8.12 POWER TRANSFORMERS – TOM LUNDQUIST, CHAIRMAN

The Power Transformers Subcommittee met at 1:30 pm, on Wednesday, October 27th with 59 members and 50 guests. 22 of the Guests requested membership.

The minutes from the San Diego meeting were approved with no changes or corrections.

Tom Lundquist reported that Everett Hager had stepped down from his Chairman position with the Subcommittee and that Tom Lundquist has been appointed as the new Chairman. Joe Watson was appointed as Vice-Chair and Bill Griesacker was appointed to Secretary.

8.12.1 WORKING GROUP AND TASK FORCE REPORTS

8.12.1.1 TASK FORCE FOR REVISION OF C57.17, REQUIREMENTS FOR ARC FURNACE TRANSFORMERS – Dominic Corsi, Chairman

The Task Force on revision of C57.17, Arc Furnace Transformers, was called to order at 8:00 am on Monday, October 25, 2004. There were 20 attendees. Eight members and twelve guests comprised the assembly.

Mr. Dom Corsi opened the meeting with a reading of the "Instructions for the WG Chair" as prescribed.

- The opportunity was provided for the WG members to identify or disclose patents that the WG member believes may be essential for the use of that standard.
- There were no responses given that specifically referenced patents and patent applications that were involved in the WG activities.

Dom Corsi then presented the Agenda. The first order of business was review and approval of the minutes from the March 2004 meeting that was held in San Diego. The minutes were approved as presented.

Under old business, a proposed revision to the Ratings Section was presented for discussion. The incentive for this revision was based on prior member comments that the Ratings Section was not flexible enough with respect to large furnace transformers (San Diego) and the need for a continuous revision of this standard as needed during the activity of the Task Force. "General Requirements for Ratings" was inserted as an addition to the Ratings Section, 4.0.

Several members engaged in a discussion concerning the "cooling water temperature limits", the first item listed in the "General Requirements for Ratings" insert. The discussion centered on the limit of 30ºC presently in the Standard. Apparently, some users have requested operation at ambient temperatures higher and up to 40ºC and manufacturer members were questioning how the present standard could accommodate this request. Changes in cooling capacity or ratings were suggested. In addition, a

request was made to review the IEC standard with respect to this area for possible alignment. At present, there was no proposal to change the standard value of 30º.

Continuing in the "General Requirements for Ratings", Table 1: HV ratings for 3-phase and 1-phase Arc Furnace Transformers were reviewed. It was suggested that the wording be changed to include "Preferred". In addition, the members recommended eliminating the 115 and 138kV levels from the Table.

In Section 5.1, "HV Insulation Levels", the 115 and 138kV levels will also be removed.

In Section 5.2, "Low Voltage Terminals", members suggested revising this table to include preferred ratings at different levels to reflect the higher voltage levels used on AFT's today. Suggested levels are: 1.2, 2.4 and 5kV.

The chair distributed two proposed documents for:

1. Appendix A: Guide for the Interpretation of DGA for Furnace Transformers
2. Appendix C: Guide for the Protection of Arc Furnace Transformers.

The chair requested the group to review and provide written comment on these drafts to the chair.

Under New Business, Dom Corsi again asked for volunteers to write Sections of the Standard.

With no other new business proposed from the members, the meeting was adjourned at 9:15am.

8.12.1.2 WORKING GROUP FOR DEVELOPMENT OF PC57.143, GUIDE FOR APPLICATION OF MONITORING TO LIQUID IMMERSED TRANSFORMERS AND COMPONENTS- Donald Chu and Andre Lux, Co-Chairmen

The Working Group met Monday, October 25th at 9:30 am. There were 80 Members and Guests in attendance.

The IEEE Standards Board Bylaw on Patents and Standards was discussed. The membership was encouraged to read the IEEE patent requirements that are contained in their registration package. An opportunity was given to WG members to identify or disclose patents that the WG members believe may be essential for the use of this standard. No items were brought up.

Comments from the members on the minutes of the last meeting in San Diego were discussed. The comments regarded items to be removed from the Guide and the reduction of Section 4 concerning communication protocols.

In March, twelve members of the working group met in Boston at the Doble conference and made significant changes to draft 13. These changes were incorporated into draft 14 and were sent to members for comment.

The Comments from the members on Draft 14 were discussed. There were 4 general comments, 27 technical comments and 22 editorial comments. Each technical comment was reviewed in detail. Sections that need work were identified and the WG will be looking for members to address those sections.

Additional comments are expected from members. All the comments will be sent to the WG members for review.

With that, the meeting adjourned at 10:45 am.

8.12.1.3 WORKING GROUP FOR DEVELOPMENT OF PC57.148, STANDARD FOR CONTROL CABINETS FOR TRANSFORMERS – Joe Watson, Chairman

The task force met at 11:00 am on Monday, October 25, 2004, with 36 in attendance. There were 27 members and 17 guests. Four of the guests requested membership and will be added to the membership list.

The roster was handed out, as well as copies of Draft 2 of the Standard, which had been previously emailed.

The group was asked if they had any knowledge of the possibility of any patents that may be essential to the implementation of the Standard. The response was negative.

The new AM system was discussed, and attendees were requested to ensure that they are registered with this system in order to receive future emails concerning this Standard. The difficulty in sending the Draft attachment was discussed. It was over the 500Kb file size limit.

The controls drawings at the end of the Standard were discussed. Discussions centered on whether these drawings should be shrunk down to 8 ½ by 11, or placed on the Web using links. Later discussion mentioned the possibility of putting these drawings in PDF files, where the larger size (such as D or E) could be maintained.

A suggestion was made to show the color-coding of the wires for the various devices.

Discussion then moved on to the mounting of the control cabinet to the tank wall. It had been previously decided to make vibration-dampening mounting standard, but several members had said that this should be an option. It was decided to make non-vibration-dampening standard unless devices are present which require vibration-dampening mounting.

The group then discussed how close the cabinet should be to the tank. Several members felt that air circulation was necessary, and perhaps enough room should be left to get a paint roller between the cabinet and tank. Seven centimeters was proposed. It was proposed that the distance should not necessarily be the same for Class I and Class II transformers. Another member proposed zero distance. This suggestion was voted and approved as a minimum spacing.

The minimum thickness of the cabinet was discussed. Three millimeters is the requirement listed in Draft 2. Fourteen gauge (1.9mm) was proposed and agreed upon.

The requirement for three separate sections in the cabinet was discussed, as well as the mounting of circuit breakers (swing panel versus rear panel). Paint coatings were discussed, and polyurethane will be added as an acceptable paint. C57.12.28 will be reviewed for information concerning paint standards, as well as options for coastal environments, etc. Panel thickness was discussed (1.9mm minimum), as well as the spacing of the rear panel from the cabinet (12mm).

The cabinet ground bus was discussed, with the agreement that the Standard would require on ground bus without specifying the location. Standoffs were mentioned as an option.

The meeting adjourned at 12:15 pm.

8.12.1.4 WORKING GROUP FOR DEVELOPMENT OF PC57.131, STANDARD REQUIREMENTS FOR TAP CHANGERS - William Henning, Chairman

The Working Group on LTC Performance met on Monday, October 25th with 17 members and 42 guests attending.

The IEEE patent slide was discussed. The Chairman asked if anyone was aware of any patents that would affect PC57.131, “Requirements for Tap Changers,” or that would affect the LTC Application Guide. No one in the room was aware of such patents.

The two documents being prepared by this Working Group have direct counterparts in the IEC Standards. They have the same scope and the same general content. A discussion was devoted to the merits and feasibility of IEEE simply adopting these two IEC Standards as dual logo IEEE/IEC Standards. It was agreed that to avoid duplication of efforts and for other similar reasons it is a highly desirable goal to combine these Standards into one. However, there appear to be three roadblocks to adopting the two IEC Standards.

- The first is administrative. Although IEC has adopted IEEE Standards for dual logo, IEEE has not adopted IEC Standards.
- Secondly, there are many small differences between PC57.131 and IEC60214-1 that would have to be resolved.
- Thirdly, C57.131 cites a long list of ANSI/IEEE Standards, while IEC60214-1 cites a long list of IEC Standards. Before adopting IEC60214-1, all of these other IEC Standards would have to be reviewed and approved.

Because of these three roadblocks, it was agreed that the Working Group would use the wording and content of these two IEC Standards as much as possible, but that we would have to write a separate document. That is the case today. Today we have IEEE PC57.131 and IEC60214-1 as separate standards.

Of the two Working Group documents, priority was given to the major revision of PC57.131. It is planned that a link to an electronic survey will be placed on this Working Group's Transformers Committee web page. Members and guests will be able to review the differences between IEEE PC57.131 and IEC60214-1 and by clicking on option buttons, give their opinions on which items to adopt and which not to adopt. Similarly, the proposed revisions from the PC57.131 reaffirmation ballot will be presented.

It was proposed, as a separate matter, to establish a Task Force to work on the LTC Application Guide.

The meeting adjourned at 2:45 pm.

8.12.1.5 WORKING GROUP FOR DEVELOPMENT OF PC57.140, GUIDE FOR THE EVALUATION AND RECONDITIONING OF LIQUID IMMERSED POWER TRANSFORMERS - Rowland James, Chairman.

The Working Group met at 3:15 PM on Monday, October 25, 2004 in Henderson, NV. There were 99 in attendance, 53 members and 45 guests.

After introductions of members and guests the chairman reviewed the Standards Association's slides pertaining to IEEE's Patent Requirements for Standards Under Development. Two slides provided by the Transformers Committee related to the IEEE's Patent Policy were presented and an opportunity was provided for WG members to identify or disclose patents that may be essential for the use of this standard. No responses were received.

1. The Association Management System (AM system) was announced. The chair encouraged all to register for it if they haven't already done so.
2. The chair announced that Draft 12 of the guide is complete and has been sent to the Editorial Staff for review. Draft 13 will be issued within one month for comments and a straw poll.
3. Several editorial comments were made including one on the fault tree table (that it is too hard to read).

4. A discussion followed on furan analysis. It was noted that there are some conflicts in furan levels and their corresponding degree of polymerization. This will be addressed and resolved in Draft 13.
5. Percent moisture in cellulose was then discussed. A possible method to determine this value is described in an EPRI paper.
6. The chair then announced that the roster will be reduced to include only those members that have contributed to the development of the guide. He also commented that anyone that submits further contribution, editorial comments or corrections will remain on the roster.
7. Since there was no other business, the meeting was adjourned

The meeting adjourned at 4:15.

.

8.12.1.6 WEST COAST WORKING GROUP - Michael Lau, Chairman

The Working Group met at 8:00 am on October 26, 2004 with 8 members and 9 guests present.

Wallace Binder provided an update on the reaffirmation processes of three Standards, IEEE62, C57.117 and C57.125.

IEEE 62 – Guide to Diagnostic Field Testing on Power Transformers will be a Standard that belongs to the Standards Subcommittee. Reaffirmation requires resolution of some negative ballots concerning moisture equilibrium and calculation issues which are being worked on by the C57.106 Working Group.

C57.117 – Guide for Reporting Failure Data and C57.125 – Guide for Failure Investigation will reside in the Power Transformers Subcommittee. Reaffirmation of both Guides are essentially completed. Some final paperwork will need to be submitted.

The Chairman advised the Group that a new Working Group has been formed to deal with transformer transportation issues.

Discussion among the Group indicated that there is a need for a Guide on step-up transformers for wind farms. Joe Watson agreed to request and set up a study session during the next Committee meeting.

The Working Group adjourned at 9:00 am.

8.12.1.6.1 WORKING GROUP FOR DEVELOPMENT OF PC57.150, GUIDE FOR THE TRANSPORTATION OF TRANSFORMERS AND REACTORS RATED 10,000 KVA OR LARGER – Tom Lundquist, Chairman

This was the first meeting of the Working Group for Transportation Issues Guide. The meeting started at 9:45 am, Wednesday, October 27, 2004.

There were 55 present with 31 requesting membership in the WG.

Tom Lundquist made the patent issue announcement and requested that anyone having any patent issues to please indicate so. None were brought forth.

Tom then discussed the title, scope and purpose of the guide. The main purpose is to give advise to users and vendors that will reduce the risk of damage to the power transformer or reactor in transport.

Questions and answers regarding the PAR were received and returned to NESCOM. Ken Hanus will try and help get the PAR through NESCOM.

The Chair, Tom Lundquist commented that he would remain Chair until the PAR is approved to avoid confusing the issue with NESCOM. He then requested volunteers for Secretary and Vice Chair. The Vice Chair position would assume the Chair position after the PAR is approved and the new chair would select the new vice chair. Sue McNelly volunteered as WG Secretary and Greg Anderson volunteered as WG Vice Chair.

There was a brief discussion as to where this WG should reside. Should it reside under the West Coast WG or under the Power Transformer SC? Tom will discuss this with the Admin Committee and get this resolved.

Task Force Assignments:

> Ewald Schweiger volunteered to be TF chair on General Issues that will apply to the equipment through out the complete shipment. Peter Balma, Joao Sousa and Les Recksiedler volunteered to work with Ewald as TF members

Examples of some issues are:

- Impact recorders, where and when should they be required?
- What is attached to the outside of the unit when shipped?
- Checklist to ensure that the vendor is doing things correctly, such as has the vendor sent special verbiage to the shipper?

Task force for specific issues related to Barge and Ship Transport: Philip Sherman and Kipp Yule volunteered as TF co Chairs and Ingo Schmidt (subject to agreement). They will work on special concerns for barge and ship transportation that can be used by vendors and users to specify risk to equipment reductions.

Task force for Rail Shipment: Mike Lau volunteered as TF Chair. Tom Lundgren, Phil Sherman, Ingo Schmidt (subject to his agreement), and Robyn Taylor will work with Mike.

Task force for Truck Rigging & Crane: Craig Swinderman volunteered as TF Chair. Tom Bassett, Shawn Galbraith, Ingo Schmidt (subject to agreement), and Jerry Murphy will work with Craig.

Phil Sherman volunteered as a liaison to this WG with RICA (Railroad Industrial Clearance Association) & SCNRA (Specialized Carriers & Rigging Association) and he will report to the WG and useful feedback from this liaison position.

At a minimum we would like to have an outline of subjects or topics from the TF chairs 2 months prior to the Jackson meeting to have documents to be posted on the web to the secretary of the WG (Sue McNelly) so WG members can review the items for discussion prior to the Jackson meeting.

A comment was made that we should include instructions on what to do when there is an impact to a unit being shipped.

Also a question was raised as to whether we should get into how a control cabinet, radiators etc should be packaged for shipment should be included.

Meeting was adjourned at 10:45 am.

8.12.1.7 WORKING GROUP FOR THE REVISION OF C57.93, INSTALLATION OF LIQUID-FILLED TRANSFORMERS - Michael Lau, Chairman

The Working Group met at 3:20 pm on October 26. There were 34 attendees comprised of 13 members, 19 guests and 2 guests requesting membership. The agenda for the meeting was reviewed and the minutes, figures, presentation and Draft 5b of the Guide were distributed.

The agenda for the meeting was reviewed, and the following items were completed at this session:

- Agenda review
- Patent review
- Progress update
- Figures and Tables update
- Adjournment

The IEEE patent policy was reviewed and the group was asked if there were any disclosures. There were none.

The PAR was approved on June 13, 2002. A revised PAR is required to include maintenance in the title. Draft 5b has been assembled and is available on the Transformers Committee website. A clause on cold weather Dewpoint testing is needed. In addition, a clause on internal grading shielding will be added,

The update resulted in a discussion of cold weather dewpoint that considered many aspects of receiving and installing a new transformer in low temperature conditions. Salient points of the discussion considered the following:

- A dewpoint test performed in sub-zero temperatures has a questionable accuracy
- Little or no water vapor will come out of insulation below freezing

- An alternative is to measure power factor of the winding after filling
- The unit can be blanketed and heated, or hot oil circulation can be utilized to get the unit above freezing temperatures for a dewpoint measurement
- Some users may rely on the unit being received with positive shipping pressure and proceed with processing without performing a dewpoint test

While a conclusion was not reached, the group agreed, in general, that some guidance is needed in this area and that a clause on the topic is needed.

A discussion was held on the series of figures in the Appendix and their inclusion and location in the Guide. A key point considered was the source and currency of the information they provide. Consensus was that the charts and figures ass value and should be maintained, but that examples and/or explanations as to their use should also be included.

Two new tables were presented for inclusion in the Guide. The first presented suggested vacuum hold times versus voltage class, and the second hold time before energization versus voltage class. The general consensus was that the values were conservative, but in the absence of manufacturers' information they would provide guidance. Some concern was expressed for those cases where the manufacturers' values may be less than those proposed for the Guide.

Minutes from the March 8, 2004 meeting in San Diego, California, were reviewed and approved.

The group was asked for volunteers to read the complete document and submit comments. Twelve people volunteered, and they were asked to try to return their comments within a month to be incorporated into Draft 6 of the Guide.

The meeting adjourned at 4:35 pm.

8.12.1.8 TASK FORCE FOR FUNCTIONAL LIFE TESTS OF DE-ENERGIZED TAP CHANGERS – Phil Hopkinson, Chairman

The Task Force met at 9:30 am on October 26th. The group is preparing a technical paper on several tests currently being performed with different types of materials and oils.

The group was polled on the patent issues and the group was not aware of any patented items included in their work.

The meeting adjourned at 10:45 am.

8.12.1.9 WORKING GROUP FOR REVISION OF C57.135, GUIDE FOR THE APPLICATION, SPECIFICATION AND TESTING OF PHASE-SHIFTING TRANSFORMERS – Tom Lundquist, Chairman

The Working Group met at 11:00 am on Tuesday, October 26th with 9 members and 21 guests present. Six of these guests requested membership.

The question of applicable patents was asked and all in attendance indicated that they had no knowledge of any patents covering materials in this Guide.

The AM system was also discussed to ensure that all members and guests understand the need to be registered to be included on WG mailings and rosters.

Tom Lundquist informed the WG that he intended to step down as WG Chair to avoid conflicts with his new position as Power Transformers Subcommittee Chair. After a request for Chairman and Secretary volunteers, Jim McIver was appointed Co-Chairman and he will assume the position of Chairman at the next meeting in Jackson, Mississippi. Joe Watson was appointed Secretary.

Two Task Forces were assembled to address comments from the original approval ballot and the recent re-affirmation ballot. The figures in the existing Guide will need to be recreated to comply with IEEE format requirements and some figures may be revised to resolve ballot comments.

The first group will address comments on Section 4 and will be led by Walter Seitlinger with support from Gustaf Preininger, Bipin Patel and Tim Raymond. The second group will address comments on Sections 3, 5 and 7 and will be led by Jim McIver with support from Bipin Patel and Robert Veitch. Tom Lundquist will distribute a Draft 1 of the Guide.

Joe Watson will post a copy of the existing Guide and subsequent Drafts on the website for review by the WG members.

The meeting adjourned at 12:15 pm.

8.12.1.10 WORKING GROUP FOR REVISION OF C57.12.10, STANDARD REQUIREMENTS FOR LIQUID IMMERSED POWER TRANSFORMERS - Javier Arteaga, Chairman

The WG met on October 26, 2004 from 1:45 PM to 3:00 PM. In attendance were 12 members and 15 guests. Five guests requested membership and were welcome.

After the introductions were made, the WG chair advised the group members to identify or disclose patents that may be essential for the use of this standard, and no patent was brought to group's attention.

The meeting was dedicated to discuss the different Liquid Preservation Systems. Four systems will be included in the standard, being their use at the option of user and manufacturer:

- Sealed-Tank System
- Inert-Gas Pressure System
- Conservator-Tank System without Diaphragm
- Conservator-Tank System with Diaphragm

Gas-liquid seal system present in current standard was eliminated due to its lack of use.
The top oil temperature range of operation for these systems in current standard is 100°C. It was pointed out that current C57.12.00 specifies the minimum operating ambient temperature of -20°C and the maximum top oil temperature of 65+40=105°C, making the range of top oil temperature of 125°C. A preservation system for a range of 100°C may result on liquid levels that may leak out of the tank or, as minimum, would make more frequent the operation of the bleeder valve, resulting in more maintenance of the transformer. It was proposed to increase the range to 125°C. It was acknowledge that this will result on larger gas spaces. One manufacturer indicated that they do this already. It was noted that conditions present during overload conditions are addressed in C57.91, but the larger temperature range will increase the overload capability of the transformer.
It was requested to manufacturers to comment on the impact of this requested change on the design of the transformer, noting that is the average liquid temperature, not the top liquid temperature, the one used to determine the size of the gas space.
Regarding the specific preservation systems, the following other items were discussed:

Sealed-Tank System

A note will be added to this system indicating that the use of this system may result in the introduction of oxygen and moisture into the transformer due to the operation of the bleeder valve. Standard accessories for this system will be a pressure-vacuum gage and a pressure-vacuum bleeder valve.

Inert-Gas Pressure System

No changes from current standard

Conservator-Tank System without Diaphragm

It was agreed to use this system without any limitation on the capacity of the transformer. It was noted that this practice is already in use in Canada. Standard C57.12.80 will be reviewed for the definition of conservator tank.

A combination of valves shall be provided in the conservator tank and the main tank to close the flow of liquid between both tanks. The size of the valves will be at the manufacturer’s option.

A drain valve will be located on the conservator tank side as near the bottom as possible.

A dehydrating breather with desiccant to absorb at least 20% of its own weight in moisture will be provided.

Liquid level indicator will be provided.

Upon request, a pressure vacuum bleeder and a gas accumulation relay can be provided.

Conservator-Tank System with Diaphragm

The same accessories required for systems without diaphragm will be required for this system, plus the following accessories:

- A diaphragm which characteristics, including its permeability, will be included in Rubber Air Cell (use the terminology Diaphragm instead)
- A vent valve at the top of the conservator tank release any air trapped in the liquid side of the tank will be required.
- A vacuum-equalizing valve will be required when the conservator tank is designed for full vacuum filling.

With no more time for discussions the meeting adjourned.

8.12.2 OLD BUSINESS

None

8.12.3 NEW BUSINESS

New officers of the Power Transformer Subcommittee have been appointed as reported at the initiation of the meeting with Tom Lundquist as Chairman, Joe Watson as Vice Chairman and Bill Griesacker as Secretary.

The chair reported that a decision is made that the PC57.150 Transportation Issues WG will report directly to the Power Transformer Subcommittee rather than as a TF under the West Coast Working Group.

The AM system was discussed and it was stressed to the Committee membership that it is important to keep personal information updated in the AM system.

Tom Lundquist reminded everyone of the process for developing or revising IEEE Standards and Guides. No drafts of new or revised Standards or Guides should be developed or circulated before a PAR is obtained. Members are not indemnified by IEEE for work on any draft documents created without first obtaining a PAR.

Tom Lundquist also notified the Working Group chairs that each Working Group needs a co-chair.

The meeting adjourned at 2:45 pm.