



CSA Z462 2nd TO 3rd EDITION DIFFERENCES **CHANGES & UPDATES**

Provided to you by:

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Notes:

- 1. Not all potential changes to CSA Z462, 3rd Edition are included in this document.
- 2. You are cautioned to consult the approved CSA Z462, 3rd Edition, 2015 prior to making any changes in any established safe work practices. A pdf or hardcopy can be purchased from CSA Group.
- 3. Written opinions by the authors are personal technical opinions. You are advised to consult the CSA Group (e.g. Canadian Standards Association) for specific formal interpretation.
- 4. CSA Z462 remains technically harmonized with NFPA 70E.
- 5. At the time of creating this document CSA Z462 is not referenced in any Canadian jurisdictional Act, Code or Regulation.

Introduction:

The following list of differences may not be complete, but highlights some of the key differences between the 2nd to 3rd Editions of CSA Z462. Employers need to review the changes and decide on what revisions may be required to your Electrical Safety Program, supporting Electrical Hazard Analysis Documentation and related Electrical Safe Work Practices and Procedures, etc.

You are NOT immediately required to train all of your workers to the new 2015 CSA Z462 3rd Edition Standard.

Employers are recommended to FIRST update your Electrical Safety Program before training your workers. Otherwise your current documentation will not support the requirements of the new 3rd Edition of CSA Z462 including arc flash and shock risk assessments. Employers need to be prepared with updated documentation to support a new workflow process. Following their training your Workers could return without adequate supporting documentation to allow them to perform their jobs. Training on new industry terminology will be lost and forgotten if employees are not reinforcing this knowledge on the job and in the field.

Training on the new 2015 CSA Z462 3rd Edition is best coordinated with the required updates to your Electrical Safety Program.

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Some Key Changes to CSA Z462 Are:

- A key change to the entire content of CSA Z462 is a broader inclusion of the concept of "Risk Assessment" related to an energized electrical work task instead of just a hazard analysis. This change has affected numerous definitions and Clauses throughout the entire 2015, 3rd Edition of CSA Z462. To this end significant changes are the addition of new terms:
 - a. Risk Assessment Procedure.
 - b. Arc Flash Risk Assessment replaces Arc Flash Hazard Analysis.
 - c. Shock Risk Assessment replaces Shock Hazard Analysis.
- **2.** New definitions have been added to clarify the difference between hazard and risk and risk assessment, they are: Hazard, Hazardous, Risk and Risk Assessment.
- **3.** The following definitions have been updated: Boundary, Restricted Approach, Incident Energy and Qualified Person.
- **4.** The Prohibited Approach Boundary for shock has been deleted.
- **5.** All references to a Hazard/risk category have been deleted. This term has been replaced with the new term, Arc Flash PPE Category.
- 6. Clause 4.1.7 Electrical Safety Program was moved to Clause 4.1.5 Electrical Safety Program. This move correctly placed the requirement for a management system as the highest priority in CSA Z462. Additionally the Electrical Safety Program should be developed and implemented as a part of the overall Occupational Health & Safety Management System. The Electrical Safety Program can be a stand-alone document, but should be implemented and harmonized with the requirements of the overall Occupational Health & Safety Management System.
- 7. New Clause 4.1.5.2 now requires that a developed Electrical Safety Program outlines requirements to consider condition of maintenance of energized electrical equipment. Please note that a new CSA Group Guideline, *CSA Z463 Guideline on maintenance of electrical systems* was published in 2014 and it identifies the need for electrical equipment maintenance for protective devices to ensure incident energy calculations are accurate. In the United States, the *NFPA 70B Recommended Practice for Electrical Equipment Maintenance Standard* has been the industry Standard for quite some time for reviewing the requirements of an Electrical equipment maintenance. Specific technical maintenance tests and results are identified in the *ANSI/NETA MTS Standard for Maintenance Testing Specifications for Electrical Power Equipment and Systems*. Similar to CSA Z462 and the requirements for an Electrical Safety Program, CSA Z463 recommends employers develop an Electrical Equipment Maintenance Program (EEMP).



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- 8. Clause 4.1.5.6 Electrical safety program procedures. This Clause relates to an Electrical Safety Program identifying the need for procedures to be developed and used as a control measure to reduce risk and now reads: "The Electrical Safety Program shall identify the procedures to be utilized before work is started by workers exposed to an electrical hazard."
- 9. Clause 4.1.7.6 Hazard identification and risk assessment procedure has been changed to Clause 4.1.5.7 "Risk Assessment Procedure". This aligns with the overall change of the core Clauses in CSA Z462 to risk assessment. There are three requirements of completing a "Risk Assessment Procedure." The procedure shall identify the process to be used by the worker before work is started to carry out the following:
 - a. Identify hazards;
 - b. Assess risks; and
 - c. Implement risk control according to a hierarchy of methods.

New content was added to this Clause to identify what the expected hierarchy of risk control methods is based on industry accepted Occupational Health & Safety Management System Standards, CSA Z1000 for Canada and ANSI Z10 for the United States. This hierarchy of risk control methods would also be recognized by the OH&S Regulator as appropriate due diligence.

- a. Eliminating the hazard, de-energize;
- b. Substitute with other materials, processes, or equipment;
- c. Engineering controls "Safety by Design;"
- d. Warning signs and barricades, systems that increase awareness of potential hazards;
- e. Administrative controls, training, procedures, instructions and scheduling; and
- f. Electrical Specific PPE, Tools & Equipment and ensure its appropriate selection, use and maintenance.
- 10. Clause 4.1.5.9.1 Electrical safety program falls under Clause 4.1.5.9 Electrical safety auditing. Auditing your Electrical Safety Program is part of a continuous improvement process; Plan, Do, Check, Act. Many employers already conduct annual internal system audits for their overall Occupational Health & Safety Management System, but it will typically not include a review of practices related to the effective management of arc flash and shock hazards. Typically employers will have an external safety audit performed at intervals of three years. It is recommended that an internal electrical safety audit occur on an annual basis. The new Clause reads: "The Electrical Safety Program shall be audited to verify that the principles and procedures of the Electrical Safety Program are in compliance with CSA Z462. Audits shall be performed at intervals not to exceed three years.
- **11.**Clause 4.1.5.9.2 Field work. This Clause reads: "Field work shall be audited to verify that the requirements contained in the procedures are being followed by the Qualified Electrical Workers and Non-Electrical Workers. When the auditing determines that the principles and procedures developed referencing content from the Electrical Safety Program are not being followed, the appropriate revisions shall be made to the procedures following a Management of Change



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process. This Clause is actually promoting that an internal electrical safety audit be performed at intervals not to exceed one year.

- **12.** Clause 4.1.6.1 Training General Requirements. There is a change in the context that training requirements should be reviewed based on the level of risk of exposure of workers to electrical hazards, both electrical workers and non-electrical workers. This Clause of CSA Z462 pertains to an Employer's electrical safety training requirements. Previous editions of CSA Z462 explained how Employers are to provide adequate electrical safety training that is determined by the worker's exposure to electrical hazards. The new alignment of CSA Z462 with OH&S principles of risk assessment applies to worker training as well. Potentially every worker, including both Electrical and Non-Electrical workers, has a level of risk to exposure to electrical hazards. The level of risk is what determines the level of training required. This section of CSA Z462 applies to every worker, not just Qualified Electrical Workers. When the risk associated with an electrical hazard cannot be reduced, Employers shall provide adequate electrical safety training to all workers, including Non-Electrical Workers.
- **13.** Clause 4.1.6.2 Type of Training. Wording clarified to identify that the "type and extent of the training" needs to be considered. Currently this Clause identifies classroom and on-the-job training. ESPS's interpretation of classroom training today in industry has a broad interpretation that includes brick-and-mortar and e-Learning environments. The original training content in CSA Z462 was developed years before the emergence of new forms of electrical safety training, including blended learning systems where e-Learning is used as an effective replacement to classroom training or a prerequisite to brick-and-mortar type classroom training and/or on-thejob instruction. Employers need to decide what type(s) of training is best for their workers and document this within their Electrical Safety Program.
- **14.** Additional content has been added to Clause 4.1.6 Training.
 - a. Clause 4.1.6.3.1 Contact Release, "Workers exposed to shock hazards shall be trained in methods of safe release of victims from contact with exposed energized electrical conductors or circuit parts. Refresher training shall occur annually."
 - b. Clause 4.1.6.3.2 First Aid, Emergency Response and Resuscitation
 - "Workers responsible for responding to medical emergencies shall be trained in first aid i. and emergency procedures.
 - ii. Workers responsible for responding to medical emergencies shall be trained in cardiopulmonary resuscitation (CPR).
 - iii. Workers responsible for responding to medical emergencies shall be trained in the use of an automated external defibrillator (AED) if an employer's emergency response plan includes the use of this device.
 - Retraining in the applicable emergency response techniques shall occur at intervals iv. required to maintain certification in those techniques."





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- c. Clause 4.1.6.3.3 Training Verification Employers shall verify at least annually that worker training required by this section is current.
- d. Clause 4.1.6.3.4 Documentation The employer shall document that the training required by Clause 4.1.6.3 has occurred.
- e. Clause 4.1.6.4 Worker training. Some updates have been made to this Clause. Clause 4.1.6.4.1(a) There have been slight changes to this Qualified Persons Clause. It now reads:
 "Such persons shall be familiar with the proper use of the applicable special precautionary techniques, electrical policies and procedures, PPE, insulating and shielding materials, and insulated tools and test equipment."
- **15.** Clause 4.1.7 Host and Contract Employer's Responsibilities was relocated Clause 4.1.5 to Clause 4.1.7 to clarify the flow and organization of the information presented in CSA Z462 and place appropriate emphasis that an Electrical Safety Program is a priority and within the Electrical Safety Program specific content is documented such as host and contract employer's responsibilities.
- **16.**Clause 4.1.8.3.2 Ground Fault Circuit Interrupter (GFCI) Protection stipulates the use of GFCI protection for 125 volt, 15, 20 or 30 ampere circuits.
- **17.**New Clause 4.3.2.2.4 Normal Operation. This adds the inclusion of the concept of "*Normal Operation*" vs "*Abnormal Operation*" of energized electrical equipment to CSA Z462. With respect to normal conditions of energized electrical equipment, these conditions are assessed as:
 - a. The equipment is properly installed;
 - b. The equipment is properly maintained;
 - c. All equipment doors are closed and secured;
 - d. All equipment covers are in place and secured; and
 - e. There is no evidence of impending failure.

When energized electrical equipment is in a "Normal Condition" it poses a very low and acceptable risk of exposure to electrical hazards for workers and no arc-rated clothing is required to be worn. There is a Note that outlines what the term "properly installed" means in relation to this Clause content. The Information Note reads: "The phrase "properly installed" means that the equipment is installed in accordance with applicable industry codes and standards and the manufacturer's recommendations. The phrase "properly maintained" means that the equipment has been maintained in accordance with the manufacturer's recommendations and applicable industry codes and standards. The phrase "evidence of impending failure" means that there is evidence such as arcing, overheating, loose or bound equipment parts, visible damage, or deterioration."



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The normal condition of energized electrical equipment relates to the probability of an arcing fault and arc flash occurring or exposure to shock. If the energized electrical equipment is in a normal condition the probability of an arcing fault occurring would be very low.

- **18.**Clause 4.3.2.3 Energized Electrical Work Permit. The conditions of when an Energized Electrical Work Permit (EEWP) is required were updated and clarified, Clause 4.3.2.3.1 General:
 - a. "When work is performed inside the Restricted Approach Boundary, thus implying that a shock hazard exists.
 - b. When a worker interacts with the equipment when conductors or circuit parts are not exposed, but an increased likelihood of injury from an exposure to an arc flash hazard exists. An example of this would be through-door racking in or out of power circuit breakers, but would not be required for normal operation of energized electrical equipment."
- 19. Clause 4.3.2.3 Energized electrical work permit and specifically Clause 4.3.2.3.3 Exemptions to work permit, related to the requirement for an Energized Electrical Work Permit (EEWP) have been revised to clarify that the EEWP is <u>NOT</u> required for:
 - a. Testing, troubleshooting and voltage measuring.
 - b. Thermography and visual inspections if the Restricted Approach Boundary is not crossed. This would include Ultrasonic inspections.
 - c. Access and egress to an area with energized electrical equipment if no electrical work is performed and the Restricted Approach Boundary is not crossed.
 - d. General housekeeping and miscellaneous non-electrical tasks if the Restricted Approach Boundary is not crossed.
 - e. Where the employer's arc flash risk assessment required by CSA Z462 identifies no arc flash hazards.
- **20.**Clause 4.3.4.1 Shock Risk Assessment. No longer called Shock Hazard Analysis, renamed to align with overall change to CSA Z462 to risk based.
- **21.**Clause 4.3.4 Approach Boundaries to Energized Electrical Conductors and Circuit Parts for Shock Protection. The Prohibited Approach Boundary for shock has been deleted. With respect to the requirement for shock related PPE, tools & equipment there was no difference between the Restricted Approach Boundary and the Prohibited Approach Boundary.
- 22. CSA Z462 Table 1A Approach boundaries to energized electrical conductors or circuit parts for shock protection for ac systems (distance from energized electrical conductor or circuit parts to worker) some changes have been made to the "Nominal system voltage ranges, phase to phase." Specifically the existing range of 50V 300V has been changed to 50V 150V and the existing range 301 750V has changed to 151V 750V. This change impacts the Restricted Approach Boundary for shock for 208V or 240V work tasks where the Restricted Approach Boundary will no longer be "Avoid Contact" and will be 0.3 m or 12 inches. Additionally the Prohibited Approach Boundary has been deleted.

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- **23.** With respect to CSA Z462 Table 1B Approach boundaries to energized electrical conductors or circuit parts for shock protection for dc systems (distance from energized electrical conductors or circuit parts to worker) the Prohibited Approach Boundary has been deleted.
- 24. Clause 4.3.5 Arc Flash Risk Assessment. One of the most significant changes to CSA Z462 is the formal inclusion of the requirement for a Risk Assessment Procedure to be followed. In order for the entire CSA Z462 document to align with a risk assessment methodology, changes were necessary to the terms and explanation of arc flash hazard analysis and shock hazard analysis.

Clause 4.3.5.1 General

Refers to risk assessments and when they are to be performed. It reads:

"An Arc Flash Risk Assessment shall be performed and shall:

- 1) Determine if an arc flash hazard exists. If an arc flash hazard exists, the risk assessment shall determine:
 - a) Appropriate safety-related work practices,
 - b) The arc flash boundary, and
 - c) The PPE that personnel within the arc flash boundary shall use.
- 2) Be updated when a major modification or renovation takes place. It shall be reviewed periodically, at intervals not to exceed five years, to account for changes in the electrical distribution system that could affect the results of the analysis.
- 3) Take into consideration the design of the overcurrent protective device and its opening time, including its condition of maintenance."

Some slight changes have been made to the notes section:

"Notes:

- (1) Improper or inadequate maintenance can result in increased opening time of the overcurrent protective device, thus increasing the incident energy. When equipment is not properly installed or properly maintained, PPE selection based upon incident energy analysis or the PPE category method may not provide adequate protection from arc flash hazards.
- (2) Both larger and smaller available short-circuit currents could result in higher available arc flash energies. If the available short-circuit current increases without a decrease in the opening time of the overcurrent protective device, the arc flash energy will increase. If the available short-circuit current decreases, resulting in a longer opening time for the overcurrent protective device, arc flash energies could also increase.

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(3) The occurrence of arcing fault inside an enclosure produces a variety of physical phenomena very different from a bolted fault. For example, the arc energy resulting from an arc developed in air will cause a sudden pressure increase and localized overheating. Equipment and design practices are available to minimize the energy levels and the number of procedures that could expose a worker to high levels of incident energy.

Proven designs such as arc-resistant switchgear, remote racking (insertion or removal), remote opening and closing of switching devices, high-resistance grounding of low voltage and 5 kV (nominal) systems, current limitation, and specification of covered bus or covered conductors within equipment are techniques available to reduce the risk associated with an arc flash incident. See Informative Annex O for Safety-Related Design Requirements.

- (4) For maintenance on overcurrent protective devices, see also Clause 5.2.4 and Annex B.
- (5) See IEEE 1584 for more information regarding arc flash hazards for three-phase systems." [IEEE 1584 still includes the exemption for arc flash risk assessment when the equipment is 240V or less, single transformer and transformer rating is 125kVA or less.]
- 4.3.5.2 Documentation

It reads: The results of the arc flash risk assessment shall be documented.

4.3.4.3 Arc Flash Boundary

The Arc Flash Boundary shall be the distance at which the incident energy equals 5 J/cm² (1.2 cal/cm²). A note has been added that reads: The Arc Flash Boundary shall be permitted to be determined by Table 4B or Table 4C when the requirements of these tables apply.

You have to reference the Parameters to the Table for AC or the Table for DC systems and use the Arc Flash Boundary distance listed in the parameters after you verify the maximum short circuit current and maximum fault clearing time parameter for the specific equipment and voltages listed.

- 4.3.5.4 is now titled Arc Flash PPE
- 4.3.5.4.1 General is now:

One of the following methods shall be used for the selection of PPE. Either, but not both, methods shall be permitted to be used on the same piece of equipment. The results of an incident energy analysis to specify an Arc Flash PPE Category in Table 5 shall be prohibited.

4.3.5.4.2 Incident energy analysis method

This clause has had the first paragraph removed that speaks about an incident energy analysis determining the incident energy exposure to workers.

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4.3.5.4.3 is now titled Arc flash PPE category method

"The requirements of Clauses 4.3.7.3.15 and 4.3.7.3.16 shall apply when the Arc Flash PPE Category method is used for the selection of arc flash PPE."

- **25.** Clause 4.3.5.3 Arc Flash Boundary. The Arc Flash Boundary shall be the distance at which the incident energy equals 5 J/cm² (1.2 cal/cm²). A note has been added that reads: The Arc Flash Boundary shall be permitted to be determined by Table 4B or Table 4C when the requirements of these tables apply. You have to reference the Parameters for Table 4B for AC or Table 4C for DC systems and use the Arc Flash Boundary distance listed after you verify the maximum short circuit current and maximum fault clearing time parameters for the specific equipment and voltages listed.
- **26.**Clause 4.3.5.5 Equipment Labeling has changes made to the body of the Clause relating to changing the wording used from hazard analysis to risk assessment. Additional information has been added to the end of the Clause that reads:

"When the review of the Arc Flash Hazard Risk Assessment identifies a change that renders the label inaccurate, the label shall be updated.

The owner of the electrical equipment shall be responsible for the documentation, installation, and maintenance of the field-marked label.

Labels applied prior to the effective date of this edition of the Standard are acceptable if they contain the available incident energy or required level of PPE."

- **27.**Clause 4.3.6.4 Wearing of conductive articles. The change to this clause relates to wearing conductive articles of clothing and that they shall not be worn within the Restricted Approach Boundary or where they present an electrical contact hazard.
- **28.** Clause 4.3.6.8 Clear spaces. Now reads: "Working space required by other codes and standards shall not be used for storage. The space shall be kept clear to permit safe operations and maintenance of electrical equipment."
- **29.** Clause 4.3.6.13 Reclosing circuits after protective device operation. This is a new Clause that reads: "After a circuit is de-energized by the automatic operation of a circuit protective device, the circuit shall not be manually re-energized until it has been determined that the equipment and circuit can be safely energized. There shall be no repetitive manual reclosing of circuit breakers or re-energizing of circuits through replaced fuses. When it is determined from the design of the circuit and the overcurrent devices involved that the automatic operation of a device was caused by an overload rather than a fault condition, examination of the circuit or connected equipment shall not be required before the circuit is re-energized."
- **30.** Clause 4.3.7.3.15 Selection of personal protective equipment for various tasks. The existing Hazard/risk categories Table Method has been deleted and replaced with a new work task-based table and condition of equipment assessment to determine if arc flash PPE is required. This new Arc Flash Identification Table Method still utilizes the same parameter information for



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the selection of arc rated clothing for the identified equipment, voltage and work task, but based on an Arc Flash PPE Category. The term HRC has been deleted from CSA Z462. The Clause is updated to reflect the new Table. It now reads:

Clause 4.3.7.3.15.1 Alternating Current (AC) Equipment

"When the Arc Flash PPE Category method specified in Clause 4.3.5.4.3 is selected in lieu of the incident energy analysis method specified in Clause 4.3.5.4.2, CSA Z462 Table 4A shall be used to identify when arc flash PPE is required."

"When arc flash PPE is required, CSA Z462 Table 4B shall be used to determine the Arc Flash PPE Category for AC equipment and Table 4C shall be used to determine the Arc Flash PPE Category for DC equipment."

The estimated maximum available short-circuit current and maximum fault clearing times indicated in the parameters in Table 4B must be validated for the specific single line diagram related to the work task that will be executed when arc flash PPE is identified as required due to the abnormal condition of energized electrical equipment. After validating this information the Qualified Electrical Worker must apply the minimum working distances listed and the Arc Flash Boundary distance listed in the parameters to the work task.

An incident energy analysis shall be required in accordance with Clause 4.3.5.4.2 for the following:

- 1) Tasks not listed in CSA Z462 Table 4A.
- 2) Power systems with greater than the estimated maximum available short-circuit current.
- 3) Power systems with longer than the maximum fault clearing lines, and
- 4) Tasks with less than the minimum working distance listed.

Clause 4.3.7.3.15.2 Direct Current (DC) Equipment is new and reads:

When the Arc Flash PPE Category method specified in Clause 4.3.5.4.3 is selected in lieu of the incident energy analysis method specified in Clause 4.3.5.4.2, CSA Z462 Table 4A shall be used to identify when arc flash PPE is required.

When arc flash PPE is required, CSA Z462 Table 4C shall be used to determine the Arc Flash PPE Category.

The estimated maximum available short circuit current, and maximum arc duration listed must be complied with for the specific DC work tasks. After validating these parameters the working distances for DC equipment listed must be applied to the specific DC work task as listed in CSA Z462 Table 4A.

An incident energy analysis shall be required in accordance with Clause 4.3.5.4.2 for the following:

- 1) Tasks not listed in CSA Z462 Table 4A.
- 2) Power systems with greater than the estimated maximum available short circuit current.





- Power systems with longer than the maximum arc duration, or
- 4) Tasks with less than the minimum working distance.

The notes at the end of each table have also been changed.

The related PPE selection table has now been renamed to "Table 5 - Personal protective equipment (PPE)." There are four (4) Arc Flash PPE Categories, 1 (min 4 cal/cm² ATPV or E_{BT}). 2 (min. 8 cal/cm² ATPV or E_{BT}), 3 (min 25 cal/cm² ATPV or E_{BT}) and 4 (min 40 cal/cm² ATPV or EBT). So instead of the Hazard/risk category Tables we have three (3) tables used to identify an Arc Flash PPE Category for an energized electrical work task.

Table 1 - New Arc Flash PPE Category Compared to Hazard/risk Categories

CSA Z462-2012 Table 5 Hazard/risk categorization of protective clothing for personal protective equipment	CSA Z462-15 Table 5 Personal protective equipment (PPE) [Arc Flash PPE Category]	ATPV or E _{BT} of arc-rated clothing
HRC 0	Not Applicable	
HRC 1	Arc Flash PPE Category 1	Minimum 4 cal/cm ²
HRC 2	Arc Flash PPE Category 2	Minimum 8 cal/cm ²
HRC 3	Arc Flash PPE Category 3	Minimum 25 cal/cm ²
HRC 4 [other ATPV ratings would classify as HRC 4]	Arc Flash PPE Category 4	Minimum 40 cal/cm ² [other ATPV ratings would classify as Arc Flash PPE Category 4]

This Table is not part of CSA Z462-2015. It is for informational purposes only in this document.

Notes:

- A. 100% natural fibre clothing shall be worn by the Qualified Electrical Worker at all times.
- B. Arc-rated clothing is available up to an ATPV of 140 cal/cm². There is an arc flash suit available from the Oberon Company with an ATPV of 140 cal/cm². All arc-rated clothing performs the same, it protects the skin to the 50% probability of the onset of a second degree burn when the incident energy exposure is equal to the ATPV.
- **31.** The concept of HRC 0 is deleted, as above the Arc Flash PPE Categories start at Arc Flash PPE Category 1, minimum 4 cal/cm2 arc rating. There is NO Arc Flash PPE Category 0. Minimum 100% natural fibre clothing would be required to be worn by a Qualified Electrical Worker who may have to wear arc rated clothing related to an energized electrical work task.
- 32. It is clarified that you cannot use Arc flash PPE Categories when you have completed an engineering based incident energy analysis. You cannot reference an Arc Flash PPE Category 1, 2, 3 or 4 with respect to incident energy analysis calculations. In the case of

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incident energy analysis arc rated clothing is determined by its ATPV or E_{BT} value, equal to or greater than the incident energy. You can refer to Annex H for recommendations for arc rated clothing when engineering incident energy analysis has been completed, two arc rated levels is recommended to reduce costs, simplify selection and maintenance costs.

- **33.** Clause 4.3.7.5.2 Barricades. Additions have been made to this Clause. The first replaces the idea that conductive barricades may not be used where they might increase the likelihood of exposure to an electrical hazard, as opposed to causing the exposure. Also, the following sentence was added to the end: "Where the Arc Flash Boundary is greater than the Limited Approach Boundary, barricades shall not be placed closer than the Arc Flash Boundary."
- **34.** Clause 4.3.10 Cutting or Drilling. This Clause has been added. It reads: "Before cutting or drilling into equipment, floors, walls, or structural elements where a likelihood of contacting energized electrical lines or parts exists, the employer shall perform a risk assessment to:
 - a. Identify and mark the location of conductors, cables, raceways, or equipment,
 - b. Create an electrically safe work condition, and
 - c. Identify safe work practices and personal protective equipment to be used."
- **35.**Clause 5.2 General Maintenance Requirements, Clause 5.2.3 Equipment maintenance. This Clause has had some changes made to it.

A new note has been added that reads: "Electrical equipment shall be maintained in accordance with the manufacturer's instructions or industry consensus standards to reduce the risk associated with failure. The equipment owner or the owner's designated representative shall be responsible for maintenance of the electrical equipment and documentation.

Maintenance, tests, and inspections shall be documented.

Common industry practice is to apply test or calibration decals to equipment to indicate the test or calibration date and overall condition of equipment that has been tested and maintained in the field. These decals provide the worker with immediate indication of last maintenance date and if the tested device or system was found acceptable on the date of test. This local information can assist the worker in the assessment of overall electrical equipment maintenance status."

- **36.** Clause 5.2.7 Guarding of energized electrical conductors and circuit parts. There has been an addition to this clause that reads: "Covers and doors shall be in place with all associated fasteners and latches secured."
- **37.** Clause 5.2.14.3 Repair and replacement. This new Clause reads: "Cords and cord caps for portable electrical equipment shall be repaired and replaced by qualified personnel and checked for proper polarity, grounding, and continuity prior to returning to service."



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- **38.** Clause 5.2.15. This is another new Clause. It states: "For overhead electric lines under the employer's control, grade elevation shall be maintained to preserve no less than the minimum designed vertical and horizontal clearances."
- **39.**Clause 5.3 Substations, switchgear assemblies, switchboards, panel boards, motor control centers, and disconnect switches, Clause 5.3.5 Protective devices. Has a revised note. It now states:

"Improper or inadequate maintenance can result in increased opening time of the overcurrent protective device, thus increasing the incident energy."

- **40.** Clause 5.6 Fuses and circuit breakers, Clause 5.6.1 Fuses. A new section has been added to this Clause. It reads: "Non-current limiting fuses shall not be modified to allow their insertion into current-limiting fuse-holders."
- **41.**Clause 5.11 Personal safety and protective equipment. Changes have been made to the following clauses:

Clause 5.11.2.1 Visual Inspection

"Visual Inspection reads: Safety and protective equipment and protective tools shall be visually inspected for damage and defects before initial use. Thereafter, such inspections shall be conducted as often as service conditions require, but at least every 12 months, unless otherwise specified by the applicable CSA, ULC, or ASTM Standard."

Clause 5.11.2.2 Testing

The beginning of this Clause has the following insertion: "The insulation of protective equipment and protective tools that is used as primary protection from shock hazards and requires an insulation system to ensure protection of personnel, e.g., as listed in Clause 5.11, shall be verified by appropriate test and visual inspection before initial use to ascertain that insulating capability has been retained."

Clause 5.11.4 Test Instruments

Reads: "Test instruments and associated test leads used to verify the absence or presence of voltage shall be maintained to assure functional integrity. The maintenance program shall include functional verification, as described in Clause 4.1.8.1.5."

42. Clause 6.2.4.3.2 Arc flash risk assessment procedure. This clause has been changed from Arc Flash Hazard Analysis Procedure to Arc Flash Risk Assessment Procedure and now states:

"Each task performed in the electrolytic cell line working zone shall be analyzed for the likelihood of arc flash injury. If there is a likelihood of personal injury, appropriate measures shall be taken to protect persons exposed to arc flash hazards. These measures shall include one or more of the following:

a) Provision of appropriate PPE (Clause 6.2.4.4.3) to prevent injury from the arc flash hazard;



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- b) Alteration of work procedures to reduce the likelihood of occurrence of an arc flash incident; and
- c) Schedule the task so that work can be performed when the cell line is de-energized."
- **43.** Clause 6.3 Safety requirements related to batteries and battery rooms or battery enclosures. This Clause is related to batteries and battery rooms or battery enclosures, updates have been made to align with risk assessment. Important Clauses within it are:

"Clause 6.3.2.1 Battery risk assessment

Prior to any work on a battery system, a risk assessment shall be performed to identify the chemical, electrical shock, and arc flash hazards and assess the risks associated with the type of tasks to be performed.

Clause 6.3.2.4 Abnormal battery conditions

This Clause has been shortened to now read: "Instrumentation that provides alarms for early warning of abnormal conditions of battery condition, if present, shall be tested annually.

Note: Battery monitoring systems typically include alarms for such conditions as overvoltage, undervoltage, overcurrent, ground fault, and over-temperature. The type of conditions monitored will vary depending upon the battery technology. One source of guidance on monitoring battery systems is IEEE 1491."

Clause 6.3.3.2 Battery activities that do not include handling of electrolyte

This Clause now has a new sentence at the end as well as a note at the end. It states:

"Workers performing any activity not involving the handling of electrolyte shall wear safety glasses.

Note: Battery maintenance activities usually do not involve handling electrolyte. Batteries with solid electrolyte, such as most lithium batteries, or immobilized electrolyte, such as valve-regulated lead acid batteries, present little or no electrolyte hazard. Most modern density meters expose a worker to a quantity of electrolyte too minute to be considered hazardous, if at all. Such work would not be considered handling electrolyte. However, if specific gravity readings are taken using a bulb hydrometer, the risk of exposure is higher – this would be considered to be handling electrolyte, and the requirements of Clause 6.3.3.1 would apply."



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Additional Comments:

In CSA Z462 there never was a "Dangerous" incident energy level where no work task execution is allowed. This is a myth. The value of 40 cal/cm² is historical in nature originally based on available arc-rated cloth that could be layered and 40 cal/cm² was one of the layering combinations available. There is a note in CSA Z462/NFPA 70E that indicates that greater emphasis is required. This statement is not true, greater emphasis should be required if incident energy is 1.2 cal/cm² or greater as clothing that is not arc rated will ignite and the clothing burning may cause a significant burn to the skin. Originally the NFPA 70E Technical Committee was going to have two additional HRCs, HRC 5 at 65 cal/cm² and HRC 6 at 100 cal/cm².

There is no correlation between incident energy and arc blast pressure. The potential pressure wave released when an arc flash event occurs is related to the amount of arcing current NOT incident energy. Equipment can have a low incident energy and higher arc blast pressure, or a higher incident energy and a lower arc blast pressure. There have been no reported fatalities due to physical injury from arc blast pressure. The pressure actual moves the worker away from the arcing fault and resulting arc flash event.

CSA Z462, 2 nd to 3 rd Edition Differences			
	CLAUSE 1 – SCOF	Έ	
Clause	CSA Z462, 2 nd Edition	CSA Z462, 3 rd Edition	
Clause 1.1 General		safety maintenance requirements and other administrative controls [added]. This places emphasis on the need for minimum electrical equipment maintenance to sustain "normal energized electrical equipment operation."	
Clause 1.1 General		Note: This standard addresses safety of workers whose job responsibilities entail interaction with electrical equipment and systems with potential exposure to energized electrical equipment and circuit parts. Concepts in this standard are often adapted to other workers whose exposure to electrical hazards is unintentional or not recognized as part of their job responsibilities. The highest risk for	

Document: ESPS CSA Z462 2nd to 3rd Edition

<u>Table 2 – Differences Summary Table Format – Not all updates and changes will be</u> <u>duplicated in this Table from above</u>

Project Reference #: ESP Change Management



ESPS electrical safet	Document: ELECTRICAL SAFETY PROGRAM	Subject: CSA Z4 Difference	62 2 nd to 3 rd Edition s Changes & Updates	OBERON	
PROGRAM SOLUTIONS IN	Issued by: Approved by: Rev #. TWB/JDP TWB/JDP 2.1		Rev Date: April 15, 2015		
	CSA Z462, 2 nd to 3	rd Edition	Differences		
			injury from electrica workers involves u with overhead pow shock from machin appliances.	al hazards for other nintentional contact ver lines and electric nes, tools, and	
	CLAUSE 3	– DEFINITI	ONS		
Clause	CSA Z462, 2 nd Editio	on	CSA Z462	2, 3 rd Edition	
Clause 3	Arc Flash Hazard Analysis		Deleted. Replaced Flash Risk Assess identified in the boo specifically Clause	d with new term Arc ment which is dy of Clause 4, 4.3.5.	
Clause 3	Boundary, Prohibited Approa [related to shock]	ch	Deleted. Redundant to Restricted Approach Boundary. PPE will be on already for shock when inside the Restricted Approach Boundary.		
Clause 3	Hazard		Added. A source of possible injury or damage to health.		
Clause 3	Hazardous		Added. Involving e	exposure to at least	
Clause 3	Incident Energy		Updated to include the words thermal energy instead of just energy		
Clause 3	Luminaire		Updated. A complete designed to accome and to connect the conductors.	and the lighting unit amodate the lamp(s) lamp(s) to circuit	
Clause 3	Qualified Person (worker)		Definition updated the skills and know has <u>demonstrated</u> knowledge." As we "recognize" has be "identify and avoid	from "one who has /ledge" to "one who skills and ell the word en changed to the hazards."	
Clause 3	Risk		Added. Refers to " likelihood of occurr damage to health a injury or damage to from a hazard." Th harm that could be	a combination of the rence of injury or and the severity of b health that results he severity is the caused.	
Clause 3	Risk Assessment		Added. "An overal identifies the hazar potential severity o health, estimates the occurrence or injur	I process that rds, estimates the of injury or damage to he likelihood of the ry or damage to	

Project Reference #: ESP Change Management

Document: ESPS CSA Z462 2nd to 3rd Edition Differences, Changes & Updates



ESPS electrical safet	Document: ELECTRICAL SAFETY PROGRAM	Subject: CSA Z4 Difference	462 2 nd to 3 rd Edition es Changes & Updates	ÖOBERON	
PROGRAM SOLUTIONS in	Issued by: Approved by: TWB/JDP TWB/JDP	Rev#: 2.1	Rev Date: April 15, 2015		
	CSA Z462, 2 nd to 3 ^r	^d Edition	Differences		
			health, and determ	ines if protective	
			measures are requ	iired. Note: As used in	
			this Standard, "arc fl	ash risk assessment"	
			risk assessments."	ssment are types of	
	CLAUSE 4 – SAFETY RE	LATED W	ORK PRACTICES		
Clause	CSA Z462, 2 nd Edition	1	CSA Z462	2, 3 rd Edition	
Clause 4.1	Clause 4.1.5 Host and contrac	t	The order of the Cl	lauses have	
	employer's responsibilities		changed, the inform	nation is the same	
	Clause 4.1.7 Electrical safety p	orogram	With some updates	s. The order of the	
	Order of these two Clauses wa	nc.	Clauses is now.		
	swapped.	.0	Clause 4.1.1 Gene	ral requirements for	
			electrical -safety-re	elated work practices	
			Clause 4.1.2 Purpo	ose	
			Clause 4.1.3 Resp	onsibility	
			Clause 4.1.4 Orga	nization	
			Clause 4.1.5 Electi	rical safety program	
			Clause 4.1.0 Salet	and contract	
			employer's response	sibilities	
			Clause 4.1.8 Use c	of electrical	
			equipment		
			Clause 4.2 Establishing an electrical safe work condition		
			Clause 4.3 Work in	volving electrical	
Clause 4.1.6			Updates to 4.1.6.3	Emergency	
Training			procedures	<u> </u>	
Clause 4.1.7 Electrical Safetv	Was Clause 4.1.7, it was swap Clause 4.1.5 in CSA Z462. 3 rd	ped with Edition	Various additions t	o text added.	
Program			General: The langu	uage "activity	
			appropriate for the	electrical hazards"	
			has been changed	to "activity	
			appropriate to the lectrical hazards."	risk associated with	
			Hazard Identificatio	on and Risk	
			Assessment Proce	dure changed to just	
			"Risk Assessment	Procedure."	





ESPS electrical safety	Document: ELECTRIC PRO	CAL SAFETY GRAM	Subject: CSA Z4 Difference	462 2 nd to 3 rd Edition es Changes & Updates	OBERON
PROGRAM SOLUTIONS inc.	Issued by: TWB/JDP	Approved by: TWB/JDP	Rev #: 2.1	Rev Date: April 15, 2015	
	CSA	Z462, 2 nd to 3 rd	d Edition	Differences	
				Additional Note ad preventive and pro- measures that sho on the application of Health & Safety Ma Specific reference Z1000 Occupation management Stan following hierarchy 1. De-energize 2. Substitution 3. Engineering 4. Warning sig 5. Administrati and procedu 6. Personal pro- with approp maintenanc Audit of Electrical S not exceed three (S	ded to emphasize the tective risk control uld be applied based of Occupational anagement Systems. is made to the CSA al health and safety dard and the of control measures: ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ;
Clause 4.1.5.2 Maintenance	New content.			The new content a electrical safety pro- elements that cons maintenance of ele and systems." Renumbering of su required after addin Clause. The new CSA Z46	dded states "The ogram shall include sider condition of ectrical equipment ub Clauses was ng this new sub 3 Guideline on
				maintenance of ele be referenced for in establishing an Ele Maintenance Prog	ectrical systems can nformation on ectrical Equipment ram and appropriate

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ESPS electrical safet	Document: ELECTRICAL SAFETY PROGRAM ty*		462 2 nd to 3 rd Edition es Changes & Updates	OBERON
PROGRAM SOLUTIONS IN	Issued by: Approved b TWB/JDP TWB/J	y: Rev #. DP 2.1	Rev Date: April 15, 2015	
	CSA Z462, 2	nd to 3rd Edition	Differences	
			maintenance strate of maintenance.	egies and frequency
Clause 4.1.8.3 Ground fault circuit interrupter (GFCI) protection			New sub-clause ad Maintenance and d GFCI protection sh an employee is ope and plug-connecte maintenance and d supplied by 125-vo ampere circuits. W operate or use equ greater than 125-vo ampere circuits GF assured equipmen conductor program implemented.	dded. construction. all be provided when erating or using cord d tools related to construction activity blt, 15-, 20-, or 30- here employees lipment supplied by olt, 15-, 20-, or 30- CI protection or an t grounding a shall be
Clause 4.3.2.2.4 Normal operation	content provided.	or Clause		
Clause 4.3.4	Approach Boundaries to electrical conductors ar for shock protection	o energized nd circuit parts	Deleted Prohibited Reordered the info presentation. More information now.	Approach Boundary. rmation to improve e logical order of
CSA Z462 Table 1A	Nominal voltage ranges	s changed	50V - 300V is now now covered and v Restricted Approad 151-300V	50V -150V [208V vill have a defined ch Boundary]
Clause 4.3.7.3.13	Care and maintenance clothing and arc-rated a	of arc-rated arc flash suits	Laundering Standa industrial via ASTN to be provided to w launder.	ards home care and <i>I</i> . Instructions need vorkers if they home

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	CSA 2462, 2 nd to 3 nd Edition Differences					
Annex	CSA 7462 2 nd Edition	CSA 7462 3rd Edition				
Annex B Safety- related electrical maintenance		This Annex has a few minor changes to align it with changes to Clauses and the arc flash PPE category Tables. Reference is also not made to the new CSA Z463 Guideline on maintenance of electrical systems.				
Annex C Limits of approach		This has also been slightly changed with C.1.3.4 and C.2.6 being removed entirely, with the Prohibited Approach Boundary being deleted.				
Annex D Incident energy and arc flash boundary calculation methods		Realigned content more user friendly to read and interpret. Now includes information on the Dr. Ralph Lee calculation method and some Clause name changes as well as some new Clause information.				
Annex E Electrical safety program		This Annex has had slight changes made to align with the new Risk Assessment Procedure content of CSA Z462.				
Annex F Risk assessment procedure		This Annex has also had slight changes made mostly to wording.				
Annex H Guidance on selection of protective clothing and other personal protective equipment		Updated to align with risk assessment and updated referencing new Arc flash identification Table 4A and Arc Flash PPE Category Tables 4B and 4C. This Annex has changes made to Table H.1. Changes are made to reflect the new Arc Flash PPE Category. Applicable tasks have been changed to applicable situations. Changes have also been made to change hazard analysis to risk assessment. Clause H.4 and H.5 and Table H.4 and H.5 have been removed. This Annex has had three items added				
job briefing and planning checklist		to the checklist.				



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	CSA	Z462, 2 nd to 3 rd	^d Edition	Diffe	erences	
Annex J Sample energized electrical work permit				Thi cor ass	is Annex has ntaining questic sessment added	had a new section ons related to risk to the middle of it.
Annex O Safety- related design				Thi bot inc cor wo	is Annex has ha th content relate ident energy rec ntrol methods, a rding changes.	d changes made to d to design options, luction and other risk s well as some minor
Annex P				De Cla	leted redundant ause content.	to definitions and
Annex Q Arc flash and shock warning and information labels				Up Pro	dated with new phibited approac	label examples. h boundary deleted.
Annex U Human performance and workplace electrical safety	No content prev	iously.		Thi rela per rela like cor	is new Annex ha ates to human b formance. This ated to the proba elihood of occurr mpleting a risk a bocedure.	as been added. It ehavior and is an important topic ability parameter of rence when ssessment

Disclaimer:

Please be aware that this document doesn't provide an all-inclusive review of all changes in CSA Z462, 3rd Edition, 2015. You are advised to reference the published document and confirm the changes. Additionally, any comments that are provided in this document that are interpretive opinions are based on a subject matter expert's professional experience and opinions.

If you require additional specific information, please consult with the CSA Group.

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