
	Document: ELECTRICAL SAFETY PROGRAM		Subject: CSA Z462 3 rd to 4 th Edition Differences Changes & Updates		
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CSA Z462 3rd to 4th EDITION DIFFERENCES 2015 vs. 2018 CHANGES & UPDATES

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Important Notice for Use:

1. Not all changes to CSA Z462, 4th Edition, 2018 are included in this document.
2. You are cautioned to consult the CSA Z462, 4th Edition, 2018 prior to making any changes to established safe work practices and your company's Electrical Safety Program.
3. Written opinions by the authors are personal technical opinions. You are advised to consult the CSA Group for specific formal interpretation when required.
4. The 2018 Edition of both CSA Z462 & NFPA 70E remain technically harmonized.
5. CSA Z462 includes additional annexes that are not included in NFPA 70E and specific clause content aligned with other applicable CSA Standards, such as CSA Z460.

Introduction:

On behalf of our clients we have highlighted some of the key differences between the 2015 and 2018 Editions of CSA Z462. **Employers should have ample quantities of printed or digital copies of the CSA Z462 Standard available for every worker** and will need to review the changes and decide on what revisions may be required to their Electrical Safety Program and supporting Risk Assessment Procedure, including Arc Flash and Shock Risk Assessment related documentation and related Electrical Safe Work Practices and Procedures, etc.



You are NOT immediately required to train all your workers to the new CSA Z462, 4th Edition, 2018. Where changes are made to your Electrical Safety Program in response to the CSA Z462, 4th Edition, 2018, training is then required in a timely manner to ensure your work practices reflect the application of the changes.

Employers are recommended to **FIRST update your Electrical Safety Program** before training your workers. Employers need to be prepared with updated documentation to support the 2018 Edition Work Flow Process. Training on the new CSA Z462, 4th Edition, 2018 is best coordinated with the required updates to your Electrical Safety Program.

This "Differences" document provides you with a useful reference of the changes between the current 2015, 3rd Edition of CSA Z462 and the 2018, 4th Edition.

2018 Change Management

Employers shall implement and document an overall Electrical Safety Program. This is a mandatory requirement of CSA Z462 Workplace electrical safety Standard, Clause 4.1.6 Electrical Safety Program. As an element of the ongoing management of your documentation you are required to update the policies and practice requirements of the latest edition of the CSA Z462 Standard.

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Ask yourself the following questions as you review this document:

- How might these changes impact the existing policies, practices, processes, and procedures used to execute justified and authorized energized electrical work tasks?
- What new processes should be added to your Electrical Safety Program with respect to proactive management of arc flash and shock hazards?

Danatec can license you a complete Electrical Safety Program that is used as the basis for due diligence to provincial, territorial or federal OH&S Regulations and the documented implementation in the field of CSA Z462's requirements. Contact Danatec sales Agent, Unlimited PPE at 1-905-573-0300 for more information or see our website at www.unlimitedppe.com.

Changes & Updates Overview:

The 2018, 4th Edition of the CSA Z462 Workplace electrical safety Standard continues to evolve. The majority of the changes and updates are in Clause 3 Definitions and Clause 4 Safety-related work practices. Some minor changes are in Clause 5 Safety-related maintenance requirements and Clause 6 Safety requirements for special equipment. Several annexes have been modified. It is important that you understand the changes made as they will affect your company's Electrical Safety Program and how you complete energized electrical work tasks.



In the 4th Edition of CSA Z462 changes and updates have been made to further align the Standard with Occupational Health & Safety Management System Standards and related Risk Assessment Standards. The concept of completing a Risk Assessment Procedure for every energized electrical work task is mandatory and shall be documented as a requirement in your company's Electrical Safety Program. An Arc Flash Risk Assessment and Shock Risk Assessment are components of the work task's overall Risk Assessment Procedure.

We also need to clarify what energized electrical work is. CSA Z462 still retains its definition of "Working On", but we need to differentiate energized "Operation" of power distribution and branch circuit electrical equipment vs energized electrical maintenance, for example diagnostics & troubleshooting, repair and alteration, and isolation work tasks (e.g. racking in and out of power circuit breakers and installing temporary protective grounds).

Top 10 Key Changes:

1. Low Voltage Threshold

The 50V low voltage threshold in CSA Z462 has been lowered to 30V to align with the CEC Part 1 Definitions for voltage; 30V is extra low voltage. Existing Clause 4.3.2.2.3 changes from 50V down to 30V.

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2. Risk Assessment Procedure

Existing Clause 4.1.5.7 Risk assessment procedure (RAP) has been changed to a section of clauses in 2018 as:

- 4.1.6.8 Risk assessment procedure
 - 4.1.6.8.1 General (Electrical Safety Program)
 - 4.1.6.8.2 Elements of a risk assessment procedure (Existing Clause 4.1.5.7)
 - 4.1.6.8.3 Human Error (NEW)
 - 4.1.6.8.4 Hierarchy of risk control methods (Moved into body from notes)

The Hierarchy of Control Methods was moved from a non-mandatory note to Clause 4.1.6.8.4 Hierarchy of risk control methods. These control methods shall be applied to a work task's risk assessment to reduce the Residual Risk Level to as low as reasonably practicable and must be applied in the order listed.

- a. De-energize;
- b. Substitution;
- c. Engineering controls "Safety by Design";
- d. Awareness, warning signs, and barricading;
- e. Administrative controls, training and procedures; and
- f. Electrical-specific PPE, tools and equipment and their proper care, use and maintenance.



3. Human Error

Existing Clause 4.1.5.7 Risk assessment procedure (RAP) was expanded and now includes a new subclause, Clause 4.1.6.8.3 Human Error. The requirement for a RAP to be completed for a specific work task shall take human error into consideration and its potential negative impact on people, processes, the work environment, and equipment. Human error will drive up the probability of the arcing fault and arc flash or shock exposure to the worker. Arc flash PPE can impact a worker's performance and contribute to human error, e.g. green/yellow faceshields that alter colour perception, heavy weight garments can cause heat stress and disorientation, inadequate work task lighting can cause mistakes, arc flash suit hoods without a hood ventilation system or LED can negatively impact human performance, etc. Updated arc flash PPE is available that improves worker performance, including clear gray shield lenses, ultra-lightweight fabrics, hood ventilation systems, hood/faceshield mounted LED lamps, etc.

4. Job Safety Planning

Existing Clause 4.1.5.8 Job briefing has been changed to a section of clauses in 2018 as:

- 4.1.6.9 Job safety planning and job briefing
- 4.1.6.10 General (requirements before starting each job)
- 4.1.6.11 Job safety planning (includes new requirements per below)
- 4.1.6.12 Job briefing (existing content from Clause 4.1.5.8)
- 4.1.6.13 Change in scope (existing content from Clause 4.1.5.8)

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Significant changes as new requirements for Job Safety Planning include:

- a. Be completed by a qualified person.
- b. Be documented.
- c. Description of the job and the individual tasks.
- d. Shock Risk Assessment.
- e. Arc Flash Risk Assessment.

5. Shock Risk Assessment

Clause 4.3.4 Shock Risk Assessment has been updated to align with the risk assessment procedure focus by including a step in the process “to estimate the likelihood of occurrence of injury or damage to health and the potential severity of injury or damage to health”; this risk assessment language and process is now also included when completing an Arc Flash Risk Assessment for a work task. A Shock Risk Assessment shall be performed:

- a. to identify shock hazards;
- b. to estimate the likelihood of occurrence of injury or damage to health and the potential severity of injury or damage to health; and
- c. to determine if additional protective measures are required, including the use of PPE.

6. Removal of the 40 cal/cm² Limit (Myth)



Deletion of the two notes that implied or were misunderstood related to 40 cal/cm² incident energy being “dangerous and greater emphasis required” and “No PPE available”. This statement is false and no substantiation was offered. It is noted that 1.2 cal/cm² of incident exposure to a worker when they are NOT wearing arc-rated PPE is “dangerous” as any exposed skin could receive a 2nd degree skin burn injury based on the Stoll Curve. Arc flash incident energy doesn’t directly correlate to arc blast pressure. Rather the potential for arc blast pressure relates to the arcing fault current magnitude and related to the electrical equipment door been open or close and how much copper is vaporized. Arcing fault current will be higher on low voltage electrical equipment, but there may be less copper vaporized that on high voltage equipment.

- a. Clause 4.3.7.1 General, Note (2) is deleted
- b. Annex D, D.4.1 General, Note (2) is deleted

7. Arc Flash Risk Assessment, Severity of Injury or Damage to Health and Likelihood of Occurrence

Clause 4.3.5 Arc flash risk assessment has been altered refining the risk assessment focused process. Clause 4.3.5.1 General and its notes are now divided into three subclauses:

- a. Clause 4.3.5.1 General
- b. Clause 4.3.5.2 Estimate of Likelihood and Severity
- c. Clause 4.3.5.3 Additional Protective Measures

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Clause 4.3.5.1 General now indicates that an Arc Flash Risk Assessment shall be performed:

- a. to identify arc flash hazards;
- b. to estimate the likelihood of occurrence of injury or damage to health and the potential severity of injury or damage to health; and
- c. to determine if additional protective measures are required, including the use of PPE.

An entire new subclause, Clause 4.3.5.2 Estimate of Likelihood and Severity that the determination of estimate of likelihood of occurrence of injury or damage to health and the potential severity of injury or damage to health shall take into consideration (the old notes are included with this subclause):

1. The design of the electrical equipment, including its overcurrent protective device and its operating time; and
2. The electrical equipment operating condition and condition of maintenance.

Clause 4.3.5.3 Additional Protective Measures includes the three requirements for Arc Flash Risk Assessment in the CSA Z462, 2015, 3rd Edition, but adds in the use of NEW Table 2 Estimate of the likelihood of occurrence of an arc flash incident for ac and dc systems.

If additional protective measures are required they shall be selected and implemented according to the hierarchy risk control identified in Clause 4.1.6.8.4.



- a. Appropriate safety-related work practices;
- b. The Arc Flash Boundary; and
- c. The PPE that personnel within the Arc Flash Boundary shall use.

Table 2 may be used to estimate the likelihood of occurrence of an arc flash event to determine if additional protective measures are required.

This new Table 2 is the old Table 4A, but instead of advising if Arc Flash PPE is required, it now states Likelihood of Occurrence. A simple “Yes” or “No” column is still used.

8. Arc Flash Risk Assessment, Likelihood of Occurrence Table

The new Table 2 Estimate of the likelihood of occurrence of an arc flash incident for ac and dc systems is a standalone table to be used as a primary reference when completing an energized electrical work task’s Arc Flash Risk Assessment and is applied first in determining the Likelihood of Occurrence of an arcing fault and arc flash. After using this table to determine that it is likely that an arcing fault and arc flash could occur related to the work task’s description and the Condition of Maintenance of the energized electrical equipment, the Qualified Electrical Worker would determine “additional protective measures”. These protective measures are applied against an arc flash hazard exposure to reduce risk using one of two methods (e.g. Method 1 incident energy analysis, Method 2 arc flash PPE category method) to determine the Arc Flash Boundary and the arc-rated PPE to be worn for the energized work task when standing at a specific Working

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Distance. Safety-related work practices are still required to be followed.

9. Arc Flash Risk Assessment, Arc Flash PPE Category Method, Typical Fault Clearing Times of Overcurrent Protective Devices

The Arc Flash PPE Category Method or Arc Flash Risk Assessment is updated to only use the existing Table 4B, 4C and 5 renumbered to Table 6A, 6B and 6C. New Notes have been added to Table 6A Arc flash PPE categories for alternating current (ac) systems indicating typical fault clearing times of overcurrent protective devices:

- a. 0.5 cycle fault clearing time is typical for current limiting fuses when the fault current is within the current limiting range.
- b. 1.5 cycle fault clearing time is typical for molded case circuit breakers rated less than 1000V with an instantaneous integral trip.
- c. 3.0 cycle fault clearing time is typical for insulated case circuit breakers rated less than 1000V with an instantaneous integral drip or relay operating time.
- d. 5.0 cycle fault clearing time is typical for relay operated circuit breakers rated 1kV to 35kV when the relay operates in the instantaneous range (i.e. "no intentional time delay").
- e. 20 cycle fault clearing time is typical for air frame and insulated case circuit breakers with a short time fault clearing delay for motor inrush.
- f. 30 cycle fault clearing time is typical for air frame and insulated case circuit breakers with a short time fault clearing delay without instantaneous trip.

See IEEE 1584-2002 Table 1 for further information regarding notes B through D.



10. Equipment Labeling no longer required

For "industrial" workplaces with supervision you no longer need to install equipment labels for arc flash and shock, as long as you provide access to the incident energy analysis data or results of using the arc flash PPE category method in "results tables", "spreadsheets", on single line diagrams, or the hazard information could be included on a Work Order related to specific electrical equipment and the identified protective device, load or line side.

Clause 1 Scope

Clause 1 Scope has not changed from the previous edition. Please be advised that all industry sectors are reviewing and referencing CSA Z462, and the Provincial and Territorial OH&S department in your jurisdiction may provide informational references to CSA Z462 and may use it in an incident investigation even though they have not formally adopted CSA Z462 into OH&S law.

One important item to note is the 50V threshold for application noted in Clause 4.3.2.2.3 and specific requirements in CSA Z462 has now been lowered to 30V to align with the CEC Part 1.

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Clause 3 Definitions

In Clause 3 Definitions, additional clarification is provided with several new definitions added or updates to existing definitions that are used within the CSA Z462 Standard.

New Definitions:

Electrical Safety Program
Maintenance, Condition of
Working Distance

Updated Definitions:

Arc Flash Hazard
Boundary, Arc Flash
Boundary, Restricted Approach
Electrical Hazard
Electrically-Safe Work Condition
Electrical Safety
Enclosed
Enclosure
Qualified Person
Risk Assessment
Shock Hazard

Some global changes to terms or phrases have also been implemented.

Clause 4 Safety-related work practices

This clause in CSA Z462 provides details on the recommended general requirements for safe work practices to follow. The key requirements of CSA Z462 are provided in this clause related to Clause 4.1 General requirements for electrical-safety-related work practices and procedures, Clause 4.2 Establishing an Electrically-Safe Work Condition and Clause 4.3 Work Involving Electrical Hazards.

Clause 4.1 General requirements for electrical-safety-related work practices and procedures

In the 2018 Edition further emphasis has been placed on ensuring your company has in place an Electrical Safety Program with supporting documentation.

The following clauses have been changed or are new:

Clause 4.1.4: Specific focus has been placed on hazard elimination and de-energization as the first priority in the implementation of safety-related work practices.

Clause 4.1.6: This has been added to identify that your company's Electrical Safety Program should include a provision that new or modified electrical equipment or systems have to comply with the inspection requirements of the applicable installation codes and standards prior to being placed in

service.

Clause 4.1.6.8.3: This is new and advises that the work task’s Risk Assessment Procedure (added as a mandatory requirement in the 2015 Edition) shall consider the impact of human error and its negative consequences on people, processes, the work environment and equipment. With respect to additional information on Human Performance Behavior, Annex U Human Performance and Workplace Electrical Safety was added in the 2015 Edition.

In the Example Electrical Risk Assessment Matrix below, Probability (Pr) would be comprised of three parameters that need to be validated before the energized electrical work task is completed to ensure that the Residual Risk Level is as low as reasonably practicable:



1. Qualified & Competent Worker assigned the work tasks
2. Human Performance Behavior of the worker is normal
3. Condition of maintenance of the electrical equipment is “Normal”

Example Electrical Risk Assessment Matrix

Consequence	Severity (Se)	Risk Class (Rc)					Likelihood of Occurrence Parameter		
		4-5	6-10	11-15	16-20	21-23	Frequency (Fr)	Probability (Pr)	Avoidance (Av)
Arc Flash - Irreversible: Trauma; death	8						Hourly 5	Common 5	
Arc Flash - Permanent Third-degree burn	6						Daily 5	Likely 4	
Arc Flash -Reversible Second-degree burn	3						Weekly 4	Possible 3	Impossible 5
Arc Flash - Reversible First-degree burn	1						Yearly 3	Rare 2	Possible 3
No Injury	0						Less Often 2	Negligible 1	Likely 1

Clause 4.1.6.8.4 Hierarchy of risk control methods, with respect to the work task’s Risk Assessment Procedure the hierarchy of risk control methods is now included as a mandatory Clause rather than a note. When you implement a work task’s Risk Assessment Procedure, the control methods shall be applied in the following order to achieve an acceptable Residual Risk Level:

1. Elimination, de-energize;
2. Substitution;
3. Engineering Controls “Safety by Design;”
4. Awareness, use warning signs & barricading;
5. Administrative controls, training and use procedures; and

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6. Electrical-specific PPE, tools & equipment, ensuring proper care, use and maintenance.

Clause 4.1.6.9 Job safety planning and job briefing shall now be completed and documented by a Qualified Person.

Clause 4.1.6.10 Incident investigations has been added and now requires that your Electrical Safety Program include elements to ensure electrical incidents are investigated.

Clause 4.1.6.11.3 is moved from Clause 4.2 and requires that a company's lockout program and procedure be audited at least annually to identify and correct any deficiencies.

In Clause 4.1.7 Training, the information presented has been reorganized; first, the training requirements for Qualified Persons is provided, then training frequency, type of training and the requirement for training documentation to be retained is provided. Lockout procedure training requirements have been moved to this clause from Clause 4.2.

Clause 4.2 Establishing an electrically-safe work condition

This clause has been totally reorganized and as noted above the training and auditing requirements have been moved to Clause 4.1.

New requirements have been added in Clause 4.2.5 Process for establishing and verifying an electrically-safe work condition. Two new steps have been added:



1. Release of stored energy
2. Release or block stored mechanical energy

As well, an exception has been added for power systems >1000V, and non-contact test instruments may be used to test each phase conductor. This could include a permanently mounted test device that complies with applicable industry standards.

Please be aware that the material in CSA Z462 would be aligned or taken from the CSA Z460 Control of hazardous energy – lockout and other methods.

Clause 4.3 Work involving electrical hazards

Several changes and updates were made to the 4.3 clauses for the 2018 edition. An important deletion was a note that indicated if the incident energy level is greater than 40 cal/cm² greater emphasis is required. This note has been deleted as there was no substantiation to this statement. In reality, an incident energy exposure of 1.2 cal/cm² to exposed human tissue can cause the onset of a 2nd degree skin burn based on the Stoll Curve. Arc blast pressure is not correlated to incident energy, it is correlated to magnitude of arcing fault current, open or closed door on electrical equipment and amount of copper vaporized. At the time we wrote this paper there have been no documented fatalities related to arc blast

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pressure. Another important item of note is the change from a 50V threshold to a 30V threshold for the requirement to de-energize, aligning this with CEC Part 1 Section 0 – Object, Scope, and Definitions, Voltage, extra low voltage – any voltage not exceeding 30V, low voltage – any voltage exceeding 30V but not exceeding 750V, and high voltage – any voltage exceeding 750V.

Clause 4.3.2.2.4 Normal operating condition has added a sixth item that needs to be considered: the equipment is used in accordance with instruction included in the applicable CE Code Part II Standard and in accordance with manufacturer’s instructions.

Clause 4.3.4 is renamed to Shock Risk Assessment and has been reworded and aligned with risk assessment language similar to Arc Flash Risk Assessment. A Shock Risk Assessment shall be performed to:

- a. Identify if an assigned work task will expose you to a shock hazard;
- 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.

Additional protective measures are now determined as part of the work task’s Risk Assessment Procedure and based on the Hierarchy of Control Methods as documented in Clause 4.1.6.8 Risk assessment procedure.

Clause 4.3.5 Arc flash risk assessment

This clause had been updated and significant changes have occurred with respect to completing a work task’s Arc Flash Risk Assessment.

To complete an Arc Flash Risk Assessment, you must complete three steps:

- a. Identify arc flash hazards related to the assigned work task;
- 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.

Within the process of completing a risk assessment for an energized electrical work task and specifically the Arc Flash Risk Assessment, the existing Table 4A has been removed from the Arc Flash PPE Category Table Method, renumbered, and renamed as Table 2 Estimate of the likelihood of occurrence of an arc flash incident for ac and dc systems and modified such that work tasks listed are assessed based on the Likelihood of Occurrence of an arcing fault and arc flash occurring based on the work task description and the condition of maintenance of the energized electrical equipment.

Table 2 is included within Clause 4.3.5 Arc flash risk assessment and it is applied as a first step in completing a work task’s Arc Flash Risk Assessment.

If the Likelihood of Occurrence in Table 2 is determined to be “Yes” then you should proceed to decide what additional protective measures (e.g. work practices, PPE and the Arc Flash Boundary distance) are required using the Incident Energy Analysis Method or the Arc Flash PPE Category “Table Method”. The format of the table has been updated to group the work tasks based on assessed equipment operating condition “Any”, “Normal” or “Abnormal”. Table 2 also includes a definition for “Normal”.

- a. The equipment is properly installed in accordance with the manufacturer’s recommendations and applicable industry codes and standards;
- b. The equipment is properly maintained in accordance with the manufacturer’s recommendations and applicable industry codes and standards;
- c. The equipment is used in accordance with instructions included in the listing and labeling and in accordance with manufacturer’s instructions;
- d. Equipment doors are closed and secured;
- e. Equipment covers are in place and secured; and
- f. There is no evidence of impending failure such as arcing, overheating, loose or bound equipment parts, visible damage or deterioration.

CSA Z462 Table 2 Estimate of the likelihood of occurrence of an arc flash incident for ac and dc systems - Layout:

Work Task	Equipment Condition	Likelihood of Occurrence*
Work task description	Any	No
Work task description	Any	Yes
Work task description	Normal	No
	Abnormal	Yes



Table 2 provides this explanation related to Likelihood of Occurrence:

* As defined in this Standard, the two components of risk are the likelihood of occurrence of injury or damage to health and the severity of injury or damage to health that results from a hazard. Risk assessment is an overall process that involves estimating both the likelihood of occurrence and severity to determine if additional protective measures are required. The estimate of the likelihood of occurrence contained in this table does not cover every possible condition or situation, nor does it address severity of injury or damage to health. Where this table identifies “No” as an estimate of likelihood of occurrence, it means that an arc flash incident is not likely to occur. Where this table identifies “Yes” as an estimate of likelihood of occurrence, it means that additional protective measures are required to be selected and implemented according to the hierarchy of risk control identified in Clause 4.1.6.8.4.

The text below is from CSA Z462 Clause 4.1.6.8.4 Hierarchy of risk control methods:

The risk assessment procedure shall require that preventive and protective risk control methods be implemented in accordance with the following hierarchy:

- a. Elimination;
- b. Substitution;

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- c. Engineering controls;
- d. Awareness;
- e. Administrative controls; and
- f. PPE.

Notes:

1. Elimination, substitution, and engineering controls are the most effective methods to reduce risk as they are usually applied at the source of possible injury or damage to health and they are less likely to be affected by human error. Awareness, administrative controls and PPE are the least effective methods to reduce risk as they are not applied at the source and they are more likely to be affected by human error.
2. See CAN/CSA-Z1000 and CAN/CSA-Z1002 for more information regarding the hierarchy of risk control methods.
3. The risk assessment procedure may include identifying situations where more than one person is required to be part of the process, as well as the training and equipment that should be provided to evaluators.
4. For an example of a risk assessment procedure, see Annex F.

This new Table 2 Estimate of the likelihood of occurrence of an arc flash incident for ac and dc systems is now the starting point of completing an Arc Flash Risk Assessment.

After the Likelihood of Occurrence is determined as “Yes”, the Qualified Person determines specific protective measures e.g. work practices, the Arc Flash Boundary distance and arc flash PPE for the specific work tasks using an Incident Energy Analysis Method or Arc Flash PPE Category Method (Table Method). A detailed explanation of this process is now included as Clause 4.3.5 Arc flash risk assessment and the specific use of Table 2 in Clause 4.3.5.3 Additional protective measures.



Clause 4.3.5.6 Arc flash PPE

This clause has been reworked and the existing Annex H, Table H.2 has been relocated to this clause and is now Table 3 Selection of arc-rated clothing and other PPE when the incident energy analysis method is used (new text in Clause 4.3.5.6.2 to use this Table 3). Two methods of determining additional protective measures for arc flash are still available. Table 3 identifies that for incident energy analysis, only procure and provide arc-rated clothing choices for the Qualified Person to select from:

- a. Engineering Incident Energy Analysis Method (Annex D provides methods of calculation; a Qualified Person will not complete the calculations); and
- b. Arc Flash PPE Category method, using Tables 6A, 6B and 6C.

The clause also clarifies that you CANNOT identify arc flash PPE by an Arc Flash PPE Category number when engineering incident energy analysis has been completed.

The new CSA Z462 Table 3 Selection of arc-rated clothing and other PPE when the incident energy analysis method (CSA Z462-2015 Annex H, Table H.2) is used for a two “system” or two “level” arc flash

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PPE clothing choice.

1. Incident energy exposure equal to 1.2 cal/ cm² up to 12 cal/ cm²
2. Incident energy exposures greater than 12 cal/cm²

There is a note to Table 3 with respect to arc flash protection for the hands:



Rubber insulating gloves with leather protectors provide arc flash protection in addition to shock protection. Higher class rubber insulating gloves with leather protectors, due to their increased material thickness, provide increased arc flash protection.

New Tables and Renumbering of Tables:

- Table 2 was Rubber insulating equipment test intervals and is now Table 2 Estimate of likelihood of occurrence of an arc flash incident for ac and dc systems (New Table 2 was Table 4A in 2015 Edition).
- Table 3 Standards for personal protective equipment is now Table 3 Selection of arc-rated clothing and other PPE when the incident energy analysis method is used.
- Table 4A Arc flash hazard identification for alternating current (ac) and direct current (dc) systems is now Table 4 Rubber insulating equipment test intervals.
- Table 5 Personal protective equipment (PPE) is now Table 5 Standards for personal protective equipment.
- Table 6 Standards related to the protective equipment specified in Clause 4.3.7.4 and 4.3.7.5 is now Table 7.
- New Table 6A is the old Table 4B.
- New Table 6B is the old Table 4C.
- New Table 6C is the old Table 5.

CSA Z462 2015 Edition	CSA Z462 2018 Edition
Table 1A	Table 1A
Table 1B	Table 1B
Table 2 Rubber insulating equipment test intervals	Table 2 Estimate of the likelihood of occurrence of an arc flash incident for ac and dc systems
Table 3 Standards for personal protective equipment Clauses 4.3.7.3.13 and 4.3.7.3.14	Table 3 Selection of arc-rated clothing and other PPE when the incident energy analysis method is used
N/A	Table 4 Rubber insulating equipment test intervals
N/A	Table 5 Standards related to the protective equipment specified in Clauses 4.3.7.3.13 and 4.3.7.3.14
Table 4A	Table 2 above
Table 4B	Table 6A
Table 4C	Table 6B
Table 5	Table 6C
Table 6 Standards related to the protective equipment specified in Clauses 4.3.7.4 and 4.3.7.5	N/A
	Table 7 Standards related to the protective equipment specified in Clause 4.3.7.4

With respect to Table 6A it was the 2015 Table 4B; it changed the reference of maximum available fault

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current available to maximum available fault current. Additionally, the notes have been updated to advise of typical fault clearing times of overcurrent protective devices to reference when verifying the Table 6A parameter of maximum fault clearing time.

Clause 4.3.5.7 Equipment labeling

This clause has been updated with individual unique subclauses to add clarity. A new option is available for supervised industrial installations. Equipment Labels do not have to be used as long as the information is provided in a manner that is readily available to the Qualified Person e.g. posted “results table” from engineering study or generic spreadsheet of information, information included on single line diagrams, or information printed out on Work Orders for specific electrical equipment protective device, line and load side.

Table 6.1 – Arc-Flash Analysis Summary Table

Bus Name	Device Name	Bus kV	Bus Bolted Fault kA	Device Bolted Fault kA	Arcing Fault kA	Trip Time (s.)	Bkr. Opening (s.)	AF Boundary	Working Distance (in.)	Incident Energy (cal/cm ²)
01ES-2501-A	50/51-2501-09A	25.00	6.29	1.88	1.88	1.95	0.05	28' 2"	3'	105
01ES-2501-A (Line Side)	50/51-25-26.122	25.00	6.29	4.42	4.42	1.086	0.05	27' 9"	3'	102
01ES-2501-B	50/51-2501-9B	25.00	6.29	1.88	1.88	1.95	0.05	28' 2"	3'	105
01ES-2501-B (Line Side)	50/51-25-26.122	25.00	6.29	4.42	4.42	1.086	0.05	27' 9"	3'	102
01ES-2502-A	50/51-2502-02A	25.00	5.81	1.40	1.40	1.95	0.05	23' 9"	3'	75
01ES-2502-A (LineSide)	50/51-2501-10A	25.00	5.81	4.42	4.42	0.551	0.05	20'	3'	53
01ES-2502-B	50/51-2502-02B	25.00	5.81	1.40	1.40	1.95	0.05	23' 9"	3'	75
01ES-2502-B (Line Side)	50/51-2501-10B	25.00	5.81	4.42	4.42	0.551	0.05	20'	3'	53
01ES-2503-A	50/51-2501-09A	25.00	6.29	4.42	4.42	0.231	0.05	13' 5"	3'	24
01ES-2503-A (LineSide)	50/51-01ES-2503-01A	25.00	6.29	1.88	1.88	0.77	0.05	17' 11"	3'	43
01ES-2503-B	50/51-2501-09A	25.00	6.29	4.42	4.42	0.231	0.05	13' 5"	3'	24
01ES-2503-B (LineSide)	50/51-01ES-2503-01B	25.00	6.29	1.88	1.88	0.77	0.05	17' 11"	3'	43
01ES-2504-A	50/51-2502-02A	25.00	5.81	4.41	4.41	1.086	0.05	25' 11"	3'	89
01ES-2504-A (LineSide)	50/51-2504-01A	25.00	5.81	1.41	1.41	1.95	0.05	28' 10"	3'	111
01ES-2504-B	50/51-2502-02B	25.00	5.81	4.41	4.41	1.086	0.05	25' 11"	3'	89
01ES-2504-B (LineSide)	50/51-2504-01B	25.00	5.81	1.41	1.41	1.95	0.05	28' 10"	3'	111
01ES-2505-A	50/51-2505-01A	25.00	1.40	1.40	1.40	1.95	0.05	16'	3'	34
01ES-2505-A (Line Side)	50/51-2502-06A-	25.00	1.40	1.40	1.40	1.95	0.05	16'	3'	34
01ES-2505-B	50/51-2505-01B	25.00	1.40	1.40	1.40	1.95	0.05	16'	3'	34
01ES-2505-B (Line Side)	50/51-2502-06B-	25.00	1.40	1.40	1.40	1.95	0.05	16'	3'	34



Clause 5 Safety related maintenance requirements, and Clause 6 Safety requirements for special equipment

Clause 5 Safety related maintenance requirements, minor wording changes.

Clause 6 Safety requirements for special equipment, changes to research and development laboratories.

Annexes

Annex A Referenced Publications - No changes

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Annex B Informational References - No changes

Annex C Limits of Approach

1. Change accident to incident.
2. Clarify EEWP “As applicable, have”.

Annex D Incident Energy and Arc Flash Boundary Calculation Methods



1. “Short circuit currents” wording changed to “available fault currents”.
2. Clarified IEEE 1584-2002. Note the IEEE 1584 will most likely not be updated based on IEEE NFPA Arc Flash Phenomena Project until 2017.

Annex E Electrical Safety Program

1. Change E.2 Typical Electrical Safety Program Controls (6) to read “Tasks to be performed within the Limited Approach Boundary or Arc Flash Boundary of exposed energized electrical conductors and circuit parts are to be identified and categorized.”

Annex F Risk Assessment Procedure changed to Risk Assessment and Risk Control

1. Risk assessment and risk control (new title) has been completely rewritten, with a more simplified overview of Risk Assessment Procedure implementation.
2. Significant changes to this Annex, less detail and higher level. Flow charts complexity reduced. Very high-level and specific example may not be interpreted correctly, only focuses on “energy” e.g. arc flash.
3. Points to ISO 31000:2009 Risk Management – Principles and Guidelines for more detail and more details on building a Risk Assessment Procedure. In Canada for CSA Z462 this reference would be CSA Z1002.
4. Changes provide a simplified description.
5. New Figure F.1 Risk Management Process – Adapted from ISO 31000 Figure 3. This is a simplified flow chart compared to the existing flow chart.
6. New text doesn’t provide guidance on an electrical hazard specific risk assessment process that is currently in the existing Annex F.
7. High level guidance to align to risk assessment with OHSMS.
8. Leadership
9. Policy
10. Plan
11. Do
12. Check
13. Act
14. Very high-level content in new Annex F.
15. Over-simplified risk assessment matrix provided. Illustrates comparison of specifically energy and this may be misinterpreted by the user as the only harm to assess.

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16. Also references ISO 31010 Risk management – Risk assessment techniques and ANSI/AIHA Z10-2012 Occupational Health & Safety Management System for further information regarding risk assessment methods.

Annex G Sample Lockout / Tagout Procedure

1. Changed from procedure to program.
2. Added to 5.7 and 5.8 “on a known source of voltage”.

Annex H Guidance on Selection of Protective Clothing and Other Personal Protective Equipment (PPE)

1. Changed “available short circuit current” to “available fault current”.
2. Change Table H.3(a) to Table H.3 and delete Arc Flash Hazard PPE. It is moved into the clauses in new Table 3. Table H.2 is relocated to Clause 4.3.5 and is to be used to assist in defining arc-rated clothing when incident energy analysis has been completed. New reference information has been added with respect to conformity assessment of PPE.
3. Added text to clarify specific incident energy values; example “greater than or equal to 1.2 cal/cm² (5 J/cm²) and less than or equal to 8 cal/cm² (33.5 J/cm²)”.
4. New H.4 Conformity Assessment of Personal Protective Equipment (PPE) added.

Annex I Job Briefing and Planning Checklist

1. Text changes to align with Arc Flash Risk Assessment and “Any evidence of impending failure?”



Annex J Energized Electrical Work Permit

1. Minor wording fix to “Detailed description of the job procedures to be used in performing the above detailed work”.
2. Flow chart to include voltage information for decision process “greater than or equal to 30VAC” or “less than 30VAC”.

Annex K General Categories of Electrical Hazards

1. Significant rewrite.
2. Statistics quoted that put more focus on electrical shock than arc flash.
3. Quoted that electrical incidents that lead to fatal injuries in 20-year period for 98 percent related to electrocutions, with the larger percentage of these from non-electrical workers.
4. Shock and electrical fatalities are 40% overhead power lines. Quotes ratio of electrical incidents that lead to fatalities is 1:13 and for fall injuries 1:325.
5. Arc Flash, only 60 fatalities in 20 years of data as noted in 2015 NFPA Report.
6. Arc Blast, no new information added.
7. References provided for statistics.

Annex L Typical Application of Safeguards in the Cell Line Working Zone – No changes

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Annex M Layering of Protective Clothing and Total System Arc Rating – No changes

Annex N Example of Industrial Procedures and Policies for Working Near Overhead Electrical Lines and Equipment

1. “Accidents” changed to “incidents”.
2. “Accidental” changed to “unintentional”.

Annex O Safety-Related Design Requirements

1. Many additions were made to the listed options that can be applied under the Hierarchy of Control Methods to reduce risk related to the shock and arc flash hazards.
2. Shunt-trip text added for open-fuse relay that switches 800A and greatly reduces incident energy by opening the switch immediately when the first fuse opens.
3. Safety-by-Design Methods section added. List of 12 items.

Annex P Aligning Implementation of This Standard with Occupational Health and Safety Management Standards – No changes

Annex Q Human Performance and Workplace Electrical Safety – No changes

Disclaimer:

Please be aware that this document doesn't provide an all-inclusive review of all changes in the CSA Z462, 2018, 4th Edition. You are advised to reference the published document and confirm how any changes will affect your existing Electrical Safety Program. Additionally, any comments that are provided in this document that are interpretive opinions based on a subject matter expert's professional experience and opinions.

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