

CSA Z462 Arc Flash Suit Buying Guide

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There has been much written about CSA Z462. Awareness of the hazards of arc flash incidents is greater today, yet there continues to be misconceptions about arc flash suits and protection against higher incident energy hazards. "I will never wear one of those moon suits." However, there have been substantial improvements in technology of the fabrics and hood windows and development of accessories, which have addressed or mitigated many of the comfort issues. In many cases, wearing an arc flash suit is not a consideration. Because of the extent and severity of the potential energy and possible injuries that would result, an arc flash suit may be the only choice.

An arc flash suit may be your last line of defense if all else fails. The other elements of your Electrical Safety Program, (1) qualification of workers and training, (2) use of procedures, (3) establishing work practices and (4) engineering controls can dramatically reduce the probability and/or severity of an arc flash incident. They DO NOT eliminate the hazard. An arc flash suit can be that final insulating barrier, protecting the worker from burn injury.

Arc flash suits are defined by CSA Z462-08 as being a complete flame-resistant clothing and equipment system that covers the entire body, except for the hands and feet; this includes pants, a jacket, and a bee-keeper-type hood fitted with a face shield/window. As with other electrical specific PPE (Personal Protective Equipment) solutions, we have seen significant improvements in arc flash suit design and technology over the past decade. This article will focus on multi-layer arc flash suits, not layered garment solutions. It will include the essential information required when purchasing arc flash suits as well as helpful selection tips.

The first step before purchasing any electrical specific PPE is to quantify your hazard(s). Two basic methods are described within CSA Z462-08;

Method 1: Selection based on incident energy analysis,

Method 2: Selection based on hazard/risk categories.

Arc flash suits are not the first step in protecting your workers from electrical hazards but rather your last line of defense. An effective Electrical Safety Program which includes risk evaluation with prioritized preventive and protective control measures; de-energize first, reduce and/or eliminate electrical hazards through engineering "safety by design", warning signs and barriers, administrative controls including training, procedures and work practices should be considered first before your worker should ever use an arc flash suit.

When purchasing arc flash suits, the arc rating (protection level) shall be determined by your electrical hazard analysis method as prescribed within your Electrical Safety Program and NOT by using an arc flash suit manufacturer's catalogue or website. The entire arc flash suit shall have an arc rating that is suitable for the arc flash exposure. Arc flash suits are available with arc ratings up to 140 cal/cm². CSA Z462-08 recommends when incident energy exceeds 40 cal/cm² at the working distance, greater emphasis than normal can be necessary with respect to de-energizing before working within the arc flash protection boundary of the exposed electrical conductors or circuit parts. It is noted that the arc flash suit hood is tested as a complete system and the arc rating (as per ASTM F2178) is often different than the suit material.

Similar to purchasing complex machinery, buying arc flash suits should involve a detailed review of the Standards related to the product and ensuring compliance to them. This is not a task best performed by window shoppers or those easily influenced by creative marketing techniques. Most arc flash suits purchased in Canada are through MRO and/or Safety product distributors. Your distributor should be willing to collect all of the information on your behalf, providing you with the necessary tools to research the available products and make an informed decision. The very first step is to make sure the arc flash suit meets the basic requirements of CSA Z462-08. Collecting actual testing documentation and related certifications will ensure you avoid false advertising traps. Requesting the following documentation from the arc flash suit manufacturer is highly recommended (as these standards evolve ensure you request the most recent version);

Standard	Brief Description	What to Request
ASTM F1959	Fabric Arc Rating Test	Laboratory Testing Documentation
ASTM F2178	Hood/Shield Combination Test provided by the product manufacturer	Laboratory Testing Documentation
ASTM F1506	Performance Specification for construction of garments	Sample image of Garment Label including Statement of Compliance
ANSI Z87.1+ (High Impact Protection)	ANSI Z87.1+ High Mass and High Velocity Test for Impact Strength (ANSI Z87.1+ is superior to CSA Z94.3 here)	Statement of Compliance and/or 3rd Party Laboratory Testing Documentation
Visual Light Transmission	Measurement of Shield Visible Light Transmittance	Visible Light Spectral Scan including Data across all Wavelengths from 400 nm to 760 nm

Several different arc flash suit designs exist including both appropriate and inappropriate configurations. Beware of arc flash suits consisting of long coats and leggings! This combination, while it may appear to provide a cost effective alternative, can raise significant protection concerns. The energy of an arc flash is not simply radiant heat like in a steel mill but includes significant amounts of convective energy that could reveal the shortcomings of long coats and legging combinations. The two most common configurations of arc flash suits for > 15 cal/cm² arc rating and above consists of 1) Coat, Bib-Overall, Hood and 2) Coveralls, Hood. Selecting the coat and bib-overall configuration will provide an added bonus of layered protection between the worker's neck and torso, a second layer of the arc flash suit in these areas provides additional protection. When selecting an arc flash suit design, make sure you think through the process of the worker using the garments. As an example, the goal of your worker should be to achieve an electrically safe work condition at which point less protection might be required. Removing their hood and coat when not working on a system in an energized state, leaving only their bib-overalls creates a comfortable and functional solution. Disrobing of a coverall, when protection is not required, can be cumbersome and awkward.

Lighter is better!! Just ask any of your workers who have to wear an arc flash suit. This statement might contradict with your current beliefs, because the common myth within the electrical safety industry is that all arc flash suits are heavy. Newer Aramid fiber technologies are being used in the design of innovative fabric solutions so the weight now becomes a relative term to the FR (Flame Resistant) technology. Manufacturers now offer a "lighter weight" inherently FR alternative to the more traditional heavier weight FR Treated Cotton/Nylon solutions. Arc flash suits are now available with arc ratings far above 40 cal/cm² that are similar in weight to your spring jacket!

Comparing the two different FR technologies can be challenging so a helpful tip is to consider the frequency and duration of which your workers will wear their arc flash suit; lighter weight more expensive inherently FR fabric solutions are easily justified by more frequent job tasks and longer wear time durations. Most arc flash suits are constructed with multiple layers of fabric combined together to create a single garment for greater versatility. Be sure to compare the overall fabric weight (the total weight of all individual layers) relative to the protection offered (arc rating) by the suit; if the arc ratings are different between manufacture suit designs, then calculate the products protection/weight ratio to determine the optimal system for your needs (divide the arc rating by the total fabric weight to determine the performance by weight ratio per suit). This method can then be used to compare a variety of different arc flash suits.

Regardless of how light weight today's arc flash suits have become, they will be hotter and bulkier than the non-FR garments your workers are currently accustomed to using! A variety of comfort options exist to help reduce the potential of heat stress while wearing an arc flash suit, including hood ventilation systems and body cooling vests. Keep in mind that on average, workers only wear an arc flash suits for a short period of time. In many cases, these available comfort options might not be necessary.

When purchasing arc flash suit hoods with hood ventilation systems (fan systems that pump external air inside of the hood), make sure the external components are covered by FR materials or constructed of non-melting and non-flammable materials as per CSA Z462-08. If non-FR ventilation system components are visible, there is the potential for these items to ignite in the event of an arc flash accident, which could then further contribute to a worker's potential skin burn injury. Some arc flash suit hood designs allow for the hood ventilation system to be added after the initial purchase. This could be helpful if the worker's job task(s) changes requiring them to wear the suit for longer durations of time.

Wearing body cooling vests that are constructed of arc rated FR materials including non-combustible FR gel packs will help keep the worker's core temperature down. Body cooling vests must be worn under the arc flash suit and over top of the workers everyday clothing to insure their effectiveness.

Some companies provide workers with their own personal issue arc flash suits while others require workers to share. This decision is based largely on where the workers will use the arc flash suits. If workers are required to travel, such as Electricians at a large industrial site or Utility workers, then personal issue suits are most convenient. Centralized locations allow workers to share arc flash suits. Be careful about worker hygiene when sharing any PPE, specifically arc flash suit hoods. The solution might be as easy as a can of Anti-Bacterial spray depending upon the arc flash suit manufacture's recommendations. When assigning individual suits, make sure the workers are able to try on different sizes before finalizing your order. Using a sizing chart is sufficient for small groups but when a larger organization with many workers is involved, using a sizing kit (suit sizes from Small – 5XL) to individually size the workers can be more effective. You might be surprised that most workers will require different size coats compared to their bib-overalls; ordering the proper sizes is important for the optimal performance and comfort of your arc flash suits. Workers should be able to easily perform their job tasks while wearing their suit. Arc flash suits shall be loose fitting and allow for easy and rapid removal by your workers. Additional considerations that are recommended when purchasing arc flash suits include proper storage bags (or lockers), anti-scratch & anti-fog coatings on the hood lens, harness ports, high visibility stripes/bands and corporate logo embroidery.

Purchasing arc flash suits should be considered a capital cost investment for your organization. The wear life expectancy will depend upon the FR technology you select and the durability of the fabric(s). Some suits can last for over 10 years; others might require replacement more frequently. Always select arc flash suits based on your electrical hazard analysis as outlined in your Electrical Safety Program. Engage the workers who will be wearing the arc flash suits for their input; initiate a wear trial if necessary. Avoid common pit falls such as creative marketing by soliciting the actual testing documentation.

Thoughtful research and reliable suppliers can help you navigate through the misconceptions in the marketplace. Your Electrical Safety Program will see a greater level of implementation, less pushback from your users, with the right selection that best fits for the needs of your team.

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