IEEE C37.13, Low-Voltage AC Power Circuit Breakers Used in Enclosures Meeting Minutes

Meeting Date: 17 April 2023
Meeting Time: 8:00AM-12:00PM, EST
Location: Sheraton Sand Key Resort, Clearwater Beach, FL

A. Call to order

The meeting was called to order at 8:00AM EST.

B. Approval of agenda

The meeting agenda was reviewed. Motion to approve the agenda was made by Jeff Mizener and seconded by Mike Lafond. The agenda was approved by unanimous consent

C. Introductions/Attendance

Introductions were made of all attendees. Attendees are listed below. Quorum was confirmed with 15 of 21 members present and a total of 39 attendees

First Name	Last Name	Affiliation	Type
Emmanuel	Ankrah	KEMA Powertest LLC	Guest
Andreas	Bartels	Powell Industries	Guest
Fancis	Beauchemin	Hydro-Quebec	Guest
Randy	Blake	Schneider Electric	Guest
Chris	Bohrer	Utility Relay Co.	Guest
Robert	Burns	Eaton Corporation	Guest
Ted	Burse	Powell Industries, Inc	Member
Clint	Carne	Schneider Electric	Secretary
Stephen	Cary	2 Phase	Guest
Aivand	Chiravuri	Black & Veatch	Guest
Daniel	Delfino	ABB	Member
Eric	Doroz	Eaton	Guest
Doug	Edwards	Siemens Industry, Inc.	Member
Keith	Flowers	Siemens Industry, Inc.	Chair
Marc	Foster	Schneider Electric	Guest
Lou	Grahor	Eaton Corporation	Member
Paul	Grein	Group CBS	Guest
Erin	Hardy	Eaton	Guest
Dan	Hrncir	Eaton	Member
John	Kaminski	Siemens Industry, Inc.	Guest
Michael	Lafond	U.L.	Member
Adrian	Lopez	Powell Industries	Guest
Josh	Lustig	Black & Veatch	Guest
Jeff	Mizener	Siemens Industry, Inc.	Member
Darryl	Moser	ABB	Member
John	Owen	Powertech Labs	Guest
Owen	Parks	ABB	Member
Damian	Perrin	Entergy	Guest
Wahaj	Saleem	Siemens Industry, Inc.	Guest

Dean	Sigmon	xPert Solutions	Member
Kevin	Sippel	Eaton Electric	Guest
Donald	Swing	Powell Industries	Guest
Bryan	Tatum	Underwriters Laboratories	Guest
Christo	Thomas	SCHNEIDER ELECTRIC USA INC	Member
Andrew	Truman	Black & Veatch	Guest
Marcelo	Valdes	ABB	Member
Will	Weishuhn	ABB	Guest
Matt	Westerdale	Bureau of Reclamation	Guest
Danish	Zia	UL LLC	Member

D. Approval of Spring 2022 Meeting Minutes

Spring 2022 IEEE C37.13 Working Group meeting were reviewed. Motion to approve the minutes was made by Mike Lafond and seconded by Jeff Mizener. The meeting minutes were approved by unanimous consent.

E. Rules and guidelines for conducting working group meetings

The IEEE Patent Policy and Business Conduct slides may be reviewed at the following website:

"INSTRUCTIONS FOR CHAIRS OF STANDARDS DEVELOPMENT ACTIVITES"
and "IEEE SA COPYRIGHT POLICY"

No essential patent were declared during the meeting.

F. **Working group P&Ps**

The approved template for the Switchgear Committee is:

https://www.ewh.ieee.org/soc/pes/switchgear/O-and-P/PES_SWG_WG_PnP_Final_2019-03-19.pdf

G. Document status report

- PAR request date: 07 May 2019
- PAR approval date: 05 Sep 2019
- PAR expiration date: 31 Dec 2023

H. Old business

- Time-Current Curves
  - The industry does not have clear guidance about what curves should be included in a TCC, and specifically the meaning of each curve is not defined.
  - **ACTION**: Task force will continue work to bring text for review in fall.

- EMC testing of electronic trip systems
  - The ad hoc recommended reference a specific revision of IEC 60947-2 Annex F & J, FCC Part 15B. Remove reference to C37.90.1 and C37.90.2.

- Testing Ad Hoc
  - Text from Ad Hoc was shared for clauses A.2.7.1, A.2.8.3, and A.2.9.1

- Thermal testing power circuit breakers
  - Summary of Ad Hoc work was shared with WG
    - It was discussed in the Ad Hoc that the existing test procedure has factors that are not controlled. For example, bus bar coatings, phase spacing, line to load spacing.
    - One concept that has further potential for review is that the heat should neither be added nor removed from the test device via the supporting test apparatus. (Aligning with update made in C37.20.2 recently)

  - **ACTION**: Ad Hoc continue work over summer with goal to provide recommendation in the Fall. Add to Ad Hoc membership: Eric Doroz, Bryan Tatum. Doodle poll to come out tentatively plan online meeting mid to late May.

I. New business

- C37.100.8 – Aging effect of lubricants
  - C37.100.8 asked if a mechanism operating time could be published to support their efforts to support testing of aged lubricants
  - This potentially has overlap with the work being performed by the TCC Ad Hoc.
  - Purpose of C37.100.8 is to define a process to allow manufacturers to state that a lubricant can claim X years of life.
  - Recommendation from chair: members should join the TCC Ad Hoc to help advance this topic

- Comment Review
  - Comments were shared for a proposal to add Wye voltage ratings.
    - **Motion:** Creation of Ad Hoc To study the addition of Wye ratings. Made by Marcelo Valdes and seconded by Jeff Mizener.
    - Ad Hoc Membership
      - Jeff Mizener
      - Mike Lafond
      - Danish Zia
      - Lou Grahor
      - Christo Thomas
      - Marcelo Valdez
      - Doug Edwards
      - Clint Carne - Chair
      - Keith Flowers
  - Information was shared with the WG that there are many topics still open and that C37.13 expires in 2025.
    - **Motion**: Request 2-year PAR extension. Made by Marcelo Valdes and seconded by Dean Sigmon. The motion was approved by unanimous consent.

J. Next steps

- The next planned in-person meeting: Fall 2023, Catamaran Resort San Diego, CA

K. Adjourn

Meeting ended at 12:00PM EST

Meeting minutes respectfully submitted by Clint Carne

PC37.13 TCC

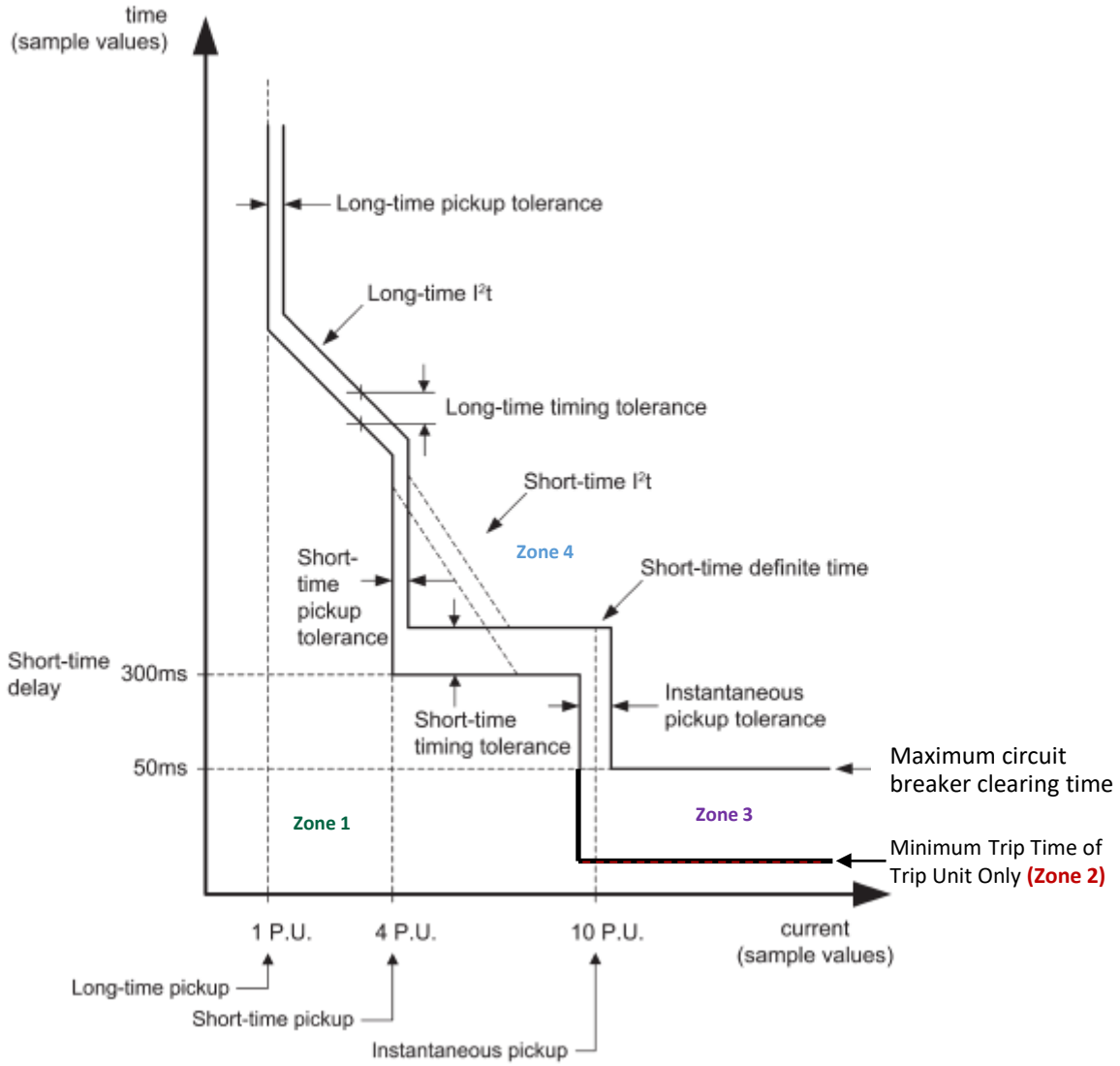
Diagram of Intent of TCC Behavior

M. Lafond

TCC Interpretation

Phase time-overcurrent characteristics

These figures and the values contained therein are for illustrative purposes only and display positive tolerances. Refer to Tables 1-4 for details.



- **Zone 1 (Below minimum trip time)**: Fault condition does not exceed trip time on trip unit and circuit breaker does not open nor receive a trip command from the trip unit. Trip unit in this zone may be processing data in anticipation of potential issuing of trip command if entering Zone 2.
- **Zone 2 (At or above trip time setting)**: Fault condition exceeds trip setting on trip unit and circuit breaker may receive a trip command from the trip unit but circuit breaker has not fully cleared the fault condition. The fastest time a trip unit can issue a trip command is represented by the lower portion of the TCC curve.
- **Zone 3 (Above Trip time setting but below maximum clearing time):** Within this zone a number of events by the trip system and circuit will occur if the fault condition continues to exist where the trip unit will issue a trip command. See next figure on next slide. Note, due to variation within the trip system sensing and decision-making issue a command. If a fault condition exceeds the minimum trip time but the fault conditions reduces in value prior to a trip command being issued, the circuit breaker may not trip.
- **Zone 4 (Above maximum clearing time)**: Fault condition exceeds trip time on trip unit and circuit breaker receives a trip command from trip unit. All poles of circuit breaker shall be open and arcing current extinguished.

TCC Interpretation

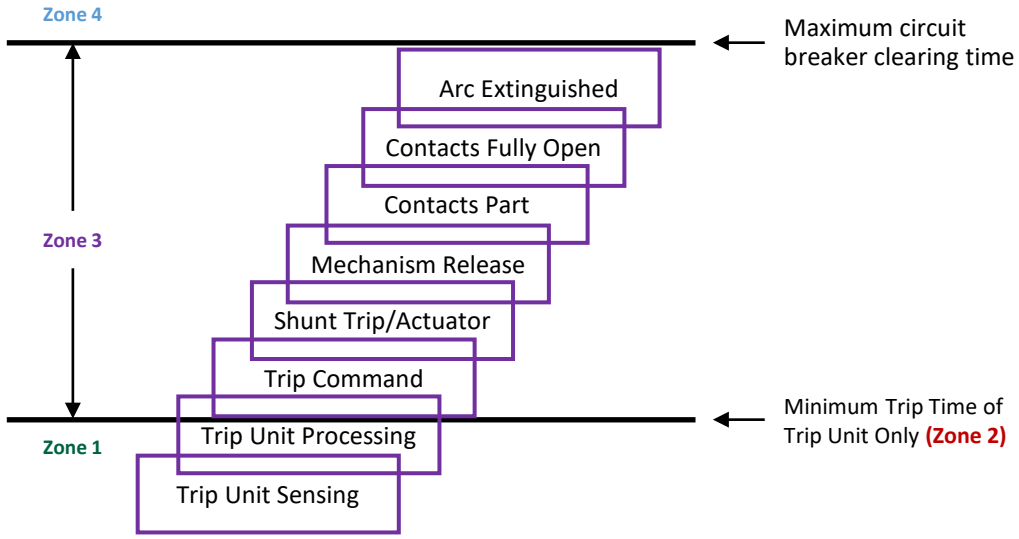


Figure 1 – Circuit breaker w/ integral trip system

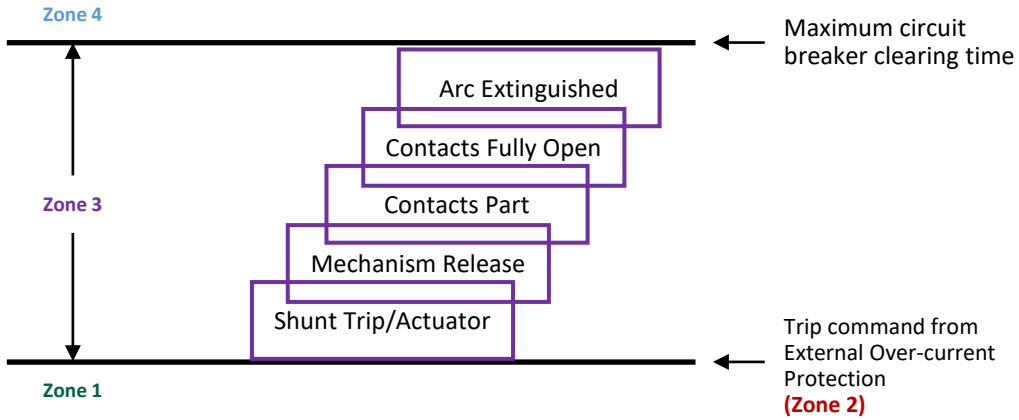
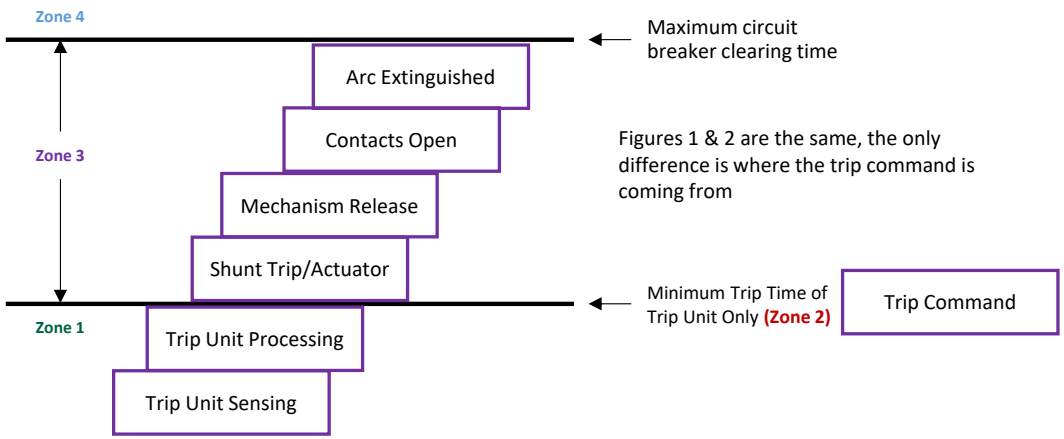


Figure 2 – Circuit breaker w/ external trip system (Non-automatic circuit breaker)

- General: A general sequence of events are shown to the left for a circuit breaker that has a trip system as an integral component of the circuit breaker (Fig. 1) and a circuit breaker that has its over-current protection external from the circuit breaker (Fig. 2) which utilizes an internal component of the circuit breaker to trip the circuit breaker (e.g. shunt trip device, fast-acting actuator, etc.). The boxes represent the minimum and maximum tolerance for each sequence event. The TCC is a representation of the fastest response time a trip system will issue an irrevocable command to trip the circuit breaker and the maximum time the circuit breaker will extinguish the arc on all poles of the circuit breaker.
- Trip Unit Sensing: Current transformer or sensor variation such as accuracy, under and over saturation conditions, etc. Applies to both electro-mechanical and electronic trip system.
- Trip Unit Processing: Electronic Trip Unit: variation in processing sensing signals and decision-making to issue a trip command. Electro-mechanical Trip Unit: variation in coil, magnetic mechanism and/or bi-metal components in response to over-current conditions.
- Trip Command: Electronic Trip Unit: variation in an irrevocable trip signal be sent by the trip unit to the shunt trip or actuator of the circuit breaker. Electro-mechanical Trip Unit: variation on the components ability to produce enough force to engage the circuit breaker trip latch release mechanism.
- Shunt Trip/Actuator: Electronic Trip Unit: variation in the response time of the shunt trip or actuator device. Electro-mechanical: variation in response time of the trip unit releasing the trip latch mechanism.
- Mechanism Release: variation in the response time of the circuit breaker mechanism to release and begin to open the contacts.
- Contacts Part: variation in the response time of the circuit breaker mechanism to open all contacts.
- Contacts Fully Open: variation in the response time of the circuit breaker mechanism to fully open all contacts on all poles.
- Arc Extinguished: variation in the circuit breaker's ability to extinguish the fault condition on all poles.



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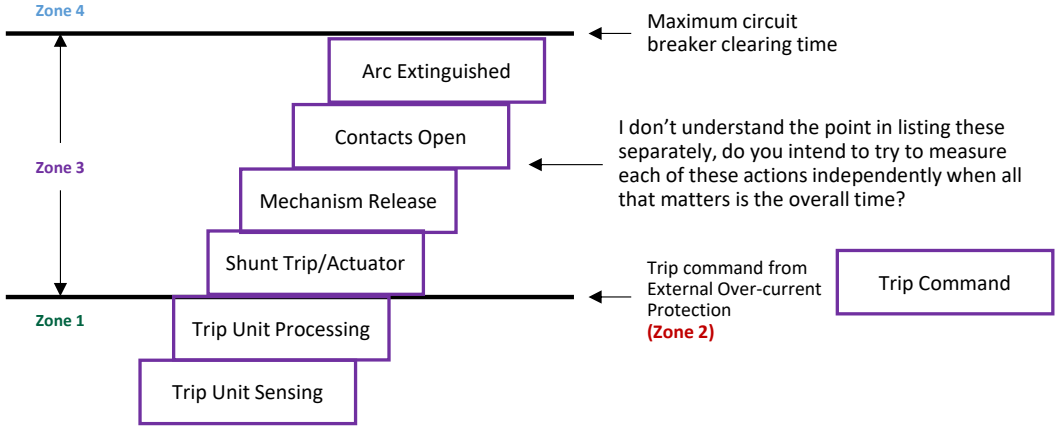

Figure 2 – Circuit breaker w/ external trip system (Non-automatic circuit breaker)

Figures 1 & 2 are the same, the only difference is where the trip command is coming from

TCC Interpretation

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Trip Unit Sensing: Current transformer or sensor variation such as accuracy, under and over saturation conditions, etc. Applies to both electro-mechanical and electronic trip system.

Trip Unit Processing: Electronic Trip Unit: variation in processing sensing signals and decision-making to issue a trip command. Electro-mechanical Trip Unit: variation in coil, magnetic mechanism and/or bi-metal components in response to over-current conditions.

Trip Command: Electronic Trip Unit: variation in a trip signal being sent by the trip unit to the shunt trip or actuator of the circuit breaker. Electro-mechanical Trip Unit: variation on the components ability to produce enough force to engage the circuit breaker trip latch release mechanism.

Shunt Trip/Actuator: Electronic Trip Unit: variation in the response time of the shunt trip or actuator device. Electro-mechanical: variation in response time of the trip unit releasing the trip latch mechanism.

Mechanism Release: variation in the response time of the circuit breaker mechanism to release and begin to open the contacts.

Contacts Open: variation in the response time of the circuit breaker mechanism to open all contacts on all poles. I changed "contacts fully open" to contacts open, it's conceivable that under some conditions the arc might be extinguished before the contact are "fully open".

Arc Extinguished: variation in the circuit breaker's ability to extinguish the fault condition on all poles.