Distribution Transformer Subcommittee Report

Chairman:	**Stephen Shull**	**Secretary:**	**Jerry Murphy**
Meeting Date:	**03/10/2010**	**Time:**	**9:30 – 10:45**

Attendance:

Members	**33**
Guests	**28**
Guests Requesting Membership	**6**
Total	**67**

Meeting Minutes / Significant Issues / Comments:

Steve opened the meeting; rosters were passed out, introductions were made and a roll call of members showed we had quorum with 33 of the 45 members in attendance.

The minutes of the fall 2010 meeting of the subcommittee were presented and a motion was made by Ron Stahara, seconded by Myron Gruber to approve the minutes; the motion carried by unanimous acclamation.

Steve made a request for a volunteer to chair a working group for C57.138, *IEEE Recommended Practice for Routine Impulse Test for Distribution Transformers.* John Crotty of ABB Inc. agreed to volunteer for this position. Steve said he would pass this information to Loren Wagenaar with the Sub-Committee's recommendation.

Marcel Fortin gave a presentation on *The Basics of Current Interruption* to the subcommittee specific to the physics of fault interruption.

The following are the reports that were submitted by the Working Groups and Task Forces.

- C57.12.20 – Overhead Distribution Transformers – Chuck Simmons reported

  The membership requirements of the WG were reviewed. Attendance at 3 of the last 5 meetings or last 2 consecutive meetings is required for membership. Since the Spring 2010 meeting, 7 members have been removed and 5 new members added. Membership stands at 29. Attendance of the membership was taken and 21 members were present and a quorum was established.

  There were no patents disclosed that impact the work of this WG.

  The minutes of the Spring 2010 Houston meeting were approved as submitted.

  The Chair reported that a one-year PAR extension has been requested and will be considered at the December 2010 NESCOM meeting.

  The Chair reported the results of the IEEE Sponsor ballot of PC57.12.20-D6 dated September 2010.
  - Ballot Open Date:24-Sep-2010
  - Ballot Close Date:24-Oct-2010
  - RESPONSE RATE:
    This ballot has met the 75% returned ballot requirement. 92 eligible people in this ballot group. 67 affirmative votes 7 negative votes with comments 0 negative votes without comments 2 abstention votes
  - 76 votes received = 82% returned 2% abstention
  - APPROVAL RATE:
    The 75% affirmation requirement is being met. 67 affirmative votes 7 negative votes with comments.
  - 74 votes = 90% affirmative

Submitted By: **Stephen Shull**
Date: **10/27/2010**

- Comments: 47 Must Be Satisfied Comments:16

The WG reviewed the 47 comments, focusing on the negative comments that must be satisfied. Based on the input of the WG, the Chair will prepare the comment response and submit the document for a re-circulation ballot. The ballot is to be completed by the Spring 2011 meeting in San Diego.

Meeting adjourned at 10:45am.

- C57.12.28, 29, 30 & 31 – Enclosure Integrity – Bob Olen reported.

There was an introduction of members and guests. The IEEE Patent Policy was presented to the group by Bob Olen. The group was asked if there were any patents that needed to be disclosed. None were announced to the group. There were no Consultants present which were sponsored by a secondary source. A quorum of the Working Group's membership was NOT present. The lack of a quorum was caused by the scheduling conflict with the Wind Power Transformer Task Force meeting.

The minutes of the March 9, 2010 working group meeting were presented. However, the minutes could not be approved due to the lack of a quorum.

C57.12.30 Pole Mounted standard for Coastal Environments and C57.12.31 Pole Mounted standard

RevCom approval for both standards was granted on June 17, 2010. IEEE publication of both standards was completed on October 7, 2010. Copies of the standards will be provided to the members of the Working Group in the very near future by IEEE.

C57.12.28 Standard for Pad Mounted Equipment - Enclosure Integrity

PAR approval was received on September 30, 2010 and a line item review of the standard was then started. The definition of the padlock device was discussed. The mounting of pad mounted equipment to the concrete pad was reviewed. The working group was asked to consider installation options to obtain security around the base of the cabinet. The water resistance requirement of the cabinet was also discussed. Two members of the Working Group volunteered to review the Enclosure Integrity Test Method to determine if any updates are needed to the tooling specified in the standard. A problem has been identified with the Munsell color designation included in the standard. Members of the Working Group were asked to bring a 3" x 6" test panel painted with their current pad mount green coating system to the next meeting. A color comparison will be conducted at the next meeting. A very brief review of the coating tests was conducted. Several of the tests will require some slight modifications.

C57.12.29 Standard for Pad Mounted Equipment - Enclosure Integrity for Coastal Environments

PAR approval was obtained on September 30, 2010. A request was made for the Working Group to review the outdoor corrosion test method and to identify alternative outdoor test sites or a test method that would yield results in a shorter time period.

The meeting was adjourned at 9:20 AM

- C57.12.34 – Three-Phase Pad-Mounted Transformers – Ron Stahara reported.

Ron Stahara called the meeting to order. To establish a quorum, a role call of the members was made. From this a quorum was declared. Ron asked that everyone introduce themselves by giving their name, company and location. Also, an attendance roster was circulated. The IEEE Patent Policy was presented to the group by Ron Stahara. The group was asked if there were any patents that needed to be disclosed. None were announced to the group. A motion was

Submitted By: Jerry Murphy
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made by Jerry Murphy and seconded by Gael Kennedy to accept the minutes of the Lombard meeting. It was approved by acclamation with no corrections.

Ron asked if the previous working group that had prepared the 2009 version of this standard had received their complimentary copy of this standard. It was found that only Steve had received the copy. Steve stated he would get with Matt Ceglia and obtain a copy to each individual. Ali Ghafourian had purchased the standard since he didn't receive one. e asked if he could get his money back. Steve said he would make this request of Matt.

The working group reviewed the topic of extending the range of the standard to 10 MVA in the new PAR. The concern was the move from Category II to Category III for the 7.5 and 10 MVA sizes as related to Table 2 which lists the nominal impedance levels for the Transformers under this standard since the Category III transformer includes the system impedance with the transformer impedance in through fault calculations. After some discussion it was decided that at these voltage levels and system configurations, it would not be necessary to consider this as an issue and we would just extend the table impedance specification.

Steve stated that based on the information that was shared today, he would produce a Title, Scope and Purpose and he would submit a PAR to NESCOM. The goal would be to acquire a PAR by the next meeting.

The meeting adjourned at 2:40 PM

- C57.12.35 – Distribution Transformer Bar Coding – Lee Matthews reported.

  The WG met on Tuesday, October 26, 2010 at 1:45 pm in the Tom Thomson Room of the Hilton Downtown Toronto Hotel in Toronto, Canada. A quorum was present for the meeting.

  The chairman reviewed the patent legal issue and asked whether there were any patents or patents pending that would affect the WG or standard. None were identified.

  The minutes of the March 8, 2010 meeting in Houston, TX were reviewed and approved.

  The chairman discussed the current status of the PAR. The PAR was approved June 17, 2010 and will expire December 31, 2014. Draft 1 (D1) of the standard was reviewed. Bob Olen agreed to review ASTM G154 requirements and different types of bar code readers and will advise the WG group at the next meeting.

  There was a discussion on different identification technologies besides bar coding. It was agreed to maintain the current Title, Scope and Purpose until more information is gathered on other identification technologies. A survey among end users was suggested to determine types of identification used.

  The Chairman requested the WG to review Draft 1 of the document and forward comments back to him by the end of January 2011.

  The meeting was adjourned at 2:35 pm.

- C57.12.36 – Distribution Substation Transformers – Jerry Murphy reported.

  Jerry opened the meeting at 8:00 AM on Monday October 25, 2010, in the Tom Thomson Room of the Toronto Hilton; introductions were made, and the attendance rosters were circulated. No new patents were disclosed. Since this Working Group was being reactivated after publication of the current standard document in 2007, no roll call of members was necessary to verify quorum since this was the first meeting.

  A request was made by one person in attendance to have the latest draft of the document available for review on the Distribution Transformer Subcommittee webpage.

  Jerry asked the people in attendance if there were any specific comments for discussion. He mentioned the options that the working group had for the next steps in the working group activities. One option was to go for reaffirmation. Gary Hoffman said that if the document went for reaffirmation, he would vote negative. Gary mentioned that there were several accessories that may have to be considered to be added to the standard. He said that the draft document of C57.12.10 was practically completed and ready for balloting. In his opinion, it was necessary to

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compare the requirements of both C57.12.10 and C57.12.36, to ensure that the differences between Distribution and Power Transformers were clarified, and to identify opportunities for improvements and changes to C57.12.36. There were other comments that supported this opinion.

Steve Shull made a motion that Gary Hoffman and Jerry Murphy get together to review the current version of C57.12.36, and compare it with the latest document of C57.12.10 that was currently submitted to REVCOM. Ron Stahara seconded the motion and it passed unanimously. After this meeting between Jerry and Gary is held, a survey within the working group may be required to get further comments about the differences between the two standards, which will define the course of action. This could range from withdrawing the standard to specific improvements that should be made to it.

The meeting was adjourned at 8:40 AM.

- C57.12.37 – Electronic Test Data Reporting – Did not meet.
- C57.12.38 – Single-Phase Pad-Mounted Transformers – Michael Falkenberry reported.

The meeting was called to order by Ali Ghafourian.

A roll call was conducted to determine if a quorum was present. Twenty (20) of the thirty-three (33) working group members were present with one additional member arriving later. Therefore, a quorum was present.

The members were asked if there were any patent issues that needed to be identified associated with the work on this standard and none were identified.

The minutes from the March, 2010, meeting in Houston were presented for review and were approved.

Marcel Fortin stated that for distribution transformers, a test was needed to ensure fast dynamic pressure withstand of the tank due to arcing faults. He suggested that the working group recommend to the Distribution Transformer Subcommittee that a Task Force be established to study and determine the appropriate arc fault test for all tank shapes. It was determined through further discussion that a new task force was not needed as Carlos Gaytan's Tank Pressure Coordination Task Force is first going to address static pressure but will then procede to address dynamic pressure.

Tom Holifield provided a draft drawing of low voltage bushing configurations for all voltages that fall under the new document scope for "480/240 volts and below." The drawing included low voltage ratings of 120/240 and 240/480 volts that we had discussed not including in the standard at the Houston meeting. After further discussion, a motion was made and seconded that 120/240 and 240/480 volt bushing arrangements be included in the standard. The motion was voted on and of the 20 members present at that time, less the chair (leaving 19 voting members), nine (9) were in favor of including these voltage ratings, five (5) were opposed, and five (5) abstained. The motion was, therefore, neither passed nor defeated, and it was tabled for further discussion at the San Diego meeting.

Figure 1A shows the dimension from the outside edge of the X1 spade to the cabinet wall as a minimum of 3 inches for a Type 1 design. A suggestion was made in the Houston meeting to consider changing this minimum dimension from 3 inches to 3.5 inches, similar to the dimension for the Type 2 design in Figure 2B. A survey was sent out to sixty-two (62) working group members and guests to see how this dimension is being specified. Only thirteen (13) responses were received, not enough from which to make any conclusions. The issue is with the type connector being used. It was suggested that the dimension be left as is and allow the user to specify any exception to that dimension in their specifications. It was also mentioned that if the user changes this dimension, it could affect other dimensions. All present were asked to return the survey and this would be discussed further at the San Diego meeting.

A request was made at the last meeting for a review of Dimension A in Figure 1A to possibly increase that minimum dimensional requirement, and similarly in Figures 1B, 2A, and 2B. After discussion, it was decided that this dimension will remain as currently in the standard.

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In the table of dimensions on Figure 1C, the last line of the table has "(when specified, see Note 7)" which refers to large interface separable connectors. It was requested that "when specified" be removed. After a discussion of the large versus small interface connectors for 35kV applications, a motion was made and seconded that the next-to-last line of the table, which is for small interface connectors, and the last line of the table, which is for large interface connectors, both be revised to reference the appropriate section from IEEE Standard 386 and to delete the current text in parenthesis for the last line. The motion passed unopposed.

The meeting was adjourned at 12:00 p.m.

- C57.15 – Step-Voltage Regulators – Craig Colopy reported.

  Membership roster shows 23 members total - Need 12 for Quorum - 15 showed up. .

  Lombard unapproved Minutes were published one year ago and were approved at this meeting. Motion: by Dan Sauer and second by Ron Stahara. This motion was unanimous approved.

  Motion for approval of the Porto Portugal unapproved minutes was made by Lee Matthews and seconded by Ron Stahara. This motion was unanimous approved.

  Announcement for notification of the Patent issues and associated conflicts was made with no response.

  IEC TC 14 Dual Logo Comments - Paul Jarman, chairman of the IEC Technical Committee 14 Power Transformers who does the coordinating of the technical groups had discussions on the possibility of a dual logo with comments at their meetings in Brazil and Washington - The Standard C57.15-2009 was reviewed by the members of the TC14 committee and comments were received from and documented from the member nations (14/637/DC). Over all response from the TC14 membership was very positive.

  Paul Jarman said that now the IEC will decide on the approach that needs to be taken to make this standard more IEC friendly. The first try will leave the document as is, then if needed based on feedback from TC 14, a joint review team would be set up from IEEE and TC 14 to harmonize document further for use in IEC community. Comments received from the Great Britain, Italy, and Japanese delegations may require an addendum or such in an IEC Dual document if the main document is acceptable to TC 14 committee. Responses to these comments on terminology and Temperature Rise Limits (IEC 60076-2) will be addressed and given to the Technical Committee for review before the TC14 Beijing Meeting in November.

  C57.15-2009 standard has been available to the industry since the first of the year. No comments or concerns were brought up by the members or guests on the use of this document.

- TF – Transformer Efficiency and Loss Evaluation (DOE) – Phil Hopkinson reported.

  The Task Force on Dielectric Transformer Efficiency and Loss Evaluation (DOE Activity) was called to order at 3:15 PM. There were 70 attendees, 26 members, and 44 guests with 5 requesting membership. A quorum was present. There were no patents to disclose. The Minutes from the March 9, 2010 meeting in Houston, Texas, were approved as written.

  1. Mr. Hopkinson reviewed slides from his presentation titled “Distribution Transformer Energy Efficiency Task Force.” The presentation is posted on the IEEE Transformer Committee Website under the Distribution Transformers Subcommittee.

  1.1. MVDT and Liquid-immersed transformers

  Current DOE energy efficiency rules are stringent, falling between TSL-4 and TSL-5 for

  - TSL-1: The NEMA TP 1 standard level
  - TSL-2: 1/3 of difference between TP 1 and minimum LCC (TSL-4)
  - TSL-3: 2/3 of difference between TP 1 and minimum LCC (TSL-4)
  - TSL-4: Minimum LCC (Life-Cycle Cost)
  - TSL-5: Maximum energy savings with no change in LCC
  - TSL-6: Maximum energy savings

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Environmental groups did not feel that the efficiency levels were stringent enough and filed a lawsuit against DOE on the grounds that carbon was not adequately monetized in the rulemaking. A settlement was reached to open the rulemaking process earlier, though the effective date for the new rules would remain unchanged. Dates for the DOE Rulemaking as a result of lawsuit settlement:

- NOPR October 2011
- Final Rule October 2012
- Effective date 1/1/2016

Lawsuit settlement by the environmentalists requires review of efficiencies by October 1, 2011. Standards may be raised or left unchanged. Standards can never be lowered or dropped (no backsliding).

Preliminary Analysis for the ANOPR is being conducted by Navigant Consulting, Lawrence Berkeley Lab and others. They are exploring issues such as cost of materials, loading and energy costs, market size, best technologies, design optimization, amorphous core, electronic transformer, hexaformer technology and others. Their Findings are estimated to be released by 1st Q 2011.

1.2. LVDT transformers

Last updated in 2006 and based on NEMA TP-1. DOE has 6-7 year review requirement. Attempt underway to synchronize LV publications with MV and estimated to be released by 1st Q, 2011. NEMA Premium Efficiency is one option to consider.

1.3. IEC Standard for Energy Efficiency

It was noted that the IEC TC14 is starting to address energy efficiency for distribution transformers. It will be discussed at their next meeting November 2010 in Beijing. Michel Sacotte of France will be the Convener (working group leader). Work will address Medium Voltage Liquid and Dry and is will be based on existing standards. Working Group delegates from the US are being solicited. Contact Phil Hopkinson if you are interested.

2. New Business

There was no new business.

The next meeting is planned for the spring in San Diego. The meeting adjourned at 4:33 PM.

Reported by: Scott Choinski, October 26, 2010.

- TF – Tank Pressure Coordination – Carlos Gayton reported.

Carlos opened the meeting at 3:15 PM on Monday October 25, 2010, in the Tom Thomson Room of the Toronto Hilton; introductions were made, and the attendance rosters were circulated. No new patents were disclosed. Quorum was reached with 15 of 26 members present.

The minutes of the spring 2010 meeting were presented and a motion was made by Ron Stahara and seconded by Alan Wilks to approve the minutes. Motion passed unanimously.

Carlos then presented a document with the report of the progress of the Task Force. The document contained a summary of:

1) Agreements from the last meeting

2) A proposal for a standardized text for Tank Withstand and PRV Requirements, and

3) Status report on documenting the history behind tank strength and PRV requirements for future reference.

Regarding item 1), even though on the last meeting it was agreed that this Task Force would be focused on covering the static pressure requirements, Marcel Fortin made comments at the padmounted transformers working group meetings in Toronto, about revisiting the evaluation for the potential adoption of dynamic pressure requirements for padmounted transformers. It was

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agreed at these meetings that this Task Force would include this subject as part of its future work to be addressed once the work underway on static pressure requirements is completed.

On item 2), the summary of the progress made since last meeting was:

- A proposed standardized text was presented for the PRV requirements, trying to resolve several editorial and unit notation inconsistencies. This proposal was based on C57.144-2004, IEEE Guide for Metric Conversion of Transformer Standards

- Regarding Tank Withstand and PRV Requirements, a summary of the research made was presented, and among the main conclusions, it was noted that after the proper consideration was made of the main factors involved to calculate the internal pressure on distribution transformers, such as oil expansion, pressure and temperature conditions on the oil and the gas space, and the solubility of the gas in the transformer oil, the actual calculated and measured pressure values were significantly lower than those that would otherwise be calculated by only using the Gas Law and ignoring the effect of gas solubility. Also, that the accurate equations were available for calculation of the internal pressure on transformers with these considerations, and that those pressure values were consistently below 49 kPa(gage) (7 psig).

Therefore, the present requirements of 49 kPa(gage) (7 psig) for tank withstand without permanent distortion and cracking pressure for the PRV of 69 kPa(gage) (10 psig) were considered to be adequate, since the main purpose of the PRV was to prevent an unsafe condition of the transformer static pressure due to either sustained overloading, or because of a high impedance internal fault.

Regarding item 3), a course of action was proposed as the next steps for review during the next spring meeting in San Diego. Steve Shull made the motion to approve for the TF to complete the informative annex of the history of tank strength and PRV requirements. This motion was seconded and it was approved unanimously.

Carlos appointed Justin Pezzin to the role of Secretary of this Task Force.

Near the end of the meeting there was some discussion about whether the PRV flow specified in the standards would be adequate for the larger distribution transformers. Steve Shull commented that this meeting was still discussing only the static pressure failure mode at the moment, and that the dynamic pressure failure mode will be discussed after this portion of the TF work has been completed.

As an additional topic for the next spring meeting in San Diego, Marcel Fortin will make a 15 minute presentation of a summary / review of the current internal arcing fault test protocols and their applications.

The meeting was adjourned at 4:15 PM

There was no other Old Business.

Under new Business, Carlos Gayton wanted to make the subcommittee aware of a discussion concerning C57.12.90 Section 11.0. He said a request that a survey of temperature tests be done of the distribution transformer manufacturers and that the subcommittee be aware that the there were a number of changes in this document that could drastically affect the heat run test of a distribution transformer. Marcel added there are many sections that will be revised and each should be looked at by the Distribution Transformer Subcommittee members but specifically the proposed back to back temperature testing method.

Ali Ghafourian reminded everyone that a Task Force for wind power transformers is currently meeting under the auspices of the Power Transformer Subcommittee. He recommends it be moved to the Distribution Subcommittee. He was concerned that the IEC document that the Task Force is proposing to use may not completely describe this product. He strongly encouraged the group to review the IEC standard that is being proposed for use by this group. Phil Hopkinson brought up that there are very subtle differences between class 1 power transformers and distribution transformers but he feels that the application tends to make the transformer fit in the Power Transformer classification. Steve added there are other issues including over-voltage and

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harmonic content that have to be considered and this group may need to be part of the Performance Subcommittee. Marcel responded to Phil comment regarding the distinction between a Distribution and a Power Transformer by asking where the distention between the two could be found. Steve replied that even though there are definitions in C57.12.80, the question of where this Task Force should be place will be decided by the ADCOM committee. Gary Hoffman stated C57.12.80 needs to do a better job in stating these definitions and invited all interested to attend the Standards Subcommittee meeting.

There were no additional new items.

The meeting adjourned at 10:35am.

Submitted By: **Jerry Murphy**
Date: **10/27/2010**