

**IEEE/PES
TRANSFORMERS
COMMITTEE**

**MEETING
MINUTES**

**CLEVELAND, OHIO
OCTOBER 19-21, 1992**

IEEE/PES TRANSFORMERS COMMITTEE
OCTOBER 21, 1992 - CLEVELAND, OHIO

MEMBERS PRESENT:

D. J. ALLAN
R. ALLUSTIARTI
M. S. ALTMAN
J. AUBIN
T. R. BALGIE
R. A. BANCROFT
R. L. BARKER
D. A. BARNARD
W. B. BINDER
W. E. BOETTGER
J. V. BONUCCHI
J. D. BORST
M. CAMBRE
D. J. CASH
J. L. CORKRAN
D. W. CROFTS
V. DAHINDEN
J. N. DAVIS
D. H. DOUGLAS
R. F. DUDLEY
F. E. ELLIOTT
D. J. FALLON
J. A. FLEEMAN
A. A. GHAFOURIAN
R. L. GRUBB
F. J. GRYSZKIEWICZ
K. S. HANUS
J. H. HARLOW
W. R. HENNING
K. R. HIGHTON
R. H. HOLLISTER
P. J. HOPKINSON
J. W. HOWARD
J. HUNT
P. IIJIMA
A. J. JONNATTI
R. D. JORDAN
E. KALLAUR
J. J. KELLY
S. P. KENNEDY
W. N. KENNEDY
J. G. LACKEY
F. A. LEWIS
H. F. LIGHT
S. LINDGREN
D. L. LOWE

D. S. LYON
J. W. MATTHEWS
S. P. MEHTA
M. C. MINGOIA
R. E. MINKWITZ, SR.
M. I. MITELMAN
H. R. MOORE
W. E. MOREHART
D. H. MULKEY
J. W. MCGILL
W. J. MCNUTT
C. G. NIEMANN
G. A. PAIVA
B. K. PATEL
W. F. PATTERSON
J. M. PATTON
P. A. PAYNE
H. A. PEARCE
D. PERCO
V. Q. PHAM
L. W. PIERCE
D. W. PLATTS
J. R. ROSSETTI
W. E. SAXON
D. N. SHARMA
H. J. SIM
L. R. SMITH
S. D. SMITH
W. W. STEIN
J. C. SULLIVAN
D. W. SUNDIN
D. S. TAKACH
L. A. TAUBER
J. B. TEMPLETON
J. C. THOMPSON
T. P. TRAUB
W. B. UHL
G. H. VAILLANCOURT
R. A. VEITCH
L. B. WAGENAAR
B. H. WARD
R. J. WHEARTY
A. L. WILKS
J. G. WOOD
W. E. WRENN

MEMBERS ABSENT:

E. J. ADOLPHSON
B. F. ALLEN
J. C. ARNOLD
D. L. BASEL
C. V. BROWN
O. R. COMPTON
T. DIAMANTIS
J. A. EBERT
K. EDWARDS
H. G. FISCHER
J. M. FRANK
M. FRYDMAN
R. E. GEARHART
D. W. GERLACH
D. A. GILLIES
R. S. GIRGIS
G. H. HALL
F. W. HEINRICHS
P. J. HOEFLER
E. HOWELLS
C. P. KAPPELER
J. P. KINNEY, JR.
A. D. KLINE
E. KOENIG
J. P. LAZAR
R. E. LEE
L. A. LOWDERMILK
R. I. LOWE
K. T. MASSOUDA
C. K. MILLER
C. MILLIAN
R. J. MUSIL
W. H. MUTSCHLER, JR.
C. J. McMILLEN
E. T. NORTON
P. E. OREHEK
S. H. OSBORN
D. A. PETERS
J. M. POLLITT
C. T. RAYMOND
P. RIFFON
C. A. ROBBINS
R. B. ROBERTSON
M. P. SAMPAT
L. J. SAVIO
R. W. SCHEU

V. SHENOY
R. J. STAHARA
L. R. STENSLAND
R. W. STONER
A. M. TEPLITZKY
V. THENAPPAN
J. A. THOMPSON
D. E. TRUAX
D. W. WHITLEY
C. W. WILLIAMS, JR

IEEE/PES TRANSFORMERS COMMITTEE
OCTOBER 21, 1992 - CLEVELAND, OHIO

GUESTS PRESENT:

D. ANDEREGG	A. J. MARTINEZ
G. ANDERSEN	C. L. MOORE
J. ANTWEILER	C. R. MURRAY
M. P. AUSTIN	C. P. McSHANE
D. E. AYERS	L. NAPOLI
B. L. BEASTER	R. C. NORDMAN
D. L. BILLINGS	D. E. PARR
J. L. BROWN	L. C. PEARSON
A. CANCINO	R. L. PLASTER
W. J. CARTER	B. POULIN
R. E. CHADWICK	G. PREININGER
J. M. CHRISTINI	R. L. PROVOST
D. CHU	R. I. PSYCK
C. C. CLAIRBORNE	J. PURI
J. C. CROUSE	G. J. REITTER
A. DELGADO	A. RIZVI
R. FAUSCH	D. ROLLING
P. T. FEGHALI	A. SALEM
G. E. FORREST	D. M. SHAH
B. I. FORSYTH	R. W. SIMPSON, JR.
M. A. FRANCKEK	P. SINGH
D. L. GALLOWAY	J. E. SMITH
R. GARCIA	T. H. STEWART
J. S. GARZA	T. SUBHASH
J. P. GIBEAULT	R. W. THOMPSON
D. F. GOODWIN	T. THORNTON
R. L. GRUNERT	E. TRUMMER
E. HANIQUE	J. VASCHAK
N. W. HANSEN	R. D. WAKEAM
J. W. HARLEY	K. WEIDMANN
T. J. HAUPERT	F. E. WILLETT
G. E. HENRY III	H. J. WINDISCH
O. HEYMAN	E. WOOLFORT
T. L. HOLDWAY	
R. HOLLINGSWORTH	
E. HUTTER	
L. KOGA	
S. KOSTYAL	
B. KUMAR	
M. Y. LAU	
J. E. LONG	
R. G. LOSS	

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 CLEVELAND, OHIO
 OCTOBER 21, 1992

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TRANSFORMERS COMMITTEE

IEEE/PES TRANSFORMERS COMMITTEE MEETING
WEDNESDAY, OCTOBER 21, 1992

Chairman: J.D. Borst

Vice Chairman: J.H. Harlow

Secretary: W.B. Binder, Jr.

- | | | |
|------|--|-------------------|
| 1. | Chairman's Remarks and Announcements | J.D. Borst |
| 2. | Approval of Minutes of April 1, 1992 | J.D. Borst |
| 3. | Vice Chairman's Report | J.H. Harlow |
| 4. | Administrative Subcommittee | J.D. Borst |
| 5. | Transformer Standards | G.H. Vaillancourt |
| 6. | Recognition and Awards | R.A. Veitch |
| 7. | Report of Technical Subcommittees | |
| 7.1 | Audible Sound and Vibration | A.M. Teplitzky |
| 7.2 | Bushing | L.B. Wagenaar |
| 7.3 | Dielectric Tests | H.R. Moore |
| 7.4 | Distribution Transformers | J.C. Thompson |
| 7.5 | Dry-Type Transformers | W. Patterson |
| 7.6 | HVDC Converter Transformers & Reactors | W.N. Kennedy |
| 7.7 | Instrument Transformers | J.N. Davis |
| 7.8 | Insulating Fluids | H.A. Pearce |
| 7.9 | Insulation Life | D.H. Douglas |
| 7.10 | Performance Characteristics | J.W. Matthews |
| 7.11 | Underground Transformers & Network
Protectors | P.E. Orehek |
| 7.12 | West Coast | L.A. Tauber |
| 8. | Reports of Liaison Representatives: | |
| 8.1 | EPRI | S.R. Lindgren |
| 8.2 | Discussion of Other Liaison Reports | |
| 9. | New Business | |

IEEE/PES TRANSFORMERS COMMITTEE
CLEVELAND, OHIO
OCTOBER 21, 1992

I. CHAIRMAN'S REMARKS AND ANNOUNCEMENTS

Chairman John Borst called the meeting to order at 8:00AM. He asked our host, Dave Douglas to come forward. Mr. Douglas thanked his host committee members:

Mrs. Douglas;
Mr. Jack Harley and his wife, Judy;
Mr. George Payerle and his wife, Donna.

Mr. Douglas announced that attendance was 241 registered and 39 spouse registrations.

Mr. Borst next invited our Portland host to give a report. Lou Tauber reported that the Spring meeting will be held at the Red Lion at Lloyd Center on March 28-31, 1993. Rooms will be \$100 single or double. The Tuesday social will be at the Oregon Museum of Science and Industry.

As West Coast Subcommittee Chairman, Mr. Tauber reported that the previous meeting of the Subcommittee was held in Durango, Colorado, from May 11 through May 14, 1992; and that the next meeting of the Subcommittee will be November 18-20, 1992 in Vancouver, B. C.

II. APPROVAL OF MINUTES OF APRIL 1, 1992

There was one correction to the published minutes. The date of the St. Petersburg meeting was stated incorrectly. The correct dates are October 31 to November 3, 1993. There being no other objections or corrections, the minutes were approved as corrected.

III. VICE CHAIRMAN'S REPORT - J. H. HARLOW

Mr. Harlow reported on the Summer Power Meeting session of the Publications Committee. Mr. Harlow pointed out the IEEE's emphasis on providing discussion for transaction papers. Advance copies of papers will be made available by Mr. Harlow to encourage discussion.

The Technical Sessions Improvement Committee will establish review committees within foreign countries in an attempt improve grammar in approved general meeting papers.

The Organization and Procedures Committee did not meet at the Summer Power Meeting.

Mr. Harlow reported on technical paper coordination. There were six papers presented at two sessions at the Summer Power Meeting. There were twenty five papers submitted for an allocation of seven slots for the Winter Power Meeting to be held in Columbus in February, 1993.

Mr. Harlow reported on the schedule of future meetings:

<u>Meeting Dates:</u>	<u>Location:</u>
10/31-11/3/93	St. Petersburg
3/20-3/23/94	Dallas
9/24-9/28/94	Milwaukee
Spring, 1995	Kansas City
11/5-11/9/95	Boston
Spring, 1996	San Francisco

Mr. Harlow's full report can be found as a part of the Administrative Subcommittee Meeting Minutes.

IV. ADMINISTRATIVE SUBCOMMITTEE

Mr. Borst reviewed the highlights of the Administrative Subcommittee meeting held Monday evening. He announced the changes in Subcommittee Chairmanship. These include Jerry Thompson replacing Frank Stevens as Chairman of the Distribution Transformers Subcommittee and Jim Templeton replacing Harold Moore as Chairman of the Dielectric Tests Subcommittee.

Future meeting registration fees will include the cost of meeting minutes.

The standards process was discussed at great length by the Administrative Subcommittee.

Mr. Borst reported on membership changes. He announced the passing of Mr. Roy Uptegraff. He introduced seven new members and outlined the requirements of membership. The seven new members are:

- D. H. Mulkey, Pacific Gas & Electric
- C. G. Nieman, Commonwealth Edison
- D. S. Lyon, Wisconsin Electric Power
- V. Q. Pham, ABB Power T & D
- D. J. Cash, Consultant
- J. Frank, International Transformer
- P. Riffon, Hydro Quebec.

The following are the complete minutes of the Administrative Subcommittee:

IEEE/PES TRANSFORMERS COMMITTEE
ADMINISTRATIVE SUBCOMMITTEE
OCTOBER 19, 1992
CLEVELAND, OHIO

I. INTRODUCTIONS OF MEMBERS AND GUESTS

Introductions were conducted prior to the start of the meeting. Chairman John Borst called the meeting to order at 7:00 P.M. The following members and guests were present:

Members:

W. B. Binder, Jr.	J. W. Matthews	L. A. Tauber
J. D. Borst	H. R. Moore	J. Thompson
J. N. Davis	W. Patterson	J. Templeton
D. H. Douglas	H. A. Pearce	R. A. Veitch
J. H. Harlow	G. H. Vaillancourt	
L. B. Wagenaar		

Guests:

Jim Howard for Paul Orehek
Luigi Napoli - IEEE Staff
Andrew Salem - IEEE Staff

II. AGENDA

After Chairman Borst reviewed the major issues to be addressed at the meeting and made additions to the agenda (included as Attachment ASC- A), he turned to the business of the meeting.

III. HOST REPORTS

Cleveland - Mr. Douglas reported there are 235 registered with more expected. This does not include 35 spouses.

Reproduction costs of meeting minutes were discussed. Henry Pearce moved that the meeting registration fee include the cost of minutes for committee members and attendant guests. The motion carried.

Portland - Mr. Tauber reported that the meeting will be held at the Red Lion at Lloyd Center on March 28-31, 1993. Rooms will be \$100 single or double. The Tuesday social will be at the Oregon Museum of Science and Industry.

Hosts are scheduled through mid 1996. Mr Harlow's report contains the places and dates for future meetings.

IV. STANDARDS

Mr. Vaillancourt reviewed his report, which is included in this report. Mr. Salem addressed the issues relating to the IEEE's international posture regarding standards. Mr. Veitch encouraged adoption of existing standards when they exist. Mr. Borst expressed a feeling of remoteness from the IEC process. The decision to adopt an IEC standard or write a new standard will be made at the technical committee level. Copyright issues between IEEE and IEC have been

be made at the technical committee level. Copyright issues between IEEE and IEC have been resolved by IEEE staff. Standards Staff is working to develop an index or bibliography of IEC standards to facilitate this effort.

IEEE Standards Board has proposed to drop the letter "C" from C57 series standards to circumvent the perceived publication block posed by ANSI and/or NEMA. Mr. Salem asked for feedback. Mr. Borst provided feedback. A spirited discussion ensued. Mr. Salem said that the Vice President of Standards feels an obligation to publish the standards that IEEE develops. This is the reason for the proposed action. ANSI itself has a six month publication rule.

There is a serious problem in ANSI and it doesn't look good to foreign entities. It is much more than the problems with the Transformers Committee. John Borst asked Staff to provide us with additional documentation of specific problems. IEEE Executive Board has said IEEE should publish its own standards. IEEE feels an obligation, when we use due process to develop a standard, to publish the standard.

Mr. Vaillancourt discussed the problems encountered in approval of C57.12.00 and C57.12.90. He will request a life extension and then the documents will be balloted.

V. IEEE/PES STANDARDS

Mr. Salem and Mr. Napoli of the Standards Board Staff were present. There was nothing more to report.

VI. STATUS OF ANSI C57 COMMITTEE

There was no report. There will be a meeting of the C57 Committee on Wednesday afternoon.

VII. PES AWARDS

Mr. Veitch reported that he will be presenting five Certificates of Appreciation and three IEEE Standards Board plaques. In addition, an IEEE Standards Board Plaque has been given to Henry Pearce for C57.106. A copy of Mr. Veitch's report follows:

RECOGNITION & AWARDS SUBCOMMITTEE REPORT
October 14, 1992

The following Certificates of Appreciation will be presented at the Transformers Committee meeting to be held in Cleveland, Ohio on October 21, 1992.

- (a) These certificates are presented to individuals who have been former Chairmen of the Transformers Committee, Subcommittees and Working Groups. The following certificates are being presented:

Wallace B. Binder	- Working Group on Transformer Failure Analysis
Ralph Stetson	- Instrument Transformers Subcommittee
Frank Stevens	- Distribution Transformer Subcommittee
David W. Sundin	- Working Group on Transformer Fire Protection
George H. Vaillancourt	- Working Group on Partial Discharge Tests for Transformers

- (b) IEEE Standards Board Plaques

The IEEE Standards Board has initiated a new program to show appreciation to Working Group Chairmen for developing new standards. For each new standard published, a plaque is prepared showing the cover of the standard and an inscription below stating:

IEEE Standards Board acknowledges with appreciation
John Doe
for his contribution in the development of this Standard
Published month/day/year

Three Standards Board plaques will be distributed to the following individuals:

- Loren Wagenaar for IEEE C57.19.00-1991, IEEE Standard General Requirements and Test Procedure for Outdoor Power Apparatus Bushings
- Loren Wagenaar for IEEE C57.19.01-1991, IEEE Standard Performance Characteristics and Dimensions for Outdoor Apparatus Bushings
- George Vaillancourt for ANSI/IEEE C57.113-1192, Guide for Partial Discharge Measurement in Liquid-Filled Power Transformers & Shunt Reactors

Respectfully submitted,

Robert A. Veitch
Chairman, Awards & Recognition

VIII. SUBCOMMITTEE ACTIVITIES

- A. Insulation Life Subcommittee. Mr. Douglas nominated Linden Pierce to chair the Working Group on Guides for Loading.
- B. West Coast Subcommittee. Mr. Tauber reported their next meeting will be held in Vancouver in November. The full text of Mr. Tauber's report is below:

Administrative Subcommittee Report - October 19, 1992

West Coast Subcommittee Report

1. The West Coast Transformers Subcommittee held its last meeting in Durango, Colorado, May 11-14, 1992 and had a presentation from representatives of the Western Area Power Administration and B. C. Hydro to discuss phase shifting transformers. Included was afield visitation to WAPA's substation at Farmington, New Mexico, to see their phase shifter transformer installation.
2. The next meeting of the West Coast Transformer Subcommittee will be held in conjunction with the West Coast Substation Committee, November 18-20, 1992 in Vancouver, B. C., Canada. Tours will include a tour of the Powerserve and Powertech facilities in Surrey, B. C., and a tour of B. C. Hydro's underground substation in Cathedral Square, in Vancouver.
3. The West Coast Transformer Subcommittee and the Bonneville Power Administration are pleased to host the spring 1993 Transformers Meeting in Portland, Oregon, March 28-31, 1993. The conference hotel is the Lloyd Center Red Lion Hotel. IEEE room rates are \$100 for either single or double occupancy. The Tuesday evening Social will be held at the newly completed Oregon Museum of Science and Industry. There will be several exhibits and also available will be planetarium and 3-dimensional movie shows at various times during the evening.

Lou Tauber
Chairman

- C. Underground Distribution Transformers and Network Protectors Subcommittee. Mr. Howard reported for Mr. Paul Orehek. A copy of Mr. Orehek's report is inserted below:

**ADMINISTRATIVE SUBCOMMITTEE REPORT
UNDERGROUND TRANSFORMERS AND NETWORK PROTECTORS SUBCOMMITTEE**

1.0 Membership - 23

- 1.1 Notices have been sent to five members due to lack of participation and to determine if any problem exists that affects their attendance and to determine if they wish to continue their membership.

2.0 Transformer Committee Membership

- 2.1 Messrs. C G. Niemann of Commonwealth Edison and D. H. Mulkey of Pacific Gas and Electric were recommended for membership in the Transformers Committee.

3.0 Standards Activities

- 3.1 C57.12.24 - Three-Phase Underground-Type Transformers The Working Group and Subcommittee approved the proposed revisions in Draft #5 and the Standard is presently being balloted in the Transformers Committee.
- 3.2 C57.12.40 - Secondary Network Liquid-Immersed Transformers The Working Group and Subcommittee approved the proposed revisions in Draft #3 and the Standard is presently being balloted in the Transformers Committee.
- 3.3 C57.12.44 - Secondary Network Protectors Draft #1 was completed after the Birmingham meeting and will have a complete review at this meeting. It is anticipated that the proposed Standard will be balloted in the Working Group after the Portland meeting.
- 3.4 C57.12.57 - Three-Phase Dry-Type Network Transformers The balloting process has started in the Working Group on the revisions incorporated in the last live years. It is anticipated that the Standard will be balloted in the Transformers Committee during the first quarter of 1993.

Respectfully submitted,

Paul E Orehek

At this point the statement was made by Staff representatives that only sponsor ballots will be handled by Standards Board Staff in the future.

- D. Dielectric Tests Subcommittee. Mr. Moore submitted his report incorporated below:

ADMINISTRATIVE SUBCOMMITTEE 10/19/92
DIELECTRIC TESTS SUBCOMMITTEE ACTIVITIES

1. MEMBERSHIP

The present membership is 70 including the 7 new members who were added at the Birmingham meeting.

2. STANDARDS ACTIVITIES

The Task Force on Enhancement Voltage Time During Power Transformer Induced Tests chaired by M. S. Altman has been disbanded since it was impossible to reach a consensus after several meetings. The Working Group On Revision Of Dielectric Tests will consider establishment of another Task Force to make a comprehensive study of the induced test, the enhancement time, the point at which the partial discharge base readings are to be taken, the criteria for apparent charge acceptance values, the definition of increasing trends, etc, since there appears to be a need to examine all of these issues.

The work on the revision of C57.98 "Guide for Transformer Impulse Tests" continues. A number of new detailed issues have been raised since the last meeting which delayed completion of the draft. An attempt is being made to resolve these issues so that a draft of the guide can be prepared and balloted.

A PAR has been prepared and is being processed on the "Guide for Protection of Distribution Transformers from Secondary (Low, Voltage) Side Surges".

The Subcommittee will consider the formation of a Working Group on Measurement of Partial Discharges in Service at the meeting on October 20.

Bob Degeneff is the chairman of the new Task Force on Metal Oxide Surge Arrester Coordination With Power Transformer Insulation.

3. LIAISON ACTIVITIES

John Crouse has agreed to serve as the Transformers Committee representative on the C92 Insulation Coordination Working Group.

Harold R. Moore October 17, 1992

Mr. Vaillancourt asked the status of C57.127 which was misplaced in 1990. The document needs to be balloted to affirm the 1990 ballot results. A PAR also needs to be prepared for the Guide for Location of Acoustic Emissions from Partial Discharges in Oil-Filled Power Transformers.

(Secretary's note: Mr. Templeton will replace Mr. Moore who is resigning as Subcommittee Chairman.)

- E. Instrument Transformers Subcommittee. Mr. Davis' report is incorporated below:

ADMINISTRATIVE SUBCOMMITTEE REPORT
INSTRUMENT TRANSFORMER SUBCOMMITTEE
CLEVELAND, OHIO
Oct. 19, 1992

1. The proposed standard, C57.13, "Standard Requirements for Instrument Transformers" will be reviewed by the IEEE Standards Board in their December meeting. Approval was delayed from June since the Communications society coordinator had not replied. A new form and draft copy has been sent to the coordinator.
2. The Transformers Committee ballot for C57.13.4, "Detection of Partial Discharges and the Measurement of Apparent Charge Within Instrument Transformers" has not received a 75% return. Three more ballots need to be returned. The draft has received 76 affirmative ballots and three negative ballots.
3. Informal coordination has been established between the Switchgear Committee drafting current transformers standards for circuit breakers. Their two drafts cover free-standing current transformers and bushing current transformers. During the present meeting a coordinator for the Instrument Transformer Committee will be named and formal coordination established.

John N. Davis, Chairman Instrument Transformers Subcommittee

Mr. Davis also questioned if the Standards Staff will copy draft documents for balloting the Committee, why is it necessary to supply 30 copies of the document when it is submitted to REVCOMM. Mr. Napoli promised to check on that question and get back to the Committee.

- F. Distribution Transformers Subcommittee. Mr. Thompson reported that a PAR will be submitted on a Data Transmission Standard for Test Data. He asked permission to submit PARs on the Joint C57/C37 Enclosure Requirements Standards. The members of ADSUBCOMM discussed the Committees willingness to except those standards.

Mr. Thompson moved that if the C57 Committee (ANSI) and the C37 Committee (ANSI) agree, the Transformers Committee agrees to accept the Joint C57/C37 Working Groups and the development of the four enclosure standards (C57.28, C57.29, C57.30, and C57.31) into the Distribution Transformers Subcommittee. This would be done pending approval by the Distribution Transformers Subcommittee. The motion passed. Staff will clarify what, if any, ballot must be undertaken. The agreement to move must be accompanied by the transfer of applicable copyrights as well. Mr. Thompson's report is included as follows:

ADMINISTRATIVE SUBCOMMITTEE MEETING
DISTRIBUTION TRANSFORMERS SUBCOMMITTEE REPORT
MONDAY, OCTOBER 19, 1992

Frank Stevens' resignation has been accepted as Frank has accepted the position of Manager of Training for Northeast Utilities and must relinquish his transformer responsibilities. Jerry Thompson of Duke Power Company in Charlotte has accepted the chairmanship which was effective this past summer.

This fall meeting has a total of six(6) working groups scheduled to have sessions. Those meeting are:

- * C57.12.20--Overhead Type Transformers
- * C57.12.21--Single Phase Live Front Padmounts * C57.12.22--Three Phase Live Front Padmounts
- * C57.12.25--Single Phase Dead Front Padmounts
- * C57.12.26--Three Phase Dead Front Padmounts
- * Bar Coding for Distribution Transformers Working Group

Both C57.12.23 and C57.12.26 have been approved in ballot at the Main Committee. C57.12.23 has been approved at the IEEE Standards Board and is currently with an IEEE editor. C57.12.26 is currently at the IEEE Standards Board awaiting approval. C57.12.22 has been approved at the Distribution Transformers Subcommittee level and will be balloted at the Main Committee during this (the fourth) quarter of 1992. The remaining standards are all on progress toward being republished at their appropriate times. In addition, C57.12.27 on Unit Substations is in the process of being removed due to lack of utilization in the user and manufacturer area.

Work has begun on the process of combining the two single phase padmount transformer documents into one document, as well as, combining the two three phase padmount transformer documents into one document. This combining of standards will reduce padmounted standards from four to two. The first working groups to begin the process are C57.12.22 and C57.12.26. These two working groups will meet together during this meeting. Work on combining the single phase documents is scheduled to begin in 1993.

The Bar Coding Standard for Distribution Transformers continues to enjoy excellent support at the working group level. Draft 2 of the proposed standard is being reviewed at this meeting.

A recent survey of the transformer user community was taken at the request of the Distribution Transformers Subcommittee. The subject was to determine the amount of support for a standard on the electronic transmittal of transformer test data from the manufacturer to the purchasing company. The survey illustrated strong support for the creation of a working group similar to the Bar Coding Working Group to bring manufacturers and users together to produce such a standard. This topic will be further discussed at the Distribution Transformers Subcommittee meeting this week.

The Joint Working Group C57/C37 on Enclosure Integrity will hold a meeting in Cleveland beginning Wednesday afternoon and lasting through Thursday. A review of Draft 6 of ANSI C57.12.30 on Enclosure Integrity for Submersible Equipment will take place at this meeting along with on-site inspection of

submersible equipment in Cleveland. This committee still has NEMA as its secretariat. Standards under its jurisdiction include ANSI C57.12.28 on Padmounted Enclosure Integrity and ANSI C57.12.29 on Padmounted Enclosure Integrity Under Severe Environments. These are current standards. In addition to ANSI C57.12.30, the committee is working on a standard for overhead equipment with the standard number of C57.12.31.

Under discussion is a move to bring the C57/37 Enclosure Integrity Working Group under the IEEE Distribution Transformers Subcommittee similar to other standards that were formerly part of the ANSI Transformer Committee with NEMA secretariats. This proposal is in part due to lack of NEMA representatives for the last six meetings of the working group.

Members of the former ANSI Transformer Committee continue to enjoy the benefits of being associated with the IEEE PES Transformers Committee. Both maintaining our standards and our own personal professional development have been enhanced by this association.

Respectfully Submitted,
J. C. Thompson, Chairman IEEE Distribution Transformers Subcommittee

- G. Dry Type Transformers Subcommittee. A copy of Mr. Paterson's report is incorporated below:

ADMINISTRATIVE SUBCOMMITTEE
DRY TYPE TRANSFORMERS SUBCOMMITTEE
OCTOBER 19, 1992 - CLEVELAND, OH

1. SUBCOMMITTEE MEMBERSHIP - 30 Members

The Subcommittee membership was reduced by one since the last meeting.

Mr. Roy Uptegraff passed away in July, 1992. Roy was a member of IEEE/PES for more than 50 years. He had served as Chairman of the Dry Type Subcommittee for more than 8 years. His death represents a great loss to the IEEE/PES and especially the Transformers Committee. See the attached obituary.

1.1 NOMINATIONS TO TRANSFORMERS COMMITTEE

- Frank, Jerome, M. International Transformer Corp.

2. WORKING GROUPS - ACTIVE

2.1 WG DRY TYPE REACTORS - C57.16

Draft D5 incorporating the changes from the Birmingham meeting is complete and will be discussed at these meetings.

2.2 TF DRY TYPE HVDC SMOOTHING REACTORS - IEEE 1277

The first draft of the test code for dry type air-core HVDC smoothing reactors has been prepared. This draft will be the main topic of discussion at this meeting session.

2.3 WG DRY TYPE TEST CODE - C57.12.91

Draft D4 was balloted within the WG. The negative ballots will be the primary topic of discussion at this meeting.

2.4 WG CAST COIL LOADING GUIDE - C57.96

Negative ballots from Draft D1 were discussed at the last meeting. Draft 2 is to be ready for review at this session.

2.5 WG SPECIALTY TRANSFORMERS - IEEE 259

The PAR for this WG expires 12/92.

All Transformer Committee negative ballots were resolved on Draft D8 at the last meeting in Birmingham.

At this meeting, the status of the (4) negatives from SCC3 will be discussed together with any additional loose ends.

2.6 WG THERMAL EVALUATION - CAST COILS - C57.12.60

The status of C57.12.60-D9 will be reviewed (it was submitted to the Standards Board at the last meeting).

A formal request to ballot the Transformers Committee for reaffirmation of C57.12.56 was prepared by Mr. Provost just prior to this session and forwarded to the Standards Board.

Wesley F. Patterson Jr - Chairman Dry Type Transformer Subcommittee

- H. Bushings Subcommittee. Mr. Wagenaar had nothing to report.
- I. Performance Characteristics Subcommittee. Mr. Matthews reported that, based on recent progress on the LTC Performance Requirements Standard, the LTC Symposium can be presented in Portland. He sought and received permission to ballot the main Committee on the LTC Standard. He was instructed to find a suitable time for the symposium with Mr. Tauber, the Portland host. A copy of Mr. Matthews' report is incorporated below:

ADMINISTRATIVE SUBCOMMITTEE
PERFORMANCE CHARACTERISTICS SUBCOMMITTEE ACTIVITIES

Working Groups - Revision C57.110

Rick Marek is replacing Max Cambre as Chairperson after this meeting.

Projects - C57.110-1986 Recommended Practice for Establishing Transformer Capability When Supplying Nonsinusoidal Load Currents

This document has been submitted for reaffirmation at the Standards Board meeting in December.

- C57.105-1987 Guide for Application of Transformer Connections in Three-Phase Distribution Systems

This Guide was reaffirmed by the Standards Board on June 13, 1992.

Miscellaneous - Load Tap Changer Seminar

Plans could not be fully developed for this Seminar during the Cleveland meeting. We have not rescheduled at this time.

Guide for Substation Life Extension - Methods of Assessing Equipment Condition

I responded to a request from the IEEE Substations Committee for input on this subject regarding transformers.

Definition of "New" Design

A request has been received to provide a definition of what constitutes a "new" design regarding test requirements in C57.12.00. I will attempt to answer this question directly.

PCS Chairman

- J. Dielectric Fluids Subcommittee. A copy of Mr. Pearce's report is shown below:.

ADMINISTRATIVE SUBCOMMITTEE REPORT
INSULATING FLUIDS SUBCOMMITTEE
October 19, 1992

The Insulating Fluids Subcommittee is meeting on Monday and Tuesday mornings. The Oil Guide C57.106 and Gas Guide C57.104 have now been printed and issued.

The primary effort at this session involves the work in preparing two new guides, C57.130, Gas Analysis During Factory Tests and P1258, Gas Analysis of Transformers Filled with Silicone Fluid.

Henry Pearce

- K. HVDC Converter Transformers and Smoothing Reactors Subcommittee. Mr. Kennedy had nothing to report.

IX. VICE CHAIRMAN'S REPORT

Mr. Harlow discussed three particular committee responsibilities which are the Vice Chairman's. He also reported on Technical Paper Coordination. He listed the future meeting schedule.

Mr. Harlow also reported on the last meeting of Technical Council. Items of particular interest include:

- A new PES Organizational manual is soon to be published.
- The new due date for SPM Technical papers is 1/1/93.
- Balloting of standards by IEEE Staff has been a great success and Technical Council will come back with a recommendation for other mailing services.
- The PES Directory should show Working Group assignments.
- Technical Council is soliciting a tutorial session for the T & D Conference in the spring of 1994. The opportunity is available for the Transformers Committee to sponsor a session if we have an appropriate topic.

A request has been received to make a Technical Paper presentation at the Spring 1993 Transformers Committee meeting. The Vice Chairman will work with the Portland host to find an appropriate time slot.

Mr. Harlow's complete report is as follows:

IEEE PES TRANSFORMERS COMMITTEE
VICE CHAIRMAN'S REPORT
OCTOBER 19, 1992

- I. Reports of PES Committee to which the Vice Chairman serves as liaison. All meetings held in conjunction with 1992 Summer Power Meeting, Seattle, WA, July 13-14, 1992.

- A. Publications Committee

1. Distribution of preprints of Technical Papers. A copy of each paper approved for presentation at the 1992 SPM was provided ten weeks in advance of the meeting. These were duplicated and distributed to all members of the Administrative Subcommittee, hopefully to be further distributed to persons known to have interest in particular topics.

This IEEE "experiment" in early paper distribution does not appear to have been as successful as desired. It will be repeated for the 1993 WPM. I'm open to suggestions as to how to improve the procedure in order to get papers of particular interest to the right people.

2. A modification to the one page summary, of papers submitted is suggested to require a statement on the impact of the paper on the industry and on why the paper is important. This suggestion received very favorable committee response. An example will be prepared and be considered at the 1993 WPM.

A task force is developing a new technical paper review form. The grading criteria is expected to give greater insight to practical as opposed to theoretical papers.

4. Question asked: How might electronic publishing be used to advantage? Discussion planned for next meeting.

- B. Technical Session Improvement Committee

1. As a change in policy, the critique prepared by the technical session chairman will be sent to the authors. Previously, these were kept confidential and used for internal assessment of the session.
2. The matter of grammatical deficiencies in many foreign submittals was again discussed. Jerry Hagge, Chairman of Technical Council, proposed that a foreign, non-technical review be accomplished before papers are sent to IEEE, i.e., Japanese papers would be reviewed and approved by a local Japanese committee before submission.

- C. Organization and Procedures Committee

The committee did not meet at the 1992 SPM.

II. Technical Paper Coordination

- A. 1992 Summer Power Meeting, Seattle, WA, July 12-16, 1992. Six papers were presented at two sessions, one of which was a joint session with, the Power Systems Communications Committee.
- B. 1992 Winter Power Meeting, Columbus, OH, Jan. 31-Feb. 5, 1993. An unusually High 25 papers have been submitted for review by the Transformers Committee. The committee quota for presentation is seven, for an allowed 28% acceptance rate.

III. Future Meeting Schedule

March 28-31, 1993	Portland, OR	Lou Tauber
Oct 31-Nov 3, 1993	Petersburg Beach, FL	Jim Harlow/ Charlie Williams
March 20-23, 1994	Dallas, TX	Ken Hanus
Sept 24-28, 1994	Milwaukee, WI	Sam Mehta
Spring, 1995	Kansas City, MO	Henry Windisch
Nov 5-9, 1995	Boston, MA	Ken Skinger
Spring, 1996	San Francisco, CA	John Wood

Respectfully submitted,

J. H. Harlow
Vice Chairman

X. SECRETARY'S REPORT

Mr. Binder announced the passing of Roy Uptegraff.

Mr. Binder announced the resignations from the Committee of Len Swenson and Frank Stevens.

Seven new membership applications were submitted and approved. They are:

- D. H .Mulkey - P G & E (User)
- C. G. Niemann - Commonwealth Edison (User)
- D. S. Lyon - W E P C O (User)
- D. J. Cash - Consultant (General Interest)
- Van Quan Pham - ABB (Producer)
- Jerome Frank-International Transformer (Producer)
- Pierre Riffon - Hydro Quebec (User)

Membership stands at 148 Voting Members and 13 Emeritus Members.

The Membership roster has been updated and marked up galley proofs have been sent to IEEE for the PES Directory.

XI. NEW BUSINESS

Mr. Thompson discussed the start of a project on electronic submittal of test data. A common format is needed but there are differences between distribution and power transformers beyond the first page of the test report.

The Subcommittee discussed the appropriateness of constituting a permanent Working Group within a subcommittee to perform future oversight and revision of C57.12.00 and C57.12.90. This will be a matter of old business for discussion at the Portland ADSUBCOMM Meeting.

XII. ADJOURNMENT

Mr. Veitch moved the meeting be adjourned. Adjourned at 11:00 p.m.

V. STANDARDS - G. H. VAILLANCOURT

Mr. Vaillancourt reviewed the highlights of his report (Incorporated below as part of these minutes).

The new IEEE Standards Style Manual has been published. It emphasizes the international nature of IEEE Standards.

Committee ballots can be conducted through IEEE Staff by contacting Ms. Terry deCourcelle. Only Sponsor committee ballots will be conducted by Staff.

PARs must be forwarded to Mr. Vaillancourt to allow circulation for coordination with other PES technical committees. Please keep Mr. Vaillancourt informed of any other requests for coordination which you receive.

When submitting documents or PARs for Standards Board Approval, allow enough time to meet the agenda deadline. Remember when submitting PARs to allow enough time to circulate for coordination. Deadlines for upcoming Standards Board meetings are:

<u>Meeting</u>	<u>Agenda Deadline</u>
Dec. 3, 1992	October 23, 1992
March 18, 1993	February 5, 1993
June 17, 1993	May 7, 1993

Standards may be submitted directly to Ms. Linda Gargiulo of the Standards Board Staff.

Mr. Vaillancourt reported on the status of recent document submittals. Regarding the status of C57.12.00 and C57.12.90, Mr. Vaillancourt suggested requesting an extension so that the documents can be submitted for ballot. He said that revision must stop at some point so that the document can be submitted.

Mr. Vaillancourt reviewed the content of his report on the status of Transformer Standards. The first section contains standards sorted by responsible Subcommittee and Working Group. The second is a listing of active C57.12.00 and C57.12.90 projects. Another attachment shows projects of other Technical Committees for which coordination has been requested.

Mr. Borst made additional comments regarding the standards coordination process. The coordination process is better organized and is making progress.

Mr. Borst discussed compilation of C57.12.00 and C57.12.90. He reported on the motion from the Birmingham meeting expressing the Committee's concerns being forwarded to the Chairman of the PES Standards Coordinating Committee. Mr. Borst stated that what has been done with the compilation is similar to what was done during previous revisions. Nonetheless, the Standards Board decided to require a ballot. He agrees that this will be an opportunity to solicit comments on areas of concern. This was one of Olin Compton's concerns at the previous meeting. In effect the ballot will reaffirm the remaining sections of the two documents not previously revised and solicit information to

consider for future revisions.

Mr. Borst introduced Mr. Luigi Napoli, the new PES Administrator from IEEE Standards Staff. Mr. Napoli gave an overview of the Standards process yesterday at the Seminar for Working Group and Subcommittee Chairs.

The following is the complete text of Mr. Vaillancourt's report:

DATE: October 21, 1992
TO: Members of IEEE Transformers Committee
FROM: Georges H. Vaillancourt, Standards Subcommittee Chairman
SUBJECT: Standards Activities since the Birmingham Meeting

TRANSFORMERS STANDARDS AND COORDINATION ACTIVITIES

The status of all transformer standards or projects sorted by responsible subcommittees is reported in attachment 1. Attachment 2 gives a list of current status and unconsolidated changes under way on standards C57.12.00 and C57.12.90. Many of these changes have now been balloted individually through the Transformers Committee and we will try to incorporate them in the 1992 revision of these two very important standards.

The most frequent cause of delay for getting a new standard approved by REVCOM is coordination that was not done. In order to help improve this situation, the acronyms of the bodies that have requested coordination are listed in attachments 1 and 2 and an index of these acronyms along with the name of the contact for each committee or society can be found in attachment 3. By calling these persons it should be possible to find out who in each committee has been appointed to look after coordination for each individual standard sponsored by the Transformers Committee. The original information on who requested coordination is normally listed in the approved PAR.

Attachment 4 is a report on coordination activities for documents that are sponsored by other committees or societies and for which the Transformers Committee has requested coordination.

PES STANDARDS COORDINATING COMMITTEE MEETING

The Standards Coordinating Committee met in Seattle on Monday July 13, 1992. The topics of concern to the Transformers Committee that were discussed at that meeting are as follows:

- 1) The chairman Fred Kimsey reported that Administrative Sponsorship of C92 Insulation Coordination Standards is being assigned to PES SCC. It is currently being sponsored by PES Technical Council who will reaffirm the existing documents and will provide working members for future activities. The Transformers Committee representative will be Dr. John C. Crouse of General Electric Company.
- 2) Technical Committees were advised that the IEEE Standards Department does not currently have the staff or budgets to conduct non-standards related mailings. Staff will assist, but should be

consulted on a case-by-case basis.

- 3) PES goals as it relates to standards were reviewed. As PES & IEEE become more of an active player in international standards, the quality of IEEE standards must improve. In order to work towards broadening of IEEE standards use, it was identified that each technical committee should seek out where voids exist in IEC standards and work towards filling those voids. It should be IEEE's goal not to overlap or duplicate existing standards.
- 4) Andrew Salem of IEEE gave an update on IEEE's role as cosecretariat to various ANSI committees with NEMA. This arrangement has impeded IEEE's ability to get various C37 and C57 standards published. Other ANSI committees which are impacted are C50, C55, C62, and C97. Major area of concern is voting process and how the NEMA delegation impedes progress. John Posey, representing SPD and a member of C62, indicated that no such problem exist on arrester related standards. It was suggested that PES provides a recommendation to withdraw as cosecretariat of the above ANSI committees. Finally, it was decided that action on this be deferred until more information on this is circulated in order to arrive at a more informed decision.

The next meeting of SCC will be held in Columbus, Ohio on February 1, 1993.

DOCUMENTS SUBMITTED TO STANDARDS BOARD

NESCOM 06/17/92 (PAR's)

C57.12.00	Conditional approval (Explain need)
C57.12.44	Approved
C57.12.70	Approved with changes
C57.12.90	Conditional approval (Explain need)

REVCOM 06/17/92 (Standards)

C57.12.26	Revision approved
C57.12.70	Reaffirmation approved
C57.13	Revision not approved (Coordination problems)
C57.19.101	Adopted as full-use
C57.105	Reaffirmation approved
C57.109-1985	Extended to June 1994
C57.117	Reaffirmation approved

NESCOM 09/16/92 (PAR's)

C57.12.00	Approved
C57.119	Approved (change required in title and scope)

REVCOM 09/16/92 (Standards)

C57.12.00	Revision not approved, ballot needed
C57.12.00c	Approved as supplement
C57.12.00h	Approved as supplement
C57.12.00i	Approved as supplement
C57.12.00j	Approved as supplement

C57.12.00k	Approved as supplement
C57.12.60	New trial-use approved
C57.12.90	Revision not approved, ballot needed
C57.12.90b	Not approved as supplement
C57.12.90c	Not approved as supplement
C57.12.90e	Not approved as supplement

FUTURE STANDARDS BOARD MEETINGS

<u>Deadline for Submittal</u>	<u>Meeting Date</u>
October 23, 1992	December 3, 1992
February 5, 1993	March 18, 1993
May 7, 1993	June 17, 1993

NEW IEEE STANDARDS STYLE MANUAL

The IEEE Standards Department has mailed out, a new 1992 edition of the IEEE Standards Style Manual, to all working group chairmen. The main changes in this edition were made to harmonize IEEE style with that of the international standards organizations, ISO and IEC. Some of the substantive changes are as follows:

- 1) References can only be made to standards documents from standards-developing organizations. Any other type of publication must become a bibliographic reference.
- 2) Notes will no longer be parts of the standard unless they are notes to a table or to a figure.
- 3) There will be nomenclature differences; for example, the appendixes will be called informative annexes, all sections will be called clauses, and all subsections will be called subclauses.

However, IEEE is making exceptions to certain elements of ISO/IEC style. For example, the decimal point will continue to be represented by a period (rather than by a comma), the structure of IEEE titles and front matter will be maintained, and equations will continue to be represented in their current manner.

With only a few exceptions, all standards submitted after January 1, 1993, will need to be prepared in the new style. Extra copies of the 1992 IEEE Standards Style Manual can be obtained by phoning the IEEE Standards Department at (908) 562-3836.

Submitted by:
G. H. Vaillancourt

VI. RECOGNITION AND AWARDS - R. A. VEITCH

Mr. Veitch made five presentations of PES Certificates of Appreciation to outgoing Working Group and Subcommittee Chairs. These were presented to Wally Binder, David Sundin, George Vaillancourt, Ralph Stetson, and Frank Stevens.

IEEE Standards Board plaques for completion of standards work were presented to Loren Wagenaar for C57.19.00 and for C57.19.01 and to George Vaillancourt for C57.113. Mr. Henry Pearce was recognized as having received his plaque earlier for C57.106.

If anyone knows of a certificate which has not been presented, please inform Mr. Veitch.

VII. SUBCOMMITTEE REPORTS - (The complete minutes of each Subcommittee are incorporated below. Any discussion from the floor of the Transformers Committee Meeting precedes the Subcommittee Minutes.)

A. Audible Sound and Vibration - A. M. Teplitsky

No Subcommittee meeting was held. There was no report.

B. Bushings - L. B. Wagenaar

BUSHING SUBCOMMITTEE
Report to the Transformers Committee
October 21, 1992

The Bushing Subcommittee met on Tuesday, October 20, 1992 with twelve members and ten guests present. After approvals of the minutes of the March 31, 1992 meeting, it was reported that C57.19.00 and C57.19.01 have been published by IEEE. The subcommittee then heard the reports of its three working groups:

Working Group on Revision of C57.19.01

Chairman Pritpal Singh reported that the working group met on Monday, October 19 with nine members and four guests present. Major items of discussion included:

- 1) Figure 1(B), which shows the standard dimension of the normally ungrounded voltage tap, will be removed because this tap is no longer used by any manufacturer.
- 2) The values for cantilever loading proposed for Table 8 at the last meeting were reviewed and it was decided to obtain input from the Circuit Breaker committee representative.
- 3) It was proposed that the allowable permanent deflection at the bottom terminal of transformer bushings be increased to 0.06 in. from 0.03 in. The allowable permanent deflection at the lower end of circuit breaker and interchangeable bushings will remain at 0.03 in.
- 4) The power factor limit for oil-impregnated, paper-insulated bushings will be changed from 0.55 to 0.50%.

Working Group on Bushing for DC Applications (DC57.19.03)

Chairman Olaf Heyman reported that nine members and three guests attended meeting the meeting which was held on Monday, October 19. The working group continued its discussion on the new document and made the following decisions:

- 1) The ESDD (Equivalent Salt Deposit Density) during the contamination test will be 0.01 mg/cm² unless otherwise specified by the user.
- 2) The minimum creepage distance for indoor application will be 17mm/kV (0.67 in/kV).

It was also reported that the HVDC Converter Transformer and Smoothing Reactor Subcommittee had again revised the criteria for partial discharge during the polarity reversal tests in PC57.129. The DC bushing standard will be revised accordingly. There was also some discussion about the appropriate test voltage for measuring partial discharge during the one-

hour ac test. The formula given in PC57.129 will be considered for this purpose. Information to be collected for conclusion in the next draft include creepage distances for outdoor applications. An attempt will also be made and rain conductivities used in other bushing tests to find a correlation between switching impulse and lightning impulse requirements. If possible, the next draft will be balloted within the working group before the next meeting.

Working Group on Bushing Application Guide (PC57.19.100)

Chairman Fred Elliot reported that the working group met on Monday and again on Tuesday morning with twelve members and fifteen guests present. It was reported that C57.19.101, Bushing Loading Guide, had been approved by the IEEE Standards Board as a full-use guide. The working group then reviewed the results of the latest subcommittee ballot of the document. The ballot received a 79% response and one negative vote. The negative vote proposed a revision of the equations in the bushing loading portion of the guide. The proposal was discussed at length but without resolution. Resolution will be attempted by comparing results of the two methods, and through discussion and correspondence. Numerous other comments on affirmative ballots were discussed and several charges were made. If possible, Draft 9 will be re-balloted before next meeting.

Additional Bushing Subcommittee Discussion

Pritpal Singh reported on the latest draft of IEC SC 36A document for bushings. Changes include a correction factor to correct creepage distance for porcelain diameter, permissible operating cantilever loadings, routine lightning impulse tests for bushings rated 300m and above, and specification of a test tap on bushings rated 72kV. The last item is contrary to our practice where we specify a test tap for bushings rated through 69kV and voltage taps for bushings at higher voltages.

One item of new business was introduced at the meeting. A transformer manufacturer pointed out that C57.19.01 allows the current transformer (CT) pocket to extend beyond the inner end of the bushing flange by using an extended metallic ground fail. It was further pointed out that this geometry is particularly susceptible to a possible safety hazard wherein a flasher from the bottom of the bushing to the CT can cause high voltages within the transformer control cabinet. This situation can be prevented if the bottom of the CT is protected by a ground shield, and the manufacturer has requested a formal definition of CT pocket and definitive requirements of the inner flange length with respect to the CT pocket length. Discussion of this topic revealed that this practice was at least 30 years old and that a few incidences of high voltages in control cabinets had indeed occurred. It was agreed that this item would be considered at future meetings and proposal for a warning that the bottom of such CT pockets should be shielded will be prepared.

C. Dielectric Tests - H. R. Moore

MEETING MINUTES
DIELECTRIC TEST SUBCOMMITTEE
October 20, 1992 Cleveland, Ohio

The Dielectric Test Subcommittee met at 9:30 A.M. with 49 members and 55 guests present. The minutes of the March 31, 1992 meeting were accepted as submitted.

CHAIRMAN'S COMMENTS

Various items from the ADCOM meeting were reviewed. The Standards Board will no longer ballot Task Force. Working Group or Subcommittee documents. The chairman of the Dielectric Tests Subcommittee has resigned, and Mr. J. B. Templeton was appointed by ADCOM to be the new subcommittee chairman.

WORKING GROUP REPORTS

I. WORKING GROUP ON REVISION OF DIELECTRIC TESTS J. B. Templeton,
Chairman R. E. Minkwitz, Sr., Secretary

The Working Group met at 4:15 P.M. on October 19, 1992 with 32 members and 26 guests present. The minutes of the March 30, 1992 meeting in Birmingham were approved as submitted.

The Task Force reports were as follows:

Task Force on Revision of Impulse Test Guide R. E. Minkwitz, Sr.,
Chairman

The Task Force met on October 19, 1992 at 9:30 A.M. with 23 members and 22 guests present. The minutes of the March 30, 1992 Birmingham meeting were approved as submitted.

The one negative ballot on Draft 5 of the Switching Impulse Test document was discussed. B. K. Patel has had numerous phone conversations and has sent letters to the individual submitting the negative ballot. The consensus of the Task Force was that reasonable effort has been made in an attempt to resolve the negative ballot and that we will proceed to finalize the document in Draft 6. A final letter of explanation will be sent to the person voting negative, and an explanation of the negative ballot and the efforts to resolve it will be provided to the Standards Board when this document is submitted as an addition to C57.98.

The negative ballots received on Draft 2 of the Forward and Table of Contents and Draft I of Impulse Testing Techniques balloted in January 1992 were then discussed. The negative votes on both of these ballots were resolved.

The next ballot reviewed was that of Draft 2 for Digital Transient Recording. The Task Force was presented with a

successful ballot of 75.4 %. There were no negative ballots and nine approved with comments. At this point, eight of the nine comments have been resolved.

The one outstanding comment related to the necessity for addressing the sensitivity and tolerances on the digital impulse measurements. The individual submitting this comment will receive the response from the Task Force that the application of the digital transient recorders is a new approach requiring understanding of new concepts. More experience is needed for defining sensitivity and tolerances of sensitivity. Failure detection techniques for this method should be developed and included in the impulse test guide after adequate experience is gained.

Draft 2 of Impulse Testing Techniques balloted in June 1992 was then discussed. A successful ballot of 77 % was presented and there were 3 negative ballots and 12 approved with comments. The editorial comments have been resolved and the Task Force agreed on the method to resolve the negative ballots. The Task Force chairman will attempt to clear the negative ballot through discussion with the submitter. The most noteworthy negatives dealt with the inclusion of impulse test requirements in C57.98. The position of the submitter of the negative ballot is that requirements should be in C57.12.00 and C57.12.90. The Task force will go forward to obtain acceptance of the wording of the requirements but will also indicate that the requirements will be placed in the next revision of C57.12.00 and C57.12.90 and not in C57.98.

Draft 1 of the ballot for Response Time of Dividers and Shunts for Impulse Testing of Transformers was then reviewed. The ballot was successful with 75.2 % responses. There was one negative ballot and 32 approved with comments. The negative ballot and "approved with comments" were resolved.

The meeting adjourned at 11:23 A.M.

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

There were 27 attendees at the first meeting of this Task force. Bob Degeneff provided a brief overview and purpose for the formation of the Task Force. Yasin Musa of AEP, and a member of the Surge Protection Devices Committee, presented information on the volt-time characteristics of metal oxide arresters. The characteristics of metal oxide are significantly different than those of silicon carbide. Thus, the issue arises as to whether the volt-time characteristics of transformer insulation is properly coordinated with that of metal oxide arresters. Basically, the Task Force will determine if a problem does exist.

The Task Force will do the following

- 1) Coordinate with the SPD Committee.
- 2) Conduct a literature search on transformer insulation volt-time characteristics.
- 3) Conduct some simulations of the affect of ZnO waveshape and surge current level on the volt-time characteristics of transformers.

Old Business

The Working Group voted to approve the formation of a Task Force to study the entire corona/partial discharge test situation. In this study, the enhancement time, point at which base readings are to be taken, definition of acceptable variation during the one hour test, criteria for apparent charge levels, etc. will be addressed. ADCOM approved the formation of this Task Force, and Mark Perkins has volunteered to be the chairman.

There was no new business and the meeting was adjourned at 4:50 p.m.

II. WORKING GROUP ON REVISION OF DIELECTRIC TESTS FOR DISTRIBUTION TRANSFORMERS J. R. Rossetti, Chairman

The Working Group met at 1:20 P.M. on October 19, 1992 with 12 members and 7 guests present. Brian Klaponski requested membership on the Working Group.

The Task Force reports were as follows:

Routine Impulse Test Guide for Distribution Transformers

This document had been balloted and approved at all levels of the Transformers Committee and submitted for inclusion in the current revision of C57.12.90. Mr. G. Vaillancourt reported that it would be included in the C57.12.90 revision along with other changes. It appears that these revisions must be balloted in the Transformers Committee so that the information will not be available for some time.

Guide for Routine Impulse Testing of Distribution Transformers D. E. Ballard, Chairman

Members of the Task Force continue to make tests on transformers to determine the sensitivity for detecting impulse failures in distribution transformers. Information was presented on a failure in a regulator. A capacitive shunt was used, and the failure was obvious on the oscillogram. It is believed that more than one turn was involved. The regulator will be dismantled to determine the location and nature of the failure. A set of curves made with the series winding shorted and not shorted was presented as a part of the study on impulse testing of regulators.

A considerable amount of time is being devoted to the study of current shunts for fault detection during distribution transformer impulse tests. Results from several tests utilizing capacitive and resistive shunts were reported. Further work is planned in this area. In the revision of C57.98 by the Revision of Dielectric Tests Working Group, the Task Force had planned to eliminate capacitive shunts. Since the goal is to use C57.98 for all transformers, this matter will have to be coordinated between these two Working Groups.

A draft of an outline for the guide was distributed. J. Cochran, L. Hilsenbeek, S. Smith, and the chairman volunteered to work on the draft.

The PAR for the Guide for Protection of Distribution Transformers from Secondary (low voltage) Side Surges was is being processed. The scope was expanded from the original concept and includes:

- Mitigation techniques.
- Test methods.

The purpose of the proposed project is to address secondary side surge protection which is not currently covered by standards.

There being no new business, the meeting was adjourned at 2:10 P.M.

III. WORKING GROUP ON PARTIAL DISCHARGE MEASUREMENT FOR TRANSFORMERS. E. Howells, Chairman

The Task Force met at 8:00 A.M. on October 20, 1992 with 40 members and guests present. The chairman of the Working Group was not present. In his absence, the chairman of the Dielectric Tests Subcommittee led a discussion on the need to establish a new Task Force or Working Group on in service measurement of partial discharges.

It had been requested that this subject be considered at the Cleveland meeting. The initial thinking was that it was too early to start such a study. However, much interest was expressed in this topic during this session.

Several discussions were presented on experience with acoustic methods for detecting or sensing partial discharges in operating transformers. Both portable and fixed acoustic sensors have been used. It appears that there has been some success in detecting discharges using the acoustic methods. There are a number of installations in service where fixed internal and external acoustic sensors are used in a monitoring system. It is expected that a considerable amount of effort will be required to develop the knowledge to interpret the outputs from such sensors. There appears to be agreement that some "false alarms" can be tolerated as a part of the development of working partial discharge measurement systems in service.

There is naturally much interest in electrical methods for detecting partial discharges in service although there are no co-numerical devices or systems available at this time.

(DIELECTRIC TESTS SUBCOMMITTEE REPORT - Cleveland, Ohio - cont'd)

The consensus of the group attending this meeting was that measurement of partial discharges in service is needed and that the Dielectric Tests Subcommittee should establish a Task Force or a Working Group on this subject.

The meeting adjourned at 9:10 A.M.

NEW BUSINESS

The subcommittee voted to expand the scope of the present Working Group on Measurement of Partial Discharges to include the in service measurement of partial discharges by both electrical and acoustic methods. This new project must be organized and a PAR prepared so that this important task can be initiated.

LIAISON ACTIVITIES

John Grouse has agreed to represent the Transformers Committee on an Insulation Coordination Subcommittee.

The meeting was adjourned at 10:40 A.M.

H. R. Moore, Chairman

D. Distribution Transformers - J. C. Thompson

IEEE POWER ENGINEERING
TRANSFORMER COMMITTEE
DISTRIBUTION TRANSFORMER SUBCOMMITTEE
MEETING MINUTES, FALL 1992

Sheraton Cleveland City Centre Hotel, Cleveland, OH October 20,
1992, 2:00 pm

Presiding Officer: Jerry C. Thompson

CHAIRMAN'S REMARKS & ANNOUNCEMENTS

- 1) The fall, 1992 meeting convened at 2:00 pm in the Hope Room with an introduction of the members and guests, plus signing in via our attendance roster. It was immediately apparent that the meeting room facilities were too small for the number in attendance at this meeting, and this will be corrected for our next meeting.
- 2) First order of business was the signing of a "Letter of Recognition and Appreciation" for Frank Stevens, our outgoing Chairman, recognizing his many years of innovative and excellent leadership of our subcommittee. The letter was signed by all members and will be sent to Frank after the meeting.
- 3) The Minutes of the Birmingham, Alabama meeting were reviewed and approved by the subcommittee without significant changes to the original document.
- 4) A report on the Monday evening ADCON meeting (SC Administrative) was given by the Chairman. The major discussion items that affect the Distribution Transformer Subcommittee were:

Publishing progress on our IEEE Standards Board approved documents, C57.12.23 and C57.12.26, continue to be delayed due to copyright and publishing disagreements between ANSI and IEEE. Proposed compromises were discussed at ADCON and a recommendation that the subject be further discussed at the C57 Main Meeting that followed the IEEE Power Transformer Meeting in Cleveland. (FYI: C57 Main passed a resolution that IEEE be given copyright and publishing rights to our documents.)

The status of the ANSI C57.12.28, C57.12.29, C57.12.30, and C57.12.31 documents that continue to have a NEMA Secretariat and a working group that meets outside of IEEE Transformers was discussed. The working group under the leadership of Joe Martin continues to seek improved performance by its NEMA Secretariat.

- 5) Gerry Paiva reviewed the current balloting process that we use within the Distribution Transformer Subcommittee. When a working group is ready for ballot, the process calls for the working group

to do a letter ballot of its members first. Upon approval at the working group level, we ballot the following in a concurrent procedure: Distribution Transformer Subcommittee, EEI/T&D and NEMA. Matt Mingoia of EEI can help members facilitate the balloting at the EEI/T&D and NEMA levels, via C57 Main. Approved documents at the concurrent stage go to the IEEE Transformer Committee and upon approval by it, to the IEEE Standards Board. This is a proven method of balloting as witnessed by our success at the balloting stage with C57.12.23 and C57.12.26.

- 6) The Chairman took this time to add emphasis to the importance of all working groups having accurate and up-to-date rosters of their groups.

WORKING GROUP REPORTS:

- 1) C57.12-20 REPORT: Overhead Transformers, Pole Mounted
Chairman - Jerry Thompson

The working group met on Monday. The current document carries a 1988 date and is due to be republished in 1993. All work on revisions has been completed with minor changes being added at the Monday meeting. Draft IV will be balloted over the winter by the working group. Review of comments will be handled at the spring meeting of this subcommittee.

- 2) C57.12.21 REPORT: Single Phase Live Front Padmounted
Transformers - Chairman Ali Ghafourian

This document is scheduled for republishing in 1993. It carries a 1980 date at present. The document has passed balloting at the working group level as of the time of the working group meeting. Concurrent balloting, per previously discussed procedures, is now underway. With the necessary approvals, this document will be forwarded to the IEEE Transformer Committee in the Spring of 1993. It has been agreed that this document will be combined with the Dead Front Single Phase Padmounted Standard (C57.12.25) at the time of C57.12.25's next republishing date of 1995. Joint work with the C57.12.25 Working Group will begin at the spring meeting and will be conducted via a joint Chairmanship.

- 3) C57.12.22 REPORT: THREE PHASE LIVE FRONT PADMOUNTED TRANSFORMERS
Chairman - Ken Hanus

This document is currently being balloted at the Subcommittee, EEI/T&D, and NEMA levels having been approved at the working group levels. The current document carries a 1988 date and is scheduled for republishing in 1993. Work began on its combination with the Three Phase Dead-Front Padmounted Standard (C57.12.26) at this meeting. A joint Chairmanship has been established to complete this process led by Ken Hanus and Ron Stahara.

- 4) C57.12.23 REPORT: SINGLE PHASE SUBMERSIBLE TRANSFORMERS
Chairman - Gerry Paiva

This working group did not meet in Cleveland since the document was recently approved for republishing and is at its IEEE editor.

- 5) C57.12.25 REPORT: SINGLE PHASE DEAD FRONT PADMOUNTED TRANSFORMERS - Chairman - Norvin Mohesky, report given -by Jerry Thompson

This working group did not meet due to its Chairman being called back to his company on late Monday. Progress remains good with the working group receiving Draft II of the document immediately after the Cleveland meeting. As previously mentioned, it has been agreed that the next publication of this document will be as a joint document with the Live Front Single Phase Padmounted Document, C57.12.21. The document will carry the C57.12.25 number at this time (1995).

- 6) C57.12.26 REPORT: THREE PHASE DEAD FRONT PADMOUNTED TRANSFORMERS - Chairman - Gerry Paiva

This working group did not meet as a strictly Three Phase Dead Front Padmounted Transformer Group at Cleveland. Instead, their meeting time was used to begin work on the joining of the two, three phase padmounted documents into one. Under the leadership of the newly appointed joint Chairmanship of Ken Hanus and Ron Stahara, work progressed and plans were made to complete the joining of these documents. It should be noted that the existing document has been approved by the IEEE Standards Board and is at its IEEE editor.

- 7) BAR CODING REPORT: Chairman - Ron Jordan

This working group continued to enjoy a large and enthusiastic attendance at Cleveland. The standard has received its PAR and continues to work toward the first publication of its document on the Standardization of Bar Coding for Distribution Transformer Labeling. Draft II was reviewed at the meeting for comments.

- 8) ANSI C57/C37 CABINET INTEGRITY WORKING GROUP REPORT: - Chairman - Joe Martin

Report was given by Tom Diamantis of Niagara Mohawk. This working group continues to meet outside of IEEE Transformers as it is under the Secretariat of NEMA., Beginning with the Cleveland Meeting, Chairman Martin will conduct the fall Meeting of this working group beginning on Wednesday afternoon after the closing of the IEEE Transformer Committee Meeting. This will afford members of the Distribution Transformer Subcommittee the opportunity to provide attendance support at the meeting of this working group. The

Cleveland Meeting is concentrating on completion of C57.12.30 on submersible equipment. Work is to begin soon on the republishing of C57.12.28 which was the working group's original document back in 1988. Coordination work is being conducted with NEMA to determine the status of the work done on the Overhead Equipment Standard (C57.12.31).

The Distribution Transformer Subcommittee continues to be in the debt of Tom Diamantis for his excellent reports and attendance at the Enclosure Integrity Working Group.

NEW BUSINESS:

- 1) The formation of a new working group on the standardization of electronic test reports was approved by a subcommittee voice ballot based on the wide spread interest shown over the summer in this working group's objectives. The Chairman of this working group will be Dave Lyon.
- 2) Support was shown for encouraging IEEE Transformer Committee Chairman John D. Borst's assistance in the resolution of the conflict between ANSI and IEEE that has delayed the publishing of our approved documents C57.12.23 and C57.12.26 and for, support for the improvement in Secretariat performance for the C57/C37 Joint Working Group on Enclosure Integrity. Mr. Borst was successful in bringing these topics to the C57 Main Committee's attention and obtaining their support.
- 3) Members were encouraged to attend the IEEE Workshop on standards making that was to be conducted immediately following this subcommittee meeting in Cleveland.

Adjournment was at 3:30 pm by the Chairman and with a voice vote of the membership.

Minutes respectfully submitted by Jerry C. Thompson,
Chairman

E. Dry-Type Transformers - W. Patterson

The complete text of Mr. Patterson's minutes are reproduced below:

IEEE PES TRANSFORMERS COMMITTEE
DRY TYPE TRANSFORMER SUBCOMMITTEE
MEETING MINUTES
CLEVELAND, OHIO - OCTOBER 19, 1992

1. Chairman Remarks and Announcements

The Dry Type Transformer Subcommittee met at 2:00 p.m. with 16 members and 10 guests present. The first order of business was the approval of the minutes of the 03/31/92 meeting in Birmingham. The minutes were approved as written.

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

Sec.2	Dry Type Reactors - HVDC Smoothing	R. Dudley
Sec.3	Dry Type Reactors - Current Limiting	R. Dudley
Sec.4	Specialty Transformers	R. Simpson
Sec.5	Cast Coil Loading Guide	L. Pierce
Sec.6	Test Code Revision	D. Barnard
Sec.7	Thermal Evaluation & Flammability	R. Provost

1.2 Following the presentations of the WG status reports, the Chairman reported on a number of issues discussed at the previous AdCom Meeting.

1.2.1 IEEE will no longer process ballots for the working groups. IEEE found it to be too costly. They will process the ballots of the Transformer Main Committee.

1.2.2 The need to have the IEEE copyright statement on all drafts was reiterated.

1.2.3 The Secretary of IEEE Transformer Committee will no longer handle the mailing of the Transformer Committee Minutes. The registration fee to the Transformers Committee will be increased to handle the mailing of the minutes.

1.2.4 IEEE will adopt 5 CENELEC documents as IEEE Documents - as originally written without change. IEEE requested that Transformer Committee people look for other IEC documents for IEEE to incorporate as IEEE Standards. If anyone knows of any such IEC documents, please submit to Mr. Wally Binder or the Chairman.

1.2.5 It was announced that a new 1992 IEEE Standard Styles Manual was issued. Working group chairmen were informed to contact Mr. Luigi Napoli of the IEEE Standards Board to obtain copies.

- 1.3 The Chairman announced the following future schedule for meetings of the Transformer Committee:

Portland, OR	03/28/93 - 03/31/93
St. Petersburg, FL	10/31/93 - 11/03/93
Dallas, TX	03/20/94 - 03/23/94
Milwaukee, WI	09/24/94 - 09/28/94
Kansas City, KS	Spring, 1995
Boston, MA	11/05/95 - 11/09/95
San Francisco, CA	Spring, 1996

- 1.4 The Chairman discussed the IEEE mailing of Power Meeting articles to him which he forwarded to the WG Chairmen. These articles are being distributed amongst interested parties in order to prepare for "discussions" prior to attending the Power Meetings. The Chairman requested that the WG Chairmen forward copies to interested members of their individual WG's in the future.

1.4.1 Mr. L. Pierce recommended that Mr. Jim Harlow compile all paper titles in a list and mail the list to all the Transformer Committee members as an alternative to trying to distribute the complete articles. Interested parties could then contact Mr. Harlow for a copy of the specific articles in which they were interested.

- 1.5 The Chairman reported that the Evaluation Form distributed by the Publication Committee to reviewers of potential Transaction articles was being modified to give greater weight to "practical" versus "theoretical" papers.

- 1.6 The Chairman announced that Mr. Harlow was looking for individuals interested in presenting a "tutorial" at the next T&D show in Chicago in the Spring of 1994. Interested parties are requested to contact either Mr. Harlow or the Chairman.

It was also noted that the T&D show after Chicago would be in Europe.

- 1.7 New Business

1.7.1 The Chairman discussed the problem of the lack of sound level criteria in the Standards for 15 kV dry type equipment. There are no sound level requirements for dry type transformers on the IEEE side; but NEMA ST-20 covers it for 600 V equipment. Following an extended discussion, a motion was made and approved to form a Task Force to analyze where sound criteria should be established (C57.12.01, C57.12.50, C57.12.51, C57.12.52, etc.). Mr. J. Sullivan agreed to Chair this Task Force. Messieurs M. Mitelman, K. Carpenter, T. Holdway, W. Schwartz, and R. Bancroft agreed to participate as members. They further agreed to present a recommendation by the next Subcommittee meeting.

1.7.2 The need to address C57.12.01 prior to it's reaffirmation date (1994) was also discussed in conjunction with the sound level discussion. For example, whether the scope should be expanded to cover 600 V equipment was discussed.

Following much discussion, a motion was made and approved to assemble a working group specifically to review C57.12.01 for possible revision prior to it's next reaffirmation vote. Mr. A. Jonnatti agreed to serve as "temporary" Chairman of this WG and to submit the PAR. Member selection and specific purposes of this WG were deferred to the next Subcommittee meeting.

1.8 There being no further business, the meeting was adjourned at 4:00 p.m.

1.9 Attendance Roster

MEMBERS PRESENT

R. Bancroft
D. Barnard
M. Cambre
R. Dudley
R. Hayes
A. Jonnatti
M. Mitelman
W. Patterson (Chairman)
P. Payne
L. Pierce
G. Pregent
R. Provost
T. Singh
R. Simpson
J. Sullivan
H. Windisch

MEMBERS ABSENT

B. Allen
A. Bimbiris
T. Darr
J. Frank
R. Gearhart
M. Haas
C. Johnson
S. Kennedy
A. Kline
E. Koenig
R. Marek
Y. Musa
W. Mutschler
K. Papp
V. Thenappan

GUESTS PRESENT

J. Bonucchi
K. Carpenter
C. Clairborne
R. Grunert
N. Hansen
T. Holdway
S. Kostyal
G. Marowski
W. Schwartz
E. Woolfort

ATTENDANCE SUMMARY

	Present	Absent
Members:	16	15
Guests:	10	

2. Working Group on Dry Type Reactors
Chairman: Mr. Richard Dudley

Ref: Dry Type HVDC Smoothing Reactors

This working group participates as a task force in the activities of the Shunt Reactor Working Group chaired by Mr. J. McGill. The working group provides recommendations relating to dry type reactors as distinguished from liquid-filled reactors.

The working group is currently undertaking two activities:

- a) Dry Type Current Limiting Reactors (see Sec.3)
- b) Dry Type HVDC Smoothing Reactors

The Dry-Type Air Core HVDC Smoothing Reactor Task Force met on 10/19/92 at 8:00 a.m. in the Jesse Owens room of the Sheraton Cleveland City Center Hotel, in Cleveland Ohio. There were 3 members and 2 guests present. The two guests requested membership. The following are the highlights of the meeting.

2.1 The attendance list was circulated.

2.2 The first draft of a test code for HVDC dry type air-core smoothing reactors was discussed. The following are the key points that were covered.

2.2.1 It was agreed to split Table 5 into two separate tables; one for oil-immersed smoothing reactors and one for dry type air core smoothing reactors. Table 5B lists the tests for dry type smoothing reactors. Amendments to the draft Table 5B include:

- The switching impulse test is a design test.
- The "current surge" test should be renamed "short circuit" test as it more aptly describes the nature of the test.
- "Seismic" should be included as "other". A note should be added to how the qualification is to be carried out; essentially in accordance with IEEE Standard 344 - Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations. This standard will be listed in the Bibliography.

2.2.2 Discussion took place on the basis of which the sound level test is to be carried out. At present it is not possible to energize a smoothing reactor with rated DC current plus ripple harmonics. Currently it is common practice to measure sound level at rated 60 Hz current and use the results to verify calculated sound level.

Based on agreement between manufacturer and end user sound level at harmonic frequencies can be measured. Based on current measurement (power supply) technology the 60 Hz measurement can be for guarantee purposes and measurement at other frequencies for information only. This approach applies to oil immersed unit as well as dry type smoothing

reactors.

2.2.3 Section 9.5.5 dealing with the "modified turn to turn" test was discussed. It was suggested that the crest voltage should be 50% of the BIL or 10-15% higher than the normal DC operating voltage. It was pointed out that BIL levels are typically 2.0 to 2.5 times the normal DC operating voltage.

2.2.4 Section 9.8 covering the wet DC Withstand test was discussed. Although this is a test of the support insulators it should be emphasized that the reactor must always be included to account for its influence.

It was pointed out that the time constant of the response of the insulators to the applied voltage is significantly larger than two as written test duration of one minute. It was decided that the test should be of 60 minutes duration. Both negative and positive polarity tests should be canceled out. It was also suggested to modify the water flow rate to 1.0 - 2.0 mm/min to be in line with current IEC documents. The water flow rate is recommended to reflect practical achievable limits.

2.2.5 Section 9.5.4 covering the Switching Impulse type test on the support insulator was discussed. The test is to be made under wet conditions per ANSI Standard 4. It was agreed that the test should be performed with waves of positive polarity as this is the worst case. It was suggested that two options should be allowed; 5 shots with no flashovers or 15 shots with a maximum of 2 flashovers allowed.

2.2.6 Editorial corrections to 9.3.1.1 were presented.

$$Z_h = \sqrt{R_h^2 + X_h^2}$$
$$E_x = \sqrt{E_z^2 + E_r^2}$$

Reword:

"If a watt meter is used to measure losses, then additional measurements of current and voltage will allow the calculation of impedance by dividing the measured voltage by the measured current."

2.3 Regarding 6.5 reword:

"The rated inductance of a smoothing reactor is that value obtained based on measurement at 60 Hz."

2.4 Regarding 6.5 the definition for rated inductance should only be included. The definition for incremental inductance should be covered in a new section 6.5.1:

"Incremental Inductance. It is often required for the inductance to be constant...".

- 2.5 Section 8 should include information on tolerances on inductance.
- 2.6 The Chairman agreed to include all modifications discussed in a second draft as well as new material for the next meeting in Portland.
- 2.7 The meeting was adjourned at 9:15 AM.
- 2.8 Attendance Roster

MEMBERS PRESENT

R. Dudley (Chairman)
P. Riffon
J. Watson
R. Jonas
S. Kennedy
F. Lewis
K. Papp
P. Payne
G. Polovick
M. Sharp
S. Silberman
R. Stojanovic
T. Traub
R. Whearty
J. Wood

MEMBERS ABSENT

R. Allustiarti
M. Altman
J. Erlingsson

GUESTS PRESENT

B. Kennedy
W. Stein

ATTENDANCE SUMMARY

	Present	Absent
Members:	3	15
Guests:	2	

- 3. Working Group on Dry Type Reactors
Chairman: Mr. Richard Dudley

Ref: C57.16 - "Requirements for Current Limiting Reactors"

This working group participates as a task force in the activities of the Shunt Reactor Working Group chaired by Mr. J. McGill. The working group provides recommendations relating to dry type reactors as distinguished from liquid-filled reactors.

The working group is currently undertaking two activities:

- a) Dry Type Current Limiting Reactors
- b) Dry Type HVDC Smoothing Reactors (see Sec.2)

The Dry Type Reactor WG met on Oct. 19, 1992 in the Don Miller room of the Sheraton Cleveland City Center Hotel in Cleveland, Ohio. There were 7 members and 2 guests present (both of whom requested membership). The following are the highlights of the meeting:

- 3.1 The attendance list was circulated.
- 3.2 The minutes of the Birmingham meeting were approved.

- 3.3 The meeting of the Dry Type Smoothing Reactor TF (see Sec.2) was reviewed. It was agreed that for the present all members of the Dry Type Reactor WG would be considered to be members of the Smoothing Reactor TF.
- 3.4 Draft D5 of the G57.16 was discussed. The following were the key points:
- 3.5 Editorial changes include:
- 3.5.1 Sec.11.4.3.1:
"(2) If watt meters ..."
- 3.5.2 Sec.2.1.4:
"... capacitor banks..."
- 3.5.3 Sec.2.3.2.1:
"... voltage, current, reactance, and frequency..."
- 3.5.4 Sec.2.3.2.4:
"Normal Rating" needs to be better defined as the existing definition implies an overload condition.
- 3.5.5 Sec.2.4.3.2:
"... 130°C"
- 3.5.6 Sec.2.4.3.3:
"... 155°C"
- 3.5.7 Sec.5.5.1.1:
"Vs = voltage in kilovolts"
- 3.5.8 Sec.2.5.1.1:
The NOTE should be made a separate definition. The effective resistance is the ac. resistance only as derived by dividing the total losses as defined in 2.5.1.1 (1) - (3) by the current squared:
$$I_1 = \frac{\text{KVA}r}{1.73 * \text{KV}s}$$
- 3.6 Referring to the newly drafted Appendix D, it was requested to change the title to "Dry Type Air Core Damping Reactors for Series Capacitor Compensation". The text will also have to be changed where appropriate. The Chairman agreed to check the IEEE standard

for series capacitors now being revised for compatibility. P. Riffon said he would supply a copy of the latest draft.

- 3.7 D.1.1 - "...power frequency fault currents". The peak currents should be added together to determine the worst case peak current duty for the capacitor discharge reactor unless more accurate system design information is available.
- 3.8 C.1.1 - It was requested that more detail be supplied regarding the guidelines for effective current for ungrounded and grounded capacitor banks.

$$I_{\text{eff}} = I_1 * 1.36$$

$$I_{\text{eff}} = I_1 * 1.49$$

A comment should also be added that the bank switching device must be selected based on these effective current ratings.

- 3.9 For the reactor described in Appendices B, C, and D a list of minimum information required to supply the reactor should also be included. Nameplate information as in 2.6.1.1 should also be included.
- 3.10 A general discussion took place regarding information taken directly from other IEEE standards. Should it be acknowledged and how? Is a listing in the bibliography sufficient? This situation occurs out of the agreement that IEEE standards should be "stand alone".
- 3.11 A discussion took place regarding the difference between a "reference" and a listing in the "bibliography". Is a reference "binding" whereas a document listed in the bibliography is for information only? This issue came up at another meeting the Chairman attended. How should this be handled?

Note: During Mr. Dudley's presentation of these to the Dry Type Subcommittee it was noted that guidelines pertaining to these issues can be found in IEEE Standards Style Manual published August 1992 (see page 7)

- 3.12 Regarding 2.1.7, is there a better descriptor than "Paralleling Current Limiting Reactors"? The definition should end "... unequal impedance voltages".
- 3.13 Table 4 was discussed at length. Based on the old standard (C57.16-1958) thousands of "Class B" current limiting reactors have been designed and have operated with no problems based on a maximum average rise of 80°C and a maximum hot spot rise of 110°C. This history must be taken into account in Table 4. Current limiting reactors do not see the same type of duty as shunt reactors and therefore the temperature limits in C57.21-1990 may be too conservative.

One idea presented was to have temperature rise limits for continuous duty versus load cycled series reactors.

One member suggested dry type transformer temperature rise limits may be based on the fact that core losses are present all the time.

A revised version of Table 4 must be such as to present the most logical increment of the hot spot allowance versus the temperature class.

Should the 105°C class be eliminated as it is not often used?

Whatever changes are needed to Table 4, Section 10.3.3 should be modified to be consistent.

Note: Regarding 10.3.3, where did the "Reference Temperature" come from?

How is the IEEE guideline regarding "preferred temperature index" to be rationalized with maximum operating temperature limits? For instance, insulation systems assigned a "preferred temperature index" of 130°C can have an actual temperature index by aging studies ranging from 130°C to 154°C.

The Chairman agreed to do more research and produce a new version of Table 4 with appropriate backup. One basic premise that should be observed is that a revised standard should not result in unwarranted increased product cost to the end user.

3.14 The meeting adjourned at 5:30 p.m. The Chairman agreed to produce draft D6 for the Portland meeting.

3.15 Attendance Roster

MEMBERS PRESENT

R. Allustiarti
R. Dudley (Chairman)
S. Kennedy
P. Payne
P. Riffon
J. Watson
J. Wood
S. Silberman
R. Stojanovic
T. Traub
R. Whearty

GUESTS PRESENT

P. Hopkinson
G. Marowski

MEMBERS ABSENT

M. Altman
J. Erlingsson
R. Jonas
F. Lewis
K. Papp
G. Polovick
M. Sharp

ATTENDANCE SUMMARY

	Present	Absent
Members:	7	11
Guests:	2	

4. Working Group on Specialty Transformers - P259

Chairman: Mr. Max Cambre
Secretary: Mr. R. W. Simpson, Jr.

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

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

4.1 The working group met on 10/19/92 at 1:20 p.m. with 5 members and 6 guests present. Following introductions, the minutes of the 03/30/92 meeting in Birmingham, AL were approved as written.

4.2 Balloting of Standards Coordinating Committee No.4 on P259/D8 was reviewed;

Ballots Eligible	19	
Ballots Returned	19	100% of Eligible
Approved	15	75% of Returned
Negatives	4	25% of Returned

However, an attempt to resolve the negatives must still be made and documented to the IEEE Standards Board. This will be required before the RevCom can review the document.

4.2.1 R. W. Simpson will contact the SCC#4 members who returned negative ballots and attempt to resolve these negatives. Documentation will be submitted to the IEEE Standards Board prior to 12/31/92.

4.3 Barring unforeseen problems with the RevCom at IEEE Standards Board, 259 should be renewed as an IEEE Standard in 1993 and this WG will not require further meetings for awhile.

4.4 M. A. Cambre announced that he has retired from GE Co. He received a vote of thanks from the WG for his work on P259 as its Chairman.

4.5 As there was no new business, the Meeting was adjourned at 1:40 PM

4.6 Attendance Roster

MEMBERS PRESENT

R. Bancroft
D. Barnard
M. Cambre (Chairman)
R. Provost
R. Simpson (Secretary)

MEMBERS ABSENT

J. Frank
R. Mayschak

GUESTS PRESENT

K. Carpenter
E. Hutter
G. Marowski
D. Sundin
R. Thomas
E. Woolfort

ATTENDANCE SUMMARY

Present Absent

Members: 5 2

Guests : 6

5. Working Group on Cast Coil Loading Guide

Chairman: Mr. Linden Pierce

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

5.1 The working group met on 10/20/92 at 9:30 AM. There were 10 members and 8 guests in attendance. Following introductions of those present, the minutes of the 03/31/92 meeting were approved as written.

5.2 Comments on Draft #1 were received from Michael Haas, Ben Allen and Wes Patterson. Comments by Wes Patterson were reviewed at the last meeting.

5.2.1 One comment by Michael Haas questioned the differences between maximum permissible temperatures and the rated insulation system temperature class. The maximum permissible temperatures were obtained from the IEC Loading Guide. IEC used on 155°C class and IEEE 150°C. For consistency the maximum permissible temperature for loading above rating was changed to 185°C for the 150°C insulation temperature class.

5.2.2 Ben Allen's comment was that temperature limits for operation above nameplate be removed and not operate the unit above nameplate load. This was discussed and rejected.

5.3 The Chairman made the following proposal to address the time constant issue. The Chairman will develop a computer program to calculate time constants considering the specific characteristics of the transformer design. Specific heat of epoxy, mass of epoxy, conductor spacing, current density, etc. The program will be calibrated with test data using imbedded thermocouples on a prototype unit.

5.3.1 The program would be made available to all manufacturers on the working group. The manufacturers would use the program to determine time constants for a range of KVA's and insulation temperature classes. The data would be submitted to Henry Windisch, consultant, Black & Veitch. Henry will protect the proprietary interests and identities of the

manufactures and provide a table or curve by KVA of minimum time constant. This activity may be expanded into a task force of users only.

5.4 After a general discussion of other editorial changes the meeting adjourned at 10:05 AM

5.5 Attendance Roster

MEMBERS PRESENT

R. Bancroft
D. Barnard
R. Hayes
G. Marowski
W. Patterson
L. Pierce (Chairman)
G. Pregent
R. Simpson
J. Sullivan
H. Windisch
E. Koenig
T. Lanoue
W. Mutschler
M. Rajadhyaksha

MEMBERS ABSENT

B. Allen
A. Bimbiris
J. Frank
R. Gearhart
R. Goethals
R. Grant
M. Haas
M. Iman
C. Johnson
A. Jonnatti

GUESTS PRESENT

K. Carpenter
J. Cultrera
R. Gruhert
O. Heyman
S. Mort
R. Provost
T. Singh
B. Wirtz

ATTENDANCE SUMMARY

	Present	Absent
Members:	11	13
Guests.:	8	

6. Working Group on Test Code PC57.12.91

Chairman: Mr. David Barnard
Secretary: Mr. Henry Windisch

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

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

6.1 The Meeting was called to order by Chairman Barnard at 10:55 AM at the Sheraton City Center in Cleveland, Ohio on Monday, 10/19/92. The Meeting was attended by 16 members and 9 guests.

6.2 Introductions were made and the Meeting Minutes of the Birmingham Meeting were approved.

6.3 Chairman Barnard stated that the ballot for reaffirmation of the existing Standard C57.12.91 was successful, so we now have a little more time to get the revised Standard completed.

6.4 The results of Balloting Draft D4 of PC57.12.91 are as follows:

Ballots Eligible	31
Ballots Returned	27
Approved	21
Negatives	6

Most of the comments which were editorial in nature are now being incorporated into Draft D5.

6.5 Review of negative ballots and resolution of those negative ballots was the main task of today's meeting.

6.6 Guy Pregent's negative ballot was the first to be addressed. After much discussion Guy indicated he would be satisfied if Draft D5 included the items discussed. Wes Patterson will send Guy a reference showing the use of 240 as a suitable value for Alloyed Aluminum, in the temperature correction equations. There is some inconsistency among the Standards regarding this value. The value of 230 is most often used. Chairman Barnard will resolve which value to use and incorporate that value into Draft D5.

6.7 Wes Patterson's negative ballot indicated several editorial and substantive comments. The major area of concern was whether controlling current or watts losses was the proper parameter for the heat run. The Draft D4 used current in some locations and losses in other. The question was not resolved, but Wes will attempt to clarify which is more appropriate and get it in Draft D5. The solution is complicated by the temperature differences in separate windings.

6.8 Equation 49 will be modified to incorporate Wes Patterson's comments.

6.9 Considerable discussion resulted from Wes Patterson's many comments. Dave will incorporate most of these into Draft D5.

6.10 Ben Allen was not present but Chairman Barnard will contact Ben and resolve as many comments as possible.

6.11 Missing references will be incorporated into Draft D5 by Chairman Barnard.

6.12 Ben Allen suggested that paragraphs 8.2.2 and 8.2.3 should be deleted, since these methods were no longer used. A vote was taken and it was unanimously agreed upon to retain these paragraphs.

- 6.13 It was suggested that this working group have 2 sessions at the next meeting. Wes Patterson will arrange for that. Furthermore, it was agreed that this discussion would be carried on at 2:50 PM today in the Hope Room.
- 6.14 The meeting was adjourned at 12:10 PM.
- 6.15 The PC57.12.91 meeting was reconvened at 3:00 PM at the Sheraton City Center in the Hope Room.
- 6.15.1 Discussion continued about comments received on Draft D4 ballots.
- 6.15.2 References C57.12.58, C57.12.59, C57.12.60 and C57.12.96 have not been referenced in the text and will be deleted. Other references will be properly numbered and suitably referenced in the text.
- 6.15.3 A vigorous discussion continued on many parts of the Standard. Chairman Barnard will incorporate appropriate comments into Draft D5. Dave intends to have Draft D5 on the street by the end of the year and urges everyone to return their ballots as soon as possible.
- 6.15.4 Sheldon Kennedy is still not listed as a member of this working group and has requested again to be on the member roster.
- 6.15.5 The meeting was adjourned at 4:10 PM.
- 6.16 Attendance Roster

MEMBERS PRESENT

R. Bancroft
D. Barnard (Chairman)
M. Cambre
T. Holdway
A. Jonnatti
M. Mitelman
W. Patterson
L. Pierce
G. Prgent
R. Provost
W. Schwartz
R. Simpson
T. Singh
J. Sullivan
H. Windisch (Secretary)

MEMBERS ABSENT

B. Allen
J. Frank
R. Gearhart
M. Haas
R. Hayes
R. Hollister
C. Johnson
C. Kirsch
A. Kline
E. Koenig
R. Marek
W. Mutschler
J. Nay
M. Rajadhyaksha
V. Thenappan

GUESTS PRESENT

K. Carpenter
N. Hansen
E. Hutter
S. Kennedy

ATTENDANCE SUMMARY

Present Absent

Members: 15 15
Guests.: 10

G. Marowski
D. Milliman
G. Morehart
R. Thomas
B. Ward
E. Woolfort

7. Working Group on Thermal Evaluation of Dry Type Transformers Working Group on Flammability Issues

Chairman: Mr. Richard Provost

This working group has been charged with developing C57.12.60, the thermal evaluation guide for cast coil transformers. The work on this standard has been mostly completed and the standard was submitted to be issued for trial use. Trial use was employed due to the WG being unable to define an existing system to use as a control for comparison with an insulation system under test.

Subordinate to this WG is a working group charged with monitoring developments in flammability and toxicity of dry type transformers.

This working group is also monitoring the status of C57.12.56, the thermal evaluation guide for conventional dry type transformers.

- 7.1 The working group met on 10/20/92 at 10:55 AM. There were 6 members and 10 guests present. Following the introductions of those present, the minutes of the 03/31/91 group meeting in Birmingham were reviewed and approved as written.

The Chairman notified the working group that C57.12.60, "Trial Use Standard Test Procedures For Thermal Evaluation of Insulation Systems For Solid Cast And Resin Encapsulated Power And Distribution Transformers", has been approved by the IEEE Standards Board. An editor will be assigned soon and the document is expected to be issued in late first or early second Quarter 1993. The Chairman reminded members that, once published, the two year clock begins to gather data and comments and revise the document to a "Full-Status" Standard must be submitted at the end of 24 months..

The matching document for Open Ventilated Dry Type Transformers, ANSI/IEEE C57.12.56, is due for reaffirmation this year. IEEE has been requested to ballot the main Transformers Committee to reaffirm this standard, as decided in our last meeting. The extension of time to reaffirm this document expires in March 1993.

- 7.2 On the subject of flammability two documents were submitted for addition to the literature file. A technical paper entitled "Evaluation of Potential Health Hazards From Fires Involving Liquid And Solid Utility Materials" was originally presented at an EPRI seminar. IEC Publication 707 provides test methods for flammability of electrical insulating materials, and is similar to UL 94. The Chairman encouraged all members and guests to submit

any literature/technical papers which may be included in the file.

7.2.1 A bibliography of literature on file was distributed. Discussion of the CENELEC Document HD 464 S1 related to the fire behavior classification of dry type transformers led to a suggestion that we request IEEE to make copies of the final draft of this document available to the working group. Mr. Luigi Napoli of IEEE agreed to check into it.

7.3 With no new business, the meeting was adjourned at 11:35 AM.

7.4 Attendance Roster

MEMBERS PRESENT

R. Bancroft
D. Barnard
M. Cambre
W. Patterson
R. Provost (Chairman)
R. Simpson
L. Pierce

MEMBERS ABSENT

B. Allen
V. Dahinden
J. Frank
A. Kline
R. Marek
J. Nay

GUESTS PRESENT

K. Carpenter
F. David
J. Goudie
E. Hutter
G. Marowski
L. Napoli
G. Pregent
W. Schwartz
R. Wicks
E. Woolfort

ATTENDANCE SUMMARY

Present Absent

Members: 6 7

Guests.: 10

F. HVDC Converter Transformers - W. N. Kennedy

MINUTES OF THE OCTOBER 19, 1992 MEETING OF THE
HVDC CONVERTER TRANSFORMER AND SMOOTHING REACTOR SUBCOMMITTEE
CLEVELAND, OH

Members Present:

D. Allan	GEC Alsthom
F. David	Federal Pioneer
R. Dudley	Trench Electric
F. Elliott	Bonneville Power Administration
K. Highton	Consultant
W. Kennedy	ABB Muncie
V. Pham	ABB Varennes
P. Riffon	Hydro Quebec
W. Stein	Siemens
G. Vaillancourt	Hydro Quebec
J. Watson	Los Angeles Dept. of Water and Power

Members Absent:

V. Dahinden	H. Weidmann AG
E. Norton	Consultant
K. Papp	Trench Electric

Guests Present:

S. Lindgren	EPRI
J. McGill	Siemens

The meeting was called to order at 9:30 AM with ten members and three guests present. Mr. Joe Watson of Los Angeles Department of Water and Power requested membership to replace Sam Oklu from the same company. We welcome Mr. Watson to the subcommittee.

We held a brief discussion on the activities of CIGRE JWG 12/14.10. The paper on specifications for converter transformers has been published in ELECTRA, while the paper on dielectric testing of converter transformers and smoothing reactors has been accepted by the joint working group and has been sent to the parent study committees for approval. The working group has completed an initial survey on tolerances during impedance measurements. No progress has been made in the area of stray loss measurements since the last report. A task force on converter transformer and smoothing reactor reliability in service is also being developed, and is currently in its fifth draft. It shows that bushings and the corresponding insulation structure are major elements in service failures; work being done in the IEEE Bushing Subcommittee will help improve this situation by increasing test voltages by 15%.

The remainder of the meeting was devoted to discussing draft 5 of our PCS7.129 "General Requirements and Test Code for Oil-Immersed Converter Transformers for DC Power Transmission", which was distributed at the meeting. The basis for our discussion were comments prepared by Pierre Riffon from Hydro-Quebec on our previous draft. There was general agreement on the calculation of load losses which permits a manufacturer to use values for the

harmonic loss factors obtained from earlier units for evaluation purposes, but would require him to measure the factors on the actual unit to calculate losses for the temperature run test. The previous draft suggested values for K_n , and was found to be impractical because there was wide variation of the factors depending on the manufacturer. There will be an expanded discussion in the test code section of the new draft 6 regarding measurement of the harmonic loss factors. It was mentioned that IEC is now working on a standard for converter transformers and that we will need to coordinate with them to develop a common approach for loss calculation if possible.

We accepted Mr. Riffon's proposals to extend the time period for partial discharge measurements during both the dc applied and polarity reversal tests. We will add partial discharge requirements after the first reversal in the polarity reversal test.

There was some question regarding the partial discharge level that should be accepted for the new ac applied test. Per the discussion, I will prepare a brief comparison between the ac applied test voltage with the impulse, dc applied, and operating voltage for several recent designs.

The changes discussed above will be included in Draft 6. Our present intention is to circulate the draft as a subcommittee ballot prior to the next meeting.

In addition, the first meeting of Mr. Dudley's task force on dry-type smoothing reactors was held prior to our meeting. Material prepared for the dry-type meeting, as well as subjects discussed at the meeting, will be included in the second draft of the dry-type and oil-filled smoothing reactor standard. It is expected to circulate that document prior to the next meeting also.

Respectfully submitted,

William Kennedy Chairman,
HVDC Converter Transformer
and Smoothing Reactor Subcommittee

G. Instrument Transformers - J. N. Davis

IEEE/PES TRANSFORMERS COMMITTEE
INSTRUMENT TRANSFORMER SUBCOMMITTEE MEETING
CLEVELAND, OHIO
Oct. 20, 1992

1. The Instrument Transformer Subcommittee meeting started at 8:00 AM, Oct. 20, 1992. Fifteen committee members and eleven guests attended.
2. Introductions of members and guests were made.
 - 2.1 The minutes of the previous meeting (Birmingham, Ala.) were approved.
3. The chair gave status reports on C57.13, "Standard Requirements for Instrument Transformers" and C57.13.4, "Detection of Partial Discharges and Measurement of Apparent Charge Within Instrument Transformers".
4. The drafts of C37.014 a and b were discussed. Mr. Jeffrey Fleeman volunteered to coordinate this subcommittee and the C37.014 drafting group.
5. The published EPRI symposium on high voltage instrument transformer failures was discussed.
 - 5.1 A six person working group was formed to investigate tests and measurements which may alleviate the problems discussed by EPRI.
 - 5.2 Insulating liquids, particularly oil base, and other materials should be investigated. Long term and extensive testing would be required. The scope would cover the industry, European, Japanese, and North American manufacturers and their suppliers of materials, especially oil.
 - 5.2.1 The activity would entail cooperation and coordination between various subcommittees of the Transformers Committee.
 - 5.2.2 Cooperation and sharing of information by EPRI, Doble, and others with the Transformer Committee would be helpful.
6. Under new business, the suggestion was made that any rewording or revision of existing standards should be submitted to the chairman and the secretary of the subcommittee. This file would be activated when a new edition is prepared.
7. The meeting adjourned at approximately 12.00 noon.

Respectfully submitted,
John N. Davis
Chairman Instrument Transformer Subcommittee

H. Insulating Fluids - H. A. Pearce

IEEE
POWER ENGINEERING SOCIETY
TRANSFORMERS COMMITTEE MINUTES
INSULATING FLUIDS SUBCOMMITTEE
OCTOBER 19-20, 1992 - CLEVELAND, OHIO

The Insulating Fluids Subcommittee met on Monday morning, October 19, and Tuesday morning, October 20, with 25 members and 36 guests present. On Monday, the working group on PC 57.130 and the subcommittee met simultaneously.

The minutes of the meeting held in Birmingham (March 30-31, 1992) were approved as submitted.

MEMBERS PRESENT:

D.J. Allan	J.G. Lackey
R.L. Barker	C.P. McShane
J.L. Corkran	S.K. Mort
D.W. Crofts	H.A. Pearce
D.H. Douglas	A.J. Pereira
G.E. Forrest	G.J. Reitter
J. Goudie	D.W. Sundin
F.J. Gryzkiewicz	T.P. Traub
T.J. Hauptert	R.A. Veitch
F.W. Heinrichs	L. Wagenaar
E. Kallaur	R.P. Wakeam
J.J. Kelly	
G.W. Lacasse	

GUESTS PRESENT:

J. Cultrera	R.C. Deffwer	A. Bartek
J.D. MacDonald	D. Chu	D. Anderegg
B. Noirhomme	M. Lau	O.W. Iwanusiw
B. Forsyth	A.J. Martinez	J.P.B. Melanson
B. Wirtz	L. Kiss	W. Brener
P. Feghali	D. Shah	C. Murray
K. Weidmann	F. David	W. Boetlger
E.J. Adolphson	K.Y.L. Sun	P. Iisima
D. Croghan	W.C. Arent	A. Carlos
E.R. Trummer	C.C. Claiborne	J.V. Bonucchi
A. Cancino	D. Getson	A. Delgado
D. Cash	R. Russman	F. Lewis

INSULATING FLUIDS SUBCOMMITTEE

PROJECTS:

C57.104 & C57.106 have been printed and issued.

C57.130 Guide for Gas Analysis During Factory Test

This session was devoted to an in-depth discussion of this guide.

Much time was spent on sampling procedures and sampling frequencies. Many changes and additions were suggested for the present draft. A new PAR will be requested by the Subcommittee Chairman in order to change the title, as noted at the last meeting. The new title will be "Guide for the Use of Dissolved Gas Analysis During Factory Thermal Tests for the Evaluation of Oil Immersed Transformers and Reactors." This will be a Trial Use Guide.

The Working Group, chaired by James Kinney and assisted by Frank Heinrichs, will prepare Draft 6 for circulation to the entire Subcommittee prior to the next meeting. This Working Group needs more data from manufacturers in order to establish limits.

P 1258 - Silicone Gas Guide

Jim Goudie is heading the activity of collecting data to establish recommended limits and to prepare Draft 2 of this guide. They plan to circulate Draft 2 to the subcommittee members prior to the next meeting.

Gas Analysis of Transformers Containing HMWH or Less Flammable Hydrocarbons

It was previously decided that the following information be included in the next revision of C57.104. In the interim these minutes will contain the following statements as a reference:

The analysis and interpretation of dissolved gas data in Less Flammable Hydrocarbon fluids is similar to that in conventional transformer oil. Solubility constants of commonly found gases in these fluids are within 15% of those in conventional oil. As these fluids are hydrocarbon based, the decomposition products of both the insulating fluid and cellulose have been shown to be comparable to those expected for a given problem condition in equipment filled with conventional transformer oil. The user should consult the manufacturer of the transformer and the dielectric fluid for specific instructions before attempting to interpret dissolved gas data from electrical equipment filled with these fluids.

This concluded the business for the Insulating Fluids Subcommittee at this session.

Henry Pearce, Chairman
Frank Heinrichs, Secretary

I. Insulation Life - D. H. Douglas

Mr. Douglas reported on the Tuesday meeting of the Subcommittee. Following his remarks, there was discussion from the floor regarding the definition of thermal duplicate. The comment was made that we are splitting hairs on defining thermal duplicate while attempting to create one loading guide for all transformers.

A question on publication of Working Group Papers was held. The appropriate procedure was described as obtaining approval through the Working Group, balloting the Subcommittee, then sending the paper to the Main Committee for concurrence. The paper is then automatically accepted for publication at \$100 per page to avoid using the page allocation to cover this.

Mr. Douglas' full report is incorporated below:

MEETING MINUTES INSULATION LIFE SUBCOMMITTEE
OF THE
IEEE TRANSFORMERS COMMITTEE
SHERATON CLEVELAND HOTEL - CLEVELAND, OHIO

The Insulation Life Subcommittee met on Tuesday, October 20, 1992, at 10:55 A.M. There was a total attendance of 105, consisting of 33 Subcommittee Members and 72 guests. After introductions were made, the minutes of the previous meeting in Birmingham, Alabama, were approved as issued. The chairman introduced and welcomed ten new members to the Subcommittee.

1. Fred Elliott - Bonneville Power
2. Don Chu - Consolidated Edison
3. Bruce Forsyth - Southwest Electric
4. Jim Long - United Illuminating Co.
5. Chuck Murray - Consultant
6. George Payerle - Custom Materials
7. Paulett Payne - PEPCO
8. Mahesh Sampat - General Electric
9. Craig Stiegemeier - ABB Power T&D
10. Loren Wagenaar - American Electric Power

At this time, the four W/G's of the Subcommittee reported.

Heintz Fischer, Chairman of the Working Group on High Temperature Insulation for Liquid-Filled Power Transformers, reported that they met on Monday with 22 members and 38 guests present.

The Chairman reported on two ballots of drafts of the "Background Information" paper since the last meeting. First, the W.G. was balloted on Draft 5 with the following results: 37 ballots sent, 35 ballots returned, 34 approved, 1 negative. The one negative vote was quickly resolved. Then, a ballot of Draft 6 was sent to the Insulation Life Subcommittee and the returns were as follows:

54 ballots sent
48 ballots returned
38 approved
4 approved with comments
2 negative
4 not voting

Comments received and the basis for the two negative ballots were discussed. Actions taken were:

1. Changes were made in the Appendix discussing possible ways to define the rating of a hybrid insulation system.
2. The need for a stronger Conclusions or Summary section was acknowledge and will be added in Draft 7.
3. It was voted to adopt a contribution from Lin Pierce for classification of wire enamels.
4. It was voted to also retain the present Figure 9 which classifies wire enamels based on a more subjective "Overload Figure of Merit". The point was raised by Lin Pierce that there is little, if any, support for the "Overload Figure of Merit" in Industry literature.
5. It was decided that Frank Heinrich's negative ballot should be discussed at the Insulation Life Subcommittee meeting, with an attempt to resolve it before the next ballot. Frank did defend his negative ballot at the Subcommittee meeting, causing vigorous debate. After making his points, Frank withdrew his negative ballot.
6. A new joint WG and Subcommittee ballot will be conducted when appropriate revisions have been made based on the above points.

The next item of business was to discuss the next activity to be undertaken by the W.G. It was ultimately voted that a Task Force should be formed to prepare a draft of a "Guide for the Application of High Temperature Insulation Materials in Liquid-Filled Power Transformers". Volunteers were accepted to make up the Task Force.

The meeting was adjourned at 12:08 P.M.

The second W.G. report was given by Bill Wrenn, substituting for Dave Takach. Dave has resigned as Chairman of the Working Group on Loading Guides. The Chairman recognized Dave for the excellent job he has done in pulling the three loading guides together and getting the new guide to a point of being nearly complete. Lin Pierce of G.E. Rome, GA has accepted the job of Chairman of the Working Group.

Bill reported that the Working Group met Monday, with 31 members and 39 guests present.

Linden Pierce made a formal presentation to the Working Group summarizing his recent paper entitled "Predicting Liquid Field Transformer Loading Capability", which was presented at the September 1992 IEEE IAS Petroleum and Chemical Industry Technical Conference held in San Antonio, Texas. This paper summarizes the new, improved loading guide equations and a computer program required to solve these equations.

The presentation was in three parts.

1. A discussion of the present IEEE loading guide limitations.
2. Results of recent experimental investigations.
3. A discussion of the improved loading guide equations.

Part 1 Limitations of the present IEEE loading guide.

- present loading guide methods use exponential interpolation of steady-state data.
- present loading guide method uses hottest spot rise over tank top oil and assumes that winding top oil rise and tank top oil rise are equal.
- present loading guide method yields inaccurate results for high, short-time overloads.
- limited experimental data exists to support present loading guide equations with respect to hottest spot temperature change with time.
- present loading guides determine the oil time constant based on top oil rise, but transformer tank and fluid are at average temperature. To compensate, the thermal capacities of tank steel and oil were reduced by an assumption of a ratio of average-to-top oil rise. However, this ratio is not the same for all units.
- present loading guide equations for time constant equation introduced in 1962 forgot about assumptions made earlier that were used to reduce steel and oil thermal capacities.
- present loading guides consider only one fluid-mineral oil. Silicones and NTHC fluids are not considered.
- present loading guide method assumes constant ambient temperature.

Part 2 Results of recent experimental investigations.

- Data from recent experiments conducted by Linden Pierce, Ed Norton, and Aubin and Langhame indicate that during overloads duct oil temperatures increases at a much faster rate than tank oil temperatures.
- This results in winding hottest spot temperatures (for naturally cooled transformer, OA or FA) higher than those predicted by the present loading guide equation.
- Hence, the present loading guide equation must be revised to accurately predict winding hottest spot temperatures.

Part 3 Improved loading guide equations.

- the new equations utilize a more detailed heat transfer model that more accurately describes the physics of transformer cooling.
- they include a temperature correction for winding resistance.
- viscosity changes of the transformer fluids are taken into account.
- the new equations consider duct oil temperature rise instead of top oil.
- new equations considers variable ambient temperature conditions and varying load conditions.
- fluids other than just mineral oil, such as silicones and high fire-point liquids are considered by the new equations.
- the new equations are based on bottom oil temperature. - compared with the present IEEE loading guide equations, these new equations predict:
 - a. less capability for OA and FA units
 - b. more capability for NDFOA (non-directed flow) units

The latest draft of the proposed loading guide will include the new equations developed by Linden Pierce in Appendix G. It will be balloted now by the W.G. and Insulation Life Subcommittee before the next meeting.

The next report was from the Working Group on Thermal Evaluation of Liquid Immersed Power and Distribution Transformers. The Working Group met Monday afternoon. In attendance were 8 working-group members and 24 guests. Larry Lowdermilk, Chairman of the Working Group, could not attend this meeting, so he asked Chuck McMillen to chair the meeting:

The chairman reviewed the ballot of the Working Group of Draft 1 of C57.100, the Standard Test Procedure for Thermal Evaluation of Oil-Immerse Distribution and Power Transformers. The results were 9 affirmative, 7 negative, 2 abstentions, and 10 ballots were not returned. All negative ballots were accompanied by comments and suggestions for improvement of the procedure.

The comments and suggestions were incorporated into Draft 2.

The major changes in Draft 2 were as follows:

- The margin that must be demonstrated when end-point tests are performed on full size distribution transformers and power transformer models is increased from 2 times to 5 times the present 65C life curve, when qualifying new materials or a new curve for a proposed system.
- The basis of dielectric end point tests both on full sized distribution transformers and power transformer models was established at 65% of rated voltage.
- All "shalls" in Draft 1 are changed to "shoulds", except for the Annex, the Standard Test Procedure for Sealed Tube Aging of Liquid Immersed Transformer Insulation. "Shalls" were retained for this procedure.

Discussion of the changes at this meeting expressed concerns about the increase in test margin from 2 times to 5 times for power transformer models, since no one has demonstrated the margin for these models. The GE EPRI tests demonstrated only 5 times the present C57.92 Life Curve which has a life of 65,000 hours at rated hottest spot temperature compared to the 180,000 hours of the new life curve.

Finally, concern was expressed that establishes an end point dielectric test margin of 65% of rated test is too great for power transformer models. Draft 2 will now be balloted in the WG and Subcommittee before the next meeting.

The final report was given by Bob Grubb, Chairman of the Working Group on Thermal Tests. They met on Monday, October 19, with 12 members and 20 guests in attendance.

The first order of business was a status report on Project PC57.12.00L, Definition of Thermal Duplicate. The Chairman had prepared a new revision of Draft 2 of the Definition and a Task Force meeting was held on Sunday, October 18, with 13 attendees (8 members and 5 guests) to review the document before it is balloted.

The question was again raised as to whether the proper way to resolve the question of definition of "thermal duplicate" would be to eliminate the reference to "thermal duplicate" completely from C57.12.00 and to consider the thermal test to be a design test. The point was made that short circuit testing could also be of critical significance, yet no attempt is made to define the characteristics of designs subjected to short circuit testing as they relate to the designs that are not tested. Discussion continued on this issue and reached conclusion in a Task Force vote (5 to 2) to continue with the charge that the Task Force had been given in attempting to define "thermal duplicate".

Concern was expressed that the definition was becoming too cumbersome, and that perhaps a shorter definition, or simply the table of tolerances, should be included in C57.12.00, with the equations left in a guide format placed in an appropriate appendix. After discussion, the consensus of the group was to proceed with a ballot of Draft 2 (as is) to the Working Group.

The Chairman reported on the status of the ballot of Draft 12 of Project P838/ANSI PC57.119. Recommended Procedures for Performing Temperature Rise Tests on Oil Immersed Power Transformers at Loads Beyond Nameplate Rating. The ballot was sent to the Insulation Life Subcommittee and the Main Committee. 110 of 144 ballots were returned, and there were 94 affirmative and 3 negative ballots. The Chairman distributed a 9 page listing he had compiled of all the comments this ballot generated, including those attached to both affirmative and negative ballots. The remainder of the meeting was spent in discussion and resolution of as many of the comments as time would allow. A summary of key items discussed follows:

- One negative ballot asked for reference in this document to Project PC57.130, which is the proposed Guide for the Detection and Identification of Gases Generated During Factory Tests. The group expressed concern in doing this, since that proposed guide is not published yet. This concern will be discussed with the negative balloter.
- The final item discussed had to do with whether cooling equipment should be left on or off from the time of shutdown for winding gradient measurement. Experience of one manufacturer was discussed where leaving pumps on would result in unrealistically low calculation of gradients if connections were such that measurements could not be started very quickly after shutdown. Discussion pointed out the dilemma that the test method is intended to supply information both on the winding temperature at the time of shutdown, and on the winding time constant, and that keeping cooling on could, in some cases, sacrifice the ability to accurately calculate winding temperature, while turning cooling off will sacrifice accurate calculation of the time constant. It was suggested that the history of the document be checked, as there was a conscious decision earlier on to keep the cooling running during shutdown. A personnel safety question was also raised in that static charge build-up with pumps running could discharge and be felt by test personnel making connections. In order to proceed in the face of this difficult to resolve issue of whether cooling should be left on or off, it was suggested that this overall document, which is sure to have several areas of contention, should be issued as a "trial use" document. In that way, the document would be out to be tested and used by all, and experience with its use would hopefully resolve these issues. This suggestion was met with enthusiasm.

Meeting time expired after review of about 2 pages of the 9 page compilation of comments to the ballot of Draft 12.

The Chairman secured a meeting room to continue the Working Group's discussion of these comments the next day at 8:00 A.M.

The Working Group met at 8:00 A.M. on Tuesday, October 20, 1992, as a continuation of the previous day's meeting. There were 12 members present at this meeting.

Discussion continued on the comments compiled as a result of the ballot of Draft 12, centering first on those comments which constituted negative ballots.

The meeting adjourned at 9:20 A.M., with a number of comments still not addressed by the group. The Chairman will attempt to resolve the remaining few issues constituting negative ballots by direct contact with these balloters. Discussion will continue also as to whether it is necessary to ballot a complete new Draft, or whether changes to Draft 12 can be balloted separately.

It is the opinion of the Subcommittee Chairman that the W/G is making a valiant effort to get a successful ballot of the Transformers Committee and complete a long, agonizing job to publish this document.

Under old business, the agenda of the Subcommittee called for a discussion of a subject that seems to be gathering some interest momentum. The subject is whether dielectric stress has any significant effect on insulation loss of life. Many feel it does. However, time ran out and the subject will be brought up again at the next meeting in Portland.

Respectfully Submitted

David H. Douglas
Subcommittee Chairman

J. Performance Characteristics - J. W. Matthews

PERFORMANCE CHARACTERISTICS SUBCOMMITTEE
MEETING MINUTES - CLEVELAND, OHIO - OCTOBER 20, 1992

I. Introduction/Attendance

The Performance Characteristics Subcommittee (PCS) met at 2:00 p.m. on Tuesday, October 20, 1992, with 39 members and 30 guests in attendance.

II. Approval of Minutes

The minutes of the March 31, 1992, PCS Meeting were approved as written.

III. Chairman's Remarks

A. Administrative Subcommittee Notes

The following information, obtained at the October 19, 1992, meeting of the Administrative Subcommittee was presented:

1. Future Committee meetings are scheduled as follows:

Spring 1993 - Portland, OR - Mar. 28-31
Fall 1993 - St. Petersburg, FL - Oct. 31-Nov. 3
Spring 1994 - Dallas, TX - Mar. 20-23
Fall 1994 - Milwaukee, WI - Sept. 24-28
Spring 1995 - Kansas City, MO
Fall 1995 - Boston, MA - Nov. 5-9
Spring 1996 - San Francisco, CA

2. Luigi Napoli has replaced Sue Vogel as our Coordinator with the Standards Office. His phone number is (908)562-3812 and fax number (908)562-1571. Luigi will be presenting a training session for Working Group and Subcommittee Chairpersons this after at 3:30 p.m.

3. Standards Coordination notes:

- A new Standards Style Manual, which is more in line with IEC style, has been published. All Working Group chairpersons should have received a copy last month.
- IEC document copyright is no longer a problem. IEEE has received blanket approval to adopt IEC documents.
- The Standards Office can no longer provide balloting service for Working Group or Subcommittee ballots due to the volume of work. Service is still provided for ballots of the full Committee.

4. The combined revisions submitted for C57.12.00 and C57.12.90 were not approved by the Standards Board.

All of the individual revision projects were approved as Supplements to the existing Standards. The entire documents incorporating the supplements must now be balloted for reaffirmation.

5. The Committee Chairman has requested presentation of a tutorial at the next T&D Conference in Spring, 1994. Notify John Borst if you are interested in presenting a tutorial.
6. It was sadly announced that Roy Uptegraff has passed away. We will miss his contributions to our work and his companionship during our meetings.

B. Membership

Dennis Allan (GEC), Barry Beaster (Delta Star), Don Cash (Consultant), Alfonso Delgado (Prolec), Bruce Forsyth (Southwest Electric), Jim Long (United Illuminating), Rick Marek (ABB National Industri), Al Martinez (Entergy), Stephen Smith (Kuhlman), Edgar Trummer (Elin), and Ralph Wakeam (Siemens) were added to the roster. Jim Arnold, Ken Linsley, Dinesh Patel and C. Stiegmeier were removed from the roster. Membership now stands at 85.

IV Agenda Changes

A request to add rail shipment and/or seismic design information to nameplate was added to the agenda as the fourth item of New Business.

V. Working Group Reports

A. Loss Tolerance and Measurement - W. R. (Bill) Hemming

The Working Group on Loss Tolerances and Measurement met on Monday, October 19 at 2:50 p.m. with 16 members and 22 guests present. Minutes of the previous Working Group meeting, held on March 30, 1992, were reviewed and accepted without change.

The first item of business was a report by the Power Systems Instrumentation and Measurement Task Force on Low Power Factor Power Measurement. Eddy So is chairman of this task force. We reviewed, again, the Scope and Introduction sections of the guide. In addition, portions of Section 2 have now been written on Measurement Methods. This includes the wattmeter method and the bridge method, used to measure low power factor inductive or capacitive loads. This guide will cover instrumentation used to measure power at high voltage under low power factor conditions. As such, it will apply to power transformers, high voltage reactors, power cables, capacitor banks and bushings. It is being written concurrently with the Transformer Loss Measurement Guide.

A second report was given by Ramsis Girgis on the Guide for Transformer Loss Measurement. Draft 7 of the Guide has been prepared. Draft 7 contains a section describing a reduction in

excitation current that can occur during the no-load loss test as the excitation voltage is increased from 80% to 110%. A proposed section on "Phase Angle Error of a Conventional Loss Measuring System" was distributed and reviewed at the meeting. Also proposed at the Task Force meeting was a working group report paper, which would provide background information to aid in the interpretation and application of the recent test code revisions on load and no-load loss measurements. Task force members expressed concern over the added work load that writing such a paper would mean, given that we are writing two guides now. The Working Group chairman agreed to write a first draft of such a paper before our next meeting. After the Working Group meeting, Davis Parr volunteered to help assemble a Working Group report to be published in the transactions.

The last two subjects discussed were our resistance measurement proposal and a proposal for how to deal with power loss and voltage drop in the shorting leads and connections during the load loss test. Oli Iwanusiw volunteered to work on draft of these two revisions to C57.12.90. That concluded the meeting of the Working Group on Loss Tolerances and Measurement.

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

The Working Group met on Monday, October 19, 1992, at 8:00 a.m. and 9:30 a.m. There were 10 members and 13 guests present.

Chairman Sheldon Kennedy noted the passing of Roy Uptegraff, Working Group member and transformer committee member.

Minutes of the March 30, 1992, meeting were approved.

The latest copy of the latest IEC draft on Converter Transformers was distributed for comment and harmonization purposes.

Draft 7 had been distributed at the last meeting. Only 47% of the ballots have been returned. Members were urged to return outstanding ballots. Other standards groups are setting precedents for harmonic loss calculation methods since this standard has not been completed.

In order to keep forging ahead with this standard, presently received ballots were discussed. Comments and editorial notes were read.

Negative ballots received were addressed. Items not agreed upon will be deferred until the next meeting. Several negative comments were received regarding load loss tests under section 8.6.2. Step (1) will be modified slightly. During Step (1) resistance will be measured and corrected to reference temperature during step (2). Presently the correction to reference temperature is made during step (1).

Two negative comments were made regarding the use of loss data enhanced with harmonic losses. Both ballots agreed with the use of the enhanced harmonic losses for the purpose of temperature rise tests and cooling. Both disagreed with its use for commercial guarantees. It was felt that loss guarantees should be kept as sinusoidal measurements. Additional harmonic losses should be supplied at the time of quotation. These losses added to the sinusoidal losses would provide "typical" or "approximate" operating losses. This figure will not be guaranteed itself, but may be used for a comparison of probable actual service losses. This approach would be in harmony with the IEC draft.

It was noted that information concerning load loss test methods for circuit 31 transformers with paralleled primary windings be included. This was errantly deleted in Draft 6 and was not re-inserted in Draft 7.

In addition, notes regarding the proper calculation of load losses with various circuits incorporating paralleled primary windings were discussed. The problem was acknowledged. Roger Hayes will prepare proposed wording for this issue. The text will address whether the paralleled windings are on a common core or separate core.

It was recommended that Table II of the Appendix be revised to reflect RMS per-unit values as opposed to fundamental per-unit values. Sheldon Kennedy will revise the table and submit it to the Working Group for consideration. The IEC draft will also be compared with this method.

Don Klein had submitted information developed through Fourier analysis for the 3 Pulse Winding Information of Table II. A request was made to review Don's method of calculation as well as gathering feedback on these values from users in industry. It was suggested that this method should be added in appendix form or perhaps as a technical paper.

Also, on page A-24 were notes regarding loss of life. A note in this section stated that loss of life calculations would be provided in a separate appendix under "special calculations". This appendix was never developed. This note exists for both the dry type and liquid filled transformers. The question was raised as to who should write this section. Should the loading guides through the Insulation Life Subcommittee and the Dry Type Transformer Subcommittee be used with the exception of using the load losses enhanced with harmonic losses? Should a separate guide be written for this standard? Is there sufficient data available to do this? Should the rectifier transformer working group decide this or should the appropriate subcommittee decide this issue? Both subcommittees will be contacted regarding these questions.

It was noted that temperature rise methods only included methods pertinent to liquid filled transformers. This will be revised with proper wording used for dry type transformers.

There being no further comments, the meeting was adjourned at 10:35 a.m.

At the end of the meeting, Jeewan Puri requested membership in the Working Group.

C. Revision C57.109 - B. K. (Bipin) Patel

Bipin Patel presented the following report.

The working group met on Monday, October 19, 1992, at 4:14 p.m. with nine members and ten guests present. After usual introduction, the minutes of the Birmingham meeting were approved without changes.

The following were announced:

K. R. Lindsley of ABB has resigned his membership verbally via a telephone call. He will not be able to attend the Transformers Committee meetings.

Our WG has been requested by the Transformers Committee to be a coordination group with the WG on Guide for Protective Relay Applications to Power Transformers (C57.91) of Power Systems Relay Committee. The chairman will circulate any drafts received from this WG to the members for review. If the through-fault-current duration WG is not in existence at that time, then it will be taken to the Performance Characteristics Subcommittee for appropriate review.

Next, the results of the ballotings of Drafts 3 and 4 were discussed. A copy of the results summary, negative comments, and marked-up Draft 5 were provided to the members and guests for discussion.

Draft 3 balloting in Performance Characteristics Subcommittee:

Number Sent Out:	79)	
Number Received:	62)	
Approved:	58)	Total Response: 78.5%
Disapproved:	2)	
Not Voting:	2)	
No Response:	17)	

Draft 4 balloting in Main Committee:

Number sent out:	139)	
Number received:	114)	
Approved:	109)	Total Response: 82%
Disapproved:	1)	
Not Voting:	4)	
No Response:	25)	

All disapproved votes were resolved successfully.

The comments of the disapproved votes for both ballotings were editorial. The resolution didn't change the meaning or technical contents of the drafts. As a result, Draft 3 was modified to Draft 4 and balloted in the Main Committee. A marked-up copy of Draft 5 was prepared after the balloting of Draft 4, reflecting editorial comments and the resolution of the disapproved vote. At the meeting, the major editorial comments and the resolutions of all disapproved votes were discussed with the following conclusions:

1. Marked draft 5 was accepted and approved with their following additional changes:
 - a. Change "reproduced" to "adopted" in Subsections 4.1 and 4.3 on pages 6 and 9, respectively. This is per the advice from the staff of the IEEE Standards Board.

The tables being copied in the guide from ANSI C57.12.00-1987 have errors. The use of word "adopted" rather than "reproduced" allows to correct these errors. These errors will be communicated to the appropriate group in the Transformers Committee for future revisions.

- b. Note in the definitions section on page 3 will be modified by changing "self-cooled" to "lowest nameplate." Since this was a part of Don Chu's disapproved vote, the chairman will discuss this change with him for his approval. The word "lowest" was later suggested to be replaced by "minimum" to be consistent with its use in various other places in ANSI C57.12.00-1987. The "minimum nameplate" was acceptable to Don Chu and was so noted during presentation at the Performance Characteristics Subcommittee meeting.

The WG further discussed that the above changes are strictly editorial and no new balloting is required. The conclusion was to publish Draft 5 and seek IEEE Standard Board's approval for publication.

The chairman stated that Draft 5 will be prepared as discussed. He will seek Eugene Kallaur's assistance in ensuring that the changes discussed are adequately incorporated prior to its publishing to the WG members.

There was no old or new business discussed. The chairman expects to publish draft 5 and prepare needed paperwork for application to the IEEE Standards Board prior to November 30, 1992. Hopefully, this concludes the WG's task and no future meetings are needed.

The meeting adjourned at 5:20 p.m.

NOTE: At the Performance Characteristics Subcommittee meeting, the WG was advised to circulate draft 5 within the same main committee balloting body for review since changes were made to draft 4, which balloted. A minimum 30-day period is required to receive comments. If there are not substantial comments received, an application will be made to the IEEE Standards Board for approval.

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

The LTC Performance Requirements Working Group met at 1:20 p.m. on Monday, October 19, 1992, with 12 members and 25 guests in attendance. Introductions were made and the minutes of the previous meeting in Birmingham, Alabama were accepted.

The main portion of the meeting consisted of a continuation of the discussion of the many comments that were received when Draft 6 was balloted upon by the Performance Characteristics Subcommittee. Of the comments discussed, the following were the most important and involved the most discussion:

For service conditions, the standard will state that "unless specified otherwise, LTCs shall be suitable for operation when immersed in insulating fluid over a range of temperatures from -25C to 100C. These limits will apply whether the LTC is located in the main tank of a transformer or in a separate compartment.

For the Mechanical Endurance Test, it was agreed that the oscillograms taken during this test would be referred to as "timing oscillograms". Also, that for the test to be successful, the oscillograms taken at the start and finish of the test "shall show no significant difference in the timing of the movement of the contacts".

There was considerable discussion about the words "undue wear of the mechanical parts" and "normal servicing" that would be permitted during the mechanical endurance test. "Undue wear" is to be defined as a problem "that would cause erratic LTC operation or would lead to mechanical failure if operation continued". Also, the words "normal servicing" were change to "scheduled servicing, such as lubrication and minor adjustments "that would be permitted during the mechanical endurance test". Switching impulse tests will be required for LTCs that are applied at other than the neutral point of the windings for systems with normal voltages of 138 kV and above, not 115 kV as previously stated. The maximum value of partial discharge during the applied voltage test will be 50 micro-volts, as presently stated in Draft 6, but the words that this "includes contributions from leads and test equipment", will be added. A paragraph will be added to the section on Motor-Drive Mechanism to cover permissible variation of auxiliary supply. The wording of this paragraph will closely follow a similar paragraph in IEC-214 except that reference to

D.C. auxiliary power supply to the motor-drive mechanism will be omitted. The environment of the motor-drive mechanism for suitable operation will be the same as required by IEC: -25C to 40C. The review of the comments received for Draft 6 was completed at the Working Group meeting. The one negative ballot that was submitted was successfully resolved. The Chairman agreed to have a Draft 7 prepared and to request that the next ballot be by the Transformers Committee. The meeting was adjourned at 4:10 p.m. It was also announced that the symposium on the subject of Load Tap Changers, which was originally scheduled for this meeting, will be held at the next meeting in Portland.

- E. Failure Analysis - M. S. (Mike) Altman The Working Group met at 1:20 p.m. with 38 people present. Introductions were made and minutes of the last meeting discussed. Harold Light discussed his meeting Sunday, Task Force for GSU Failure Survey. In Hal's meeting, the scope of the task force was discussed, revised and agreed to. Hal will send a solicitation letter to all members of the task force. He hopes to revise the letter per comments received and get some case histories by the next meeting in Portland. The 100 MVA lower limit was discussed. 100 MVA was picked because it is the medium power - large power dividing line. If good reports of failures are sent in on 85 MVA units, the report would be used. Harold will adjust the lower limit as needed. The status of C57.117 and 125 were then discussed. C57.117, Guide for Reporting Failure Data, has been reaffirmed. C57.125, Guide for Failure Analysis, has just been published. It was asked if anyone was interested in chairing a TF to begin revision of 117 or 125. There were no takers. It was generally agreed, without a vote, that Hal's T.F. would cause the use of both guides to bring to light any areas of weakness. It was suggested the GSU failure Task Force be moved from Sunday to Monday afternoon to run concurrently with the Working Group meeting. This request will be taken to the SC and if okay, the next meeting will be on Monday. The comment was made that some method should be put in place to continue collecting data after the survey is complete and some thought should be given to how data collected would be circulated. Meeting was adjourned at 2:20 p.m.
- F. Revision C57.110 - R. P. (Rick) Marek The Working Group met on Monday, October 19, 1992, at 4:15 p.m. This was essentially an organizational meeting. Rick Marek, the chairman could not attend, and the meeting was chaired by Max Cambra. Thirty-one attended and 22 requested membership on the Working Group. The meeting opened with introductions and a statement by the temporary chairman concerning the resolution of the negative ballots on reaffirmation of C57.110. The negatives were resolved and a reaffirmation submittal was sent to the standards office. John Matthews received a confirmation of the submittal and the review committee will review the submittal prior to its December meeting. It should be clearly pointed out that the negative votes were resolved with the intention of immediately rewriting C57.110 to address the negatives. The rest of the meeting was devoted to

discuss just what should be the expanded scope of the revised document. Some of the issues are summarized below:

1. Revise Section 5.3 to adequately address specification of transformers to be constructed. The present guide is too conservative for new designs.
2. Consideration of overheating of neutrals due to triplens causing zero sequence currents within the neutral.
3. Broaden PAR to include transformer voltage below 600V.
4. Arrive at a symbol other than "K" to designate the value by which the eddy and stray losses are multiplied due to harmonics.
5. Write a tutorial to introduce new users of the guide to how harmonics affect transformer heating and the significance of the tables. A tutorial does exist, and should be revised.
6. Consideration should be given for differences in kVA ratings and in dedicated versus general purpose usage. This would introduce the concept of a loading guide. Please note that no decisions were made, and the comments only serve the new Working Group chairman in formulating the PAR for the revision of 34 C57.110. The meeting adjourned at 5:25 p.m.

VI. Project Reports - None

VII. Old Business

A. Seismic Guide - L. W. Pierce

Status report: P638, Working Group on Qualification of Class 1E Transformers

IEEE Std 638-1992, "IEEE Standard for Qualification of Class 1E Transformers for Nuclear Power Generating Stations" was approved March 19, 1992, by the IEEE Standards Board and printed June 22, 1992. It may now be ordered from the IEEE Service Center under order number SH15230. The price is \$25.50 for IEEE members and \$35 for non-members.

This will be the last report of this IEEE Working Group.

The PCS Chairman thanked Linden and others for their dedication in carrying out this endeavor.

- B. Reaffirmation of C57.105-1987 - G. J. Reitter George reported that reaffirmation of this document, which is the guide for Application of Transformer Connections in Three Phase Systems, was approved at the June Standards Board Meeting.

VIII. New Business

- A. Request for Addition of PCB Content to Nameplate Information in C57.12.00 Discussion of this request led to the decision that additional background information is needed. Don Fallon offered to contact Paul Orehek for follow-up.

- B. Revision of Cooling Class Designations in C57.12.00 A proposal was made to adopt the IEC Cooling Class Designations. It was suggested that the IEC designations are more definitive than the present IEEE designations. Following brief discussion, a Task Force was formed to review the proposal. Bill McNutt, Jeff Fleeman, Bob Veitch, George Reitter, John Wood and Don Platts volunteered for this task. The following two New Business items could not be addressed due to lack of time. Details on these items will be sent to PCS members for discussion at the next meeting:
- C. Request for addition of data required on Manufacturer's Test Reports in C57.12.90. D. Request for addition of Rail Shipment and/or Seismic Design Information to Nameplate Information in C57.12.00.

IX. Next Meeting

The next meeting will be held on Tuesday, March 30, 1993, in Portland, Oregon. The meeting was adjourned at 3:22 p.m.

Respectfully submitted,
John W. Matthews PCS Chairman

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

Mr. James Howard reported for Mr. Orehek.

IEEE UNDERGROUND TRANSFORMERS AND NETWORK
PROTECTORS COMMITTEE MEETING - CLEVELAND,
OHIO - OCTOBER 20, 1992

I. INTRODUCTION/ATTENDANCE

The Underground Transformers and Network Protectors Subcommittee met at 10:55 am on October 20, 1992 with 13 members and four guests present. The attendance roster is attached.

II. APPROVAL OF MINUTES

The minutes of the March 31, 1992 meeting in Birmingham, Alabama were approved with only minor spelling corrections. (Page 3 Item #7 added to "Silicon" and Page 4 #3 changed "chan" to "then".)

III. ACTING CHAIRMAN'S REMARKS

A. Administrative Subcommittee Notes - Jim Howard (Substituting for P.E. Orehek), provided the following information from the AdComm meeting of October 19, 1992:

1. There are several additional meetings being held in conjunction with the Transformers Committee meetings. These include an ANSI C57 meeting, a meeting of the C57/C37 joint working group on enclosure integrity, a NEMA ATR Distribution Transformers Committee Meeting, two tours of manufacturer's facilities and an IEEE staff sponsored training session for working group and subcommittee chairmen.
2. A technical paper presentation will be made at the Portland meeting, as well as, a seminar on tap changers.
3. The Cleveland host, Dave Douglas, indicated that everyone liked having tables at the reception, that approximately 243 were expected to be in attendance and that finances are close to budget. Since there has been some concern about the cost of publishing and sending the minutes, the registration will be increased \$10.00 at the Portland meeting to cover the preparation and mailing of the minutes. Money will be taken from the reserve fund to help defer costs for the minutes of the Cleveland meeting. This applies only to the overall minutes issued by the Transformers Committee.
4. The next meeting will be held in Portland, Oregon at the Red Lion Inn at Lloyd Center and that cost will be \$100.00 per room single or double.

5. When future project authorization requests (PAR) are submitted for approval, requesters will be encouraged to review available international standards and recommend their adoption or incorporation instead of developing a new standard. IEC has indicated that they encourage such adoption and the copy right is no issue. IEEE is working with IEC to get a list of IEC standards that are available or in progress.
6. There was much discussion concerning processing of standards through ANSI and the C57 Main Committee after the standard has been approved by the IEEE Standards Board. It was indicated there is an agreement that IEEE would not publish a standard unless there is a six month delay in ANSI publishing it. Power Engineering Society executive personnel and IEEE staff recommend that IEEE publish the standard as a IEEE standard as soon as the IEEE Standards Board approves it. This recommendation was not acted on by the AdComm, since it was indicated that they have no documentation that there is definitely a problem in getting the standards published by ANSI. IEEE staff will provide a list showing the progress on the various standards that have been approved by the IEEE Standards Board. All indications are that once the IEEE Standards Board approves a standard that it will be sent to the ANSI C57 main committee who would then submit it to EEI, NEMA and other interested parties. Jerry Thompson of Duke Power indicated that the C57.12.23 standard has been approved by the Standards Board, but is now with IEEE editors. The reason for this should be determined.
7. It was noted that the PAR for the C57.12.44 was approved by NESCOM on 6/17/92.
8. Certificates of appreciation or Standards Board plaques will be presented to former Chairman of transformer committees, subcommittees or working groups. Chairman of subcommittees should notify Bob Veitch when working group chairman change.
9. It was noted that IEEE will only ballot the Main Committee, not working groups or subcommittees.
10. Four working groups that had previously been under the Distribution Transformer (57.12.2) Subcommittee did not come over to IEEE, but are now seeking to be transferred. These are the C57.12.28, 29, 30 and 31 working groups. It was noted that NEMA personnel have not been present for the last seven meetings, even though the last meeting was held only a few blocks from their headquarters. Adcomm agreed to accept these four working groups if the ANSI C57 Main Committee would release them. It was recommended that when negotiations take place for this transfer, ownership of the documents should

be included in the agreement to prevent the problems that are now being faced by the working groups of the former .2 and .4 subcommittees.

11. The vice chairman reported that submission of discussions of technical papers to be presented at the summer and winter power meetings is being encouraged. As a result, the vice chairman will send all subcommittee chairmen copies of the approved papers for the Summer and Winter Power Meetings. The chairman of the subcommittees are encouraged to review these papers and send any to working group chairmen who might have an interest or would be capable of presenting a discussion. In turn, the working chairman are encouraged to send out copies of any papers to working group members who may be interested in the subject or have the technical capability to comment on the papers as a discussor. The vice chairman also indicated that an organization and procedures manual has been approved and will be sent out.

12. Future Meetings

It was announced that the fall meeting will be held March 28-31, 1993 in Portland, Oregon. The next meeting will be October 31 -November 3, 1993, in St. Petersburg Beach, Florida. The two 1994 meetings will be March 20-23, in Dallas, Texas and Milwaukee, Wisconsin on September 24-28. The 1995 meetings will be held in Kansas City, Kansas in the spring and in Boston, Mass. November 5-9. The spring 1996 meeting will be in San Francisco. The 1997 Summer Power Meeting will be held somewhere in Europe.

IV. WORKING GROUP REPORTS

A. Three-phase Dry Type Network Transformers (C57.12.57) - B. Nutt - Chairman

1. The working group met on Tuesday, Oct. 20, 1992 at 8 a.m. with nine members and six visitors present.
2. The minutes of March 31, 1992 meeting in Birmingham, Alabama were approved as written.
3. Draft No. 6 of the C57.12.57 standard was distributed and discussed by those present. The following changes were made:
 - a. In the table of contents, sections 7 and 8 will be added and section 1.5 will be deleted.
 - b. Section 6.5.1 will be included in 5.8.2.1 and section 6.5.2 will be included in section 5.8.2.3.

- c. Other editorial changes were made to correct or clarify meanings of statements within the document.
 4. The balloting process on Draft 6 will begin in the next two weeks with a updated copy sent to the working group. The meeting adjourned at 8:50 a.m.
- B. Network Protectors (C57.12.44) - R.B. Robertson - Chairman
1. The working group met at 8 a.m. on October 19, 1992 with 14 members and five guest present during the four working group sessions.
 2. The minutes of the March 30, 1991 and April 1, 1992 meeting in Birmingham, Alabama were approved as submitted.
 3. During the course of the meeting the working group reviewed all 12 sections of the PC57.12.44 D/1 including cover page and introduction. Drafting and art work requirements/support was discussed
 4. Scheduling was worked out to meet the deadlines as follows:
 - a. All sections are to be updated to include the changes discussed and submitted to the secretary on diskettes, with hard copy of the information, for putting together the entire document to meet IEEE standard requirements by December 1, 1992.
 - b. A copy of the total updated document is to be forwarded to working group members for their review by mid December 1992. This updated document will include all necessary editing to meet IEEE standards requirements.
 - c. The working group is to return the edited document to the secretary with any changes or corrections by 2/15/93. These changes or corrections are to be incorporated in a final draft #1. It will be sent out to the working group with the minutes prior to the next meeting. It was indicated the completed draft #1 of PC57.12.44 will be balloted by the working group at the spring 1993 meeting at Portland, Oregon and it is expected to be balloted at the subcommittee level prior to the fall 1993 meeting.
 - d. It was indicated that the working group will need at least four sessions for the spring meeting and a fifth session will be very helpful. The meeting was adjourned at 2:35 p.m.
- C. Liquid-filled Secondary Network Transformers (C57.12.40) - E.A. Bertolini -Chairman

1. The working group at 4:15 p.m. on October 19, 1992 with 12 members and five guests present. The minutes of the previous meeting, held in Birmingham, Alabama, were approved as written.
2. It was indicated that the clearance dimension shown in figure 3 and 4 were confirmed as 1" rather than 1-1/2". The results working group balloting was reviewed. The results of the Underground Transformer and Network Protectors Subcommittee balloting was also reviewed.
3. The working group was notified of the status of future required balloting.
 - a. IEEE has draft #3. This will be sent to the IEEE Transformers Committee for balloting.
 - b. A copy of draft #3 was sent to EEI. They will ballot the EEI T&D Committee and also provide a copy to NEMA.
 - c. No new business was presented and there were no requests or concerns expressed. The working will require one session at the next meeting. The meeting was adjourned at 4:25 p.m.

D. Three-phase Underground Transformers (C57.12.24) -
J.W. Howard -Chairman

The working group met on Monday, October 19, 1992 at 2:55 p.m. with nine members and five guests present. One of the guest requested membership. The minutes of the March 3, 1992 meeting were approved as written. The chairman reported on balloting to this point and handed out comments from EEI T&D Committee balloting. He indicated that the IEEE Main Transformer Committee ballot results should be received in the near future. The chairman indicated that several members had been inactive and that they would be contacted. If they do not respond, they will be dropped from membership on the working group. No items of new business or concerns were presented. The next meeting was announced for March 29, 1993 in Portland, Oregon. The meeting adjourned at 3:36 p.m.

V. OLD BUSINESS

It was noted that the concern about impedance terminology and requested changes to the nameplate were submitted to the appropriate personnel but that no response has been received as of this date.

VI. NEW BUSINESS

It was noted that Betty Tobin of Seattle City Light is trying to set up a discussion group at the Winter Power Meeting concerning network operations and problems. Any working group member that is interested

should contact her concerning the details. The primary item of discussion at the 1993 winter power meeting will be manhole fires.

VIII. ADJOURNMENT

The meeting was adjourned at 11:53 p.m.

Respectfully submitted by:
J.W. Howard Acting Chairman

L. West Coast - L. A. Tauber

IEEE WEST COAST TRANSFORMER SUBCOMMITTEE
MEETING MINUTES
NOVEMBER 19, 1992
VANCOUVER B.C., CANADA

1. Attendees:

NAME	COMPANY	MEMBER/ GUEST
Dave Allaway	Puget Power & Light	M
Burhan Becer	Kilborn Engineering	G
Dave Brucker	Cooper Power Systems	M
Jens Erlingsson	Pacific Gas & Electric	M
Rulon Fronc	L.A.Dept. of Water & Power	G
John Galbraith	Bonneville Power Administration	M
Jim Gillies	Consultant	M
Bill Isberg (Secretary)	Isberg & Associates/Colectro	M
Mostafa Jafarnia	North America Transformer	G
Gary McCulla	Salt River Project	M
Bob Stewart	BC Hydro	G
Lou Tauber (Chairperson)	Bonneville Power Administration	M
Chuck Todd	Tacoma City Light	M
Joe Watson	L.A. Dept. of Water & Power	M

2. Membership:

Bob Stewart was accepted as new member of the West Coast Transformer Subcommittee, representing BC Hydro.

3. New Business:

- Main Transformers Committee in Cleveland. The Chairman, Lou Tauber reported the following regarding the Cleveland meeting:

The Main Transformers Committee is having difficulties in handling the costs of distributing the meeting minutes. It has been suggested that future meeting minute distribution costs be added to the main meeting registration fee (approximately \$20)

There was a discussion regarding the long review times for ANSI to approve and adopt IEEE standards.

Working group balloting for draft standards are no longer being done by the IEEE Standards staff, due to increased work volume. This does not apply to Main Transformers Committee balloting.

The next meeting of the Main Transformers Committee in Portland will have a seminar presented on Load Tap Changers, and a technical paper presentation.

- Vice Chairman & Secretary Positions for the West Coast Transformer Subcommittee.

Due to additional work responsibilities, Bill Isberg has stepped down as the Vice Chair and Secretary. Dave Brucker has agreed to take over the responsibilities as of the next meeting.

- Future Meetings. It was agreed that a short West Coast Transformer Subcommittee meeting and working group meetings should be held in Portland. The Portland meeting will be held March 29-31, 1993.
- Future West Coast Transformer Subcommittee Standards Topics. There were discussions regarding starting a new guide on different transformer monitoring schemes (or at least collating and evaluating results of both "on-line" and "off-line" monitoring). Bill Isberg suggested that the Subcommittee might develop a guide concerning "Scada Ready" power transformers. Lou Tauber said that he would discuss these ideas with the Main Committee at the next ADCOM meeting.

4. Working Group Reports.

Loss Evaluation Guide. The standard has been published. The Lou Tauber has promised that a letter of appreciation will be sent to Roger Jacobsen.

Fire Protection Guide. The layout of the guide was reorganized, and Joe Watson indicated that he will have a coherent copy of the next draft of this guide available by the next meeting. The goal is to have a version of the guide available for balloting within one year.

Installation Guide Consolidation. The latest version of this guide was presented to the Subcommittee and Main Committee membership. Responses from the Subcommittee are due by January 29, 1993

Padmount Liquid Filled Unit Substation Standard Revision. Chuck Todd indicated that his investigation revealed that there was little or no need for this standard to be updated since it is not being used.

Respectfully Submitted,
Lou Tauber, Chairperson
West Coast Transformer Subcommittee

VIII. Liaison Reports

- A. EPRI - S. R. Lindgren
Mr. Lindgren's full report is as follows:

EPRI LIAISON REPORT
September 30, 1992
Stan Lindgren, Project Manager

The following report is for inclusion in your minutes for the October 21, 1992, meeting.

1. EHV Converter Transformer:

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

A final report will be published pending patent filing.

2. Amorphous Steel For Power Transformers:

A pilot facility automated cutting line has been built and tested.

No problems have been reported with 500 kVA unit installed and placed in service June 1987. Core loss has declined several percent since the unit was installed. However, the first core using consolidated material had higher losses than expected. Project is being reassessed.

3. Advanced Power Transformer:

Reduced load loss feasibility has been demonstrated.

Detailed analytical studies exploring individual design aspects has been completed.

As a part of Phase II a 47 MVA three phase core form prototype was built and successfully short circuit tested March, 1991 delivered to HL&P and is now in service.

Two 80 MVA 115 kV delta to 161 kV wye, three phase units were built for one end of ESEERCO's six-phase demonstration project. Although 2 winding, the units are comparable to autotransformers. One unit was successfully short circuit tested February 1992. Two different factory test problems were encountered, and both transformers were rewound with conventional windings while investigation of failure causes was pursued. Cause of a dielectric test problem was found to be unrelated to the technology. Cause of an excitation test problem indicated the need for better quality control for the conductor.

Development of shell form conductor and physical models continues.

4. Static Electrification in Power Transformers:

This is the suspected failure mechanism in over 23 core form and shell form FOA transformers worldwide. Recent failures involve 20 year old transformers. One unit had been recently reprocessed after oil was removed for maintenance. The "installed spare" unit subsequently failed January 1992 with original oil that had not been touched.

Current work is focussed on the effects of temperature and moisture transients. Tests on representative transformer cooling components have been completed. A project is underway to monitor a large FOA transformer in the field. The instrumentation systems have been tested and are ready for a prototype installation. A 3rd Workshop was held in January 1992 in San Jose, California.

5. Bubble Evolution in Overloaded Transformers:

Very rapid load changes can cause bubble formulation under some conditions and reduce 60 Hz and impulse dielectric strength. This has been demonstrated in models with rapid/high O.L.

A project to better identify moisture conditions associated with bubbles and verify GE mathematical model was completed (Interim Report EL6761) but raised questions about nitrogen blanketed transformers.

A final report (EL7291) covering more complete test data is published. A computer program covering bubble evolution plus the ANSI Loading Guide formulas is being developed as an EPRIGEM.

6. Active Transformer Noise Cancellation System:

Only noise reduction in one direction has been pursued.

An initial evaluation on a substation transformer was completed that demonstrated over 10 decibel reduction of 120 Hz with a small trial system.

Two systems are being linked together to handle a larger transformer and improve reduction of higher frequencies.

A field demonstration is underway.

7. 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 is underway to study fast disconnect switching transient effects on HVCTS.

8. Power Transformer Tank Rupture - Risk Assessment and Mitigation

This project will be completed late 1992. Over 20 well documented cases have been collected from which several were selected for detailed study.

9. Geomagnetic Induced Currents (GIC)

EPRI has three projects underway.

A feasibility demonstration is in process for detection of transformer core saturation at twenty locations and reporting to a central location. Useful data was collected from several GIC events. The system is being expanded to 24 locations.

Two transformer neutral GIC blocking devices were installed in 1991 and preliminary field trials were performed with good results in June, 1991.

A project to evaluate the response of protective relaying systems to GIC has just been initiated.

10. Thermal Models for Real-Time Monitoring

This new project is underway involving all transmission components including power transformers.

B. Cigre SC12 - W. N. Kennedy

Mr. Kennedy's full report is as follows:

LIAISON REPORT
CIGRE SC-12 TRANSFORMERS
FOR IEEE TRANSFORMER COMMITTEE
10/21/92

A. Introduction

The 34th session of CIGRE was held August 30 to September 5, 1992 in Paris. Study Committee 12 (Transformers) conducted a discussion meeting on 9/3, participated in a panel discussion on life extension on 8/31, and held a

joint meeting on static electrification with SC1 5 (Insulation) on 9/5. Working groups met throughout the week, and a poster session for the transformer papers was held in the afternoon of 9/5.

Three preferential subjects were discussed at the main transformer session - essential requirements to maintain transformers in service, modern testing requirements, and transformer modeling. Highlights from these discussions are summarized below, followed by comments on the session on static electrification, working group activities, and topics for discussion at the 1993 colloquium. A list of the transformer-related papers published at the session is given in Appendix 1.

B. Highlights of Discussion

1) Essential Requirements to Maintain Transformers in Service (Including DGA, HPLC, monitoring and Life extension.)

* General consensus of usefulness of DGA, but there are cautions about potential traps in IEC599.

* HPLC and furanic techniques continue to show great promise. There needs to be improvement in sensors, particularly those used for on-line monitoring.

*Development in degree of polymerization techniques allow small samples to be removed from transformers, but there can be wide variations in the results depending on what location they are removed.

* There is increasing interest in on-line monitoring systems. In addition to a major presentation by Jack Harley on TPAS, other systems were described by individuals from Japan, Great Britain and Germany. Harley reported ten TPAS units presently on-line with 8-9 more expected by the end of the year. In Great Britain they will be installing 26 of their own monitoring systems shortly. Many utility users report problems with the electronics in the monitors under service conditions. At present the use of on-line monitoring systems has been somewhat restricted by their high cost. Harley mentioned that TPAS was developed for units >= 100 MVA; a simpler system will be made for lower MVA units.

* Jack Harley described that the TPAS system has detected instances of acoustic partial discharges from energized transformers. Harold Moore raised the question that although separate low frequency and impulse testing has generally worked, we may now be getting partial discharges in service occurring below the protection level of the arrestors due to

superposition of operating voltage and surges.

* It was generally agreed that replacing an old transformer simply to lower losses cannot be justified; there must be additional factors present - technical, economical, strategic - to affect the change.

* Data was presented from several sources indicating that particle count does not increase with age up through approximately four years service if the transformer was thoroughly cleaned during processing.

* A representative from the C.I.S. (formerly U.S.S.R.) presented breakdown results on insulation models which showed a decrease in switching impulse strength of 15-20% for aged insulation; full wave results were unchanged. The reduction in S.I. strength was accompanied by an increase in the variance of the breakdowns.

* On-line measurements of particle count was shown to be sensitive to location of sampling.

* The term "Life Management" is preferred over "Life Extension".

2) Modern Testing Requirements

* Transfer functions are being widely used in Europe to detect partial discharges or failures within coils during impulse tests. The technique was hoped to eliminate misinterpretation of impulse test results. Discussions at this meeting showed that there are problems with the method - the transfer function can be effected by temperature, external noise, and the time of chop during chopped wave testing. It is also limited by the number of bits used in the digital recorder, the frequency limit (typically 1-3 MHz), and the digital filter effect of the equipment.

* The use of zinc-oxide arrestors is thought to permit reduced impulse test levels, although care must be exercised to avoid superimposed transients. It was generally agreed that no new tests are required for very fast transient (VFT) impulses associated with insulated substations. It was cautioned that chopped wave tests would be necessary. (In Canada, chopped wave tests are not required on transformers protected with zinc-oxide external arrestors.)

3) Modelling (High Frequency Transients, Thermal, and Operating During Unbalanced Conditions (GIC))

* Papers published for the conference show progress in modelling transients using both time and frequency domain to include losses and core effects up to 1 MHz and beyond. Additional work is necessary to represent damping factors.

* Concern was expressed that little measurement data has been published to confirm these improved programs.

* Excellent work has been accomplished modelling GIC thermal effects on transformers.

* There is general agreement that IEC 549 thermal models

are not accurate under transient loads. Thermal exponents may be too conservative and CIGRE is quite interested in IEEE work being done at present.

4) Static Electrification

CIGRE has a joint working group between study committee 1 2 (transformers) and SC 1 5 (insulation) to study static electrification. Stan Lindgren of EPRI is the covenor of the working group which in turn has two task forces - one to develop a test cell to measure electrostatic charging tendency and one to review failures in actual transformers. Their papers were included in the 1992 CIGRE SC15 conference papers and two others were distributed at the meeting. Observations from the meeting include:

* The new test cell has been tested at three different laboratories and consists of a spinning metallic disk insulated on both sides with pressboard. Initial results indicate considerable variability with results; the spinning disk is being replaced by a ring-shaped electrode for less scatter. The cell will be used for two studies:

a) Different oils with the same pressboard

b) Different insulating materials with the same oil.

* A survey of transformer static electrification failures is complete and a summary report will be written. The survey covers 23 failures throughout the world with 15 in the U.S. All U.S. failures were shell form; most of the rest were core form. All were FOA units.

* Weidmann in Europe has an extensive program in this area. Results were presented at an EPRI workshop in January and additional data was given in a supplementary paper at the CIGRE session.

* Charge generation is highest at elevated temperatures, while resistivity is greatest at lower temperatures. A worst case scenario for static electrification would include a warm charge generation followed by a cold leakage path, or a reprocessed transformer.

* Moisture transfer may play a significant role but it is difficult to model transient conditions.

5) Working Group Activity

a) 12.09 Thermal Aspects

* Life assessment work completed. Results indicate life duration is not the same as thermal aging; other factors such as gassing, maintenance, etc. need to be considered, also.

* Surveys on utility overloading practices and on gas in oil results from factory temperature runs are underway.

b) 12/14.10 HVDC converter Transformers

* A paper on HVDC dielectric testing has been sent to parent study committees for approval. The paper will be published in ELECTRA when accepted.

* A survey on in-service HVDC failures has been

completed. Minor corrections were suggested on draft 5 of the paper, which will also be submitted to ELECTRA.

* Other subjects being studied include loss calculations, acoustic guidelines, and tolerances on impedances.

c) 12.14 Reliability

* A computer program has been developed to tabulate transformer failure statistics. It will be distributed shortly to interested parties.

6) Future Work

There were three subjects selected for discussion at the next CIGRE colloquium to be held in early September 1993:

a) Installation of Power Transformers on Site

* Transportation, relocation, storage, and erection on site.

* Oil processing, oil quality, tests and quality assurance.

* Repair and refurbishment on site.

b) Tank Rupture, Environmental and Safety Aspects of Transformers (including gas insulated transformers).

c) PCB Contamination Problems in Transformers.

Please contact me for copies of any papers, or with comments on any of the above subjects.

William Kennedy

US Representative to Cigre SC 12 (Transformers)

Appendix 1

List of Technical Papers	CIGRE 1992 Session
12-101	Allan, D. and Corderoy, B. "Transformer Insulation Condition Monitoring, Life Assessment and Life Extension Techniques in Australia"
12-102	Hironniemi, E. et al. ".Experiences of On- and Off-Line Condition Monitoring of Power Transformers in Service"
12-103	Breen, G. "Essential Requirements to Maintain Transformers in Service"
12-104	Bassetto, A., Pereira, M.S.C., and Petri, V. "How the Products from Insulating Oil Degradation Can Affect the Life of Transformers"
12-105	Provanzana, J.H. et al. "Transformer condition Monitoring - Realizing an Integrated Adaptive Analysis System"
12-106	Boisdon, C. et al. "Condition Diagnosis and Monitoring of Transformers - Possibility of Estimating Transformer Lifetime"
12-201	Malewski, R. et al. "Five Years of Monitoring the Impulse Test of Power Transformers with Digital Recorders and the Transfer Function Method"
12-202	Gurin, V.V. et al. "Service Experience and Requirements for Insulation High-Voltage Tests of EHV Power Transformers and Shunt Reactors"
12-203	Kozlowski, M. and Ketner, A. "Critical Estimation of Standardized Lightning Surge Test Procedures on Neutral of a Power Transformer"
12-204	Cornick, K. et al. "Distribution of Very Fast Transient Overvoltages in Transformer Windings"
12-301	Holland, S.A., Stadler, C. and Haydock, L. "Transient Loss Analysis of Power Transformers Using Magnetic and Electric Equivalent Circuits"
12-302	Seitlinger, W. "Transformer Model Based on the Magnetic Circuit"
12-303	Kress, K., Konig, D., and Muller, W. "Travelling Waves as Causes of Internal Resonance Phenomena as Coils and Windings"
12-304	Degeneff, R.C. et al. "Modeling Power Transformers for Transient Voltage Calculations"

- 12-305 Cosaert, F. et al. "Dynamic Analysis of Thermal Behavior of Transformers Using Optical Fibre Measurements"
- 15/12-01 Poittevin, J. and Sapet, J. "Preventive Detection of Electrostatic Phenomena in Transformers"
- 15/12-02 Lindgren, S. et al. "Temperature and Moisture Transient Effects on Flow Electrification in Power Transformers"
- 15/13-03 Joint Working Group 12/15.13 "Static Electrification in Power Transformers"
- Panel 1-02 Shenoy, V. "Life Extension of Power Transformers"

Papers Distributed at the Conference

Krause, Ch. et al. "Electrostatic Charging in Large Size Models of Power Transformer Cooling Ducts"

Knorr, W. et al. "Power Transformers for Higher Temperatures. A New Development in Transformer History"

IX. NEW BUSINESS

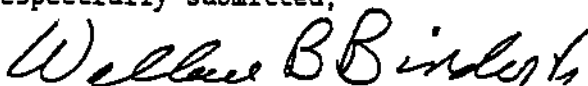
A proposal was made from the floor to change the meeting schedule by eliminating subcommittee meetings for the fall meeting to expedite standards development. Some discussion was conducted. Subcommittee chairmen may schedule multiple sessions. Most subcommittees have substantive business to conduct. A survey taken a short time ago indicated a reluctance by the membership to extend the meetings into Wednesday afternoons or Thursday. Many subcommittees may require more than one session on Tuesday. This can be scheduled with the host. The subcommittee meetings are important for those who cannot attend the working group meetings. Transformers Committee business should be conducted the year around.

The question was asked from the floor regarding what happened to sound levels for power transformers. It was indicated that this is an active item on the agenda of the Audible Sound and Vibration Subcommittee.

Jeff Fleeman invited everyone to the Winter Power Meeting to be held in Columbus, Ohio in 1993.

There being no further new business, the meeting of the Transformers Committee was declared adjourned at 12:00 noon.

Respectfully submitted,



Wallace B. Binder, Jr.
Secretary, IEEE/PES Transformers Committee

IEEE/PES TRANSFORMERS COMMITTEE

Administrative Subcommittee Meeting
October 19, 1992 - 6:15 p.m.
Cleveland, Ohio

AGENDA

1. Introduction of Members and Guests
2. Approval of the Cleveland Meeting Minutes
3. Additions to and/or Approval of the Agenda
4. Committee Finances and Meeting Arrangements
 - Cleveland Host - D. Douglas, Centerior Energy
 - Portland Host - L. A. Tauber
5. Standards Subcommittee - G. Vaillancourt
 - Standards Status
 - PES Standards Coordinating Committee
6. Status of IEEE Standards - L. Napoli /A. Salem
 - IEEE/ANSI Status
7. Status of ANSI C57 Committee - L. Savio
8. Review of PES Awards Committee - R. A. Veitch
9. Review of Technical Council Activities - J. D. Borst
10. Subcommittees' Activities Discussion - Subcommittee Chairmen
11. Vice Chairman's Report - J. H. Harlow
 - Technical Papers / Sessions
 - PES Technical Council Committees
 - Organization and Procedures
 - Technical Sessions Improvement
 - Publications
12. Secretary's Report - W. B. Binder, Jr.
 - Membership Review
 - New Member Applications Approval
13. New Business
14. Adjourn

IEEE/PES TRANSFORMER COMMITTEE ATTENDANCE STATISTICS

GROUP	Charlotte	Denver	Montreal	Phoenix	Baltimore	Birmingham	Cleveland	MAXIMUM AVERAGE
	Oct. 1989	Mar. 1990	Oct. 1990	May 1991	Nov. 1991	Apr. 1992	Oct. 1992	
Committee Registration: Members and Guests	200	202	257	237	247	205	245	285
Spouses	42	52	74	63	59	45	40	74
Luncheon		110	128	140	117	138	120	140
SC ADMINISTRATIVE	18	20	24	19	21	18	18	24
SC AUDIBLE SOUND AND VIBRATION	29	26	19	0	25	36	0	36
SC RISINGS	14	16	23	26	37	31	22	37
WG Bushing Applications Guide	13	21	29	25	19	21	27	29
WG DC Applications of Bushings	14	12	14	13	14	15	12	15
WG Revision C57.19.01					11	15	13	15
SC DIELECTRIC TESTS	77	81	88	78	72	93	104	104
WG Revision of Dielectric Tests	32	33	35	48	53	56	58	58
IF Rev. of Impulse Test Guide	41	41	55	47	41		45	55
IF Enhancement Voltage Time		16		22	25		21	25
IF Metal Oxide Surge Arrester Coordination							27	27
WG Rev. Dielectric Tests on Distr. Transf.	39	28	30	27	21	29	19	39
IF Low Side Surge Req. for Distr. Transf.	27	26	19		25		24	27
IF Rev. Distr. Impulse Guide					25		25	25
WG Partial Discharge Tests	46	44	24	42	67	46	40	67
IF Acoustic Detection of Partial Discharge	16	22	22	20	22		22	22
IF Measurement of Apparent Charge	21	13	16	17	22		22	22
SC DRY-TYPE TRANSFORMERS	25	28	31	32	29	42	26	42
WG Test Code C57.91	23	28	29	28	22	31	25	31
WG Dry-Type Dielectric Problems	30	25	21	29	0	0	0	30
WG Dry-Type Reactors	8	12	10	9	12	15	9	15
WG Dry-Type Thermal Eval. and Flammability	23	22	24	28	0	27	16	28
WG Dry-Type Thermal Problems	30	27	24	29	0	0	0	30
WG Insulation Req. for Specialty Transf.	11	10	10	19	12	20	11	20
WG Cast Coil Loading Guide			20	30	22	25	19	30
SC HVDC CONVERTER TRANSFS. AND REACTORS	12	15	15	11	9	11	13	15
SC INSTRUMENT TRANSFORMERS	12	11	22	13	22	23	26	26
SC INSULATING FLUIDS	25	33	34	36	54	68	61	68
WG Gas Analysis During Factory Tests	39	36	36	72				72
SC INSULATION LIFE	50	71	61	81	91	71	138	138
WG Guides for Loading	41	47	44	51	62	74	70	74
IF Loss of Insulation Life			12	32	18	25	0	32
WG Thermal Eval. of Distr. and Power Transf.	46	44	67	56	35	40	32	67
WG Thermal Tests	16	20	22	30	54	48	32	54
WG High Temperature Insulation				46	33	59	60	60

Note: Maintain data for last four years only.

IEEE/PES TRANSFORMER COMMITTEE ATTENDANCE STATISTICS

GROUP	Charlotte Oct. 1989	Denver Mar. 1990	Montreal Oct. 1990	Phoenix May 1991	Baltimore Nov. 1991	Birmingham Apr. 1992	Cleveland Oct. 1992	MAXIMUM AVERAGE
SC PERFORMANCE CHARACTERISTICS								
WG Failure Analysis Guide	76	67	77	77	85	86	69	86
WG Loss Tolerance and Measurement	53	50	33	42	31	28	38	53
TF Loss Measurement Guide	41	31	24	35	37	26	38	41
TF Low Power Factor Measurements			24					24
WG LTC Performance Requirements	20	35	28	31	30	25	37	ERR
WG Qualification of Class 1E Nuclear Tr.	5	5	10	6	4	0	0	37
WG Revision C57.109						26	19	29
WG Semi-Conductor Rectifier Transformers	21	19	17	0	23	30	23	ERR
SC WEST COAST								
WG Consolidation of Installation Guides	12	20	0	18	0	10	14*	20
WG Seismic Guide	10		0	0	0		0	10
WG Loss Evaluation Guide	8		0	0	0		0	8
WG Fire Protection			0	0	0		0	0
SC DISTRIBUTION TRANSFORMERS								
WG Overhead Type Distr. Transfs. C57.12.20					34	28	35	35
WG Single-Phase Live Front Padmount C57.12.21						23	23*	23
WG Three-Phase Live Front Padmount C57.12.22						14	14*	14
WG Single-Phase Submersible C57.12.23						15	15*	15
WG Single-Phase Deadfront Padmount C57.12.25						0	0*	0
WG Three-Phase Deadfront Padmount C57.12.26						28	28*	28
WG Bar Coding						0	0*	0
WG Joint C57/37 on Cabinet Integrity C57.12.28						0	0*	0
SC UNDERGROUND TRANSFS. AND NETWORK PROTECTORS								
WG Three-Phase Underground Transfs.					25	21	17	25
WG Liquid-Filled Sec. Network Transfs.					19	16	14	19
WG Secondary Network Protectors					17	21	17	21
WG Dry-Type Network Transfs.					31	16	19	19
						29	15	31

Note: Maintain data for last four years only.

*estimated

*STANDARD PROJECT	*TITLE	PUB DATE	WORKING GROUP	WG CHAIRPERSON	IF CHAIRPERSON	PAR DATE	DRAFT DATE	STATUS AND COMMENTS
**SUBCOMMITTEE: ANSI C57.12.1 / CHAIRPERSON: NONE ASSIGNED / PHONE:								
*C57.12.10	TRANSFORMERS 230KV AND BELOW -8333/10417KVA 1 PH, -100000 KVA 3 PH w/o LTC, -100000KVA w/ LTC - SAFETY REQUIREMENTS							
NONE		06/04/87	NONE ASSIGNED			/ / /		
**SUBCOMMITTEE: ANSI DOCUMENT / CHAIRPERSON: / PHONE:								
*C57.17	REQUIREMENTS FOR ARC FURNACE TRANSFORMERS					/ / /		LAST REVISED IN 1986
**SUBCOMMITTEE: ASSIGNED TO MANY SUBCOMM. / CHAIRPERSON: MANY / PHONE:								
*C57.12.00	GENERAL REQUIREMENTS FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS					/ / /		CHANGES CONSOLIDATED
VARIOUS		03/20/87		W. B. BINDER		/ / /		REV. SUBMITTED 09/16/92
*C57.12.90	STANDARD TEST CODE FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS & GUIDE FOR SC TESTING OF					/ / /		CHANGES CONSOLIDATED
VARIOUS		03/16/87		G. H. VAILLANCOURT		/ / /		BALLOTING REVISION IN TC
**SUBCOMMITTEE: AUDIBLE SOUND & VIBRATION / CHAIRPERSON: A. M. TEPLITSKY / PHONE: (212)460-4859								
*C57.112	GUIDE FOR THE CONTROL OF TRANSFORMER SOUND							NEW TASK FORCE TO START WORK
P523		/ /	SUBCOMMITTEE	A.M. TEPLITSKY		12/28/73	11/01/89	CHECK FILES FOR NEVER PAR
*C57.12.90	TRANSFORMER SOUND POWER MEASUREMENT							APPROVED BY SB 09/16/92
PC57.12.90b		/ /	SUBCOMMITTEE	A. M. TEPLITSKY		03/01/86	/ /	INCLUDE IN 1992 REVISION

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

*STANDARD PROJECT	*TITLE	PUB DATE	WORKING GROUP	WG CHAIRPERSON	*COMMITTEES REQUESTING COORDINATION IF CHAIRPERSON	PAR DATE	DRAFT DATE	STATUS AND COMMENTS
**SUBCOMMITTEE: BUSHING / CHAIRPERSON: L. B. WAGENHAAR / PHONE: (614)223-2259								
*C57.19.00	*GENERAL REQUIREMENTS AND TEST PROCEDURES FOR OUTDOOR APPARATUS BUSHINGS (IEEE 21)				*TD,PSR,IC,SWGR,,			PUBLISHED 1992
PC57.19.00	07/23/76 SUBCOMMITTEE			L. B. WAGENHAAR		04/01/79	01/31/90	APPROVED BY ANSI 03/31/92
*C57.19.01	*STANDARD PERFORMANCE CHARACTERISTICS AND DIMENSIONS FOR OUTDOOR APPARATUS BUSHINGS (IEEE 24)				*SPD,IAS,IC,SWGR,,			PUBLISHED 1992
PC57.19.01	08/05/83 REVISION TO C57.19.01			PRIT SINGH		11/01/89	02/04/91	APPROVED BY ANSI 03/20/92
*C57.19.03	*STANDARD REQUIREMENTS, TERMINOLOGY AND TEST CODE FOR BUSHINGS FOR DC APPLICATIONS				*SPD,IC,SWGR,,,			WORKING ON DRAFT
PC57.19.03	/ / BUSHINGS FOR DC APPLICATION			OLOF HEYMAN		11/09/89	02/01/92	SF6 BUSHINGS NOT INCLUDED
*C57.19.100	*GUIDE FOR APPLICATION OF APPARATUS BUSHINGS.				*SWGR,SUB,PSR,,,			RESOLVING BALLOT COMMENTS
P800	/ / BUSHING APPLICATION GUIDE			F. E. ELLIOTT		09/27/79	01/20/92	
*C57.19.101	*GUIDE FOR LOADING POWER APPARATUS BUSHINGS				*,,,,,,		/ / / /	APPROVED AS FULL-USE 06/17/92
P757	10/20/88 BUSHING APPLICATION GUIDE			F. E. ELLIOTT				
**SUBCOMMITTEE: DIELECTRIC TESTS / CHAIRPERSON: J. B. TEMPLETON / PHONE: (317)289-1211								
*C57.113	*GUIDE FOR PARTIAL DISCHARGE MEASUREMENT IN LIQUID-FILLED POWER TRANSFORMERS AND SHUNT REACTOR				*,,,,,,			PUBLISHED AS FULL-USE 1992
P545	01/01/88 P. D. TESTS FOR TRANSFORMERS			E. HOWELLS		09/25/91	/ /	
*C57.127	*GUIDE FOR THE DETECTION OF ACOUSTIC EMISSIONS FROM PARTIAL DISCHARGES IN OIL-IMMERSED POWER TRANSFORMERS				*TD,ED&P,CIGRE,IEC,,			REBALLOT MAIN COMMITTEE
PC57.127	/ / P. D. TESTS FOR TRANSFORMERS			E. HOWELLS		03/10/88	10/01/89	WAITING FOR BALLOT
*C57.12.00	*NEW SEC 6.8 MINIMUM EXTERNAL CLEARANCES BETWEEN LIVE PARTS				*,,,,,,			APPROVED BY SB 09/16/92
PC57.12.00J	/ / NOT SPECIFIED			R. A. VEITCH		12/28/86	/ /	INCLUDE IN 1992 REVISION
*C57.12.90	*ROUTINE IMPULSE TESTS FOR DISTRIBUTION TRANSFORMERS				*RMC,PSC,,,,,			
PC57.12.90c	/ / REV. DIELECTRIC TESTS DIST TR			JOHN ROSETTI		09/10/87	/ /	INCLUDE IN 1992 REVISION

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

*STANDARD	*TITLE	PAR DATE	WG CHAIRPERSON	*COMMITTEES REQUESTING COORDINATION IF CHAIRPERSON	DRAFT DATE	STATUS AND COMMENTS
*C57.12.90	*ENHANCEMENT VOLTAGE TIME DURATION DURING POWER TRANSFORMER INDUCED TESTS					DRAFT 1 BEING PREPARED
PC57.12.90d	/ / REVISION OF DIELECTRIC TESTS	09/28/90	J. B. TEMPLETON	M. ALTMAN	/ /	
*C57.21	*REQUIREMENTS, TERMINOLOGY AND TEST CODE FOR SHUNT REACTORS RATED OVER 500KVA					COMPLETE
PC57.21a	04/02/91 DIELEC TESTS OF SHUNT REACTORS	12/11/86	W. M. KENNEDY		/ /	ANSI APPROVED 08/09/91
*C57.98	*ROUTINE TEST GUIDE FOR DISTRIBUTION TRANSFORMERS			*T&D, PSIR, , , ,		SUBMITTED PAR TO STD BOARD
NEW	/ / REV. DIELECTRIC TESTS DIST TR	09/25/91	JOHN ROSETTI	D. E. BALLARD	/ /	
*C57.98	*IEEE GUIDE FOR TRANSFORMER IMPULSE TESTS			*NONE, , , , ,		SU SURGE BALLOTING MAIN CIMH
PC57.98	06/01/86 REVISION OF DIELECTRIC TESTS	02/01/86	J. B. TEMPLETON	R. E. HINKVITZ, SR.	12/02/91	REAFFIRMED 03/18/92
*NEW	*GUIDE FOR THE LOCATION OF ACOUSTIC EMISSIONS FROM PARTIAL DISCHARGES IN OIL-IMMERSED POWER TRANSFORMERS					BALLOTING WORKING GROUP
NO PAR YET	/ / P. D. TESTS FOR TRANSFORMERS		E. HOWELLS		/ /	SUBMIT PAR AS SOON AS POSSIBLE
**SUBCOMMITTEE: DISTRIBUTION TRANSFORMERS / CHAIRPERSON: J. C. THOMPSON / PHONE: (704)373-5139						
*C57.12.20	*OVERHEAD-TYPE DISTRIBUTION TRANSFORMERS, 500 KVA AND SMALLER: HV 34500 VOLTS AND BELOW, L V 7970/13800Y & BELOW			*T&D, IAS/REP, SCC14, , , ,		PAR APPROVED BY NESCOM
PC57.12.20	01/11/88 POLE MOUNTED DISTRIBUTION TR	12/05/91	J. C. THOMPSON		03/17/92	NESCOM REQUEST SCC14 COORD.
*C57.12.21	*STANDARD REQUIREMENTS FOR PAD-MOUNTED, COMPARTMENTAL-TYPE, SELF-COOLED, SINGLE-PHASE DIST TRANSFORMERS WITH HV BUSHINGS			*T&D, IAS/REP, , , , ,		PAR APPROVED BY SB 06/27/91
PC57.12.21	10/22/79 3-PHASE PADMOUNT TR LIVE FRONT	06/27/91	A. GHAFOURIAN		/ /	BEING REVISED IN TC
*C57.12.22	*PAD-MOUNTED, COMPARTMENTAL-TYPE SELF-COOLED, 3-PHASE DIST. TR WITH HV BUSHINGS, 2500KVA AND SMALLER: . . . REQUIREMENTS.			*T&D, IAS/REP, IAS/PSE, , , ,		PAR APPROVED BY STD BOARD
PC57.12.22	05/10/89 3 PHASE PADMOUNT TR LIVE FRONT	06/27/91	KEN HANUS		02/03/92	PLAN TO COMPLETE IN 1992
*C57.12.23	*UNDERGROUND-TYPE, SELF-COOLED, 1-PHASE DISTRIBUTION TR WITH SEPERABLE INSULATED HV CONNECT HV 249400GTY. .LV, 240. .:167KVA.			*T&D, IC, IAS/REP, IAS/PSE, , , ,		PAR APPROVED BY STD BOARD
PC57.12.23	09/19/85 1-PHASE SUBMERSIBLE TR	06/27/91	GERRY PAIVA		01/03/91	SUBMITTED TO SB 03/18/92

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*COMMITTEES REQUESTING COORDINATION								
*C57.12.25	REQUIREMENTS FOR PAD-MOUNTED COMP-TYPE, SELF-COOLED, 1-PHASE DISTRIBUTION TR W/SEP INS HV CONN, HV 34500GrDY...167kVA...	05/11/90	1-PHASE PADMOUNT TR DEADFRONT	NORVIN KOHESKY	*TED, IC, IAS/REP, IAS/PSE,,	06/27/91	/ /	PAR APPROVED BY STD. BOARD NEMA SECRETARIAT
*C57.12.26	PAD-MOUNTED COMPARTMENTAL-TYPE SELF-COOLED, 3-PHASE DIST TR FOR USE W/ SEPERABLE INSULATED HV CONN., HV 34500GrDY...2500kVA	04/16/86	3-PHASE PADMOUNT TR DEADFRONT	GERRY PAIVA	*TED, IC, IAS/REP, IAS/PSE, SCC14,	12/05/91	/ /	REV. APP. BY SB 06/17/92
*C57.12.27	CONFORMANCE REQUIREMENTS FOR LIQUID-FILLED DISTRIBUTION TR USED IN PAD-MOUNTED INSTALLATIONS, INCL. UNIT SUBSTATIONS	09/02/81	UNIT SUBSTATIONS	JIM LYONS	*TED, IAS/REP, IAS/PSE...	06/27/91	/ /	DOCUMENT NOT USED BY INDUSTRY V.G. RECOMMENDS WITHDRAW STD
*C57.12.28	PAD-MOUNTED EQUIPMENT - ENCLOSURE INTEGRITY	06/24/87	JOINT WG ON CABINET INTEGRITY	J. MARTIN	*.....	/ /	/ /	PAR TO BE SUBMITTED NOT TRANSFERRED TO TC YET
*C57.12.29	PAD-MOUNTED EQUIPMENT - ENCLOSURE INTEGRITY IN COASTAL ENVIRONMENTS	/ /	JOINT WG ON CABINET INTEGRITY	J. MARTIN	*.....	/ /	/ /	APPROVED BY SUBCOMMITTEE NOT TRANSFERRED TO TC YET
*C57.12.30	SUBMERSIBLE EQUIPMENT - ENCLOSURE INTEGRITY	/ /	JOINT WG ON CABINET INTEGRITY	J. MARTIN	*.....	/ /	/ /	PAR TO BE SUBMITTED NOT TRANSFERRED TO TC YET
*C57.12.31	COATING STANDARD FOR POLE MOUNTED TRANSFORMERS	/ /	JOINT WG ON CABINET INTEGRITY	J. MARTIN	*.....	/ /	/ /	PAR TO BE SUBMITTED NOT TRANSFERRED TO TC YET
*IEEE1265	STANDARD FOR BAR CODING FOR DISTRIBUTION TRANSFORMERS (POLE-MOUNTED, PAD-MOUNTED AND UNDERGROUND)				*ATH/TSC, IAS/REP....			PAR APPROVED 06/27/91
P1265	/ /	BAR CODE STANDARD		RON JORDAN		06/27/91	03/20/92	
**SUBCOMMITTEE: DRY-TYPE POWER TRANSFORMERS / CHAIRPERSON: M. PATTERSON / PHONE: (703)688-3325								
*C57.12.50	REQ. FOR VENTILATED DRY-TYPE DISTRIBUTION TR, 1-500kVA, 1 PHASE, AND 15-500kVA, 3-PHASE HV 601-34500VOLTS, LV 120-600V				*.....			BALLOTING TRANSFER TO TR COMM
NONE	08/15/80	NONE ASSIGNED				/ /	/ /	BALLOTING REAFFIRMATION

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*SUBCOMMITTEE: DRY-TYPE TRANSFORMERS / CHAIRPERSON: W. PATTERSON / PHONE: (703)688-3325								
*C57.124	PC57.124	/ /	DRY TYPE DIELECTRIC PROBLEMS	A. D. KLINE		06/27/91	/ /	ANSI APPROVED 10/11/91
*C57.12.01	GENERAL REQUIREMENTS FOR DRY-TYPE DIST. AND POWER TR INCL THOSE WITH SOLID CAST &/or RESIN-ENCAPSULATED WINDINGS	02/02/89	NOT SPECIFIED				/ /	APP. BY SB 02/02/89
*C57.12.51	REQ. FOR VENTILATED DRY-TYPE POWER TR, 501kVA & LARGER, 3 PHASE, WITH HV 601-34500V, LV 208Y/120 TO 4160 VOLTS	12/22/80	NONE ASSIGNED				/ /	BALLOTING TRANSFER TO TR CO
*C57.12.52	REQ. FOR SEALED DRY-TYPE POWER TRANSFORMERS, 501kVA & LARGER, 3 PHASE, WITH HV 601-34500V, LV 208Y/120 TO 4160 VOLTS	12/22/80	NONE ASSIGNED				/ /	BALLOTING REAFFIRMATION
*C57.12.55	CONFORMANCE STANDARD FOR TR- DRY-TYPE TRANSFORMERS USED IN UNIT INSTALLATIONS, INCL. UNIT SUBSTATIONS	04/07/86					/ /	BALLOTING TRANSFER TO TR CO
*C57.12.56	TEST PROCEDURE FOR THERMAL EVALUATION OF INSULATION SYST FOR VENTILATED DRY-TYPE POWER & DISTRIBUTION TRANSFORMERS	08/27/84	THERMAL EVALUATION OF DRY-TYPE	R. L. PROVOST			/ /	BALLOTING REAFFIRMATION
*C57.12.50	GUIDE FOR CONDUCTING TRANSIENT VOLTAGE ANALYSIS OF A DRY-TYPE TRANSFORMER COIL						/ /	TRANSFER TO TR COMM
P745	DRY TYPE DIELECTRIC PROBLEMS		A. D. KLINE			06/28/78	10/01/84	ANSI APPROVED 10/11/91
*C57.12.59	GUIDE FOR DRY-TYPE TRANSFORMER THROUGH-FAULT CURRENT DURATION	01/01/89	DRY-TYPE THRU FAULT DUR GUIDE	NONE		09/13/84	12/19/85	ANSI APPROVED 08/09/91
*C57.12.60	TEST PROCEDURES FOR THERMAL EVALUATION OF INSULATION SYSTEMS FOR SOLID-CAST & RESIN ENCAP POWER & DIST TRANSFORMER							APPROVED BY SB 09/16/92
PC57.12.60	THERMAL EVALUATION OF DRY-TYPE		R. L. PROVOST			08/17/89	/ /	TRIAL-USE STANDARD

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*C57.12.91	*TEST CODE FOR DRY-TYPE DISTRIBUTION AND POWER TRANSFORMERS	11/29/78	TEST CODE FOR DRY TYPE TR	D. BARKARD	*SPD,EN,,,,	06/01/89	/ /	BALLOTTING REAFFIRMATION WORKING ON REVISION(05 COMING)
*C57.16	*REQUIREMENTS FOR CURRENT LIMITING REACTORS	09/19/58	DRY TYPE REACTORS	RICHARD DUDLEY	*NEHA,IAS,TED,,,	03/21/91	/ /	PREPARING DRAFT 6
*C57.21	*REQUIREMENTS TERMINOLOGY, AND TEST CODE FOR SIRUNT REACTORS RATED OVER 500KVA	06/02/91	DRY TYPE REACTORS	RICHARD DUDLEY		/ /	/ /	COMPLETE ANSI APPROVED 08/09/91
*C57.94	*RECOMMENDED PRACTICE FOR INSTALLATION, APPLICATION, OPERATION & MAINTENANCE OF DRY-TYPE GEN PURPOSE DIST & POWER TR	12/09/87	APPLICATION OF DRY-TYPE TR					PUB. 1982, REAFFIRMED 1987
*C57.96	*GUIDE FOR LOADING DRY-TYPE DISTRIBUTION AND POWER TRANSFORMERS	04/26/89	GUIDE FOR LOADING DRY-TYPE TR	U. H. MUTSCHLER	*SCC14,,,,,	04/26/89	/ /	BALLOTTING REAFFIRMATION
*C57.96	*GUIDE FOR LOADING DRY-TYPE DISTRIBUTION AND POWER TRANSFORMERS	/ /	CAST COIL LOADING GUIDE	LINDEN PIERCE	*TED,SCC14,SCC10,,,	05/06/91	03/06/92	INCRP CAST COIL IN C57.96 COMPLETE BY 10/93
*IEEE 259	*TEST PROCEDURE FOR EVALUATION OF SYSTEMS OF INSULATION FOR SPECIALTY TRANSFORMERS							BALLOTTING TC ON REVISION
P259	06/22/72	SPECIALTY TRANSFORMERS	MAX CAMBRE			09/26/91	11/16/91	LIFE EXTENDED TO 12/92 100%
**SUBCOMMITTEE: HVACC ON HIGH VOLTAGE TR / CHAIRPERSON: / PHONE:								
*C57.12.13	*CONFORMANCE REQUIREMENTS FOR LIQUID-FILLED TRANSFORMERS USED IN UNIT INSTALLATIONS INCL. UNIT SUBSTATIONS							NOT TRANSFERRED TO IEEE
NONE							/ /	BALLOTTING REAFFIRMATION
**SUBCOMMITTEE: HVDC CONVERTER TR & REACTOR / CHAIRPERSON: U. N. KENNEDY / PHONE: (317)266-9387								
*C57.129	*GENERAL REQUIREMENTS & TEST CODE FOR OIL-IMPERSED HVDC CONVERTER TRANSFORMERS AND SMOOTHING REACTORS FOR DC POWER TRANS							REVISED PARS TO STD BOARD

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PROJECT PUB DATE WORKING GROUP WG CHAIRPERSON TF CHAIRPERSON PAR DATE DRAFT DATE STATUS AND COMMENTS
PC57.129 / / SUBCOMMITTEE U. N. KENNEDY 09/26/91 / / PD TO BE ADDED AFTER POL. REV.
*IEEE1277 *GENERAL REQUIREMENTS & TEST CODE FOR OIL-IMMERSED AND DRY-TYPE HVDC *SUB***** FIRST TF MEETING TOOK PLACE
SMOOTHING REACTORS
P1277 / / SUBCOMMITTEE 09/25/91 / / PAR APPROVED 09/26/91

**SUBCOMMITTEE: INSTRUMENT TRANSFORMERS / CHAIRPERSON: J. N. DAVIS / PHONE: (404)393-9831

*C57.13 *REQUIREMENTS FOR INSTRUMENT TRANSFORMERS *PSIN,PSR,SPD,,, COMPLETE COORDINATION AND
P546 03/30/78 SUBCOMMITTEE 05/29/80 / / RESUBMIT TO SB
*C57.13.1 *GUIDE FOR FIELD TESTING OF RELAYING CURRENT TRANSFORMERS *,,,,, TRANSFER FROM PSR
NONE 08/25/87 SUBCOMMITTEE / / / / REAFFIRMED 03/18/92
*C57.13.2 *CONFORMANCE TEST PROCEDURES FOR INSTRUMENT TRANSFORMERS *,,,,, PUBLISHED 1992
NONE 04/16/86 SUBCOMMITTEE 09/26/91 / / TRANSFER TO TC APPROVED
*C57.13.3 *GUIDE FOR THE GROUNDING OF INSTRUMENT TR SECONDARY CIRCUITS AND CASES *,,,,, TRANSFER FROM PSRC COMMITTEE
NONE 01/23/87 SUBCOMMITTEE / / / /
*C57.13.4 *DETECTION OF PARTIAL DISCHARGE AND MEASUREMENT OF APPARENT CHARGE *T&D,,,,, D6 BEING BALLOTTED IN TC
WITHIN INSTRUMENT TRANSFORMERS
P832 / / A. J. JONNATTI 05/28/80 05/28/92 RESOLVING 3 NEGATIVES

**SUBCOMMITTEE: INSULATING FLUIDS / CHAIRPERSON: H. A. PEARCE / PHONE: (412)983-4335

*C57.104 *GUIDE FOR THE DETECTION AND DETERMINATION OF GENERATED GAS IN *PSR,T&D,,,,, STARTED REVISING
OIL-IMMERSED TRANSFORMERS & THEIR RELATION TO SERVICEABILITY.
PC57.104 06/07/78 NONE F. W. HEINRICH, SEC 05/31/90 / / PUBLISHED 1992
*C57.106 *GUIDE FOR ACCEPTANCE AND MAINTENANCE OF INSULATING OIL IN EQUIPMENT *NONE,,,,, PUBLISHED 1992
PC57.106 06/16/78 SUBCOMMITTEE 06/19/86 / / ANSI APPROVED 11/20/91
*C57.111 *GUIDE FOR ACCEPTANCE OF SILICONE INSULATING FLUID AND ITS MAINTENANCE *JAS,T&D,ED&PG,IEC,, PUBLISHED
IN TRANSFORMERS

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PC57.121	*GUIDE FOR ACCEPTANCE AND MAINTENANCE OF LESS FLAMMABLE HYDROCARBON FLUID IN TRANSFORMERS	02/02/89	SUBCOMMITTEE	WG CHAIRPERSON	TF CHAIRPERSON	12/10/87	/ /	NOT AN ANSI STANDARD ANSI APPROVED 08/09/91
P954		02/22/88	SUBCOMMITTEE		*PSRC,T&D,IAS,IEC,,	04/12/82	06/10/87	
*C57.130	*GUIDE FOR THE DETECTION AND DETERMINATION OF GASES GENERATED IN OIL-IMMERSED TRANSFORMERS DURING FACTORY TESTS	/ /		J. P. KINNEY	*NONE,,,,,			REQUESTING DATA FOR TABLES
PC57.130	GAS ANALYSIS DURING FACT. TESTS	/ /		F. V. HEINRICHS		06/01/89	05/06/91	T. F. FORMED TO CONDUCT SURVEY
*IEEE 637	*GUIDE FOR THE RECLAMATION OF INSULATING OIL AND CRITERIA FOR ITS USE	06/04/84	SUBCOMMITTEE		*,,,,,	/ /	/ /	REAFFIRMED 03/18/92
P637								
*IEEE 799	*GUIDE FOR HANDLING AND DISPOSING OF ASKARELS	11/17/86	SUBCOMMITTEE		*EIS,IAC,T&D,,,	09/27/79	/ /	REAFFIRMED 03/18/92
P799								
*IEEE1258	*GUIDE FOR INTERPRETATION OF GASES IN SILICONE LIQUID-FILLED TRANSFORMERS	/ /		JIM GOUDIE	*T&D,SCC14,,,,			PAR APPROVED BY SB 12/05/91
P1258						12/05/91	/ /	SURVEY CONDUCTED
**SUBCOMMITTEE: INSULATION LIFE / CHAIRPERSON: D. H. DOUGLAS / PHONE: (216)447-3370								
*C57.100	*TEST PROCEDURE FOR THERMAL EVALUATION OF OIL-IMMERSED DISTRIBUTION TRANSFORMERS	08/19/85	THERMAL EVALUATION	L. A. LORDERMILK	*HPE,EH,T&D,SPD,,	10/20/88	03/03/92	7 NEGATIVES IN JOINT WQ-SC REAFFIRMED 03/18/92
PC57.100								BEING REVISED
*C57.115	*GUIDE FOR LOADING MINERAL-OIL-IMMERSED POWER TRANSFORMERS RATED IN EXCESS OF 100MVA (65 C WINDING RISE)	03/21/91	GUIDES FOR LOADING	D. S. TAKACH	*,,,,,	/ /	/ /	ANSI APPROVED 01/13/92
P756								NEW PAR APPROVED 09/17/92
*C57.119	*RECOMMENDED PRACTICE FOR PERFORMING TEMP. RISE TESTS ON OIL-IMMERSED POWER TRANSFORMER AT LOADS BEYOND MP RATING (P838)	/ /	THERMAL TESTS	R. L. GRUBB	*SWGR,SUBS,SCC4,P8RC,IAS,EI	09/17/92	02/22/92	REVISING PAR (TITLE & SCOPE)
PC57.119								CONDUCTING SURVEY
*C57.12.00	*DEFINITION OF THERMAL DUPLICATE PROJECT	/ /			*EH,IAS,,,,,	05/31/90	/ /	
PC57.12.001					R. L. GRUBB			

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*C57.91	*GUIDE FOR LOADING MINERAL OIL-IMMERSED TRANSFORMERS	03/21/91	GUIDES FOR LOADING	L. PIERCE	*SUB,T&D,PSE,,,	06/13/85	10/18/91	PUB. 1/12/81, REAFFIRMED 1991 APPROVED BY ANSI 01/13/92
*C57.92	*GUIDE FOR LOADING MINERAL OIL-IMMERSED POWER TRANSFORMERS UP TO & INCL 100 MVA WITH 55 C OR 65 C AVE. WINDING RISE	03/21/91	GUIDES FOR LOADING	L. PIERCE	*T&D,SUB,PSE,,,	06/28/85	10/18/91	PUB. 1/12/81, REAFFIRMED 1991 TO BE COMBINED INTO C57.91
*C57.95	*GUIDE FOR LOADING LIQUID-IMMERSED STEP-VOLTAGE AND INDUCTION-VOLTAGE REGULATORS	03/21/91	GUIDES FOR LOADING	D. S. TAKACH		/ /	/ /	PUB. 08/19/85, REAFFIRMED 1991 ANSI APPROVED 01/13/92
*IEEE1276	*TRIAL-USE GENERAL REQUIREMENTS FOR LIQUID-FILLED DISTRIBUTION AND POWER TR UTILIZING HIGH TEMP SOLID INSULATING MATERIAL	/ /	HIGH TEMPERATURE INSULATION	HEINZ FISCHER	*T&D,,,,,			SUBMITTING PAR
P1276	/ /	/ /				09/25/91	/ /	WILL CONDUCT SURVEY ON M-I M.

**SUBCOMMITTEE: NONE ASSIGNED / CHAIRPERSON: NONE ASSIGNED / PHONE:

*C57.12.70	*TERMINAL MARKINGS AND CONNECTIONS FOR DISTRIBUTION & POWER TRANSFORMERS	12/17/86						WAITING COPYRIGHT TRANSFER
*C57.12.80	*TERMINOLOGY FOR POWER & DISTRIBUTION TRANSFORMERS	12/17/86						REAF BY SB ON 06/17/92 REAFFIRMED 05/01/92
*C57.99	*GUIDE FOR LOADING DRY-TYPE AND OIL-IMMERSED CURRENT-LIMITING REACTORS	/ /				03/28/78	/ /	NEEDS REVISION

**SUBCOMMITTEE: NOT ASSIGNED / CHAIRPERSON: / PHONE:

*C57.12.53	*REQUIREMENTS FOR DRY-TYPE, UNDERGROUND, SINGLE-PHASE WITH SEPARABLE INSULATED H-V 24940 grdy/14400 V AND <; LV 240/120 V	/ /						NEW STANDARD
NONE	/ /	/ /				/ /	/ /	

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*C57.12.54	*REQUIREMENTS FOR DRY-TYPE, UNDERGROUND 3 PHASE DISTRIBUTION TRANSFORMERS, 2500 KVA OR <, HV 24940 gtdY/14400 OR <, LV 480V	/ /			* , , , , ,	/ /	/ /	
NONE								
**SUBCOMMITTEE: PERFORMANCE CHARACTERISTICS / CHAIRPERSON: J. V. MATTHEWS / PHONE: (301)597-6775								
*C57.105	*GUIDE FOR APPLICATION OF TRANSFORMER CONNECTIONS IN THREE-PHASE DISTRIBUTION SYSTEMS				* , , , , ,			REAFFIRMED BY SB 06/17/92
PC57.105	06/11/76 PROJECT			GEORGE REITNER		/ /	/ /	
*C57.109	*GUIDE FOR THROUGH-FAULT CURRENT DURATION				*PSR, , , , ,			LIFE EXTENDED TO 06/94
PC57.109	08/19/85 SHORT-CIRCUIT DURATION			B. K. PATEL		06/27/91	/ /	DO4 BALLOTTED, NEEDS REVISING
*C57.110	*RECOMMENDED PRACTICE FOR ESTABLISHING TRANSFORMER CAPABILITY WHEN SUPPLYING NONSINUSOIDAL LOAD CURRENTS				* , , , , ,			EXTENDED TO 03/23/93
PC57.110	08/21/87 REVISION OF C57.110			R. P. MAREK		/ /	/ /	REAF. SUBMITTED 12/03/92
*C57.116	*GUIDE FOR TRANSFORMERS DIRECTLY CONNECTED TO GENERATORS				* , , , , ,			APPROVED BY SB 01/03/89
NONE	01/03/89 TR DIRECTLY CONNECTED TO GEN			B. K. PATEL		/ /	/ /	NOTHING OUTSTANDING
*C57.117	*GUIDE FOR REPORTING FAILURE DATA FOR POWER TRANSFORMERS AND SHUNT REACTORS				* , , , , ,			REAFFIRMED BY SB 06/17/92
P786	08/21/87 TRANSFORMER RELIABILITY			M. ALTMAN		/ /	/ /	UNDER REVIEW BY FAILURE U.G.
*C57.123	*GUIDE FOR TRANSFORMER LOSS MEASUREMENT				* , , , , ,			TF WORKING
P1098	/ / LOSS TOLERANCE AND MEASUREMENT			V. R. HENNING	RANJIS GIRGIS	06/13/85	03/20/92	
*C57.125	*GUIDE FOR FAILURE INVESTIGATION, DOCUMENTATION AND ANALYSIS FOR POWER TRANSFORMERS AND SHUNT REACTORS				*T&D, ED&PQ, PSE, SUGR,,			APPROVED BY STD BOARD 6/26/91
PC57.125	/ / FAILURE ANALYSIS			M. ALTMAN		06/28/87	10/16/90	ANSI APPROVED 11/20/91
*C57.12.00	*TRANSFORMER LOSS MEASUREMENT AND TOLERANCES (P787, P462)				* , , , , ,			APPROVED BY SB 09/16/92
PC57.12.00c	/ / LOSS TOLERANCE AND MEASUREMENT			V. R. HENNING		06/28/79	/ /	INCLUDE IN 1992 REVISION

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*C57.12.00 PC57.12.00c1	*REVISION OF SECTION 5.9 REFERENCE TEMP FOR NO-LOAD LOSS LOSS TOLERANCE AND MEASUREMENT	/ /		W. R. HENNING			06/28/79 09/04/91	APPROVED BY SB 09/16/92 INCLUDE IN 1992 REVISION
*C57.12.00 PC57.12.00c2	*ADD TO SEC 9.3.1 ACCURACY REQUIREMENT FOR MEASURED LOSSES LOSS TOLERANCE AND MEASUREMENT	/ /		W. R. HENNING			06/28/79 09/04/91	APPROVED BY SB 09/16/92 INCLUDE IN 1992 REVISION
*C57.12.00 PC57.12.00h	*LTC TAP POSITION INDICATION PROJECT	/ /		R. H. FRAZER	*NONE		09/28/86 12/17/91	APPROVED BY SB 09/16/92 INCLUDE IN 1992 REVISION
*C57.12.00 PC57.12.00i	*NAMEPLATE INFORMATION CHANGE DIRECTED VS NON-DIRECTED FLOW PROJECT	/ /		J. W. MATTHEWS	*TBA		12/28/86 / /	APPROVED BY SB 09/16/92 INCLUDE IN 1992 REVISION
*C57.12.00 PC57.12.00k	*TABLE 16-C ROUTINE DIST TR RESISTANCE TEST PROJECT	/ /		C. J. McMILLEN	*		03/28/87 / /	APPROVED BY SB 09/16/92 INCLUDE IN 1992 REVISION
*C57.12.90 NONE	*SECTION 7.3 FIGURES 9 & 10 REVERSED PROJECT	/ /			*		/ / / /	READY INCLUDE IN 1992 REVISION
*C57.12.90 PC57.12.90e	*REVISION TO SEC 9 IMPEDANCE AND LOAD LOSSES LOSS TOLERANCE AND MEASUREMENT	/ /		W. R. HENNING	*		06/28/79 09/05/91	INCLUDE IN 1992 REVISION
*C57.12.90 PC57.12.90a3	*REVISION TO SEC 8 NO-LOAD LOSSES & EXCITATION CURRENT LOSS TOLERANCE AND MEASUREMENT	/ /		W. R. HENNING	*		06/28/79 09/04/91	INCLUDE IN 1992 REVISION
*C57.131 PC57.131	*REQUIREMENTS FOR LOAD TAP CHANGERS LTC PERFORMANCE REQUIREMENTS	/ /		T. P. TRAUB	*EN, T&D		08/17/89 12/01/91	SC BALLOT COMPLETED TO HOLD SYMPOSIUM IN CLEVELAND
*C57.18.10 PC57.18.10	*REQUIREMENTS FOR SEMI-CONDUCTOR RECTIFIER TRANSFORMERS SEMI-CONDUCTOR RECT TR	/ /		SHeldon KENNEDY	*NONE		12/28/81 / /	BALLOTING W&G, ONLY 47% RET. PAR HAS BEEN FOUND
*C57.21 500kVA	*REQUIREMENTS, TECHNOLOGY, AND TEST CODE FOR SHUNT REACTORS RATED OVER TEST CODE FOR SHUNT REACTORS	04/02/91		J. W. McGILL	*EN, T&D, PSR		06/09/85 03/20/90	ANSI APPROVED 08/09/91
*IEEE 638 P638	*QUALIFICATION OF CLASS 1E TR FOR NUCLEAR POWER GENERATING STATIONS QUALIFICATION OF TR FOR 1E APP	/ /		L. W. PIERCE	*NPE, SUB, SC2, SCC10,,		10/29/90 04/27/90	APPROVED BY SB 03/18/92 NEW PAR APPROVED 12/04/90

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

*STANDARD PROJECT	*TITLE	PUB DATE	WORKING GROUP	WG CHAIRPERSON	*COMMITTEES REQUESTING COORDINATION TF CHAIRPERSON	PAR DATE	DRAFT DATE	STATUS AND COMMENTS
**SUBCOMMITTEE: STANDARDS / CHAIRPERSON: / PHONE:								
*C57.15	*REQUIREMENTS, TERMINOLOGY, & TEST CODE FOR STEP-VOLTAGE AND INDUCTION VOLTAGE REGULATORS			G. H. VAILLANCOURT				REAFFIRMED 05/01/92
**SUBCOMMITTEE: UG TR & NETWORK PROTECTORS / CHAIRPERSON: P. E. ORENEK / PHONE: (201)430-7743								
*C57.12.24	*UNDERGROUND-TYPE 3-PHASE DIST- RIBUTION TRANSFORMERS, 2500KVA AND SMALLER: HV, 34500GRDY...& BELOW, LV, 480 V AND BELOW				*T&D, IC, IAS/REP, IAC/PSE,,			BEING BALLOTTED IN TC
PC57.12.24	05/10/88	3-PHASE UG-TYPE TRANSFORMERS	J. W. HOWARD				06/27/91	04/01/92
*C57.12.40	*REQUIREMENTS FOR SECONDARY NETWORK TRANSFORMERS, SUBWAY & VAULT TYPES (LIQUID IMMERSED)				*SCC14,,,			BALLOTTING REVISION IN TC
PC57.12.40	05/18/90	LIQUID-FILLED NETWORK TRANSFMR	E. A. BERTOLINI				12/05/91	/ /
*C57.12.44	*STANDARD REQUIREMENTS FOR SECONDARY NETWORK PROTECTORS				*T&D, SMGR, IAS/REP, IAS/PSE, EEI,			PAR APPROVED BY SB 06/17/92
PC57.12.44	/ /	SECONDARY NETWORK PROTECTORS	R. B. ROBERTSON				06/27/91	/ /
*C57.12.57	*REQUIREMENTS FOR VENTILATED DRY-TYPE NETWORK TRANSFORMERS 2500KVA AND BELOW, W/HV 34500V AND BELOW, LV 216Y...AND 480Y..				*T&D, EEI/T&D, SCC14,,,			WAITING COPYRIGHT TRANSFER
PC57.12.57	06/15/86	DRY-TYPE NETWORK TRANSFORMERS	B. MUTT				12/05/91	/ /
**SUBCOMMITTEE: WEST COAST / CHAIRPERSON: L. A. TAUBER / PHONE: (503)326-2323								
*C57.114	*SEISMIC GUIDE FOR POWER TRANSFORMERS AND REACTORS				*NPE, SUBS,,,			APP BY SB 02/15/90
P513	02/15/90	SEISMIC GUIDE	S. OKLU				09/06/73	07/26/88
*C57.120	*LOSS EVALUATION GUIDE FOR POWER TRANSFORMERS AND REACTORS				*SUB, EH, ED&PG, IAS, IEC,			PUBLISHED 1992
P642	/ /	LOSS EVALUATION GUIDE	R. JACOBSEN				05/01/80	05/23/89
*C57.128	*FIRE PROTECTION OF OUTDOOR LIQUID-IMMERSED POWER TRANSFORMERS				*NPE, SUB, PSR,,,			DRAFT BEING PREPARED
PC57.128	/ /	FIRE PROTECTION	DAVID SUNDIN				06/01/89	/ /

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

*STANDARD	*TITLE	PUB DATE	WORKING GROUP	WG CHAIRPERSON	*COMMITTEES REQUESTING COORDINATION TF CHAIRPERSON	PAR DATE	DRAFT DATE	STATUS AND COMMENTS
*C57.12.11	*GUIDE FOR INSTALLATION OF OIL-IMMERSED TRANSFORMERS (10MVA & LARGER, 69-287KV RATING)							TO BE REPLACED BY C57.93
PC57.93	05/09/80 CON. INSTALLATION GUIDES			D. A. GILLIES		/ / /		LIFE EXTENSION TO 12/92 99%
*C57.12.12	*GUIDE FOR INSTALLATION OF OIL-IMMERSED TRANSFORMERS 345KV AND ABOVE							TO BE REPLACED BY C57.93
PC57.93	05/09/80 CON. INSTALLATION GUIDES			D. A. GILLIES		/ / /		LIFE EXTENSION TO 12/92 99%
*C57.93	*GUIDE FOR INSTALLATION OF LIQUID-IMMERSED POWER TRANSFORMERS.				*NONE			BALLOTING MAIN COMMITTEE
PC57.93	/ / CONSOLIDATION OF INST. GUIDES			D. A. GILLIES		06/01/89 / /		WITHDRAW 12.11/12.12 WHEN APP.

STATUS REPORT OF STANDARDS C57.12.00 AND C57.12.90 IEEE/PES TRANSFORMERS COMMITTEE

ATTACHMENT 2

*TITLE

PROJECT YEAR PUB DATE SUBCOMMITTEE SC CHAIRPERSON NG CHAIRPERSON PAR DATE DRAFT DATE STATUS AND COMMENTS

**STANDARD:C57.12.00 RESPONSIBLE CHAIRPERSON: W. B. BINDER PHONE: (216)384-5625 FAX: (216)384-5014

*GENERAL REQUIREMENTS FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS

CHANGES CONSOLIDATED

VARIOUS 1987 03/20/87 ASSIGNED TO MANY SUBCOMM. MANY

PC57.12.00c 0 / / PERFORMANCE CHARACTERISTICS J. W. MATTHEWS *TRANSFORMER LOSS MEASUREMENT AND TOLERANCES (P787,P462)

W. R. HENNING 06/28/79 / / REV. SUBMITTED 09/16/92

PC57.12.00c1 0 / / PERFORMANCE CHARACTERISTICS J. W. MATTHEWS *REVISION OF SECTION 5.9 REFERENCE TEMP FOR NO-LOAD LOSS

W. R. HENNING 06/28/79 09/04/91 APPROVED BY SB 09/16/92 INCLUDE IN 1992 REVISION

PC57.12.00c2 0 / / PERFORMANCE CHARACTERISTICS J. W. MATTHEWS *ADD TO SEC 9.3.1 ACCURACY REQUIREMENT FOR MEASURED LOSSES

W. R. HENNING 06/28/79 09/04/91 APPROVED BY SB 09/16/92 INCLUDE IN 1992 REVISION

*LTC TAP POSITION INDICATION

PC57.12.00h 0 / / PERFORMANCE CHARACTERISTICS J. W. MATTHEWS *NONE

R. H. FRAZER 09/28/86 12/17/91 APPROVED BY SB 09/16/92 INCLUDE IN 1992 REVISION

*NAMEPLATE INFORMATION CHANGE DIRECTED VS NON-DIRECTED FLOW

PC57.12.00i 0 / / PERFORMANCE CHARACTERISTICS J. W. MATTHEWS *TBA

J. W. MATTHEWS 12/28/86 / / APPROVED BY SB 09/16/92 INCLUDE IN 1992 REVISION

*NEW SEC 6-8 MINIMUM EXTERNAL CLEARANCES BETWEEN LIVE PARTS

PC57.12.00j 0 / / DIELECTRIC TESTS J. B. TEMPLETON *NONE

R. A. VEITCH 12/28/86 / / APPROVED BY SB 09/16/92 INCLUDE IN 1992 REVISION

*TABLE 16-C ROUTINE DIST TR RESISTANCE TEST

PC57.12.00k 0 / / PERFORMANCE CHARACTERISTICS J. W. MATTHEWS *NONE

C. J. McMILLEN 03/28/87 / / APPROVED BY SB 09/16/92 INCLUDE IN 1992 REVISION

*DEFINITION OF THERMAL DUPLICATE

PC57.12.00l 0 / / INSULATION LIFE D. H. DOUGLAS *EN, IAS

R. L. GRUBB 05/31/90 / / CONDUCTING SURVEY

12/01/92

COORDINATION ACTIVITIES OF THE IEEE/PES TRANSFORMERS COMMITTEE

ATTACHMENT 4

*PROJECT NUMBER AND TITLE

DATE	RESPONSIBLE COMMITTEE	CONTACT IN RESP. COMM.	CONTACT PHONE NO.	TRANSFORMERS COMMITTEE COORDINATOR	TRANSFORMERS COMMITTEE SUBCOMMITTEE	COORDINATOR PHONE NO.	
*PC62.22	/ /	SPD	S. S. KERSHAU	716-375-7296	L. B. WAGEMAAR	DIELECTRIC TESTS	614-223-2259
*C37.112	10/22/91	SWGR	E. F. VEVERKA	414-835-1544	GEORGE VAILLANCOURT	DIELECTRIC TESTS	514-652-8515
*P1122	06/05/92	PSIM	T. R. McCOMB	613-990-5826	R. MINKWITZ, SR.	DIELECTRIC TESTS	617-828-3241
*PXXX	01/10/92	SUBS	PHILIP R. HARNERY	914-577-2591	R. F. DUDLEY	DRY TYPE	416-298-8108
*P1030.3	08/19/91	T&D	CLIFFORD C. DIEMOND	503-222-2109	WILLIAM N. KENNEDY	HVDC CONV. TR & SMOOTHING REAC	317-286-9387
*PC37.97	12/10/87	PSR	STEVE CONRAD	505-848-2642	JOHN N. DAVIS	INSTRUMENT TRANSFORMERS	404-393-9831
*PC37.110	05/31/90	PSR	L. J. SZULZE	312-255-5760	JOHN N. DAVIS	INSTRUMENT TRANSFORMERS	404-393-9831
*PC57.13.1	/ /	PSR	D. R. VOLZKA	414-221-2730	JOHN N. DAVIS	INSTRUMENT TRANSFORMERS	404-393-9831
*NEW	01/31/92	PSIM	T. R. McCOMB	613-990-5826	J. N. DAVIS	INSTRUMENT TRANSFORMERS	404-393-9831
*P980	06/15/92	SUBS	RICHARD G. COTTRELL	517-788-0817	M. A. PEARCE	INSULATING FLUIDS	412-376-3182
*P55	10/30/81	IC	FRED KINSEY		L. J. SAVIO	INSULATION LIFE ?	212-460-4187

COORDINATION ACTIVITIES OF THE IEEE/PES TRANSFORMERS COMMITTEE
ATTACHMENT 4

*PROJECT NUMBER AND TITLE	RESPONSIBLE COMMITTEE	CONTACT PHONE NO.	TRANSFORMERS COMMITTEE COORDINATOR	TRANSFORMERS COMMITTEE SUBCOMMITTEE	COORDINATOR PHONE NO.
*PC37.107 STANDARD FOR DIGITAL PROTECTION SYSTEM DESIGN					
12/28/85	PSR	STIG L. NILSSON	415-855-2314	UNKNOWN, PLEASE IDENTIFY	
*PC37.108 GUIDE FOR THE PROTECTION OF NETWORK TRANSFORMERS					
/ /	PSR	THOMAS E. WIEDMAN	312-294-2810	UNKNOWN, PLEASE IDENTIFY	
*PC37.109 GUIDE FOR THE PROTECTION OF SHUNT REACTORS					
/ /	PSR	LAVERN L. DVORAK	303-231-1636	UNKNOWN, PLEASE IDENTIFY	
*PC62.2.01 APPLICATION GUIDE FOR SURGE PROTECTION OF ELECTRIC GENERATING PLANTS					
06/01/84	SPD	G. L. GAIBROIS	313-897-0485	G. W. ILIFF	
*PC62.11 STANDARD FOR METAL-OXIDE SURGE ARRESTERS FOR AC POWER CIRCUITS					
/ /	SPD	R. M. SIMPSON	919-836-7059	UNKNOWN, PLEASE IDENTIFY	
*P656 STANDARD FOR THE MEASUREMENT OF AUDIBLE NOISE FROM OVERHEAD TRANSMISSION LINES					
03/08/91	T&D	JAMES R. STEWART	518-395-5025	ALAN H. TEPLITSKY	AUDIBLE SOUND AND VIBRATION 212-460-4859
*P957 GUIDE FOR CLEANING INSULATORS					
04/01/92	T&D	WILLIAM L. GIBSON	415-973-3747	L. B. WAGENAAR	BUSHING 614-223-2259
*PC37.04h MECHANICAL LOADING REQUIREMENTS OF CIRCUIT BREAKER TERMINALS					
01/07/91	SWGR	GEORGE R. HANKS	615-751-4020	LOREN B. WAGENAAR	BUSHINGS 614-223-2259
*P1030 STANDARD TEST SPECIFICATION FOR SURGE PROTECTIVE DEVICES FOR LOW VOLTAGE AC POWER CIRCUITS					
12/03/90	SPD	LEWIS DOUGLAS SWEENEY	602-834-9372	MANESH P. SAMPAT	DIELECTRIC TESTS 704-462-3226
*PC62.42 GUIDE FOR THE APPLICATION OF LOW-VOLTAGE SURGE PROTECTIVE DEVICES					
01/21/91	SPD	MICHAEL M. FLACK	404-551-4904	MANESH P. SAMPAT	DIELECTRIC TESTS 704-462-3226
*P1223 POWER SYSTEM DIGITAL TESTING TECHNIQUES					
/ /	PSIM	T. R. McCOMB	613-990-5826	R. RINKWITZ, SR.	DIELECTRIC TESTS 617-828-3241

COORDINATION ACTIVITY OF IEEE/PES TRANSFORMERS COMMITTEE
LIST OF LIAISON REPRESENTATIVES
ATTACHMENT 3

ACRONYM	SOCIETY/COMMITTEE	LIAISON REPRESENTATIVE	PHONE NUMBER
AIM/TSC	AUTOMATIC IDENTIFICATION MANUFACTURERS (TSC COMM.)		
ED&PG	ENERGY DEVELOPMENT AND POWER GENERATION COMMITTEE	C. A. LENNON JR.	(702) 293-8817
EEI	EDISON ELECTRIC INSTITUTE (T&D COMM.)	M. C. HINGOJA	(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. M. INGHAM	(313) 236-0130
IAS/REP	IAS/RURAL ELECTRIC POWER COMMITTEE	C. HERTZ	(217) 563-8333
IC	INSULATED CONDUCTORS COMMITTEE	F. E. KINSEY	(704) 373-6562
IEC	INTERNATIONAL ELECTROTECHNICAL COMMISSION	R. S. GIRGIS	(317) 286-9532
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION	J. GAUTHIER	(202) 457-8400
NPE	NUCLEAR POWER ENGINEERING COMMITTEE	A. R. ROBY	(203) 665-3157
PSC	POWER SYSTEM COMMUNICATIONS COMMITTEE		
PSE	POWER SYSTEM ENGINEERING COMMITTEE	R. BEDNARIK	(212) 580-6675
PSIM	POWER SYSTEM INSTRUMENTATION MEASUREMENT COMMITTEE	T. R. MC COMB	(613) 990-5826
PSRC	POWER SYSTEM RELAYING COMMITTEE	A. G. PAHADXE	(703) 231-7029
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) 335-2361
SUBS	SUBSTATIONS COMMITTEE	J. E. HOLLADAY	(615) 689-5781
SWGR	SWITCHGEAR COMMITTEE	D. M. LARSON	(203) 634-5739
TC	TRANSFORMERS COMMITTEE	G. H. VAILLANCOURT	(514) 652-8515
TSC	TECHNICAL SYMBOLOGY COMMITTEE (PART OF AIM)		
T&D	TRANSMISSION AND DISTRIBUTION COMMITTEE	F. D. MYERS	(314) 682-8401

STATUS REPORT OF STANDARDS C57.12.00 AND C57.12.90 IEEE/PES TRANSFORMERS COMMITTEE

ATTACHMENT 2

*TITLE PROJECT YEAR PUB DATE SUBCOMMITTEE SC CHAIRPERSON WG CHAIRPERSON PAR DATE DRAFT DATE STATUS AND COMMENTS

**STANDARD:C57.12.90 RESPONSIBLE CHAIRPERSON: G. H. VAILLANCOURT PHONE: (514)652-8515 FAX: (514)652-8555

*STANDARD TEST CODE FOR LIQUID-IMMERSED DISTRIBUTION, POWER, AND REGULATING TRANSFORMERS & GUIDE FOR SC TESTING OF

1987 03/18/87 ASSIGNED TO MANY SUBCOM. MANY

*SECTION 7.3 FIGURES 9 & 10 REVERSED

1987 / / PERFORMANCE CHARACTERISTICS J. V. MATTHEWS

*TRANSFORMER SOUND POWER MEASUREMENT

0 / / AUDIBLE SOUND & VIBRATION A. M. TEPLITSKY

*ROUTINE IMPULSE TESTS FOR DISTRIBUTION TRANSFORMERS

0 / / DIELECTRIC TESTS J. B. TEMPLETON

*ENHANCEMENT VOLTAGE TIME DURATION DURING POWER TRANSFORMER INDUCED TESTS

0 / / DIELECTRIC TESTS J. B. TEMPLETON

*REVISION TO SEC 9 IMPEDANCE AND LOAD LOSSES

0 / / PERFORMANCE CHARACTERISTICS J. V. MATTHEWS

*REVISION TO SEC 8 NO-LOAD LOSSES & EXCITATION CURRENT

0 / / PERFORMANCE CHARACTERISTICS J. V. MATTHEWS

CHANGES CONSOLIDATED
 / / / / BALLOTTING REVISION IN TC
 / / / / READY
 / / / / INCLUDE IN 1992 REVISION
 03/01/86 / / INCLUDE IN 1992 REVISION
 09/10/87 / / INCLUDE IN 1992 REVISION
 09/28/90 / / DRAFT 1 BEING PREPARED
 06/28/79 09/05/91 INCLUDE IN 1992 REVISION
 06/28/79 09/04/91 INCLUDE IN 1992 REVISION

COORDINATION ACTIVITIES OF THE IEEE/PES TRANSFORMERS COMMITTEE
ATTACHMENT 4

PROJECT NUMBER AND TITLE	RESPONSIBLE COMMITTEE	CONTACT PHONE NO.	TRANSFORMERS COMMITTEE COORDINATOR	TRANSFORMERS COMMITTEE SUBCOMMITTEE	COORDINATOR PHONE NO.
*P1257	GUIDE FOR DIAGNOSTICS AND FAILURE INVESTIGATION OF POWER CIRCUIT BREAKERS				
05/01/91	SMGR L. ROLANDO SAAVEDRA	504-363-8765	WALLACE B. BINDER JR.	PERFORMANCE CHARACTERISTICS	216-304-5625
*PC37.91	GUIDE FOR PROTECTIVE RELAY APPLICATION TO POWER TRANSFORMERS				
/ /	PSR R. J. FERNANDEZ	215-770-5619	B. K. PATEL	PERFORMANCE CHARACTERISTICS	205-877-7740
*P1292	GUIDE FOR DIAGNOSTIC OF POWER APPARATUS				
/ /	PSIH DAVID TRAIN	617-926-4900	EDDIE SO	PERFORMANCE CHARACTERISTICS	613-990-5806
*NEW	RECOMMENDED PRACTICE FOR REPORTING FIELD TROUBLE DATA FOR POWER CIRCUIT BREAKERS				
03/17/92	SMGR D. H. LARSON	203-634-5739	G. VAILLANCOURT	STANDARDS (INFORMATION)	514-652-8515
*NEW	GUIDE FOR THE COMMISSIONING OF ELECTRICAL SYSTEMS IN HYDROELECTRIC POWER PLANTS				
07/26/90	ED&PG LOUIS A. TAUBER	503-326-2323	D. A. GILLIES	WEST COAST	503-622-4847
*NEW	GUIDE FOR INSTALLING TEMPORARY SUBSTATIONS				
03/30/91	SUBS SHASHI G. PATEL	404-362-5386	D. A. GILLIES	WEST COAST	503-622-4847
*P979	GUIDE FOR SUBSTATION FIRE PROTECTION				
01/10/92	SUBS A. J. BOLGER	604-663-2879	D. W. SUNDIN	WEST COAST	414-524-3221

