

IEEE Power & Energy Society
Switchgear Committee
C37.20.7 Working Group Report
06-May-2014

The working group met on Tuesday, May 6, at 8:02AM.

Agenda:

The agenda was previously distributed. Agenda accepted without objection.

Patents:

Those registered at the Switchgear Committee meeting in Orlando had to acknowledge the IEEE-SA rules on Patents, and therefore, review in this meeting is not required. Nevertheless, the chair displayed the Patents slides and reminded attendees of their obligations. The participants were reminded that anti-competitive issues are never allowed for discussions.

General:

The PAR for this project was approved by the IEEE-SA Standards Board on November 9, 2011, and is valid through 2015.

Members introduced themselves, identified their company and their affiliation. Total attendance was 73 persons. Attendance included 28 working group members (of 30, with 1 absent and 1 excused, plus 46 guests. Attendance is as shown below:

Members / Affiliation	Members / Affiliation	Guests / Affiliation	Guests / Affiliation
C. Ball (P) – S&C	D. Lemmerman (P) – Exelon/PECO	B. Anderson (P) - Eaton	J. Kaminski (P) - Siemens
P. Barnhart (P) - UL	F. Mayle (P) - Technibus	J. Arambewela (P) – General Switchgear & Controls	J. LaGree (P) - Eaton
J. Baskin (P) – Federal Pacific	D. Mazumdar (P) - AZZ	J. Biasse (P) - Schneider	A. Lizardo (P) - ABB
R. Boyce (P) – Eaton	D. Mohla (P) – DCM Electrical Consulting	J. Campbell (P) – Powell	J. McClelland (P) – Technibus
J. Bowen (E) - Aramco	A. Morse (P) - Eaton	C. Canne (P) – Schneider	C. McCollum (P) - ABB
E. Byron (P) - Schneider	T. Olsen (P) - Siemens	S. Colsch (P) - Schneider	R. Morris (P) - Eaton
J. Earl (P) - ABB	M Orosz (P) - Schneider	R. Cohn (P) – Powercon	D. Moser (P) – ABB
D. Edwards (P) - Siemens	A. Patel (P) - GE	M. Crooks (P) - Eaton	M. Parvin (P) – Chicago Bridge & Iron
M. Flack (P) – Southern Nuclear	C. Schneider (P) - Schneider	D. Delfino (P) - GE	A. Petersen (P) - ABB
K. Flowers (P) - Siemens	J. Smith (A) - Eaton	E. Dullini (P) - ABB	S. Powell (P) - AZZ
D. Gohil (P) - AZZ	P. Sullivan (P) - DuPont	D. Dunne (P) - Schneider	R. Puckett (E) – retired
H. Josten (P) - Siemens	C. Taylor (P) - Eaton	D. Elliott (P) – ABB	S. Reddy (P) – Powell
A. Jur (P) – Eaton	M. Valdes (P) - GE	S. Flores (P) - Schneider	M. Roberson (P) – AZZ
C. Kennedy (P) - Schneider	M. Wactor (P) – Powell	A. Gibbs (P) - Schneider	R. Rohr (P) – Powell
M. Lafond (P) - GE	R. Warren (P) – DNV-GL (formerly KEMA)	P. Gingrich (P) - AZZ	T. Rohrer (P) - Exiscan
		L. Grahor (P) - Eaton	A. Rowell (P) - Eaton
		J. Hanson (P) - Schneider	M. Seabrook (P) – GE
		T. Hawkins (P) – Siemens	G. Sims (P) – Eaton
		T. Hendricks (P) - Schneider	T. Sorvari (P) - Enbridge
		J. Hidaka (P) – UL	R. Tanner (P) – Schneider
		J. Hines (P) - Eaton	J. Thayalan (P) – Schneider
		D. Hrcir (P) – Eaton	T. Tobin (P) – S&C
		D. Jackson (P) – ABB	L. Yonce (E) – Eaton
		J. Joseph (P) – Toshiba	T. Woodyard (P) - Siemens

The minutes from the Fall 2013 meeting were corrected to show R. Morris (Bob) as the presenter on wire size for arc initiation, and with this change, were approved. A. Morse (Allan) moved to approve and D. Mohla seconded. Passed unanimously.

Chair Comments:

Objective is to get through the issues on the agenda, and then move to ballot.

Wire size for arc initiation for low-voltage products:

The material presented by R. Morris at the Fall 2013 meeting was briefly reviewed. The recommendation of the task force for MCCs (Annex H) is to use a no. 10 AWG wire on the line side, but for the load side of protective devices (up to 600A) with both current and duration limitation characteristics, use a no. 14 AWG wire for arc initiation on the load side of the short-circuit protective device (SCPD) in low-voltage MCCs (Annex H).

Substantial discussion took place regarding the need or non-need for testing on the load side of an MCC “bucket” which has an SCPD with current limiting characteristics.

Use of the tables from IEC as discussed in the Fall 2013 meeting for testing in MCCs for compartments protected by an SCPD in another compartment (i.e., a compartment on the load side of an SCPD in another compartment). These tables are reproduced below:

Table 1: for tests without current limiting SCPD with a maximum wire size of 1.5mm². (16AWG = 1.31mm², 14 AWG = 2.08mm²), this table changes the wire size for different test currents.

Table 1 – Sizes of the copper ignition wire without current limiting protection device

Test current (rms value) kA	Wire size mm ²
≤ 25	0,75
> 25 ≤ 40	1,0
> 40	1,5

If the test current is influenced by current-limiting protection devices, the size of the ignition wire should be chosen from Table 2 according to the let-through current of this device so that the melting of the wire can be expected before the operation of this device.

Table 2: for tests with a current limiting SCPD with a maximum wire size of 1.1mm². (18 AWG = 0.823mm²), this table changes the wire size for different let through current peak levels.

Table 2 – Sizes of the copper ignition wire with current limiting protection device

Let-through current (peak value) kA	Wire size	
	min. mm ²	max. mm ²
≤ 10	0,1	0,2
20	0,15	0,3
30	0,2	0,5
40	0,3	0,6
50	0,4	0,8
60	0,5	0,8
70	0,6	0,9
80	0,7	1,0
90	0,8	1,1

A task group was formed to report with definitive recommendations on all of the low voltage products back on issues of wire size for LV tests consisting of:

H. Josten, C. Schneider, A. Jur, R. Morris, D. Hrnccir, D. Dunne, M. Crooks, M. Valdes. The task force is to provide recommendations by July 31.

Grounding during tests:

The working group had been asked to comment on the method of grounding (or not grounding) of the generator during testing. The consensus (overwhelming) was to continue to require solidly grounded (or connected to the neutral) as today, but with the addition of a requirement to determine the prospective currents in the ground or neutral connection.

Peak current requirements with reduced voltage testing:

E. Dullni made a presentation at the Fall 2013 meeting concerning the peak current requirements and test experience when reduced voltage tests are used due to laboratory limitations. In the case of reduced voltage tests, the requirement is that peak current be at least 90% of the rated peak current. If you fail to meet the peak, you must retest. If you cannot meet the peak, you have to increase the symmetrical test current or increase the test voltage sufficiently to meet the peak current requirement. If you again miss the 90% peak, you have to test yet again.

Mr. Dullni presented a proposal at the Fall 2013 meeting to modify the requirements with respect to peak current requirements during reduced voltage testing to avoid “over-testing” the equipment (testing to a higher current level than is necessary purely to meet the peak current of 90%). This proposal involves integrating the arc energy in the tests. Mr. Dullni’s presentation will be provided with the minutes.

The proposal from the Fall 2013 meeting was reviewed again. Extracted from the previous presentation, the recommendations are:

- If an arc fault test turns out to be not valid, because the maximum peak current did not achieve 90% of the prospective value, **the arc power integrated over the first 3 half-cycles** should be determined from the same test.
 - Arc power (current x arc voltage) can be supplied by the lab.
- **A reference value of arc energy** is obtained by multiplying the arc power integrated over the first 3 half-cycles by the **ratio of 90% rated peak current and actually measured peak current**.
- A repetition test with increased mean short-circuit current or increased source voltage should be accepted as valid, if
 - either the peak value is above 90% of the rated short-circuit peak current or
 - the arc power integrated over the first 3 half-cycles is higher than the reference value of arc energy from the first test irrespective of the height of the peak current.
- **Consider implementing such a condition in the guide in order to avoid repetitive arc fault tests just because of an impact of the erratic behavior of the arc.**

Consensus – we need data on test experience of MV producers on test experience. Suggested data elements are:

- rated voltage
- test voltage
- prospective peak current
- length of arc wire between phases
- actual test peak current
- shape of the conductors (round, rectangular)
- Comments (if relevant) on conductor configuration and relation of prospective shorting bar location vs. arc test location.

M. Wactor will create a form with needed information, and manufacturers are asked to forward their input to P. Barnhart so that identification of firms is removed and the data is consistent. It is requested that input be provided by May 31.

Test duration for low voltage products:

MCCs (for example) have no short-time rating and the short-circuit rating is based on a test duration of three cycles (50ms). The proposed duration of arcing tests is 50ms, but this seems unrealistic in real applications. Discussion in the meeting seems to suggest that the minimum duration of an arcing test for MCCs ought to be 100ms, and also for switchboards. It also seems reasonable that if the equipment has a short-time rating, the preferred duration should be the short-time duration, up to 0.5s.

C. Schneider moved, M. Valdes seconded, to require all low voltage products to have a minimum arcing duration of 0.1s and, if with short-time rating, for the short-time duration up to 0.5s. Motion passed.

New proposal for suffix C and C1:

The latest draft (D6) includes a proposal for recognizing the old “type C” accessibility for historical purposes, and creation of a new “type C1” accessibility for protection when withdrawing a circuit breaker in one compartment while other compartments remain energized and an arcing event occurs in one of those other compartments. Consensus – delete the proposed “type C1” and revert the text for “type C” to the text from earlier drafts.

Retrofit / Retrofill equipment:

There was a discussion of conversions of non-arc-resistant existing equipment to be arc-resistant. It was agreed that while this group might wish to consider this in the future, but we are not able to address this arena at this time.

It is expect that the next draft will be sent out for comments about six weeks before the Fall meeting, with comments due two weeks before the Fall meeting. The desire is to begin balloting after the Fall meeting.

The meeting adjourned at 11:58AM.

Report submitted by: M. Wactor, WG Chair