C37.04 Meeting in St Pete Beach, FL 4/28/2015
Minutes

R W Alexander, Recorder – S M Cary - Secretary

Standard Ratings and Requirements for AC High Voltage Circuit Breakers with Rated Maximum Voltage above 1000 V

Steve opened the meeting with introductions

Status: The C37.04 draft with all amendments included (C37.04a, C37.04b), and C37.06 and NEMA SG4 contents was completed and circulated for comment.

Attendance:	Total	76
	Members	35
	Guests	41

Items discussed:

Spring 2014 Minute approval, Moved: Anne Bosma, 2nd: Mike Skidmore

Fall 2014 Minute approval, Moved: Mike Skidmore, 2nd: Xi Zhu

PAR expires 2015. Working to having a first ballot complete by Fall 2015.
Will need a PAR extension.

It was noted a draft 2.5 of the standard was sent to working group was sent out. Comments made to that draft revision by the following working group members were reviewed:

Billings (13), Liu (2), Dufournet (3), Schuetz (13), Olsen (166). Eleven (11) additional comments were received from Alexander but meeting time expired so these were not reviewed. All these comments are attached to the minute notes.

Service capability draft subclause 5.8.2.5 were clarified. It was noted that the new proposal excludes operations at low currents and asymmetrical currents. It was clarified that HV accumulate to 600% based on CIGRE study IEC 62271-310 TR annex A. The second sentence noting 800% for HV will be removed from the draft.

Stan Billings to make a revision to 5.5.2.2 to change from 8.33 ms to ½ cycle

5.8 Out-of-Phase (OP) an option on all ratings (change in draft will be made)

5.9.2 It was decided that WG will coordinate with C37.010 WG on suggested working

7.4.1a What is trip free? Dan Sciffbauer to review history and make a recommendation for a .04 definition

Remove t3 eg E2 values convert completely to 2 parameter description
5.12.6

7.3.6 Manual trip on outdoor circuit breakers More than one utility noted the feature is being removed in the field. It was proposed to make this an optional feature on outdoor breakers. Consensus on whether to make option: Yes for the ballot draft.

7.4.2 Margin for pressure alarm? 10% change to whatever is required for "one operation". WG was agreeable to making this proposed change to the draft.

Carl Schuetz and Tom Mulcahay prepared a list of which definitions should be included .

Volunteer requested to input bibliography items. Gil Carmona volunteered to "Fix" the bibliography by having current papers etc not just 50 year old items.

Cap switching definitions will be listed in the definitions section under 3.0.

Time variables need to be consistent. t' for TRV NOT operating sequence will need a different variable – subject will be reviewed with C37.09 and recommendation made at next meeting

List of symbols in annex to be provided

The word "Rated" is removed from capabilities as redundant.

7.3.1 Position indicators: International symbols, colors etc. harmonization within IEEE docs LVSD to bring to ADSCOM.

Bus surge impedance for ITRV why 260 ohms? Do we need a different value. WG to evaluate and report for recommended change.

Arc furnace Duty (SG-4 addition)

It was clarified by Bill Long that "up to" is a requirement and not a test specification. So the manufacturer makes test evaluation the requirement must be minimum 350 A for schedule 1 and so on.

It was concluded that Table D1 from SG4 could be simplified and possibly "fostered" to IAS to make their own standard? To be decided "off line"

Meeting adjourned 9:55

R W Alexander
Member WG C37.04

S M Cary
Secretary C37.04

Working Group Attendees – Meeting 4/28/2015:

First	Last	Company	City	State	Status
Mauricio	Aristizabal	ABB	Pittsburgh	PA	Member
Xi	Zhu	GE Energy Management	Atlanta	GA	Member
Devki	Sharma	Consultant	Byram	MS	Member
Roy	Alexander	RWA Engineering	Cranberry Twp.	PA	Member
Stan	Billings	Mitsubishi Electric PP	Warrendale	PA	Member
Steven	Brown	Allen & Hoshall	Bartlett	TN	Member
Albert	Livshitz	CE Power Solutions	Loveland	OH	Member
Anne	Bosma	ABB AB	Ludvika	Sweden	Member
Denis	Dufournet	Alstom Grid	Villeurbanne	France	Member
Ted	Burse	Powell Industries, Inc	Houston	TX	Member
Russell	Long	Retired	Pittsburgh	PA	Member
Dean	Sigmon	Eaton Corporation	Greenwood	SC	Guest
Chih	Chow	PEPCO	Washington	DC	Member
Hua Ying	Liu	Southern California Edison	Pomona	CA	Member
Jingxuan (Joanne)	Hu	RBJ Engineering Corporation	Winnipeg	Canada	Guest
Arben	Bufi	Hitachi HVB, Inc.	Suwanee	GA	Member
Helmut	Heiermeier	ABB	Baden	Switzerland	Member
Anthony	Ricciuti	Eaton Corporation	Moon Township	PA	Guest
Tanner	Esco	Eaton Corporation	Greenwood	SC	Guest
John	Webb	ABB	Florence	SC	Member
Eldridge	Byron	Schneider Electric	Smyrna	TN	Member
Dave	Mitchell	Dominion	Richmond	VA	Member
Victor	Hermosillo	Alstom Grid	Charleroi	PA	Member
Thomas	Pellerito	DTE Energy	Detroit	MI	Member
Patrick	Di Lillo	Consolidated Edison Co. of NY, Inc.	New York	NY	Member
Roderick	Sauls	Southern Company Services	Birmingham	AL	Member
Todd	Irwin	Alstom Grid Inc	Smithville	MO	Guest
Donald	Cantrelle	Georgia Power	Forest Park	GA	Guest
Douglas	Giraud	Powell Electrical Systems	Houston	TX	Member
Vincent	Marshall	Southern Company Services	Forest Park	GA	Guest
Neil	McCord	Southern States	Hampton	GA	Guest

Michael	Skidmore	AEP	Pickerington	OH	Member
Lucas	Collette	Mitsubishi Electric	Warrendale	PA	Guest
Bernie	Dwyer	PECO	Berwyn	PA	Guest
Jon	Rogers	Siemens Energy, Inc	richland	MS	Member
Gilbert	Carmona	Southern California Edison	Pomona	CA	Member
Jiong	Zhang	MEPPI	West Covina	CA	Guest
Cody	Brehm		Milwaukee	WI	Guest
Steven	Chen	Eaton Corporation	Moon Township	PA	Member
Shawn	Patterson	US Bureau of Reclamation	Denver	CO	Guest
John	Shullaw	GE Energy Management	West Burlington	IA	Guest
Sushil	Shinde	ABB Inc.	Mt Pleasant	PA	Member
Dave	Collette	Mitsubishi Electric	Warrendale	PA	Guest
Brad	Leccia	Eaton	Moon Township	PA	Guest
Gary	Martin	Entergy	Kenner	LA	Guest
Vernon	Toups	Siemens	Richland	MS	Member
Robert	Foster	Megger	Paradise	CA	Guest
John	Hall	Tennessee Valley Authority	Chattanooga	TN	Member
Charles	Hendrickson	Arizona Public Service Company	Phoenix	AZ	Guest
Don	Steigerwalt	Duke Energy	Charlotte	NC	Guest
Stephen	Cary	GE Energy Management	Chapel Hill	NC	Secretary
Tom	Mulcahy	Dominion Virginia Power	Richmond	VA	Member
Jan	Weisker	Siemens AG	Berlin	Germany	Guest
Donald	Swing	Powell Industries	Houston	TX	Guest
Carl	Schuetz	American Transmission Company (ATC)	Waukesha	WI	Member
Robert	Sazanowicz	The United Illuminating Company	Wallingford	CT	Member
Peter	Marzec	S&C Electric Co.	Chicago	IL	Guest
Michael	Christian	ABB	Lake Mary	FL	Guest
Syed Shahab Uddin	Ahmed	Siemens Energy Inc	Madison	MS	Guest
Brian	Roberts	Southern States, LLC	Hampton	GA	Guest
Roy	Hutchins	Southern Company Services	Birmingham	AL	Guest
John	Eastman	INCON	Saco	ME	Guest
Casey	Weeks	Siemens Energy	Richland	MS	Guest
Timothy	McGee	Siemens Energy	Richland	MS	Guest
Humayun	Tariq	American Electric Power	Gahanna	OH	Guest
Wei	Zhang	Hitachi HVB, Inc.	Suwanee	GA	Guest
Jon	Schumann	American Transmission Company	Waukesha	WI	Guest
Aasim	Atiq	Siemens Energy	Ridgeland	MS	Guest
Daniel	Schiffbauer	Toshiba International Corporation	Oliver	PA	Guest
Mike	Boening	Plansee Powertech AG	Seon	Switzerland	Guest
Jeffrey	Brogdon	Georgia Transmission	Suwanee	GA	Guest
Victor	Savulyak	DNV GL KEMA Laboratory	Chalfont	PA	Guest
Harish	Sharma	Southern Company	Birmingham	AL	Member

Jason	Cunningham	Hitachi HVB, Inc.		Suwanee	GA	Guest
Jerry	Wen	BC Hydro		Burnaby	Canada	Guest
Jean-Marc	Torres	EATON		horseheads	NY	Guest

Appendix A Comments Reviewed

billings - 1	5.5.2.2	8	The definition of "t" in Figure 1 equation should be “contact part time plus 8.3 ms"	Revise as recommended.	Accepted - Must decide location to make note
billings - 2	5.5.2.4	8	Implies that there is no derating for the Standard duty cycle	Clarify when derating of the standard duty cycle is applicable	Please propose specific wording to make it clear
billings - 3	5.5.2.5	11	Service capability should not be determined by arithmetical sum of currents	We suggest that the service capability be verified by the completion of one duty cycle at 100% plus a summation of currents =/> than 80% Ir equal to 6 or 8 X Ir.	Proposed change is still a summation?
billings - 4	5.6	1	Confusion between 5.6 and 5.62	Revise 5.6 title to just "Transient Recovery Voltage"	Accepted - Change Made
billings - 5	5.6.4.3.2	1	Implies that the selection of fast TRVs results in the "best" interrupter.	Change the Title to “Definite purpose ratings for transformer limited faults”.	Accepted Change Made
billings - 6	5.8	24	Implies that Out of Phase is included as a requirement for all breakers rated 100 kV and above. OP used to be optional - Is this correct?	Need to clarify.	The change was proposed by WG member - that is why it was in red
billings - 7	5.9.1	7	Test requirement to demonstrate compliance is missing.	We suggest that compliance to rated interrupting time be determined based on tested Minimum interrupting time	Test requirements to determine interrupting time belongs in C37.09

billings - 8	5.9.2	16	It is not clear who has responsibilty for adding the time delay relay.	Provide clarification. It is always dangerous to assume the other party will be responsible.	Proposed wording to revise subclause
billings - 9	5.12	10	Subclauses 5.12.1 and 5.12.2 apply only to pressureized fluid (pneumatic or hydraulic) operating systems while the subsequent subclauses apply to all circuit breakers.	Clarify the application of subclauses 5.12.1 & 5.12.2 and break out the subsequent clauses as 5.13, 5.14, etc.	Agree - Change pending
billings - 10	7.3.6	27	Manual releases for outdoor circuit breakers should be identified as maintenance devices only.	The purpose for manual releases should be clarified. Other use of such functionality should be strongly discouraged.	Rejected - Such discussion should be placed in application guide
billings - 11	7.4.1 a)	8	Trip-free function needs additional description. Typical spring-spring mechanisms will not meet the present description because the close function will be maintained until completely closed. The trip release will be energized but will not open until close is completed.	Change the clause to "The circuit breaker operating mechanism(s) closing release system (mechanical or electrical) shall be designed…"	Pending

Liu - 1	5.5.2.5		I would strongly disagree with the changes in service capability duty requirements due to: 1. short circuit duty in our system has been increasing in the last 15 years due to 3rd party interconnections. 2. the reduction in service capability means that the maintenance intervals are shortened. This requires more frequent internal inspections, which would increase the cost to maintain the system	Keep the same service capability duty requirements as in C37.04-1999	Pending
Dufournet - 1	5.6		A lot of information coming from C37.04b is included in the new text. This information was useful when C37.04b was written in order to explain the 2-parameter and 4-parameter description of TRV coming from IEC and other ascpects of harmonization with IEC 62271-100. Today it should be	Transfer unnecessary information to IEEE C37.011. As this guide will be under revision soon, no information will be lost. The reduced size of C37.04 will be beneficial to the reader who will find more easily what he needs.	Microsoft tables and figure cross references have been added so sections can be deleted or replaced- WG determine what should be removed

			considered that teh purpose of a standard on ratings is not to be a text book on TRVs but to give requirements. My proposal is therefore to transfer a lot of this information in IEEE C37.011 (Guide for the application of TRV for HV circuit breakers), in some cases it is already there.		
Dufournet- 2	5.6.4.3.2		As already indicated in the draft of IEEE C37.06.1, it should be indicated that TLF is not applicable to GIS circuit breakers	TLF is not applicable to GIS circuit breakers due to the high value of the capacitance between the circuit breaker and the transformer	Accepted - Change made
Schuetz 1	5.2	19	Some breakers use capacitors connected from the HV terminal to ground for TRV control. They should also be precluded from damage when undergoing dielectric withstand capability testing.	add wording in line 19 after "circuit breaker", "or connected high voltage terminal to ground"	Accepted
Schuetz 2	Whole document		Multiple instances exist where indoor and outdoor breaker classes are mentioned. I believe the approprite ratings are	Replace indoor breaker with class S1 and outdoor breaker with class S2.	Accepted

			S1 and S2.		
Schuetz 3	5.5	23	Where does the 70% power factor come from?		
Schuetz 4	5.5.2.5.1	17	The sum of currents is expressed as an "8x" multiplier. In section 5.5.2.5 multipliers are expressed in words as in lines 14 and 15 "8 times".	Show the multiplider in the same manner consistently.	Accepted
Schuetz 5	5.6.2.3.1	14	Values of t3 are referred to IEC 62271-100	Since IEC and IEEE TRV requirements are standardized include the values in this standard.	
Schuetz 6	5.6.3.1	27-31	Text spacing needs adjusting to fit on one line.		Accepted
Schuetz 7	5.6.4.3.1		E2 is listed in the C37.06 reference.	If E2 is truly used add the year of C37.06 it is taken from.	Accepted - Change Pending

Schuetz 8	5.12.6	4	The requirements referred to are not clear.	Provide clarifying wording for this requirement.	Planning to delete this subclause
Schuetz 9	7.3.6	30	Is the manual release for an outdoor class external to the mechanism cabinet and do the manufacturers support this requirement?		Yes - Mfg to comment
Schuetz 10	7.4.2	6	Not sure if 10% margin is enough to give an alarm and have enough pressure left to close the breaker. The alarm purpose should provide ample margin to respond before a lockout occurs.	Change the wording "10 percent" to "one operation".	
Schuetz 11	7.4.3	17	Same as above	Change the wording "10 percent" to "one operation".	
Schuetz 12	7.4.4	32	As a user a mean time to failure of 8 years is unacceptable.	Change the mean time to failure (suggested 20 yrs) or remove this requirement.	

Schuetz 13	9.1.6	Fig. 17	There is no doubt that existing relays are configured this way. However, with modern relays the burden is very low and this type of connection is not needed. Additionally, this type of connection produces large CT voltages for internal breaker faults that need to be considered when this connection is used.	Add internal breaker fault concerns or remove figure.	
Olsen - 001			Entire document - use continuous line numbers. Highlight the entire document from beginning to end and then select continuous line numbering from the page layout menu.	See comment	Accepted - Change Made
Olsen - 002			Check title, scope and purpose and make them match the approved PAR.	See comment	Accepted - Change Made
Olsen - 003			In these comments, "line number" is answred with the form "pp.ll" where pp is the page number (i-ix, or 1-108) and ll is the line number. In some cases,	See comment	Accepted - Change made

			pages don't have line numbers.		
Olsen - 004	Abstract	ii.10	Change "IEEE Std C37.013" to "IEEE Std 62271-37-013" This matches page 1.24.	See comment	Accepted - Change Made
Olsen - 005	Introduct ion	iv.2	Delete extraneous orphan "r".	See comment	Accepted - Change Made
Olsen - 006	1	1.24	Change "62271-013" to "62271-37-013 and add [B21] or the appropriate bibliographic reference. Since GCBs are not covered in this document, 62271-37-013 should not be in clause 2.	See comment	Accepted - Change Made
Olsen - 007	1	1.24	At first instance of a bibliographic entry, add the IEEE footnote on bibliography location "The numbers in brackets correspond to those of the bibliography in Annex A."	See comment	Accepted - Change Pending
Olsen - 008	2	2.01	Change ANSI to IEEE.	See comment	Accepted - Change Made
Olsen - 009	2	2.01	Delete date	See comment	Accepted - Change Made
Olsen - 010	2	2.04	Change NEMA to ANSI.	See comment	Accepted - Change Made
Olsen - 011	2	2.06	Change NEMA to ANSI.	See comment	Accepted - Change Made
Olsen - 012	2	2.11 2.13	Delete the designation of the edition.	See comment	Accepted - Change Made
Olsen - 013	2	2.24	Delete date.	See comment	Accepted - Change

					Made
Olsen - 014	2	2.26	Delete lines 26-27 and put 62271-37-013 in bibliography .	See comment	Accepted - Change Made
Olsen - 015	2	2	Add IEEE footnotes for sources for ANSI, ASME, IEC, IEEE, and other SDO's documents.	See comment	Accepted - Change Pending
Olsen - 016	3	3.19	Add definitions for: air system alarm pressure switch continuous noise hydraulic system impulse noise intermittent noise lockout pressure switch stroke	See comment	Pending Decision
Olsen - 017	3	3.19	Strongly suggest moving definitions of various capacitance switching terms to the definitions clause where they belong.	See comment	Pending Decision
Olsen - 018	5	4.13	Change "the rating of a circuit breaker" to "The ratings and capabilities of a circuit breaker". Not all of the items are ratings, e.g., TRV has associated values but they are not ratings. They are values to be met in testing to achieve a	See comment	Accepted - Change Made

			valid test.		
Olsen - 019	5	4.31	Change "by ANSI C37.54" to "with ANSI C37.54".	See comment	Accepted - Change Made
Olsen - 020	5	4.35	The note must be made normative. Delete "NOTE --".	See comment	Accepted - Change Made
Olsen - 021	5.5.1	7.26	Add "(I_{rated})" at the end of the title.	See comment	Accepted - Change Made
Olsen - 022	5.5.2.2	8.16	Add IEEE footnote about notes being informative, "Notes in text, tables, and figures of a standard are given for information only and do not contain requirements needed to implement this standard."	See comment	Accepted - Changing Pending
Olsen - 023	5.5.2.5.1	9.19	Correct style of I_{rated}.	See comment	Accepted change made
Olsen - 024			Global - the whole document has variables in multiple styles. Edit the entire document and put each occurrence of an individual variable (such as I_{rated}) in one consistent style. See attached Word file for a list of the ones that I observed, but I am sure I missed at	See comment. Also see .pdf file included with this spreadsheet.	Accepted - Complete check pending

			least some.		
Olsen - 025	5.5.2.5.2	9.37 9.39	Change "rated symmetrical interrupting capability" and "rated short-circuit current' to I_{rated}.	See comment	Pending Decision
Olsen - 026	5.6.1	10.2 1	Delete date. Also, why not refer to the expanation of TRVs in annexes B and C?	See comment	Correcte d date - Change pending
Olsen - 027	5.6.1	10.3 9	Delete the designation of the edition.	See comment	Accepted - Change Pending
Olsen - 028	5.6.1	12.0 5	Change Annex A to Annex B.	See comment	Accepted - Change Pending
Olsen - 029	5.6.1	12.1 1	Change Table B to figure B.2.	See comment	Accepted - Change made on line 8, Table B1 was changed to Figure B.2.
Olsen - 030	5.6.1	12.1 3	Delete date.	See comment	Accepted - Also changed the date on line 11
Olsen - 031	5.6.1.2	13.1 8	Delete return so the orphan moves to line 13.17.	See comment	Accepted - Change Made
Olsen - 032	5.6.1.3	14.1 1	Change TRY to TRV.	See comment	Accepted - Change Made
Olsen - 033	5.6.1.3	14.2 5	Delete extraneous return so line 14.25 moves up to line 14.24	See comment	Accepted - Change Made
Olsen - 034	5.6.1.4	15.2 3	Delete extraneous space in 5.6.4.3.3.	See comment	Accepted - Change Made
Olsen - 035	5.6.1.5	15.3 8	Change "breaker test procedures in subclause 4.8.1.7 of IEEE Std C37.09" to	See comment	Accepted - Change Made

			"breaker short-line fault test procedures in IEEE Std C37.09".		
Olsen - 036	5.6.2.2	16.18	Global comment - change multiplication signs to the format used in line 16.29.	See comment	Accepted - Change Made
Olsen - 037	5.6.2.2	16.23	Change "2kV/ s" to "2kV/μs"	See comment	Accepted - Change Made
Olsen - 038	5.6.2.2	16.27	Global - check all bibliographic references - this one is not B17.	See comment	Accepted - Change Pending
Olsen - 039	5.6.2.2	17.08	change Annex E to 5.6.3.2.	See comment	Accepted - Change Made
Olsen - 040	5.6.2.2	17.16	Delete lines 16-17 - they duplicate lines 7-8.	See comment	Accepted - Change Made
Olsen - 041	5.6.2.2	17.21	E.1.5 is a bad reference. I am afraid I can't figure out what it should be.	See comment	Accepted - Change pending
Olsen - 042	5.6.2.2	17.25	Delete the designation of the edition.	See comment	Accepted - Change Made - also deleted a space
Olsen - 043	5.6.2.2	17.29	Change B19 to B18, and delete "the proposal for" in line 17.30.	See comment	Accepted - Change Made
Olsen - 044	5.6.2.2	18.01	Delete the return so line 18.01 moves up to line 17.37.	See comment	Accepted - Change Made
Olsen - 045	5.6.2.3.1	19.14	Delete [B5] since this is in clause 2.	See comment	Accepted - Change Made
Olsen - 046	5.6.2.3.1	19.33 19.35	Change "8 and 9" to "12 and 13" and change "4 and 5" to "8 and 9" and change both occurences of "will be" to "are".	See comment	Accepted - Change Made

Olsen - 047	5.6.2.3.1	19.38	Change "cable systems and line systems are described in Clause 3 and are also" to "cable systems (class S1) and line systems (class S1) are".	See comment	Change as follows: "cable systems (Class S1) and line systems (Class S2) are".
Olsen - 048	5.6.3.1	20.26 20.28 20.30	Fix misplaced line breaks.	See comment	Accepted - Change Made
Olsen - 049	5.6.3.2	21.12 21.13	Fix misplaced line breaks.	See comment	Accepted - Change Made - Please review
Olsen - 050	5.6.3.2	21.15	Change from "The primary list of rated conditions found in this standard are based on the effectively grounded system with a first-pole-to-clear factor of 1.3." to "Table 16 shows TRV values for circuit breakers rated 100 kV and above for use on effectively grounded systems."	See comment	Accepted - Change Made
Olsen - 051	5.6.3.2	21.17	Change from "A separate table of TRV values for rated voltages 100 kV and above using the first-pole-to-clear factor of 1.5 is also found	See comment	Accepted - Change Made - Note linked cross references does not allow inserting just number so it

			in this standard for those applications requiring this higher rating." to "Tables 17 and 19 show TRV values for rated voltages 100 kV and above using a first-pole-to-clear factor of 1.5."		reads Table 17 and Table 19
Olsen - 052	5.6.3.2	21.32	Change C62.92 [B13] to C62.92.1 [B13].	See comment	Accepted - Change Made
Olsen - 053	5.6.3.2	22.08	In lines 22.08 to 22.10, delete dates. Change [B21] to [B20].	See comment	Accepted - Change Made
Olsen - 054	5.6.3.2	22.24	Delete lines 22.24 through 22.26.	See comment	Accepted - Change Made
Olsen - 055	5.6.3.2	22.33	Delete date.	See comment	Accepted - Change Made
Olsen - 056	5.6.4.1	23.02	Change notes to footnotes to make them normative. Also in the u' row, change i_c to u_c. And, delete [B5] at the end.	See comment	Accepted - Changes Made
Olsen - 057	5.6.4.2	24.07	Change 5.9.6.3.3 to 5.6.4.3.3.	See comment	Accepted Change Made
Olsen - 058	5.6.4.3.1	24.15	Change "the rating tables and Table 2" to "Table 2 times the rated values shown in tables 8, 9, 12, 13, 16, 17, 18, or 19, as appropriate.	See comment	Accepted - Change Made
Olsen - 059	5.6.4.3.1	24.31	Change "per-unitized" (not a word)	See comment	Accepted - Change Made

			to "on a per unit basis".		
Olsen - 060	5.6.4.3.1	24.33	Change Annex D to Annexes B and C.	See comment	Accepted - Change Made
Olsen - 061	5.6.4.3.1	25.02	Global - the expression for per unit is pu, no periods, no upper case.	See comment	Accepted - Changes made to page 25
Olsen - 062	5.6.4.3.1	25.02	Change notes to footnotes to make them normative. In note 1, delete "an the E2 multipliers from Table 6, column 5 in IEEE Std C37.06" since C37.06 is going away and this document does not have E2 factors. In note 2, delete "and E2 multipliers from this standard and t3 multipliers derived from IEEE 62271-100 (Ed. 1.2)-2006 [B6]. Also in note 2, make a similar change as respects cable sytems. E.G. should be lower case, e.g. In the second last line, what is the factor K as it is not in the bable and therefore the last two lines do not relate to the table.	See comment	Accepted - Some changes completed - other changes pending
Olsen - 063	5.6.4.3.2	28.05	Delete "both Two" and	See comment	Accepted -

			the extraneous quotations mark.		Changes made
Olsen - 064	5.6.4.3.2	28.10	Fix alignment of lines 28.10-28.11. In line 28.12, delete (presently being balloted)" and in line 28.13, change % to percentage.	See comment	Accepted - Changes made
Olsen - 065	5.6.4.3.3	28.15	Change "as well as for" to "and with".	See comment	Accepted - Changes made
Olsen - 066	5.6.4.3.3	28.18	Delete "or related" as there is no such thing as a "related transient recovery voltage envelope".	See comment	Accepted - Ted to review change - committee voted to not call TRV a rating
Olsen - 067	5.6.4.3.3	28.22	Change 2C to 3, and delete last sentence.	See comment	Accepted - Changes made
Olsen - 068	5.6.4.3.3	28.31	In note 2, delete "the application guide to this standard, " Also, a new variable, t_l, not defined is used and it needs to be defined.	See comment	Pending Decision
Olsen - 069	5.6.4.3.4	30.15	There is no table 4. Where are the values that are discussed?	See comment	Table 4 exists on page 31
Olsen - 070	5.6.4.3.4	31.01	Delete the parenthetical expression.	See comment	Accepted - Changes made
Olsen - 071	5.6.4.3.4	31.06	"r.m.s." should be "rms" (no periods). I_{sc} should be I_{rated}. Notes need to be normative.	See comment	Accepted - rms change made - normative change pending
Olsen - 072	5.7	31.15	Add at the end of the line "(only for class C1 or class C2"	See comment	Accepted - Change made

Olsen - 073	5.8	33.15	The wording says that class S2 under 100kV does not need out-of-phase switching current as a rating, obviously an error. Change the sentence to "Rated out-of-phase switching is a standard rating for class S2 circuit breakers and an optional rating for class S1 circuit breakers".	See comment	Accepted - Change made
Olsen - 074	5.8	33.22	Change "its operation" to "contact part" since "its operation" can have a thousand different meanings but "contact part" is specific (as in existing clause 5.9.3)..	See comment	Accepted - Change Made
Olsen - 075	5.8.1	33.28	In the last sentence, the rating should be cited as I_{rated}.	See comment	Accepted - Change Made
Olsen - 076	5.8.2	33.33	Change "one cycle circuit" to "one cycle for circuit".	See comment	Accepted - Change Made
Olsen - 077	5.8.2	33.3	This is misplaced. Clause 5.9 deals with interrupting time, not clause 5.8. Move clause 5.8.2 to be a new clause 5.9.2 and renumber existing clauses 5.9.2 and	See comment	Rejected - 5.8.2 is about out-of-phase interrupting time

			5.9.3.		
Olsen - 078	5.9	33.36	Global - cannot use t' as the time interval and as indicated times in figures 2, 3, and so on. One of them has to change to a different variable.	See comment	Rejected for now - IEC uses t' for both as does C37.09, so this will be discussed at meeting on how to reslove
Olsen - 079	5.9.3	34.20	Delete "arcing". The definition is for contact parting time, not arcing contact parting time.	See comment	Accepted - Change made
Olsen - 080	5.12.6	36.04	Change "internal switchgear capacitors" to "capacitors used for assuring even voltage distribution on circuit breakers with multiple breaks per pole".	See comment	If no criteria for PD is accepted by working group then subclause 5.12.6 will be deleted
Olsen - 081	6.1	39.xx	In note 5, Change from "pollution level." Refer to table C1 of IEEE C37.100.1-2007), the manufacturer" to "pollution level (IEEE C37.100.1), refer to the manufacturer"	See comment	Accepted - Change Made
Olsen - 082	6.2	40.xx	In the header, in the last column, add "(3)"	See comment	Accepted - Change Made
Olsen - 083	6.2	43.04	Delete "Error! Reference souce not found"	See comment	Accepted - Change Made

Olsen - 084	6.2	43.10	Change "clause 5.9.2, subclause covering rated interrupting time" to "clauses 5.9.1 and 5.9.2". (This coordinates with relocation of clause 5.8.2 to 5.9.2).	See comment	It refers to 5.9.1 - See previous comment about moving out-of-phase interrupting time
Olsen - 085	6.2	44.02	In column 5, delete "(6)" since this deals with GIS and GIS is not in this table.	See comment	Accepted - Change Made
Olsen - 086	6.2	45.02	In the top header, change (7) (8) (9) to (6) (7) (8). In the header for preferred and alternate ratings, delete (8) since it is referred to in the top header.	See comment	Accepted - Change Made
Olsen - 087	6.2	45.04	Delete footnote b as not relevant to this table. Also delete b in the header.	See comment	Pending Decision
Olsen - 088	6.2	46.06	Delete edition and clause reference. Simply refer to C37.012.	See comment	Accepted - Change Made
Olsen - 089	6.2	46.26	Delete item (6) as applicable to GIS which is not covered in table 10, and therefore the information does not apply.	See comment	Accepted - Change Made
Olsen - 090	6.3	47.10	In footnote b, change "Error! Reference source not found" to	See comment	Accepted - Change Made

			"Table 14".		
Olsen - 091	6.3	48.08	Add at the end, "and 5.9.2" to coordinate with relocation of clause 5.8.2.	See comment	See comment to 43.10
Olsen - 092	6.3	50.03	In column 5, delete "(6)" as obsolete information. And, in column 6, change (7) to (6).	See comment	Accepted - Change Made
Olsen - 093	6.3	51.xx	In item 2, delete date and change xxxx to 5.6.3.2. In item 4, change table 11 to table 11 and table 13.	See comment	Accepted - Change Made
Olsen - 094	6.3	51.xx	Delete item 6 as being obsolete information. We do not care about the 2000 revision since the information is unchaged from the 2009 edition. If we do care, lets go back and cite the 1964 version too (attempt at humor?)	See comment	Accepted - Change Made
Olsen - 095	6.3	53.02	Delete citation of footnote b as irrelevant. Also delete footnote b as irrelevant. In footnote c, (renumber), change "Error! Reference source not found" to Table 14 in both places.	See comment	Accepted - Change Made
Olsen - 096	6.3	54.xx	In item 1, delete the	See comment	Accepted - Change

			date and clause reference, simply refer to C37.012.		Made
Olsen - 097	6.3	54.xx	In item 4, change "Error! Reference source not found" to "Table 14".	See comment	Accepted - Change Made
Olsen - 098	6.3	54.xx	In item 6, change "prove Class C1" to "prove Clase C0 or Class C1".	See comment	Changed to "prove Class C1 or Class C2" - Prove C0, C1 or C2 to be discussed at meeting
Olsen - 099	6.3	54.xx	In item 7, delete "the previous values listed in ANSI C37.06-2000 and" as obsolete information, and change "represent" to "represents".	See comment	Accepted - Change Made
Olsen - 100	6.3	54.xx	At the beginning of item 8, change or to For.	See comment	Accepted - Change Made
Olsen - 101	6.4	56.xx	In item 3, add at the end, "and 5.9.2" to coordinate with relocation of clause 5.8.2. Also, reformat item 2 to mimic the format of item 3 on page 43.	See comment	See previous comment
Olsen - 102	6.4	61.xx	In item 2, delete date and change xxxx to 5.6.3.2. In item 4, change "Error! Reference source not found" to "tables 15-18"	See comment	Accepted - Change Made

Olsen - 103	6.4	61.xx	In item 7, delete the year from lines 1 and 2.	See comment	Accepted - Change Made
Olsen - 104	6.4	64.xx	In time 1, delete the year. In item 2, change "Error! Reference source not found" to "table 15 and table 19".	See comment	Accepted - Change Made
Olsen - 105	6.4	65.xx	On pages 65 and 66, delete b and c footnote citations from the header. On page 66, delete footnote as irrelevant to the table.	See comment	Change pending
Olsen - 106	6.4	67.xx	Global - convert to portait from landscape.	See comment	Change pending
Olsen - 107	6.4	67.xx	In item 1, delete date and clause reference, simply refer to C37.012. In items 2 and 4, change table 16 to table 20. In item 6, Change "prove Class C1" to "prove Clase C0 or Class C1".	See comment	Accepted most changes - some changes pending
Olsen - 108	6.5	68.xx	In 6.5, change "Error! Reference source not found" to "Table 21".	See comment	Accepted - Change Made
Olsen - 109	6.5	69.xx	Delete "NOTE 1 --" and "NOTE 2 --" so that the text becomes normative.	See comment	Change pending
Olsen - 110	6.6	72.xx	In item 4, change MG to MG1, and add MG1 to bibliography.	See comment	Accepted - addition to bibliography pending

Olsen - 111	6.6	75.05	Change "Error! Reference source not found" to "Table 23".	See comment	Accepted - Change Made
Olsen - 112	7.3.1	76.09	Side note - this is a topic for discussion in St. Pete Beach as a topic that affects multiple documents and subcommittees.	See comment	Ted - can you make agenda item for discussion
Olsen - 113	7.3.4	76.20	Delete the parenthetical expression.	See comment	Accepted - Change Made
Olsen - 114	7.4.1	77.37	Change table 20 to table 24.	See comment	Accepted - Change Made
Olsen - 115	7.4,1	78.02	Delete the extraneous item d).	See comment	Accepted - Change Made
Olsen - 116	7.4.4	78.31	Change 7.4.5.1 to 7.4.4.1.	See comment	Accepted - Change Made
Olsen - 117	7.4.4.1	78.37	Delete the apostrophe.	See comment	Accepted - Change Made
Olsen - 118	7.4.4.1	78.41	Change test duty 4 to test duty T100s.	See comment	Accepted - Change Made
Olsen - 119	7.4.4.1	78.43	Change test duty 4 to test duty T100s.	See comment	Accepted - Change Made
Olsen - 120	7.5	79.03	Change table 20 to table 24.	See comment	Accepted - Change Made
Olsen - 121	7.8.3	79.22	Change operated to controlled.	See comment	Accepted - Change Made
Olsen - 122	7.12.2	81.01	Change all footnote citations to superscripts .	See comment	Accepted - Change Made
Olsen - 123	7.13	82.05	Add ANSI S1.1 and ANSI S1.13 to clause 2.	See comment	Accepted - Change Pending
Olsen - 124	7.16	82.20	Delete "and NEMA 107-1988" and replace with "and NEMA CC1". Reason? The present version of NEMA CC1 includes Annex A	See comment	Accepted - Change Made

			which is the replacement for the old NEMA 107.		
Olsen - 125	7.16	83.05	Insert return to relocate footnote c.	See comment	Accepted - Change Made
Olsen - 126	7.18.1	83.11	Delete parenthetical. C37.017 is published.	See comment	Accepted - Change Made
Olsen - 127	7.18.2	83.15	Change table 24 to table 28.	See comment	Accepted - Change Made
Olsen - 128	7.18.3	84.05	Change figures B-2 to B-6 to figures C-2 to C-6.	See comment	Accepted - Change Made
Olsen - 129	7.19.5	85.07	Change table 4 to table 29, and change figure 8 to figure 11.	See comment	Accepted - Change Made
Olsen - 130	7.20.3	86.06	Fix font in lines 86.06 through 86.17.	See comment	Accepted - Change Made
Olsen - 131	8.3	88.20	Delete item q as information not appropriate to a nameplate.	See comment	Accepted - Change Made
Olsen - 132	9.1.5.1	91.05	Change figures 3 through 5 to figures 12 through 14.	See comment	Accepted - Change Made
Olsen - 133	9.1.5.1	92.08	The editorial comment is incorrect, as the intent of the arrows is to relate to the CT polarity. This is clear because of the further labels that relate to core flux, primary current, and secondary current.	See comment	Accepted - Change is being made
Olsen - 134	9.1.6	94.14	Change Figures 6 thorugh 9 to figures 15 through 18.	See comment	Accepted - Change is being made
Olsen - 135	9.2	96.15	The style for ac and dc is lower case, except when at the	See comment	Accepted - Change made

			beginning of a sentence.		
Olsen - 136	Annex A	98.01	The bibliography should be Annex A.	See comment	Change pending
Olsen - 137	Annex B	99.07	Delete the sentence beginning "See TRV envelope…" Change "Clause 5 of IEEE Std C37.04b-2008" to "clause 5.6.2.3."	See comment	Accepted - Change made
Olsen - 138	B.1	99.12	Delete the entire line.	See comment	Accepted - Change made
Olsen - 139	B.1	99.18	Delete "as determined by another standard (see IEEE Std C37.04-1999, 5.9.1.1) and delete the parenthetical at the end of line 99.19.	See comment	Accepted - Change made
Olsen - 140	B.1	99.26	Delete the year and clause. And delete lines 99.28 through 99.29.	See comment	Accepted - Change made
Olsen - 141	B.1	100.01	Delete lines 100.01 and 100.02, because there is no discussion of the ratio in the figures.	See comment	Accepted - Change made
Olsen - 142	B.1	100.06	Change "Error! Reference source not found" to "the ratings in this standard".	See comment	Accepted - Change made
Olsen - 143	B.2	100.10	As indicated earlier, we need to use a different symbol than t' which is used in the duty cycle.	See comment	See previous comment
Olsen - 144	B.2	100.19	Delete the sentence that begins	See comment	Accepted - Change made

			"The symbols are…".		
Olsen - 145	Annex C	101. 05	Delete date.	See comment	Accepted - Change made
Olsen - 146	Annex C	101. 13	Delete the sentence that begins "See TRV envelope".	See comment	Accepted - Change made
Olsen - 147	C.1	101. 28	Delete "as specified in IEEE Std C37.04b-2008".	See comment	Accepted - Change made
Olsen - 148	C.1	102. 04	Change "are defined in Table 1" to "are defined and shown in Table 1". Delete date from line 102.04, and delete lines 102.06 and 102.07.	See comment	Accepted - Change made
Olsen - 149	C.1	102. 17	As indicated earlier, we need to use a different symbol than t' which is used in the duty cycle.	See comment	See previous comment
Olsen - 150	D.3	103. 13 103. 19	Delete B1.	See comment	Accepted - Change made
Olsen - 151	E.1	105. 07	In line 105.07, delete "wound type" as few if any of the ratios identified would be wound type, and wound type is not important to the thought that ratios are shown in the table. In line 105.08, change table 10 to table 30.	See comment	Accepted - Change made
Olsen - 152	E.2	105. 13	Change figure 5 to figures 12-14. Delete the rest of the clause, from "A	See comment	Complete change pending

			fourth secondary…" and continuing through line 105.20.		
Olsen - 153	E.5	105. 30	Change Figures 6 through 9 to figures 15 through 18.	See comment	Accepted - Change made
Olsen - 154	E.6.1	106. 19	After "voltage tests", add "(if applicable)".	See comment	Accepted - Change made
Olsen - 155	Annex F	106. 28	Delete Annex F and move bibliography to Annex A.	See comment	Pending change
Olsen - 156		106. 41	Delete [B5] since this is in clause 2.	See comment	Accepted - Change made
Olsen - 157		106. 43	Change 100 to 200, and delete year information. Also suggest deleting altogether as not really relevant to this document.	See comment	Accepted - Change made - complete delete pending
Olsen - 158		106. 46	Delete [B7] since this is in clause 2.	See comment	Change pending
Olsen - 159		107. 01	Delete [B8] as this is in clause 2.	See comment	Change pending
Olsen - 160		107. 03	Delete [B9] because the dictionary is cited in clause 3 and the terms of reference (IEEE 100 and seventh edition, etc.) are obsolete.	See comment	Change pending
Olsen - 161		107. 05	Delete [B10] as it is in clause 2.	See comment	Change pending
Olsen - 162		107. 07	For [B11] through [B15], delete dates.	See comment	Accepted - Change made
Olsen - 163		107. 21	For [B17], delete date.	See comment	Accepted - Change made

Olsen - 164			Add citation for IEEE Std 62271-37-013. Also, add a footnote if 62271-37-013 is not done by the time that this one is done that this document is under preparation to replace IEEE Std C37.013.	See comment	Change pending
Olsen - 165			Add new document "[Bxx] Naef, O., Zimmerman, C. P., and Beehler, J. E., "Proposed Transient Recovery Voltage Ratings for Power Circuit Breakers," IEEE Transactions on Power Apparatus and Systems, vol. PAS-84, no. 7, pp. 580–608, July 1965." This obtained from [B19] in C37.011-2011.	See comment	Change pending
Olsen - 166		108.01	Move text to page 107.	See comment	Change pending
RWA1	5.7.6	1298	The back to back inrush frequency is no longer a rated value , but is only used for testing. It has no direct value for application	**5.7.6 Tested back-to-back capacitor bank inrush making frequency (f_{bi})**	

				The tested back-to-back capacitor bank inrush making frequency is the minimuminrush current frequency to which I_{bi} (clause 5.7.5) is tested .. f_{bi} is a value for inrush current testing to prove the inrush capability. In service there is no practical upper limit for f_{bi} . The inrush (or outrush) current frequency is important for shock wave limited devices as oil circuit breakers but has only a small influence on other breaking technologies. I_{bi} is the limiting quantity and its primary effect is contact wear for SF_6 technologies and restrike performance for vacuum technologies. The previously used $I \times f$ limitations were only valid for oil breakers and are not important for Vacuum or SF_6 technologies. I_{bi} is based on a 2000 operation service life with no contact maintenance. for fewer operations I_{bi} can be much higher up to the close and latch capability for at least 2 operations. For SF_6 devices, for one order of magnitude variations in inrush current magnitude, an increase in the inrush current should be accompanied by a directly proportional decrease in the number of expected operations at the higher inrush current. For example: If the inrush current is 3 x I_{bi}, the number of operations should be reduced to 2000/3 = 666. For Vacuum devices, an increase in inrush current above I_{bi} may be accompanied by a higher risk of restrikes.	
RWA 2	Table 10	1482	Values in col 9,11, and 13 do not make sense	values should be changed as follows: column 9,11,13 lines 1 - 10 should be "2", col 9 lines 17-19 "4", col 11 lines 11-19 "4"; col 13 lines 11-19 "7"	
RWA 3	info to table 10	1498	item (3) needs to be corrected. The back to back inrush frequency is no longer a rating only lower limit on a tested value	(3) The rated transient inrush current peak is the highest magnitude of current that the circuit breaker shall be required to close at any voltage up to the rated maximum voltage and shall be as determined by the system as unmodified by the circuit breaker. The tested transient inrush current frequency is the lowest frequency that the circuit breaker shall be tested at 100% rated back-to-back capacitor switching inrush current rating.	
RWA 4	info to table 10	1503	item (4) is incorrect The old I x f	delete item(4) in its entirety	

			criteria no longer applies		
RWA 5	Table 14	1587	values not consistent in columns 9, 11	values changed as follows: column 9 make all lines "4" column 11 make all values "2"	
RWA 6	info to table 14	1605	item (3) needs to be corrected. The back to back inrush frequency is no longer a rating only lower limit on a tested value	(3) The rated transient inrush current peak is the highest magnitude of current that the circuit breaker shall be required to close at any voltage up to the rated maximum voltage and shall be as determined by the system as unmodified by the circuit breaker. The tested transient inrush current frequency is the lowest frequency that the circuit breaker shall be tested at 100% rated back-to-back capacitor switching inrush current rating.	
RWA 7	info to table 20	1756	item (3) needs to be corrected. The back to back inrush frequency is no longer a rating only lower limit on a tested value	(3) The rated transient inrush current peak is the highest magnitude of current that the circuit breaker shall be required to close at any voltage up to the rated maximum voltage and shall be as determined by the system as unmodified by the circuit breaker. The tested transient inrush current frequency is the lowest frequency that the circuit breaker shall be tested at 100% rated back-to-back capacitor switching inrush current rating.	
RWA 8	3.0	399	we will likely need some definitions	many of the rated quantities could be definitions 56.1,5.3,5.4. 5.7.1, 5.7.2, 5.7.3,5.7.4,5.7.5,5.7.6 etc.	
RWA 9	5.5.2.2	585	this is OK but something needs to be added about the last half wave as discussed in C37.010	peak and duration of the last half wave during testing will define the assymmetrical capability et. Etc. This concept neeeds to be introduced since we are going to require these values on the nameplate to make C37.010 useable.	
RWA 10	5.6.1.3	page 14 line 11 TRY ?	This was changed!	"TRY" should be changed to 'TRV'	
RWA 11	8.1	2308	need to add last half wave quantities	after (m) add: T100a Tested last half wave magnitude and duration	