POWER TRANSFORMERS SUBCOMMITTEE MINUTES
ORLANDO, FLORIDA OCTOBER 17, 2001

The Power Transformers Subcommittee met at 9:30 AM on Wednesday, October 17th with 45 members and 71 guests present. Five guests requested and were granted membership in the Subcommittee.

The following Working Group reports were presented:

Working Group for the Revision of C57.12.10. Javier Arteaga, Chairman

The Working Group for the revision to C57.12.10 met on Monday, October 15, 2001 at 9:30 AM. There were 34 people in attendance. The official Working Group membership will be established based on the requests for membership received from all of the prior meetings.

Minutes from the meeting held in Amsterdam were reviewed with specific interest in who has already accepted assignments to write specific sections. The initial assignments are as follows:

- Ratings: John Rossetti, Rich von Gemminger
- Construction: Dennis Marlow, Rowland James, Bob Hartgrove
- LTC: Jim Harlow

The request is to complete drafts for each of these sections by the end of November. Prior suggestions for change, along with these draft sections will be compiled and issued to the Working Group by the end of December. Any of the Working Group members with suggestions may contact those assigned to work on the specific sections or either the Working Group Chair or Secretary.

There was a strong desire from the Working Group to have an electronic copy of the current version of the standard. The electronic copy issued by Jin Sim in 1997 will be sent to all Working Group members by October 30th.

There was a suggestion to add provisions for electronic gauges and meters. It was noted that Phil McClure has already submitted some work for the development of C57.12.36 (Distribution Substation Transformers) that can be used as a starting point. Dennis Marlow will contact Phil to discuss the details.

The following information regarding copyrights was requested to be added to the minutes as follows:

1. IEEE and NEMA have reached an agreement regarding the NEMA-copyrighted C57 standards, including C57.12.10.
2. IEEE “shall have the sole responsibility for the maintenance and future re-affirmations or revisions to the jointly-owned C57 standards.” This means that

the Transformers Committee can issue PAR's for the revision of these standards as needed.

3. The documents will continue to also be balloted by the C57 Committee and submitted to ANSI for recognition.
4. The jointly-owned C57 standards shall be designated ANSI/IEEE/NEMA C57.X.X

The PAR's for both C57.12.10 and C57.12.36 will be submitted by th October 26th deadline. The reason these PAR's are being submitted at the same time is to try and define a clear distinction between the two documents. The titles will be as follows:

C57.12.10 – Standard Requirements for Liquid Immersed Power Transformers
C57.12.36 – Standard Requirements for Liquid Immersed Distribution Substation Transformers

The scope of each document will clearly define the ratings and there won't be any overlap.

With no further business, the meeting adjourned at 10:20 AM.

Working Group on LTC Performance – William Henning, Chairman

The Working Group on Load Tap Changer Performance met on Monday, October 15th at 1:45 PM with 12 members and 12 guests attending. The first subject discussed was the reaffirmation of C57.131, "Standard Requirements for Load Tap Changers." A request has been submitted to conduct and electronic ballot of the reaffirmation. No action was required of the Working Group at this meeting in Orlando. At the next meeting, it is anticipated that the Working Group may be assigned the task to address possible negative comments resulting from the reaffirmation ballot. We will return to this subject later in the minutes.

The second subject of discussion was tap changer contact life determination. Jim Harlow presented background information for this discussion, The issues are (1) is there a need for a formal definition of contact life and (2) is there a need for a standard method for its determination? The C57.131 standard states that the results of the Service Duty Test may be used by the manufacturer to extrapolate an ultimate contact life based on observation of the contacts after 50,000 operations. But the standard does not provide a method for this determination. An intention to survey the Working Group on this subject was expressed at the meeting, but subsequent discussions led to a decision to defer this subject until a later date.

The decision to defer this action results from consideration of the mission and purpose of this Working Group and the timing of the work. The past and future activity of this Working Group was also discussed at this meeting, and informally afterward. The name of this Working Group is Load Tap Changer Performance. It had that name when it was first established under the chairmanship of Tom Traub and it produced the standard

C57.131, which now is up for five-year reaffirmation. In 1997 the Working Group was re-established with the same name. A PAR for the project to write a Load Tap Changer Application Guide was approved by the IEEE Standards Board. At that time, coordination with IEC and copyright issues were a concern of the Standards Board members. The IEEE Standard C57.131 was largely based on IEC 214. In fact, the wording of these two documents are nearly identical. Because C57.131 was based on IEC Standard 214, it made sense that the new proposed guide, with designation C57.141, would likely be based on the IEC 547 Guide.

At about this time, the IEC Working Group 26 started to revise the IEC Standard 214 (60214-1). Work is also being done by IEC to revise its Tap Changer Guide, formerly IEC 547, but now designated as 60214-2. Unfortunately, the timing of the task of our IEEE Working Group has been "out of phase" with the work being done in IEC. It seemed to make sense for IEEE to wait for IEC to complete its work. At one point it was proposed that our Working Group be disbanded until the IEC finished its work.

With the passage of time, the revised IEC 214, now 60214-1 is in the Committee Draft stage. IEEE C57.131 is due for reaffirmation. It would appear that the immediate task for this Working Group should be to consider a revision of C57.131. This could be a subject for discussion at the next Working Group meeting. The PAR for C57.141, the Application Guide, will probably expire with no Guide being produced at this time.

The immediate focus of the Working Group will be reaffirmation of C57.131. After that, work on an Application Guide could begin.

Working Group on Phase Shifting Transformers – Tom Lundquist, Co-Chairman

No Working Group meeting was held in Orlando. The Guide has been approved and submitted to IEEE. The IEEE editor advised that the PST Guide C57.135 will probably be published in May or June 2002.

Working Group on Diagnostic Field Testing & Monitoring of Liquid-Filled Transformers – Andre Lux & Donald Chu, Co-Chairmen

The Working Group met Sunday afternoon and Tuesday morning. 24 members and guests were in attendance for the Sunday meeting.

Draft 10 and comments from a recently-conducted survey on the Guide were discussed in both meetings. All relevant comments that were obtained in the survey are being incorporated into Draft 11.

After all the comments are incorporated, the Guide will be re-organized and volunteers will be needed to take a section of the Guide and edit, re-write sections, etc. The re-organized Guide will be sent to the Working Group membership well in advance of the spring meeting. The Working Group will meet during the Doble conference in April to review Draft 11 in detail.

Working Group for the Guide for the Evaluation and Reconditioning of Liquid Immersed Power Transformers, C57.140, Rowland James, Chairman

The Working Group met at 8:00 AM on Tuesday, October 16, with 66 in attendance. There were 32 members and 34 guests -- 19 requested membership.

After introductions a brief discussion of the latest draft's status was held. Volunteers were accepted for a number of sections.

Attached is a summary of the status of the Guide

The chairman appointed several task forces to assume the responsibility of completing the individual sections and will make assignments to complete the articles. Revisions and additions to draft 6 are due by the end of February 2002. Draft 7 will be mailed out electronically shortly thereafter.

The meeting was adjourned at 9:15 AM.

Article	**Author**	**Status**
1. Overview / Scope	Rowland James	completed - needs review does it match PAR?
1.2. Purpose	Rowland James	completed - needs review
2. References –	Malcolm Thaden	awaiting input
3. Definitions		volunteers needed add after guide is written??
4. Condition Assessment	Brian Sparling, Phil Mc Clure, Jeewan Puri,John Crouse	
4.1External		
4.1.1Dissolved Gas Analysis	Brian Sparling	completed - needs review
4.1.2 Oil Quality Assessment	Brian Sparling	completed - needs review
4.1.3 Furan Analysis	Brian Sparling	completed - needs review
4.1.4 Power Factor	Alan Wilson and Tommy Spitzer	awaiting input
4.1.5 Frequency Response Analysis –	Alan Wilson	awaiting input
4.1.6 Radiator/Fans/ Pumps/Cooler Condition	Michael Havener & Robert Thompson	awaiting input
4.1.7 Bushings –	Alan Wilson	awaiting input
4.1.8 Surge Arresters –	Robert Thompson	awaiting input
4.1.9 Load Tap Changer –	Don Platts	awaiting input
4.1.10 Rapid Rise Relay	Mike Barnes	awaiting input, volunteers needed
4.1.11 Pressure Relief Devices	Mike Barnes	awaiting input, volunteers needed
4.1.12 Constant Oil Pressure system	Robert Thompson	volunteers needed
4.1.13 Gas Blanketed System	Rowland James	volunteers needed
4.1.14 Tank Condition	Rowland James	volunteers needed
4.1.15 Vibration/Noise –		volunteers needed
4.1.16 Partial Discharge Detection	Hem Shertukde	awaiting input

4.1.17 Controls, Alarms, Annunciators	Phil McClure	completed –review needed
4.1.18 Infrared Inspection	Tom Prevost & Robert Thompson	awaiting input
4.1.19 Gas Detector Relay	Mike Barnes	awaiting input, volunteers needed
4.1.20 Liquid and Winding Temperature Gauges	Mike Barnes	awaiting input, volunteers needed
4.1.21 Liquid Level Indicator	Mike Barnes	awaiting input, volunteers needed
4.2. Internal	Rowland James, Mike Franchek	
4.2.1 Core & Coil Inspection	Rowland James & Robert Thompson	awaiting input, volunteers needed
4.2.2 Bus and Leads	??	completed - needs review
4.2.3 De-energized Tap Changer	Jeewan Puri	completed– review needed
4.2.4 Pumps	Michael Havener	awaiting input
4.2.5 Gaskets	Joe Watson	volunteers and input needed
4.2.6 Bushing Current Transformers	Brian Sparling	volunteers and input needed
4.2.7 Bushings –	Alan Wilson	awaiting input
5. Risk Assessment	[Joe Watson, Paulette Payne, Bill Bartley]	
5.1 Need For Particular Transformer		volunteers and input needed
5.2 Value to User		volunteers and input needed
5.3 Vintage		volunteers and input needed
5.4 Not Full Vacuum		volunteers and input needed
5.5 Low or High Density Paper		volunteers and input needed
5.6 Spare Parts Availability		volunteers and input needed
5.7 Operational History (loading & through faults		volunteers and input needed
5.8 Type of Construction		volunteers and input needed
5.9 Animal Caused Outages		volunteers and input needed
5.10 Shielding		volunteers and input needed
5.11Grounding		volunteers and input needed
5.12 Operating Environment	–	volunteers and input needed
6. Reconditioning	[Rowland James, Javier Arteaga, Mike Lau, Van Nhi Nguyen, John Progar, Juan Thierry, Mike Barnes]	
6.1 External		
6.1.1 Surge Arrester Replacement	??	completed - review needed
6.1.2 Fan/Pump Replacement	?? and Michael Havener	awaiting input /review needed
6.1.3 Pressure Relief Device Maintenance/ Replacement	–	completed - needs review
6.1.4 Oil Dry Out/Reclamation	Mike Lau	completed - needs review
6.1.5 Load Tap Changer Maintenance/ Upgrade (contacts)	Mike Lau & Saurabh Ghosh	completed - needs review
6.1.6 Bushing Replacement	Mike Lau	completed - needs review

6.1.7 Oil and Winding Temperature Gauges	Mike Lau & Saurabh Ghosh	completed - needs review
6.1.8 Liquid Level Gauge(s)	Mike Lau & Saurabh Ghosh	completed - needs review
6.1.9 Fault-Pressure Relay	Mike Lau	completed - needs review
6.1.10 Gas Detector Relay	Mike Lau	completed - needs review
6.1.11 Tank	Mike Lau	completed - needs review
6.1.12 Free-breathing Transformers	Mike Lau	completed - needs review
6.2 Internal	Rowland James, Mike Lau	
6.2.1 Core & Coil Reclamping	Mike Lau & Robert Thompson	completed - needs review
6.2.1a Coil Reclamping shell forms	Juan Thierry and John Progar	awaiting input
6.2.2 Paper Sampling for Degree of Polymerization Tests	Tom Prevost and Tom Lundquist	awaiting input
6.2.3 De-energized Tap Changer Maintenance/Upgrade	??	completed - needs review
6.2.4 Maintenance of Leads	Rowland James	awaiting input
7. Bibliography	Andre Lux	review and/or volunteers needed

West Coast Working Group, Michael Lau, Chairman

The West Coast Working Group did not meet in Orlando, but a session is planned for the next meeting in Vancouver.

Working Group for the Installation of Liquid-Filled Transformers, C57.93, Michael Lau, Chairman

The Working Group on The Installation of Liquid-filled Transformers was called to order at 3:20 PM on Tuesday October 16, 2001. There were 35 attendees, 14 members, 9 requesting membership, and 12 guests. The agenda for the meeting was reviewed, followed by approval of the Minutes from the April 10, 2001, meeting in Amsterdam, Netherlands. The agenda, minutes and copies of the overheads presented were distributed.

1) A new PAR has been prepared. The PAR will be submitted after this meeting pending any scope changes that may result from this session.

2) Results from the survey of the Power Transformer Subcommittee on the installation guide were presented. Approximately 15 responses were received, with 10 providing detailed input, representing manufacturers, users and consultants. The results initiated comments in many areas including: old vs. new units, concern for absolute limits, utilization of public domain data to facilitate educated decisions, and the testing for oxygen and combustible gases prior and during internal inspections. The working group expressed a general philosophy of working to provide guidance versus absolute limits. Furthermore, manufacturers instruction books would be consulted, as they will provide a valuable source of information.

3) Volunteers were requested to re-write several sections of the guide. There was an excellent response from the group and volunteers were as follows:

• Clause 3.8.3 –	Energization under cold conditions	H. Moore, S. Mcnally & M. Lau
• Clause 4.3 –	Inspection & Receipt	A. Peterson
• Clause 4.6.1 –	Oil filling	D. Baranowski
• Clause 4.8.4 –	Vacuum filling	J. McIver & T. Prevost
• Clause 4.9.2 –	Method 2 – Short Circuit Method	A. Peterson
• Clause 4.10 –	Recirculation	P. Pilitteri
• New item –	Internal inspection airflow	M. Lau

4) Under old business a discussion of the installation of oil filled transformers for indoor application was raised, particularly since this guide covers transformers as small as 501 kVA. The specific concern was for cooling and safety issues related to units installed indoors. After discussion the working group voted to not include these concerns in the guide, but to refer the reader/user to other industry standards that address this issue.

   A second item under old business was the measurement of dew point at temperatures as low as −20° C. The revised guide will consider this area, and it was suggested that ASTM D2029 could provide valuable input.

5) Under new business Clause 4.9.4 Method 4 – Hot air drying was raised for consideration. It was decided this was no longer a preferable method of drying, but that it should be moved to an annex for historical reference. In addition, it was indicated that Doble was embarking on a similar effort to produce installation guidelines. The group suggested a liaison between IEEE and Doble and Paulette Payne volunteered to provide this support.

The meeting adjourned at 4:35 PM.

Working Group for the Control Cabinet Guide, Joe Watson, Chairman

The Working Group started out as a Task Force, meeting at 9:30 AM on Tuesday, October 16th, 2001 with 49 members and guests present.

Discussions were held on the task of developing a Guide for control cabinets. It was agreed that the scope of the Guide will begin as a Guide for the Layout, Functionality and Construction of Control Cabinets for Class II Power Transformers. No PAR will be established until the Working Group assembles various users' requirements and makes substantial progress toward a number of standard designs that are substantially in compliance with those users' requirements.

Steven Schappell was volunteered by Jin Sim as a Co-Chairman. Shawn Cross later volunteered to serve as a Working Group officer and will be appointed Secretary.

After a lengthy discussion on the eventual content of this Guide, it was agreed that more work was needed toward incorporating various users' designs into a small number of standard modular designs with optional features. Representatives from 5 different North American transformer manufacturers volunteered to help develop a collection of various users' requirements, as well as their own standard cabinet designs and work toward common designs. This work will begin following the meeting and continue throughout the next few months.

OLD BUSINESS:

E. Hager stated Rulon Frank, Chairman of the W.G. for Guide for Substation Design to meet Seismic Withstand was looking for a 500kv transformer tank to test bushings. The tank would be one ready for salvaging.

NEW BUSINESS:

1. Joe Watson presented information on a repair process utilized by FPL for corroded aluminum coolers. The process involves careful sandblasting and coating with a slow-setting epoxy. The presentation will be posted on the Transformers Committee website under the Power Transformers Subcomittee page.
2. Joe Watson also presented information on experiments by FPL of on-line bushing power factor testing. The initial results are promising and this work is continuing. This presentation will also be posted on the Transformers Committee website under the Power Transformers Subcomittee page.
3. Bipin Patel led a discussion, raising the question of the impact of merchant power plants on power systems and the effects of the repeated transients produced from frequent switching of peaking units on GSU's at base loaded stations.
4. Brian Sparling discussed a request from IEC for information that had been produced by a former Transformer Committee Task Force. The discussion led to a consensus to survey the Subcommittee on these questions in order to provide current information.
5. It was announced that D. Corsi would head up a task force for C57.17, ARC Furnace Transformers.

The meeting adjourned at 10:45 AM.