8.4 DRY TYPE TRANSFORMERS SC CHAIRMAN C. W. JOHNSON, JR.

8.4.1 Introductions and Approval of Minutes

The Dry Type Transformer Subcommittee met in Henderson, NV on October 27, 2004 with 15 members and 8 guests present; 1 guest requested membership. Introductions were made and the attendance roster was circulated. Minutes from the October 8, 2003 meeting were reviewed and approved.

Prior to any other activities, IEEE patent policy was discussed. Attendees were asked if they know of any patents that were essential to the implementation of any of the standards related topics under current control of the subcommittee. None were noted.

8.4.2 Working Group Reports

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

8.4.2.1 WG Dry Type General Requirements C57.12.01 Chairman John Sullivan

The working group met in the Estancia E meeting room of the Green Valley Ranch Resort & Spa in Las Vegas, Nevada.

Chairman John Sullivan called the meeting to order at 1:45 PM on Monday October 25, 2004.

The meeting was convened with ten (10) members and eight (8) guests present. (Four) 4 guests requested membership.

Introductions were made.

The first order of business was to ask the members if they knew of any patents or pending patents that apply to the contents of the C57.12.01 standard. No one knew of any patents that pertained to C57.12.01.

The minutes of the San Diego meeting were approved.

Members were encouraged to sign up to the Transformers Committee AMS system. Without a valid working e-mail address entered into this system, members will not receive meeting notices or committee correspondence.

The current status of the C57.12.01 standard was discussed:

- The working Group PAR expires 31 December, 2005.
- The revised standard will be submitted for ballot prior to the spring 2005 meeting.
- Comments and any negatives will be resolved prior to or during the spring meeting.
- Final ballot is planned immediately after the spring meeting to meet the December 31 deadline.

Comments received since the last meeting was discussed.

1. Figure 2 and figure 2 (continued) are not of good quality. This will be corrected when the standard is published.

2. Section 4.2 – Annex A is data that may belong in the body of the standard or in the loading guide C57.96. The consensus of the working group was to leave the material in Annex A in its present location for this revision and address the issue during the next revision.

3. A task force of Carl Bush, Charles Johnson, Anthony Jonnatti, Phil Hopkinson and John Sullivan was appointed to review and clarify the contents of Section 5.10.5 and Table 5. Their resolution will be included in the final draft of the standard.

4. Language to clarify section 5.10.2 will be resolved by Carl Bush, Anthony Jonnatti and John Sullivan. The new language will be included in the final draft of the standard.

5. Paragraph 5.1 and section 5.7 will be addressed in the next revision of the standard.

6. The remaining comments were editorial and will be corrected as necessary.

There being no old business or new business presented, the meeting adjourned at 3:00 pm.

8.4.2.2 Dry Type Reactor TF **Chairman Richard Dudley**

The Dry Type Reactors T.F. met in the Estancia E Meeting Room of the Green Valley Resort Hotel in Las Vegas, Nevada on Oct. 25, 2004 at 8:00 a.m. There were 8 members and 4 guests present. The following are the highlights of the meeting.

1. The minutes of the Dry Type Reactors T.F. meeting in San Diego were approved.

NOTE: The minutes of the Las Vegas meeting of the T.F. will not be approved until the meeting in Jackson, Mississippi.

2. IEEE patent policy was discussed; details in registration package. Attendees were asked if they know of any patents that were essential to the implementation of any of the standards related topics under current consideration by the T.F. None were noted.

3. The first draft of an informative annex, prepared by the Chairman, on circuit breaker TRV issues associated with the application of series reactors was discussed. The draft annex covers a description of the TRV phenomenon, reactor application issues and mitigation. The following are the highlights of discussions.

   (i) Pierre Riffon reviewed work now in progress in the switchgear committees of both IEC and IEEE on circuit breaker TRV issues. The proposed annex for inclusion in a revision of IEEE C57.16 should be consistent with this standards development work.

   - IEEE will adopt IEC's method of defining TRV waveforms for CBs 100 kV and above. IEC will follow IEEE terminology for CBs rated 100 kV and below.

   - An amendment to IEC 62271-100 Alternating Current Circuit Breakers is at the CDV stage; voltage stage. The focus of the amendment is on CBs 100 kV and below. Four classes of CBs are defined; 2 for cable systems (lower TRV capability) and 2 for line application.

   - The IEEE Switchgear Committee is in the process of revising IEEE C37.06. The revision will be consistent with the IEC CB standard.

   - Pierre Riffon will provide T.F. members a copy of the amendment to IEC 62271-100 and background information on the revision process for IEEE C37.06.

(ii) In applying series reactors it is critical to evaluate the type of CB to be utilized and its TRV capability vs the system requirements.

(iii) SF_6 CBs are especially vulnerable to TRV. Capacitors, applied across a series reactor or to ground, provide the best mitigation. Capacitors applied across a series reactor are usually low cost compared to the cost of using a higher class CB.

(iv) Pierre Riffon will prepare Draft #2 of the annex "Application of Series Reactors and Circuit Breaker RTV Consideration" taking the proceeding into consideration.

1. A draft proposal, prepared by the Chairman, covering the measurement of inductance of tapped filter reactors was discussed; Annex A clause A.5.4.2. The following are the highlights.

   (i) The inductance of all tap positions MUST be measured on the first unit of an order.

   (ii) It was noted that practice at site during commissioning of filters is to measure the capacitance value of individual capacitor cans, calculate the total capacitance, select the closest tap to meet design tuning and verify the appropriate tap by measuring the high frequency impedance response of the filter. Inductance of the filter reactor (at the selected tap position) is not measured. Therefore the exact inductance value at the tap positions does not appear to be critical; tapping range and sufficient steps is important.

   (iii) For multi-tuned filters, the inductance of the filter reactor (taps) should be measured at either the lowest or highest tuning frequency; to be specified.

   (iv) Inductance should be measured at a minimum of 3 points; typically maximum, minimum and nominal.

   (v) For continuously tunable filter reactors the inductance should be measured at nominal and extremes of regulation.

   (vi) Should Note 2 be in the main part of C57.16; Clause 7.2.5? The Chairman will review the standard and recommend appropriate location(s).

1. Should Table 5 in C57.16 be harmonized with the current revision of C57.21 and the transformer standard; standardized BILs? What is the impact on filter reactors? A NOTE should be added to Table 5 stating that in the application of series reactors different BILs are specified across the coil and to ground. The BIL across the reactor is usually lower; strongly influenced by the inductance of the reactor and arrester protection practice. What is the impact of the different BILs in Table 5? T.F. members were asked to provide their thoughts and input on this complex issue.

The meeting adjourned at 9:15 a.m.

8.4.2.3 WG Dry Type Thermal Evaluation C57.12.56/60 Chairman Richard Provost

The working group met in Las Vegas, NV at the Green Valley Ranch Resort at 9:30 AM on Tuesday, October 26, 2004 with nine members and two 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 Title of the document will be: "IEEE Standard Test Procedure for Thermal Evaluation of Insulation Systems for Dry Type Power and Distribution Transformers, Including Ventilated, Solid-Cast and Resin Encapsulated Transformers". This needs to be modified in the draft document.

There was a discussion related to the scope in the draft document, however, this needs to be reworded to be consistent with the Scope of the PAR, as well as the title. This should resolve many of the issues discussed in the meeting. The Scope of the PAR is worded as follows: This Test Procedure is for the thermal evaluation of insulation systems of dry type power and distribution transformers, including both ventilated technology and solid-cast / encapsulated technology, to be used for determining the temperature classification of the insulation systems.

There was a discussion related to the voltage ratings covered in both the introduction and the scope of the draft document, as well as how they relate to other documents, such as IEEE 259. Bill Simpson agreed to propose rewording as appropriate.

Martin Navarro provided draft definitions which were the basis of substantial discussion, especially around the use of gas insulated windings and whether they are covered by this document. It was agreed that this would not be included, and that we would look at C57.12.52 (gas insulated product standard) to consider future revisions (outside of current scope) of this document. The working group agreed to review these definitions and provide feedback to the chair, who will then forward them to Martin.

Martin Navarro also provided a presentation with the various technologies used to produce coils which may be applicable to this standard. The group agreed to review these "typical" technologies, and then this information would be included as an informative annex in the next revision.

Bill Simpson agreed to look at relevant IEC documents for definitions, etc., as a part of this review.

For the next meeting we agreed that we would be reviewing all of the revised definitions, as well as to further discuss the test procedures for models and coils consistent with the draft document. The working group agreed to look at these procedures prior to the next working group meeting.

8.4.2.4 WG Dry Type Test Code C57.12.91 Chairman Derek Foster

1 The working group met at 1:45 pm with 9 members and 4 guests present. Two guests requested membership: Don MacMillan of Hunterdon Transformer and Yunxiang Chen, company not listed.

2 After introductions the minutes from the March 9, 2004 meeting in San Diego were approved as written.

3 The Chairman reviewed the IEEE information on patents and asked if anyone present had any reason to believe the work we were assigned would have any patent implications. No one replied.

4 Old Business

The Chairman led a discussion of the various clauses of the standard objected to by Nigel McQuin during the last ballot. Nigel McQuin was not present for the meeting. The meeting consisted of discussing these comments by clause numbers.

Prior to the meeting the Chairman sent to the members via email, a document containing each clause in question with the comment by Mr. McQuin and had asked for their opinion as to whether theses clauses should be revised or remain as written. A matrix voting form was included with the email whereby members could vote on each clause, stating their opinion as to whether the change should be accepted.

Only 3 members submitted a complted matrix. Therefore, the members were requested to review the document and to send in the completed matrix as soon as possible. Also included on the voting form is a question to be answered as to whether the member desires to have a PAR initiated for complete review of the standard.

Just prior to the meeting, Nigel McQuin returned the voting form, in which he agreed to withdraw some of his objections and to accept a compromise on some others.

Jeewan Puri submitted a copy of the re-write of Clause 13 of C57.12.90. The Chairman sent this to the members for review and comment, with a view to include this in the next revision of the standard.

There being no new business, the meeting was adjourned at 3:05 pm..

8.4.3 Report On Status Of IEEE STD. 259 **William Simpson Jr.**

The reaffirmation of IEEE Std 259-1999: Standard Test Procedure for Evaluation of Systems of Insulation for Dry-Type Specialty and General-Purpose Transformers was approved by the IEEE-SA Standards Board on 23 September 2004. There were no negative ballots, however one comment received was technical in nature and would have required a revision of the standard. It was agreed to circulate the recommended modification to members of the SC for review. If deemed appropriate, it will be submitted as a proposed revision during the next updating of the standard.

It is recommended that this standard be forwarded through the USNC TAG to TC14 to IEC/TC98, the Technical Committee on Electrical Insulation Systems (EIS), to be included as a Part in the IEC 61857 series of standards on the thermal evaluation of EIS.

8.4.4 New Business

1 The chair gave a report on the activities of the Administrative Subcommittee meeting.

2 Sites for upcoming meetings were announced.

3 The Association Management System (AMS) was discussed and the chair asked that all attendees register their email address so that SC members could be added to the system.

4 The subcommittee was once again reminded that the working group members are required to participate and not just attend the meetings. A suggestion was again made for working group chairs to consider removing inactive members from the group. Several WG chairmen stated they had removed inactive members from their rosters.

5 The subcommittee discussed the four (4) ANSI documents (C57.12.50, C57.12.51, C57.12.52, and C57.12.55) transferred from NEMA. The status of the documents remains in flux as we have no information on how to have the documents approved as IEEE standards. The SC chairman will request support from Bill Chiu on how we should proceed.

6 The SC chairman talked about the Cenelec standards used in Europe to validate dry transformer performance. These standards the dry transformer capability to withstand flammability, climatic, and environmental conditions under normal operation. The members were asked if they thought these issues were applicable to our transformers and if we should consider referencing the Cenelec strandards in our documents. The consensus was that the documents were not needed.

7 The SC chairman discussed the difference in polarity of the impulse waveform for IEEE and IEC standards for dry transformers. IEEE C57.12.91 requires dry transformer impulse testing with a positive crest waveform and the corresponding IEC standards state that a negative waveform be used. The chairman asked if the membership if an effort should be made to harmonize the waveform polarity. After some discussion, there was no consensus opinion.

8 There being no further business, the subcommittee meeting adjourned at 2:45 PM.