Minutes of Study Group for C37.04 & C37.09 (Rev. 1 – 14 Nov. 2019)
Possible Corrigenda and Amendments for C37.04-2018 and C37.09-2018
Session I: Monday, October 7th, 2019 8:00 – 9:45 am
Session II: Wednesday, October 9th, 2019 1:30 – 3:15 pm
Catamaran Resort & Spa, San Diego, CA

========== Session I (Monday) ==========

1. Welcome
2. Introductions
   Meeting opened with 61 in attendance, 46 of which registering for membership. (Attachment 1)
3. A call for knowledge of essential patents was made; no respondents
4. No additions to the published agenda were requested. (Attachment 2)
5. New Business
   a. Explanation of Errata, Corrigendum & Amendment process.
   b. A review of the IEEE Standards Board Policies and Procedures manual showed that any Study Group has a limited life of six months, from the date of the first meeting with the possibility of a single six-month extension by the sponsor for justifiable reason.
   c. One item where text was omitted from Table 1 of C37.09-2018 that was included in the draft sent to RevCom was identified as an erratum.
   d. The sense of the study group was the errata should be handled by SG officers as soon as possible as no vote or PAR is required; corrigenda should be first work of SG because as errors in existing text the ballot work should be quick, and ballot quickly resolved; amendments would be a future effort due to complexity.
   e. Began review of items submitted by interested individuals or previously identified as items from final ballots of C37.04 which may deserve additional scrutiny as submitted to chair and tabulated on spreadsheet. Items were dispositioned as either for corrigenda or for amendment. (Attachment 3)
   f. Time for the session expired with only about one-half of the items reviewed. It was agreed to attempt to meet for a second session during the switchgear committee meeting if an open time slot with a large enough room could be identified, else the SG would request an extension. If a new meeting was not possible or if the work could not be completed in the additional time, the study group would request an extension because the six month life of a study group would expire approximately one month prior to the next switchgear committee meeting.

Chair adjourned session at 9:45 am

========== Session II (Wednesday) ==========

6. Welcome to session II
   Clarification that according to standard practices of switchgear committee where two sessions of a group are scheduled for purposes of attendance the sessions are considered as one extended meeting and attendance at either satisfies the 50% attendance requirement in WG P&P.

7. Introductions
   Meeting opened with 37 in attendance, 28 from first session and 9 new individuals, 3 of whom requested membership, raising total membership to 50 of which 26 were present. A quorum of the total group was met. (Attachment 1)

8. A call for knowledge of essential patents was made; no respondents

9. Review of additional items for consideration continued. All items were determined by study group as not suitable for a corrigendum and tabled for future consideration. (Attachment 3)

10. Motion made by John Webb to request HVCB subcommittee to authorize two PARs, one for items associated with C37.04 and one for C37.09, to take up only the items identified as corrigenda. Seconded by Ken Edwards with friendly amendment that during the corrigenda process all references to other documents would be verified. The corrigenda items are:

    a. C37.04: Certain TRV values in C37.04 Table 13, Table 14, Table 17, Table 18, Table 19 and Table 20 vary from values in IEC 62271-100 by rounding errors from formulae given in C37.04 Table 3. These to be corrected and harmonized with IEC where those values are correct.

    b. C37.09: Clause 4.10.4 the ratio of zero and positive sequence currents in single phase capacitive switching procedure should be less than 3.0 rather than greater than 3.0.

    c. C37.09: Errors in clause 4.10.9.1.8 and 4.10.9.2.7 regarding the procedure for separate making tests.

    d. C37.09: 4.10.9.1.3 change in punctuation for clarity

    e. C37.09: Throughout document unify terms for rated voltage, including in equations to use “Ur” rather than “V”

    f. C37.09: Clause 5.9 and 5.9.1 have identical text, modify to make clear.

    g. C37.09: Clause 4.1.2 i) is missing some words required for clear meaning.

    h. Check references in and between C37.04 and C37.09

    The motion carried by voice vote without objection.

Chair adjourned the session at 3:15 pm

Attachments: (1) Attendance list (Rev. 1 – 14 Nov. 2019)

(2) Meeting Agenda

(3) Tabulation of items raised by study group with disposition to corrigenda or ammendment.

Role	First Name	Last Name	Company	City	State	10/07/19	10/09/19
Chair	Jan	Weisker	Siemens AG	Berlin	Other	X	X
Secretary	John	Webb	ABB	Florence	SC	X	X
Member	Herman	Bannink	KEMA Netherlands	Zelhem	Other	X	
Member	Ted	Burse	Powell Industries, Inc	Houston	TX	X	
Member	Eldridge	Byron	Schneider Electric	Smyrna	TN	X	
Member	Stephen	Cary	Eaton	Mebane	NC	X	X
Member	Steven	Chen	Eaton Corporation	MOON TOWNSHIP	PA	X	X
Member	Vincent	Chiodo	HICO	Pittsburgh	PA	X	
Member	Michael	Christian	ABB	Sanford	FL	X	
Member	Lucas	Collette	Duquesne Light	Pittsburgh	PA	X	
Member	Bianca	Cosby	San Diego Gas & Electric	San Diego	CA	X	
Member	Michael	Crawford	Mitsubishi Electric	Cranberry Twp	PA	X	X
Member	Jason	Cunningham	Southern States, LLC	Suwanee	GA	X	
Member	Patrick	Di Lillo	Consolidated Edison Co. of NY, Inc.	New York	NY	X	X
Member	Ken	Edwards	FirstEnergy Corp.	Akron	OH		X
Member	Emily	Eftink	Burns & McDonnell	Kansas City	MO	X	X
Member	Sergio	Flores	Schneider Electric Inc. USA	SMYRNA	TN	X	
Member	John	Hall	Tennessee Valley Authority	Chattanooga	TN	X	
Member	Jeremy	Hensberger	Mitsubishi Electric Power Products	Warrendale	PA	X	X
Member	Victor	Hermosillo	GE Grid Solutions	Charleroi	PA	X	X
Member	Roy	Hutchins	Southern Company Services	Birmingham	AL	X	X
Member	Todd	Irwin	GE Grid Solutions	Smithville	MO	X	X
Member	Christopher	Jarnigan	Southern Company Services	Birmingham	AL	X	X
Member	David	Johnson	HVCB	TEMECULA	CA		X
Member	Thomas	Keels	kEElectric Engineering	Mesa	AZ	X	X
Member	Scott	Lanning	S&C Electric	Libertyville	IL	X	
Member	Hua Ying	Liu	Southern California Edison	Pomona	CA	X	X
Member	Vincent	Marshall	Southern Company Services	Forest Park	GA	X	X
Member	Peter	Marzec	S&C Electric Co.	Chicago	IL	X	
Member	Steven	May	Southern Company	Forest Park	GA	X	X
Member	Neil	McCord	KEC Precision	Athens	GA	X	
Member	Mirko	Palazzo	ABB	Zurich	Other	X	
Member	Andrew	Peterson	ABB	Sanford	FL	X	X
Member	Lise	Phan	Pacific Gas and Electric Company	San Ramon	CA	X	
Member	Anthony	Ricciuti	Eaton Corporation	Moon Township	PA	X	X
Member	Jon	Rogers	Siemens Energy, Inc	richland	MS	X	
Member	Sushil	Shinde	ABB Inc.	Mt Pleasant	PA	X	
Member	Michael	Skidmore	AEP	Pickerington	OH	X	X
Member	James	Stage	Dominion Energy	Richmond	VA	X	
Member	Donald	Swing	Powell Industries	Houston	TX	X	
Member	Vernon	Toups	Siemens	Richland	MS	X	X
Member	James	van de Ligt	CANA High Voltage Ltd.	Calgary	AB	X	
Member	Casey	Weeks	Siemens Energy	Richland	MS	X	X
Member	William	Weishuhn	ABB	Monument	CO	X	
Member	Matt	Westerdale	Bureau of Reclamation	Denver	CO	X	
Member	Terrance	Woodyard	Siemens Industry Inc.	Wendell	NC	X	X
Member	Richard	York	Mitsubishi Electric Power Products	Pittsburgh	PA	X	
Member	Marcus	Young	Mitsubishi Electric Power Products,	Knoxville	TN	X	X

Role	First Name	Last Name	Company	City	State	10/07/19	10/09/19
Member	Wei	Zhang	Hitachi T&D Solutions, Inc.	Suwanee	GA		
Member	Xi	Zhu	GE Energy Management	Atlanta	GA		X
Guest	Daniel	Crist	Siemens Industry, Inc.	Richland	MS	X	X
Guest	Federico	Di Michele	CESI S.p.A.	Milano	Other	X	
Guest	Howard	Fennell	Nashville Electric Service	Nashville	TN	X	
Guest	Roopendra H	Jala	S&C Electric Company	Chicago	IL	X	
Guest	Hyung Kyu	Kim	Hyosung	Greensburg	PA		X
Guest	SangTae	Kim	HICO/HYOSUNG	Pittsburgh	PA	X	X
Guest	Carl	Kurinko	ABB Inc.	North Huntingdon	PA		X
Guest	JOOHYUN	LEE	HYOSUNG	CHANGWON	Other	X	X
Guest	Yingjie	Ling	GE	Chareleroi	PA		X
Guest	Dave	Mitchell	Mitch and Associates	Henrico	VA	X	
Guest	Anthony	Natale	HICO America	Pittsburgh	PA	X	
Guest	Thomas	Pellerito	DTE Energy	Detroit	MI	X	
Guest	Alan	Peterson	Utility Service Corporation	Huntsville	AL	X	
Guest	Craig	Polchinski	MEPPI	Warrendale	PA	X	
Guest	Brian	Roberts	Southern States, LLC	Hampton	GA	X	
Guest	Victor	Savulyak	DNV GL KEMA Laboratory	Chalfont	PA		X
Guest	Devki	Sharma	Entergy	JAN - Jackson, MS	MS		X
Guest	Zheng	Shen	Illinois Institute of Technology	Chicago	IL	X	
Guest	Henk	te Paske	KEMA Netherlands	Arnhem	Other	X	
Guest	Torsten	Wirz	ABB AG	Ratingen	Other	X	X
Guest	Dong Sun	Yoon	HICO America	Greensburg	PA		X
Guest	Mina	Youssef	Eaton Corporation	Omaha	NE		X
50	**Members**					**46**	**26**
Total Attendance						**61**	**37**

Study Group re: C37.04 & C37.09 HVCB Standards Next Activities

Catamaran Resort & Spa, San Diego CA

7 October, 2019 8:00 – 9:45am

Agenda

- Intro. of Attendees, Membership Process
- Call for knowledge of essential Patents
- No prior meeting minutes
- Errata, Corrigendum and Amendment Explanation
- New Business / Charge to Study Group
  - Open call for topics for consideration
- Urgency / Next Steps / Timeline

		Study group to C37.04 and 09					
No	**Std.**	**Category**	**Page**	**Sub-clause**	**Comment**	**Proposed Change**	**Remark**
1	04+09	General			Consider to reunite 04 and 09	Merge 04 and 09	Next Revision?
2	09	Technical			E=Ur/root 3 is missing from Table 1 T100s 1ph	Correct table	Errata
3	09	Technical		4.10.4	Grounding conditions for capacitive loads to be corrcted	Effectively grounded --> X0/X1 < 3	Corrigendum
4	09	Technical		4.10.9.1.8	Wrong reference to separate making operations	Reference should read 4.10.9.1.3	Corrigendum
5	09	Technical		4.10.9.2.7	Wrong reference to separate making operations	Reference should read 4.10.9.2.3	Corrigendum
6	09	Editorial		4.10.9.1.3	item b) seems to be wrong: b) The making current shall be appropriate to the capacitance current switching duty, to demonstrate back-to-back capacitor bank switching ratings, the making current shall be equal to the rated back-to-back capacitor bank inrush making current (Ibi), and the frequency shall be at least equal to the tested back-to-back capacitor bank inrush making frequency (fbi).	should read: b) The making current shall be appropriate to the capacitance current switching duty. To demonstrate back-to-back capacitor bank switching ratings, the making current shall be equal to the rated back-to-back capacitor bank inrush making current (Ibi), and the frequency shall be at least equal to the tested back-to-back capacitor bank inrush making frequency (fbi).	Corrigendum
7	09	Technical	52	4.8.4.5	Test duty T100s 1ph is performed with a symmetrical current equal to the rated short-circuit current and with a maximum arcing time as defined as follows Arcing time = minimum arcing time + 0.75 × t1	- Make clear wht is minimum arcing time	Amendment
8	09	Technical			Define Time interval between tests	as per IEC 62271-100; 6.106.1 (future 7.106.1)	Amendment
9	09	Technical	70	4.10.9.2.7	Discrepancy between C1 test procedure in IEEE and IEC, IEEE asks for steps in 30 deg, IEC changed to 10 deg	harmonize again	Amendment
10	09+04	Technical	84	4.3.18	Low-Temp Test – TL and TLL are neither defined in .09 or referenced in .04	Define TL and TLL	Amendment
11	09	Editorial	76	4.12.4.1	For rated voltage V and Ur is used	should be unified	Amendment
12	09	Technical			T100a procedure is generally accepted	but give more guidance if circuit-breaker is not stabil for min arcing time	Amendment
13	04	Technical		7.17.2 + Ta	size and threading of terminal studs on high voltage circuit breaker connections While a degree of harmonization is certainly desirable, this is a normative clause and technically should a different terminal threading be used, the breaker cannot be labeled as compliant with IEEE C37.04.	Is this really a good idea?	Amendment
14	04	Technical		Table 31	the accuracy class ratings of current transformers of outdoor circuit breakers is exclusively listed in Table 31	Remove table	Amendment

		Study group to C37.04 and 09					
No	**Std.**	**Category**	**Page**	**Sub-clause**	**Comment**	**Proposed Change**	**Remark**
15	04	Technical		Figure 12 + 13	Figures 12 & 13 explaining polarity marking and numbering of terminals on bushing mounted CTs, and the order and numbering of all CT's and their wires. This seems much more like a customer specification or a convention, but hardly necessary for the CB to perform its functions.	Proposal to be made later	Amendment
16	04	General		Annex E	Annex E (in its entirety) came from NEMA SG4 but really 'belongs' to instrument transformer sub-committee. In our last meeting of NEMA 8SG we discussed this topic and that while it was agreed perhaps 10 years ago that C37.04 would incorporate all of NEMA SG4, so that that document could be retired, there were several comments during the balloting of C37.04 that the above types of requirements were really not appropriate because the breaker will operate just fine with a different threading on the studs. We (NEMA) are also questioning that decision and have moved to extend SG4.	Remove Annex E?	Amendment
17	04	Technical			Define interrupting time in cycles not milliseconds – for 50 Hz / 60 Hz breakers both may be 3-cycles, but at 50 Hz will not be 50 ms.	Create new definition, new calculation	Amendment
18	04	Technical			Remove interrupting time as a "Rated" value but rather a related time value. (and why not define in terms of minimum arcing time?)	see also #17	Amendment
19	04	Technical			HVCB TRV levels – different kaf values. (i.e. T10 test 145 kV kpp 1.5: IEEE = 291 kV, IEC = 273 kV) [e-mail 2/1/19]	Harmonize	Amendment
20	04	Technical			Chopped Wave test required? Breaker is not harmed by the chopping of the voltage wave, but the higher peak, even for 2 µs, may cause flashover. (Is 1.29 pu realistic?)	Reconsider chopped wave requirement	Amendment
21	09	Technical			BIL requirement for (effectively) no negative tolerance – I don't believe this improves the statistical outcome of the test.	Reconsider tolerance on BIL test, currently average shall be positive	Amendment
22	09	Technical			Requirement to perform all interruption tests in a minimum volume enclosure?	Requiremnt to be added?	Amendment
23	09	Technical			Double Earth Fault in IEEE	Test necessary?	Amendment
24	09	Technical			Is single-phase asymmetrical test really necessary?		Amendment
25	09	Technical			TRV T60 values for CB's > 100 kV		Amendment
26	04	Technical			A few rounding errors in TRV tabulated values		Corrigendum

		Study group to C37.04 and 09					
No	**Std.**	**Category**	**Page**	**Sub-clause**	**Comment**	**Proposed Change**	**Remark**
27	04	Technical	23	Table 1	Allow contact temperature in non-oxidizing atmospheres to match IEC levels		Amendment
28	04	Technical	18	4.2.3	Is “light” pollution level as “normal” for bushing creepage really correct? IEC uses Medium.		Amendment
29	04	Technical			Users have asked for an out-of-phase voltage withstand capability (across contacts) for circuit breakers which may be across different transmission lines		No action for 04 and 09
30	04	Technical			Add rated voltages (and all related values in relevant tables) for 420 kV and 1200 kV	Introduce 300 kV and 420 kV, not UHV	Amendment
32	04	Technical			Eliminate capacitive switching class ‘C0’ as was originally done in C37.04a (but C37.09a resurrected it)	But cap switching has to be optional	Amendment
33	04	Technical			Add preferred ratings (normal & switching currents) for auxiliary contacts		Amendment
34	04	Editorial	17	4.1.2	indent i) (...) due to causes external (...) ==> external causes ???	Correct	Corrigendum
35	04	Editorial	38	5.9 and 5.9.1	Same Headline for both??	Ist that correct	Corrigendum
36	04+09	General			Check references in and between		Corrigendum