CITY OF LUBBOCK, TEXAS

REGULAR CITY COUNCIL MEETING

THURSDAY, MAY 12, 2016

TESTIMONY OF JAHAN RASTY, PH.D., P.E., M.B.A

AND JAMES DICKENS, PH.D., P.E.

ON BEHALF OF OMEGA FLEX, INC.

Transcribed By: Julie G. Davault, CSR

Job No. 051516

MR. SCANLAN: So what I'd like to do for a few minutes is turn this over to Dr. Dickens and Dr. Rasty from Texas Tech and they can do go over some recent testing that was conducted on these types of products.

02:31PM DR. RASTY: Thank you for the invitation to come here and speak to you. My name is Jahan Rasty and this is Dr. James Dickens. We're both faculty at College of Engineering at Texas Tech. I'm in the Mechanical Engineering Department and Dr. Dickens is in Electro Engineering. My area of expertise is I'm a materials scientist by training. My area of expertise has to do with damage mechanics, metallurgy. And Dr. Dickens is the director of Pulsed Power Laboratory here at Texas Tech.

A little background about why we're here. About 9, 10 months ago, Chancellor Hance called me and told me about this new proposal for this new standard that's going to be adopted. And he told me that the proposal was made by a manufacturer that claimed that their product actually met this new standard. And they wanted us to conduct a series of experiments to see if the product meets their -- the alleged standards or not.

So we decided to put a series of experiments together. We actually conducted experiments over over

30 CSST, corrugated stainless steel tubings. And we wanted to make sure that -- one of their -- one of the things that they told us was that it was very important to do the testing according to what the standards specifies, which means treating the CSST to -- subjecting it to the required 96-hour accelerated corrosion testing and also subjecting it to normal tear and wear that it experiences. That's another one of their -- the requirements because when they put these things in -- into residential places, it goes through studs, stud holes, and it creates nicks and -- on the surface and could actually deteriorate the material and degrade it somewhat.

So we put it through that testing. We put it through that corrosion testing. One of the things that we noticed is that because of the fact that the mulched layer nature of this thing is that it has an aluminum mesh that comes in contact, at the very end, with a brass fitting. And there's a phenomena called galvanic corrosion that could occur when two dissimilar metals come in contact in the presence of some sort of electrolyte. And the electrolyte could have bigger sources. You know, when they install these things, they could do this bubble testing or -- to apply some solution to see if -- if it bubbles out or not, to see

02:34PM 1 if there's a leak, or other means of electrolyte.
02:34PM 2 And we noticed that that, in fact, could create
02:34PM 3 corrosion at the interface of the aluminum mesh. And
02:34PM 4 some of the tests -- And it -- Of the 30 tests, 10 of
02:34PM 5 those actually failed. And we noticed that there was a
02:34PM 6 breach to the inner core. And our conclusion was that
02:34PM 7 it -- it -- the product doesn't stand up to its claim as
02:34PM 8 setting the standard.
02:34PM 9 And Dr. -- Let me -- Okay. Let's see if
02:34PM 10 we have some of the pictures -- Yes. Here on the left,
02:34PM 11 you see the actual new, as received, material, and then
02:34PM 12 on the right, that's specimen number 3 and specimen
02:35PM 13 number 11, on the right side is the actual corroded
02:35PM 14 specimen. As you can see, the duration and size of
02:35PM 15 corrosion versus the new material, as you see it on the
02:35PM 16 left side.
02:35PM 17 And then when we tested those -- Another
02:35PM 18 thing that we wanted to test is that the whole idea
02:35PM 19 about CSST is that its flexibility makes it an ideal
02:35PM 20 material because, unlike the solid black pipe, the fact
02:35PM 21 that it can bend through various areas, it gives it the
02:35PM 22 advantage that it has. So it's not really fair to test
02:35PM 23 this material under ideal conditions, laboratory
02:35PM 24 conditions, as a straight pipe, without any nicks on the
02:35PM 25 outer surface, without any corrosion testing and without

any mesh, because that's what it's really -- its real advantage is, the fact that it can bend. So we also bent it according to the manufacturer bending criteria. And we noticed that because of this bending, the actual shield, the aluminum shield that it is supposed to distribute the energy, and, therefore, not cause the arcing to go through, failed at the bend point. And we got a lot of holes right at the bend points. So as you can see at the top picture.

And the bottom picture there shows the type of corrosion that can occur as a result of the accelerated corrosion testing that we put this material through.

Here is the type of wear that you get or deformation that you get when you bend this thing. The actual shield opens up and it doesn't provide the protection that it claims.

Here's, again, another -- You can see the hole, actually, right through the area where the bend is. And the real reason for that is because the mesh comes apart when you bend this material.

Another phenomena that we observed was the fact that because of the corrosion at the interface of the aluminum mesh and the brass fitting, you get additional resistance. And Dr. Dickens will speak more

about that. This resistance deteriorates the conduction of energy. You get some sort of a shock effect as the arc travels through it. You can see that the -- the pipe actually collapses under compressive stresses, right at the point where the -- where it connects to the brass fitting. And we observed this thing on a multiple number of the tests of specimens.

Here's a situation where I can point where it was bent. The thing not only created a hole, but it just snapped in two.

This is a different series.

But Dr. Dickens right now, I'll turn it over and he will talk more about the electrical --

(Unintelligible.)

DR. DICKENS: So one of the -- the goal was to test to the LC-1027 standard. There's a lightning standard in there, a particular shape. I've spoken with many of you about it. In addition, there are certain treatments that have be done to meet the standard, and incorporation of the LC-1 is also in there. So when you do all of that and you apply all this to these samples, as Dr. Rasty said, they failed 10 times out of 30. All of the samples were treated according to the LC-1027 standard, except for the bend is not explicitly called out in there; however, the bend is -- is the recommended

bend radius by the manufacturer. And so the result of that, though, is several failures occurred at as low as 36 coulombs and then we had multiple failures at the 85, 95 coulomb level as they are now. So we had both 37 coulomb failures and we had 95 coulomb failures when they were treated as you see there. That's exactly the -- the real specimens that were -- were tested.

I guess the one thing I -- you know, before I step down and turn it back over, I'm not criticizing that pipe at all. I think that pipe is great. I think all of the pipes that offer the lightning protection, to varying degrees, are more than acceptable. Unfortunately, I have yellow pipe in my house. My children, I have two young children, and we're going to work on getting it out of there. I've known I've had it for a while. And, you know, in the interim, when there's a lightning strike, the kids are instructed to go outside. And -- and we will replace it. But I would replace it with any of the lightning resistant materials. And so, again, I'm not criticizing that material, saying it's not acceptable. I think it's more than acceptable, but I think the standard as Lubbock has it now and the codes committee has written it, is not quite where it needs to be. You see the yellow pipe that was here, that yellow pipe, obviously, got a hole

02:40PM in it. And the yellow CSST pipe like that has been
02:40PM shown to fail at .1 coulombs. That is nothing. That --
02:40PM that is awful. That is so dangerous. That is a
02:40PM dangerous product. There's no question about that.
02:40PM This product, any of the lightning-resistant products,
02:40PM according to LC-1, as I mentioned in my three-minute
02:40PM talk last time, that is a product that's appropriate and
02:40PM that I would stand behind in my house, with my children.
02:40PM Again, when you look at the damage that's caused to this
02:41PM pipe from a 10 coulomb shock, it blows the pipe in half.
02:41PM We don't -- we don't see that. We saw smaller holes.
02:41PM That's what we've traditionally seen. So take that
02:41PM under advisement.

MR. SCANLAN: And so I'd just like to reiterate what Dr. Dickens said, is that it's not our position that this type -- this FlashShield product is inferior or that it doesn't work. You know, it's a -- it's a good product. It's a safe product. It just does not work as advertised. It does not meet the requirements that is currently proposed in front of the Lubbock ordinance. As we stand here today, there is no product that can meet the requirements of the Lubbock ordinance. And so voting in favor of that ordinance would, in fact, result in the ban of the corrugated stainless steel tubing.

(Transcription portion ended.)

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COUNTY OF TARRANT )

I, Julie G. Davault, Certified Shorthand Reporter in and for Tarrant County, Texas, hereby certify that the foregoing pages numbered 1 through 9 constitute a full, true and correct copy of the audio file provided to me labeled as http://lubbocktx.swagit.com/play/05122016-725/#54, approximately minutes 16.41-27.41.

Witness my hand on this 18th day of May, 2016.

Julie G. Davault, CSR
Certification No. 2092
Expiration Date: 12-31-16
VERITEXT LEGAL SOLUTIONS
Firm Registration No. 571
300 Throckmorton Street
Suite 1600
Fort Worth, Texas 76102
817.336.3042 1.800.336.4000