MINUTES OF MEETING
BUSHING SUBCOMMITTEE
OF THE
IEEE/PES TRANSFORMER COMMITTEE
Milwaukee, WI
October 24, 2012

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

5.1.1 Introduction/Attendance

Chair opened the meeting at 9:30 AM and welcomed the members and guests. There were 110 attendees, 87 guests with 23 of 40 members present. A quorum was reached.

5.1.2 Chairman's Remarks

a) Next meeting will be held in Munich, Germany on March 17th through March 21th hosted by Maschinenfabrik Reinhausen
b) Reviewed the current status of all the bushing standards and future dates
c) The Chair indicated what is needed to become a Transformer Committee Member. Informed the group that they needed to be IEEE-PES members first.
d) The Chair informed that technical presentations are welcome and please contact the Chair for review of the presentation materials prior to presenting. The technical presentations on new technology and new products will be uploaded to the IEEE website.

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

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

No meeting held, Mr. Ellis informed the group that he would like to step down as Chair.

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

WG Revision C57.19.01 Standard Requirements for Bushings.

The working group met on Tuesday October 23, 2012, at 9:30 am with a total of 57 participants. Of those, 17 members and 40 guests with 4 guests requesting membership.

Working Group membership is 27 Members.

- The meeting was opened with introductions and the presentation and approval of the minutes from the previous meeting.
- Old business (to be referred to C57.19.00):
  - Definition for epoxy-resin impregnated paper (ERIP) bushings: Florian Costa has volunteered to identify and tabulate technical differences comparing to RIP bushings. Is there a need for a separate 'type of construction' for bushing? (to be referred to C57.19.00).
  - Clarification on the definition given in C57.19.00 2004 for solid type bushing and cast insulation bushing is needed: still pending. (to be referred to C57.19.00).

- The scope of the standard has been updated to include the use of “liquid-filled” as opposed to “oil-filled” transformer and reactors.

Scope

*This standard covers electrical, dimensional, and related requirements for outdoor, power apparatus bushings that have basic impulse insulation levels (BILs) of **200 kV** and above. It provides specific values for dimensional and related requirements that are to be interpreted, measured, or tested in accordance with IEEE Std C57.19.00. Bushings covered by this standard are **5,000-amp or less rated continuous current** and intended for **use in free air** as components of **liquid-filled** transformers and reactors.*

- The main topic for the meeting was the presentation of the results of the survey on the C57.19.01 2000 revision, “how did it affect your company?” by Mario Locarno, Doble Engineering.
    - 6 survey questions.
    - 112 survey participants.
    - > 80 companies.
    - Results of the survey will be distributed to the WG members and guests for consideration before a decision is made regarding nominal system voltages for bushing. Also, survey results will be posted on the TC web page.

- Meeting was adjourned at 10:30 am.

Minutes by: Arturo Del Rio, WG Chair.
e-mail: arturod@ieee.org
Milwaukee, October 23, 2012.

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

No meeting, par expires at the end of the year. There was a comment from Mario Larcano that the Chair had informed him the standard is complete.

5.1.3.4 WG PC57.19.04 – GSU Bushings – Carlo Arpino, Chair – JD Brafa, Vice Chair

1) Attendance:
   a) 39 Attendees:
      i) 17 of 28 Members were present. At the beginning of the meeting the membership list was presented, and by rising of hands, the members were counted. At that time just 10 members were present, so it was deemed a quorum was not reached. No official business was conducted.
      ii) 22 Guests
         (1) 14 New Guests, 8 Repeat Guests
2) Agenda:
   Meeting minutes from the Spring 2012 meeting in Nashville were presented and no objections were noted. Due to the lack of a quorum at the time the minutes were presented, the minutes were not officially approved.

- Title, Scope, and project plan to completion were presented

- The working group is currently on track to complete the work before the expiration of the PAR in December 2015.

- IEEE C57.116 Section 10, from revision D1.1, was reviewed between S12 and F12 meeting by Phil Swan and deemed acceptable in technical content. Discussion was made to ask for reference to PC57.19.04 in this section. Mr. Randal Kyle agreed to make this request of the C57.116 WG.

- Request was made of the membership for nominations of Secretary. None were received.

- The following topics were discussed to determine the consensus of the WG:
  1. Test tap standardization (against)
  2. Cantilever strength requirements (should be higher than C57.19.01)
  3. Partial discharge limits, Power factor, and capacitance limits (same as C57.19.01)
  4. Standardization of Creep (Heavy - 44 mm/kV L-G)
  5. CT pocket standardization (300mm)
  6. Lower terminal configuration (single or double flat spade)
  7. Upper terminal configuration (consideration of "round" terminal with machined flats vs. square orientation of individual flat spades)
  8. Voltage classes to include (only 15kV, 25kV, and 34.5kV)

- Agreement was made to disseminate 1st draft of this standard to the members and guests before S13 meeting in Munich

- W. Knuth will discuss with a bus manufacturer to see if they would be willing to give a presentation on thermal considerations of enclosed bus design as well as expected short circuit forces during for Fall 2013 meeting in St. Louis.

3) Adjournment: Meeting was adjourned at 2:59pm.

5.1.3.5 C57.19.03, future IEC/IEEE65700.19.03 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 little recent progress over the last year. A working draft containing earlier comments was circulated to the IEC/IEEE group members in September prior to a document for voting.

No meeting was planned for Milwaukee.

5.1.4 IEC Bushing Standards Activity - John Graham

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, target dates for individual working groups are based around provision of documents for discussion in New Delhi.

SC36A Chairman, Lars Johansson (SE) is retiring and John Graham (UK) will take over as Chairman from Nov 1st 2012.

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 unfortunately due to business circumstances of Convenor this work has not progresses.
In Melbourne it was decided that a joint working group should be formed for the AC and DC bushing standards including experts from TC14 (Transformers). A Request for Experts was circulated by IEC in January 2012 and the extended group has been announced.
Previous comments have now been reviewed and circulated to the new JMT5 for further comment prior to the preparation of a Committee Draft (CD). Due to changes in SC36A Chairman a new Convenor will be found for JMT5.

Other Work –
IEC61463 Seismic qualification of bushings – a new maintenance team MT6 has been formed and held it's first meeting in Milan on October 9th. The team will review other existing standards including IEEE693 to strengthen the document. It is hoped to have a CD by March 2013.
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.
IEC61639 Bushings for direct connection transformer/GIS – this is under review by the switchgear committee SC17C MT27 and has been re-numbered IEC62271-pt211.
TC36 SPG (standards planning group) also met in Milan in October to review the work of the insulator subcommittees and plan for the New Delhi meeting.

Cigré:
There is a Cigré working group A2: 43 Bushing Reliability chaired by Antun Mikulecky from Hungary. The group has held two meetings this year in Dubrovnik, Croatia in May and at the General Session in Paris in August
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
October 16th 2012

5.1.5 IEEE 693 - Interaction of Bushings and Transformers during Seismic Events – Eric Weatherbee

Next meeting will be held in April at PG&E headquarters in San Francisco. Dr. Anshel Schiff is preparing papers for comment on his current approach for the next iteration of the standard. Distribution to the OEM transformer and bushing manufacturers will be through the transformer committee by the end of the year. Next version of the standard is on-target for 2014 completion.

Short presentation showing videos of an OIP porcelain bushing subjected to 1g, 2g and 2.5g shake table testing was presented by Eric Weatherbee

5.1.6 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 October 22nd, 2012, at 4:45pm with 41 attendees. Of those, 14 members and 27 guests with 7 guests requesting membership.

- The meeting was opened with attendance sheets and introductions.

- The minutes for the S12 Nashville meeting were presented.
- The TF Chair requested comments on the version #2-C of the guide which was distributed by e-mail prior to the meeting. 5 discussion groups were formed for focused discussiones on:
    - PD in Instruments Transformers, led by Vladimir Khalin.
    - Annex A- PD Test circuits, led by Eberhard Lemke.
    - Annex B- Shielding and Grounding, led by Wolfang Hauschild.
    - PD in Bushings, led by John Graham.
    - Generalities and Definitions, led by Eberhard Lemke.

- After the discussions, each group presented a summary of comments and suggestions from their discussion that will be considered in the next draft. Follow up by the group leaders with comments on the discussed draft #2-C. The TF Chair will provide e-mail addresses to the leaders to facilitate direct communication.

- Meeting was adjourned at 5:50 pm.

Minutes by: Arturo Del Rio.
Nashville, October 22nd, 2012.

5.1.7 Unfinished 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.

- Presentation “Distribution Transformer Bushings – A Manufacturers View” by Paul Buchanan.
    - Mr. Buchanan discussed the lack of mechanical requirements. The Chair commented that their needs to be defined quality checks to maintain the longevity of the products. The Chair asked Mr. Buchanan to summarize his thoughts and suggestions for the next meeting.
- Presentation “IEEE Transformer Gas Bushings” – John Graham
    - Mr. Graham proposed that a standard needs to be developed. The Chair asked for volunteers to help Mr. Graham ID the differences between IEEE C57.19 and IEC to send out to the users and manufacturers to determine if these bushings should be made to a standard.

5.1.8 New Business

5.1.9 Adjournment

The meeting adjourned at 10:45 AM.

Minutes submitted respectively by,
Eric Weatherbee
Secretary
Bushing Subcommittee