ELECTRICAL Safety Measures

"Elimination is the first priority! Ensure a risk assessment is completed before energized work tasks are completed."

Clause 4.3.5 Arc Flash Risk Assessment

By Terry Becker, P.Eng., CESCP, IEEE Senior Member

The new edition of CSA Z462 Workplace electrical safety Standard, 2024 Edition published March 28, 2024. The most significant change relates to Clause 4.3.5 Arc flash risk assessment and the deletion of the term "arc flash PPE category." Related to a Qualified Person completing a work task-based arc flash risk assessment it is also important to discuss the difference between a work task's arc flash risk assessment and an engineering power system study calculation for incident energy at an assumed working distance and the arc flash boundary.

A power system study and incident energy calculation **IS NOT** an arc flash risk assessment. The report issued by the electrical engineering consultant is a technical report that identifies the scope of calculations completed, background information/substantiation of calculations completed, and the results of the technical calculations completed. There is no inherent "risk assessment" in a P.Eng. arc flash hazard incident energy analysis and report issued and there shouldn't be.

As defined in CSA Z462, Clause 4.3.5 Arc flash risk assessment, Clause 4.3.5.1 General:

An arc flash risk assessment shall be performed to do the following:
(a) Identify arc flash hazards;
b) Estimate the likelihood of occurrence of injury or damage to health and the potential severity of injury or damage to health; and
(c) Determine if additional protective measures are required, including the use of PPE.

Additionally as identified in CSA Z462, Clause 4.1.7.9.2

Job safety planning:

The job safety plan shall
(a) be completed by a Qualified Person;
(b) be documented; and
(c) include the following information:
- *i. a description of the job and individual tasks;*
- *ii. Identification of the electrical hazads associated with each task;*
- *iii. a shock risk assessment in accordance with Clause 4.3.4 for tasks involving a shock hazard;*
- *iv. an arc flash risk assessment in accordance with Clause 4.3.5 for tasks involving an arc flash hazard;*
- *v. work procedures involved, special precautions, and energy source controls; and*
- *vi. an emergency response plan.*

To be clear an arc flash incident energy analysis study completed by a P.Eng. Electrical Engineer **IS NOT** an arc flash risk assessment! An arc flash risk assessment is performed and documented by a Qualified Person as outlined in an employer's compliant Electrical Safety Program.

With the deletion of the term "arc flash PPE category" from CSA Z462 it required that the existing "arc flash PPE category" method Tables, 6A, 6B and 6C be renamed and Table 6C deleted which was a cross-reference table equating an arc flash PPE category # to a minimum arc-rating of arc flash PPE. Table 1 below illustrates the cross reference of the arc flash PPE category to the minimum arc rating arc flash PPE that was Table 6C. In CSA Z462 2024 Edition Table V.1, Table V.2 and V.3 it will just list a minimum arc-rating.

Table 1 – Min. Arc-Rating Of Deleted Arc Flash PPE Categories

Arc Flash PPE Category (deleted term)	Min. Arc-Rating, Arc Thermal Performance Value (ATPV)	Comments
1	4.0	Table V.1 240VAC single phase electrical equipment only.[1] Table V.2 low voltage panelboards only.
2	8.0	Table V.1 low and high voltage electrical equipment. Table V.2 low voltage electrical equipment only. Table V.3 low voltage dc 150-600VDC.
3	25.0	Table V.1 two instances, 240VAC work tasks.[1] Table V.2 N/A. Table V.3 low voltage dc, 150-600VDC.
4	40.0	Table V.1 low voltage and high voltage electrical equipment. Table V.2 low voltage MCC and high voltage electrical equipment. Table V.3 low voltage dc 150-600VDC.
5	75.0	Table V.1 low and high voltage electrical equipment. Table V.2 low voltage switchgear only. Table V.3 N/A.

[1]It is noted that there is no technically credible substantiation that a 240VAC single phase abnormal arcing fault can sustain. No notes or detailed are provided in CSA Z462. Employers must consider third party research. IEEE 1584 doesn't apply to single phase electrical equipment. It is not recommended to use Table V.1 for ac electrical equipment, use Table V.2

As identified in CSA Z462, Clause 4.3.5.6 Arc flash PPE the employer has two options that a Qualified Person can use to determine what arc flash PPE and they need to execute an authorized energized electrical work task and to determine the arc flash boundary to apply: "Method 1 Incident Energy Analysis in accordance with Clause 4.3.5.6.2; or Method 2 Arc Flash PPE Selection Table Method (see normative Annex V for example of arc flash PPE selection table methods)." Method 2 was renamed with the deletion of the term "arc flash PPE category."

Additional in the 2024 Edition of CSA Z462 a separate change occurred completely deleting Clause 4.3.7.3.15 Arc flash PPE category method. This was accommodated by moving the existing Table 6A and 6B renamed to Table V.2 and Table V.3 to Annex V which was published in the 2021 Edition of CSA Z462 with an alternate to Table 6A, Table V.1 for ac electrical equipment.

With the deletion of the term "arc flash PPE category" when using the arc flash PPE selection table method when you comply with the listed electrical equipment parameters you immediately select arc flash PPE with a "minimum arc rating in cal/cm^2, this is the Arc Thermal Performance Value (ATPV) of arc flash PPE that the employer has procured and made available for the Qualified Person to select from.

With respect to the arc flash PPE the employer could specify and procure the employer was provided a table in CSA Z462, in the 2021 Edition it was Table 3, in the 2024 Edition it is now Table 2 (2021 Edition Table 2 was renamed and relocated to Annex F, Table F.2). This table provided two arc-rated arc flash PPE ATPVs or arc-rated levels, Level 1: 1.2 to 12.0 cal/cm^2 (e.g., coverall or shirt/pant and arc-rated face shield/balaclava and suitable hand protection) and Level 2: >12.0 cal/cm2 (e.g., full body arc flash suit and suitable hand protection). For the 2024 Edition of CSA Z462, Table 2 the title has now been changed that the recommended two arc-rated "Levels" can be applied to both arc flash hazard incident energy analysis and the use of the arc flash PPE selection table method.

I have attempted above to provide an explanation of the difference between a Qualified Person performing a work task's arc flash risk assessment and a P.Eng. Electrical Engineer completing a technical calculation for incident energy and the arc flash boundary distance for specific electrical equipment. It still may not be clear and if you want to discuss this information please contact me via email, terry.becker@twbesc.ca.

If you are interested in discussing the information presented in this article or would like a specific topic presented, contact me at terry.becker@twbesc.ca or 587.433.3777.

Terry Becker, P.Eng., CESCP, IEEE Senior Member is a founding member and the First Past Vice-Chair of the CSA Z462 Workplace electrical safety Standard Technical Committee and currently a Voting Member and Clause 4.1 and Annexes Working Group Leader. Terry is also a Founding Member and a Voting Member on the CSA Z463 Maintenance of electrical systems Standard and a Voting Member of the IEEE 1584 Guide for Performing for Arc-Flash Hazard Calculations. Terry has presented at Conferences and Workshops on electrical safety in Canada, the USA, India, Australia and Italy. Terry is a Professional Engineer in the Provinces of BC, AB, ON and PEI. Terry is an Electrical Safety Specialist, Management Consultant, and can be reached at 587.433.3777 or by email **terry.becker@twbesc.ca**.