IEEE SWITCHGEAR COMMITTEE CORRESPONDENCE

Minutes: Working Group on Revision of Fuse Standards-C37.41, High-Voltage Fuses Subcommittee
Place: Clearwater Beach, FL
Date: April 17th – 19th, 2023
Chair: Sterlin Cochran
Secretary: John Leach

WG Voting Members "VM", non-voting members "NVM" and non-members "NM" present on 17th (Task Force meeting) and 18th and 19th, WG meeting.

Name	Employer/Affiliation	Status	17th	18th	19th
Ed Allingham	Hydro One	NM	x	-	
Tim Anderson	Aluma-Form	NM	x	x	
Emmanuel Ankrah*	KEMA Labs	NVM	x	x	x
Brian Betts	Mersen	VM	-	-	
Jacob Blake	Hubbell	NM	x	x	-
Glenn Borchardt	S & C Electric Co.	VM	-	-	
Chris Borck	Eaton	VM	x	x	x
Mohit Chabra	S&C Electric	VM	x	x	-
Anand Chiravuri	Black and Veatch	NM	-	x	
Sterlin Cochran	Eaton (Chair)	VM	x	x	x
Jeramie Cooper	Eaton	VM	x	x	x
Brennen Fleming	Hubbell Power Systems	VM	x	x	-
Rich Frye	Eaton	VM	-	-	
Juan Gill	Southern States	NM			x
Gary Haynes	ABB Inc.	VM	x	x	x
Danny Hoss*	Southern States	NVM	x	x	
Travis Johnson	Xcel Energy	VM	-	-	x
Pat Kula	Hubbell Power Systems	VM	-	-	
John Leach	-/Self (V-Chair/Secretary)	VM	x	x	x
Eric (Qian) Li	Powertech Labs	NVM	x	x	x
Pete Marzec	S&C Electric	VM	x	x	x
Chris Morton	PowerTech Labs	VM	-	-	-
Aaron Motes	ABB–Hi-Tech	VM	x	x	x
Carlos Nieto*	S&C Electric	NVM	x	x	
John Owen	Powertech Labs	NM	-	x	
Laura Reid	Hubbell	NM			x
Caryn Riley	Georgia Tech/NEETRAC	VM	x	x	-
Jen Santuli	IEEE-SA	NM	-	x	
Jon Spencer	Utility Solutions	VM	x	x	x
Dustin Sullivan	Hubbell Power Systems	VM	x	-	-
Dragan Tabakovic	Hubbell	NM	-	x	
Bryan Tatum	UL Solutions	NM	x	-	
Jean-Mark Torres	Hubbell Power Systems	VM	-	-	

Santiago Pelaez Uwego	ABB	NVM	x	x	x
Bill Walter	We-Energies	VM	-	-	
Randy Ward*	Aluma-Form	NVM	x	x	
Jim Wenzel	Eaton	VM	x	x	-
Robert Wolf	Hubbell Power Systems	VM	-	-	
Charles Worthington	Hubbell Power Systems	VM	x	x	x
Elija Yarbrough	Hubbel	NM	x	x	-
Danish Zia	UL LLC	VM	-	x	x

Voting Members – 15, Non-voting members – 6, non-members (guests) – 9
Voting Members not present – 8
*Now eligible for voting membership

1. **The Task force meeting concerning Test Series 4** - this meeting was on Monday 17th April afternoon (see item 8).

2. **Meeting Call to Order**
   The WG meetings were called to order on Tuesday April 18th at 10:15 am and at 2:00pm, and again on Wednesday April 19th 2022 at 8:00 a.m.

3. **Approval of agenda**
   The present draft number of PC37.42 was corrected in the provisional agenda and the agender was approved with this change (proposed Jim Wenzel, seconded John Leach).

4. **Attendee introductions**
   Attendees were asked to sign in. John explained that per WG rules, after the first meeting, when all present can become voting members, anyone attending a subsequent meeting could request membership and provide the secretary with their contact information. They are then classed as a "non-voting" member. After attending 2 of 4 meetings, they can request membership and become a voting member. Guests are called "non-members". Attendees introduced themselves. We have three new voting members at this meeting, Jacob Blake, Mohit Chhabra, and Brennen Fleming, who were welcomed.

5. **Approval of Wednesday October 19th, 2022, Burlington VT minutes**
   The October minutes were reviewed and accepted as circulated.

6. **Report from the Chair**
   Sterlin welcomed everyone and explained that the intent of the meeting was to move through the latest draft of the document, covering those sections for which input had been received and then to discuss any other points raised that needed discussion. He reported that there had been a TS4 Task force meeting on Monday that had made good progress and we would be discussing their findings at the Wednesday meeting.

7. **Report and Discussion of Relevant IEC activities (Tuesday) – John Leach**
   John stated that there had been significant activity relevant to the WG on LV fuses tested above 1 000 V AC but that a full report would be given at the Subcommittee meeting on Wednesday afternoon.

8. **Reports from the Task Force (Wednesday)**

a) TF3, Test Series 4 for cutouts (Hayes): The task force recommends reducing the number of TS 4 tests from 4 (4.1, 4.2, 4.3, and 4.4), each at a different current, on the maximum and minimum of two assumed homogeneous series (1200A/100T, 750A/65K, 600A/50T, and 160A/6k) to two test currents, 4.1 and 4.2 at 675A and 160A. The 675A test would be on 65K and 50T links, while the 160A test would be on the minimum link size (as at present). In addition the two parameter method would be used for specifying TRV. TRV values would be similar to present values, but the effect of source impedance would be taken into account, as this reduces the values slightly compared to assuming that all impedance is on the source side of the fuse (rather than the impedance of the protected transformer being on the load side as occurs in practice). There was significant discussion concerning the two parameter TRV (for example, that the specified envelope is the minimum, but values exceeding this are at the discretion of the manufacturer). Also, an appropriate value for source impedance was discussed, since cutouts can be used with higher prospective currents than their maximum I/C, when paired with current-limiting fuses. Attempts were made to compare TRV values with circuit breakers, but it was pointed out that the high frequency TRV only occurs when a cutout is mounted directly adjacent (or on) a transformer, and it has a bolted secondary fault. The occurrence of this fault is therefore likely to be quite rare.

   John Leach pointed out that we have maintained a full description of how the testing for cutouts, using the high frequency TS4, has changed over time, first with the revision to C37.41 in 2016 and then its corrigendum. Presently, in PC37.41, this is Annex J. Additional information will have to be added by TF3 to bring this up-to-date. Members agreed that we should keep this “history” available to the users to explain the various methods that have been used to demonstrate satisfactory performance of cutouts with the transformer bolted secondary fault condition, and the “bursting” of the auxiliary tube that may, or may not, occur around this region.

   There was some debate concerning the ease of some test stations to achieve the desired TRV values for TS4 at 27 kV, and whether (apparently permitted in some standards) if the correct TRV is not possible an exception is allowed. The general view is that, since some test stations can achieve the required values, no exceptions should be allowed. If a station cannot achieve the desired numbers, tests should either be performed elsewhere of the station in question should purchase the required equipment (usually suitable inductors).

9. Revision of C37.41/42 – (Tuesday) review of draft 3f

1) Discussion of the current draft of the combined C37.41 and C37.42 began where the WG left off at the last meeting, with 18.1.2.3 (polymeric insulator testing). There was debate as to whether after the long-term deformation/creep testing a temperature rise test was necessary if the dimensions of the support were within the manufacturer’s specification. However, due to the possible difficulty of obtaining this value, this requirement was removed and the temperature rise test is used to determine a pass.
2) Various subclauses were improved to make the required testing clearer (note that this is the first revision since polymer testing was introduced in the standard).
3) Revisions through 18.2 were completed. However, there was a debate concerning whether the whole clause 18, presently termed “Tests for **expulsion fuses** having cutout fuse supports utilizing polymeric insulators” should instead be called “Tests for cutout fuse supports utilizing polymeric insulators”. In several cases tests may use a solid blade (thus becoming a disconnecting cutout), in which case what is being tested is not a fuse. We define a cutout fuse support (“a support that uses an insulator or insulators having a single-

point mounting bracket, generally located centrally between the terminals that are mounted at each end of the insulator(s)"). This support can be used with a variety of devices: a fuseholder (enabling a fuse link, refill unit, or fuse unit to be inserted into a cutout fuse support) which makes it a "*fuse cutout*", a disconnecting blade or a fuseholder with a solid fuse link, which makes it a "*disconnecting cutout*", and a current-limiting fuse, making it a "*cutout-mounted current-limiting fuse*". It can also be used with recloser type devices. *[Note the term "solid blade" is used extensively in the document, particularly Clause 18, but the definition "disconnecting cutout" uses the term "disconnecting blade" – differentiated from using a solid fuse link – not "solid blade". The terms blade and disconnecting blade are defined as equivalent and have a definition. Therefore "solid" is redundant or the term "disconnecting blade" should be used. The definition would also cover the use of a fuseholder and solid fuse link for the task.*]

In view of the relative newness of this clause, and the equivalent new IEC standard IEC 60282-4 "Additional testing requirements for high-voltage expulsion fuses utilizing polymeric insulators". Members were urged to give Clause 18 significant study before the next meeting. *[Note: while IEC 60282-4 uses the term "disconnecting blade", this only appears elsewhere in IEC in the expulsion fuse standard IEC 60282-2 in connection with an open-link cutout. Disconnecting cutouts are not otherwise acknowledged by IEC.]*

4) It was pointed out that we still have a significant section of the standard to review, and not much time left if we are to avoid having to extend the PAR. The revision of the dielectric tables has not been done – while we agreed to revert to the "previous" method of specifying testing (related to fuse voltage rather than BIL) both John Leach and Sterlin Cochran had examined this and the task is far from simple (previous values are in obsolete versions of C37.42, C37.46, and C37.47). Garry Haynes stated that he was the one pushing for this change back and so he would attempt this task before the next WG meeting.

The following items from the previous meetings are still outstanding:

5) There was some discussion of definitions, particularly related to "switches" and "disconnecting" devices. A request was made for someone relatively new in our industry to look at our definitions critically, as many of us know what is meant and do not recognize the difficulty for others with less experience. **Brian Betts** volunteered to do this.

6) The review list is shown below with reviewed sections removed (some members, who have already fulfilled their tasks, are blank – but are welcome to review any other areas that have not yet been reviewed!) Some areas may have been reviewed but with no comments – please let John Leach know this so it can be removed from the "to do" table:

Joshua Arlund	
Brian Betts	Annex J, 3
Glenn Borchardt	8, TS4
Chris Borck	
Sterlin Cochran	Annex J, Annex K, TS4
Jeramie Cooper	18, TS4
Rich Frye	
Gary Haynes	TS4
Travis Johnson	20, 21, 22, Annex G, Annex H, TS4

John Leach	
Chris Morton	TS4
Caryn Riley	18, Annex B, C, D, E, F, TS4
Jon Spencer	
Jean Mark Torres	
Bill Walter	20, 21, 22
Jim Wenzel	Annex I, TS4
Robert Wolf	
Charles Worthington	
Danish Zia	TS4

Please feel free to review other sections than “your” section.

10. New Business None

11. New Business None

12. Next meeting

Fall 2023 (October 08 – 13), Catamaran Resort, San Diego, CA

Spring 2024, (March 31st – April 4th) Westin Beach, Fort Lauderdale, FL

Fall 2024, (October 13th – 17th) OMNI Hotel, Oklahoma City, OK

Spring 2025, (April 13th – 17th) Wyndham Grand Orlando Resort Bonnet Creek, Orlando, FL

Fall 2025 (October 5th – 9th) Peppermill Resort, Reno NV

13. Adjournment: motion to adjourn, proposed Jon Spencer seconded Charles Worthington approved unanimously at 9:45 on April 19th, 2023

Respectfully Submitted,
John Leach, Secretary (04/22/23)