

## IEEE SWITCHGEAR COMMITTEE CORRESPONDENCE

Minutes: IEEE High-Voltage Fuses Subcommittee  
Place: Charlotte, NC  
Date: Wednesday, April 26, 2017  
Presiding officer: John Leach – Chair  
Recorder: Alan Yerges – Secretary/Vice-Chair

### MEMBERS PRESENT

|                  |  |
|------------------|--|
| Glenn Borchardt  | S & C Electric Company                 |
| Sterlin Cochran  | Hubbell Power                          |
| Rodolfo Elizondo | Peakdemand.com                         |
| Gary Haynes      | ABB Inc.                               |
| Blake Henard     | Hubbell Power                          |
| John Leach       | Consultant - Hi-Tech Fuses/ABB (Chair) |
| Brad Lewis       | AEP                                    |
| Sean Moody       | Mersen                                 |
| Jon Spencer      | Utility Solutions                      |
| Jim Wenzel       | Eaton                                  |
| Alan Yerges      | Eaton (Secretary)                      |

### MEMBERS ABSENT

|                     |                         |
|---------------------|-------------------------|
| Jonathan Deverick^  | Dominion Virginia Power |
| Frank Lambert       | GT/NEETRAC              |
| Chris Lettow^       | S&C Electric Company    |
| T. E. Royster       | Dominion Energy         |
| Mark Stavnes        | S & C Electric          |
| Charles Worthington | Hubbell Power           |

^ correspondence only

### GUESTS

|                 |               |
|-----------------|---------------|
| Chris Borck     | Eaton         |
| Sam Cheng       | PG&E          |
| Casey Daren     | Hi-Tech/ABB   |
| Emily Goss      | Hubbell Power |
| Alex Lizardo    | ABB           |
| Bobby Moorhead  | Dominion      |
| Chris Morton    | PowerTech     |
| Dustin Sullivan | Hubbell Power |
| Randy Ward      | Alumaform     |
| Matt Westerdale | Hubbell Power |

### HONORARY MEMBERS

John Angelis, L. Ron Beard, Ray Capra, Steve Hassler, Frank Ladonne, Herb Pflanz, R (Kris) Ranjan, John Schaffer, Frank Muench, Don Parker, Jan Zawadzki. R. Neville Parry, J. R. Marek

1. **Call meeting to order** - at 1:30 PM
2. **Approval of Agenda** – No changes requested, agenda accepted.

**3. Member/guest introduction** – 11 members, 10 guests. Blake Henard, Brad Lewis and Rodolfo Elizondo all met the requirements for membership with this meeting (i.e. to attend four of six meetings) and are welcomed to the subcommittee.

**4. Roster check–**

- a. Roster circulated for correction.
- b. No one was moved to Honorary Status.
- c. Blake Henard, Brad Lewis and Rodolfo Elizondo were moved to member status.

**5. Approval of Sept, 2016 minutes** – Reviewed and approved.

**6. Standards Document Status Report: (see Annex B)**

- a. C37.41: has been published as of December 2016, and errata sheet is required due to some unnoticed editing errors.
- b. C37.41: a Par has been submitted for a corrigendum to cover some clarifications.
- c. C37.42: is approved and is pending publication as of April 2017.
- d. C37.45: final draft was approved May, 2016 and it has been published – an errata has been published (4/4/17) to correct a change in title by the editor.
- e. C37.40, C37.43, C37.46, C37.47 should be withdrawn as they are covered by updates to C37.41 and C37.42.
- f. C37.48 is now in revision. PAR has been approved from 2017 to 2021.
- g. C37.48.1 will be combined into C37.48.

**7. Working Group Reports**

**a) Revision of Fuse Standards – J. Leach**

- a. The Working Group met on April 25-26, 2017 at 8am with 26 new members and 5 guests present.
- b. Working group reviewed C37.41 errors that were discovered after publishing, due to changes made during editing. The most significant issue involved a format change to a table that unintentionally changed the testing requirements. These items have been adjusted and should be published (hopefully soon) in an errata sheet.
- c. An issue in C37.41 involving Test Series 4 interruption testing was discovered with the definition of test current  $I_{t1}$  and  $I_{t2}$ . This error was to be corrected by a corrigendum (special PAR and ballot of only the items changed).
- d. Also included in the C37.41 corrigendum was a need for clarification on mechanical life testing of polymer cutouts.
- e. Also included in the C37.41 corrigendum were changes associated with the approach to testing Test Series 4 interruption. This will remove a need to define a fuse link auxiliary tube burst condition, and add additional current levels to test. Sterlin Cochran was recognized for his assistance in providing photos of various burst conditions.
- f. PAR for C37.48 was further reviewed to discuss both updates as well as approach to aligning or distinguishing with IEC.

**8. Report of liaison to other committees**

**a) ER&P Committee – John Leach**

- a. John reported that the ER&P committee met at 12:00 pm on April 26<sup>th</sup> to review possible awards. At the next meeting, up to 15 student members of IEEE will be invited (registration covered by the committee) to attend the Switchgear meeting.

**9. IEC Report – John Leach:** (for full report see Annex A)

- a. TC32 and SC32A (Fuse Committee and SubCommittee) met in Frankfurt, Germany October 10-14, 2016.
- b. HV DC Fuse standard is going to be developed by TC32 WG1 (with HV and LV participation). The USA will be represented..
- c. New work proposal for polymer cutout testing was approved to move forward, and this will be led by Sterlin Cochran.
- d. As John Leach was named as the new chair of SC32A, a new US representative will be needed to attend future SC32A meetings to look out for the USA's interests.
- e. MT3 (CL fuses) also met and prepared a CD, that has been circulated as a revision of IEC 60282-1.
- f. The next meeting of MT3 will be in Bilbao, May 2017, and WG8 (polymer cutouts) will meet at the same time.

#### 10. Unfinished business

- a. No unfinished business.

#### 11. New business

- a. No new business.

#### 12. Next meetings:

Fall 2017 (October 8-13) Marriott Portland Sable Oaks, Portland, ME

Spring 2018 (April 22-27) Disney's Contemporary Resort, Lake Buena Vista, FL

Fall 2018 (14 Oct – 18 Oct), Kansas City Marriott Downtown, MO

Spring 2019 (April 28-May 1) Hilton, Burlington, VT

Fall 2019 (Oct 6-10) Catamaran Resort, San Diego, CA

#### 13. Adjournment – 2:25 PM

#### Annex A

## SC32A - U.S.A. Technical Advisory Group

Dr. John G. Leach, Technical Advisor ♦ [j.g.leach@ieee.org](mailto:j.g.leach@ieee.org) ♦ 828-256-3744 ♦ Fax 828-322-2376

#### IEC Report 2017-1 October 2016 to April 2017

From: Dr. John G. Leach, Technical Advisor TC32 and SC32A, April 20 2017

#### Summary

Since the October 2016 report there have been meetings of TC32, TC32 CAG, SC32A and MT3 (all at the 80<sup>th</sup> General Meeting in Frankfurt, Germany, October 10<sup>th</sup> – 14<sup>th</sup> 2016). John Leach attended all of these meetings, representing the USA. The New Work Item proposal (NWIP) by the US National Committee (32A/319/NP) for a standard “Additional testing requirements for high-voltage expulsion fuses utilizing polymeric insulators” was approved. This means that the Subcommittee now meets the requirements for an active committee for the next three years, providing a meeting is held in 2018. John Leach has been appointed Chair of SC32A and convener of SC32A MT3 and MT6, and reappointed convener of MT7. Sterlin Cochran has been appointed convener of WG8. The first Committee Draft of Edition 8 of IEC 60282-1 has finished circulation.



1) **Report of activities at the IEC 80<sup>th</sup> General meeting, in Frankfurt, Germany, from October 10<sup>th</sup> through the 14<sup>th</sup>, 2016.**

a) **Meeting of TC32 CAG**

The Chairman's Advisory Group met on October 11<sup>th</sup> from 10:00 to 12:00. There were 12 officers and delegates present. It was agreed that members should include MT/WG convenors as well as TC/SC officers. The purpose of the CAG is primarily to oversee the allocation of new work, avoiding duplication and ensuring a timely completion. Also the aim is to ensure the TC structure is appropriate, and oversee liaisons. The present scopes and work of TC32, its SCs, and MTs were reviewed. Decisions made were:

- The Scope of TC32 and all SCs should include the preparation of Application Guides
- Overlap between SC32B and SC32C needs examination. To this end a TC32/WG should be formed to clarify, review and differentiate their scopes.
- In response to a request of SC32B to develop HV fuses for DC voltage and special applications, it was agreed that, while this work fell within the scope of SC32A, they had no interest in the subject at the moment. Because the difference between LV and HV nominal voltages exists, and must be respected, SC32B and SC32A must create a TC32/WG to clarify, review and differentiate their scopes. A new standard for HV fuses/special applications will be written in a TC32/MT with relevant experts from both SC32A and SC32B.
- SC32B advised the CAG that it intended to start work on a standard for Battery fuses and that this work did not encroach on the scopes of other SCs.

b) **Meeting of TC32**

The Fuse Technical Committee met on Wednesday October 12<sup>th</sup> starting at 14:00 h. There were seven heads of delegation present (France, Austria, China, USA, Japan, UK, and Germany), plus seven additional delegates and an observer from Belarus. The convenor was TC Chair Viktor Martincic from Slovenia (but he did not count as a representative from Slovenia, who were therefore not represented).

The program of work was updated. Viktor agreed to become convenor of MT2 (revision of IEC/TR 60943 Guidance concerning the permissible temperature rise for parts of electrical equipment, in particular for terminals) since Mr. Vollet has resigned. Work in MT3, Review of the IEV (International Electrotechnical Vocabulary) Revision of IEC 60050-441, has yet to start. Convenor B. Muller apologized for the delay. New members were proposed: M. Altenhuber, J. Leach, J. F. De Palma, and J. Cai. They must ask for validation and registration from their NC (in the case of Leach this has been done). Based on the CAG recommendations AHGs (Ad-Hoc groups) were formed to clarify, review and differentiate SC scopes (and include the preparation of Application Guides):

- TC32/AHG1 between SC32B and SC32C
- TC32/AHG2 between SC32A and SC32B

These TC32/AHG will report for the next TC32 meeting. John Leach has become a member of AHG2.

It was decided to create a new standard for HV fuses / DC and/or special application (primarily dc fuses for solar farms) in a TC32/WG with relevant experts from both SC32A and SC32B. TC32 appointed Mr. De Palma as the convenor of this TC32/WG 1. The FR NC shall confirm this appointment. Members from the USA are John Leach, Sean Moody and Sakthidharan Krishnamoorthy.

Mr. Jean Francois de Palma was appointed by TC32 to be Chairman of SC32B.

The next meeting is to be within 3 years, probably at the General meeting in China (Shanghai) 2019.

### c) **Meeting of SC32A**

The HV Fuses Subcommittee met on Thursday October 13<sup>th</sup> from 9:00 to 17:00 h. with seven countries represented (China, France, Germany, Japan, Spain, UK, and USA) and 17 present. Viktor Martincic was a classed as a guest, and did not represent Slovenia; similarly the Chair, Mariusz Wilniewicz, could not represent Poland.

The Chairman reminded the subcommittee of the main items of the work done in the last years. He also stated his wish to step down from his chairmanship in December 2016 earlier than the end of his mandate (as announced in 32A/316/AC, calling for candidates). A new chairman should be appointed in December 2016.

The secretary presented the activity report, situation, and trends of the Sub-Committee. It is intended that Mr. Raphaël Buisson, who has been nominated as assistant secretary, take over the role of secretary in the next 2 years as it is anticipated that the actual secretary Mr. Didier Fulchiron will retire by then.

**IEC 60282-1** (current-limiting fuses). John Leach, acting convenor of the MT3, presented a report on the activity of the MT3. MT3 issued an informative document (32A/314/INF) presenting some proposals for a possible revision of IEC 60282-1. MT3 requested to extend the stability period of IEC 60282-1 to 2020 and to authorize a new edition of the IEC 60282-1. It was agreed that 60282-1 will be revised on the basis of the MT3 proposal. The stability period of IEC 60282-1 was extended to 2020.

**IEC 60644** (motor circuit fuses) contains information that is also present in the application guide IEC/TR 62655. It was suggested to do an amendment of the IEC 60644 to remove the "guidance information" and update the wording about the purpose of the standard. While the French NC did not approve this revision proposal (for reasons not explained), other NCs did approve the proposal. The stability date of IEC 60644 was changed to 2019.

**IEC/TR 62655** (Tutorial/application guide). This has a stability date of 2018. John Leach, acting-convenor of MT6, made a presentation of the situation. It was suggested that no formal revision should be started before next edition of the IEC 60282-1 is published. It was therefore decided to change the stability date to 2022.

#### **Stability dates:**

60282-1: 2022  
60282-2: 2020  
60549: 2020  
60644: 2019  
62655: 2022

**Appointments/reappointments of Convenors** for the next three years: With no other candidates for MT3 and MT6 other than John Leach the following appointments were made:

MT3: John Leach (USA)  
MT4: Juan Carlos Pérez Quesada (Spain)  
MT6: John Leach (USA)  
MT7: John Leach (USA)

**Follow-up of SMB decisions 155/24 and 156/21.** The Secretary presented the background and history of the successive decisions made by the SMB related to the "Annual review of TC/SC statistics" and pointed out what SMB considered to be a low activity level for the SC32A, thus challenging the very relevance of the Sub-Committee (to be considered active at least three of five metrics must be met). It was noted that the USNC recently issued a NP about "Additional testing requirements for high-voltage expulsion fuses utilizing polymeric insulators", and that this

NP changed the statistics and put the SC on the right side of the stated thresholds. It was further noted that, should the project be actually launched, it would result in an increased number of standards under the responsibility of the SC, meeting one of the SMB metrics we currently fail. For the next years, NCs agree we should not employ some “artificial ways” to maintain SC32A active (which appears to be done by some subcommittees). The revised metrics for the SC (after the US NWIP) are shown below (blue being non-conforming):

- Number of active projects less than or equal to 5
- Number of NP in the last three years equal 0
- Number of publications less than or equal to 5
- Number of experts less than or equal to 10
- Number of meetings in last 5 years less than or equal to 1

**Next Meeting:** In order to maintain two meetings in any 5 year period our next meeting has to be in two years (the next period could then be three years). An invitation to the general meeting in 2018 (Korea) will be sought, but if this is not possible, a meeting in Slovenia is an alternative.

#### d) Meeting of MT3

The maintenance Team for current-limiting fuses met on Friday 14<sup>th</sup> of October from 9:00 to 16:00 h. There were seven members and two guests (sec and assistant sec of SC32A) present. The meeting was led by the new convenor, John Leach.

The main items discussed, in preparation for the first CD were as follows.

Fuse current rating system for special applications. It was agreed that the term “allowable continuous current” would be introduced (it is used in IEC TR 62655). It is essentially the same as the “maximum permissible continuous current  $I_{encl}$ ” used in the technical report but is not restricted to fuses used in enclosures. However problems with the tests in IEC 60282-1 for the liquid-tightness of a fuse for use in a transformer led us to propose the introduction of a term “maximum enclosure current,  $I_{ep}$ ”. In this case, component temperatures higher than those presently permitted may be used by agreement between the manufacturer and user.

Review fuse homogeneous test requirements. The present calculations for “minimum breaking current” for non-tested fuses, and the testing needed is written for Back-Up type fuses. Proposals were made for General-Purpose and Full-Range fuses, but agreement could not be reached. Those present agreed to study the options based on their testing experience and agreement by e-mail exchanges would be attempted. [Later follow up concluded that no additional changes to the standard were necessary.]

Based on the proposal to the subcommittee it was decided that the CD would be submitted before the end of December. [This was done, and the CD was circulated in January.]

Date and place of next meeting: The next MT3 meeting needed to be after comments to the CD are received. Thus it cannot be before early April. Juan-Carlos offered to host the meeting in Bilbao and a suggested date of May 11th and 12th (Thursday and Friday) was proposed [and later confirmed].

## 2) Activities subsequent to the General Meeting

The New Work Item Proposal, submitted by the US NC (32A/319/NP) closed on December 23<sup>rd</sup> 2016. The results, issued January 20<sup>th</sup>, was that of the 12 P-members voting (of a possible 16) there was one negative (Spain) and the rest approving. Importantly, four countries proposed participation (USA, UK, Australia, and China) which was the minimum number for approval of the project. A working group has therefore been set up under the leadership of Sterlin Cochran (USA), with additional members: Trevor Blackburn (Australia), Shi Weijian (China), Harold Handcock (UK) and John Leach (USA) secretary. The first meeting of the WG (WG8) will be in

Bilbao, Spain, on May 10<sup>th</sup> the day before the MT3 meeting. John Leach pursued copyright approval from IEEE to use parts of Clause 18 of the revised C37.41-2016 for many months. Permission was finally granted on April 4<sup>th</sup> 2017. Provisional proposals to the WG are to modify the IEEE requirements somewhat, reducing the amount of required testing and aligning more closely with existing IEC polymer insulator testing. It is felt that this will make the proposals more acceptable to the IEC community.

Nomination for Chair of SC 32A: High-voltage fuses Questionnaire 32/217/Q was circulated on 2016-11-11 and closed 2016-12-23. John Leach was nominated and the results circulated on 2017-01-20 (32/222/RQ) with 12 P-members approving and none not approving. John has been appointed for the period 2017-01-01 to 2022-12-31. Note that, during this period, someone else from the USA will be required to attend SC32A meetings in order to have the USA represented.

32/223/AC: Mr Jean-François De Palma (FRANCE) has been appointed secretary of TC 32 to succeed Mr Jean-Claude Luquain.

The first Committee Draft for the revision of IEC 60282-1 (32A/323/CD) was circulated on January 20<sup>th</sup> 2017 and closed 2017-04-14. A Review Report (32A/322/RR) was issued with project dates: CD: 2017-09-29, CDV: 2018-12-31, FDIS 2019-06-28, IS: 2019-12-31 (the CD in September was assuming that significant comments would be received from the first CD and we would need a second circulation since little can be changed after the CDV is issued). The comments have now been received and there are only 41 to be considered. Over half of these are minor editorial corrections.

**Date and place of next meetings:** Our next MT3 meeting will be in Bilbao, Spain on Thursday/Friday May 11<sup>th</sup> and 12<sup>th</sup>, 2017, and the WG8 meeting will be in Bilbao, May 10<sup>th</sup>, 2017.

John Leach, 4/20/17

Annex B: Document Status – April 2017

| Document | Title   | Sub-Committee | WG Chair   | PAR                                 | IEEE Status                                  | Activity/Plans  |
|----------|---|---------------|--|-------------------------------------|--|---|
| C37.40   | Standard Service Conditions and Definitions for High-Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Accessories.   | HVF           |  |                                     | Approved 2003<br>R2009<br>TO BE<br>WITHDRAWN | None - Combined with C37.41                               |
| C37.41   | IEEE Standard Design Tests for High-Voltage (> 1000 V) Fuses and Accessories  | HVF           | John Leach<br>828 256 3744<br>j.g.leach@ieee.org | Submitted for approval              | Approved 2016                                | PAR for corrigendum submitted and errata to be published. |
| C37.42   | IEEE Standard Specification for High-Voltage (> 1000 V) Fuses, and Accessories.   | HVF           | John Leach<br>828 256 3744<br>j.g.leach@ieee.org |                                     | Approved 2016                                | Not yet published (April 2017)                            |
| C37.43   | Standard Specifications for High-Voltage Expulsion, Current-Limiting and Combination Type Distribution and Power Class External Fuses, with Rated Voltages from 1kV through 38kV, Used for the Protection of Shunt Capacitors | HVF           |  |                                     | Approved 2008<br>TO BE<br>WITHDRAWN          | None – Combined with C37.42                               |
| C37.45   | IEEE Standard Design Tests and Specifications for High-Voltage (> 1000 V) Distribution Class Enclosed Single-Pole Air Switches  | HVF           | John Leach<br>828 256 3744<br>j.g.leach@ieee.org |                                     | Approved 2016                                | Published 2016, Errata published April 2017               |
| C37.46   | Standard for High-Voltage (>1000 V) Expulsion and Current-Limiting Type Power Class Fuses and Fuse Disconnecting Switches.  | HVF           |  |                                     | Approved 2010<br>TO BE<br>WITHDRAWN          | None - Combined with C37.42                               |
| C37.47   | Standard Specifications for High-Voltage (>1000 V) Current-Limiting Type Power Class Fuses and Fuse Disconnecting Switches  | HVF           |  |                                     | Approved 2011<br>TO BE<br>WITHDRAWN          | None - Combined with C37.42                               |
| C37.48   | Draft Guide and Tutorial for the Application of High-Voltage Fuses and Accessories.   | HVF           | John Leach<br>828 256 3744<br>j.g.leach@ieee.org | Approved 2017<br>Expires 12/31/2021 | Approved 2005<br>R2010                       | Revision started - Good to 2020                           |
| C37.48.1 | Guide for the Application, Operation, and Coordination of High Voltage (>1000 V) Current-Limiting Fuses.  | HVF           | John Leach<br>828 256 3744<br>j.g.leach@ieee.org |                                     | Approved 2011                                | None – Good to 2021<br>To be combined with C37.48.        |