



# Safety Measures <sup>ELECTRICAL</sup>

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

## CSA Z462 Annexes

**By Terry Becker, P.Eng., CESC, IEEE Senior Member**

The CSA Z462 Workplace electrical safety Standard is a detailed and comprehensive Standard which provides specific policies, practices, processes, and procedural requirements related to shock and arc flash hazards. Interpretation and application is required and important. The Annexes in CSA Z462 provide a valuable resource for interpretation of the mandatory Clauses and in relationship to field application. Supplemental information is provided that you should be aware of and when you develop and are implementing your company's Electrical Safety Program.

In the CSA Z462 2021 Edition several existing Annexes have been updated and the provision of several new Annexes is included to provide additional explanatory and supplemental information to reference with respect to the

core Clause content of CSA Z462.

**Annex A Aligning Implementation of this Standard with CSA Z45001 [Updated]:** Has been completely updated referencing CSA Z45001 and a new cross reference table provided specific to CSA Z462 and the CSA Z45001 occupational health and safety management system intent or objective and in support of development of a compliant Electrical Safety Program.

**Annex B Safety-Related Electrical Maintenance:** High level overview of the importance of electrical equipment maintenance and electrical safety. Highlights referencing CSA Z463 Maintenance of Electrical Systems Standard. Some minor updates in 2021 Edition.

**Annex C Limits of Approach:** This Annex has been there since the beginning and stresses that distance is our friend and a barrier to exposure to electrical shock and arc flash. Table C.1 lists the minimum air insulation distances for avoiding flashover.

**Annex D Incident Energy and Arc Flash Boundary Calculation Methods [Updated]:** The existing IEEE 1584 2002 Edition detailed formula content is deleted and a reference only to the new updated IEEE 1584 2018 Edition added.

**Annex E Electrical Safety Program:** Simple summary list items of principles, controls and procedural requirements are provided.

**Annex F Risk Assessment and Risk Control:** This Annex provides summary details in support of Clause 4.1.7.8 Risk Assessment Procedure. Figure F.1 Risk Management Process is a good visual aid to the six (6) steps to implementing a risk assessment procedure for energized electrical work tasks. The Annex links energized electrical work task risk assessments to occupational health and safety management system (OHSMS) hazard identification and risk assessment (HIRA). An example 2 X 2 qualitative risk matrix is provided.

**Annex G Sample Lockout Policy and Program and Sample General Lockout Procedure (Invidual Lockout):** This is a generic template extracted from CSA Z460 Control of hazardous energy – Lockout and other methods.

**Annex H Guidance of Selection of Protective Clothing and Other Personal Protective Equipment:** This Annexes advises that when the arc flash PPE category method is utilized to determine additional protective measures for a work task's arc flash risk assessment, two arc-rated arc flash PPE levels is recommended to be available to Qualified Persons, this aligns with CSA Z462 Table 3 when incident energy analysis has been completed. Information is also provided on "Conformity Assessment of PPE." In Table H.1 the minimum arc-rating of 40 should be replaced with 75 (2024 Edition change recommended)

**Annex I Sample Job Briefing and Planning Checklists [Updated]:** A new Figure I.2 Sample job planning checklist is added to illustrate how the Clause 4.1.7.9.2 Job Safety Planning can be documented. An employer's Electrical Safety Program must include an Energized Electrical Job Safety Planning form to be completed before energized work tasks are undertaken.

**Annex J Sample Energized Electrical Work Permit [Updated]:** Sample energized electrical work permit Figure J.2 Energized electrical work permit flow chart was amended to update the applicability of the permit for 30VAC or now 60VDC. The example EEWP aligns with Clause 4.3.2.2 requirements.

**Annex K General Categories of Electrical Hazards [Updated]:** A complete rewrite related to arc blast is now included indicating that arc blast pressure is not as significant as it has been presented in the past. Note I have quoted that 40 cal/cm<sup>2</sup> of incident energy is not a stop point for energized work which has been a true statement for over 10 years. This updated published information in Annex K will now provide additional substantiation for this. Energized work tasks can be performed up to 140 cal/cm<sup>2</sup> of incident energy, as an arc flash suit is available from Oberon Company with an ATPV of 140 cal/cm<sup>2</sup>.

**Annex L Typical Application of Safeguards in the Cell Line Working Zone:** No changes to this content. Provides guidance that CSA Z462 applies to electrolytic line cells. Clause 6 Safety Requirements for Special Equipment includes electrolytic line cells in Clause 6.2.

**Annex M Layering of Protective Clothing and Total System Arc Rating:** This Annex provides details with respect to approved testing so arc-rated clothing can be layered to achieve higher Arc Thermal Performance Values (ATPVs). An arc flash suit is an example of achieving a Total System Arc Rating. Arc flash suits are available up to an ATPV of 140 cal/cm<sup>2</sup> from Oberon Company.

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**Annex N Example of Industrial Procedures and Policies for Working Within the Limited Approach Boundary of Overhead or Buried Electrical Power Lines and Equipment:** This Annex provides policy, practices, and procedural related content for high voltage overhead electrical equipment. This information can be used complimentary to Provincial, Territorial, or Federal OH&S legislation related to high voltage electrical equipment. There are other Standards that can also be referenced with more detailed information such as CAN/ULC S801 Standard on Electric Utility Workplace Electrical Safety for Generation, Transmission and Distribution.

**Annex O Safety-Related Design [Updated]:** This was an existing Annex that was updated with additional content in reference to the hierarchy of risk control method of “Safety-by-Design,” “Prevention-Through-Design.”

**Annex P Electrical Switching & Isolation [NEW]:** An Annex related to electrical switching and isolation is added to provide general information for low or high voltage complex switching and isolation including a new Figure P.2 Example Switching Order form.

**Annex Q Arc Flash and Shock Warning Equipment Labels [Updated]:** Arc flash and shock warning equipment labels includes minor wording updates, and updated example equipment labels to correct the orange color used to properly align with ANSI Z535. A specific note is now included that states electrical hazard information for supervised industrial installations can be provided in alternative methods other than the application of equipment labels.

**Annex R Substation Systems and Equipment:** Not known by industry CSA Z462 includes some good content specific to high voltage overhead electrical equipment, in this Annex outdoor high voltage substations non-utility or utility owned.

**Annex S Guidance for Preventing Shock Injuries from Electrostatic Discharges in Manufacturing Operations:** This Annex was added several editions ago based on a submission from Lanny Floyd, retired Dupont and one of the founding members of the IEEE ESW and a significant contributor to the body of knowledge in electrical safety and specifically the need for Electrical Safety Programs.

**Annex T Temporary Protective Grounding [NEW]:** A new Annex on temporary protective Grounding is added provide additional application information further than the content of CSA Z462, Clause 4.2.6.

**Annex U Human Performance and Workplace Electrical Safety:** This is an amazing Annex with detailed information that is based on the extensive work completed in this area in the nuclear power industry. In CSA Z462 Clause 4.1.7.8 Risk Assessment Procedure, Clause 4.1.7.8.3 Human Error is specifically identified as a key contributing factor related to likelihood of occurrence.

**Annex V Arc Flash PPE Categories [New]:** This is a normative Annex providing an alternate table to the existing CSA Z462 Clause 4.3.7.3.15 Arc Flash PPE Category Method Table 6A. An instructional flow chart is included “Arc-flash PPE categories selection flow chart” and then Table V.1.

**Annex W Bibliography:** Detailed list of additional reference Standards.

**Annex X Requests for Amendments to CSA Z462:** This Annex provide direction on a person, organization or committee submitting Requests for Amendment of CSA Z462. FYI Requests for Amendment are open for the 2024 Edition of CSA Z462 until February 3, 2022.

The Annexes in most Standards I believe are overlooked by users of the Standard and provide valuable supporting information, examples, detailed information in support of the core mandatory Clauses.

If you are interested in discussing the information presented in this article do not hesitate to contact me at [terry.becker@twbesc.ca](mailto:terry.becker@twbesc.ca) or 587.433.3777.



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

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