



2015 Revision to NFPA 70E & CSA Z462

“The only thing that is constant is change.”

-- Heraclitus (500 BC)

There are few universal truths in life:

- The sun will rise in the east every morning.
- There is nothing in the world a cute as your baby... except maybe your dog.
- Politicians will always disappoint us... always.
- And, just when you think you really know the latest revision of a standard, the new revision is ready for print.

And so, the world turns. As new research is conducted, old topics debated, and best practices are refined, the world's most influential electrical safety standards evolve to keep pace. Now, sometime before the golf season ends and deer season begins NFPA 70E and CSA Z462 are set to release the latest revisions.

The following is a brief summary of some of the more significant changes and evolutions with some insight regarding the reasons for the revisions. This overview is *not* intended to be all-inclusive, nor is it intended to be a replacement for reading the standards in their

entirety. At best, it is an attempt to provide the reader with an indication that they will need to (A) purchase a copy of the new revision, (B) study the modifications to the text, and (C) consider how the changes might influence their documented Electrical Safety Programs.

It is also important to note that the changes anticipated herein are based on the most recent drafts and final committee balloting – however the final revision could differ based on the results of final edits, approvals and votes which could affect the final text.

(Note: because CSA Z462 is harmonized with NFPA 70E, and the differences are minimal, this paper will focus on NFPA 70E.)

Concepts of Hazard and Risk:

The 2012 revision of NFPA 70E and CSA Z462 made several changes to separate the concepts of Hazard and Risk. The two concepts deserve to be separate, and are, in fact, distinct concepts in other occupational health and safety (OHS) standards. The 2015 revisions of NFPA 70E and CSA Z462, continue this effort to separate and clarify these important, foundational concepts.

Hazard, Hazardous, Risk and Risk Assessment have all been added to the Definitions section, further delineating and separating of the use of those terms.

Whereas a *Hazard* is the *source* of potential injury, or damage to a worker's health; *Risk* is a combination of the *likelihood and potential severity* of that injury (paraphrased).

Consequently, any references to the hybridized "Hazard/Risk Categories" (or HRC) have been replaced with the more accurate and descriptive "PPE Category".

The various forms of "Hazard Analyses" have been changed to "Risk Assessments" which:

- *Identify* the hazard(s)
- *Estimate* of the potential *severity* and *likelihood* of injury / harm
- Determine what if any *protective measures* are appropriate.

These changes might not appear significant at first glance, but they are significant in the way that they bring these standards in line with other safety standards. And as you will see, they have a great deal of impact on the Task Tables in 130.7(C)(15).

Other Global Changes:

The term "harm" has been clarified to read, "injury or damage to health."

Because "probability" has the connotation of a mathematically derived calculation, the 2015 revisions of 70E and Z462 will refer to the "likelihood" of an event.

In a continuation of the effort from the 2012 revision, all references to Flame Resistant or "FR" are changed to Arc Resistant or "AR." It is an important detail that seeks to eliminate any potential confusion with regard to PPE appropriate for use around a potential Arc Flash Hazard.

Scope (for NFPA70E only):

Traditionally, the Scope of NFPA 70E has seen very few changes over the years. This cycle, however, brings about a few notable exceptions. For consistency with related standards and industry best practices, and to emphasize the importance of safety-related maintenance and administrative controls (such as training) the revised scope will also include "safety-related maintenance requirements, and other administrative controls." The committee also added an informational note warning that the highest risk of electrical-related injury "for other workers involve unintentional contact with overhead power lines and electric shock from machines, tools and appliances..." The addition of this note to the Scope continues the efforts to impress upon readers that electrical safety is something that effects workers across the organization -- not just the electrical group.

The most significant change to the scope, however, resulted from an MSHA (Mining Safety & Health Administration) decision to accept the NFPA 70E standard in much the same way that OSHA does, making it a de facto electrical safety standard for the mining industry. Consequently, the exemption for mining applications previously found in the Scope [section 90.2(B)] will be removed in 70E-2015.

Prohibited Approach Boundary:

The *Prohibited Approach Boundary* (distance from a conductor that was considered the same as making contact) has been eliminated from the definitions after some interesting debate.

Those who advocated for it's continued inclusion in the standard generally thought that it underscored the difference between working in

contact with the conductor versus working in proximity that would require shock protection.

The Committee determined that previous changes to the standard have made the *Prohibited Approach Boundary* obsolete since it no longer triggers any behavior on the part of the worker or Manager. Generally speaking:

- The *Limited Approach Boundary* defines the boundary for unqualified workers.
- The *Restricted Approach Boundary* defines area in which qualified personnel are required to utilize PPE to prevent shock.
- The *Arc Flash Boundary* defines the area where arc resistant PPE is required.

But the *Prohibited Approach Boundary* had no actual instructional value within the standard -- no requirements associated with it -- it had essentially become an answer to a trivia question. The committee ultimately decided that the term added a layer of complexity and was a possible source of confusion without actually adding any direction to the user.

Maintenance and Your ESP:

The *Electrical Safety Program* (formerly 110.3) is being moved to the beginning of Article 110, *General Requirements for Electrical Safety-Related Work Practices*, to provide clarity since the implementation of an Electrical Safety Program (ESP) would naturally be the first element of the section that an employer would address, followed logically by the other considerations of the section (Training, Relationships with Contractors, etc.).

As with the previous (2012) revision, and as we saw earlier within the Scope, maintenance is once again being placed front-and-center as a keystone of electrical safety. After the

mandate that the employer must implement an *Electrical Safety Program*, the first consideration listed [110.1(B) *Maintenance*] is that the ESP must give consideration to the equipment maintenance.

Because improperly or poorly maintained electrical equipment can result in failures, and can result in longer clearing times, personnel safety is directly affected by the condition of the equipment in their proximity. It only makes sense that the standards would continue to focus attention on the condition and maintenance of the equipment. We will see this again in the Task Tables in Article 130.

Auditing and Training Intervals:

Auditing the Electrical Safety Program [110.1(I)] will continue to be required at intervals of three years or fewer. But the audit of *Field Work* (to verify that workers and managers are following the ESP procedures) will now be required at least annually (whereas there was no prescribed interval previously).

Annual auditing of field work actually brings the section in line with various training intervals required in Article 110.2 (*Training Requirements*) of the standard. The annual training or refresher is required for aspects of emergency response training, including contact release, CPR, AED, as well as for training verification.

Normal Operation:

Do you wear a full “bomb suit” to plug in your laptop, or when you walk past an MCC? Then you will be very interested to learn about the

Normal Operations clause to the *Energized Work* [130.2(A)] section.

Past revisions added Informational Notes to indicate that enclosed electrical equipment that has been properly installed and maintained, and is under normal operating conditions is “not likely” to pose an a hazard. NFPA 70E-2015 will move this concept to the body of the standard, the reader is now given clear direction that *Normal Operation* of equipment will be permitted as long as the equipment is properly installed and maintained, doors and covers are closed and secured, and there is no evidence of pending failure. We will see these points echoed in the Task Tables later in article 130.

Energized Work Permits:

The requirements around *Energized Work Permits* (EWPs) have been loosened and clarified. No longer are the *Limited Approach Boundary* or the *Arc Flash Boundary* triggers for requiring a EWP. Instead, the permits will be required when working inside the *Restricted Approach Boundary* and, as previously, when conductors are not exposed, but there is an increased risk of injury due to arc flash.

The *Exemptions to Work Permit* also saw clarifications. As before, a permit is not required for testing and troubleshooting. Thermography, visual inspection, general housekeeping, access and ingress with no electrical work are all exempt when done outside the *Restricted Approach Boundary*. An exemption will also exist for tasks that a risk assessment determines has no arc flash hazard.

Selection of Arc Flash PPE

The committee has added additional language to stop the all too common practice of mixing the method of selecting appropriate PPE. Users may either use the *Incident Energy Analysis* method, or the *Arc Flash PPE Selection Categories* method (formerly referred to as the Hazard/Risk Categories method), but not both on the same piece of equipment.

Furthermore, sites that perform an *Incident Energy Analysis* to generate the Arc Flash Hazard Analysis Labels, are not permitted to then compare the calculated cal/cm² value to the *Arc Flash PPE Levels* from the tables, and then list the *Arc Flash PPE Level* on the labels. Instead, PPE selection based on specific cal/cm² requirements would be appropriate.

Similar restrictions are repeated in the labeling requirements, stating that incident energy or PPE category can be listed on the labels, “but not both.”

“No Bling Zone”

Jewelry wearers take note: the standard has clarified an ambiguity with regard to when conductive articles such watches, necklaces, etc. can be worn. Leave the bling in your locker when you are going to be working within the *Restricted Approach Boundary*.

Arc Flash Hazard Identification Table

Gone are the traditional Hazard/Risk Category Classification (HRC) Tables. The former table method for selecting PPE based on classifications of equipment (which in turn is based on the voltage, available fault current, clearing time and minimum working distance) and the risk associated with the task. Consequently, lower risk tasks required less

PPE than higher risk tasks despite the fact that the thermal energy produced in an arc flash incident is in no way effected by the risk of the task. The potential result was that a worker could find himself under-protected.

It is worth pointing out that there has been no evidence to indicate that workers have been injured as a result of being under-protected when using the table method. However, the potential was there, and the committee addressed the potential issue proactively.

The new table method for PPE selection, separates the Tasks and the Arc Flash PPE Selection into two discrete tables.

The new *Task Table* identifies whether the task requires Arc Flash PPE or not. The determination is made based on whether the task increases the risk of triggering an arc event, and whether the equipment condition should be trusted, using the same criteria we saw earlier under *Normal Operation* (properly installed, properly maintained, covers secured, no evidence of impending failure). The *Task Table* combines AC & DC in the same table.

After the *Task Table* indicates that the task or equipment condition require personnel to utilize Arc Flash PPE, the user is instructed to consult the *Arc Flash PPE Categories* Table to determine what level of PPE is required. PPE requirements are based on the equipment parameters (similar to previous revisions: voltage, available fault current, clearing time and working distance). Whereas, previous revisions listed various levels of PPE for a category of equipment, now there is simply one level of PPE prescribed for each category of equipment.

Arc Flash Boundaries is a new column in the *Arc Flash PPE Categories* Table. The *Arc Flash Boundary* has been rounded up to the nearest

foot for equipment falling into Category 2 or higher. Gone is the column indicating the requirement for rubber gloves. Similarly, the column for insulated tools no longer exists, but the *Insulated Tools and Equipment* section was modified so that the trigger to utilize insulated tools is now the *Restricted Approach Boundary* (as opposed to the *Limited Approach Boundary* as with the 2012 revision).

PPE Category 0

Category 0 PPE (formerly HRC 0) is no longer listed in the PPE Tables. Because users only consult the *Arc Flash PPE Categories* Table when they require Arc Flash PPE, any PPE listed in the table would have to be Arc Resistant. The former Category 0 was not actually Arc Resistant -- the cotton could ignite, it simply didn't melt. Eliminating Category 0 ensures that personnel who are at risk of encountering an arc flash will be dressed in materials that are Arc Resistant, which Category 0 never was.

One common complaint that people have with the elimination of Category 0 is that personnel will see it as a green light to begin wearing meltable fabrics when working with electrical applications. I would point out that a facility's Electrical Safety Program can require personnel to wear more conservative attire by making it part of their Electrical Safety Program, and site-specific policies. Furthermore, there are numerous references to the prohibition of wearing meltable fabrics as or with PPE.

Thermography

The task of performing infrared thermography outside the *Restricted Approach Boundary* does not require the use of Arc Flash PPE as long as the equipment is properly installed, properly

maintained, covers secured, with no impending failure. This will make performing IR scans far more comfortable and easier for those who do not yet have IR windows to make the task safer and more efficient.

However, there are two important points to be made:

- (1) If for any reason, the equipment condition is suspect (not properly installed, or not properly maintained, or covers not secured, or evidence of impending failure) the thermographer would need to wear appropriate arc flash PPE.
- (2) The workers who are opening the hinged doors or removing bolted panels to expose the conductors for the thermographer's inspection are engaged in an inherently high-risk task -- one that could trigger an arc flash event. Therefore, the workers who are opening the equipment will still need to wear PPE appropriate to their potential exposure.

Barricades

A clarification was also made so that barricades are placed at the distance defined by the *Limited Approach Boundary* or the *Arc Flash Boundary*, whichever is greater.

Safety-Related Maintenance Requirements

NFPA 70E-2015 and CSA Z462-2015 consistently bolsters references to maintenance, and continued to drive home the importance of properly maintaining electrical equipment as an integral aspect of electrical safety. As we saw earlier, the Electrical Safety Program must now give consideration to equipment maintenance; and, for the first time,

users of the tables are required to consider equipment condition as part of their Arc Flash Risk Assessment. Maintenance is truly taking center stage the 2015 revision.

Article 200: Safety-Related Maintenance Requirements continues that emphasis. A new Informational Note refers readers to the IEEE 3007.2-2010 *Recommended Practice for Maintenance of Industrial and Commercial Power Systems*. Then under *General Maintenance Requirements*, it makes the point that the equipment owner or it's representative are responsible for maintenance of their electrical equipment.

A new Informational Note was also added to suggest a system of labels to indicate calibration, condition and inspection status -- again, providing the worker with critical information about condition and maintenance.

Finally, an Informational Note was also added to point out that improper maintenance of protective devices can result in increased clearing times, which thereby results in higher incident energy.

Conclusion

This latest revision contains several changes that are significant advancements for safeguarding workers who may encounter electrical hazards on the job. The committees should be applauded.

There is no substitute for studying the standard in its entirety. This summary was not an all-inclusive detailing of the standard. The author strongly encourages anyone who works with electricity or who manages those who do, to purchase and study this important, life-saving standard.