Dry Type Transformers Subcommittee – Unapproved Meeting Minutes
October 17, 2007 – Minneapolis, Minnesota

8.10 Dry Type Transformers SC — Acting Chair Paulette Payne

8.10.1 Introductions and Approval of Minutes

Meeting was held at 1:30 pm on Wednesday, October 17th, with 12 members and 4 guests, of whom three requested membership. The minutes from the Dallas meeting were approved as written.

In the absence of the SC Chairman Charles Johnson, Paulette Payne chaired the SC meeting and Roger Wicks functioned as acting secretary.

8.10.2 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:

8.10.2.1 WG Dry Type Test Code C57.12.91 — Chairman Derek Foster

1. The working group met at 3:15 pm with 11 members and 5 guests present.
2. There were no comments regarding the minutes from the March 12, 2007 meeting in Dallas. The minutes were approved as written.
3. The Chairman asked if anyone present had any information regarding patent issues, which may affect the work of the group. No replies were received.
4. Professor Eberhard Lemke gave a presentation to the working group on partial discharge measurement in dry-type transformers, and the relevance of C57.113, Guide for Partial Discharge Measurements in Liquid-Filled Power Transformers and Shunt Reactors, to this working group.
5. There being no new business, the meeting was adjourned at 4:30 pm.

8.10.2.2 WG Dry Type Thermal Evaluation C57.12.56/60 — Chairman Roger Wicks

The working group met in Minneapolis at the Hilton Minneapolis at 1:45 PM on Monday, October 15, 2007 with 5 members and 10 guests present. Attendees introduced themselves and signed a roster.

The Chair reviewed the minutes from the last meeting, which were approved as read. The chair reviewed the patent documents for our meeting, and no patent related issues were noted for the work of this working group.

The bulk of the meeting was spent discussing changes agreed upon at the last meeting, including:

Moving the simulated impulse testing to the annex. Bill Simpson mentioned that this may create some issues in that most, if not all of the approved systems in use today used this method. It was also suggested that we may want to consider retaining this method in the annex as a Normative "alternative" method.

The chair again discussed the need for some simplified drawings covering open-wound technologies and Mark Gromlovits agreed to help with this. Rick Marek also noted that all of the drawings we use will need to be in TIF format. Mark will check with Jeewan to see if he has the original files.

There were further discussion regarding the methods required for thermally evaluating LV windings which are outside the scope of this document, but could be covered by IEEE 259. In the original C57.12.56 document, the LV windings were required to be tested, wheras in the original C57.12.60, testing of the LV windings was not included.

New Business:
We discussed the need to revise the title and scope of the document, changing the word "ventilated" to become "open-wound". This more accurately describes the equipment tested to this requirement, and also covers testing of dry-type sealed transformers, which are not covered under any other test procedure. The WG chair will submit a PAR revision as well as a PAR extension (already done).

Clause 4.2.1 (b) should including a requirement for bifilar windings in order to facilitate turn-to-turn testing.

It was suggested to review the estimated time per cycle requirements in Table 1 to be reflect more realistic aging cycles which would be required by a testing company (increments of 24 hours). For example, appropriate numbers may be 24/96/336 hours vs. the 30/100/300 hours in our current document.

The chair agreed to compile all of these changes, along with the new graphics and circulate a survey ballot to the dry-type subcommittee and the working group members.

Meeting adjourned at 3:15 PM.

8.10.2.3 WG for Revision of IEEE C57.16: Dry Type Reactors Chairman Richard Dudley

The W.G. for the Revision of IEEE C57.16 met in the Hennepin / Carver Meeting Room of the Hilton Minneapolis Hotel in Minneapolis, Minnesota on Oct. 15, 2007 from 8:00 a.m. to 9:15 a.m. There were 9 members and 3 guests present. The following are the highlights.

1. Introductions were made.

2. The minutes of the W.G. meeting in Dallas were approved.
   Note: The minutes of the Minneapolis meeting will not be formally approved until the next meeting in Charlotte, NC.

3. IEEE patent policy was reviewed and no patent issues were identified.

4. The remainder of the meeting was devoted to the revision of IEEE C57.16; outstanding issues from the Dallas meeting, issues raised in correspondence and Draft #1 of the revision of IEEE C57.16 prepared and distributed by the Chairman to W.G. members prior to the meeting. The following are the highlights.

   (i) "Annex F" covering CB TRV issues associated with the application of CLRs was discussed. Fred Elliot has asked for input from Ken Edwards who works at BPA and is a member of the IEEE Switchgear Committee. Pierre Riffon again reiterated the need for Annex F as there have been CB failures due to TRV issues associated with the application of CLRs.

(ii) Sound measurement of FRs was discussed. Klaus Papp and Christoph Ploetner will upgrade the current material. They will also draft a clause "Background Information" to be included after "General". Information to be covered includes; contractual site measurement of sound vs. factory testing (Per Pierre Riffon site measurement may be more meaningful as harmonics are all present simultaneously; including phase relationships, vs. one at a time in factory testing.), rationale behind factory testing (Factory testing can be meaningful if all major harmonics are considered and resonances are assessed), role of factory testing to verify calculations (and as such can be regarded as a "GO" or "NO GO" test, etc.

(iii) Clause A.9 on "de-Q'ing" of filter reactors was reviewed. Information will be added on the possible impact of de-Q'ing on the operating temperature of the FR conductor insulation system; depending on the type of de-Q'ing employed. Basically de-Q'ing should not impact the service life of the FR insulation system. The Chairman will draft the material.

(iv) Annex D on reactors in enclosures was discussed. The Chairman will provide a list of reference papers to be included in a clause to be called "Supporting Documentation" (vs. "Reference" or "Bibliography") per IEEE editorial staff guidance.

There are 2 types of enclosures for reactors; manufacturer supplied (to which test code applies) and "user" erected. A clause will be added (vs. a note per the Dallas minutes) covering "user" erected enclosures re information that should be supplied to the manufacturer by the user. Jack Aroman will provide a draft.

(v) Clause E.4 of Annex E will be extended to include more information on indoor installation of reactors; critical issues, information the user should supply to the manufacturer, etc.

(vi) Reference material in Annex F and other annexes should be titled "Supporting Documentation" to be in line with IEEE editorial requirements.

(vii) Table 5 was discussed. Test levels for the turn-to-turn test should be first peak crest voltage and not RMS. Obsolete insulation levels should be removed and other test levels updated to be in line with work being carried out in Phil Hopkinson's T.F. Pierre Riffon will modify Table 5.

(viii) Should the turn-to-turn test be extended to higher voltage levels as an alternative to the lightning impulse test; up to 450 kV BIL? The turn-to-turn test first peak crest voltage should be 85%-90% of BIL. The Chairman will review and report to the W.G.

(ix) The Chairman stated that his objective would be to prepare Draft #2 prior to the Charlotte meeting. The Chairman also requested help in correcting editorial issues resulting from the very poor conversion of the current version of IEEE C57.16 from "pdf" to WORD by IEEE. Although the Chairman's "Administrative Assistant" had done a great job correcting the WORD version supplied by IEEE there are still errors.

The meeting adjourned at 9:15 a.m.

8.10.2.4 Dry Type General Requirements Chairman John Sullivan

The working group met in the Ramsey room of The Hilton Minneapolis Hotel.

The meeting was called to order at 11:05 AM by Chairman John Sullivan

The meeting was convened with six (6) members and six (6) guests present.

Introductions were made and the minutes of the last meeting held in Dallas, Texas USA March 12, 2007 were approved.

The IEEE–SA patent slides were shown and a request was made for disclosure of any patents that may be related to the work of the working group. No patents or patent claims pertinent to C57.12.01 were identified by working group members.

Task force reports discussion:

Table 5 – John Sullivan
Table 5, Dielectric insulation levels for dry-type transformers used on systems with BIL's 200kV BIL and below was revised as directed by the working group at the Dallas meeting. The Table was revised by Charles Johnson to consist of four (4) columns. The first two columns for nominal system voltage and low-frequency voltage insulation levels remain the same. The right side of the table was condensed to two (2) columns, BIL rating and chopped wave minimum time to flashover. The consensus of the working group was to extend BIL to 250 kV and to specify allowable alternative test values.

Partial Discharge –Yunxiang Chen

Yunxiang Chen presented an extract of IEC 60076-11, Partial discharge. Chen proposed harmonization with the IEC standard. The IEC standard states the maximum acceptable partial discharge level is 10 pC. He also displayed several partial discharge test reports from European manufacturers. These reports indicate the transformers under test are essentially partial discharge free at the 160% voltage level. Chen will work with the rest of task force members to prepare a tentative revision to table 6 with supporting documentation for the spring meeting in Charlotte.

Next meeting: spring 2008 March 16-20, 2008 in Charlotte, North Caroline.

With no new or old business the meeting was adjourned at 11:40 AM.

8.10.2.5 IEEE PC57.12.52 - Sealed Dry Type Power Transformers Chairman Sheldon Kennedy

The Working Group met on Monday, October 15, 2007 at 9:30 AM with 6 members and 6 guests present. Sheldon Kennedy chaired the meeting.

The IEEE disclosure statement was read. There were no patents pertaining to this standards work for which any members had awareness.

There were no minutes to approve as this was the initial meeting of the new working group.

The Chair announced that we were beginning work on C57.12.52, which had been approved as a PAR by IEEE. The PAR was granted on May 7, 2007 and will expire on December 31, 2011.

The Chair explained that this document is one of the NEMA documents that came over to IEEE when all of the NEMA standards were moved to IEEE. As such, the document is old, last revised in 1981, and not in the correct format of an IEEE document. Also, there was no electronic copy available from NEMA or IEEE. Roger Wicks' wife was kind enough to scan the hard copy and make a Word document that we were able to begin to work with. The document still has to be put into the IEEE template and that will change much of its present format.

The Chair also explained changes that occurred during the NesCom review process. The scope and purpose have revisions, consistent with IEEE documents and the NEMA format has been removed.

Next we began to review the document. The designation of these transformers will be updated from GA to GN to be more consistent with IEC and new IEEE designations. As this was an old NEMA products standard, it was very specific with regard to exact kVA ratings and voltages. These will be expanded to allow more ratings. Upper kVA ratings of many sizes are too low for modern dry type transformers.

Tables 2 and 3 are obsolete for the BIL levels and low frequency test values. The Chair will review C57.12.01 and harmonize these tables with the main document.

References to standards will need to be updated.

Table 4 is gives very little information on impedance values and has outdated language. The impedance values will be updated and the language removed or corrected.

Clause 5.1 describes the insulation system. Roger Wicks will review this and see if he can propose a better definition that may incorporate something from C57.12.56 and C57.12.60. In line 5.1.2 the document states that the transformers are filled with a suitable gas. This will be modified to state that they are filled with a suitable gas, including air.

Time expired and the chair asked members to continue to review the document for proposed revisions. The meeting was adjourned at 10:45 AM.

8.10.2.6 IEEE PC57.12.51 **Chairman Paulette Payne**

Paulette is on a fast track to revise this document. She balloted this document (closing on October 6th successfully). There were 3 negative balloters with 23 comments. Several of the comments were discussed in the subcommittee. More work will be conducted to finish this document in preparing the revision for reballoting.

8.10.3 Old Business **Paulette Payne**

Ray Barnitkas provided a brief report related to his review of C57.124 (Practice for the Detection of PD in Dry-Type Transformers) which Chuck Johnson had asked him to look at during our Dallas meeting. Ray provided Chuck (electronically) and the WG his recommendation that the document needs work. Since the document date requires work prior to the end of the year, Paulette will talk with Chuck about filing a request to IEEE for an extension so that the appropriate action can be taken on this document (either balloting for reaffirmation to get all the comments or

initiation of a PAR for the revision of the document. The WG will make this decision at the meeting in Dallas

8.10.4 New Business

Phil Hopkinson reminded the Dry-Type SC of the information which will be on the website related to the new energy efficiency requirements for distribution transformers.

The meeting was adjourned at 2:50pm.