publication soon after the ballot.

The first topic of discussion was a request from Gene Morehart of Acme, suggesting we add the 600 volt units to this standard. It was decided that we did not want to include specialty transformers and we would consider adding the general purpose transformers to the scope of the standard. The chairman stated we will put this on a future agenda.

The next item of discussion was a handout from the Chairman concerning interrelationships of dielectric insulation levels with BIL's 200 KV and below. The discussion was on whether the hi-pot levels should be related to BIL. Wes Patterson stated hi-pot should be related to system voltage and not BIL. There was also a discussion on what IEC and the Canadian standards say

for this matter. Wes stated we should try to harmonize our standard with the others. The Chairman said he would get together with others and try to put together a more plausible document.

The next topic was on another handout from the Chairman on partial discharge. He stated this handout was based on the Canadian standards. This will be the start of the replacement for the item on partial discharge we just finished. The Chairman proposed we develop the partial discharge test for the complete unit and not just a coil.

Oskar Petersons asked if we could consider a fourth item to look at for the next revision of this standard: a test procedure for energy conservation. He feels we need to look at the inconsistencies in the reference temperatures for no load loss. He suggests we look at what is being done in the liquid area and try to again be consistent with what they are doing.

With no new business, the meeting was adjourned at 10:30 A.M.

7.5.2.4 Working Group on Dry-Type Hot Spot Differentials - Ms. Paulette Payne, Chair

The Working Group met at 8:00 AM in the Diamond II Room of the Sheraton with thirteen (13) members and nineteen (19) guests present.

Two (2) new members were introduced: Jeewan Puri and Dhiru Patel; working group membership is now sixteen (16).

The minutes of the April 16, 1996 meeting were approved as written.

Discussion focused on Draft 1.2 of the "Guide for Determination of Hottest Spot Temperature". Don Kline identified additional effects on hottest spot temperature rise (section 6.2.d), e.g. number of ventilating ducts, size, thickness and spacing. Richard Dudley suggested that encapsulation thickness be added.

It was decided to provide references for modeling techniques to enhance the document rather than include modeling in the Guide, as it would take more time for development and is not within the scope of the Project Authorization Request (PAR) as approved. The scope of the PAR is to describe methodologies for determination of hottest spot temperature. The membership agreed to pursue both testing and analytical techniques. Lin Pierce will provide reference papers for modeling techniques for developing a list of references in the Guide.

Richard Dudley stated he has measured surface temperature of reactors. It was noted that measurement would be more difficult with transformers due to the difference in construction. Richard will provide information on temperature probes applied during testing.

Don Kline suggested we include in the Introduction of the Guide an explanation for why the Guide is being developed and an explanation of the approach taken in developing the methodologies so that the voting body is aware of the Working Group's intentions. Don agreed to prepare a draft of the Introduction.

The aforementioned individuals with assignments agreed to provide the documentation in one month. Jeewan Puri and Dilip Purohit agreed to do a preliminary review of the next draft Guide

before being finalized and sent to the membership for review.

Being no other business, the meeting adjourned at 8:40 a.m.

7.5.2.5 Working Group on Dry-Type Specialty Transformers - P259- Mr. William Simpson, Chair

The Dry-Type Specialty Transformer working group met at 1:20 PM on October 28, 1996 in the Commonwealth meeting room of the Sheraton, Burlington, VT. There were eleven members and six guests present. The following are the highlights of the meeting.

Introductions were made and the minutes of the April 15, 1995 meeting in San Francisco, CA were approved as read.

Draft P259/D2(10/9/96) was circulated to the Dry Type Subcommittee for ballot; 19 affirmative ballots have been received out of 39 issued. The working group agreed that if no negative ballots were received P259/D2 should be circulated to the Main Committee for ballot.

IEC/TC98 "Electrical Insulation Systems" met in April 1996. Comments on IEC Draft Std. 1858 were discussed and the working group prepared a new draft for circulation. This IEC document "Standard Test Procedure for Thermal Evaluation of Electrical Insulation Systems" is related to P259 work and harmonization should proceed through the U.S. national committee.

In other related standards activity, it was noted that there would be an IAG meeting on UL 1446 on November 19, 1996 at UL offices in Northbrook, Illinois.

As there was no new business, the meeting adjourned at 1:45 PM.

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

The Dry-Type Test Code working group met at 8:00 AM on October 28, 1996 in the Kingsland Room of the Sheraton Burlington Hotel in Burlington, Vermont. There were fourteen members and four guests present.

Introductions were made and the minutes of the April 15, 1996 meeting in San Francisco, CA were approved as read.

The chair stated that an error had been noted in the new published revision of C57.12.91: equation 25 on page 47 is incorrect. The IEEE will send out an amendment to the standard.

Oskars Peterson noted that there is no reference temperature given for the correction of no-load losses from ambient conditions. Oskars recommended that a reference temperature be added to the next revision of C57.12.91.

Wayne Hansen discussed power-factor measurements and how the test environment can impact the test results. Wayne stated that he believed the standard was acceptable as written.

The chair stated that another working group is presently preparing hot-spot test methodology and that members of the test code working group were participating in develop of the test method.

As there was no new further new business, the meeting adjourned at 8:20 AM.

7.5.2.7 Working Group on Dry-Type Reactors - C57.16 - Mr. Richard Dudley, Chair

The Dry-Type Air Core Reactor working group met at 2:50 PM on October 28, 1996 in the Diamond I meeting room at the Sheraton Burlington Hotel in Burlington, VT. There were five members and three guests present. The following are the highlights of the meeting.

The attendance list was circulated. The minutes of the San Francisco meeting were approved.

The Chair informed the attendees that, on the recirculation ballot of draft 11 of the C57.16 revision, there were no negative ballots. Therefore, the balloting process was 100% successful. The revision (basically a complete rewrite) of C57.16 is now complete. Draft 11 was sent out to the IEEE for submission to the Standards Board at the November meeting. The chair thanked the working group members for their help in making the revision process a success.

The remainder of the working group meeting was devoted to further discussions of draft 4 of the smoothing reactor standard.

I. Input from manufacturers was requested regarding test methods or calculation of sound levels for oil-immersed and dry type smoothing reactors.

II. As an alternative to a factory short-circuit verification, a field short-circuit test was discussed. However, it was not deemed practical or safe for the HVDC systems as the specified short-circuit level is based on a worst case system scenario; including a failure of protection systems. This type of information will be included in an annex as well as information on test lab short-circuit capability and background material on short-circuit capability calculation methods.

III. Fitness for seismic events will be by calculation and hence it will be called a verification.

IV. An annex will be included on "Insulation Co-ordination Considerations". Some of the information that will be included is co-ordination of insulation levels, dielectric tests in the field, and tests after factory repairs (especially dielectric test levels). Section 12.3.2 will be moved into the annex.

V. A statement will be included in Section 6.6.1 that BIL levels are project specific and that standardized levels are not appropriate as for ac power transformers, etc.

VI. Information on construction and installation for dry type air core smoothing reactors will be included in an annex as much of the data consists of information for or instructions to the end user versus oil immersed smoothing reactors where the information will remain in the main body of the standard as the bulk of the data relates to peripherals supplied with the unit.

VII. Due to the anticipated completion date of the smoothing reactor standard, only metric units will be used.

VIII. Section 5.2.4 "Other Unusual Service Conditions" should include abnormal numbers of line faults and commutation failures.

The chair requested working group members to supply any inputs regarding draft 4 or the above discussions as soon as possible so that he could start work on draft 5.

The meeting adjourned at 4:30 PM.

7.5.2.8 Working Group on Dry-Type Reactors - TF Smoothing Reactors- Mr. Richard Dudley, Chair

Ref.: Dry-Type Air Core Smoothing Reactors - IEEE 1277

The Dry-Type Air Core Smoothing Reactor Task Force met at 8:00 AM on October 28, 1996 in the Willsboro meeting room of the Sheraton Burlington Hotel in Burlington, VT. There were two members and four guests present. The following are the highlights of the meeting:

The attendance list was circulated. The minutes of the previous meeting were approved.

Draft 4 of "General Requirements And Test Code For Dry-Type And Oil-Immersed Smoothing Reactors For D.C. Power Transmission" was discussed. The main points are as follows.

I. A general discussion took place on Allan Forest's suggestion that if multiple coils were used to make up one smoothing reactor, then based on a demonstration of the voltage split under voltage surge conditions, impulse tests could be carried out on separate coils at an appropriate test voltage level. This suggestion was deemed reasonable.

II. Factory sound level tests were discussed. There are no proven test methods to demonstrate operating sound levels. Some options that will be investigated by task force members include:

- A bridge connection using 2 identical smoothing reactors can be used so that the coils can be loaded with rated d.c. plus rated ripple current; one frequency at a time. This method could apply equally to both dry type and oil-immersed smoothing reactors.
- The smoothing reactor can be loaded with current at the major harmonic ripple frequency and at a level to produce in-service sound level. This level can be predetermined by calculation. Potential problems with this approach are core non-linearity problems in the case of oil-immersed smoothing reactors and eddy heating in the case of dry type smoothing reactors. Power supply requirements will need to be evaluated.

III. Sound level tests at the site were discussed. Can meaningful results be obtained? Some guidelines regarding site sound level measurements could be included in an annex.

IV. Q factor should be measured at the main ripple harmonic frequencies.

V. It is important to limit the amount of overshoot on the lightning impulse test. References to other standards or guides will be included.

VI. The short-circuit test was discussed. Since previous input showed that major test laboratories cannot achieve rated short-circuit levels for large smoothing reactors, then proof of performance by calculation was the only valid option. Consequently, the descriptor should be "short circuit verification". Fred Elliot stated this was consistent with the practice for high power transformers and that in IEC, equal credibility would be given

to performing the short-circuit test and verification by calculation provided the calculation was supported by reference to short-circuit tests previously performed on equipment of similar design.

VII. With the widespread use of digital impulse test systems, the "modified turn to turn test" should be designated as "other". Test acceptance criteria should be documented for digital test systems. Guidance will be sought from the Dielectric Tests subcommittee.

VIII. In draft 5 of the standard, test code and other background information will be differentiated regarding oil-immersed and dry type smoothing reactors.

IX. It was decided that no equivalent kVA lower limit had to be set in the since the title and scope were very specific: smoothing reactors for d.c. transmission.

The chair stated that he would prepare draft 5 prior to the meeting in Graz, Austria. The meeting adjourned at 9:15 AM.

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
SUBCOMMITTE CHAIR: PHONE:·	DRY-TYPE TRANSFORMERS W. PATTERSON (919)848-1860				
C57.12.01 NONE	GENERAL REQUIREMENTS FOR DRY-TYPE DIST. AND POWER TR INCL THOSE WITH SOLID CAST &/or RESIN-ENCAPSULATED WINDINGS	JONATTI A. (813)442-0414		2/2/89 9/28/82 1996	PAR EXTENDED TO DEC 96
C57.12.50 NONE	REQ. FOR VENTILATED DRY-TYPE DISTRIBUTION TR, 1-500kVA, 1 PHASE, AND 15-500kVA, 3-PHASE HV 601-34500VOLTS,LV 120-600V	PATTERSON W. (919)848-1860		6/12/89 1994	COPYRIGHT NOT RELEASED BALLOT REAFFIRMATION
C57.12.51 NONE	REQ. FOR VENTILATED DRY-TYPE POWER TR, 501kVA & LARGER, 3 PHASE. WITH HV 601-34500V, LV 208Y/120 TO 4160 VOLTS	PATTERSON W. (919)848-1860		6/12/89 1994	COPYRIGHT NOT RELEASED BALLOT REAFFIRMATION
C57.12.52 NONE	REQ. FOR SEALED DRY-TYPE POWER TRANSFORMERS, 501kVA & LARGER, 3 PHASE, WITH HV 601-34500V,LV 208Y/120 TO 4160 VOLTS	PATTERSON W. (919)848-1860		6/12/89 1994	COPYRIGHT NOT RELEASED BALLOT REAFFIRMATION
C57.12.55 NONE	CONFORMANCE STANDARD FOR TR- DRY-TYPE TRANSFORMERS USED IN UNIT INSTALLATIONS, INCL. UNIT SUBSTATIONS	PATTERSON W. (919)848-1860		4/7/86 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	PROVOST R. L. (302)999-2225		8/27/84 1995	TO BE PUBLISHED ANSI APPROVED 01/04/94
C57.12.58 P745	GUIDE FOR CONDUCTING TRANSIENT VOLTAGE ANALYSIS OF A DRY-TYPE TRANSFORMER COIL	KLINE A. D. (404)762-1642	IEC IAS	6/27/91 6/28/78 2001	REAFFIRMED 9/19/96
C57.12.59 NONE	GUIDE FOR DRY-TYPE TRANSFORMER THROUGH-FAULT CURRENT DURATION	PATTERSON W. (919)848-1860		1/1/89 9/13/84 1996	EXTENDED 12/1996 ASK FOR PAR EXTENSION

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
C57.12.60 PC57.12.60	TEST PROCEDURES FOR THERMAL EVALUATION OF INSULATION SYSTEMS FOR SOLID-CAST & RESIN ENCAP POWER & DIST TRANSFORMER	PROVOST R. L. (302)999-2225	IAS NEMA IEC	10/25/92 8/17/89 1994	APPROVED BY SB 10/25/92 BEING BALLOTTED IN C57
C57.12.91 PC57.12.91	TEST CODE FOR DRY-TYPE DISTRIBUTION AND POWER TRANSFORMERS	BARNARD D. (919)738-4251	SPD EM	6/14/95 2000	
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	9/19/58 12/11/95 1976	BALLOTED FOR RECIRCULATION
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 BALLOTTING 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 5/6/91 1996	PAR WITHDRAWN SUBMIT NEW PAR
C57.99 P731	GUIDE FOR LOADING DRY-TYPE AND OIL-IMMERSED CURRENT-LIMITING REACTORS	DUDLEY R. (416) 298-8108		3/28/78 1990	NEEDS REVISION (PAR TOO OLD) PAR WITHDRAWN

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
IEEE 259 P259	TEST PROCEDURE FOR EVALUATION OF SYSTEMS OF INSULATION FOR SPECIALTY TRANSFORMERS	SIMPSON R. W. JR. (603)284-4362		6/22/72 3/21/96 1979	PAR APPROVED 03/21/96
SUBCOMMITTE	**HVDC CONVERTER TR & REACTOR**				
CHAIR:	**W. N. KENNEDY**				
PHONE:	**(317)286-9387**				
C57.129 PC57.129	GENERAL REQUIREMENTS & TEST CODE FOR OIL-IMMERSED HVDC CONVERTER TRANSFORMERS AND SMOOTHING REACTORS FOR DC POWER	KENNEDY W. N. (317)286-9387	EM SUB T&D PSIM	9/26/91 0	PAR EXTENDED TO JUNE 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 JUNE 1997

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

The subcommittee met at 10:55 a.m. in the Willsboro Room of the Sheraton, Burlington Conference Center in Burlington, Vermont. There were 6 members and 3 guests present. The following are the highlights:

1. The attendance list was circulated.
2. The minutes of the San Francisco meeting were accepted.
3. Wally Binder informed the subcommittee about new procedures for standards work.
4. Richard Dudley informed the subcommittee of Bill Kennedy's intention to submit the converter transformer standard for recirculation ballot once he had completed changes to bring the polarity reversal test in line with the IEC standard.
5. Subcommittee members were in agreement regarding the polarity reversal test but felt that loss measurement and calculation methodology in the IEC standard was not as stringent as that in the draft IEEE standard for converter transformers and hence the IEEE method should be kept in the draft sent for recirculation ballot.
6. Draft #4 of the HVDC SMR standard was discussed. The main points are as follows:

   a) Sound level determination was discussed. Converter transformers and smoothing reactors are two of the main sources of noise in a converter station. Factory measurement of sound level is a challenge especially in terms of obtaining values that are representative of the installed conditions. Some factory test options for SMRs are the use of a bridge circuit which allows testing with d.c. plus a major triple harmonic or testing with an equivalent harmonic current.

      Manufacturers of both oil immersed and dry type SMRs were requested to carry out assessments and trials and report back to the chairman. If alternative test methods cannot be adequately defined then they may have to be included in a Normative Annex vs. the main text of the standard.

   b) Measurement of sound level of SMRs at site was discussed. There are a number of difficulties. They include clearances due to high voltage, the presence of other equipment, the height above ground of dry type SMRs, etc. A site verification measurement may be late in a project's time frame in terms of demonstrating that contractual requirements are met.

   c) Since the performance of a short circuit test at meaningful current level is not possible the requirement will be labeled as a short circuit verification and will be proven by calculation. Reference to short circuit tests on smaller units and a correlation with strength of materials will be used to validate the calculations. Background information regarding test lab capabilities or calculation method will be included an Annex.

   d) Some subcommittee members felt the short circuit test or verification was not needed since from a systems point of view the magnitude and duration has not historically been a problem for SMRs used on past projects. As a minimum the short circuit

requirements for SMRs will be put into proper perspective in the introduction of the section dealing with short circuit capability verification.

The subcommittee adjourned at 12:00 p.m. The chairman stated that discussions regarding the HVDC SMR standard would continue at the meeting of the Dry Type Reactor Working Group commencing at 2:50 p.m. The chairman's objective is to prepare Draft #5 for the Graz meeting.

Minutes submitted by: Richard F. Dudley

STANDARD / PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION		PUB DATE / PAR DATE / REV DUE	STATUS AND COMMENTS
SUBCOMMITTE	**HVDC CONVERTER TR & REACTOR**					
CHAIR:	**W. N. KENNEDY**					
PHONE:	**(317)286-9387**					
C57.129	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	SUB	9/26/91 0	PAR EXTENDED TO JUNE 97
PC57.129						
IEEE1277	GENERAL REQUIREMENTS & TEST CODE FOR OIL-IMMERSED AND DRY-TYPE HVDC SMOOTHING REACTORS	(317)286-9387	SUB		9/25/91 0	PAR EXTENDED TO JUNE 1997
P1277						

7.7 Instrument Transformers - J. E. Smith, Chair

7.7.1 Chair's Remarks & Announcements

The subcommittee met on October 29, 1996 with 10 members and guests present.

The Chairman requested that the 3 WG Chairmen poll their membership and determine whether meeting rooms will be required at the meeting in Austria.

They are to report back to J. Smith by Nov. 29, 1996.

The minutes of the April 16, 1996 meeting were approved as written.

The Transformers Committee Secretary, B. Patel, has requested that the Subcommittee minutes be submitted within 45 days of the meeting. The I.T. Subcommittee Secretary, R. McTaggart, therefore requested that the WG minutes be submitted to him within 30 days.

7.7.2 Under old business, the following items were discussed:

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' have both received a unanimous vote for reaffirmation.

The balloting of C57.13.2 'Conformance Testing Procedures for Instrument Transformers' produced 2 negative votes, primarily because it was felt that no-one is using it and therefore it is not needed. It was agreed to re-affirm it for now and to re-evaluate it at a later date.

Partial Discharge Testing Guide / Standards issues were discussed. The PAR for proposed Guide P832/65 has expired and before a new one can be issued, justification must be provided for not adopting IEC 270. Concerns were expressed over loss of control and the difficulty of making revisions if IEC were adopted. It was agreed to poll other C57 Subcommittees to determine whether they are leaning towards adopting IEC standards for P.D. measurement.

The Chairman has provided CIGRE Working Group 12.16 with the requested US Test Requirements, along with the reasons for the differences from IEC Standards (developed by J. Ma, V. Raff, and P. Riffon).

No comments were received from the I.T. Subcommittee membership regarding the request from the Bushing Subcommittee C57.12.00 (re. shielding of current transformers in the bushing pocket) . The request will be re-sent to the membership.

7.7.3 Under new business, the following items were discussed:

It had been suggested by a V. Raff that a report sponsored by the Power Systems Relaying Committee entitled 'Transient Response of Current Transformers' (76 CH 1130-4 PWR) be included as part of C57.13. Because he was not at this meeting, he will be asked to provide reasons for this request. The attendees did not anticipate sufficient demand for Transient Performance C.T.'s in North America to justify its inclusion. IEC 44-6 was suggested as an alternative and copies provided for interested members.

A report was given by A Jonatti on the activities of IEC TC 38:

A copy of C57.13 has been submitted for comparison, at their request. No feedback has been received yet.

IEC 185 and IEC 186 are about to be replaced by IEC 44-1 and IEC 44-2.

The following WG's reported on their activities at the Burlington meeting:

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

October 28, 1996 PM Session

A total of thirteen people attended the session.

The comments prepared by members Riffon, Raff and Ma on The CIGRE paper entitled "State of the Art of Instrument Transformers - Design Aspects" and its accompanying paper "Tests on I.T." was discussed.

The routine Sealing Test proposal was discussed without any change.

Limits for treated mineral oil as provided in the Table of IEEE Std C57.106.1991 were accepted to be included in to the test guide.

The proposed DGA (Dissolved Gas in Oil) criteria were to be checked and reviewed for the next meeting.

Oct. 29, 1996 AM Session

A total sixteen people attended the morning session.

The chair of the WG believed that the complete draft would be made available in 12 months.

The pre-draft document was discussed. The major change is to delete the routine partial discharge test table.

7.7.5 Working Group on C57.13 Revision - Tom Nelson

The working group met at 9:30 am on October 29, 1996. There were 13 members and 5 guests present.

The topics discussed were:

- Definition of K class: V. Khalin provided a proposed draft - to be distributed to the WG members for comment
- A tolerance of +/- 5% on burden accuracy was discussed - to be discussed further at the next meeting
- Changes to tables 10 through 14 proposed by J. Smith will be distributed to the WG members for comment

- Changes to tables 2 and 3 proposed by V. Raff will be distributed to the WG members for comment
- Working group members were given the opportunity to submit proposed changes to the present standard for distribution to the members before the next meeting
- Comments on the distributed documents should be sent to the WG chairman for distribution to the other WG members

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

OLD BUSINESS

Approval of minutes, San Francisco, CA

NEW BUSINESS

In an effort to move forward, Chairperson re-circulated 0.15 accuracy class proposal and background survey material about electronic metering burdens. The group was asked if, since the original proposal last year, there were any other proposals or objections. J. Smith proposed the addition of smaller burdens for both metering and relaying which would have power factors of unity. There was group discussion and general agreement for the following CT burdens:

BURDEN*	PF	VA @5A	RELAY	COMMENTS
E0.2	1.0	5 VA	20V	SIMILAR TO B0.2, BUT PF=1 vs 0.9
E0.02	1.0	1 VA	4V	1/5 OF PRESENT B0.1 BUT PF=1
				ESSENTIALLY "NO LOAD" CT BURDEN

(* PROPOSED)

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
SUBCOMMITTE CHAIR: PHONE:	INSTRUMENT TRANSFORMERS J. E. SMITH (919)827-3220				
C57.13 P546	REQUIREMENTS FOR INSTRUMENT TRANSFORMERS	NELSON T. (301)975-2956	PSIM PSR SPD	3/30/94 6/14/94 1999	WORKING ON CHANGES REV. PAR APPROVED 06/14/94
C57.13.1 PSRC	GUIDE FOR FIELD TESTING OF RELAYING CURRENT TRANSFORMERS	SMITH J. E. (919-827-2121		8/25/87 1997	R1992 RELAY COMM. DOCUMENT
C57.13.2 NONE	CONFORMANCE TEST PROCEDURES FOR INSTRUMENT TRANSFORMERS	SMITH J. E. (919-827-2121		4/16/86 9/26/91 1996	REVISE OR REAFF. BY DEC 96 REQUEST PAR EXT. TO JUNE 97
C57.13.3 NONE	GUIDE FOR THE GROUNDING OF INSTRUMENT TR SECONDARY CICUITS AND CASES	SMITH J. E. (919-827-2121		1/23/87 1995	REVISE OR REAF. BY 12/96 R1990
C57.13.4 P832	DETECTION OF PARTIAL DISCHARGE AND MEASUREMENT OF APPARENT CHARGE WITHIN INSTRUMENT TRANSFORMERS	JONNATTI A. J. (813)785-2788	T&D	5/28/80 0	PAR WITHDRAWN DOCUMENT NEVER SUBMITTED TO SB
C57.13.5 PC57.13.5	TEST REQUIREMENTS FOR INSTRUMENT TRANSFORMERS OF A NOMINAL VOLTAGE OF 115KV AND ABOVE	MA J. (706)554-8800	SWGR EM TC 38 US T	9/19/96 0	REVISED PAR APPROVED 9/19/96
C57.13.6 PC57.13.6	REQUIREMENTS FOR INSTRUMENT TRANSFORMERS FOR USE WITH ELECTRONIC REVENUE METERS AND RELAYS	TEN-HAAGEN C. W (603)749-8433	PSIM PSC PSR TD		REVISED PAR DISSAPROVED 9/96 MAKE CHANGES AND RESUBMIT PAR

7.8 Insulating Fluids - F. J. Gryszkiewicz

The Insulating Fluids Subcommittee met in Burlington, VT on Monday and Tuesday, October 28 and 29, 1996 with 34 members and 35 guests in attendance. Two of the guests requested membership on the Subcommittee, bringing total membership to 76. Due to a business trip abroad, Subcommittee Chairman Frank Gryszkiewicz was not able to attend this meeting. Subcommittee Secretary Gene Kallaur conducted the meetings in his place.

The minutes of the April 15 - 16, 1996 meeting in San Francisco, CA 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

The Insulating Fluids Subcommittee met on Monday, October 28 to discuss this item of business. Prior to the San Francisco meeting, Draft 10 of this document was balloted at the Main Committee. The ballot resulted in 12 negative votes. Due to time constraints, W.G. Chairman Frank Heinrichs did not contact the negative balloters. However, he has developed suggested changes to the document which should resolve all negatives. These changes were discussed at the meeting, and will be incorporated into Draft 11. Draft 11 will be re-balloted at the Main Committee level prior to the next meeting in Graz, Austria.

7.8.1.2 Reaffirmation of C57.104 - IEEE Guide for the Interpretation of Gases Generated in Oil-Immersed Transformers

The Insulating Fluids Subcommittee met on Monday, October 28 to discuss this item of business. WG Chairman Frank Heinrichs had sent out letters requesting suggestions for changes to the Standard to the WG. Of the five WG members, only one response was received. Additional membership to the WG was requested, and six attendees volunteered to join. Chairman Heinrichs will send a survey letter to all Subcommittee members requesting input for revisions required to this Standard. Since the PAR for this project expires in two years, this timeframe was established as a target for completion of all work.

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

The Insulating Fluids Subcommittee met on Monday, October 28 to discuss this item of business. WG Chairman Jim Goudie reported that Draft 8 of this document was balloted at the Main Committee level in the Spring of 1996. The ballot failed, being 9 ballots short of the required 75% return. Of the returned ballots, only one negative was cast. The negative ballot has not yet been returned to the Subcommittee, so the nature of its contents is not known at this time. IEEE will be contacted to get this information. Several comments were received on form and style. The document will be re-drafted into currently accepted format, the negative vote resolved, and then the document will be re-balloted as Draft 9 at the Main Committee level. WG Chairman Goudie requests help from all Committee members in returning their ballots for Draft 9 in a timely fashion.

7.8.1.4 Guide for the Interpretation of Gases Generated in Load Tap Changers

The Insulating Fluids Subcommittee met on Tuesday, October 29 to discuss this item of business. This WG was established to initially investigate the need and interest in the development of such a guide, and currently has five members. Three additional attendees joined the WG at this meeting. WG Chairman Rich Youngblood conducted a discussion on the immediate direction for the WG to take. It was agreed that a questionnaire on the topic would be developed and sent to the Main Committee. The results of this questionnaire would be used to determine the degree of interest in such a guide, as well as defining its scope. If the results of the questionnaire warrant it, a request for a PAR will be developed.

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

The Insulating Fluids Subcommittee met on Tuesday, October 29 to discuss this item of business. Draft 2 of the guide was successfully balloted at the Main Committee level. This ballot resulted in no negatives and several editorial comments. WG Chairman Patrick McShane incorporated all comments, and discussed the proposed Draft 3 at the meeting. A motion was made to submit Draft 3 for balloting to the Main Committee. The motion was seconded and passed unanimously.

7.8.1.6 Reaffirmation of C57.106 - IEEE Guide for Acceptance and Maintenance of Insulating Oil in Equipment

WG Chairman Joe Kelly was not able to attend the Burlington meeting due to a conflicting ASTM D27 meeting. Therefore, no meeting of the WG was held. However, one new member was added to the WG roster.

7.8.2 New Business

Patrick McShane suggested that we consider the adoption of the IEC standard for polyesters (synthetic dielectric fluids), and that the IEC adopt our C57.121 on Less Flammable Hydrocarbon Fluids. This matter will be discussed with Subcommittee Chairman Gryszkiewicz upon his return from abroad.

This concluded the business of the Insulating Fluids Subcommittee at this session. The Subcommittee will next meet in Graz, Austria.

Eugene Kallaur, Secretary

for

Frank J. Gryszkiewicz, Chairman

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
SUBCOMMITTE CHAIR: PHONE:	INSULATING FLUIDS F. GRYSZKIEWICZ (617)926-4900				
C57.104 PC57.104	GUIDE FOR THE DETECTION AND DETERMINATION OF GENERATED GAS IN OIL-IMMERSED TRANSFORMERS & THEIR RELATION	HEINRICHS F. W. (412)941-6924	PSR T&D	6/7/92 5/31/90 1996	REVISE OR REAFF. BY DEC 96 PAR SUBMITTED FOR APPROVAL 10/96
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 OR REAFF. BY DEC 96 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 IEC 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 IEC T&D IAS	2/22/88 3/21/96 1996	PAR APPROVED 03/21/96
C57.130 PC57.130	T-U GUIDE FOR USE OF DISS. GAS ANALYSIS DURING FACTORY THERMAL TESTSFOR THE EVALUATION OF OIL-IMMERSED TRANS. AND	HEINRICHS 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 ASKARELS	(617)926-4900	EIS IAC T&D	11/17/86 9/27/79 1997	REAFFIRMED 03/18/92

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
IEEE1258 P1258	TRIAL-USE GUIDE FOR INTERPRETATION OF GASES GENERATED IN SILICONE-IMMERSED TRANSFORMERS	GRYSZKIEWICZ I. (617)926-4900	T&D ICC	6/15/95 0	

7.9 Insulation Life - L. W. Pierce

The Insulation Life Subcommittee met on Tuesday, October 29, 1996 with 24 members and 36 guests in attendance. The minutes of the April 16, 1996 in San Francisco 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 Monday Oct. 28, 1996 at 8:00 AM with 16 members and 24 guests present. The minutes of the April meeting in San Francisco were approved as written. In response to a request during the last meeting, Bob Del Vecchio and Pierre Feghali provided an excellent tutorial paper, "Calculation of the Average Oil temperature in a Power Transformer".

A Ballot of Draft 4 was mailed to the Task Force in September. 11 of the 43 ballots were returned with one negative. Comments from the returned ballots and comments from those present were reviewed. Many of the comments were editorial and were accepted. However several comments were rejected. One comment rejected was to add to the various lists of examples of transformer components that are subject to additional heating.

A new section to elaborate on the calculation of oil temperatures was included in Draft 4. After discussion, it was decided that this section needs to be rewritten to conform with the style of the other portions. This will be combined into the next draft.

After extensive discussion it was concluded that the statement about extra heating in an area with stagnant oil should be strengthened by separating it from the discussion of restrictions in oil flow paths.

The basis for the negative ballot submitted by Subhash Tuli was that the calculation method is too detailed, and the test method too expensive, therefore, another simpler calculation method such as that in IEC is needed. To support his request he tabulated a comparison of measured versus calculated temperatures. During discussion comments supporting this were:

- A manufacturer that doesn't have a sophisticated computer program, or experience with hot spot temperature measurements will find these requirements impossible to meet.
- The multiplier for the winding gradient provides a lower limit for the hot spot differential.
- A simple calculation method could be used by both the manufacturer and the user, while the calculation method now specified can only be done by the manufacturer.

The Chair pointed out that last year at the Boston meeting the Task Force specifically voted to remove the IEC calculation method from the draft because, "the multiplier to be used is specific to the transformer design, and it is highly unlikely that the Task Force would be able to develop an acceptable procedure." The Task Force voted 22 to 5 to continue without the IEC method.

A revised draft will be sent to the Task Force, Working Group, and Insulation Life Subcommittee before the end of the year.

7.9.2 Working Group on High Temperature Insulation for Liquid-Immersed Power Transformers. Michael A. Franchek, Chairman, Roger C. Wicks, Acting Secretary.

The Working Group met at 9:30 AM on October 28, 1996 with 21 members and 20 guests present with 1 guest requesting membership. After introductions, the minutes of the April 15, 1996 meeting were approved as written.

The Chairman gave a brief review of the status of the document, including the changes made to make up Draft 5.2, The Chairman then read the comments from the IEEE Standards Editor following a review of the document. The comments noted that the document met the basic editorial requirements as stated in the 1994 Style Manual. The Chairman noted that there will be a new Style Manual in 1997, but that this document will be grandfathered under the 1994 Style Manual. The Editor suggested that the Working Group evaluate the Clauses 6 through 10 in the Draft Trial Use Guide to see if any of the material belonged in the Annex rather than in the body of the document.

Each of the Clauses 6 through 10 were discussed individually in the meeting, and the Working Group voted to retain Clauses 6 through 9 within the body of the document, and to move Clause 10, Gas Analysis, to become part of the Normative Annex A which also deals with gas Analysis of transformers insulated with high temperature insulation.

During these discussions, a couple of editorial comments were pointed out, as follows:

The éhc that is mentioned in Section 8 (as well as Section 5.2 - Table 1) should be changed to éhk since the lettering for cellulose was changed from "C" to "K".

Annex A should be correctly identified as a normative annex as part of the title.

The Chairman then discussed the next steps in the process of creating a ballot pool and balloting Draft 6.0 to the main Transformers Committee and the ballot pool. The Chairman is working with Tom Traub to get this ballot pool developed as soon as possible. The document was omitted from the last ballot pool listing due to the revision of the Working Group's PAR in March 1996.

For old business, The Chairman then thanked the members for submitting DGA results for transformers insulated with high temperature insulation. The information is being used to make up two tables in the Annex (Tables A1 and A2). the Chairman requested that additional DGA results be sent to him soon for incorporation into Draft 6.0.

7.9.3 Task Force on Definition of Thermal Duplicate-Barry Beaster Chairman

The Task Force met on Monday, October 28, 1996 with 13 members and 24 guests attending. Requesting membership to the Task Force were Tim Huff of Kuhlman Electric and Jerry Corkran of Cooper Power Systems. This brings the present membership to 22 members.

As an action item identified in the minutes of the San Francisco meeting, sample calculations were requested to test the equations being proposed. Chairman Barry Beaster presented calculations

for the variation in oil and winding gradient rises with losses for an OA/FOA/FOA transformer. The analysis showed that the mean oil and winding gradient rises can be adjusted by applying proper exponents to a power curve of total losses. Calculations for both the OA and FOA cooling modes were presented.

Another set of calculations was presented to show the effect of changing the effective cooling surface area by changing the number of radiators. Similar power curves for oil and winding gradient rises were demonstrated. Other members will prepare similar calculations for comparison of results.

An update of C57.12.80 is under way and the definition of thermal duplicated is included. The Task Force reviewed the definition and a voice vote in the affirmative was made to adopt the definition without change. This definition is as follows:

> "Thermal Duplicate: A transformer whose thermal design characteristics are identical to a design previously tested, or whose differences in thermal characteristics are within agreed upon variations, such that the thermal performance of the thermal duplicate transformer shall comply with performance guarantees established by standards or specifications."

A suggestion was offered by Linden Pierce to revise the draft to include this proposed definition of thermal duplicate and the revision to Table 17 of C57.12.00 and to include the detailed criteria and equations in a separate guide or as a normative Annex. This approach was approved by voice vote and the revised document will be balloted by the Task Force, the Working Group on Thermal Tests and the Insulation Life Subcommittee.

7.9.4 Task Force on Revision of Temperature Test Code (Section 11 of C57.12.90) - George Henry Chairman

This Task Force did not meet. A new draft is being prepared by George Henry for ballot before the next meeting.

7.9.5 Working Group on Thermal Evaluation of Liquid Immersed Power & Distribution Transformers. Larry Lowdermilk, Chairman.

This Working Group did not meet. A draft has been submitted to IEEE for balloting of the Balloting Group. Since the original PAR expired a new PAR was submitted and will be considered at the December meeting. If the PAR is approved the document will be balloted.

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

The Working Group on Thermal Tests met at 4:15 P.M. on Monday, October 28, 1996 with 18 members and 14 guests in attendance. Two of the guests have requested membership and are welcomed to the Working Group. These new members are Stephen Foss, Underground Systems, Inc. and Tim Huff of Kuhlman Electric Corp.

After the normal introductions, the minutes of the previous meeting in San Francisco were approved as mailed. The majority of the rest of the meeting consisted of a review and discussion of PC57.119, "Recommended Practice for Performing Temperature Rise Tests on Oil Immersed Power Transformers at Loads Beyond Nameplate Ratings".

After resolutions of the negative ballots on Draft 13.0 and a discussion of Draft 13.1 at the last meeting, Chairman Bob Grubb incorporated the comments into Draft 13.2, which has recently been sent to the IEEE Standards Board for balloting. An earlier draft had been successfully balloted in the Transformers Committee however when submitted to the Standards Board the format was rejected and a major rewrite was necessary to meet the present style guidelines. During the rewrite some additional corrections were found to be necessary for accuracy, and additional drafts were prepared and reviewed by the Working Group. Because of the many changes it was decided to reballot the current draft of the document. The current draft has been submitted to the IEEE Standards Balloting Service and the ballot should be conducted shortly; and hopefully this document will be on track for approval and publication.

New Business was as follows:

1) The Working Group membership will be reduced to those members who actively participate, specifically by response to ballots. Individuals will be removed from the roster if they have not attended any of the last three meetings, and have not responded to any Working group ballots in that timeframe.

2) A question was raised from the floor on whether a method was established to allow calculation of thermal performance when thermal testing can not be done at the rating specified.

Specifically, the questioner asked whether the test could be done at a lower rating with some of the cooling not in use, followed by calculations of thermal performance at the specified ratings. The Chairman pointed out that shutting off or otherwise modifying some of the cooling changed the thermal characteristics of the transformer, and calculations using the equations of the recommended practice under these conditions would not be accurate. Linden Pierce stated that a tolerance on losses of 20 % and a temperature rise adjustment was allowed by C57.12.90.

7.9.7 New Business

V.S. N. Sankar presented a problem with the time constant of simulated winding temperature indicators being longer than the time constant of the winding. This caused a problem of late starting of fans and pumps on units experiencing overloads shortly after startup. A Task Force was appointed to review the present IEEE standards for these devices and make recommendations for changes in the functional requirements. Initially this Task Force will conduct its business by correspondence. Task force members are V.S. N. Sankar (Chairman), R. M. Del Vecchio, M. F. Barnes, S. C. Tuli, F. N. Weffer, Stephen Foss, Gordon Denny, A. C. Hall, Joe Foldi, and Mike Lau.

Subhash Tuli asked a question about proposals to measure bottom oil during thermal tests. Procedures are being incorporated into the revision of Test Code C57.12.90 by George Henry.

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

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION		PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
SUBCOMMITTE	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	NPE	SPD	3/18/92	PAR SUBMITTED FOR APPROVAL 10/96
C57.100		(704)462-3113	EM		10/20/88	
			T&D		1997	
C57.115	GUIDE FOR LOADING MINERAL-OIL-IMMERSED POWER TRANSFORMERS RATED IN EXCESS OF 100MVA (65 C WINDING RISE)	PIERCE L. W.			3/21/91	STANDARD WITHDRAWN, COMBINED WITH C57.91
P756		(706)291-3166				
C57.119	RECOMMENDED PRACTICE FOR PERFORMING TEMP. RISE TESTS ON OIL-IMMERSED POWER TRANSFORMER AT LOADS BEYOND NP RATING	GRUBB R. L.	SWGR	PSRC		
P838		(414)547-0121	SUBS	IAS	9/17/92	APPLY FOR NEW PAR
			SCC4	EI	0	
C57.12.00	DEFINITION OF THERMAL DUPLICATE	GRUBB R. L.	EM	PESC		PAR WITHDRAWN
PC57.12.001		(414)547-0121	IAS		5/31/90	WORK INCLUDED IN C57.12.00
			I&CPS		1997	
C57.12.90	STANDARD TEST CODE FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS	HENRY G.				WILL START REVISING SECT. 11
NEW		(501)534-5332			1998	
C57.12.90	REVISION OF TEMPERATURE RISE TESTS	HENRY G.				TO BALLOT D3 IN TF, WG, SC
PC57.12.90		(501)543-6546				
C57.91	GUIDE FOR LOADING MINERAL OIL-IMMERSED TRANSFORMERS	PIERCE L.	SUB		6/14/95	
PC57.91		(706)291-3166	T&D		6/13/85	APPLY FOR NEW PAR
			PSE		2000	
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.	T&D		3/21/91	STANDARD WITHDRAWN, COMBINED WITH C57.91
PC57.92		(706)291-3166	SUB			
			PSE			

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
C57.95 NONE	GUIDE FOR LOADING LIQUID-IMMERSED STEP-VOLTAGE AND INDUCTION-VOLTAGE REGULATORS	(314)554-3097		3/21/91 1996	NO WORK IN PROGRESS BALLOT FOR REAF. REQUESTED
IEEE1276 P1276	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	PAR APPROVED 03/21/96

7.10 Performance Characteristics - H. Jin Sim

7.10.1 Introduction/Attendance

The Performance Characteristics Subcommittee (PCS) met at 9:30 a.m. on Tuesday, October 29, 1996, with 58 members and 50 guests attending. This is a new record. Previous record was 106 attendance in San Francisco meeting.

7.10.2 Approval of Meeting Minutes

The minutes of the April 16, 1996, PCS Meeting in San Francisco, CA 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 October 28,1996 Administrative Subcommittee meeting were highlighted as follows:

1. Bill Henning has resigned as the WG Chair for Loss Measurement and Tolerance and Ramsis Girgis will assume the chairmanship of the WG. Tom Traub has resigned as the WG Chair for LTC Performance Requirements and Bill Henning will assume the chairmanship of this WG. Starting with next project, WG for PCS revision to C57.12.90 will be chaired by P. Feghali.
2. The next Transformers Committee meeting will be held in Graz, Austria, hosted by Ed Trummer, the week before IEEE/PES Summer Power Meeting in Berlin, Germany. All members are encouraged to attend both of these and pick-up necessary information at the registration desk.
3. All WG chairs are strongly recommended to become a full committee member.

7.10.3.2 Membership

New Members, Lawrence Kirchner (R.E. Uptegraff), Ed Cromer (Tri-State G&T association), and Francois Ruelland (Ferranti-Packard Transformers) were added to the roster. Membership now stands at 98.

7.10.4 Agenda Changes

Added one old business item and three new business items as described later.

7.10.5 Working Group Reports

7.10.5.1 Revisions to C57.12.90 - H. J. Sim

C57.133 Guide for Short Circuit Testing - Nigel McQuin

The WG on Performance Characteristics Subcommittee Revision of C57.12.90 and WG for Guide for Short Circuit Testing met on Monday, October 28, 1996, at 9:30 am with 49 members and guests attending.

The chair reported that the new revision of the test code C57.12.90 will not have the Part II Guide for Short-Circuit Testing of Distribution and Power Transformers. This part will be a separate Guide with C57.133. The WG for PCS revisions to C57.12.90 will have a new chair, P. Feghali of North American Transformers, starting with the next project.

Next WG, C57.133 Guide for Short-Circuit Testing of Distribution and Power Transformers had some progress to report. The chair Nigel McQuin could not attend the meeting and Jin Sim conducted the meeting. Jin Sim stressed the need for getting the document processed as fast as we can so that the industry will continue to have a guide. The Draft 1 has been circulated to the WG members and comments were received and discussed as follows.

Jin Sim stated that the Draft 1 is basically same as the current Guide Part II except major revision has been made to LVI section. He also stressed the fact that there are several other major issues which need to be worked on immediately following the publication of the Guide. These include adding maximum impedance changes as a part of pass/fail criteria and Frequency Response Analysis to be added as a new terminal measurement.

Jerry Corkran reviewed his comments on the draft 1. He wanted to harmonize our guide with IEC guide as best as we can. In addition to several editorial comments, Jerry stated that the LVI is most useful for round coils and not for rectangular coils. This point was discussed and Jin Sim pointed out that the LVI is used to determine the extent of the visual inspection as the pass/fail criterion in the current test code only requires to have dielectric tests and visual inspection performed after short-circuit testing.

B. Poulin pointed out that the guide should be upgraded to a recommended practice since the content is much closer to a recommended practice. WG members and guests agreed with him and the chair McQuin will need to revise the PAR to accommodate this. (PCS Chair's note: The WG Chair Nigel McQuin does not recommend PAR change, noting the need for getting the existing guide out as soon as possible. WG chair has been advised to proceed with the current PAR and write a letter to all WG members before next meeting.)

After the meeting, the following individuals volunteered to be members of the C57.133.

Eddy So of NRC Canada, Joe Watson of ZTR USA, Peter Iijima of BPA, John Crouse of General Electric, B. Poulin of NAT, Enrique Betancourt of GE Prolec, and Joe Foldi of ABB Canada. With this new addition, we now have 10 WG members.

The meeting adjourned at 10:45 am.

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 2:50 P.M., October 28, 1996 in the Emerald Ballroom I at the Sheraton Burlington Hotel Conference Center,

Burlington, Vermont. There were 23 members and 19 guests present. Subhas Sarkar requested membership in the Working Group.

The minutes of the San Francisco meeting were approved with no comments.

The Chair then reviewed the September 19 approval of the revised PAR by the IEEE Standards Board. It was noted that the Power Systems Engineering group of the Industry Applications Society was added to the list of groups which have requested coordination. It was noted that for reference, the other coordination groups are: the T&D Committee, the PSR Committee, NEMA and PSIM.

The Chair reported the results of the Summer Working Group ballots. Ballot 1 was "Terminology correction and clarification" and Ballot 2 concerned the addition of a "K-factor clarification informative annex". The following table summarizes the results of the 38 ballots sent out:

	Ballot 1		Ballot 2	
Response	28	74%	27	71%
Affirmative	23	82%	22	81%
Abstain	1	4%	1	4%
Negative	4	14%	3	15%

Max Cambre voted negative with comments that could result in substantial changes. His comments concerned the form of the equations defining FHL and his concern that the equations were not developed in sufficient detail. A negative vote from James Deffenbaugh reflected a similar concern. However, they both agreed it would be best to include the material in draft 4, considering the generally affirmative response. The ballot on draft 4 was mailed to the Working Group before the meeting and is due on November 30.

Bryce Hesterman voted negative on Ballot 1, preferring to retain the current formulas. He also felt that the footnote recommending a harmonic limit of 25 should be included in the body of the document, since it is frequently overlooked. Max Cambre suggested that hmax be added to the list of symbols as a solution. Bryce had also noted that hmax was not defined. There were no objections to including the additional wording in the body as well as a definition.

Bryce Hesterman also voted negative on Ballot 2. His past experience indicated that UL would not agree with the definition as written, although he felt it was accurate. Lin Pierce objected stating he is sure UL would support the proposal. The Chair noted that in fact, Working Group member, Mike Shacker of UL had submitted his affirmative vote.

Jerry Frank voted negative, citing his objection to the use of FHL instead of K. He also felt that all of the examples should have a higher 3rd harmonic content. This same comment was submitted by Wes Schwartz. After a discussion concerning the examples, a cursory review indicated that while the 3rd was frequently present in the harmonic profiles, the magnitudes were relatively low. The general consensus was that while not all of the examples should have a high 3rd harmonic, some examples should be modified, where appropriate. The Chair requested that the membership review the current version of C57.110 and Draft 4 with this suggestion in mind.

The group agreed that at least one more example should be changed to reflect a strong 3rd harmonic content. Suggested changes should be submitted with the ballots, hand written if necessary, in the format of draft 4.

Dudley Galloway as chairman of the Liquid Filled Task Force, made the additions to draft 4 from the work of his group. As a result of some confusion, a liquid filled example was not included in the last draft, but will be included in the next. Dudley agreed to restructure Lin's example to match the format of the document. Subhas Sarkar offered to assist Dudley and he also joined the Task Force.

Jerry Frank requested the floor to make a motion to split the C57.110 document into a Part A and a Part B. The Chair commented that the IEEE Styles Manual no longer permits a two part Standard. Also, the approved PAR includes Liquid filled units and must be addressed. He was advised that he could submit a request for a PAR to develop a new document and that copies of the IEEE Styles Manual are available from Luigi Napoli.

The Chair requested some direction from the Working Group concerning calculations using the Other Stray Losses for liquid filled transformers. The Chair was reluctant to complicate the document by defining a variation of the factor FHL, since these losses do not increase by the square of the frequency. Lin Pierce suggested using verbatim the wording concerning liquid filled units from the Rectifier Standard, C57.18.10. Sheldon Kennedy also recommended using the liquid examples from this standard.

So far, Jerry Frank has submitted the only response to the ballot on draft 4. His negative vote reiterated his objections to ballots 1 and 2. He also requested a disclaimer in the document to note that a nameplate change is required for a de-rated UL listed unit. The general consensus was that the note was un-necessary.

The meeting adjourned at 4:07 P.M.

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

The WG on Loss Tolerances and Measurement met on Monday, October 28, 1996, at 2:50 p.m. with 18 members and 12 guests attending. Minutes of the previous meeting in San Francisco, CA were approved as written.

Ramsis Girgis presented the results of a subcommittee survey on the Loss Measurement Guide. There were 35 approved votes, 12 approved with comments, 2 not approved, and 9 abstentions. The comments addressed the title, typing corrections, actual rather than simulated waveforms, references, improved figures, addition of thermal wattmeter method, and discussion of anomalous losses.

The two negative votes can be resolved with minor changes to the document.

The Task Force to write an Instrumentation Guide for Low Power Factor Measurements, chaired by Eddy So, had met earlier at 1:20 p.m. There was a discussion on how uncertainties should be added.

The remaining meeting time was devoted to the drafting of an interpretation on how Section 8 of C57.12.90, on No-load Loss measurements, should be applied when testing transformers with amorphous metal cores.

The meeting was adjourned at 3:30 p.m.

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

The Working Group met on Monday, October 28, 1996, at 8:00 a.m. and 9:30 a.m. There were 18 members and 8 guests present.

Introductions were made. Minutes of the April 15, 1996, meeting in San Francisco, CA were approved.

Jeewan Puri reported on his Task Force's work regarding a default table of harmonics, Table 11. A note will be added in the text to refer to the table. Cautionary note 3 will be moved to the top of the table to give emphasis to the use of the table. This table is a default harmonic spectrum which may be offered by a manufacturer when a user has no data available. The Task Force's recommendation for the inclusion of Table 11 was then accepted.

The ballot of Draft 11 was discussed. Draft 11 is being balloted to the WG and the PCS. Presently 26 % of the WG ballots have been returned, while 23 % of the PCS ballots have been returned. The ballot is open until November 30, 1996. The WG has an 80 % approval, while the PCS ballot has a 90 % approval to date.

Discussion of negative ballots and approved ballots with comments commenced with the hope of obtaining more approval. Mark Perkins cast a negative ballot noting that there was no reference to tables 2 and 3 in the text. In the first working group session, it was voted to drop tables 2 and 3 regarding thermal and dielectric corrections for altitude. C57.12.00 and C57.12.01 would be referenced. However, at the beginning of the second session, Phil Hopkinson made a case to retain the tables and add the reference to them in the text. The motion was eventually approved overturning the first session's decision.

Jerry Frank submitted a negative ballot. He wishes the term "K-factor" to be used instead of FHL, Harmonic Loss Factor. This issue has been discussed at length at previous meetings. There appears to be no resolution to this negative ballot. Jerry Frank was not present for the meetings. The term FHL will continue to be used in the standard in harmony with other IEEE WG as well as IEC.

Ken Ziemann cast a negative ballot. He felt there was still confusion between RMS KVA and Fundamental KVA. Fundamental KVA ratings are the new method proposed by IEC while RMS KVA ratings are the traditional ratings of C57.18-1964. Ken points out that Table 9 gives the same rating as Example 3 of the Annex. This Example had an error on the previous Draft. The presumed correction gave this mathematical error. To keep from changing the entire example, the current rating of the converter will be increased slightly so that Table 9 does not give the same results. Ken also notes that Example 2 would have a higher KVA rating using Table 9. It was noted that this is exactly the difference of the two methods and was correct. Ken also points out that we are not clear as to whether nameplate current ratings are RMS or Fundamental values. The WG voted to clarify these ratings to be RMS values as these are the currents a user sees with

his meters on the transformer lines. Manufacturers must assure that their test data is available for the fundamental values for the purpose of guarantees. This concluded the negative ballots.

Richard Dudley gave comments with his approval ballot. Richard recommended that information on loss measurement systems with power supplies which can provide distorted waveshapes such as Eddy So's work discusses be included. The WG had previously discussed these issues. The Forward references the reader to work by other WG's of the PCS regarding loss measurement systems. This should not be the undertaking of this WG. Also, our test currents are all sinusoidal and not distorted. There is no practical method available to cost effectively test rectifier transformers with the ratings of this standard's scope. This has been done on very small transformers and also on very large HVDC units. In one case, the cost is very small, in the other, while the cost is high, it is built into the price of the transformers.

Other minor editorial items were noted. The use of the term "Equivalent Thermal Test Current" will be used in the text replacing RMS current for thermal tests. This definition will also be used for the test currents given in the definitions.

Subhas Sarkar also noted some problems with the definition and test methods given for commutating reactance for single way transformers when an interphase transformer is present. These methods have been in place since 1935. It was decided to table any work on this subject for future revisions. Time is of the essence in completing this work.

The direction of this ballot and standard were discussed. The PAR expires in June of 1997. We do not have another WG meeting scheduled until then in Graz, Austria. It was moved that the discussed corrections and modifications of Draft 11 be circulated immediately to the WG and PCS membership for consideration before the ballot expires on November 30, 1996. We are hopeful of successful ballots of both WG and PCS. Assuming this is obtained, the revisions will be incorporated into Draft 12. Draft 12 will then be balloted to the main Transformers Committee, in hopes of obtaining approval before the expiration of the PAR in June of 1997.

Next Phil Hopkinson gave a report of the IEC meeting in Shenyang, China. Negative ballots by the North American delegations sent the IEC Converter Transformer standard back to the committee. Errors in the IEC examples and definitions of KVA ratings were the primary problems. Harmonization with, or adoption of C57.18.10 were recommended. United States involvement in the IEC process was definitely important in this effort.

The meeting adjourned at 10:45 a.m.

7.10.5.5 Revisions to C57.12.00 - Donald W. Platts

The Working Group met on Monday, October 28, 1996 at 1:20 PM. We had 17 members and 29 guests present.

The minutes of the San Francisco meeting on April 15, 1996 were approved with one change. In the discussion of Leon Plaster's proposal to revise Table 17, the minutes stated that we would make the mechanical test an "Other test," because calculations could be used. The statement was corrected to keep the mechanical test as a "Design test," because the intent is for a design study.

We discussed the comments returned on Leon Plaster's draft of Note 8 for Table 17 of C57.12.00. It allows the "Design Tests" for Mechanical Lifting and Moving Devices, to be accomplished by testing, or calculation. Based on the comments, the new note (8) reference in Table 17 will be corrected. After great discussion about adding to the note, the WG voted 26-0 to retain the Note (8) wording as drafted.

Before the next meeting, this change will be balloted in the Performance Characteristics Subcommittee.

Don Platts reviewed the status of the list of activities under consideration by the working group. All of the items pertaining to testing have been, or will be referred to the Dielectric Test Subcommittee. The LTC testing for operation and proper sequencing will be referred to the WG for Revision of C57.12.90. The draft prepared by the Task Force For Revision of Cooling Class designations was forwarded to the Standards Subcommittee at the conclusion of our April meeting.

Subash Tuli reported that the changes previously approved for C57.12.00 will be sent to the Balloting Group in about a month.

New Business:

Carl Niemann asked if we had addressed information about the varying risk of tank rupture with change of gas space above the oil. It was reported in a study from GE's DStar program. In discussion we noted that EPRI, and others had also done studies, however, we did not have any standards related topics from those reports. The chair asked Carl to review the report, and provide a brief description of any topics that could be properly addressed by a standard, or guide. He will report at our next meeting.

Lin Pierce suggested that clause 6.6.1 "Insulation Liquids" be updated to remove askarel, and add silicone and high temperature fluids. He will prepare a draft of the proposed change.

The meeting adjourned at 2:35.

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 Technical Council Chair, Mr. Don Volzka, has completed reviewing the appropriateness of PES performing the Survey of Generator Step-Up Transformer Failures and reviewing legal concerns with publishing this survey as a PES Special Publication. He has determined that it is appropriate and there should be no legal problems. He has informed us that it does require some editing to put it in camera ready form for printing." (PCS Chair's note: After the meeting, Ed Cromer of Tri-State G&T Association volunteered to provide this editing work.)

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 appreciated the transformer committee's time and effort in reviewing the guide, and particularly the comments offered which have been incorporated into the guide. Our primary contribution pertained to the accuracy in wording and intent as to how the guide pertains to power transformers. 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 provided the following ballot summary:

163	Eligible voters	127 returned
119	Affirmative votes	
3	Negative votes	
5	Abstention	
127	Votes = 77 % returned	3 % Abstention
119	Affirmative votes	
3	Negative votes	
122	Votes total	97 % Affirmative votes

Two of the negative votes have been resolved. The third negative ballot, from Frank Heinrichs, was not resolvable and will need to be addressed at a future meeting of the Failure Analysis WG. Frank has stated that the guide incorrectly refers to DGA as a useful diagnostic tool after a transformer has failed when it should only be relied on while in service. Don believes that there are arguments on both sides of this issue which will need to be resolved in a future revision.

Following our procedure, Don will circulate another ballot including Frank's negative ballot. The committee will be asked if they want to change their vote as a result of Frank's negative ballot. If the required majority (75%) does not change, the guide will be reaffirmed.

7.10.6.4 Single Phase Harmonics Limits

T&D Committee is in process of writing a standard titled Harmonic Limits for Single-Phase Equipment (under 16 A and 230 V nominal rating) and requested our committee to coordinate. Rick Marek will be our coordinator for this project.

7.10.7 Old Business

A potential operational problem associated with differences in response time of WTI and the winding temperature will be addressed by a Task Force under Insulation Life Subcommittee.

7.10.8 New Business

Switching Transients Induced by Transformer/Breaker Interaction will be addressed by a newly formed WG chaired by Dr. Degeneff. There was a discussion if this item should be worked on by Dielectric Tests Subcommittee. The PCS chair will discuss this during our next Administrative Subcommittee meeting.

A need for LTC Application Guide was discussed by the PCS chair. There is a concern in the industry that some users specify the LTC to "initiate and complete the operation during through fault condition" which is very unlikely event. This item will be addressed by the LTC Performance WG chaired by Bill Henning and will be harmonized with an IEC Guide.

IEEE Standard 638-1992, IEEE Standard for Qualification of Class 1E Transformers for Nuclear Power Generating Stations needs to be reaffirmed. George Reitter volunteered to carry out the ballot.

Power System Relaying Committee is in process of writing PC37.104, Guide for Automatic Reclosing and requested our committee to coordinate. Don Cash will be our coordinator on this project.

A motion was made to initiate the work on Recommended Practice for Establishing Transformer Capability When Supplying Nonsinusoidal Load Currents by Jerry Frank to utilize the term "K factor" for small transformers of up to 30 KVA and 600 V. After some discussion, the motion was voted down.

7.10.9 Next Meeting

The next meeting will be held on Thursday, July 17, 1997, in Graz, Austria.

The meeting adjourned at 10:45 a.m.

Respectfully submitted,
H. Jin Sim
PCS Chairman
pcsmin.f96

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
SUBCOMMITTE	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	REAFFIRMED BY SB 06/17/92 BEING BALLOTED IN C57
C57.109 PC57 109	GUIDE FOR THROUGH-FAULT CURRENT DURATION	PATEL B. (205)877-7740	PSR	3/16/93 6/27/91 1998	APPLY FOR PAR TO REVISE
C57.110 PC57 110	RECOMMENDED PRACTICE FOR ESTABLISHING TRANSFORMER CAPABILITY WHEN SUPPLYING NONSINUSOIDAL LOAD CURRENTS	MAREK R. P. (804)838-8080	T&D IA/PSE PSR NEMA	12/3/92 9/19/96 1997	REAFFIRMED 1992
C57.116 NONE	GUIDE FOR TRANSFORMERS DIRECTLTY CONNECTED TO GENERATORS	REITTER G. (415)508-2864		1/3/89 6/28/79 1999	REAFFIRMED IS REVISION NEEDED?
C57.117 P786	GUIDE FOR REPORTING FAILURE DATA FOR POWER TRANSFORMERS AND SHUNT REACTORS	ALTMAN M. (407)694-4975		6/17/92 1997	REAFFIRMED BY SB 06/17/92 ANSI APPROVED 7/93
C57.12.00 PC57.12.00	SECTION 8 - TESTING OF LTC CONNECTIONS	PLATS 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

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
C57.12.00 PC57.12.00	9.3 TABLE 19 - TOLERANCE FOR LOSSES	HENNING W. (414)547-0121			TO BE BALLOTED
C57.12.00 PC57.12.00	SECTION 8 - DIELECTRIC TESTING OF SECONDARY CONTROL WIRING	TULI S. (414)547-0121			BALLOTING
C57.12.00 PC57.12.00	SECTION 5.9 - AUXILIARY LOSSES ON CLAS I AND CLASS II POWER TRANSFORMERS	TULI S. (414)547-0121			BALLOTING
C57.12.00 PC57.12.00	TABLE 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 PC57.12.00m	GENERAL REQUIREMENTS FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS	PLATTS D. (610)774-4686			INCLUDE IN NEXT REVISION COORDINATE WITH S. TULI
C57.12.90 PC57.12.90	STANDARD TEST CODE FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS	SIM JIN (919)580-3234			NEW PAR NESCOM 03/15/95 COORDINATE WITH S. SMITH
C57.12.90 PC57.12.90	CLAUSE 15 - NEW CLAUSE FOR CERTIFICATION TEST DATA	JIN S. (919)580-3234			APPROVED BY PCS
C57.12.90 PC57.12.90	CLAUSE 9 - ADD MEASUREMENT OF AUXILARY LOSSES	TULI S. (414)547-0121			D1 BALLOTED IN PCS

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION		PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
C57.123	GUIDE FOR TRANSFORMER LOSS MEASUREMENT	HENNING W. R.			6/13/85	
P1098		(414)547-0121			0	PAR EXT. TO 06/97 APPROVED
C57.125	GUIDE FOR FAILURE INVESTIGATION, DOCUMENTATION AND ANALYSIS FOR POWER TRANSFORMERS AND SHUNT REACTORS	ALTMAN M.	T&D	SWGR	6/27/91	BALLOTING REAFFIRMATION
PC57.125		(407)694-4975	ED&PG		6/28/87	
			PSE		1996	REQUEST PAR EXTENSION
C57.131	REQUIREMENTS FOR LOAD TAP CHANGERS	TRAUB T. P.			3/16/95	
PC57.131		(312)394-2704			0	
C57.133	GUIDE FOR SHORT-CIRCUIT TESTING OF DISTRIBUTION AND POWER TRANSFORMERS	McQUIN N.	T&D,SWG	SUBS		PAR APPROVED
PC57.133		(412) 829-1205	PSR	IAS/PSE	9/21/95	
			IECTC14	IAS/REP		PART II OF C57.12.90
C57.18.10	REQUIREMENTS FOR SEMICONDUCTOR RECTIFIER TRANSFORMERS	KENNEDY S. P.	NONE			PAR EXT. TO 06/97 REQUESTED
PC57.18.10		(716)896-6500			12/28/81	
					0	BALLOTING IN SC (10/96)
C57.21	REQUIREMENTS,TERMINOLOGY, AND TEST CODE FOR SHUNT REACTORS RATED OVER 500kVA	McGILL J. W.	EM		4/2/91	APPLY FOR PAR EXTENSION
PC57.21		(414)475-3422	T&D		6/9/88	
			PSR		2000	R1995
IEEE 638	QUALIFICATION OF CLASS 1E TR FOR NUCLEAR POWER GENERATING STATIONS	PIERCE L. W.	NPE	SCC10	3/19/92	APPROVED BY SB 03/18/92
P638		(706)291-3166	SUB		10/29/90	
			SC2		1997	

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

Meeting Minutes - Burlington, Vermont

7.11.1 Introduction/Attendance

The Underground Transformers and Network Protectors Subcommittee met at 9:30 a.m. on October 29, 1996, with nine members and four guests present.

7.11.2 Approval of Minutes

The minutes of the April 16, 1996 meeting in San Francisco were approved as submitted.

7.11.3 Membership

Mr. Edward Bertolini of Consolidated Edison Company of New York resigned as a member of the Subcommittee and from the chairmanship of the Working Group for Secondary Network Transformers - Liquid Filled. Mr. Leon Plaster of ABB Power T&D Company was appointed as the new Chairman of the Working Group. Membership is now 16.

7.11.4 Chairman's Remarks

Administrative Subcommittee Notes

A. The next meeting will be held in Graz, Austria at the Das Weitzer and Grand Hotel Wiesler Hotels. Rooms will be $120 to 150/night and must be reserved by March 31, 1997. Room rates include tax and additional guests. Hosts for the Fall 1998 meeting are still needed.

B. The invitation to visit Reinhausen Germany, manufacturer of tap changers, in Regensburg, Germany prior to the Transformers Committee meeting is filled to the point where there is a waiting list. If anyone signed up for the trip and will not be able to make it, please cancel so someone else can be accommodated. If anyone hasn't signed up and would like to go, please add your name to the waiting list.

C. The new open standards preparation and balloting process for PES was discussed again at length. This will involve requesting an invitation to ballot for standards which are expected to be balloted in the next 12 months. If anyone still doesn't understand the process, please read the Vice Chairman's report in the San Francisco meeting minutes.

D. Transformers Committee Certificates of Appreciation will be presented at the Main Committee meeting on Wednesday, October 30, 1996, to Carl G. Niemann and Edward A. Bertolini. These awards are for Working Group Chairman who are able to complete revision of the standard they are responsible for, get it approved and published within the five year period. Carl's award is for "C57.12.24 - Underground Three-Phase Distribution Transformers" and Ed's award is for "C57.12.40 - Secondary Network Transformers - Subway and Vault Types." Congratulations to Carl and Ed for their contributions and leadership.

E. The Administrative Committee also is recommending the Working Group on Secondary Network Protectors for the Technical Committee Working Group Recognition Award. This

recommendation was based on the outstanding work achieved by this Working Group in developing a new standard on a very technical piece of equipment in a five year period. This was also the first new standard published by the Transformers Committee since the transferring of the maintenance responsibilities of distribution standards from ANSI to IEEE. Again, congratulations are in order to the members of this group for their contributions.

F. The chair informed the Subcommittee that ANSI C57.12.40 was published in January, 1996 after being approved by the IEEE Standards Board in December, 1994. The document has many errors and after some discussion with the NEMA Secretariat it was decided all corrections will be made to the document, the Working Group Chairman would be given a final galley proof for approval and NEMA will republish the document. The Standard is still not published due to some miscommunications at NEMA. The NEMA Secretariat assured us they would give this top priority.

G. Since there was no policy on how to respond to request for interpretations of any part of a transformer standard, the Subcommittee passed the following "Request for interpretations will be accepted up to 30 days prior to the Transformer Committee Meeting and will be acted upon within 30 days after the meeting."

H. Working Group Chairman received a letter from NESCOM in June related to the completion of PARs. Defining the scope of the project was emphasized and if a new Chairman is appointed to a Working Group, a new PAR must be requested.

I. The Subcommittee recommends that all Working Group Chairman be members of the Main Committee.

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 six members and six guests in attendance.

The minutes of the meeting on April 15, 1996 in San Francisco, California were approved as submitted.

The PAR application for the revision of the standard was approved on June 20, 1996 by the IEEE Standards Board. Complete review of the standard will begin at the next meeting.

The Group concluded discussion on the wording for tank rupture values and agreed to include in the next revision of the Standard a value of 15 psig for design pressure tests and a value of 7 psig for tank withstand without deformation tests. This wording was taken from the three-phase padmounted transformer document and will also be included in the Secondary Network Transformers (Liquid-Filled) and Secondary Network Protectors Standards so all of the Subcommittee's standards will be consistent.

There being no additional new or old business, the meeting was adjourned at 11:30 a.m.

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

The working group met on Monday, April 15, 1996 at 9:30 a.m. with 11 members and two guests in attendance.

The minutes of the April 15, 1995 meeting in San Francisco, California were approved as submitted.

Mr. William Farechio of Consolidated Edison Company of New York requested membership in the Working Group.

The revised standard was published in January, 1996 and many errors are in the document. NEMA agreed to correct the errors and republish the document. Due to some problems, it still has not been published but after some discussions with the NEMA Secretariat this will be made a top priority.

Stainless steel tank requirements for inclusion in the standard were discussed. The Group agreed to table this topic until more information is available.

A letter of gratitude for all his years of dedicated work and leadership to the Working Groups and Subcommittee will be written to Edward A. Bertolini, Past Chairman of the Working Group for Secondary Network Transformers, Subway and Vault Types.

The Working Group Chairman is to submit a new PAR for approval to start work on the next revision.

There being no additional business the meeting was adjourned at 10:40 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, October 28, 1996 with nine members and four guests present.

The minutes of the April 15, 1996 meeting in San Francisco, California were approved as submitted.

Messrs. John P. Halferty and Edward J. Hanker of SPD Technologies requested membership in the Working Group.

Copies of Draft 2 of IEEE Guide for the Protection of Network Transformers developed by a WG in the Power System Relaying Committee and minutes their last two meetings were distributed for the members information.

The Low Voltage Switchgear Devices Subcommittee of the Switchgear Committee requested an interpretation on the test conditions and descriptions of the electrical tests in the standard. Comments were distributed and discussed and the Chairman will reply.

Fuse pictures were added to the proposed revision of the standard with their catalog numbers and curve characteristics. The WG is attempting to include pictures of all fuses ever used along with their catalog number and characteristic in the standard. Further review is still required.

Sections 7, 8, 9, and part of 10 were reviewed in detail for any revisions. The only major changes were to revise the nominal trip current in Table 8 from 0.1 percent to 0.2 percent and to add the current rating in the table headings.

All dimensions are presently being reviewed for conversion to metric units when the document is revised. The standard is due for revision in 1999 and is on schedule. The first nine sections have been completely reviewed and revised accordingly. It was noted that when conversion to metric is completed, hardware is excluded from this requirement.

There being no additional business, the meeting was adjourned at 9:15 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 are as follows:

July 15-18,1997	Graz, Austria
November 26-29,1997	St. Louis, Missouri
April 26-29, 1998	Little Rock, Arkansas

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

STANDARD / PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION		PUB DATE / PAR DATE / REV DUE	STATUS AND COMMENTS
SUBCOMMITTE	UG TR & NETWORK PROTECTORS					
CHAIR:	P. E. OREHEK					
PHONE:	(201)430-7743					
C57.12.24 PC57.12.24	UNDERGROUND-TYPE 3-PHASE DISTRIBUTION TRANSFORMERS,2500kVA AND SMALLER: HV,34500GrdY..& BELOW,LV,480 V AND BELOW	NIEMANN C. (708)410-5307	T&D IC IAS/REPC	IAS/PSEC IEC TC 14	5/10/88 6/20/96 1993	PAR APPROVED 6/20/96
C57.12.40 PC57.12.40	REQUIREMENTS FOR SECONDARY NETWORK TRANSFORMERS, SUBWAY & VAULT TYPES (LIQUID IMMERSED)	BERTOLINI E. A. (212)460-4913	SCC14		3/19/92 12/5/91 1997	ANSI APPROVED 02/28/94 PUBLISHED JAN 1996
C57.12.44 PC57.12.44	STANDARD REQUIREMENTS FOR SECONDARY NETWORK PROTECTORS	MULKEY D. H. (415)973-4699	T&D SWGR IAS/REPC	IAS/PSEC EEI NEMA	12/20/94 9/21/95 1999	PUBLISHED DEC 94 PAR APPROVED 09/21/95
C57.12.57 PC57.12.57	REQUIREMENTS FOR VENTILATED DRY-TYPE NETWORK TRANSFORMERS 2500kVA AND BELOW, W/HV 34500V AND BELOW,LV 216Y..AND	NUTT B. (214)698-7447	T&D EEI/T&D SCC14		3/18/92 12/5/91 1997	APPLY FOR NEW PAR

7.12 West Coast - E. G. Hager, Jr.

Meeting was opened at 08:15 am on Thursday, November 7, 1996, in Las Vegas, NV, by Chairman Red Hager. There were 10 members and 2 guests in attendance. In addition, there were 1 member and 4 guests at the Working Group meeting on Wednesday, November 6th. Dave Brucker was not present at the Wednesday meeting.

7.12.1 Old Business

Chairman Hager noted that the Committee was without a Vice-Chair and Secretary. He asked for volunteers to take on these responsibilities. Chairman Hager reported on the Main Committee meeting that was held the prior week in Vermont. The activities of the Phase Shifting Working Group were discussed. If any members were not interested in reviewing and balloting this Working Group's activities they should notify either the Subcommittee Chairman or the Working Group Chairman.

The next meeting of the Main Committee is scheduled next July 15 - 18 in Graz, Austria. The meeting following that is scheduled for St. Louis on November 16 - 19, 1997.

Working Group meeting held on Wednesday, November 6th, resulted in the following actions:

- The Loss Evaluation Guide Working Group reaffirmed the present Guide.
- The Working Group on Grounding Transformer Application Guide is disbanded.
- The Installation Guide for Liquid Immersed Transformers after successful completion, balloting, and printing of the Guide is, as presently constituted, disbanded. The Chairman asked persons interested in leading the efforts for the next revision to contact him.
- The Life Extension of Generator Step-Up Transformers Working Group is producing a paper covering this subject. Bob Stewart reported on the efforts to date. Don Laird from LADWP suggested that this is a good subject for a panel discussion at a future IEEE Summer or Winter Power Society Meeting.
- The activities of the Phase Shifting Transformer Guide Working Group during the recent Main Committee were reported by Co-Chairman Trummer. A copy of the minutes from this Working Group is attached.

7.12.2 New Business

The next meeting of the Subcommittee is scheduled for the week of May 5, 1997 in Scottsdale, AZ. More specific information will be provided at a later date.

Submitted by Secretary, Dave Brucker
West Coast Transformer Subcommittee

7.12.3 West Coast Subcommittee Guide For The Application, Specification And Testing Of Phase Shifting Transformers

The Working Group met on Monday, October 28 at 2:50 PM with 22 members and 11 guests present. After introductions by Chairman, Edgar Trummer, the minutes of the April 15, 1996 meeting were approved as written.

Draft #2 was sent to the Working Group, but was not balloted. At the meeting, the scope of each section was discussed. During discussion, the following additional work was identified with the following assignments:

- Section 2.0 - References: Review by Bipin Patel
- Section 5.0 - Theory and Application of Phase Shifting Transformers: Re-organization of Section required for consistency and standardization of figures required. Joe MacDonald and Vic Sankar. Dan Perco to add description of other types and applications of phase shifting transformers. Guide covers single-core, dual-core and quadrature booster designs.
- Section 6.0 - Usual Service Conditions: Draft to be prepared by Mike Lau.
- Section 7.0- Rating Data: Draft to be prepared by Joe Watson.
- Section 8.0 - Construction for Oil-Immersed Phase Shifting Transformers: Draft to be prepared by Joe Watson.
- Section 9.0 - Short Circuit Characteristics: Draft to be prepared by Jean-Christophe Riboud.
- Section 11.0 -Testing: Jack McGill and Paul Russman will review the test requirements for phase-shifting transformers. Discussions were held on what impulse wave shape should be applied during factory testing to simulate the field condition where the phase-shifting transformer is by-passed. Under this condition, both the source and load terminals see the impulse waveshape simultaneously. Jack McGill will review.

The Working Group concurred that the deadline for submitting the aforementioned work would be the end of December, 1996. The Working Group would ballot in February, 1997.

he meeting adjourned at 3:45 pm. Since all business was completed, it was not necessary to hold the scheduled second session (4:15 - 5:30 pm).

Donald Chu
Working Group Secretary

STANDARD PROJECT	TITLE	WORKING GROUP CHAIR AND PHONE	COMMITTEES REQUESTING COORDINATION		PUB DATE PAR DATE REV DUE	STATUS AND COMMENTS
SUBCOMMITTE CHAIR: PHONE:	WEST COAST E. G. HAGER (619)789-3022					
C57.114 P513	SEISMIC GUIDE FOR POWER TRANSFORMERS AND REACTORS	OKLU S. (213)481-4823	NPE SUBS		2/15/90	STANDARD WITHDRAWN
C57.12.11 PC57.93	GUIDE FOR INSTALLATION OF OIL-IMMERSED TRANSFORMERS (10MVA & LARGER, 69-287kV RATING)	GILLIES D. A. (503)622-4847			5/9/80	TO BE REPLACED BY C57.93
C57.12.12 PC57.93	GUIDE FOR INSTALLATION OF OIL-IMMERSED TRANSFORMERS 345kV AND ABOVE	GILLIES D. A. (503)622-4847			5/9/80	TO BE REPLACED BY C57.93
C57.120 P842	LOSS EVALUATION GUIDE FOR POWER TRANSFORMERS AND REACTORS	JACOBSEN R.	SUB EM ED&PG	IAS IEC	12/3/91 5/1/80 1996	REVISE OR REAFF. BY DEC 96 PAR EXTENSION NEEDED
C57.128 PC57.128	FIRE PROTECTION OF OUTDOOR LIQUID-IMMERSED POWER TRANSFORMERS	HAGER R.	NPE SUB PSR		6/1/89 0	APPLY FOR NEW PAR
C57.135 PC57.135	GUIDE FOR APPLICATION, TESTING, INSTALLATION AND OPERATION OF PHASE ANGLE SHIFTING TRANSFORMERS	TRUMMER E. 43-3172-606-404	PSRC EMC IAS/PSP	IEC TC14	6/20/96 0	PAR Approved 6/20/96
C57.93 PC57.93	GUIDE FOR INSTALLATION OF LIQUID-IMMERSED POWER TRANSFORMERS.	GILLIES D. A. (503)622-4847	NONE		12/12/95 0	REVISION APPROVED 12/11/95 WITHDRAW 12.11/12.12 WHEN APP.

8.0 Reports of Liaison Representatives

8.1 EPRI - S. R. Lindgren

EPRI

Electric Power
Research Institute *Powering Progress through Innovative Solutions*

MEMORANDUM

October 24. 1996

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

FROM: Stan Lindgren, Project Manager

SUBJECT: **EPRI LIAISON REPORT**

The following report is for inclusion in your minutes for the October 30, 1996 meeting.

1. EHV Converter Transformer

   Test results confirmed 25% or greater major insulation size reduction can be attained with some further work.

   Final report will be published pending patent filing 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 continues. 1425 BIL dielectric models have been tested successfully. A 25 MVA single phase, 161 kV model testing program including short circuit is in process.

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 a t 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. A broad range of static electrification activity was again produced. Tests and monitoring results are being evaluated

Results of the field tests are being reflected in a large-scale flow-model experiment starting in 1996 that will simulate the 500 kV transformer under laboratory conditions and controls.

4. Bubble Evolution in Overloaded Transformers:

Very rapid load changes can cause bubble formation under some conditions and reduce 60 Hz 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. A report is in process. Phase II is being 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, bushings and potheads in laboratories and in service, including on-line tan delta, partial discharge and other available monitoring methods. Units will be 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.

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 metalinsulated-semiconductor sensors to monitor multiple gases. A field demonstration program is completed involving over 30 prototypes starting with the first in October 1993. Individual ppm for hydrogen, acetylene, ethylene and carbon monoxide is monitored.

8. Power Transformer Remaining Life Prediction & Extension

This project involves two areas of work:

Furaldehydes in Transformer Oil

A project is in process to develop a correlation between furaldehydes in oil samples with degree of polymerization (DP) found in paper insulation samples taken from a significant number of transformers in

service. Additional laboratory experimental work is being added to search for trace chemicals that are an early indication of insulation degradation that can be sensed with on-line monitoring.

Vibration & Frequency Response Analysis (FRA)

A project is in process to develop a correlation between existing winding conditions and vibration & FRA tests before and after internal inspection and reclamping of the same transformers.

The objective is to develop noninvasive field test methods and criteria that can be used to predict winding condition in the broad variety of existing power transformers without entering the transformer.

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 test is planned for early 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 is scheduled for November 12 & 13,1996 in Tampa, FL.

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

8.2 SCC4 - P. A. Payne

No report.

8.3 CIGRE SC12 - W. N. Kennedy

Mr. Kennedy was absent due to illness and no report was given.

9.0 Old Business

There was no old business discussed.

10.0 New Business

Bob Grubb made a proposal to form a Power Transformer Subcommittee to address the topics that are specific to power transformers similar to the Distribution Transformers Subcommittee. After a brief discussion on the pros and cons of the proposal a motion was passed by a voice vote to form a task force to formulate a scope statement for this new committee. Bob Grubb will head the task force and Linden Pierce, Loren Wagenaar, and Jin Sim were charged to report the progress on the task force to the AdSub Committee for further review/action.

On the similar line of thinking, Don Platts raised the question on the existence of the West Coast Subcommittee. His point appeared to take this opportunity to reorganize the subcommittees for a more consistent format to meet today's needs. No action was taken on the topic.

Don also mentioned that he knows a travel agency that will be willing to work with us help make travel plans for the meeting in Graz. Nothing is known at this time but he will pursue this effort. In the meantime, you can contact him or the agency direct at (800) 847-6748 for assistance.

11.0 Adjournment

The meeting was adjourned at 10:50 AM.

Respectfully submitted,
Bipin K. Patel, Secretary

Attachment 1

STATUS REPORT ON STANDARDS OF IEEE/PES TRANSFORMERS COMMITTEE

10-Jan-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
C57.100 C57.100	TEST PROCEDURE FOR THERMAL EVALUATION OF OIL-IMMERSED DISTRIBUTION TRANSFORMERS	INSULATION LIFE L. W. PIERCE	LOWDERMILK L. A. (704)462-3113	NPE EM T&D SPD	3/18/92 10/20/88 1997	PAR SUBMITTED FOR APPROVAL 10/96
C57.104 PC57.104	GUIDE FOR THE DETECTION AND DETERMINATION OF GENERATED GAS IN OIL-IMMERSED TRANSFORMERS & THEIR RELATION TO SERVICEABIL	INSULATING FLUIDS F. GRYSZKIEWICZ	HEINRICHS F. W. (412)941-6924	PSR T&D	6/7/92 5/31/90 1996	REVISE OR REAFF. BY DEC 96 PAR SUBMITTED FOR APPROVAL 10/96
C57.105 PC57.105	GUIDE FOR APPLICATION OF TRANSFORMER CONNECTIONS IN THREE-PHASE DISTRIBUTION SYSTEMS	PERFORMANCE CHARACTERISTICS H. J. SIM	REITTER G. (415)591-4463		6/17/92 1997	REAFFIRMED BY SB 06/17/92 BEING BALLOTED IN C57
C57.106 PC57.106	GUIDE FOR ACCEPTANCE AND MAINTENANCE OF INSULATING OIL IN EQUIPMENT	INSULATING FLUIDS F. GRYSZKIEWICZ	(617)926-4900	NONE	11/20/91 6/19/86 1996	REVISE OR REAFF. BY DEC 96 REQUEST PAR EXT. TO JUNE 97
C57.109 PC57.109	GUIDE FOR THROUGH-FAULT CURRENT DURATION	PERFORMANCE CHARACTERISTICS H. J. SIM	PATEL B. (205)877-7740	PSR	3/16/93 6/27/91 1998	APPLY FOR PAR TO REVISE
C57.110 PC57.110	RECOMMENDED PRACTICE FOR ESTABLISHING TRANSFORMER CAPABILITY WHEN SUPPLYING NONSINUSOIDAL LOAD CURRENTS	PERFORMANCE CHARACTERISTICS H. J. SIM	MAREK R. P. (804)838-8080	T&D PSR NEMA IA/PSE	12/3/92 9/19/96 1997	REAFFIRMED 1992
C57.111 NONE	GUIDE FOR ACCEPTANCE OF SILICONE INSULATING FLUID AND ITS MAINTENANCE IN TRANSFORMERS	INSULATING FLUIDS F. GRYSZKIEWICZ	(617)926-4900	IAS T&D ED&PG IEC	2/2/89 7 2000	REAFFIRMED 03/15/1995 OR PAR EXTENSION

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE SC CHAIR	WG CHAIR AND PHONE NO. TF CHAIR	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	LATEST STATUS/ COMMENTS
C57.113 P545	GUIDE FOR PARTIAL DISCHARGE MEASUREMENT IN LIQUID-FILLED POWER TRANSFORMERS AND SHUNT REACTOR	DIELECTRIC TESTS L. B. WAGENAAR	POULIN B. [408]157-8326	PSIM IAS/PS IEC TC	12/5/91 6/20/96 1996	PAR APPROVED 6/20/96 REVISE OR REAFF. BY DEC 96
C57.114 P513	SEISMIC GUIDE FOR POWER TRANSFORMERS AND REACTORS	WEST COAST E. G. HAGER	OKLU S. (213)481-4823	NPE SUBS.	2/15/90	STANDARD WITHDRAWN
C57.115 P756	GUIDE FOR LOADING MINERAL-OIL-IMMERSED POWER TRANSFORMERS RATED IN EXCESS OF 100MVA (65 C WINDING RISE)	INSULATION LIFE L. W. PIERCE	PIERCE L. W. (706)291-3166		3/21/91	STANDARD WITHDRAWN, COMBINED WITH C57.91
C57.116 NONE	GUIDE FOR TRANSFORMERS DIRECTLTY CONNECTED TO GENERATORS	PERFORMANCE CHARACTERISTICS H. J. SIM	REITTER G. (415)508-2864		1/3/89 6/28/79 1999	REAFFIRMED IS REVISION NEEDED?
C57.117 P786	GUIDE FOR REPORTING FAILURE DATA FOR POWER TRANSFORMERS AND SHUNT REACTORS	PERFORMANCE CHARACTERISTICS H. J. SIM	ALTMAN M. (407)694-4975		6/17/92 1997	REAFFIRMED BY SB 06/17/92 ANSI APPROVED 7/93
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 EI	9/17/92 0	APPLY FOR NEW PAR
C57.12.00 VARIOUS	GENERAL REQUIREMENTS FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS	STANDARDS T. P. TRAUB	TULI S. (414)547-0121	T&D PSRC SWG SUBS IAS IEC-TC	6/16/93 6/15/95 1998	FORMING BALOTTING GROUP EDITING REVISION
C57.12.00 PC57.12.00	AUDIBLE SOUND LEVEL REQUIREMENTS	AUDIBLE SOUND & VIBRATION J. PURI	PURI J. (704)282-7413			UNDER DEVELOPMENT

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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 I. B. WAGENAAR	MINKWITZ R. E. (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	TULI S. (414)547-0121			BALLOTING
C57.12.00 PC57.12.00	SECTION 8 - TESTING OF LTC CONNECTIONS	PERFORMANCE CHARACTERISTICS H. J. SIM	PLATS 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 BALLOTED

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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. P. TRAUB	TULI S. (414)547-0121			CORRECTIONS BEING DONE
C57.12.00 PC57.12.00	TABLE 17 - SWITCHING IMPULSE TESTS - NOTE 8 ADDED	DIELECTRIC TESTS L. B. WAGENAAR	POULIN B. (408)957-8326			APPROVED BY SUBCOMMITTEE
C57.12.00 PC57.12.00	SECTION 5.9 - AUXILIARY LOSSES ON CLAS I AND CLASS II POWER TRANSFORMERS	PERFORMANCE CHARACTERISTICS H. J. SIM	TULI S. (414)547-0121			BALLOTING
C57.12.00 PC57.12.001	DEFINITION OF THERMAL DUPLICATE	INSULATION LIFE L. W. PIERCE	GRUBB R. L. (414)547-0121 BARRY BEASTER	EM IAS I&CPS PESC	5/31/90 1997	PAR WITHDRAWN WORK INCLUDED IN C57.12.00
C57.12.00 PC57.12.00m	GENERAL REQUIREMENTS FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS	PERFORMANCE CHARACTERISTICS H. J. SIM	PLATTS D. (610)774-4686			INCLUDE IN NEXT REVISION COORDINATE WITH S. TULI
C57.12.01 NONE	GENERAL REQUIREMENTS FOR DRY-TYPE DIST. AND POWER TR INCL THOSE WITH SOLID CAST &/or RESIN-ENCAPSULATED WINDINGS	DRY-TYPE TRANSFORMERS W. PATTERSON	JONATTI A. (813)442-0414		2/2/89 9/28/82 1996	PAR EXTENDED TO DEC 96
C57.12.10 ANSI	TRANSFORMERS 230kV AND BELOW - 8333/10417kVA 1 PH, -100000 kVA 3 PH w/o LTC, -100000kVA w/ LTC - SAFETY REQUIREMENTS	STANDARDS T. P. TRAUB	(312)394-2704		6/4/87 1993	ANSI STANDARD NEEDS A HOME, DUE FOR REAF.

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C57.12.11 PC57.93	GUIDE FOR INSTALLATION OF OIL-IMMERSED TRANSFORMERS (10MVA & LARGER, 69-287kV RATING)	WEST COAST E. G. HAGER	GILLIES D. A. (503)622-4847				5/9/80	TO BE REPLACED BY C57.93
C57.12.12 PC57.93	GUIDE FOR INSTALLATION OF OIL-IMMERSED TRANSFORMERS 345kV AND ABOVE	WEST COAST E. G. HAGER	GILLIES D. A. (503)622-4847				5/9/80	TO BE REPLACED BY C57.93
C57.12.13 ANSI	CONFORMANCE REQUIREMENTS FOR LIQUID-FILLED TRANSFORMERS USED IN UNIT INSTALLATIONS INCL. UNIT SUBSTATIONS	STANDARDS T. P. TRAUB					9/2/81 1987	ASSIGN TO SUBCOMMITTEE NEMA STANDARD
C57.12.20 PC57.12.20	OVERHEAD-TYPE DISTRIBUTION TRANSFORMERS, 500 kVA AND SMALLER: H V 34500 VOLTS AND BELOW, L V 7970/13800Y & BELOW	DISTRIBUTION TRANSFORMERS K. S. HANUS	ANDERSON G. W. (913)339-2931				6/20/96 2001	
C57.12.21 PC57.12.21	STANDARD REQUIREMENTS FOR PAD-MOUNTED, COMPARTMENTAL-TYPE, SELF-COOLED, SINGLE-PHASE DIST TRANSFORMERS WITH HV BUSHINGS	DISTRIBUTION TRANSFORMERS K. S. HANUS	GHAFOURIAN A. (601)796-4255	T&D	IAS/RE		10/22/79 6/27/91 1985	PAR EXTENDED TO JUNE 97
C57.12.22 PC57.12.22	PAD-MOUNTED,COMPARTMENTAL-TYPE SELF-COOLED,3-PHASE DIST. TR WITH HV BUSHINGS,2500kVA AND SMALLER:...REQUIREMENTS.	DISTRIBUTION TRANSFORMERS K. S. HANUS	HANUS K. (817)882-6025	T&D	IAS/RE	IAS/PS	1/9/95 6/27/91 1999	AWAITING PUB. BY NEMA
C57.12.23 PC57.12.23	UNDERGROUND-TYPE,SELF-COOLED, 1-PHASE DISTRIBUTION TR WITH SEPERABLE INSULATED HV CONNECT HV 24940GrdY..LV,240..;167kVA.	DISTRIBUTION TRANSFORMERS K. S. HANUS	SCHEU R. W. (704) 462-3164	T&D IAS/PSE	IC	IAS/RE	9/19/85 6/27/91 1996	ANSI APPROVED 02/18/94 TO BE PUBLISHED BY NEMA
C57.12.24 PC57.12.24	UNDERGROUND-TYPE 3-PHASE DISTRIBUTION TRANSFORMERS,2500kVA AND SMALLER: HV,34500GrdY..& BELOW,LV,480 V AND BELOW	UG TR & NETWORK PROTECTORS P. E. OREHEK	NIEMANN C. (708)410-5307	T&D IAS/PSE	IC IEC TC	IAS/RE	5/10/88 6/20/96 1993	PAR APPROVED 6/20/96

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C57.12.25 PC57.12.25	REQUIREMENTS FOR PAD-MOUNTED COMP-TYPE,SELF-COOLED,1-PHASE DISTRIBUTION TR W/SEP INS HV CONN,HV 34500GrdY...167kVA...	DISTRIBUTION TRANSFORMERS K. S. HANUS	MOHESKY N. (314)239-6783	T&D IC IAS/RE IAS/PSE	5/11/90 6/27/91 1995	PAR WITHDRAWN SUBMIT NEW PAR
C57.12.26 PC57.12.26	PAD-MOUNTED COMPARTMENTAL-TYPE SELF-COOLED,3-PHASE DIST TR for USE W/ SEPERABLE INSULATED HV CONN.,HV 34500GrdY..2500kVA	DISTRIBUTION TRANSFORMERS K. S. HANUS	PEARSON L. C. (817)882-6025	T&D IC IAS/RE IAS/PSE SCC14	6/17/92 12/5/91 1997	TO BE PUBLISHED BY NEMA
C57.12.27 PC57.12.27	STANDARD FOR TRANSFORMERS - LIQUID FILLED DISTRIBUTION TRANSFORMERS USED IN PAD-MOUNTED INSTALLATIONS, INCLUD. UNIT SUBS	DISTRIBUTION TRANSFORMERS K. S. HANUS	MILLER J. R. (314) 634-2111		6/27/91 0	PAR WITHDRAWN SUBMIT NEW PAR
C57.12.28 ANSI	PAD-MOUNTED EQUIPMENT - ENCLOSURE INTEGRITY	DISTRIBUTION TRANSFORMERS K. S. HANUS	MARTIN J.		6/24/87 1994	JOINT C37/C57 PROJECT AWAITING PUBLICATION
C57.12.29 ANSI	PAD-MOUNTED EQUIPMENT - ENCLOSURE INTEGRITY IN COASTAL ENVIRONMENTS	DISTRIBUTION TRANSFORMERS K. S. HANUS	MARTIN J.		1996	PUBLISHED IN 1992 NOT TRANSFORMERS COMM.
C57.12.30 ANSI	SUBMERSIBLE EQUIPMENT - ENCLOSURE INTEGRITY	DISTRIBUTION TRANSFORMERS K. S. HANUS	MARTIN J.		1994	TO BE BALLOTED NUMBER TO BE CHANGED
C57.12.31 ANSI	COATING STANDARD FOR POLE MOUNTED TRANSFORMERS	DISTRIBUTION TRANSFORMERS K. S. HANUS	MARTIN J.		1994	JOINT C37/C57 PROJECT AWAITING PUBLICATION
C57.12.32 ANSI	ENCLOSURE INTEGRITY OF SUBMERSIBLE EQUIPMENT	DISTRIBUTION TRANSFORMERS K. S. HANUS	HANUS K. (817)882-6020			AWAITING PUBLICATION BY NEMA

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C57.12.33 PC57.12.33	GUIDE FOR EVALUATION OF LOSSES IN DISTRIBUTION TRANSFORMERS	DISTRIBUTION TRANSFORMERS K. S. HANUS	PEKAREK T. (216) 479-3400	PSIM		PAR DISSAPROVED 03/21/96 NESCOM WANTS CLARIFICATION
C57.12.34 PC57.12.34	REQUIREMENTS FOR THREE PHASE PAD-MOUNTED DISTRIBUTION TRANSFORMERS	DISTRIBUTION TRANSFORMERS K. S. HANUS	PEARSON L. C. (817)882-6025	ICC	9/21/95	
C57.12.35 P1265	STANDARD FOR BAR CODING FOR DISTRIBUTION TRANSFORMERS (POLE-MOUNTED, PAD-MOUNTED AND UNDERGROUND)	DISTRIBUTION TRANSFORMERS K. S. HANUS	JORDAN RON (619)482-3239		6/20/96 2001	APPROVED BY STANDARDS BOARD 6/20/96 PREVIOUSLY P1265
C57.12.40 PC57.12.40	REQUIREMENTS FOR SECONDARY NETWORK TRANSFORMERS, SUBWAY & VAULT TYPES (LIQUID IMMERSED)	UG TR & NETWORK PROTECTORS P. E. OREHEK	BERTOLINI E. A. (212)460-4913	SCC14	3/19/92 12/5/91 1997	ANSI APPROVED 02/28/94 PUBLISHED JAN 1996
C57.12.44 PC57.12.44	STANDARD REQUIREMENTS FOR SECONDARY NETWORK PROTECTORS	UG TR & NETWORK PROTECTORS P. E. OREHEK	MULKEY D. H. (415)973-4699	T&D SWGR IAS/RE IAS/PSE EEI NEMA	12/20/94 9/21/95 1999	PUBLISHED DEC 94 PAR APPROVED 09/21/95
C57.12.50 NONE	REQ. FOR VENTILATED DRY-TYPE DISTRIBUTION TR, 1-500kVA, 1 PHASE, AND 15-500kVA, 3-PHASE HV 601-34500VOLTS,LV 120-600V	DRY-TYPE TRANSFORMERS W. PATTERSON	PATTERSON W. (919)848-1860		6/12/89 1994	COPYRIGHT NOT RELEASED BALLOT REAFFIRMATION
C57.12.51 NONE	REQ. FOR VENTILATED DRY-TYPE POWER TR, 501kVA & LARGER, 3 PHASE, WITH HV 601-34500V, LV 208Y/120 TO 4160 VOLTS	DRY-TYPE TRANSFORMERS W. PATTERSON	PATTERSON W. (919)848-1860		6/12/89 1994	COPYRIGHT NOT RELEASED BALLOT REAFFIRMATION
C57.12.52 NONE	REQ. FOR SEALED DRY-TYPE POWER TRANSFORMERS, 501kVA & LARGER, 3 PHASE, WITH HV 601-34500V,LV 208Y/120 TO 4160 VOLTS	DRY-TYPE TRANSFORMERS W. PATTERSON	PATTERSON W. (919)848-1860		6/12/89 1994	COPYRIGHT NOT RELEASED BALLOT REAFFIRMATION

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C57.12.53 ANSI	REQUIREMENTS FOR DRY-TYPE, UNDERGROUND, SINGLE-PHASE WITH SEPARABLE INSULATED H-V 24940 grdY/14400 V AND <; LV 240/120 V	STANDARDS T. P. TRAUB			0	ONLY TITLE EXIST (NO PAR) IS IT REQUIRED?
C57.12.54 ANSI	REQUIREMENTS FOR DRY-TYPE, UNDERGROUND 3 PHASE DISTRIBUTION TRANSFORMERS,2500 kVA OR <, HV 24940 grdY/14400 OR <,LV 480V	STANDARDS T. P. TRAUB			0	ONLY TITLE EXISTS IS IT REQUIRED?
C57.12.55 NONE	CONFORMANCE STANDARD FOR TR- DRY-TYPE TRANSFORMERS USED IN UNIT INSTALLATIONS, INCL. UNIT SUBSTATIONS	DRY-TYPE TRANSFORMERS W. PATTERSON	PATTERSON W. (919)848-1860		4/7/86 1992	COPYRIGHT NOT RELEASED BALLOT REAFFIRMATION
C57.12.56 PC57.12.56	TEST PROCEDURE FOR THERMAL EVALUATION OF INSULATION SYST FOR VENTILATED DRY-TYPE POWER & DISTRIBUTION TRANSFORMERS	DRY-TYPE TRANSFORMERS W. PATTERSON	PROVOST R. L. (302)999-2225		8/27/84 1995	TO BE PUBLISHED ANSI APPROVED 01/04/94
C57.12.57 PC57.12.57	REQUIREMENTS FOR VENTILATED DRY-TYPE NETWORK TRANSFORMERS 2500kVA AND BELOW, W/HV 34500V AND BELOW,LV 216Y..AND 480Y..	UG TR & NETWORK PROTECTORS P. E. OREHEK	NUTT B. (214)698-7447	T&D EEI/T& SCC14	3/18/92 12/5/91 1997	APPLY FOR NEW PAR
C57.12.58 P745	GUIDE FOR CONDUCTING TRANSIENT VOLTAGE ANALYSIS OF A DRY-TYPE TRANSFORMER COIL	DRY-TYPE TRANSFORMERS W. PATTERSON	KLINE A. D. (404)762-1642	IEC IAS	6/27/91 6/28/78 2001	REAFFIRMED 9/19/96
C57.12.59 NONE	GUIDE FOR DRY-TYPE TRANSFORMER THROUGH-FAULT CURRENT DURATION	DRY-TYPE TRANSFORMERS W. PATTERSON	PATTERSON W. (919)848-1860		1/1/89 9/13/84 1996	EXTENDED 12/1996 ASK FOR PAR EXTENSION
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	IAS NEMA IEC	10/25/92 8/17/89 1994	APPROVED BY SB 10/25/92 BEING BALLOTTED IN C57

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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	REVISING TERMINOLOGY REVISE OR REAF. BEFORE 12/97
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	WILL START REVISION PAR APPROVED 06/14/95
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 PSRC SWG IECTC1 USTAG	3/16/93 6/15/95 1998	MAKING RUNNING CHANGE LIST WG COLLECTING CHANGES
C57.12.90 NEW	STANDARD TEST CODE FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS	INSULATION LIFE L. W. PIERCE	HENRY G. (501)534-5332		1998	WILL START REVISING SECT. 11
C57.12.90 PC57.12.90	CLAUSE 9 - ADD MEASUREMENT OF AUXILARY LOSSES	PERFORMANCE CHARACTERISTICS H. J. SIM	TULI S. (414)547-0121			D1 BALLOTED IN PCS
C57.12.90 PC57.12.90	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

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C57.12.90 PC57.12.90	CLAUSE 10 - ADD HI-POT TEST FOR CONTROL WIRING	DIELECTRIC TESTS L. B. WAGENAAR	TULI S. (414)547-0121					D1 BALOTTED IN SUBCOM
C57.12.90 PC57.12.90	REVISE INDUCED TESTS FOR CLASS II POWER TRANSFORMERS	DIELECTRIC TESTS L. B. WAGENAAR	PERKINS M. (317)286-9334					D1 BALOTTED IN TF
C57.12.90 PC57.12.90	REVISION OF TEMPERATURE RISE TESTS	INSULATION LIFE L. W. PIERCE	HENRY G. (501)543-6546					TO BALLOT D3 IN TF, WG, SC
C57.12.90 PC57.12.90d	REVISION OF THE INDUCED TEST	DIELECTRIC TESTS L. B. WAGENAAR	POULIN B. (408)957-8326 M. PERKINS				9/28/90 0	INCLUDE IN C57.12.90 COORDINATE WITH STEVE SMITH
C57.12.90 PC57.12.90x	CLAUSE 13 - ADD TEST PROCEDURE FOR MEASURING SOUND INTENSITY	AUDIBLE SOUND & VIBRATION J. PURI	GIRGIS R. (317)286-9532 TULI S.					D1 BEING PREPARED COORDINATE WITH STEVE SMITH
C57.12.91 PC57.12.91	TEST CODE FOR DRY-TYPE DISTRIBUTION AND POWER TRANSFORMERS	DRY-TYPE TRANSFORMERS W. PATTERSON	BARNARD D. (919)738-4251	SPD	EM		6/14/95 2000	
C57.120 P842	LOSS EVALUATION GUIDE FOR POWER TRANSFORMERS AND REACTORS	WEST COAST E. G. HAGER	JACOBSEN R.	SUB IAS	EM IEC	ED&PG	12/3/91 5/1/80 1996	REVISE OR REAFF. BY DEC 96 PAR EXTENSION NEEDED
C57.121 P954	GUIDE FOR ACCEPTANCE AND MAINTENANCE OF LESS FLAMMABLE HYDROCARBON FLUID IN TRANSFORMERS	INSULATING FLUIDS F. GRYSZKIEWICZ	McSHANE C. P. (617)926-4900	PSRC IEC	T&D	IAS	2/22/88 3/21/96 1996	PAR APPROVED 03/21/96

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C57.123 P1098	GUIDE FOR TRANSFORMER LOSS MEASUREMENT	PERFORMANCE CHARACTERISTICS H. J. SIM	HENNING W. R. (414)547-0121 RAMSIS GIRGIS		6/13/85 0	PAR EXT. TO 06/97 APPROVED
C57.124 PC57.124	RECOMMENDED PRACTICE FOR THE DETECTION OF PD AND THE MEASUREMENT OF APPARENT CHARGE IN DRY-TYPE TRANSFORMERS	DRY-TYPE TRANSFORMERS W. PATTERSON	KLINE A. D. (404)762-1642	NONE	6/29/91 6/27/91 2001	REAFFIRMED 9/18/96
C57.125 PC57.125	GUIDE FOR FAILURE INVESTIGATION, DOCUMENTATION AND ANALYSIS FOR POWER TRANSFORMERS AND SHUNT REACTORS	PERFORMANCE CHARACTERISTICS H. J. SIM	ALTMAN M. (407)694-4975	T&D ED&PG PSE SWGR	6/27/91 6/28/87 1996	BALLOTING REAFFIRMATION REQUEST PAR EXTENSION
C57.127 PC57.127	GUIDE FOR THE DETECTION OF ACOUSTIC EMISSIONS FROM PARTIAL DISCHARGES IN OIL-IMMERSED POWER TRANSFORMERS	DIELECTRIC TESTS L. B. WAGENAAR	HOWELLS E. (414)835-1500	T&D ED&PG CIGRE IEC	3/10/88 0	PAR WITHDRAWN BY SB APPLY FOR PAR TO REBALLOT
C57.128 PC57.128	FIRE PROTECTION OF OUTDOOR LIQUID-IMMERSED POWER TRANSFORMERS	WEST COAST E. G. HAGER	HAGER R. NORBERG J.	NPE SUB 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 W. N. KENNEDY	KENNEDY W. N. (317)286-9387	EM T&D PSIM SUB	9/26/91 0	PAR EXTENDED TO JUNE 97
C57.13 P546	REQUIREMENTS FOR INSTRUMENT TRANSFORMERS	INSTRUMENT TRANSFORMERS J. E. SMITH	NELSON T. (301)975-2956	PSIM PSR SPD	3/30/94 6/14/94 1999	WORKING ON CHANGES REV. PAR APPROVED 06/14/94
C57.13.1 PSRC	GUIDE FOR FIELD TESTING OF RELAYING CURRENT TRANSFORMERS	INSTRUMENT TRANSFORMERS J. E. SMITH	SMITH J. E. (919-827-2121		8/25/87 1997	R1992 RELAY COMM. DOCUMENT

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE SC CHAIR	WG CHAIR AND PHONE NO. TF CHAIR	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	LATEST STATUS/ COMMENTS
C57.13.2 NONE	CONFORMANCE TEST PROCEDURES FOR INSTRUMENT TRANSFORMERS	INSTRUMENT TRANSFORMERS J. E. SMITH	SMITH J. E. (919-827-2121		4/16/86 9/26/91 1996	REVISE OR REAFF. BY DEC 96 REQUEST PAR EXT. TO JUNE 97
C57.13.3 NONE	GUIDE FOR THE GROUNDING OF INSTRUMENT TR SECONDARY CICUITS AND CASES	INSTRUMENT TRANSFORMERS J. E. SMITH	SMITH J. E. (919-827-2121		1/23/87 1995	REVISE OR REAF. BY 12/96 R1990
C57.13.4 P832	DETECTION OF PARTIAL DISCHARGE AND MEASUREMENT OF APPARENT CHARGE WITHIN INSTRUMENT TRANSFORMERS	INSTRUMENT TRANSFORMERS J. E. SMITH	JONNATTI A. J. (813)785-2788	T&D	5/28/80 0	PAR WITHDRAWN DOCUMENT NEVER SUBMITTED TO SB
C57.13.5 PC57.13.5	TEST REQUIREMENTS FOR INSTRUMENT TRANSFORMERS OF A NOMINAL VOLTAGE OF 115KV AND ABOVE	INSTRUMENT TRANSFORMERS J. E. SMITH	MA J. (706)554-8800	SWGR EM TC 38	9/19/96 0	REVISED PAR APPROVED 9/19/96
C57.13.6 PC57.13.6	REQUIREMENTS FOR INSTRUMENT TRANSFORMERS FOR USE WITH ELECTRONIC REVENUE METERS AND RELAYS	INSTRUMENT TRANSFORMERS J. E. SMITH	TEN-HAAGEN C. W. (603)749-8433	PSIM PSR TD PSC		REVISED PAR DISSAPROVED 9 /96 MAKE CHANGES AND RESUBMIT PAR
C57.130 PC57.130	T-U GUIDE FOR USE OF DISS. GAS ANALYSIS DURING FACTORY THERMAL TESTSFOR THE EVALUATION OF OIL-IMMERSED TRANS. AND REACT.	INSULATING FLUIDS F. GRYSZKIEWICZ	HEINRICHS F. W. (412)941-6924	NONE	3/17/93 0	PREPARING D11
C57.131 PC57.131	REQUIREMENTS FOR LOAD TAP CHANGERS	PERFORMANCE CHARACTERISTICS H. J. SIM	TRAUB T. P. (312)394-2704		3/16/95 0	
C57.133 PC57.133	GUIDE FOR SHORT-CIRCUIT TESTING OF DISTRIBUTION AND POWER TRANSFORMERS	PERFORMANCE CHARACTERISTICS H. J. SIM	McQUIN N. (412) 829-1205	T&D,S PSR IECTC1 SUBS IAS/PS IAS/RE	9/21/95	PAR APPROVED PART II OF C57.12.90

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE SC CHAIR	WG CHAIR AND PHONE NO. TF CHAIR	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	LATEST STATUS/ COMMENTS
C57.134 PC57.134	GUIDE FOR THE DETERMINATION OF HOTTEST SPOT TEMPERATURE IN DRY TYPE TRANSFORMERS	DRY-TYPE TRANSFORMERS W. PATTERSON	PAYNE P. (202)388-2138		9/21/95	PAR APPROVED
C57.135 PC57.135	GUIDE FOR APPLICATION, TESTING, INSTALLATION AND OPERATION OF PHASE ANGLE SHIFTING TRANSFORMERS	WEST COAST E. G. HAGER	TRUMMER E. 43-3172-606-404 DON CHU (WG SEC)	PSRC EMC IAS/PS IEC TC1	6/20/96 0	PAR Approved 6/20/96
C57.136 PC57.136	GUIDE FOR SOUND LEVEL ABATEMENT AND DETERMINATION IN OIL-FILLED TRANSFORMERS	AUDIBLE SOUND & VIBRATION J. PURI	McGILL J. (414)475-3422		3/21/96	DRAFT 1 PRODUCED PAR APPROVED 03/21/96
C57.137 PC57.137		INSULATING FLUIDS F. GRYSZKIEWICZ	(617)926-4900			
C57.138 NEW	RECOMMENDED PRACTICE FOR ROUTINE IMPULSE TEST FOR DISTRIBUTION TRANSFORMERS	DIELECTRIC TESTS L. B. WAGENAAR	ROSSETTI J. (901)528-4743	T&D IA/PSE PSIM	9/19/96	
C57.15 NONE	REQUIREMENTS, TERMINOLOGY, & TEST CODE FOR STEP-VOLTAGE REGULATORS	DISTRIBUTION TRANSFORMERS K. S. HANUS	DIAMANTIS T. (315)428-5688	SUBS IAS/PS	3/18/87 9/21/95 1997	SCOPE REVISED TO ISSUE DRAFT 4
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 IAS T&D	9/19/58 12/11/95 1976	BALLOTED FOR RECIRCULATION
C57.17 ANSI	REQUIREMENTS FOR ARC FURNACE TRANSFORMERS	STANDARDS T. P. TRAUB			1986	LAST REVISED IN 1986 ANSI DOCUMENT

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE SC CHAIR	WG CHAIR AND PHONE NO. TF CHAIR	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	LATEST STATUS/ COMMENTS
C57.18.10 PC57.18.10	REQUIREMENTS FOR SEMICONDUCTOR RECTIFIER TRANSFORMERS	PERFORMANCE CHARACTERISTICS H. J. SIM	KENNEDY S. P. (716)896-6500	NONE	12/28/81 0	PAR EXT. TO 06/97 REQUESTED BALLOTING IN SC (10/96)
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 IA/PSE ICC IEC SC3	7/23/91 6/20/96 1996	PAR APPROVED 6/20/96
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 IA/PSE IEC SC	8/5/91 6/20/96 1996	BEING BALLOTED
C57.19.03 PC57.19.03	STANDARD REQUIREMENTS, TERMINOLOGY AND TEST CODE FOR BUSHINGS FOR DC APPLICATIONS	BUSHING F. E. ELLIOTT	HEYMAN OLOF 46-240-83152		6/20/96 2001	APPROVED BY STANDARDS BOARD 6/20/96
C57.19.100 P800	GUIDE FOR APPLICATION OF APPARATUS BUSHINGS.	BUSHING F. E. ELLIOTT	ELLIOTT F. E. (503)230-3900	SWGR SUB 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 1995	PAR MORE THAN 4 YEAR OLD ACTION NEEDED ON PAR
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 T&D PSR	4/2/91 6/9/88 2000	APPLY FOR PAR EXTENSION R1995

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
C57.21 PC57.21a	REQUIREMENTS,TERMINOLOGY AND TEST CODE FOR SH. REACTORS OVER 500kVA	DIELECTRIC TESTS L. B. WAGENAAR	KENNEDY W. N. (317)286-9387	NONE	4/2/91 12/11/86 1995	PAR MORE THAN 4 YEAR OLD PAR WITHDRAWN
C57.91 PC57.91	GUIDE FOR LOADING MINERAL OIL-IMMERSED TRANSFORMERS	INSULATION LIFE L. W. PIERCE	PIERCE L. (706)291-3166	SUB T&D PSE	6/14/95 6/13/85 2000	APPLY FOR NEW PAR
C57.92 PC57.92	GUIDE FOR LOADING MINERAL OIL-IMMERSED POWER TRANSFORMERS UP TO & INCL 100 MVA WITH 55 C OR 65 C AVE. WINDING RISE	INSULATION LIFE L. W. PIERCE	PIERCE L. (706)291-3166	T&D SUB PSE	3/21/91	STANDARD WITHDRAWN, COMBINED WITH C57.91
C57.93 PC57.93	GUIDE FOR INSTALLATION OF LIQUID-IMMERSED POWER TRANSFORMERS.	WEST COAST E. G. HAGER	GILLIES D. A. (503)622-4847	NONE	12/12/95 0	REVISION APPROVED 12/11/95 WITHDRAW 12.11/12.12 WHEN APP.
C57.94 NONE	RECOMMENDED PRACTICE FOR INSTALLATION, APPLICATION,OPERATION & MAINTENANCE OF DRY-TYPE GEN PURPOSE DIST & POWER TR	DRY-TYPE TRANSFORMERS W. PATTERSON	PATTERSON W. (919)848-1860		12/9/87 1992	PUB. 1982, REAFFIRMED 1987 BALLOTTING REAFFIRMATION
C57.95 NONE	GUIDE FOR LOADING LIQUID-IMMERSED STEP-VOLTAGE AND INDUCTION-VOLTAGE REGULATORS	INSULATION LIFE L. W. PIERCE	(314)554-3097		3/21/91 1996	NO WORK IN PROGRESS BALLOT FOR REAF. REQUESTED
C57.96 PC57.96	GUIDE FOR LOADING DRY-TYPE DISTRIBUTION AND POWER TRANSFORMERS	DRY-TYPE TRANSFORMERS W. PATTERSON	PIERCE L. (706)291-3166	T&D SCC14 SCC10	4/26/89 5/6/91 1996	PAR WITHDRAWN SUBMIT NEW PAR
C57.98 PC57.98	IEEE GUIDE FOR TRANSFORMER IMPULSE TESTS	DIELECTRIC TESTS L. B. WAGENAAR	POULIN B. (408)957-8326 R. E. MINKWITZ, SR.	NONE	6/1/86 12/2/93 1999	PUBLISHED JAN 95 DISCUSS PAR BUSINESS

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

STANDARD/ PROJECT	TITLE OF DOCUMENT	SUBCOMMITTEE SC CHAIR	WG CHAIR AND PHONE NO. TF CHAIR	COMMITTEES REQUESTING COORDINATION	PUB DATE PAR DATE REV DUE	LATEST STATUS/ COMMENTS
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 JUNE 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 T&D IC	3/17/93 0	CONTINUE WORK IN SPD ASK FOR PAR WITHDRAWAL
IEEE1388 P1388	STANDARD FOR THE ELECTRONIC REPORTING OF TRANSFORMER TEST DATA	DISTRIBUTION TRANSFORMERS K. S. HANUS	McCAIN A. (410)291-3231	EEI NEMA ASC X1 PSR CS SAB	9/15/93 0	PREPARING D1 NO. CHANGED FROM C57.132
NEW NEW	TASK FORCE TO STUDY APPLICATON AND PROBLEMS OF DRAW-LEADS FOR BUSHINGS	BUSHING F. E. ELLIOTT	NORDMAN RUSS (414)547-0121 R. NORDMAN			NEW TASK FORCE
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	BALLOTTING WORKING GROUP SUBMIT PAR AS SOON AS POSSIBLE

Attachment 2 COORDINATION ACTIVITIES OF THE IEEE/PES TRANSFORMERS COMMITTEE

10-Jan-97

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

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

PROJECT / DATE	TITLE / COMMITTEE	CONTACT		COORDINATOR		TR SUBCOMM	STATUS
P1268	GUIDE FOR INSTALLING TEMPORARY SUBSTATIONS						D1 READY FOR WG COMMENTS
3/30/91	SUBS	SHASHI G. PATEL	404-362-5386	D. A. GILLIES	503-622-4847	WEST COAST	
P1291	GUIDE FOR PARTIAL DISCHARGE MEASUREMENTS IN POWER SWITCHGEAR						ANSI APPROVED 08/30/93
10/22/91	SWGR	E. F. VEVERKA	414-835-1544	G. H. VAILLANCOURT	514-652-8515	STANDARDS	
P1303	GUIDE FOR STATIC VAR COMPENSATOR FIELD TESTS						APPROVED BY SB 06/94
9/17/92	SUBS	PHILIP R. NANNERY	914-577-2591	R. F. DUDLEY	416-298-8108	DRY TYPE	
P1304	CURRENT MEASURING SYSTEMS WHICH USE OPTICAL TECHNIQUES						
6/18/92	PSIM	T. R. McCOMB	613-990-5826	J. E. SMITH	919-827-3220	INSTRUMENT TRANSFORMERS	
P1325	RECOMMENDED PRACTICE FOR REPORTING FIELD TROUBLE DATA FOR POWER CIRCUIT BREAKERS						INFORMATION COPY REQUESTED
3/17/92	SWGR	D. M. LARSON	203-634-5739	G. H. VAILLANCOURT	514-652-8515	STANDARDS	
P1459	STD DEF. FOR THE MEAS. OF ELECTRIC POWER QUANTITIES UNDER SINUSOIDAL, NON-SIN., BALANCED OR UNBALANCED CONDITIONS						APPLYING FOR PAR
	PSIM	A. E. EMMANUEL	508-831-5239	EDDIE SO	613-993-2660	PERFORMANCE CHARACTERISTICS	
P420	STANDARD FOR THE DESIGN AND QUALIFICATION OF CLASS 1E CONTROL BOARDS, PANELS, AND RACKS USED IN NUCLEAR GENERATING STN						INFORMATION COPY
11/5/94	NPE	M. S. ZAR	312-269-2222	L. W. PIERCE	706-291-3166	INSULATION LIFE	
PC 37.104	GUIDE FOR AUTOMATIC RECLOSING						
7/19/96	PSRC	WILLIAM STRANG	618-288-9211	H. J. SIM	919-580-3234	PERFORMANCE CHARACTERISTICS	
PC37.10	GUIDE FOR DIAGNOSTICS AND FAILURE INVESTIGATION OF POWER CIRCUIT BREAKERS						DRAFT IN REVISION IN WG
5/1/91	SWGR	L. ROLANDO SAAVED	504-363-8765	WALLACE B. BINDER JR.	216-384-5625	PERFORMANCE CHARACTERISTICS	
PC37.107	STANDARD FOR DIGITAL PROTECTIVE RELAY INTERFACES						EVALUATING BALLOT RESULTS
12/28/85	PSR	STIG L. NILSSON	408-335-9061	G. H. VAILLANCOURT	514-652-8515	STANDARDS	

PROJECT DATE	TITLE COMMITTEE	CONTACT		COORDINATOR		TR SUBCOMM	STATUS
PC37.108	GUIDE FOR THE PROTECTION OF NETWORK TRANSFORMERS						REAFFIRMED 1994
9/28/84	PSR	THOMAS E. WIEDMAN	312-394-2593	VACANT		STANDARDS	
PC37.109	GUIDE FOR THE PROTECTION OF SHUNT REACTORS						REAFFIRMED 1993
3/28/85	PSR	LAVERN L. DVORAK	303-231-1636	MIKE ALTMAN	407-694-4975	PERFORMANCE CHARACTERISTICS	
PC37.110	GUIDE FOR THE APPLICATION OF CURRENT TRANSFORMERS USED FOR PROTECTIVE RELAYING PURPOSES						REVISION (D21) BALOTTED IN PSR
5/31/90	PSR	GRAHAM CLOUGH	206-737-6912	J. E. SMITH	919-827-3220	INSTRUMENT TRANSFORMERS	
PC37.91	GUIDE FOR PROTECTIVE RELAY APPLICATION TO POWER TRANSFORMERS						
3/19/92	PSR	MIRIAM SANDERS	919-856-2457	RON BARKER	804-257-4671	PERFORMANCE CHARACTERISTICS	
PC37.97	GUIDE FOR PROTECTIVE RELAY APPLICATION TO POWER SYSTEM BUSES						ANSI APPROVED 05/20/91
12/10/87	PSR	STEVE CONRAD	505-848-2642	J. E. SMITH	919-827-3220	INSTRUMENT TRANSFORMERS	
PC57.13.1	GUIDE FOR FIELD TESTING OF RELAYING CURRENT TRANSFORMERS						REAFFIRMED 1992
12/31/80	PSR	ARUN G. PHADKE	703-231-7029	J. E. SMITH	919-827-3220	INSTRUMENT TRANSFORMERS	
PC62.11	STANDARD FOR METAL-OXIDE SURGE ARRESTERS FOR AC POWER CIRCUITS						NEW PAR 6/14/94
6/14/94	SPD	R. M. SIMPSON	919-836-7059	W. A. MAGUIRE	501-377-4273	DIELECTRIC TESTS	
PC62.2.01	APPLICATION GUIDE FOR SURGE PROTECTION OF ELECTRIC GENERATING PLANTS						
6/1/84	SPD	G. L. GAIBROIS	313-237-9332	VACANT		DIELECTRIC TESTS	
PC62.22	GUIDE FOR APPLICATION OF METAL OXIDE SURGE ARRESTERS FOR AC SYSTEMS						INCLUDE DIST. TRANSFORMER
12/2/93	SPD	J. WOODWORTH	716-375-7270	ROBERT DEGENEFF	518-276-6367	DIELECTRIC TESTS	
PC62.42	GUIDE FOR THE APPLICATION OF LOW-VOLTAGE SURGE PROTECTIVE DEVICES						REVISED PAR 9/22/94
7/18/94	SPD	R. DAVIDSON JR.		MAHESH P. SAMPAT	704-462-3226	DIELECTRIC TESTS	

Attachment 3

10-Jan-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	
EEI	EDISON ELECTRIC INSTITUTE (T&D COMM.)	M. C. MINGOIA	(202) 508-5177
EI	ELECTRICAL INSULATIONS	E. A. BOULTER	(508) 546-3009
EM	ELECTRIC MACHINERY COMMITTEE	B. GUPTA	(416)231-4111
IAS	INDUSTRY APPLICATION SOCIETY	B. C. JOHNSON	(512) 396-5880
IAS/PSE	IAS/POWER SYSTEM ENGINEERING COMMITTEE	R. W. INGHAM	(313) 236-0130
IAS/PSP	IAS/POWER SYSTEM PROTECTION	J. FISCHER	[215] 481-4402
IAS/REP	IAS/RURAL ELECTRIC POWER COMMITTEE	L. E. STETSON	(402) 472-2945
IC	INSULATED CONDUCTORS COMMITTEE	GARY POLHILL	(312) 394-7734
IEC/SC36A	IEC INSULATED BUSHINGS SUBCOMMITTEE 36A	BILL SAXON	(704) 382-6534
IEC/TAG	US TECHNICAL ADVISOR TO IEC TC 14	P. J. HOPKINSON	(704) 282-7469
IEC/TC42	IEC HIGH VOLTAGE TESTING TECHNIQUES COMMITTEE 42	G. H. VAILLANCOURT	(514) 652-8515
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION	J. GAUTHIER	(202) 457-8400
NPE	NUCLEAR POWER ENGINEERING COMMITTEE	M. S. ZAR	(312) 269-2222
PSC	POWER SYSTEM COMMUNICATIONS COMMITTEE	SUKHDEV WALIA	(908) 422-2104
PSE	POWER SYSTEM ENGINEERING COMMITTEE	W. A. JOHNSON	(301) 469-5252
PSIM	POWER SYSTEM INSTRUMENTATION MEASUREMENT COMMITTEE	T. R. MC COMB	(613) 990-5826
PSRC	POWER SYSTEM RELAYING COMMITTEE	R. W. HAAS	(513) 231-2584
SCC14	COORD. COM. ON QUANTITIES UNITS AND LETTER SYMBOLS	B. BARROW	(703) 285-5444
SCC4	COORDINATING COMMITTEE ON THERMAL RATING	P. E. ALEXANDER	(219) 458-4576
SPD	SURGE PROTECTIVE DEVICES COMMITTEE	J. B. POSEY	(216) 887-5129
SUBS	SUBSTATIONS COMMITTEE	GARY ENGMANN	(407) 419-3521

ABREVIATION	COMMITTEE OR SOCIETY	LIASON REPRESENTATIVE	PHONE NUMBER
SWGR	SWITCHGEAR COMMITTEE	D. F. PEELO	(604) 528-3034
T&D	TRANSMISSION AND DISTRIBUTION COMMITTEE	C. KRISHNAYA	(514) 652-8342
TC	TRANSFORMERS COMMITTEE	T. P. TRAUB	(312) 394-2704
TSC	TECHNICAL SYMBOLOGY COMMITTEE (PART OF AIM)		

IEEE/PES TRANSFORMERS COMMITTEE ATTENDANCE STATISTICS

GROUPS	Fort Mar. 93	St. Pete Nov. 1993	Dallas Mar. 1994	Milw Sep. 1994	Kan. City Apr. 1995	Boston Nov. 1995	Saint Apr.1996	Bert Oct.96	MAX	AVG
Committee Registration: Members and Guests	213	283	247	275	286	272	301	287	301	271
Spouses	48	97	43	55	45	51	64	67	97	59
Luncheon	112		125	149	158	165	167	148	167	146
SC ADMINISTRATIVE	16	21	20	22	22	20	21	19	22	20
SC AUDIBLE NOISE AND VIBRATION	26		29	32	18	26	34	23	34	27
SC BUSHINGS	17	18	39	36	35	32	32	29	39	30
WG Bushing Application Guide	21	19	22	23				0	23	17
TF Draw Lead Bushings					18	25		17	25	20
WG DC Applications of Bushings	17	13	17	19	21	19	19	0	21	16
WG Revision C57.19.01		13	22	23	32	30	30	28	32	22
SC DIELECTRIC TESTS	88	98	79	84	99	71	88	91	99	87
WG Revision of Dielectric Tests	40	60	53	56	40	39	50	49	60	48
TF on Revision of the Induced Test	25	33	38	30	48	28	32	41	48	34
TF Metal Oxide Surge Arrester Coordination	27	35	25	35	31	14	22	0	35	24
WG Rev. Dielectric Tests on Distr. Transf.	17			16	15	14	16	13	17	13
TF Rev. Distr. Impulse Guide				17	19	18	16	13	19	17
WG Diagnostic Field Testing & Monitoring						64	89	94	94	82
WG Partial Discharge Tests	66	28	23	27		27	35	44	66	36
SC DISTRIBUTION TRANSFORMERS	35	52	47	49	48	44	37	45	52	45
WG Overhead Type Distr. Transfs. C57.12.20	23	35	34	34	30	30		23	35	30
WG Single-Phase Submersible C57.12.23				15	30	23			30	23
WG Single-Phase Deadfront Padmount C57.12.25	28	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 Regs C57.15				25	40	33			40	33
SC DRY-TYPE TRANSFORMERS	39	38	33	41	45	37		26	45	37
WG Test Code C57.91	31	27	24	28		27		25	31	27
WG Dry-Type Reactors	12	7	7	12	13	10	14	9	14	11
WG Dry-Type Reactors - HVDC Smoothing		8	5	10	6	7	5		10	7
WG Dry-Type Thermal Eval. and Flammability	26	20			20	21		16	26	21
WG Dry-Type General Requirements C57.12.01		31	21	21	36	27	20		36	26
WG Insulation Req. for Specialty Transf.	6	11	8	10	10	9	11	11	11	10
WG Cast Coil Loading Guide	30	17	17	16	24	21	19	19	30	20
WG Hot Spot Diferentials		27	16	31	38	28	34		38	29
SC HVDC CONVERTER TRANF. & REACTORS	19	17		15	13		11	9	19	14

NOTE: Data maintained for four years only.

* = estimated

IEEE/PES TRANSFORMERS COMMITTEE ATTENDANCE STATISTICS

GROUPS	Port Mar. 93	St. Pete Nov. 1993	Dallas Mar. 1994	Milw. Sep. 1994	Kan. City Apr. 1995	Boston Nov. 1995	Sunr. Apr. 1996	Burl. Oct. 96	MAX	AVG
SC INSTRUMENT TRANSFORMERS	21	28	21	13	13	18		26	28	20
WG Test Req Instr Transf >115 kVA				22	30	22	16		30	23
WG Revision of C57.13				11	13	20	20		20	16
SC INSULATING FLUIDS	57	62	50	44	61	58	68	69	69	59
WG Gas Analysis During Factory Tests	57	62		44	61	58			62	56
WG Gas Analysis Silicone Transformers				44	61	58			61	54
SC INSULATION LIFE	83	60	63	45	49	57	65	60	83	60
WG Guides for Loading	69	73	61					0	73	51
WG Thermal Eval. of Distr. and Power Transf.	38	35	11				32	0	38	23
WG Thermal Tests	34	39	30	58	34	21	33	32	58	35
TF Revision of Temperature Test Code				20	22	19	37	0	37	20
TF Thermal Duplicate			27	31		26	20	37	37	28
TF Hottest Spot Temp. Rise			31	36	44	52	51	40	52	42
WG High Temperature Insulation	55	58	52	48	50	46	48	41	58	50
SC PERFORMANCE CHARACTERISTICS	60	97	83	93	88	99	106	108	108	92
WG Loss Tolerance and Measurement	39	32	35	45	36	34	37	30	45	36
TF Loss Measurement Guide				16					16	16
TF Low Power Factor Measurements				33					33	33
WG LTC Performance Requirements	38	37	37	41				0	41	31
WG PCS Rev. C57.12.00			20	21	38	29		46	46	31
WG PCS Rev. C57.12.90 Part I			15	19	15	23	34	49	49	26
WG PCS Rev. C57.12.90 Part II						5		0	5	3
WG Revision C57.110	38	32	35	30	39	40	34	42	42	36
WG Semi-Conductor Rectifier Transformers	31	23	23	22	29	33	28	26	33	27
TF Survey GSU Transf Failures				16	18	33		0	33	17
SC STANDARDS			13	12	17	14			17	14
WG Continuous Revision C57.12.00					15	15			15	15
WG Continuous Revision C57.12.90					15	15			15	15
WG Diagnostic Field Testing of Transf.				21	37	29			37	29
SC UNDERGRND. TRANF. & NETWK. PROTCS.	17	19	20	19	15	12	12	13	20	16
WG Three-Phase Underground Transfs.	9	16	16	16	10	13	10	12	16	13
WG Liquid-Filled Sec. Network Transfs.	16	15	16	15	15	15	12	13	16	15
WG Secondary Network Protectors	13	20	17	13	13	13	11	13	20	14
WG Dry-Type Network Transfs.	18	12	10	12	6	9		0	18	10
SC WEST COAST					26		9	14	26	16
WG Consolidation of Installation Guides									0	0
WG Phase Shifting Transformers					15	18	36		36	23
WG Seismic Guide									0	0
WG Loss Evaluation Guide									0	0
WG Fire Protection									0	0

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NOTE: Data maintained for four years only.

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