IEEE PC37.20.7.1 Working Group Meeting Minutes

IEEE Guide for Application, Installation, and Use of Switchgear Rated Up to 52 kV Tested for Internal Arcing Faults

Meeting Date: April 7, 2025
Meeting Time: 10:15AM-12:00 EST
Location: Wyndham Grand Orland Resort Bonnet Creek, Orlando, FL

Attendance

Members: 37, Guests: 42, quorum met.
Attendance is recorded at the end of the meeting minutes.

A. Call to Order

Meeting was called to order at 10:17am on April 7th, 2025

B. Introductions and Declaration of Affiliation

Participants introduced as noted below.

C. Approval of Agenda and Meeting Minutes

Motion to approve agenda by R. Burns, 2nd by Ron Hartzel. Approved by unanimous consent.
Motion to approve previous meeting minutes by T. Woodyard, 2nd by G. Sims. Approved by unanimous consent.

D. IEEE SA Patent Policy: Call for Patents

Slides and links to documents shared with Working Group
Verbal call for Essential Patents – none were identified.

E. IEEE SA Copyright Policy

Link and Slides for SA Copyright Policy shared to the group on the projector screen.

F. IEEE SA Participant Behavior – Individual Method

Link for Working Group Participant Behavior shared on the projector screen with all attendees.

G. Working Group P&P's

Link for Working Group P&P's shared.

H. PAR Status Report

PAR approved by SA Standards Board 04 Jun 2024 and expires 31 Dec 2028.

I. IEEE iMeet Center Workspace

Chair stated he has not yet set up the iMeet central page.

J. Quorum Check

Quorum was confirmed with circulated roster attendance sheets.

K. Review Ad Hoc Group Recommendations

a. Clause 1.2a Physical Constraints of the Site Ad Hoc:

C. French – Summary of suggestions from the ad hoc shared with the WG in D2. Clarification text added to clause 6.3 and new clause 6.3.5.2 suggested for equipment in close proximity to the arcing venting. Some questions on how to define "close proximity" will need to be worked on in future drafts.

b. Clause 1.2b Coordination with Protection Schemes Ad Hoc:

N. Nolte – not in attendance and ad hoc recommendation not presented to WG.
M. Peterson volunteered to become co-chair of the ad hoc in the absence of N. Nolte.
WG Chair requests that a recommendation be presented within 30 calendar days.

c. Clause 1.2c Base Level Structural Consistency in the Building Ad Hoc:

O. Hartmann – not in attendance and ad hoc recommendation not presented to the WG.
T. Woodyard volunteered to discuss effort with O. Hartmann.
G. Sims volunteered to be co-chair of the ad hoc.
WG Chair requests that a recommendation be presented within 30 calendar days.

d. Clause 1.2d The Effect of Installation Site Requirements on Equipent Ratings Ad Hoc:

E. Ramirez-Bettoni – not in attendance and ad hoc recommendation not presented to the WG.

A. Bartels volunteered to be the co-chair of the ad hoc and check on any work completed by E. Ramirez-Bettoni.
D. Leopard volunteered to assist with this ad hoc.
WG Chair requests that a recommendation be presented within 30 calendar days.

e. **Clause 1.2e Locations where Internal Arcing Faults Are More Likely to Occur Ad Hoc:**
F. Cozuic – ad hoc presented recommendation in a excel comment form. Ad hoc recommends the re-introduction of table B.1 from the 2007 version of C37.20.7 which would be helpful in identify potential areas of potential areas of internal arcing and possibly an insertion into clause 4.2. Some discussion that columns #2 and #3 of table B.1 may need to be refined or dropped for the targeted ad hoc subject matter.
Action – F. Cozuic will update the table and provide a recommendation to the WG within 15 calendar days.
Action – Chair to circulate D2 to WG once 1.2e recommendation is submitted.

f. **Clause 1.2f Risk Mitigation Methods Ad Hoc:**
R. Burns – presentation shared with WG on ad hoc recommendations and attached to the end of the meeting minutes. Information on arc detection relays and sensors editorially updated and some discussion may need to be added that a trip command could be sent to an arc mitigation device in addition to an upstream interruption device. A new subclause is proposed on the subject of ultrafast circuit breakers. The final sentence of this recommendation is rejected by the WG in which it states that an ultrafast circuit breaker protection would negate the need of arc resistant switchgear.
Action – Chair to incorporate the text as amended by WG in D2 of document and circulate within 30 business days.

g. **Clause 1.2g Application and Considerations for Electrical Safety Ad Hoc:**
E. Ramirez-Bettoni not in attendance and recommendation not presented to the WG.
A. Bartels volunteered to be co-chair of the ad hoc.
A. Lopez and M. Youssef volunteered to assist with this ad hoc.
WG Chair requests that a recommendation be presented within 30 calendar days.

L. Adjourn
Meeting adjourned at 11:16am.

Recorded by:
Jake Walgenbach
WG Secretary
April 7, 2025

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Attendance:

Last Name	First Name	Affiliation	Role
Lafond	Michael	National Breaker Services	Chair
Walgenbach	Jake	Siemens	Secretary
Barnhart	Paul	UL Solutions	Member
Biradar	Siddangoud	Eaton	Member
Bridges	Chris	Eaton	Member
Burns	Robert	Eaton	Member
Cohn	Bob	Powercon	Member
Coziuc	Fiori	S&C Electric Canada	Member
Creach	Randy	Avail Switchgear Systems	Member
Doroz	Arkadiusz	Eaton	Member
Flores	Sergio	Schneider Electric	Member
French	Chris	Beta Engineering	Member
Hartzel	Ron	Eaton	Member
Hawkins	Tom	Siemens Industry	Member
Haynes	Gary	ABB	Member
Hines	Jared	Eaton	Member
Holp	Tyler	Eaton	Member
Jahan	Fathmi	ABB	Member
Leopard	Dakota	Eaton	Member
Livshitz	Albert	Qualus Services	Member
McGlown	Kevin	JST Power	Member
Natale	Anthony	HICO America	Member
Orosz	Miklos	CBT&S/Meyers Power	Member
Page	Mike	Eaton	Member
Parks	Owen	ABB	Member
Peterson	Mark	Xcel Energy	Member
Ricker	Jeffery	Schneider Electric	Member
Rowell	Amy	Schneider Electric	Member
Runov	Art	S&C Electric Canada	Member
Santos	Leonel	Schneider Electric	Member
Schneider	Carl	Schneider Electric	Member
Shirode	Aniket	ABB	Member
Sims	Garett	Eaton	Member
Solanki	Lokeshkumar	ABB	Member
Trichon	Francois	Schneider Electric	Member
Tuthill	Bryan	Volta/W-Industries	Member
Woodyard	Terrance	Siemens Industry	Member
Adair	Brian	IE Corp	Guest
Aduloin	George	S&C Electric Canada	Guest
Attia	Hannan	IEM	Guest
Banda	Marco A	Spike Electric	Guest
Barracchini	Dominic	Hico America	Guest
Bartels	Andreas	Powell Industries	Guest
Bouche	Nick	Switchgear Power Systems	Guest
Bryant	Craig	Duke Energy	Guest
Bush	Kelsey	ABB	Guest
Busilan	Dan T	Dominion Energy Virginia	Guest

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Last Name	First Name	Affiliation	Role
Chhabra	Mohit	S&C Electric	Guest
Dart	David	Noja Power	Guest
Diallo	Boubacar	Southern States LLC	Guest
Door	Jeffrey	The H-J Family of Companies	Guest
Essel	Caleb	Spike Electric	Guest
Fox	Paul	Schneider Electric	Guest
Gill	Juan	Southern States	Guest
Govindarajan	Sathish	Schneider Electric	Guest
Grdina	Todd	Siemens	Guest
Howard	Michael	Eaton	Guest
Ivanov	Alex	JST Power Equipment	Guest
Jacob	Kai	Siemens AG	Guest
Jaggarnauth	Sudesh	Florida Power & Light	Guest
Jo	Seyngtae	Korea Electrotechnology Pe-	Guest
Ju	Seyoung	Hico America	Guest
Kapitula	John	ABB	Guest
Kasonga	Mick	Omcor TX	Guest
Lopez	Adrian	Spike Electric	Guest
Lovins	Colby	Federal Pacific	Guest
Lyu	Joseph	Federal Pacific	Guest
Mgunda	McPharlen	Hico America	Guest
Neighbors	Terry	ABB	Guest
Patil	Lalit	Eaton	Guest
Pecile	Conrad	Meyers Power Products	Guest
Rexford	Aaron M	Meiden American Switchgear	Guest
Sell	Jason	Switchgear Power Systems	Guest
Slattery	Chris	First Energy	Guest
Thayalan	Jey	Schneider Electric	Guest
Tillery	Tim	Howard Industries	Guest
Vangaasteck	Joe	Powercon Corp	Guest
Woo Lee	Yong	Keir	Guest
Youssef	Mina	Eaton	Guest

C37.20.7.1 Clause 1.2f Risk Mitigation Methods Ad Hoc Report

Ad hoc members

Robert Burns (chair)
Tyler Holp
Mark Peterson
Aniket Shirode
Lokesh Solanki

Scope of Work

To review the entire draft for text pertaining to methods for mitigating arcing fault risks and to make recommendations for revising the existing text and for adding new text.

Revisions being recommended are largely based on the need to cover the current state-of-the-art of risk mitigation methods. Revisions are shown as red text.

6.3.2 Installation of the switchgear

When describing recommendations for installing arc resistant switchgear, text is proposed to draw attention to the requirements for adding/installing manufacturer's required gasketing on ducts/plenums. From item "f" in list on page 15:

"f) Installing baffles to direct the flow of hot exhaust gases away from the accessible aisleways, or installing ducts to direct the hot gases away from the switchgear or out of the room. Likewise assuring the installation of required seals and gaskets for plenums and/or ducts."

6.4.2.1 Fuse protection

Text is being proposed to further define applicable fuse characteristics and compatibility as a risk mitigation method. Added text is referenced from IEC 60282-1, IEEE C37.40, 2005 Copper Bussman Technical Application Note “Fuseology” on Medium Voltage Fuses, and from 2019 ABB Distribution Solutions Medium-voltage fuses technical guide.

6.4.2.1 Fuse protection

Current-limiting fuses, when interrupting high short-circuit currents in the current-limiting region of the fuse, can reduce the energy released in a fault. This has been shown to be an effective method in low-voltage equipment. Similar benefit can be expected on medium-voltage systems. In many cases, medium-voltage fuses have a limited selection of continuous current ratings which may limit their application. There are some specialty fuses (pyrotechnic devices) available with much higher continuous current ratings.

Fuse Characteristics and Compatibility

a) Breaking Capacity: Ensure the selected fuse can interrupt the maximum fault current within the medium-voltage system's operational range (e.g., up to 52 kV).

b) Continuous Current Ratings: Specify an extended range of continuous current ratings to support diverse applications. Include specialty fuses (e.g., pyrotechnic devices) with higher ratings.

c) Time-Current Characteristics: Define standardized time-current curves to ensure consistent performance in limiting fault energy across various fuse types.

Selection Criteria

a) Rated Current: Fuse must match the normal operating current of the protected circuit.

b) Breaking Capacity: Ensure the fuse can interrupt the maximum fault current.

c) Coordination: Fuse should coordinate with upstream and downstream protection devices for selective tripping.

Specialty Fuse Considerations *(need to draft text per the outline below if the working group approves adding this section)*

a) Pyrotechnic Devices: Outline the application of pyrotechnic fuses with higher continuous current ratings, specifying their advantages and limitations in arc-resistant switchgear.

b) Dynamic Current Limitation: Discuss the ability of specialty fuses to limit current dynamically in systems with varying fault conditions.

6.4.2.5.2 Partial discharge monitoring

Small text change to improve clarity

6.4.2.5.2 Partial discharge monitoring

Partial discharge is an electrical discharge that partially bridges the insulation between conductors. Modern technology allows online detection and measurement of partial discharges in the insulation systems of switchgear while the equipment remains in service. Timely detection of insulation degradation through increasing partial discharges can identify potential problems. ~~Trending of partial discharge data over time allows prediction of failures, which can be corrected before catastrophic failure occurs.~~ Monitoring partial discharge data over time enables the prediction of failures, allowing for corrective actions to be taken before catastrophic failure occurs.

6.4.2.5.3 High-speed fault-making

The current sub-clause on high-speed fault-making devices does not include any description of current-limiting fault-making devices which create low impedance controlled arcing faults for extinguishing arcing faults in the switchgear. Proposed change is intended to cover the current state-of-the-art with regards to fault-making devices.

6.4.2.5.3 High-speed fault-making

6.4.2.5.3 High-speed fault-making
A fault-making type device can be closed very quickly, commutating the fault current from an arcing fault to the lower impedance fault-making device, effectively removing the source of energy to the arcing fault. This will limit the arcing duration, and if the total operating time (arc detection time plus fault making device operation time) can be reduced to less than 4 ms, it can also limit the overpressure within the switchgear. These devices often work in conjunction with an arc detection system (Sub-clause 6.4.2.5.1). Some fault-making devices effectively create a bolted three-phase fault, shorting all three phases together, or shorting all three phases to ground. Consideration should be given to the effects on the power distribution system when this type of device is used due to the relatively high electromagnetic stresses applied to equipment upstream of the device. Tunable series inductance can be added to the power system in conjunction with the high-speed fault-making device to limit the peak current of the bolted fault. Other fault-making devices create a relatively low-impedance controlled arcing fault that shorts the three phases together. Unlike bolted-fault type devices, this type of device limits the fault current and stress applied to upstream equipment. For all types of high-speed fault-making devices, consideration should be given to faults that may occur on the line side of the sensing devices, as the protection will not respond to faults outside its protective zone.

6.4.2.5.1 Light, sound, and/or pressure detection

This sub-clause on arc detection sensors seems out of place since these sensors are typically used in conjunction with a protective relay. Suggest moving this text to sub-clause 6.4.2.3 under a new heading 6.4.2.3.4 "Arc detection relays and sensors". Proposed change assumes deletion of 6.4.2.5.1 and relocation of that text to the new 6.4.2.3.4, and includes revision of the text to cover current state-of-the-art.

6.4.2.5.1 Light, sound, and/or pressure detection

6.4.2.3.4 Arc detection relays and sensors

Arcing faults have distinctive characteristics including but not limited to intense light, high current, localized pressure increase, and unique voltage hysteresis. Sensors may be employed to detect the unique characteristics of arcing faults. Typically, more than one sensor type is used to rapidly and positively identify an arcing fault and to distinguish it from a through-fault in the protected equipment. Arc fault detection relays use inputs from these sensors to identify arcing faults and to deliver a trip command to an upstream interrupting device. The rise time of the overpressure during a fault is faster than the opening time of the interrupting device, but fast arc sensing can effectively reduce the incident energy of the arcing fault. To further reduce the incident energy, arc detection relays may also give command for a high-speed fault-making device to operate, as described in 6.4.2.5.3.

6.4.2.5 Special sensors and devices

New topologies for risk mitigation have emerged which involve ultrafast circuit protection devices. These devices rely on high-speed fault clearing to effectively limit the effects of an arcing fault. A new sub-clause is being proposed to cover these topologies.

6.4.2.5 Special sensors and devices

6.4.2.5.4 Ultrafast Circuit Protection Devices

An ultrafast circuit protection device, used in conjunction with an arc fault detection system, can operate (detect an arc and interrupt) in less than half a cycle making it suitable for limiting the incident energy and overpressure within switchgear during an arc flash event. When introducing an ultrafast circuit protection device into a power system, due consideration must be given to ensure that the existing protection coordination for non-arc faults remains undisturbed. In addition to ultrafast de-energization, an ultrafast circuit protection device can be reset after an arc flash event further minimizing downtime and equipment loss. Many topologies for an ultrafast circuit protection device can be conceptualized. Manufacturers should give due consideration to the tradeoffs of response time, power loss, system impedance, cost, size, etc. when designing an ultrafast circuit protection device for arc flash protection. Some example topologies of ultrafast circuit breakers include, but are not limited to: solid-state circuit breakers and hybrid circuit breakers with or without active current injection. The use of an ultrafast circuit protection device in medium and/or low voltage switchgear can eliminate the need for arc-resistant switchgear.

End of Presentation