



# SAFETY SENTINEL

November 6, 2008

## ..... **Special Bulletin** .....

### *Q&A ON NATIONAL ELECTRICAL SAFETY CODE CLOTHING RULE*

Here in its entirety is the rule we are talking about, Section 410 A of the 2007 NESC:

#### **Section 41.**

#### **Supply and communications systems-Rules for employers**

#### **410. General requirements**

##### **A. General**

1. The employer shall inform each employee working on or about communications equipment or electric supply equipment and the associated lines, of the safety rules governing the employee's conduct while so engaged.

When deemed necessary, the employer shall provide a copy of such rules.

2. The employer shall provide training to all employees who work in the vicinity of exposed energized facilities. The training shall include applicable work rules required by this Part and other mandatory referenced standards or rules. The employer shall ensure that each employee has demonstrated proficiency in required tasks. The employer shall provide retraining for any employee who, as a result of routine observance of work practices, is not following work rules.

3. **Effective as of January 1, 2009, the employer shall ensure that an assessment is performed to determine potential exposure to an electric arc for employees who work on or near energized parts or equipment. If the assessment determines a potential employee exposure greater than 2 cal/cm<sup>2</sup> exists (see Neal, Bingham, and Doughty [B59]), the employer shall require employees to wear clothing or a clothing system that has an effective arc rating not less than the anticipated level of arc energy.**

When exposed to an electric arc or flame, clothing made from the following materials shall not be worn: acetate, nylon, polyester, or polypropylene.

The effective arc rating of clothing or a clothing system to be worn at voltages 1000 V and above shall be determined using Tables 410-1 and 410-2 or performing an arc hazard analysis.

When an arc hazard analysis is performed, it shall include a calculation of the estimated arc energy based on the available fault current, the duration of the arc (cycles), and the distance from the arc to the employee.

**EXCEPTION 1:** If the clothing required by this rule has the potential to create additional and greater hazards than the possible exposure to the heat energy of the electric arc, then clothing with an arc rating or arc thermal performance value (ATPV) less than that required by the rule can be worn.

**EXCEPTION 2:** For secondary systems below 1000 V, applicable work rules required by this part and engineering controls shall be utilized to limit exposure. In lieu of performing an arc hazard analysis, clothing or a clothing system with a minimum effective arc rating of 4 cal/cm<sup>2</sup> shall be required to limit the likelihood of ignition.

**NOTE 1:** If the clothing system (multiple layers) that includes an outer layer of flame resistant material and an inner layer of non-flame resistant material has been shown to block more heat than a single layer. The effect of the combination of these multiple layers can be referred to as the *effective arc rating*.

**NOTE 2:** It is recognized that arc energy levels can be excessive with secondary systems. Applicable work rules required by this part and engineering controls should be utilized.

4. Employers shall utilize positive procedures to secure compliance with these rules. Cases may arise, however, where the strict enforcement of some particular rule could seriously impede the safe progress of the work at hand; in such cases the employee in charge of the work to be done should make such temporary modification of the rules as will accomplish the work without increasing the hazard.

5. If a difference of opinion arises with respect to the application of these rules, the decision of the employer or the employer's authorized agent shall be final. This decision shall not result in any employee performing work in a manner that is unduly hazardous to the employee or to the employee's fellow workers.

The gut of the Rule is 410.A.3. It requires employers to ensure assessment of potential employee exposure and requires employers to require employees to wear clothing that is arc rated for their anticipated exposure.

***Does this rule apply all across the country?***

No, it only applies if your state has adopted it. Remember that the NESC is developed by a private group – the IEEE. It is only law after a state adopts it. Some states do not adopt the NESC at all. Some states adopt it, but not right away. Some states adopt the NESC, but not the clothing provision. Some states adopt the NESC, but tinker with the provisions. In some states, some state *agencies* with jurisdiction over some utility activities in that state adopt the NESC, while other *agencies* in the same state with jurisdiction over different utility activities do not adopt the NESC. So the first step is to determine what your state has done or plans to do.

***My state has not adopted the NESC clothing provisions. Does that mean I am off the hook with respect to the NESC clothing rule?***

No, if you are an RUS borrower. Check the RUS reg at 7 CFR 1724.50(a) which provides, in part:

A borrower shall ensure that its electric system, including all electric distribution, transmission, and generating facilities, is designed, constructed, operated, and maintained in accordance with all applicable provisions of the most current and accepted criteria of the National Electrical Safety Code (NESC) and all applicable and current electrical and safety requirements of any State or local governmental entity.

RUS has taken the position that borrowers must comply with all provisions of the 2007 NESC, even the clothing provisions, even in those states which have not adopted the NESC. NRECA is still talking with RUS about this, but so far this is their position.

***My state has adopted the NESC clothing provisions without change. Do I have to do the assessment AND have people wearing the proper arc rated clothing by January 1, 2009? Or is it just the assessment that I must do by January 1?***

First note that, once your state adopts the NESC, all questions on interpretation become questions of state law. It is possible that different states will interpret the same words differently. That said, we can still make some general statements.

As written, the NESC clothing provisions require both the assessment and the wearing to be in place by January 1, 2009. Remember this is the **2007** NESC. State regulatory bodies are likely to take the position that utilities have had 2 years to get ready to comply with the clothing part.

***How do I do the assessment?***

Good question. The Rule does not tell you. The required assessment appears to include (1) a "hazard analysis" in which you compute the potential arcs on the system and (2) a determination of which employees have "potential exposure" to those arcs.

***OK, let's fine tune the question. How do I do the hazard analysis part of the hazard assessment?***

Another good question. The Rule provides little guidance, other than saying that the analysis "shall include a calculation of the estimated arc energy based on the available fault current, the duration of the arc (cycles), and the distance from the arc to the employee". No specific methodology is required, suggested or approved.

OSHA, in its June 15, 2005 proposed rule along the same lines of the NESC rule, notes 5 widely known ways of figuring incident heat energy from electric arcs. Check Table IV-7 on page 34867 of the June 15, 2005 *Federal Register* for the list.

<http://edocket.access.gpo.gov/2005/pdf/05-11585.pdf>

***Wow, all those methods of figuring arc energy are confusing. Is there another way?***

Yes. Exception 2 allows you to skip the hazard analysis and wear a 4 cal/cm<sup>2</sup> clothing system for secondary systems below 1000 V.

This exception may change in the 2012 NESC. An NESC working group has looked into low voltage work. We likely will see a new table specifying arc rated clothing for low voltages in the 2012 NESC.

For voltages above 1000 V, you also can skip the hazard analysis and use the NESC Tables. Note that the NESC has issued Tentative Interim Amendment 2007-5 replacing Table 410-2. The NESC found the original Table 410-2 to be in error after the code was published. You can find Tentative Interim Amendment 2007-5 at:

[http://grouper.ieee.org/groups/nesc/TIA\\_5Sept2008.pdf](http://grouper.ieee.org/groups/nesc/TIA_5Sept2008.pdf)

***How about the clothing "categories," bells, whistles, laughers and screamers of NFPA 70E. How does that fit into the picture?***

NFPA 70E is out of the picture. NFPA 70E does not apply to utility operations. Repeat: **NFPA 70E does not apply to utility operations.** OK, OK, it applies in some very limited situations ... when installing lights in a parking lot under certain situations, for example.

Some utilities voluntarily follow NFPA 70E. Some vendors talk about complying with NFPA 70E. Some consultants may give you a hazard assessment based on NFPA 70E because NFPA 70E compliance results in higher arc rating clothing being worn, and so you are even less likely to have an injury claim, and so highly unlikely to sue the consultant for not telling you to wear enough protection. There are those who are working to make NFPA 70E apply to utility operations, but so far there is not much steam in that effort. Utilities do not want NFPA 70E to apply to them, as the default for NFPA 70E is to do all work de-energized. Not feasible in the 21<sup>st</sup> Century.

NFPA 70E applies mostly to inside wiring. So unless you are doing that – for example, in your own office building -- or installing lights in a parking lot or doing some other very specialized activities, you need not pay attention to the NFPA 70E clothing provisions.

***OK, our hotshot engineers have done the hazard analysis to compute the potential arcs on our system. How do I determine which employees have "potential exposure" to those arcs?***

Yet another good question without a clear answer. For starters, we do not know what "potential exposure" means.

According to Webster, the word "potential" can mean "existing in possibility" and it can mean "having the capacity or a strong possibility for development into a state of actuality". So "potential exposure" can be interpreted as "any exposure existing in possibility" or it can be interpreted as "an exposure with a strong possibility".

These differences in meaning can be the difference in requiring employees to wear clothing rated for any arc that, in theory, could occur on the system or wearing clothing rated for a more-likely-to-occur arc.

NRECA and other utilities have requested a formal interpretation from the IEEE as to the meaning of "potential exposure". In the meantime, many utilities are devising situation- and distance-based guidelines for "potential exposure". For example, many utilities take the position that there is no

exposure to an arc from equipment on which no work is being done. In addition, many establish a distance beyond which there arguably is no exposure. With this approach, you are potentially exposed only if you are within a specified distance of equipment on which someone is working.

***I am the employer. My employees arguably have potential exposure to arcs, but not on my equipment – on the equipment of another utility. Do I have to do an assessment for that situation?***

Now there's a lawyer question if I ever heard one. But it has actually come up. And the answer is that the NESC requires only that the employer "ensure" that an assessment is done. The employer itself does not actually have to do the assessment; some other entity may do it. Even so, a prudent utility will do some review of the assessment to make sure it is at least a good faith effort. In other words, make sure the other guy did not do an assessment in name only.

***We have done the assessment. And we have tried to make compliance easy on everyone: our employees will wear clothing with a base level arc rating all the time and layer up to a higher arc rating when they do certain tasks. How do I determine what the arc rating is when I wear layers?***

Add the arc rating of each layer. So if you are shooting for a level of 8, you can get it with an undershirt of 2 and an overshirt of 6, for example.

***We like cotton next to our skin. Can we wear it?***

Yes. Once you have achieved the arc rating required by your system you can wear any allowable material in addition to that. "Allowable" does not include acetate, nylon, polyester or polypropylene. ***So as far as the NESC is concerned*** you could wear cotton. But remember that even though you may be OK by NESC, ***you still have to comply with OSHA***. So if you wear thin cotton under your arc-rated clothing, and you are in an arc and the cotton ignites and burns you, you are in violation of OSHA because the clothing contributed to your injury. Same thing if you wear ignitable clothing – or rain gear -- over your arc rated clothing: OK by NESC (if not acetate, nylon, polyester or polypropylene), but if it ignites, you have an OSHA problem. In other words, if you wear cotton, it still has to be thick enough not to ignite in an arc on your system. This is true even if it is worn under arc-rated clothing. It is technically possible for enough heat to penetrate arc rated clothing to ignite cotton.

***All righty. I like the cotton answer. Sort of. Can I count the cotton layer in layering up to achieve the arc rating I need?***

Can't help you there. Although you may wear cotton as far as the NESC is concerned, you cannot include it in counting up the arc rating of your clothes, because cotton has no arc rating. This is because to have an arc rating, fabric first must have the attribute of self-extinguishing when an igniting heat source is removed. And cotton continues to burn once it is ignited, even when the heat source is removed. So it can never be arc rated and therefore does not have a number to include in the arc rating calculation.

***What about rain gear and traffic vests and other quasi clothing. I see some stuff out there marked "FR" but it has no arc rating. Is it OK to wear?***

Be very careful here. Remember you have to comply with NESC and OSHA. As far as NESC is concerned, you can wear anything – except the no-no materials – once you have achieved the arc rating you need. So you can wear non-arc-rated FR, or any other kind of non-arc-rated allowable material, once you have layered up to the proper arc rating. Because rain gear and traffic vests come off and on a lot, a prudent utility will not use even the arc-rated versions of these in calculating their required arc rating.

For OSHA, you have to wear clothing that does not contribute to an injury. That means clothing that does not ignite or melt. FR intended for utilities generally meets the no-ignite, no melt test. Arc-rated FR certainly qualifies. But there are many types of FR – some that we in the electric utility industry do not generally deal with -- and there may even be some items marked FR that are not FR under any definition. Some of this unusual FR may very well melt or ignite in utility situations. So be careful. Know your supplier. Quiz it as to what the particular characteristics are of what you are buying.

***More on the quasi stuff. What about body harnesses and body belts? Are they "clothing" for NESC purposes and therefore require an arc rating?***

Interesting. Let's look at it from the OSHA perspective first. OSHA categorically states in two letters of interpretation from 1996 that harnesses and body belts are not considered "apparel" for purposes of 1910.269(l)(6)(iii) and therefore do not have to pass the no-melt, no-ignite test. See the letters on OSHA's website at

[http://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=INTERPRETATIONS&p\\_id=22091](http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=22091)

and

[http://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=INTERPRETATIONS&p\\_id=22226](http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=22226)

So much for OSHA. What about the NESC? Are harnesses and body belts "clothing" for purposes of the NESC clothing rule? The NESC itself is silent on the subject, so it becomes a matter of interpretation by each state that adopts the NESC clothing rule. As a practical matter, states are likely to decide this question only if it is litigated as the result of an incident.

***Let's get to the bottom line. Who pays for the arc-rated clothing required by the NESC?***

That's easy. The NESC does not address who pays for it. So it could be covered by labor agreements. Or the employer could voluntarily pay for some or all of it. Or the employer could require employees to pay for it themselves.

That's the NESC. But don't forget OSHA. OSHA's November 2007 Personal Protective Equipment rule clearly states that PPE ***that is required by an OSHA rule*** must be paid for by the employer. Arguably arc protective clothing is PPE, but it is not currently required by an OSHA rule. OSHA's proposed re-write of its electric utility rules has an arc protective clothing requirement similar to the NESC rule. Arguably the arc protective clothing required by rule is PPE. So, if that proposal is finalized, then employers arguably will have to pay for the arc protective clothing required by that

OSHA rule. We may see this rule finalized in 2009. But until we do see it, there is no rule addressing who must pay for arc protective clothing.

For more information or if you would like to discuss any of these issues please contact NRECA Association Counsel Jonathan Glazier at [jonathan.glazier@nreca.coop](mailto:jonathan.glazier@nreca.coop) or 703.907.5798.

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