MINUTES OF MEETING
BUSHING SUBCOMMITTEE
OF THE
IEEE/PES TRANSFORMER COMMITTEE
Nashville, TN
March 14, 2012

5.4 Bushing Subcommittee – Peter Zhao, Chair; Eric Weatherbee, Secretary.

5.4.1 Introduction/Attendance

Chair opened the meeting at 9:30 AM and welcomed the members and guests. There were 77 attendees, 60 guests with 17 of 39 members present. A quorum was not reached.

Erin Spiewak, IEEE-SA Staff Liaison was introduced to the group.

5.4.2 Approval of Minutes of Last Meeting

The minutes of last meeting in San Diego, CA could not be approved as a quorum was not reached.

5.4.3 Chairman's Remarks

a) Next meeting will be held in Milwaukee, WI on October 21st through October 25th hosted by SPX Transformers Solutions, Inc.
b) Reviewed the current status of all bushing WG's and future dates.

5.4.4 Working Group (WG) and Task Force (TF) Reports

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

No meeting held, gathering information for futures changes or additions.

5.4.4.2 WG - Revision of C57.19.01 – Arturo Del Rio, Chair

The working group met on Tuesday March 13, 2012, at 9:30 am with a total of 56 participants. Of those, 13 members and 43 guests with 3 guests requesting membership.

- The meeting was opened with introductions and the presentation and review of the minutes from the previous meeting.
- The first topic in the agenda was further discussions on the scope of the standard to avoid conflict with the work being done on the standardization of GSU bushings for use in bus-enclosures. A change was proposed to standardize on the use of "liquid-filled" as opposed to "oil-filled" transformer and reactors: guidance is needed since dielectric characteristics may differ.
- Five topics related to the proposed changes to the standard are still under discussion:

1. Bringing back 25 kV, 115 kV and 161 kV bushings to the preferred ratings: further discussion and user survey is imperative as previous surveys among utilities supported their exclusion.
2. Taking the listed styles through 230 kV to 5,000 amps: dimensions required for 5000 amps to complete the tables.
3. Replacing the breaker plate with a smaller connection plate with an integral 2-hole or 4-hole spade: this item is parked as no justification for a change is evident.
4. The TBI cantilever requirements.
5. BIL, and Hipot test requirements for bushings for all voltage classes were compared to other existing standards (IEC, CSA). Although some discrepancy is observed, no change to the standard is foreseen at this point.

- New business:
  - In tables 5 and 6, there is no specific reference to epoxy-resin impregnated paper (ERIP) bushing technology. A recommendation was raised to include that terminology to the bushing standards.
  - Clarification on the definition given in C57.19.00 2004 for solid type bushing and cast insulation bushing is needed.
  - Distribution of the 2000-2005 utility survey material among members is needed for information and reference.
- Meeting was adjourned at 10:30 am.

Minutes by: Arturo Del Rio, WG Chair.
e-mail: arturod@ieee.org
Nashville, March 13, 2012.

5.4.4.3 WG - Revision of C57.19.100 – Tommy Spitzer, Chair

This working group met on Tuesday March 13, 2012 at 11:00 am with 11 members and 17 guests, a quorum was not achieved. We are in the ballot process with an 88% approval and 218 comments.

We discussed two areas of negative votes:

Shibao Zhang presented documentation of bushing load tests that show the current overload criteria to cause unacceptably high temperatures. This area will be revised to address these concerns.

We also discussed power factor limits. This area will also be changed.

We accepted volunteers for the ballot resolution group. The comments will be addressed and the guide sent for recirculation to complete this par before the dead line.

5.4.4.4 WG PC57.19.04 – GSU Bushings – Catherine Hurley, Chair

Minutes: WG PC57.19.04 – LV Bushings Rated >5000A and Applied in Metal Enclosures
Date: March 13, 2012 @ 1:45pm - Nashville, TN

1. Attendance:
   a. 27 Attendees:
      i. 15 of 28 Members were present (quorum was reached)

ii. 12 Guests
    1. 10 New Guests
    2. 2 Repeat Guests

2. Agenda:
    - Meeting minutes from Fall 2011 Boston meeting were presented and no objections were noted. Minutes were approved and seconded.
    - Title, Scope, and project plan to completion was presented
    - Randall Kyle (Southern Company) agreed to act as an unofficial liaison to keep this WG informed of any new business which could affect this our WG as it pertains to IEEE C57.116 Section 10
    - The following topics were discussed to determine the consensus of the majority of the membership:
        1. Test tap standardization (against)
        2. Cantilever strength requirements
        3. Partial discharge limits
        4. Power factor and capacitance limits
        5. Standardizing on a set creep for a certain contamination level
        6. CT pocket standardization
        7. Upper and lower terminal design
        8. Current densities as it pertains to terminal design
    - Lonnie Elder discussed upper/lower terminal theoretical, calculated current density as it pertains to terminal design
3. Adjournment: Motion was made to adjourn at 2:59pm. Motion was granted.

5.4.4.5 C57.19.03 – DC Bushing Standard – Les Recksiedler (IEEE) and John Graham (IEC), Chair

SC36A MT5 is working with The IEEE Bushing subcommittee with a joint working group to produce a dual logo document.
A Committee draft (CD) was circulated in May 2011 for comment to IEC and IEEE members. Comments have been received from both groups, IEC comments were discussed in Melbourne. Most comments from IEEE concerned the presentation of the document in IEC format with mainly IEC references. IEC Central Office and IEEE Program Manager have stated that IEC format takes precedence. Due to work pressures on the joint conveners there has been no recent progress.
No meeting was planned for Nashville.

5.4.4.6 IEC Bushing Standards Activity - John Graham

IEC Meetings
The IEC bushing committee SC36A met during the IEC General Session in Melbourne, Australia on October 21st 2011. The next meeting is planned for October 2013 in New Delhi, India.

IEC60137 “Insulated Bushings for Alternating Voltages above 1000V”
In April 2011 on a new revision of the document was started with the main purpose to include test values for UHV bushings (above 800kV rating) in line with the latest edition of IEC60071-1: Insulation Co-ordination. A draft was circulated in May 2011 which provoked more comments than expected concerning possible review of inconsistencies in the test method for temperature rise of external connections – this inconsistency also exists in IEEE C57.19.00 and the calculation of creepage distance in line with IEC60815.

In Melbourne it was decided that a new working group should be formed including experts from TC14 (Transformers). A Request for Experts was circulated by IEC in January 2012 and the new group will be formed shortly.
Other Work –
The stability dates of other standards have been extended.
IEC61463 Seismic qualification of bushings – a call for experts will be made to form a new maintenance committee.
IEC61464 Dissolved gas analysis of oil impregnated paper bushings – no work planned until IEC TC10 completes revision of the main DGA standard IEC60599. The bushing subcommittee will be responsible for interpretation of analysis with TC10 responsible for methods.

Cigré:
There is a Cigré working group A2: 43 Bushing Reliability chaired by Antun Mikulecky from Hungary. The group has held two meetings with the next planned for May 2012 in Dubrovnik, Croatia.
The group has three task forces;

1. Questionnaire on bushing failure rates and data.
2. Drafting of technical brochure sections – definitions, failure modes, mechanisms.
3. Drafting of technical brochure sections - diagnostics and monitoring methods, including theory, measurement method and decision criteria.

It is aimed to publish the brochure during 2013.

John Graham
March 13th 2012

5.4.4.7 IEEE 693 - Interaction of Bushings and Transformers during Seismic Events – Lonnie Elder

Next meeting will be held April 24th and 25th in San Diego, CA.

5.4.4.8 Task Force on PD Measurement on Bushings & CTs - Thang Hochanh, Chair

The task force on Partial Discharge in Bushings and PTs/CTs met on Monday March 12th, 2012, at 4:45pm with 37 attendees. Of those, 12 members and 25 guests with 6 guests requesting membership.

- The meeting was opened with attendance sheets and introductions.
- The minutes for the F11 Boston meeting were presented.
- The TF Chair presented a draft version of the guide which was distributed by e-mail prior to the meeting.
- The scope for the guide was presented and adjusted based on feedback from the group. It is the intention to present the scope in the application for the PAR, keeping in mind that the document will be a guide. At this time the scope reads: **"**this guide describes the test procedure for the measurement of PD and electrical PD detection, occurring in bushings and instrument transformers during dielectric tests in AC and DC (bushings) applications".
- Several editorial and contents changes were recommended and the meeting was dedicated to discussions on the body of the document. It is not intended to cover acoustic PD detection.
- It was pointed out that the guide should cover both narrow and wide band measurements. A specification of frequency range should be included in the guide.

- It was discussed whether interpretation of PD patterns should be included in the guide. Although enough material may be available, it may not very clear what the real cause for PD may have been. Perhaps to include basic patterns only.
- The linearity and validity of the calibration between 50% and 200% of the calibration value was discussed. This may be related to the calibrator only. If a switched calibrator is used, the change of capacitance vs voltage change may affect the result of the calibration.
- The uncertainty of the tests should be considered during the test as there are several factors contributing to it including the calibration, test equipment, detecting equipment, etc.
- A revised draft will be circulated for comments. Members are encouraged to send their comments and suggestions to the TF Chair.
- Meeting was adjourned at 5:50 pm.

Minutes by: Arturo Del Rio.
Nashville, March 13 2012.

5.4.5 Unfinished Business – none

5.4.6 New Business

- Keith Ellis proposed that a definition needs to be added to C57.19.00 for solid dielectric bushings, RIP already exists therefore he would like to develop new nomenclature for epoxy resin impregnated paper bushings. Keith is requesting manufacturers input or anyone has suggestions before the next meeting.
- The Chair opened a request from Steve Shull on a bushing standard that covers only distribution transformers (350kV BIL and below – reference Table 4 in C57.12.00). He was asked if there was any standard for bushings used in distribution transformers, and asked the group if there is a need for one. Loren Wagenaar suggested that it was covered in C57.12.100 and will look up old standard to see if it was removed. The Chair asked anyone with further information to please provide it before the next meeting, and Paul Buchanan from Moloney Electric agreed to do that.
- Oil to SF6 bushings are not covered in current bushing standards, and John Graham from Trench England agreed to collect the information on this type of bushings and have it presented in next meeting for further discussion.
- Tom Prevost – Asked that any ideas for future Tutorials (traditionally held on Thursdays) to be brought to his attention.

5.4.8 Adjournment

The meeting adjourned at 10:45 PM.

Minutes submitted respectively by,

Eric Weatherbee

Secretary
Bushing Subcommittee