MINUTES OF MEETING
BUSHING SUBCOMMITTEE
OF THE
IEEE/PES TRANSFORMER COMMITTEE
Raleigh, NC
March 19, 2003

7.6 Bushing Subcommittee – Fred Elliott Chair

7.6.1 Introduction/Attendance

Acting Chairman, Pripal Singh opened the meeting at 3:00 PM and welcomed the members and guests. There were 46 attendees with 17 members and 29 guests present.

7.6.2 Approval of Minutes of Last Meeting

The minutes were approved as written.

7.6.3 Chairman's Remarks

Since, Fred Elliott was unable to attend these meetings, Loren Wagenaar offered the following remarks after attending the Administrative Subcommittee meeting.

- Metric conversion issue was discussed. The first test case for metrification generated a lot of negative votes within the balloting group. It appears the users seem to prefer dual dimensions. The IEEE Standards Board is in the process of discussing this issue.
- Minutes of the Subcommittees due to Don Fallon and Susan McNelly on May 9, 2003
- Next Transformer Committee meeting will be held in Pittsburgh. October 5 – 9, 2003
- The Operation and Procedures manual will be revised. In addition to other changes, corresponding members will be recognized.

7.6.4 Working Group and Task Force Reports

7.6.4.1 WG Revision of C57.19.00 - Keith Ellis, Chair

A PAR extension has been requested in order to resolve one outstanding negative vote. If unresolved a recalculation ballot will be required.

7.6.4.2 TF Revision of C57.19.100 – Keith Ellis, Acting Chair for Tommy Spitzer

The acting TF Chair opened the first meeting at 11:00 AM and welcomed the guests. Introductions were made and an attendance list was circulated. There were 33 people in attendance with 25 requests for membership on the TF.

The agenda was reviewed and discussion began on the proposed revisions to the document. The following agenda items were discussed with the corresponding volunteers offering to provide suggested text for those items:

- Mounting angles greater then 20°. Volunteer; *Pritpal Singh*
- Applying “Outdoor” bushings indoors; Volunteer; *Devki Sharma*
- Temperature correction of Power Factor; *Mark Rivers*
- Harmonize with IEC. Volunteer; *Keith Ellis*
- Thermal loading above nameplate rating for bushings applied on power transformers. No action taken on this subject at this time. This item will be recirculated for clarification within the Bushing Subcommittee.
- Temperature calculation for short-time loads above bushing rating. Volunteer; *Chris Monoski*

- Test procedures for derivation of mathematical model. Volunteer: *Chris Monoski*
- Temperature rise tests for draw lead cables that are not supplied by the bushing manufacturer. Also include draw lead temperature considerations and effects of oil level in the bushing tube. Volunteer; *Pripal Singh*
- Thermal loading for bushing used with isolated-phase bus. No action at this time as there is guidance already in the document.
- Bushing maintenance practices:

    - Add a method to determine C1 power factor of RG bushings. Volunteer; *Chris Monoski*
    - C2 testing of bushings rated below 115 kV. Volunteer; *Mark Rivers*
    - The effects of the bushing power factor on transformer power factor measurements. Volunteer; *Mark Rivers*
    - Bushing storage considerations; Volunteers; *Carlo Arpino & Tommy Spitzer*

It was requested that volunteers submit their suggested text to TF Chair, Tommy Spitzer, tommy.spitzer@txu.com with a copy to Keith Ellis, Keithcota@aol.com at least 60 days before the Fall Transformers Committee meeting in Pittsburgh.

New Business

There was discussion on DGA of bushing oil. Mike Lau with BC Hydro indicated success in finding bad bushings by taking oil samples and running DGA. The acting Chair indicated that most bushing manufacturers do not recommend oil sampling from "healthy" bushings. If there is continued interest in this subject further discussion could be undertaken within the TF.

The meeting was adjourned at 12.15 PM.

7.6.4.3 Report of Technical Advisor to IEC SC36A

Pritpal Singh read a report from John Graham on the activities of TC 36, SC36A. The following is a summary.

SC36A WG4: Bushings for DC Applications.

A committee draft was circulated and comments were discussed. The following actions were agreed.

- To eliminate the need for DC tests on bushings less than 150 kV
- To allow for preconditioning at the start of the withstand and polarity reversal tests. This is opposed by users and will be discussed within the WG. Comments from IEEE would be welcome.
- To allow a limit of 10 (from 7) pulses above 2000 pC during partial discharge measurements

SC36A MT5: IEC60137 – Insulated Bushings for AC Voltages above 1 kV

A committee draft document (36A/94/CDV) was circulated and resulted in affirmative ballot. Edition 5 will be published in 2003.

Due to some comments on impulse test requirements between this document and IEC 60076-3, the committee decided to initiate the revision process to satisfy the objections from TC 14.

SC36A MT6: IEC61463 – Interpretation of Dissolved Gas Analysis of OIP Bushings

It was agreed to issue a corrigendum to correct a gas concentration ratio in Table 3 giving significant ratios of gas concentrations. The concentration and ratios given in this document are specific to bushings and differ from those given in IEC 60599. SC36A secretary will contact TC 10 and try to align the two documents.

SC36A MT7: IEC61463 – Seismic Qualification of Bushings

A new team will be set up to review the document, which was published in 1997.

Enquiry 36A/95/DC: Future work on monitoring and diagnosis of bushings

Despite interest from several National Committees, the enquiry concluded to that there was insufficient experience to prepare a standard. This work was considered to be more suited to CIGRE.

SC17C MT15: IEC 61639- Direct Connection Between Power Transformers and Gas Insulated Metal-Enclose Switchgear above 72.5 kV

No technical changes are proposed at this time.

CENELEC TC36AWG4: EN ….. - Capacitance Graded Outdoor Bushings up to 420 kV for Oil Filled Transformers

This is a European Committee parallel to IEC and produces standards/documents for use in the European Committee. As standards, they have legal status and override similar standards in the member states. This will be a dimensional standard and efforts are being made to reach a compromise between the manufacturers and the users. The latest draft will go to the National Committees.

7.6.5 Old Business

7.6.5.1 Reaffirmation of C57.19.100

Reaffirmation of this standard will be submitted to REVCOM in June of 2003

7.6.5.2 C57.19.01- 2000, Tutorial Presentation at the Fall 2003 Meeting in Pittsburgh.

A tutorial to make the members aware of this new dimensional standard will be presented at the next Transformer Committee meeting in Pittsburgh by Loren Wagenaar and others.

7.6.6 Technical Paper Summaries

IEEE Transformer Committee members at the 2003 Doble Client's Conferences in Boston, MA presented the following papers.

- Paper on C57.19.01-2000 (Performance Characteristics/Dimensions) By mark Rivers
- Paper on C2 Power Factor variations By Pritpal Singh
- Paper on Dry Polymer Bushings By Pritpal Singh
- Paper on OIP Bushings with Composite Insulators By Keith Elli

7.6.7 New Business

7.6.7.1 C57.19.01 Switching Surge Comments – Devki Sharma

Devki Sharma presented a comparison of the SW Impulse test levels between C57.19.01 (Bushing Standard) and C57.12.00 (Transformer Standard) and indicated that there is lack of coordination between the two standards. It was pointed out by some of the members that the levels in C57.12.00 were for dry test condition whereas those in C57.19.01 are for wet test conditions and for this reasons the levels in C57.12.00 are higher. Also, in Table 1 of C57.19.01, a note specifies that the dry negative SW Impulse withstand voltage of the bushing must be at least equal to the SW Impulse withstand voltage for the corresponding BIL specified in C57.12.00. This arrangement has been in

the bushing standard since 1977 and worked well without any problems. No agreement was made at this meeting. However, members are requested to send their inputs to the Chair or the Secretary if they feel the matter should be discussed at the future meetings.

7.6.7.2 Technical Advisory Group for IEC SC 36A

Outside the Bushing Subcommittee meeting, Scott Choiniski, Program Manager at NEMA, requested for volunteers who are willing to become members of the TAG (Technical Advisory Group) for the IEC SC 36A Committee. He indicated that, we do not have enough US representation in the SC 36A Committee and when decisions are made in this committee, they do not reflect opinions of our industry. Members are requested to contact Scott at the following number/address.

Scott Choinski, Program Manager
TEL: 703 841 3353
E-mail: **sco_choinski@nema.org**

7.6.8 Adjournment

The meeting was adjourned at 3:40 PM

Minutes Submitted By,

Pritpal Singh, Secretary Bushing Subcommittee

Attachments - Attendance sheets

Copies:
Members and Guests,
Don Fallon, Secretary Transformer Committee
Susan McNelly,