

Speaker 1 ([00:00](#)):

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Mike Taylor ([00:19](#)):

Hello everybody. Welcome to the next episode of the Workplace Safety Review podcast. I am Mike Taylor and I'm joined with my co-host, Adam Roseman. We're at the law firm of Greenberg Traurig, and we have a special guest with us today, Mr. James Stallcup from North Richland Hills, Texas. James and I go back, oh, maybe 15 years or so ago. We've been involved in a couple of arc flash cases and electrical safety cases. James, it's nice to have you on our show.

James Stallcup ([01:06](#)):

Thank you. Appreciate you asking me.

Mike Taylor ([01:09](#)):

So James, it'd probably take us the whole podcast if I went through your whole curriculum vitae. For those viewers that may not know James, he is the president of Grayboy International Incorporated. He's been involved with companies from ExxonMobil, Saudi Aramco, to even helping OSHA and the Department of Labor. He's been involved in electrical safety since the mid-seventies, and he is the owner of Grayboy Incorporated. James, one of the things that I think our audience would be interested in hearing about is, what is NFPA 70E?

James Stallcup ([01:51](#)):

It is a safety-related work manual that provides safety requirements for folks that are working on energized components and conductors and so forth. In other words, they're removing covers, gaining access into energized conductors and components, mainly where 70E is applicable.

Mike Taylor ([02:15](#)):

And is 70E pretty much designed, which is a national consensus standard, right? National Fire Protection Association Code 70E?

James Stallcup ([02:23](#)):

Yes.

Mike Taylor ([02:24](#)):

Is it primarily designed to minimize the risks associated with arc flash hazards?

James Stallcup ([02:32](#)):

Yes, it is. When OSHA provided their standard on that 1910:331 through 335, they came to the 70E committee and they said, "We're more performance so we need rules and regulations on the bolts and nuts how to provide your PPE when you're working on energizer equipment."

Mike Taylor ([02:56](#)):

Can you describe shortly, what is an arc flash?

James Stallcup ([03:00](#)):

Well, an arc flash is just when you maybe cause an arc to develop with a screwdriver, where you touch a hot conductor, go to ground, and then of course an arc can develop just right across there. Usually, if you don't de-energize the equipment, they'll go face-to-face on you, those arcs will. So electrical arc just develops due to something going to ground or face-to-face.

Mike Taylor ([03:27](#)):

And are some arc flashes a lot more dangerous than others, I assume?

James Stallcup ([03:32](#)):

Oh, yeah. Depending on the energy level, the calories per centimeter squared, you may have a whole room that is an arc flash boundary or you just may have three foot, three and a half foot in front, seven foot, whatever the calculations one perform. What kind of a calculation do you derive?

Mike Taylor ([03:51](#)):

Right.

Adam Roseman ([03:52](#)):

Hey James, this is Adam Roseman. Let me ask you this for our listeners. What kind of PPE do workers have to wear to protect themselves from this arc flash? I mean, I assume each arc flash is different and each PPE is different. So can you sort of give us the high level summary of the PPE necessary for workers to wear?

Mike Taylor ([04:13](#)):

Good question, Adam. How do you determine that, James?

James Stallcup ([04:17](#)):

Well, you run a calculation. The annex D will kind of get you started in 70E to perform a calories per centimeter squared calculation. And of course you also gain help of IEEE 1584 to do that. Now usually what they do, and I'm talking of when I say they, the facilities, they will either calculate the calories per centimeter squared and their equipment will have a calorie per centimeter squared rating equal to that calculation or greater, or if the parameters all work out, they'll use the tables in lieu of using the calorie calculation. And there's about 4, 5 ways in the tables that you can go through and select your equipment, but you have to stay within those parameters that's in the table, the clearing time of the over current device, the work task and so forth.

Mike Taylor ([05:15](#)):

So James, I became familiar about arc flashes when we worked together long, long time ago on one particular case. So are you saying that employers really have two ways to determine what kind of PPE to protect folks from arc flashes? You mentioned that there are tables in 70E, and I think those tables will spell out certain job tasks and based upon that job task, there's then a section that tells you, "Okay, you need to wear this kind of PPE if you're going to do this kind of work." Is that right?

James Stallcup ([05:51](#)):

Oh, yeah. Say that you're troubleshooting a control circuit or something like that. Then they would look at the clearing time of the old current device and then the parameters that are listed in the table to see if they even need PPE, you see. And that's usually table 130.7(C).

([06:12](#)):

If that table determines you need PPE, then they will go to a second table and they would pick up their calories per centimeter squared. Based upon those calories per centimeter squared and the category, they would then go to your table 130.7(C)(15)(c), and they'd get a category 1, 2, 3, or 4, see. The categories are based upon the calories per centimeter squared that the equipment will provide for you.

Mike Taylor ([06:47](#)):

You say basically, so if you're looking at these tables that I do this job task, and it comes out that it's four calories per centimeter square, then I need to purchase FR clothing that is four calories per centimeter squared to make sure that my folks are protected. Is that what you're saying?

James Stallcup ([07:10](#)):

Yes, I believe a category one is four cal, but you need fire-rated plus arc-rated if you're going to be removing covers and gaining access into the energized conductors and components that would be live, see.

Mike Taylor ([07:28](#)):

Right.

James Stallcup ([07:29](#)):

So each category would give you a certain calorie rating, see, and there's four of them that you would have. And once you have a calorie per centimeter squared that's above 40 calories per centimeter squared, then they usually say, "Well, you don't work on it energized in any way." So you de-energize, lock and tag it out.

Adam Roseman ([07:53](#)):

Hey James, this is all pretty complicated stuff that the employer needs to figure out. How do you educate workers on these issues and arc flashes and PPE? I mean, what is the best way to convey this because these are the folks that do the work?

James Stallcup ([08:10](#)):

Today, the folks that perform these job tasks, they would look at the label. 110.16 of the NEC requires a label put on to warn the electrical worker of electrical arc conditions that could occur. Then you would go to 70E and the label and 130.5(H) would require you to put certain information there that the person performing work could look at that label and reference the label and it would tell the individual the equipment they needed to wear, or the calories per centimeter squared of the equipment that they had to wear to perform the task, see.

([08:54](#)):

Now we have a table that we put in that's table 130.5(G), is in gray, and that table, if you get a calorie of 12 cal per centimeter squared or less, then you wear a certain amount of PPE to protect yourself. If it's

over 12 calories per centimeter squared, then you usually get into a moon suit and some other type of equipment to protect yourself. So that's one table, see. But you're kind of locked into performing the calories per centimeter squared calculation to do that.

(09:32):

But as you pointed out, Mike, you can go through three tables, and if you fall within those perimeters with the particular job tasks that you're doing, testing, infrared inspections, whatever it may be, and it would tell you either you need equipment or you do not need equipment for that task, and then you would go to the next table, and based upon a task, it would give you your category. You take that category and then go to your last table, which we just previously said, 130.7(C)(15)(c), and then if you had a category 2, that's equipment you'd have to wear. If you come up with a category 3, that's equipment that you'd have to wear that's listed in that table.

Mike Taylor (10:20):

And James, we talked about this a long time ago that I learned from you, is that these tables were developed a long time ago by, I think a former engineer of Chevron, and that these tables are a little overly conservative. Is that right?

James Stallcup (10:35):

Most all your tables are a little over conservative. It's based upon the experience of their people performing these job tasks that they come up with this type of PPE and what type of PPE you'd have to wear. And usually yes, they're more conservative, but they would not ever allow you to get more than a second degree burn for that particular task under those parameters that are listed under each task.

Mike Taylor (11:06):

Right. And this is all based on arc-rated clothing, not just regular FR clothing, which is really more aligned with flash fires. Is that right?

James Stallcup (11:17):

That's correct. Your arc rating gets into more of a arc rating when you're removing the covers and gaining access into working on energized components and circuit parts, or maybe just lock and tagging it out. You're lock and tagging it out so it's de-energized, and you go through those steps of article 120 of 70E along with the Annex G, which gives you a lot more information, see. 70S17 annexes, it's loaded with bolts and nuts to give you a lot more information based upon what's required in the text upfront, where it's 105, 110, 130, any of those sections or articles.

Mike Taylor (12:04):

Right. The other thing that I learned from you a long time ago is, so you have these tables and that if a sophisticated client wanted to actually do the math, there's a formula in Annex D and use a couple other consensus standards, and there's this math formula that you could figure out which would be more precise that you need to wear, I don't know, two calories per centimeter squared garment as opposed to maybe the table tells you four. Is that right?

James Stallcup (12:37):

Yeah, if you actually calculate, you get a better estimation, you get a better estimate of your calories per centimeter squared in the equipment that you would need. The table gives you a good estimate of what

you would need to wear to do the job, and sometimes the tables may have you dressed in equipment that's a little bulky for you to perform that task, see.

[\(13:03\)](#):

So we have a lot of problems with people removing their gloves and things and working on equipment when they shouldn't, but you can't stop some of those people that do not follow the requirements of 70E. But yeah, your calculation gives you a better estimate. For example, say I'm a little bicycle shop and I don't have an engineering staff. I do not have all the bolts and nuts I need. Then I can go to the table H.2 and it'll give me two categories of equipment that I wear and I can use that until I get that equipment, until I either teach my people as the man pointed out, how to go through the tables and use the tables accurately based upon the parameters that are there, or I have to do the calculation. It's either in lieu of, see.

Mike Taylor [\(14:05\)](#):

Right. So either you're following these tables, which I assume smaller to mid-size companies do as opposed to do this mathematical formula in Annex D, which would require, I guess, some level of sophistication. Hence, why is it true that smaller to mid-size companies just follow the tables as opposed to doing a mathematical calculation to figure out what arc-rated clothing you need to wear?

James Stallcup [\(14:33\)](#):

Well, it costs you some money when you go in and collect all that data to do the calculation. Now any company can go to arcadvisor.com and they have all these software programs, calculators and things to do this work. You can get a complete package. It'll probably run you quite a bit of money, or you can get individual calculators to do certain jobs, like calculate the available short circuit current from the transformer to the equipment, and then from there you'd figure your calories per centimeter squared to work on the equipment.

[\(15:11\)](#):

Basically speaking, a good electrician, they will spot the location where they're working. The further you are away from the service, the better off you are, if you don't set any transformers. The closer to the service you are, the greater the amount a short circuit current can be. So when you're working on the service equipment, you're working on a piece of dynamite, usually, if you work it energized. So that's why OSHA says the best thing to do is to lock and tag it out. Now you have some rules in 70E, under certain condition and feasibility, troubleshooting and some things like that, where you can work energized under certain conditions.

Mike Taylor [\(15:56\)](#):

I know you've been doing this for a very, very long time. Have you seen accidents over the last, oh, 20 years or so where people are wearing arc-rated clothing, but it turns out that the rating was improper and they get injured anyway?

James Stallcup [\(16:13\)](#):

Well, yes, that can happen if they do not wear their clothing, if they wear the wrong clothing,. For example, you may have PPE, then they put a coverall over it to layer. If you don't use the appropriate layering equipment, then you don't have the full calorie rating of the suit.

[\(16:37\)](#):

We have an Annex N, I believe it is, it's either... M, I'm sorry, it's M, in the back of a 70E that goes through this and tells you that if you are wearing a certain manufacturer's PPE, then if you're going to layer to make it stronger and be exposed to a greater arc, then that equipment has to match up and be listed. But if you just read 70E alone, you'd be very confused about that. You have to go over and look at the Annex M in the very back of 70E to get a good grip on it.

[\(17:16\)](#):

And yeah, you'll find sometimes people just intermixes equipment when they're not supposed to do that. It doesn't have the rating. Now, some companies might will come in and they'll take and reduce one or two cal's down and say, "Well, now this is closer," but it's not exact accurate if you don't have it listed for such use.

Mike Taylor ([17:44](#)):

And that's where the accidents can come in, right?

James Stallcup ([17:46](#)):

Oh, that can happen, and sometimes they'll wear the wrong PPE. They don't follow instructions. What I have found through the years in teaching these safety classes is that people just don't train their people. And OSHA's very strict on this in 1910.332(b), they go through the training of a qualified person to work on energized electrical equipment or even lock and tag it out. It's a very restrictive type list that they have. There's lock qualifications in this qualified person.

[\(18:28\)](#):

But if you just read the definition of a qualified person and it just says, "They have to be familiar with the installation, the operation, and the hazards involved, how to protect themselves from it," you could get a little confused. Well, I'm doing that. But if you go and read one, I believe it is 110.2 of 70E and 1910.332(b) of OSHA, and they say practically the same thing now, on the way a person has to be qualified to work on equipment.

Mike Taylor ([19:05](#)):

And that's qualified to work on live equipment. This is what this is really all about, is when you have to work on live equipment, trying to protect yourself from an arc flash, either using the tables or using the math back in Annex D.

James Stallcup ([19:19](#)):

That's correct. You got about five tables that you can use, but there's just one calculation that you would calculate the calories per centimeter squared.

Adam Roseman ([19:30](#)):

Hey, James, real quick, just last question, unless my esteemed colleague Mike has another. I mean, if you're a company, is the lesson you're sort of trying to tell folks here is, you said the tables were the most conservative, so if you just follow those tables and you actually follow them, you should be in good shape from a protection standpoint, right?

James Stallcup ([19:52](#)):

Based upon the tasks that are there and all the parameters there you're supposed to meet, then you're pretty well safe. Now any company can go to 130.7(C)(15)(a) and it tells you in lieu of doing the

calculation, you can use the tables if you follow the parameters and everything in the table in that particular task. Well, we find out that people are having problems. They'll wear one uniform to do a number of tasks and that uniform sometimes not based for that task, see.

Mike Taylor ([20:26](#)):

I see. Yeah. There's where the issue is. They pick a PPE for task one, they end up doing task two and it doesn't protect them.

James Stallcup ([20:36](#)):

You got it. And this is where you have problems with the training, and that's why now OSHA and 70E along with 70B now, the new 70B maintenance standard is mandatory rules now. And that's why they say you have to document this training. Say I come in as an outside contractor to work for you, then we're supposed to have a safety meeting, a pre-meeting, and 105.3, 110.5, I believe it is, tells you what we have to go through, you as the facility and then myself as the outside contractor, and we discuss all these hazards that might be involved. Then we know we're dressed properly and we're performing the work in a safe and reliable manner.

Mike Taylor ([21:29](#)):

That's terrific, James. James, hey, thank you so much for being on the show. We've been friends and colleagues for a very long time and this is a great honor to have you on our show and we appreciate it very much.

James Stallcup ([21:42](#)):

Well, I appreciate being with you. You get to talking about safety. God, can talk all day, but I have enjoyed being with both of you.

Mike Taylor ([21:52](#)):

Terrific, James. Well, thanks again and everybody else out there, stay tuned for the next episode of the Workplace Safety Review podcast. Stay safe, everyone.