Dry Type Transformers Subcommittee – Unapproved Meeting Minutes
October 24, 2012 – Milwaukee, WI USA

5.5 Dry Type Transformers SC **Acting Chair Tim Holdway**
Acting Secretary Sheldon Kennedy

5.5.1 Introductions and Approval of Minutes

The Subcommittee met on October 24, 2012 at 1:30 PM. There were 20 members (therefore we had a quorum) and 7 guests present.

The minutes of the Nashville, TN meeting were approved.

5.5.2 Working Group/Task Force Reports

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

5.5.2.1 IEEE PC57.12.01 - Dry Type General Requirements **Chair Tim Holdway**

The working group met in the Mitchell Room of the Hilton Milwaukee City Center Hotel.

The meeting was called to order at 1:45 PM by Chairman Tim Holdway

The meeting was convened with 16 members (out of 24 – therefore a quorum was reached with 67% attending) and 12 guests present with 4 requesting membership.

The minutes of the Nashville March 12, 2012 meeting were approved.

Motion: Subhas Sarkar
Second: Phil Hopkinson

Old business

Proposed Changes by Marcel Fortin

- Table 5
  - A motion was made by Casey Ballard to remove Note 2 and was seconded by Jim McBryde. The motion did not carry. The group agreed to remove the superscripts from the notes: S, 1, 2.
- Section 7.1
  - Proposal rejected – will remain 'as-is'
- Section 7.3.3.1 and 7.3.3.2
  - Proposal accepted as circulated via email
- Section 7.3.6.1
  - Proposal accepted as circulated via email
- Section 7.6
  - Proposal rejected – will remain 'as-is'
- Section 7.8
  - Proposal rejected – will remain 'as-is'
- Section 7.10
  - Proposal accepted as circulated via email
- Section 8.1
  - Proposal accepted with use of 'other accredited labs'
- Table 17
  - Proposal rejected – will remain 'as-is'

Proposed Changes by Aleksandr Levin

- Section 5.10.3.5
  - Proposal accepted in previous WG meetings

- Table 9
  - Proposal accepted as circulated via email
- Section 5.11.1
  - Tim to send proposal to WG members
- Sections 5.11.2.1, 5.11.2.2, and 5.11.2.3
  - Tim to send proposal to WG members
- Section 5.11.3
  - Tim to send proposal to WG members
- Section 7.5d
  - Proposal rejected – will remain 'as-is'
- Table 5
  - Addressed earlier in WG meeting

Proposed Change by Shankar Nambi

- Section 1.2
  - Proposal accepted with addition of 'and manufacturing'

Altitude correction

- Proposal was accepted when circulated by email with the change of 'When specified for installation and/or testing above 1000 m (3300 ft),'
- A lengthy discussion followed that detailed that the values in Table 1 are not just for air clearances – nor are they just for solid insulation.
  - The Table 1 values will not require a large enough air clearance correction for terminals or bushings if the initial design is a minimum clearances.
  - IEEE Std 4 should be used for air only clearances such as terminals, taps, and bushings.
  - The Chair will attempt to contact Don Kline to determine the origin of the values in Table 1 upon the suggestion of Wes Patterson
  - There was concern that the application of Table 1 to all different types of dry type transformers would lead to higher cost for certain winding types and/or insulation systems that are not as dependent on air for dielectric clearances.

New business

- Phil Hopkinson made a motion to have all medium voltage windings for dry type transformers to have a 'QA' impulse test as a routine test with the 'QA' test consisting of a reduced (50%) wave and a full (100%) wave with a 1.2x50 micro second wave shape. The motion was seconded by Jim Atwiler, but no vote took place as the discussion was cut short by time limitations. Phil will make a written proposal to the Chair who will distribute it to the group for a vote.

Next meeting: Spring 2013, Munich Germany, March 17-21

With no further business, the meeting was adjourned at 3:00 PM.
Motion: John K. John
Second: Jim McBryde

5.5.2.2 WG Dry Type O&M Guide C57.94 — Chair Dave Stankes

The meeting for the revision of IEEE C57.94 took place at 4:45PM on Monday, October 22, 2012 in the Oak Meeting Room at the Hilton City Center, Milwaukee, WI. Introductions were made and an attendance sheet was circulated. This was the second meeting of the C57.94 working group. There were 21 participants including 12 members. (Quorum achieved). Three attendees requested membership.

The minutes from the Spring 2012 Meeting in Nashville were approved.

Chairman reviewed the proposed agenda, and announced that (time permitting) Dr. Valery Davydov would present his findings on effect of moisture on failure of dry type transformers, which was presented at a recent technical seminar in Las Vegas.

The chairman provided a brief history of C57.94 WG and showed activity since Boston meeting which included two teleconferences (8/28 and 10/02). He also pointed out that Reaffirmation Comments obtained from 2006 and 2011 ballots provided a good starting point for needed changes to the document.

A summary slide containing page, clause, comments, etc. leading to current Draft 4 of document was reviewed. Areas of change included clause 4.4, 4.9.3, 4.10.1, and fair amount of changes to Clause 6 for Testing. There were several changes to references, with a new bibliography section being created for those not directly referenced in document.

The chairman presented Draft 4 of the document with included changes from the previously discussed summary slide.

There was very active and rich participation from members – special mention is made of Vijay Tendulkar, Casey Ballard, Robert Thompson, and Roger Wicks. The group discussed insulation resistance, and the possible inclusion of additional information on how age and test conditions may affect measured insulation resistance. Vijay stated that insulation resistance can change as it ages from new transformer to when the same transformer is five or more years old. He also stated that in his experience insulation resistance should not be measured at greater than 50% of the applied test voltage. Casey pointed that sufficient information on conducting insulation resistance testing is covered in C57.12.91, and is referenced in C57.94.

It was recommended that a reference to the the safe operation of tests be included in the document. Vijay said that their organization eliminated core strap to avoid mistakes at site and now permanently ground the core. He also added that if shield is used, winding terminals must be ground to discharge the collected charge. (Both AC and DC test.)

The need for more thorough review of Audible Sound clause was targeted for future discussion. It was stated that the information found in this clause is consistent with information found in manufactures guides that were reviewed by the WG.

An earlier comment from Sheldon Kennedy (from last WG meeting in Nashville) was discussed regarding the need for a comment about contacting the original manufacturer for more information when retro-filling a Freon Filled transformer. There was also some discussion regarding the presence of transformers with Freon, SF6, etc.

The WG meeting concluded with Dr. Valery Davydov presenting Moisture Related Failure in Dry Type Transformer at an Australian Utility. The presentation discussed the possible influence of contamination dust and high humidity on failure of an OVDT transformer.

The WG meeting adjourned at 6:00PM.

5.5.2.3 WG Dry Type Loading Guide C57.96 — Chair Rick Marek

The sixth meeting of the working group was held on Tuesday, October 23, 2012 in the Oak Meeting Room of the Hilton Milwaukee City Center at 3:15 P.M. With 15 guests and 11 of 20 members in attendance, there was a quorum. The minutes of the last meeting were approved as submitted. Three guests requested membership.

Comments to draft 4 were submitted by Paulette Powell, Martin Navarro, Sanjib Som and Sasha Levin. Sasha's comments were used as the basis for review of the document.

- Sealed transformers as defined in the latest version of C57.12.80 will be added to the definition clause

- The meaning of "zero gauge pressure" as referred to non-ventilated transformers was explained by the group
- It was decided to add the term "per unit load" to the definition clause as defined in C57.12.80
- Remove the word 'define' that was present in the Time constant section
- The reference to the exponent 'm' was determined to be confusing and Sasha agreed to provide a clarified revision for the next draft
- The need for a forced air cooling equation was questioned to accompany equation 13 and the chair agreed to determine if it was omitted by error
- The chair requested the group to crosscheck the numbers in Table 2 which is based on Table 3
- A note was requested limiting Table 3 to 15000ft, corresponding to the latest proposed revision of C57.12.01
- The dashed versus solid line for Figure 1 was questioned and the chair agreed to verify, but noted that all of the figures were re-drawn and needed to be reviewed closely by the group
- It was agreed to make several changes to Table 4:
- Add Resin Encapsulated to the Vacuum Cast label and possibly add 200C as well
- Change the % label to P.U. and move the second P.U. column next to the first
- Expand the title to include "not exceeding maximum hot spot temperature"
- Define H and K and the halving constants for Tables 5 and 6 and explain the inclusion of the 8 halving constant
- There was a discussion concerning the removal of the curves in favor of equations and the group was requested to compare the previous version
- A suggestion was made to use ln(a) in the headers of Tables 5 and 6
- Juan Jose Gutierrez suggested adding an example of how to make a curve from Table 5 and 6 and agreed to submit a proposal

Tim Holdway motioned to adjourn at 4:35 PM and John John seconded the motion.

5.5.2.4 IEEE PC57.12.52 - Sealed Dry Type Power Transformers — Chair Sheldon Kennedy

There was no meeting of the working group as all activity of the working group was completed. The recirculation ballot was successful and the standard was submitted for the REVCOM December meeting.

5.5.3 Old Business

There was no old business.

5.5.4 New Business

Future Meetings were announced:

Spring 2013 - Munich, Germany

Fall 2013 - St. Louis, MO

Spring 2014 - Savannah, GA

There was a call for tutorial proposals.

5.5.5 Adjournment

Being no further business, the meeting adjourned at 2:05 PM