Dry Type Transformers Subcommittee – Unapproved Meeting Minutes
October 27, 2010 – Toronto, Ontario Canada

9.4 Dry Type Transformers SC **Chair Charles Johnson**
Secretary Lewis Powell

9.4.1 Introductions and Approval of Minutes

The Dry Type Transformer Committee meeting began at 1:34pm Wednesday, October 27 in the Tom Thomson room C of the Hilton Downtown Toronto Hotel with introductions of members and guests. There were 13 members and 8 guests present. As 18 members were required for a quorum, the Houston Texas meetings were not approved. The Chair then asked if anyone knew of any patent related issues; none were identified.

9.4.2 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:

9.4.2.1 IEEE PC57.12.01 - Dry Type General Requirements — Chair Tim Holdway

1. The working group met in the Johnston Room of the Hilton Toronto Hotel

2. The meeting was called to order at 11:03 AM by Chairman Tim Holdway

3. The meeting was convened with eleven (11) members (out of 21 – therefore a quorum was reached with 52% attending) and 10 guests present.

4. The minutes of the Houston March 8, 2010 meeting were approved.
   Motion: Mark Gromlovits
   Second: Sheldon Kennedy

5. Attendees were asked if they knew of any patents that may be related to the work of this working group. No patents or patent claims pertinent to C57.12.01 were identified by working group members.

6. Old business

Nameplate

After the Houston meeting Aleksandr Levin provided Tim Holdway with the draft C57.12.00 Section 5.12.2 part 13 for distribution to the WG. The proposal included adding the words 'DOE Compliant' to the nameplates. An informal polling of the manufacturers present showed that the addition of text on the nameplates was inconsistent in the industry - some did, some didn't, and each that did had their own version. A comment was made by Dhiru Patel that the DOE was considering a mandatory marking or text on all nameplates and the decision was made to table this discussion until after the DOE had made its ruling in the spring of 2011.

Altitude Correction

In Houston, Rick Marek stated that Section 4.2.5 is vague on what dielectric tests are affected for altitudes above 3300ft (1000m). Three written suggestions were distributed to the WG and the discussion revolved around the one submitted by Tim Holdway. Mark Gromlovits suggested a modification to the text proposed by Tim, but this never made it to the motion phase.

The discussion moved to the technical aspects of dry type transformers that make altitude correction difficult since they use a complex combination of solids and air for dielectrics. The values currently in Table 1 are for a complex insulation system as they do not match

the properties of air above 1000m per IEEE STD 4. The concern centered on the higher stresses placed on the solid inter-winding insulation resulting from the dielectric test value correction factors for the thinner air at higher (>1000m) altitudes, particularly for cast technology.

Art Molden pointed out that IEEE STD 4 – 1995 Section 16.4 addressed this issue and gave guidance on how the manufacturers could address higher inter-winding stresses on solid insulations. One option was to design for higher inter-winding stresses and the other was to prove the terminals (in open air) were suitably spaced through a fixture or coil simulation that would be dielectrically tested. A suggestion was made to add IEEE STD 4 as a reference in section 4.2.5, but this was not made a motion.

The meeting moved on to other topics with no open motions and no votes taken on this issue.

Partial Discharge

As an action item from Houston, Mark Gromlovits suggested that 20pC be used for all open ventilated (open wound non cast) transformers. Dhiru Patel suggested that this value was too low and the values be left 'as-is' for non cast dry type. Other suggestions included adding text explaining surface discharge in open ventilated or having no values for open ventilated at all. The group decided to continue the discussion after each member could do more research.

A motion by Rick Marek to use the test method and 10pC level for cast windings was seconded by Chuck Johnson and was passed by a vote of 6 for, 4 against, and 1 abstain.

The test method for open ventilated was not decided and Mark Gromlovits will provide a suggestion to the WG chair before the next meeting in San Diego.

7. New business
   No new business was raised due to time constraints
8. Next meeting: Spring 11: April 10-14, San Diego, California
9. With no further business, the meeting was adjourned at 12:18 PM.
   Motion: Rick Marek
   Second: Sheldon Kennedy

9.4.2.2 IEEE PC57.12.91 - Dry Type Test Code **Chair Derek Foster**

1. The working group met in Johnston Meeting Room of the Hilton Downtown Toronto. The meeting was called to order at 3:15 PM on Monday October 25, 2010. The working group met with 5 members and 9 guests present.
2. There were no patent issues regarding this standard.
3. The minutes of the last meeting, held in Houston, could not be approved, since not enough working group members were present for a quorum.
4. Old Business

   This standard is now open for ballot until November 21, 2010.

   The ballot pool has 101 members.

   The PAR for revision of the standard expires at the end of December, so a one year extension has been applied for.

Since there were not enough members at the meeting for a quorum, this was an informational meeting, and some of the topics proposed for consideration in the next revision were briefly discussed.

Marcel Fortin agreed to provide input for the next revision, regarding section 12 of the standard on short-circuit tests and also on section 10 on partial discharge tests.

A task force will be established within the working group for the next revision, to review the proposed revisions to temperature rise test procedures in section 11 of C57.12.90, to see how this may be used in the dry-type transformer test code.

Marcel Fortin gave a presentation to the working group on the loading back method of temperature rise testing. A copy of the presentation will be sent to all members of the working group.

5. The meeting ended at 4:00 pm.

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

1. The Working Group met on Monday, October 25, 2010 at 9:30 AM with 11 members and 5 guests present. Sheldon Kennedy chaired the meeting. There were two new members added during this Working Group meeting bringing the total WG membership to 14. We had a quorum for the meeting.
2. The IEEE disclosure statement was read. There were no patents pertaining to this standards work for which any members had awareness.
3. Minutes of the March 8, 2010 meeting in Houston, Texas were reviewed and approved.
4. Draft 3 of the document was placed on the IEEE Transformers Committee website. A survey was circulated to the Dry Type Subcommittee Draft 3 before the meeting. There were no real negative comments received, but there were some editorial comments and approved with comments returns.
5. The Working Group reviewed the changes made in Draft 3.
6. Casey Ballard commented that the document layout should be changed so that Table 5 fit into Clause 6.2 better instead of being on the next page, as it was due to the size allowing it to fit better there. Casey also volunteered to update some of the older hand drawn figures imported into the standard and make them electronic figures. Casey will try to get these back by the end of November for inclusion in the document.
7. Rick Marek commented that clause 5.5.2 should be C57.12.70, not C56.12.70. He also commented that clause 6.1.2 has a typo and should be “heat” transfer, not “het” transfer. Rick also commented that the reference in Clause 9.1 to C57.96, the dry type loading guide should not be mandatory as it relates to ambient temperatures. The Working Group decided to say that the wording should be changed to “refer to IEEE C57.96 for guidance.”
8. Gene Blackburn commented that Clause 9.3 should be Clause 9.5 in line 24 on page 11. He also noted that on page 17, line 19 the reference has a type and should be changed from “UEEE” to “IEEE”.
9. The above changes will be incorporated and the revised draft will be circulated among the Working Group members as a 30 day survey. If this is successful, and there are no other comments, the chair will try to get the document to an official ballot, hopefully by the end of the year.
10. There were no other comments.

11. There was no other old business or new business.

12. The meeting was adjourned at 10:30 AM.

9.4.2.4 WG for Revision of IEEE C57.16: Dry Type Reactors **Chair Richard Dudley**

The W.G. for the Revision of IEEE C57.16 (Dry Type Reactor T.F.) met on October 25, 2010, at 8:00 a.m. in the Johnston Meeting Room of the Hilton Downtown Toronto Hotel in Toronto, Ontario. There were 12 members and 6 guests present. There are 24 members in the WG, including 5 corresponding members; therefore, there was a quorum. The following are the highlights of the meeting:

1. Introductions were made and the attendance list circulated.

2. IEEE patent policy was reviewed and no issues were raised.

3. The minutes of the W.G. meeting in Houston, Texas were approved.

   Note: The minutes of the WG meeting in Toronto, Ontario will not be approved until the WG meeting in San Diego.

4. The results of the ballot of Draft #8 were reviewed: 90% response, 87% approved, 10 negative ballots. Seven of the negative ballots included arguments that were largely editorial and can easily be dealt with outside the WG meeting. Three negative ballots raised jurisdictional scope issues with Annex F. Is some material in Annex F dealing with CB TRV issues related to the application of reactors outside the scope of the IEEE Transformer Committee and more within the jurisdiction of the IEEE Switchgear Committee? Focus of the rest of the meeting was on resolving this basic issue. Highlights of the discussions are as follows:

   (i) Annex F will be somewhat simplified; eliminate details relating to switchgear and TRV impact. Appropriate switchgear standards will be referenced, especially PC 37.011, which is in draft stage.

   (ii) Pierre Riffon's draft, that he produced based on the ballot comments, seemed to meet the above criteria and was discussed in detail. Modifications were made to make the focus "the reactor" and "capacitance mitigation". It was agreed to put material related to reactor usage rationale at the beginning of the annex as it would also refocus the annex on "the reactor" and "application"; including the possible impact of the TRV seen by the CB. Capacitor application guidelines and possibly type test implications will be included; basically temperature rise test and short circuit test.

   (iii) Pierre Riffon will revise his draft for Annex F based on the discussion. It will be circulated to WG members for comment. A further draft will be produced and the Chairman will send it to Ken Edwards of the IEEE Switchgear Committee for approval. WG members are asked to look at the reactor TRV CB issues from both sides and focus on "the reactor" and "capacitance mitigation" vs the "CB" and "impact of TRV on the CB".

   (iv) Other comments from the ballot will be reviewed by the Chairman. Changes will be made by the Chairman or the Chairman will ask for help from the WG. It is hoped that a new draft of PC 57.16 can be ready, and even balloted, well before the San Diego WG meeting.

The WG meeting adjourned at 9:15 a.m.

9.4.2.5 WG Dry Type Loading Guide C57.96 Chair Rick Marek

1. The second meeting of the working group was held in the Varley Room of the Hilton Downtown Toronto Hotel at 1:45 PM with 12 members and 6 guests in attendance. Introductions were made, and the attendance sheet was passed around. There were no patent issues. As there was a quorum, minutes of the last meeting were approved as submitted.

2. The Title, Scope and Purpose were reviewed by the Chair. He then reported the results of the survey concerning the IEC and IEEE loading guides, which were circulated to the members. The following questions were asked:

   - IEC document should be used as it is with no changes 0
   - IEC document should be used with small changes 2
   - Revision should be a blend of the IEC and IEEE documents 8
   - IEEE document should be revised 2

3. The Chair asked for comments on the two circulated documents. Since there were none, he described the differences in the two documents. The IEC document arbitrarily defines the life of a transformer at 20 years, or 180,000 hours, and is not based on any specific test data. The IEEE document isn't tied to a specific life time, but is based on actual tested insulation systems for open wound units. The IEEE guide then addresses cast transformers in a second complete document within an annex, similar to the IEC, since there are no published cast insulation systems. However, no specific life time is mentioned. This prompted a large discussion about insulation systems, material testing, differences between IEC and IEEE procedures and the differences in technologies.

4. The Chair then noted that this standard is really a guide for the user and asked who in the group actually uses the guide. Three of the four users in the group each related experiences, although none actually used the document. It was noted that while the document is not generally used by the manufacturer, it does document dry-type product capability and is a communication tool for the customer. In many cases the user is more familiar with liquid-filled units and needs tutorial information concerning dry-type transformers. It was also clarified that the document scope does not include 600 volt class units.

5. Mark Gromlovits suggested that the IEC and IEEE standards be compared side by side. The Chair asked for volunteers to compare the two documents and to select the portions that should be used in the revised guide. He will assign the sections. Six members volunteered: Jim Antweiler, Derek Foster, Mark Gromlovits, Tim Holdway, Rogelio Martinez and Dhiru Patel.

6. The Chair suggested an approach similar to the IEC standard with one standard for dry-type, which includes both open wound and cast in a single document. The IEC defines the slope by selecting the "halving constant" and then arbitrarily assigns the hottest spot temperature to a life of 180, 000 hours, where the hottest spot temperature is 10 degrees less than the insulation thermal class. This is the same hottest spot temperature used by IEEE and is independent of the different ambient temperatures used by the two standards bodies. However, he suggested one difference in that cast should be assigned a 6 degree "halving constant" as in the IEC guide but open wound should be assigned 8 or 10, which is more correct for that technology. The manufacturer would also have the option of using a tested number if available, as noted in the IEC document.

7. Dhiru Patel agreed to review the computer program in the IEEE standard, and possibly convert it to a spreadsheet that could be a very useful tool appended to the published document. The Chair recommended the removal of the loading tables and curves in favor of equations, which is similar to the IEC standard. However, some objected to the loss of the historical curves, which must be revised since they are actually incorrectly drawn in the current IEEE document. Phil Hopkinson and Manguesh Rajadhyaksha volunteered to research the standard and recommend the historical portions that should be moved to an informative annex.

8. The meeting adjourned at 2:55 PM.

9.4.3 Old Business

There was no old business.

9.4.4 Chairman's Remarks

1. Next meeting will be April 10-14 2011 in San Diego, California at the Catamaran Resort Hotel at $145 per night.
2. Working Group Practices and Procedures Manual has been approved and is available on the transformers website.
3. WG/SC Staffing
   - Should we have a backup for SG/SC officer to insure that development proceeds?
   - WG Secretaries or co-chairs are recommended.
4. Quorums: WG and SC membership
   - No Quorum limits our development and decision making.
   - Roster cleanup is recommended.
   - To insure SC business can be conducted, low attendance SC members will be offered option of participating as a corresponding member.
   - Future request for SC Membership will require confirmation from 2 WG chairs of active participation and Regular attendance at SC meetings (at least last 2 years)
   - When unable to attend, contact the subcommittee or working group chair.

9.4.5 New Business

1. There was no new business.

Being no other business, the meeting was adjourned at 2:30pm.