

Minutes for Working Group PC37.30.1

October 11, 2021

“Virtual” Videoconference

- The working group met for two sessions on October 11th.
- 22 participants were in attendance at the first session. 19 participants were in attendance at the second session. See the attached attendance roster.
- 13 out of 19 Working Group voting members attended the first session constituting a quorum and 12 out of 19 constituting a quorum for the second session.
- WG Chair Carl Reigart informed the WG that the meeting would be recorded to aid in generating the meeting minutes and asked for any objections.
 - No participants objected.
- Attendees introduced themselves with their affiliations.
- WG Chair Carl Reigart addressed the members and guests of the WG to identify any patent conflicts.
 - There were no members or guests that brought up any patent conflicts to the WG.
- WG Chair went through IEEE SA copyright slides and informed the WG the following from the PowerPoint slides:
 - IEEE SA’s copyright policy is described in Clause 7 of the IEEE SA Standards Board Bylaws and Clause 6.1 of the IEEE SA Standards Board Operations Manual;
 - Any material submitted during standards development, whether verbal, recorded, or in written form, is a Contribution and shall comply with the IEEE SA Copyright Policy;
 - No concerns about copyright by working group.
- Working group reviewed comment ID 227634 on Table 14 Column 5, 6, 7, and 8.
 - Proposal was out there to revise minimum to recommended.
 - Unanimous vote to change to recommended was accepted.
- WG chair with through Annex B.
 - Reviewed Minimum Phase Clearance to Grounded Objects IEEE C37.36b-1990
 - Reviewed draft proposal by WG Chair Carl Reigart for Table B.1.
 - Reviewed the following:
 - Proposed revised title
 - Additional notes

Draft Proposal

Table B.1 - Suggested guide for interrupting currents with vertical break air switches equipped with arcing horns and mounted in the horizontal upright position
[Based on maximum operating voltage, minimum phase clearance to grounded objects, and calculated arc reach]

Rated maximum voltage L-L	Rated impulse withstand voltage	Minimum phase clearance to grounded objects, Table 13, Column 5 (See note 1)		Resistive or transformer excitation current (See note 2)	Bus, line or cable capacitive current (See note 2)	Calculated arc reach (See note 3)		Required phase clearance to grounded objects (See Note 4)	
V_l		d		I_{or}	I_{or}	$Max. L_e, L_c$		Dr	
kV rms	kV peak	mm	(in.)	A	A	mm	(in.)	mm	(in.)
(1)	(2)	(3)		(4)	(5)	(6)		(7)	
15.5	110	178	7	2.8	1.0	127	5	305	12
27	150	254	10	2.9	1.0	229	9	483	19
38	200	330	13	2.7	1.0	305	12	635	25
48.3	250	432	17	2.7	0.9	381	15	813	32
72.5	250	432	17	1.8	0.6	381	15	813	32
72.5	350	635	25	2.1	0.7	457	18	1092	43
123	350	635	25	1.2	0.4	432	17	1067	42
123	450	864	34	1.4	0.5	508	20	1372	54
123	550	1067	42	1.7	0.6	610	24	1676	66
145	450	864	34	1.1	0.4	483	19	1346	53
145	550	1067	42	1.4	0.5	610	24	1676	66
145	650	1270	50	1.9	0.7	813	32	2083	82
170	550	1067	42	1.2	0.4	610	24	1676	66
170	650	1270	50	1.6	0.5	813	32	2083	82
170	750	1473	58	1.8	0.6	889	35	2362	93
245	900	1803	71	1.4	0.5	1016	40	2819	111
245	1050	2108	83	1.7	0.6	1219	48	3327	131
362	1050	2134	84	1.0	0.3	1067	42	3200	126
362	1300	2642	104	1.1	0.4	1168	46	3810	150
550	1550	3150	124	†	†				
550	1800	3658	144	†	†				
800	2050	4216	166	†	†				

NOTE 1 - The distance across the switch insulators to the grounded base can be ignored.
 NOTE 2 - Values given in Columns 4 and 5 are for vertical-break switches, horizontal upright mounted.
 NOTE 3 - Arc reach distances for current interruption in Column 6 are derived from calculation methods in Annex B, using equations (B.1), (B.2), (B.3), and (B.4).
 NOTE 4 - Values in Column 7 are the sums of the values in Columns 3 and 6.
 NOTE 5 - † denotes insufficient data.
 NOTE 6 - Do not use this table without prior and careful review of the entire guide. Before applying the suggestions made by this guide, it is the user's responsibility to evaluate any adverse consequences that may result if the switch should fail to interrupt current.

- WG member Ilya Glinsky had question on example for 15.5kV switch on application of column 3 vs. column 7.
 - WG Chair went through Annex with additional information for explanation
- WG Chair Carl Reigart reviewed spreadsheet for calculations for Table B.1
 - Some cases values were rounded up and some cases were rounded up
 - WG Chair discussed consensus of task force of Carl Reigart, Brett Boles, Laura Reid, and James Houston with clearances that rounding up would be more appropriate
 - No comments by working group
- WG Chair Carl Reigart shared with working group about where values from Table 13 came from.
 - Values in Table 13 Came from A Guide for Minimum Electrical Clearances – 1954
- WG Chair Carl Reigart reviewed draft proposal Table B.2.
 - Rated maximum voltage
 - Rounded up in columns 6 & column 7
 - Note 2 tells how calculated and reference equations
 - Note 4 could be Caution Label

Draft Proposal

Table B.2 - Suggested guide for interrupting currents with vertical break air switches equipped with arcing horns and mounted in the horizontal upright position
 [Based on maximum operating voltage, horn gap switch phase spacing (centerline to centerline) and calculated maximum allowable arc reach]

Rated maximum voltage L-L V_L	Rated withstand voltage impulse kV Peak	Assumed width of live parts T		Horn gap air switch phase-to-phase spacing from Table 13, Column 8		Phase to phase clearance (Maximum allowable arc reach) D_I		Maximum resistive or transformer excitation current (See notes 1 and 2) I_{cr}	Maximum Bus, line, or cable capacitive current (See notes 1 and 2) I_{cr}
				D_{cr}					
kV rms (1)		mm (3)	(in.) (3)	mm (4)	(in.) (4)	mm (5)	(in.) (5)	A (6)	A (7)
15.5	110	305	12	914	36	610	24	10.7	4.4
27	150	305	12	1219	48	914	36	9.8	3.7
38	200	305	12	1524	60	1219	48	9.5	3.5
48.3	250	305	12	1829	72	1524	60	9.5	3.5
72.5	250	305	12	1829	72	1524	60	6.1	2.1
72.5	350	305	12	2134	84	1829	72	7.6	2.7
123	350	457	18	2134	84	1676	66	3.7	1.2
123	450	457	18	2616	103	2159	85	5.1	1.7
123	550	457	18	3048	120	2591	102	6.3	2.1
145	350	457	18	2134	84	1676	66	3.0	1.0
145	450	457	18	2616	103	2159	85	4.2	1.4
145	550	457	18	3048	120	2591	102	5.2	1.7
145	650	457	18	3658	144	3200	126	6.6	2.3
170	450	610	24	2616	103	2007	79	3.1	1.0
170	550	610	24	3048	120	2438	96	4.0	1.3
170	650	610	24	3658	144	3048	120	5.2	1.8
170	750	610	24	4267	168	3658	144	6.5	2.2
245	550	610	24	3048	120	2438	96	2.4	0.8
245	650	610	24	3658	144	3048	120	3.3	1.1
245	750	610	24	4267	168	3658	144	4.2	1.4
245	900	610	24	4877	192	4267	168	5.0	1.7
245	1050	610	24	5486	216	4877	192	5.9	2.0
362	1050	610	24	5486	216	4877	192	3.5	1.2
362	1300	610	24	6096	240	5486	216	4.1	1.4
550	1550	914	36	7620	300	†	†	†	†
550	1800	914	36	8230	324	†	†	†	†
800	2050	1219	48	15240	600	†	†	†	†

NOTE 1 - Values given in Columns 6 and 7 are for vertical-break switches, horizontal-upright-mounted with minimum phase clearance to grounded objects at least equal to values in Column 4 of this table. The distance over the switch insulators to the grounded base can be ignored.

NOTE 2 - Suggested values for current interruption in Columns 6 and 7 are derived from calculation methods in Annex B, using equations (B.9) and (B.10).

NOTE 3 - † denotes insufficient data.

NOTE 4 - Do not use this table without prior and careful review of the entire guide. Before applying the suggestions made by this guide, it is the user's responsibility to evaluate any adverse consequences that may result if the switch should fail to interrupt current.

- WG Member Devki Sharma stated that the title or some information should be in there about clearance to grounded objects
- WG Chair Carl Reigart proposed an additional Table B.3 for a guide for phase clearance to grounded objects when interrupting currents on horn gap phase spacing.

Draft Proposal

Table B.3 - Suggested guide for phase clearance to grounded objects when interrupting currents with vertical break air switches equipped with arcing horns and mounted in the horizontal upright position

[Based on maximum operating voltage, minimum phase clearance to grounded objects, horn gap phase spacing and calculated arc reach]

Rated maximum voltage L-L	Rated impulse withstand voltage	Minimum phase clearance to grounded objects, Table 13, Column 5 (See note 1)		Resistive or transformer excitation current (See note 2)	Bus, line or cable capacitive current (See note 2)	Calculated arc reach (See note 3)		Required phase clearance to grounded objects (See Note 4)	
V_l		d		I_{er}	I_{cr}	$Max. L_r, L_c$		D_r	
kV rms	kV peak	mm	(in.)	A	A	mm	(in.)	mm	(in.)
(1)	(2)	(3)		(4)	(5)	(6)		(7)	
15.5	110	178	7	10.7	4.4	559	22	737	29
27	150	254	10	9.8	3.7	813	32	1067	42
38	200	330	13	9.5	3.5	1067	42	1397	55
48.3	250	432	17	9.5	3.5	1372	54	1803	71
72.5	250	432	17	6.1	2.1	1295	51	1727	68
72.5	350	635	25	7.6	2.7	1600	63	2235	88
123	350	635	25	3.7	1.2	1346	53	1981	78
123	450	864	34	5.1	1.7	1829	72	2692	106
123	550	1067	42	6.3	2.1	2261	89	3327	131
145	450	864	34	4.2	1.4	1778	70	2642	104
145	550	1067	42	5.2	1.7	2210	87	3277	129
145	650	1270	50	6.6	2.3	2794	110	4064	160
170	550	1067	42	4.0	1.3	1981	78	3048	120
170	650	1270	50	5.2	1.8	2591	102	3861	152
170	750	1473	58	6.5	2.2	3226	127	4699	185
245	900	1803	71	5.0	1.7	3581	141	5385	212
245	1050	2108	83	5.9	2.0	4216	166	6325	249
362	1050	2134	84	3.5	1.2	3683	145	5817	229
362	1300	2642	104	4.1	1.4	4318	170	6960	274
550	1550	3150	124	†	†				
550	1800	3658	144	†	†				
800	2050	4216	166	†	†				

NOTE 1 - The distance across the switch insulators to the grounded base can be ignored.

NOTE 2 - Values given in Columns 4 and 5 are those found in Table B.2 for vertical-break switches, horizontal upright mounted on horn gap phase spacing, columns 6 and 7 respectively.

NOTE 3 - Arc reach distances for current interruption in Column 6 are derived from calculation methods in Annex B, using equations (B.1), (B.2), (B.3), and (B.4).

NOTE 4 - Values in Column 7 are the sums of the values in Columns 3 and 6.

NOTE 5 - † denotes insufficient data.

NOTE 6 - Do not use this table without prior and careful review of the entire guide. Before applying the suggestions made by this guide, it is the user's responsibility to evaluate any adverse consequences that may result if the switch should fail to interrupt current.

- WG Chair Carl Reigart opened up discussion on wisdom for addition of Table B.3 into Annex.
 - WG members were polled by Secretary Jacob Blake
 - Unanimous vote to add Table B.3
 - WG Chair Carl Reigart reviewed title for proposed Table B.1
 - Jeramie Cooper suggested to make title similar to Table B.3

- Pete Kowalik suggested adding additional to Table B.3 title – “Suggested guide for additional”
- Laura Reid suggested Table B.1 – Suggested phase clearance to grounded objects: guide for interrupting currents with vertical break air switches equipped with arcing horns and mounted in the horizontal upright position [Based on maximum operating voltage, minimum phase clearance to grounded objects, and calculated arc reach]
- WG Chair proposed renaming column 6 to Additional clearance required based on calculated arc reach (See note 3)
- WG Chair proposed title Guide for recommended phase clearance to grounded objects when interrupting currents with vertical break air switches equipped with arcing horns and mounted in the horizontal upright position. position [Based on maximum operating voltage, minimum phase clearance to grounded objects, and calculated arc reach]
- WG Chair reviewed title for Table B.2
 - Laura Reid proposed to add maximum in title to mimic column 6 & column 7.
 - Suggested guide for interrupting maximum currents with vertical air break switches equipped with arcing horns and mounted in horizontal and upright position [Based on maximum operating voltage, horn gap switch spacing (centerline to centerline) and calculated maximum arc reach]]
 - John Kaminski pointed out that suggested was all throughout Annex B and proposed to keep suggested in the titles for Table B.1 and Table B.2.
- WG Chair Carl Reigart reviewed style manual for use of a Caution Note in reference to the Notes in Tables B.1-B.3.
 - Informed WG that note should move to caution note.
- First session adjourned at 12:00 PM
- Second session began 1:30 PM
- WG Chair Carl Reigart informed the WG that the meeting would be recorded to aid in generating the meeting minutes and asked for any objections.
 - No participants objected.
- Attendees introduced themselves with their affiliations.
- WG Chair Carl Reigart addressed the members and guests of the WG to identify any patent conflicts.
 - There were no members or guests that brought up any patent conflicts to the WG.
- WG Chair went through IEEE SA copyright slides and informed the WG the following from the PowerPoint slides:
 - IEEE SA’s copyright policy is described in Clause 7 of the IEEE SA Standards Board Bylaws and Clause 6.1 of the IEEE SA Standards Board Operations Manual;
 - Any material submitted during standards development, whether verbal, recorded, or in written form, is a Contribution and shall comply with the IEEE SA Copyright Policy;
 - No concerns about copyright by working group.
- WG discussed removal of Table B.1
 - James Houston was in favor of removing but also wanted to have reference for future readers.

- WG Chair Carl Reigart proposed new title for Table B.1 Examples of suggested phase clearance to grounded objects when interrupting example currents with vertical break air switches equipped with arcing horns and mounted in the horizontal upright position [Based on maximum operating voltage, minimum phase clearance to grounded objects, and calculated arc reach.
 - WG members were polled by secretary and all present working group members agreed to title.
 - Jon Spencer did not vote.
- WG Chair informed WG that he will finalize Annex B.
- Additional comments or concerns were discussed.
 - Pete Kowalik discussed that changes in Annex B required Annex A to be revised.
 - Pete Kowalik discussed adding regulator bypass table.
 - WG Chair Carl Reigart informed Pete Kowalik that he has added in latest version of the draft.
 - Devki Sharma discussed confusion of Table 13 with horn gap and horn gap spacing.
 - WG discussed column 8 to revise title to horn gap spacing instead of All horn gap switches (vertical and side break)
 - John Kaminski questioned if procedurally we could revise if no comments addressed it specifically.
 - WG Chair Carl Reigart informed working group that he would review comments and determine if change can be made.
 - WG was polled by secretary to accept change. WG members voted and approved except following WG members abstained from voting:
 - Jon Spencer
 - Devki Sharma
 - Meeting adjourned 2:28 PM.

Jacob Blake
WG Secretary

Name	Affiliation	Member/Guest	Attendance Session 1	Attendance Session 2
Brian Alexander	S&C Electric Canada	G	X	X
Andrew Berman	S&C Electric	G	X	X
Jacob Blake	Hubbell Power Systems	Secretary	X	X
Brett Boles	Southern Company	M	X	X
Steven Brown	Allen & Hoshall	G		
Timothy Cook	Pascor Atlantic	M		
Jeramie Cooper	Eaton	M	X	X
Charles Corley	Eaton	G		
Frank DeCesaro	DeCesaro Consulting Services	M	X	
Steven Donahue	Royal Switchgear Manufacturing	M		
Chris Ekpoudom	Southern States	G		
Richard Frye	Eaton	G		
Jose Gamboa	The HJ Family of Companies	G	X	X
Ilya Glinisky	Southern California Edison	M	X	X
Francisco Guzman	Southern California Edison	M		
John Hall	TVA	M		
Danny Hoss	Southern States	M	X	X
James Houston	Southern Company	M	X	X
Bill Hurst	GE	M	X	X
Joe Jasinski	ITC Holdings	G	X	X
John Kaminski	Siemens	M	X	X
Ian Klein	Hubbell Power Systems	G		
Pete Kowalik	Cleveland Price	M	X	X
Scott Lanning	S&C Electric	G		
Jeremy Moore	Pascor Atlantic	G	X	
Henning Milnikel	Siemens AG	G	X	
Christopher Morton	Powertech Labs, INC.	G		
Ir. Noor M Fadzli Othman	PETRONAS			
Laura Reid	Hubbell Power Systems	M	X	X
Carl Reigart	Hubbell Power Systems	Chair	X	X
David Rhein	Hubbell Power Systems	G		
Brent Richardson	Hubbell Power Systems	G		
Caryn Riley	Georgia Tech/NEETRAC	G	X	
Rob Ross	Cleveland Price	G		X
Devki Sharma	Entergy	M	X	
Jon Spencer	Utility Solutions	M		X
Sushil Shinde	Mitsubishi Electric Power Products	G		
Joseph Usner	AEP	M		
Adam Voyles	Ameren	G	X	X
James Wenzel	Eaton	G		
Charles Worthington	Hubbell	G	X	X
Xin Zhou	Eaton	G		