MINUTES OF MEETING
BUSHING SUBCOMMITTEE
OF THE
IEEE/PES TRANSFORMER COMMITTEE
Toronto Canada
Oct 27, 2010

9.3 Bushing Subcommittee – Fred Elliott, Chair; Peter Zhao, Secretary.

9.3.1 Introduction/Attendance

Secretary opened the meeting at 9:30 AM and welcomed the members and guests. A quorum was formed by confirmation of member attendance. There were 47 attendees with 19 members and 28 guests present. Seven (7) of those guests requested membership.

IEEE patent policy was addressed in the meeting and no patent conflict was reported.

9.3.2 Approval of Minutes of Last Meeting

The minutes of last meeting in Houston, TX was approved as written.

9.3.3 Chairman's Remarks

a) 2011 Spring meeting will be held in San Diego, California on April 10-14, 2011, sponsored by San Diego Gas & Electric.
b) WG/TF chairs are encouraged to attend Monday Lunch mtg - Std Development, and it will be free registration at San Diego mtg.
c) Bring-a-new-body event will be scheduled for San Diego mtg. It will be a free registration for the 1st time attendee from users.
d) Technical presentation session is open for volunteer presenters, and current backlog is low.

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

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

REAFFIRMATION REPORT:

All ballot comments and negative ballot issues have been addressed with no objections from the voters.

During this process it was found that a number of paragraph numbers were not provided in the final published version of the documents. The missing numbers make it confusing when one clause refers to another specific clause in the document.

IEEE is looking into how this happened and will likely publish ERRATA with the missing paragraph numbers re-inserted.

IEEE has not gotten back to me since our discussions last fall.

The reaffirmation process was extended for one year to resolve this issue.

9.3.4.2 TF - Revision of C57.19.100 – Tommy Spitzer, Chair

The working group met on Tuesday October 26, 2010 at 11:00 am with 12 members and 23 guests present. This did not constitute a quorum.

There were no patent disclosures.

Chair informed the group that the deadline for completing the revision was missed, and a PAR extension has been applied which will move the completion date to Oct. 17, 2011. The revision is complete with the exception of restoring Figure 3. Michael Williams volunteered to restore this figure. Peter Zhao suggested that since IEEE had been questioned about different power factor values being acceptable in different standards that additional wording be added to eliminate this confusion. After restoration of figure 3 and the explanation added, Draft 5 will be posted on the website for review by the working group. When all comments have been resolved I will present it to IEEE for balloting.

The meeting adjourned at 12:15

9.3.4.3 TF – GSU Bushings – Catherine Hurley, Chair

October 26, 2010

1. Attendance: The meeting consisted of 33 people in attendance: 15 of 25 Members and 18 Guests. 4 of those guests requested membership and 3 of those guests were granted membership following the meeting. A quorum was reached.

2. Agenda:
    - Membership roster was presented and notification was provided to those members at risk of losing membership due to lack of participation or attendance.
    - List of guests eligible for membership was also presented
    - Meeting minutes from both Lombard (Fall 2009) and Houston (Spring 2010) meetings were presented and approved without issue.
    - Summary of results of phone conference August 10 were discussed
    - Result of the member vote on each of the two PAR scope options was announced.
    - A status update was provided notifying the TF that the PAR had been submitted and is currently in the approval process.
    - Discussion of the GSU Bushing Standard outline was presented and some volunteers stepped forward to write/review certain sections of the standard for discussion in the Spring-2011 meeting in San Diego.

3. San Diego:
    - We have a volunteer from an IEEE bushing manufacturer who will give a presentation in the Spring-2011 meeting titled “Thermal Considerations for Bushings Applied in Enclosed Bus”.
    - We also will be working toward getting a bus manufacturer to give a similar presentation discussing the thermal considerations they take into account when designing enclosed bus.

4. Adjournment: The meeting was adjourned at 2:56pm

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

Unapproved Meeting Minutes

IEC/IEEE JMT5 Dual Logo Standard IEC/IEEE 65700-19-03
Report of Meeting Toronto, Canada

The third meeting of the Joint Maintenance Team was held on Thursday, October 28th 2010 from 13.00 to 16.00. A total of nine persons attended including eight IEEE members and three IEC members (two being common to both groups). The meeting was chaired by joint convenors Les Reckseidler (IEEE) and John Graham (IEC).

Minutes of the Houston meeting document 36A(JMT5_Graham)04 were approved.

There were no patent issues raised.

The agenda document 36A(JMT5_Graham)08 was approved.

Following the Houston meeting the results of comments discussed have been circulated and discussed further by email resolved comments were included in a fourth draft (IEC/IEEE 65700-19-03 Draft 4) which was circulated to members together with a revised compilation of comments in July 2010. These documents were reviewed at the meeting.

The main technical comments were discussed in detail and many issues resolved.
Clause 4.5 – Definition of voltage U_1 for creepage distance calculation.
It was agreed that the voltage should take consideration of both DC and AC components of voltage. The use of either peak or rms voltage AC voltage was discussed. It was agreed that rms phase to ground voltage was more appropriate. This will be included in the next draft.

Clause 8.4.1 Emission Test
The application of a DC voltage for the emission test was discussed and decided not to be appropriate technically. It was agreed that an AC voltage equal to 1.1 x U_p / √2 should be applied in a test method following IEC60137 2008. U_p as defined in clause 4.1.2 will be added to the list of variables in clause 6.3.

Clause 8.5.2 Temperature rise test
Draft 4 give one method for the determination of the equivalent test current. An alternative method was presented by Mr Testin as 36A(JMT5-Cardano)09v2. It was agreed that the basis for this method should be included in the document as an alternative method of calculation as an appendix. Mr Testin agreed to prepare the wording for the next draft.

Clause 9.2.1 Dry lightning impulse
The need to apply SIL as a routine test where the value exceeded 83% of the BIL was discussed again. Contributors have stressed the importance of both wave shapes under different conditions. It was agreed to alter the sequence of the wording to give more priority to SIL while maintaining the option for both or BIL alone where agreed.

Clause 9.5.1 Polarity reversal
It was agreed to include the same rules for sample testing of bushing rated below 150kV rating as given in clause 9.4.1.

Clause 8.2.1 Lightning impulse (Type test)
It was agreed that chopped waves with a peak voltage level of 121% of the full wave value should be applied following IEC60137 2008.

Clause 3.15 Oil
It was agreed that the definition should include other oil types as already included in IEC60137 2008.

References: All references are to be checked for the next draft for applicability and validity.

There was no other old or new business.

The meeting was adjourned at 4.00pm.

John Graham
Joint Convener

Toronto Meeting
October 28th 2010
Attendance List

Name	E Mail	IEC	IEEE
Ulf Radbrandt	ulf.radbrandt@ieee.org		X
Devki Sharma	devkisharma@ieee.org		X
Chris Stankowski	chris.stankowski@wicor.com		X
Peter Zhao	Peter.zhao@hydroone.com		X
Izy Polishchux	Izy.polishchux@hydroone.com		X
Paolo Cardano	Paolo.cardano@alstom.com	X	X
Giovanni Testin	Giovanni.testin@alstom.com	X	
Les Reckseidler	lreckseidler@hvdc.ca		X
John Graham	john.graham@trench-group.com	X	X

9.3.4.5 IEC Bushing Standards Activity - John Graham of Trench Ltd., UK

IEC BUSHINGS STANDARDISATION

The IEC bushing committee SC36A has not met since the IEC General Session in Sao Paulo, Brazil during the week of November 17th 2008. The next meeting is planned for October 2011 in Melbourne, Australia.

IEC60137 "Insulated Bushings for Alternating Voltages above 1000V"

Edition 6 was published in July 2008, the maintenance date for IEC60137 is set at 2011.
During future revision the working group should address inconsistencies in the test method for temperature rise of external connections – this inconsistency also exists in IEEE C57.19.00.
It is expected that at the Melbourne meeting a new work item proposal will be raised to set up a new maintenance team to review the document.

IEC62199 "Bushings for DC Application"

SC36A MT5 is working with The IEEE Bushing subcommittee with a joint working group to produce a dual logo document.
Two meetings have been held, in Lombard (Fall 2009) and Houston (Spring 2010). Work has proceeded by email to avoid a meeting in Europe. A fourth draft has been circulated and comments received. The next meeting will be held on Thursday Oct 28th in Toronto.
It is hoped to proceed to a Committee Draft for Voting with the main items to resolve;

- Creepage distance calculation – specification of the appropriate voltage.
- Emission test
  - Is a test required?
  - Should the applied voltage be AC or DC?
  - What are the appropriate acceptance criteria?
- Temperature rise test – agreement on method for calculation of the equivalent current.
- Dry lightning impulse test – should BIL and/or SIL tests be performed where SIL/BIL = >0.83.
- Polarity reversal test – Should the cut-off point of 150kV rating be applied.

Other Work –

No significant other work to report.

John Graham
25 October 2010

9.3.4.6. IEEE 693- Interaction of Bushings and Transformers During Seismic Events – Lonnie Elder

No report

9.3.4.7 Task Force on PD Measurement on Bushings & CTs

PARTIAL DISCHARGE IN BUSHINGS AND PTs/CTs

MINUTES OF TASK FORCE MEETING – F10 Toronto, ONT.

The task force on Partial Discharge in Bushings and PTs/CTs met on Monday October 25th, 2010, at 3:15pm with 39 attendees. Of those, 11 members and 28 guests with 3 guests requesting membership.

- The meeting was opened with patent disclosures and introductions.
- The minutes for the S10 Houston meeting were presented and approved.
- The agenda for the meeting included:

1. Presentation by Dr Wolfgang Hauschild: Some Principles and Examples for Shielding of HV and UHV Test Laboratories.

2. Presentation by Vladimir Khalin: Partial Discharge Test Methods for Instrument Transformers.

3. Presentation by Reiner Krump (presented by Thang Hochanh) : Partial Discharge Test Methods for Bushings.

- A request was made to the audience for additional contributions in the form of short presentations related to the topic for the S11 San Diego meeting.
- TF Chair Thang Hochanh will continue working on a draft for the guide.
- Meeting was adjourned at 4:30 pm.

Minutes by: Arturo Del Rio.
Toronto. October 26, 2010.

9.3.5. Old Business

9.3.5.1 Busing Service Conditions - Devki Sharma and Tommy Spitzer

The question was raised by Devki and Tommy regarding the coordination between the bushing standard C57.19.00-2004 and the application guide C57.19.100-1995.

Standard C57.19.00 Clause 4.1 includes usual service conditions as follows:
- Ambient air temperature not to exceed 40 deg C and average over 24 hours not to exceed 30 deg C.
- Temperature of transformer insulating oil in which the inboard end of the bushing is immersed not to exceed 95 deg C average over 24 hours.
- The external terminal and bus connections not to exceed 30 deg K rise over ambient.

Application Guide C57.19.100 clause 4.1.1.1 contains advice stating that rated temperatures in the bushing may be exceeded during some high temperature loading conditions resulting in reduced bushing life expectancy. Clause 5.2 gives advice for derating of bushings under this high temperature condition.

The concerns expressed during the discussion are that these two items are confusing and may even appear to be in conflict with each other. The wording and advice may need to be better coordinated in future revisions of the documents. This item will be carried forward to the next meeting for further discussions.

Loren Wagenaar has provided his comments on the subject in writing, which will be discussed during the 2011 Spring Mtg.

9.3.6.2 Breaker Bushings – Activity in Breaker Committee

It was reported that Switchgear Committee will ballot a Standard for Circuit Breaker Bushings (PC37.017, Standard for Bushings for High Voltage (over 1000 Volts ac) Circuit Breakers and Gas Insulated Switchgear). Interested individuals should join the balloting group.

9.3.6 New Business

9.3.6.1 Revision C57.19.01

The PAR for revision has been approved, and the action for revision is based on a Bushing SC survey, see attached below.

Arturo del Rio will chair the new working group. The first meeting of the Working Group is planned for the Spring 2011 meeting in San Diego.

Survey of Bushing Subcommittee
C57.19.01 Action Needed to Extend Validity of Standard

Survey Content

Chair sent out a Bushing Subcommittee Survey on May 13, 2010 to the 36 members of the Bushing Subcommittee using the AM system.. The text of the survey was:

> IEEE Bushing Subcommittee Survey 0513-1 - Action Required for C57.19.01 - Responses Due by May 28, 2010
>
> As discussed in the Subcommittee Meeting in Houston, Standard C57.19.01-2000, "IEEE Standard Performance Characteristics and Dimensions for Outdoor Apparatus Bushings" is scheduled for administrative withdrawal at the end of 2010 unless action is taken to extend it's life. The possible life extension actions are reaffirmation or revision. This standard was reaffirmed once in 2005.
>
> A. Should we apply for a second reaffirmation or apply to start a revision?
>
> B. If we start a revision effort, please list any sections or topics that you believe should be changed, added or deleted.
>
> C. If we start a revision effort, do you have suggestions for a Working Group Chair?
>
> Comments about the reasons for your responses are encouraged.
>
> Please respond to me by Friday May 28, 2010.

Survey Response

Response to the survey was as follows:

Surveys sent out	36
Bad email address returns	1
Responses Received	7
Responses for Revision	5
Responses for Reaffirmation	2

Two suggestions for WG Chair were submitted

Suggested areas for consideration included in responses:

- I suggest a revision is in order to address issues for the modulus of elasticity on 200 & 600A bushings used in equipment defined by C57.12.90-2006. The in-service failures of these bushings needs to be addressed.
- The revision should at least include:

1) Add back the voltage classes of 25 kV (150 kV BIL) and 115 kV (550 kV BIL). These two voltage classes are still among the most common bushings ordered by both OEM and utilities.

2) The TBI cantilever requirements should be put back because the bushing manufactures did not change the designs to reduce the bushing mechanical strength in order to "meet" the lowered requirement specified in the 2000 version; instead, major bushing manufactures still stick to the 1991 version for the cantilever test. For the users, the high cantilever strength means the bushing could tolerate high pulling force in the field and may have a better chance of surviving after mechanical shock such as seismic events.

3) The referred standards should be updated to the most up-to-date versions. For example, the transformer standard should be C57.12.00-2006 rather than C57.12.00-1993.

- We should take all listed styles though 230 kV to 5,000 amps as we are seeing larger and larger power transformers being purchased. Also, I have seen 230 kV 4000 and 5000 amp bushings with odd "L" dimensions. When I asked the manufacturer why they designed the bushing with the odd "L", their response was; "that rating is not covered by the standards".

  So today there are 230 kV design out in the field with 54" "L" dimensions, making obtaining replacements a long lead-time issue.

  Also, it is time to dump the breaker plates on HV bushings. By replacing the breaker plate with a smaller connection plate with a integral 2-hole or 4-hole spade. Attached are drawings of our design at 115 kV, fixed conductor and a 500 kV high current draw lead bushing with the 2-holes spades delivered to Brazil. The Transformer OEM confirmed that these designs lower the cost of their transformer. And we know it lowers the cost of the bushing.

- My opinion is that since the industry has not abandoned the 15 kV and the 25 kV ratings, they should be added back into the document.

Action Taken
A PAR request for revision has been submitted for the December Standards Board meeting. Arturo del Rio will chair the new working group. The first meeting of the Working Group is planned for the Spring 2011 meeting in San Diego.

Submitted by Fred Elliott, Bushing Subcommittee Chair
October 21, 2010

9.3.7 Adjournment

The meeting adjourned at 10:45 PM.

Minutes submitted respectively by,

Peter Zhao

Secretary
Bushing Subcommittee