ORIGINAL

UNITED STATES
NUCLEAR REGULATORY COMMISSION

IN THE MATTER OF:	DOCKET NO:
SHEARON HARRIS NUCLEAR	50-400-OL
POWER PLANT	50-401-OL

LOCATION: APEX, NORTH CAROLINA **PAGES:** 4774 - 5005

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the matter of:	:	
CAROLINA POWER AND LIGHT COMPANY and NORTH CAROLINA EASTERN MUNICIPAL POWER AGENCY	:	Docket Nos. 50-400-OL 50-401-OL
(Shearon Harris Nuclear Power Plant, Units 1 and 2)	:	

ECU Room,
Ramada Inn, U.S. 1 South,
Apex, North Carolina 27502

Friday, October 19, 1984.

The hearing in the above-entitled matter was reconvened, pursuant to adjournment, at 9:05 a.m.

BEFORE:

JAMES L. KELLEY, Esq., Chairman,
Atomic Safety and Licensing Board.

DR. JAMES H. CARPENTER, Member.

DR. GLENN O. BRIGHT, Member.

APPEARANCES:

(As heretofore noted.)

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PROCEEDINGS

JUDGE KELLEY: Good morning.

Whereupon,

RANDALL EBERLY

and

ROBERT L. FERGUSON,

resumed the stand and, having been previously sworn, were examined and testified on their oath as follows:

JUDGE KELLEY: We have a pending motion about order of presentation that we are about ready to rule on. We want to clarify one point in our own minds. The Panel that will appear beginning later this morning, Mr. Miller and Mr. Dakin, you indicated -- I wasn't clear whether it was one or both decided to go back to Pittsburgh or New York today.

MR. O'NEILL: Certainly both would desire to go back to Pittsburgh but we certainly hope to finish at least Mr. Dakin today. Mr. Miller is on another panel as well.

JUDGE KELLEY: Next week?

MR. O'NEILL: Well, it depends on how far we get. We always have eternal optimism that we might get through a couple of these panels a day. We would like very much to do that. Why don't we see how we go.

JUDGE KELLEY: Okay. He would be on the second panel, Mr. Miller?

MR. O'NEILL: Mr. Miller is listed on 9A. When I

discussed with Mr. Eddleman and attempted to renegotiate a reordering, he would not agree to take 9A out of sequence. He would only agree to take 9C out of sequence. That is as far as we worked out an agreement and that is where we were. So it would be 9C and then we would go to 9 and 9B and then 9A, it would be the third panel.

JUDGE KELLEY: You mean we would have to get through four panels today in order for Mr.Miller to finish, or three?

MR. O'NEILL: It would be three panels. My preference was to have 9C then 9A then 9 and 9B. But I wasn't --

JUDGE KELLEY: You didn't so move though.

MR. O'NEILL: I didn't so move because I couldn't sell it to Mr. Eddleman.

JUDGE KELLEY: Okay.

MR. EDDLEMAN: Let me point out, for this record, that even moving 9C I think has done me some damage. I'm not as well prepared for that as I would have been if they had gone according --

JUDGE KELLEY: There's nothing before the house to move anymore than the C right now. This was a matter of information, I think. I understand your -- should we be considering something like that, then we'd have to have further discussion.

Well, the pending motion was essentially to divide Mr. Masciantonio, the Staff's witnesses appearances up in parts

to correspond with the different parts of the contention.

We are denying that motion. We are going to adhere to the prior sequence of presentations that were established last month. It seems to us that just by way of the reasoning that brought us to that conclusion, we agree with the Applicants that this might tend to produce more orderly record. But there's something to be said for having everything the Staff had to say in one place, too.

Against that, we also agree with Mr. Eddleman that that approach would tend to complicate and almost certainly prolong his cross examination of Mr. Masciantonia. Those factors strike us as approximately a wash. We are affected by the Staff's willingness to consent to the motion, but their lack of enthusiasm overall for this approach. The factor of convenience to witnesses is a factor that we normally try to take into account and take pretty seriously.

But we think on the facts as they've been explained to us here, that doesn't seem to us to weigh terribly strongly. It seems to us that if Mr. Dakin does go back today with the intention of not coming back, we would assume that Mr. Miller would be able to assist the Applicant's in their consideration of whatever the Staff has to say. That comes on next week.

And we don't see other factors having to do with witness convenience that really seem to weigh much in this

particular scale.

And then considered against those factors, is the factor that this comes very late in the day. The Applicants did move for the order of presentation we now have and their now moving during the hearing to change it over Mr.Eddleman's objection. And we think it would have some impact on his preparation for cross examination and the situation where we can and we should take into account his limited resources in terms of time and energy.

So that leads us to deny the motion and adhere to our prior proposed order of proof.

We have nothing further this morning before turning to -- or returning to questioning witnesses. Let me ask Mr. Eddleman, anything further to raise?

MR. EDDLEMAN: Judge, may I inquire, I was not sure when the Board intended to rule on the motion I made before lunch yesterday to admit the various Eddleman exhibits 2 through 9 on contention 116.

JUDGE KELLEY: To be honest with you, I don't think we thought about it this morning before coming in that is pending, right?

MR. EDDLEMAN: Yes, your Honor, I just wanted to know--

JUDGE KELLEY: Let us look back in the transcript on that and we will have something else to say later this morning.

MR. EDDLEMAN: Okay.

JUDGE KELLEY: Applicants?

MR. BAXTER: Mr. Chairman, I would just like to note for the record an additional appearance on behalf of Applicants to Mr. O'Neill's right, Michael A. Swagger, of our firm.

JUDGE KELLEY: Thank you. Welcome, Mr. Swagger.

Staff, anything else before we resume?

MRS. MOORE: Yes,sir. I would like to ask the Board whether they've decided upon Mr. Plato -- or Dr. Plato, as of yet?

JUDGE KELLEY: Yes, I think we have something to say on that topic.

MRS. MOORE: Could we know today, so I can contact him?

JUDGE KELLEY: Dr. Carpenter will speak to it.

MRS. MOORE: Thank you.

JUDGE CARPENTER: The Board wishes to accept the Staff's order of proffering Dr. Plato except for the concern that you mentioned about the schedule. We have been dragging our feet a little bit to see how fast we were going to come along on these contentions. Can you tell us again what the schedule of conflicts are?

MRS. MOORE: The basic problem is that Dr. Plato is unavailable during the week of November 6. Our witness, the Staff's internal witness, Mr. Block, is unavailable until

November 1. Those are the two factors. I had hoped that we could put Dr. Plato on with our panel of witnesses. I realize he hasn't filed any testimony but he would be just for Board questioning. I thought it would be helpful to ask him at the same time as the other Staff witnesses.

The only way that I foresee this could be accomplished is to designate November 1st and 2nd as days to deal with Joint 4, but that might interrupt another issue and I don't know how the other parties would feel about that.

JUDGE KELLEY: That's something you could explore a bit, maybe at a break?

MRS. MOORE: I'd be happy to.

JUDGE CARPENTER: Thank you. Well, let's leave that issue to be resolved and you can report back.

(Pause.)

JUDGE KELLEY: Mrs. Moore, does this bring us to Staff questions on this Panel?

MRS. MOORE: I don't remember whether Applicant was asking of if they had any cross examination.

JUDGE KELLEY: You're right, I'm sorry.

MR. O'NEILL: We were asked and said we had none.

JUDGE KELLEY: Okay, then that brings it to us, right?

MR. EDDLEMAN: Mr. Runkle also said that he had none. He informed me after the hearing yesterday.

JUDGE KELLEY: Okay. Thank you.

EXAMINATION BY THE BOARD

BY JUDGE CARPENTER:

Q. I would like to ask Staff about their response to question 30.

A. (Witness Ferguson) Yes.

Q. Which indicates that there are still three open items. You testified yesterday the Staff site walkdown can't be done until construction has been completed. What shall the Board do about these other open items which sit in this contention.

A. (Witness Eberly) I guess as we stated yesterday, the Applicants have submitted some information on the fire doors in their October 10th submittal. And that will be under review in the next several weeks. I can't give you an exact schedule and the completion of the alternate shutdown capability at this point.

A. (Witness Ferguson) These are items which have been investigated on all plants. We assume there will be resolved to Staff's satisfaction, but we can't exactly say when.

Q. With respect to these so-called "special doors" the Applicant's witness made a point of the fact that some of these special doors, airtight doors, bullet resistant doors, have not been fire tested. As a layman, it isn't clear to me why one can't decide what the fire protection capability in the door is from examining the nature of the materials

of construction, the thickness of the door, et cetera.

Am I mis-thinking when I think that?

A. (Witness Eberly) No, not at all. That is probably the way we will review them. We anticipate that a label tested fire door will be used wherever possible and if a special purpose door has to be used, then we will look at materials of construction. And with some divine intervention I am usually able to, by looking at it, ascertain whether it's going to give us reasonable degree of fire protection.

The other thing we do look at is the redundant safe shutdown equipment on either side of that fire barrier and the combustible loading. And that's generally the basis for our approval.

A. (Witness Ferguson) Similar type problems have been encountered. Essentially all plants have similar type doors for similar type applications and in the past the majority of them have been shown to be adequate. There's been a few cases where modifications have been made and they weren't accepted where they were replaced. I'm not sure how they would turn out in this case.

Q. Thank you for giving me the perspective on the technical aspects. The administrative aspects are still not clear.

A. (Witness Eberly) Well, to address that issue, we have to issue a final safety evaluation input on the plant

prior to licensing and because our walkdown is generally conducted, oh, two or three months prior to the issuance of the license, it is usually in that time period that we close everything out. So that would be about the time period that we would expect to have everything completed.

BY JUDGE KELLEY:

Q Looking at these three items, I understand a walkdown is kind of a final confirmation that everything looks okay and I would think that is of interest to us except for the fact that it is nice to know it is going to be done. But the other items, fire doors or alternative safe shutdown capability systems, assuming they are within the scope of this contention-- I'm not suggesting that they're not, but under that assumption, since we have a contention pending before us, and to have to resolve it on the record, if the Staff isn't ready to take a position on the adequacy of the Applicant's plans in those two respects, this may be part of your question to Mrs. Moore. But the question is, where does that leave us. Are we to just go into a sort of hold configuration until you are ready and come back and have another hearing or is this such a sort of -- not minor, but is it a sort of a mechanical kind of determination that there wouldn't be any point in having cross examination on or another option, do we need the Staff's opinion at all on this point? Can the Court just

go ahead and say, it looks fine to us. The Staff didn't get to it, but we think it's okay, and therefore, we will sign off without an opinion from the Staff. Can we do that?

MRS. MOORE: Your Honor, might I suggest that we handle that from the lawyer's prospective rather than from the witnesses perspective. Or did you want the witnesses to answer that question?

JUDGE KELLEY: The Staff practice may have some bearing on it, but I grant you it is partly a legal point. It seems to me that it is something that might be usefully spoken to while we have the Staff here and the Staff can tell us what the practice is.

If you want to speak to that at this point, we'd be happy to hear from you and the other parties, too.

What about fire doors? Here we've got an Applicant who, as I understand it, has said, they've gotten all their information together, they've submitted it to the Staff, and the Staff hasn't done the work yet. And that is understandable, they just got the material.

But here we are in the middle. What do we do?

MRS. MOORE: Did you want the witness to address that?

JUDGE KELLEY: Why don't you address it, if you want to?

MRS. MOORE: Well, I believe that with respect to

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fire doors, any inadequacy in fire doors is not really part of this contention. The Staff will review the information, it has been listed as an open item, and it will be resolved in the SER before the license is issued. Since it is not within the scope of the contention, then the Board does not need to keep the record open to receive the Staff's review.

End 1

JUDGE KELLEY: Why do you say it is not within the contention? Why does the testimony of the witnesses note at the very end the qualification of fire doors is an open item; if it is just irrelevant, why even refer to it?

MRS. MOORE: Your Honor, we did that as part of our responsibility to keep the Board and parties informed. We listed the open items in the SER though they are not necessarily relevant to this contention. That was purely a judgment that it was a place to make the Board aware that there were open items there, though they are not within the scope of this contention.

JUDGE KELLEY: And why do you say that they are not within the scope of this contention?

MRS. MOORE: This contention has certain specific allegations and there are no allegations that the fire doors are inadequate.

JUDGE KELLEY: Excuse me a moment to find the text.

MRS. MOORE: The contention is quoted on page five of Mr. Eberly's testimony.

JUDGE KELLEY: Right.

"Availability of control and power to safety equipment."

That is pretty clear. It doesn't say fire doors.

MR. EDDLEMAN: Judge, may I point out where I think

the contention --

JUDGE KELLEY: Would you please, Mr. Eddleman?

MR. EDDLEMAN: The contention addresses the realism of the testing of fire barriers and these doors form part of the fire barriers.

In addition, it questions the adequacy of the analysis of spreading of fires. And I believe what the witnesses just said about looking at the combustible loading on both sides is a fire spread analysis that involves these doors.

JUDGE KELLEY: Which particular sentence of the contention would you point us to that you would rely on in saying that fire doors are within the scope?

MR. EDDLEMAN: Judge, I don't have it in front of me, but I think that the one on fire barriers is that the barriers haven't been tested under conditions that....

MR. O'NEILL: Mr. Chairman, if I may help Mr. Eddleman, we had negotiated the text of that statement and in our negotiations had specifically limited that part of the contention to fire barriers with respect to fires in cable trays. So that that part of the contention does not include anything other than cable tray wraps or penetration seals. And we had a rather long day in negotiating the language of that particular sentence.

JUDJE KELLEY: More narrowly, does it not refer

first to cable trays and then, so far as cable trays are concerned, whether the tests represent actual plant conditions? And you can talk about cable trays from a lot of different perspectives, I would think, but one of them would be actual plant conditions or not.

MR. O'NEILL: That is correct. It goes only to the testing program and narrowly to cable trays.

JUDGE KELLEY: Okay.

Where else do we get to fire doors, Mr. Eddleman?

Or do you want to respond to that? Go ahead, if you wish to.

MR. EDDLEMAN: I think Mr. O'Neill is right, that we negotiated that down some....

MRS. MOORE: Your Honor, we will provide Mr. Eddleman with a copy of the contention if that would facilitate matters.

JUDGE KELLEY: Please do. Thank you.

(Document handed to Mr. Eddleman.)

(Mr. Eddleman reviewing document.)

MR. EDDLEMAN: Okay. In the first full sentence on page six of the Staff testimony --

JUDGE KELLEY: Okay.

MR. EDDLEMAN: It says:

"Another vague statement is fire barriers used 'where practical'" -- and then it goes

down to the end of it and says: "...and what type of fire barriers should be used."

Now here I think --

JUDGE KELLEY: Let me just take in that whole sentence, excuse me.

(Pause.)

All right. Go ahead.

MR. EDDLEMAN: I think a fire barrier is defined as a rated fire barrier, and I believe if you look at the Standard Review Plan it says that you are rated when you have been tested.

And these doors, although they form part of the fire area boundaries, have not been tested, that is on the record.

So then if the argument is it is not practical, then you have got to make a determination on that within the scope of the contention.

JUDGE KELLEY: Mr. O'Neill, what would you have to say about the parenthetical phrase at the end of this sentence referring to what type of fire barrier should be used; doesn't that include doors?

MR. O'NEILL: Certainly a door is a fire barrier, Judge Kelley.

JUDGE KELLEY: Yes.

MR. O'NEILL: This rather general sentence, in our

view, never went to a detailed discussion of the qualification of each door. What it went to, we thought up until now, is the decisionmaking process of how it is determined whether or not you will have a rated barrier in a given area and how you will make the determination what kind of barrier it will be.

You have, as Mrs. Serbanescu testified, options in some cases of putting wraps around cable trays and a suppression system in lieu of separating fire areas with rated fire barriers. And I believe the discussion on that contention went to that issue.

JUDGE KELLEY: Okay.

MR. O'NEILL: But if I could make another point with respect to that: The commitment is to have three hour fire rated doors and barriers around all fire areas or the equivalent.

As Mrs. Serbanescu testified all but maybe one or two of these doors goes to an exterior -- outside, there are no combustible loads there, was her testimony. Beyond that, she testified that these doors are of a construction that exceeds the construction of a fire door: there are special doors and haven't been tested, and that is part of her testimony.

We did not view this issue really encompassed within the contention except to the extent of the fire

hazard analysis that has been put into issue and we went through the whole discussion of how that analysis is done. This was a Staff open item but it does not go to the contention, in our view.

But in the alternative, we believe the Board certainly has enough information, if it believes somehow it falls into one of these sentences in this rather long contention, to make a decision without waiting for the Staff to say yes, these 24 doors are okay.

JUDGE KELLEY: Just as a matter of law, I mean, isn't that true? I assume there can be cases where you want to do one thing and the Staff is opposed to it and takes a different position. You can put that issue to the Board and the Board can decide either your way or their way or some other way.

MR. O'NEILL: That is correct.

JUDGE KELLEY: You don't have to have the Staff's blessing as a matter of law.

MR. O'NEILL: We don't always have the Staff's blessing in hearings.

JUDGE KELLEY: All right.

MR. EDDLEMAN: Judge, if I might respond to that point, I believe that the Staff witnesses testified that the plant couldn't be licensed without their blessing on these open items.

JUDGE KELLEY: Well they take that position as an advocate. Maybe the Board won't agree.

MR. EDDLEMAN: Perhaps so. I don't know as a matter of law, but I would take the same position, and that is that you would have to have their checking on it, and I would say the same thing is true of the walkdown. Just because the Applicants say that such and such is in place, if the Staff can't verify it that would be a problem. And what I think the problem is is this:

If you say Okay the Applicants have presented evidence that indicates that they are right and the Staff said they hadn't completed their review and therefore we accept what the Applicants say, okay. Up to that point, up to the point of that decision the burden of proof is on the Applicants to prove it is right, okay.

But as soon as you make that decision, the burden of proof is on the Intervenors to prove it is wrong, and we would not have discovery available to us as to what these folks are doing, and we would probably have to use the Freedom of Information Act with all of the possible delays we have there; it gets into a real can of worms and I would say it is really a prejudice to rights of Intervenors.

If the Staff has not completed its rev'ew o. some information, I think we have the right to get that

review into the record and cross-examine it if necessary.

MRS. MOORE: Your Honor --

MR. EDDLEMAN: And I can't say how much cross-examination of it would be necessary until I see the results of it.

MRS. MOORE: Your Honor --

JUDGE KELLEY: May I just make an observation, at least in an attempt to shed some light on this as far -- at least as far as I am concerned:

This is not a new problem. You have a hearing six months to a year before a plant is ready to operate and there are various systems that aren't done yet, where the analysis isn't done yet and then you get into disputes about whether you have to have the Staff position in a hearing and cross-examination on a particular point or whether you don't.

And I am sure there are varying views on this, and one that I have stated in the past and what I happen to believe is whether the issue in question is something that, realistically viewed, requires an opportunity for cross-examination.

An awful lot of this walkdown determination is just a final check to make sure it is there. And from a Board's perspective, let's assume that there is a requirement that some certain piece of hardware be in place.

If that is the requirement -- not how good it is or a lot of details about it but just that it is there, then the Staff coming back and saying It's there ought to be enough and we ought not have to have cross-examination on a point like that.

On the other hand, if it is something that is debateable, it is complicated, it involves judgment, that is what cross-examination is for. And hopefully we will be at a point now to have enough information in to get the Staff's judgment on those kinds of things.

And that kind of approach is what I have tended to use to decide one way or the other on whether something has to be held open, whether we have to retain jurisdiction or whether we can just leave it for Staff confirmation without a hearing.

Do you follow me?

MR. EDDLEMAN: I understand what you are saying.

JUDGE KELLEY: You may not agree with me, but do you follow me?

MR. EDDLEMAN: I understand what you are saying, Judge, but let me point out sort of the other side of that.

First, even in the narrow example you gave of just is it there or not, if the Staff comes back and says it's not there, okay, already the burden of proof has reversed.

Also, I think it has been brought out in testimony that some of the things they are checking on is not just is it there but is it set up in the way that it is required to be: either it is complicated things like can you see through the piping and stuff below to see what's there that has to be there....

There are things that are not as simple as the example that you gave, and I think that a good bit of that has been brought out in the Staff's testimony also.

JUDGE KELLEY: That's right. You and I may disagree on what is simple and what isn't in a given case, too.

MR. EDDLEMAN: And I would like to also point out that there is a good bit of stuff in here, not just the walkdown, that hasn't been reviewed such that, you know, the walkdown might be a backup check on that. And in that case the walkdown assumes a greater importance and I think -- this is going to the adequacy of the record that is already before the Board is what I am getting at here.

Now I don't want to get totally lost in this because --

JUDGE KELLEY: No, let's not.

MR. EDDLEMAN: -- I am speaking to the point about where the contention ties into the doors....

JUDGE KELLEY: Let's get back to the doors in the contention. We have been through the first few sentences. Is there something else that you would point to that in your view demonstrates the applicability of this contention to the adequacy of the fire doors?

MR. EDDLEMAN: There is a sentence down toward the end:

> "Further 'analysis' of what happens if the fire spreads is generally a rationalization that it can't spread much not an analysis. See, for example, analysis of effects of postulated fires."

Now I think what the witnesses just said is that they have to look at the potential for a fire spreading through one of those special doors in their review. So I think that is directly within the scope of this part of the contention.

JUDGE KELLEY: It is true though, isn't it, this contention does not say the fire doors proposed for the Shearon Harris plant are inadequate to protect public health and safety because they won't withstand fire for an hour or three hours or eight hours or whatever you think it ought to withstand. You don't have a clean straightforward statement that fire doors are in issue, correct?

MR. EDDLEMAN: Well that's right. This contention was formulated in 1982 and at that point I believe what the FSAR said about fire doors was that all the doors would be rated tested fire doors. And you know there was no basis for including it then, but it is a change that has happened.

What I am saying is, you know, you can't expect the contention to say -- for example when it says fire barriers, okay. We hear from the witnesses the Applicants' haven't decided even yet what material of fire barriers they are going to use. Okay? You raise the question.

If you said, okay, suppose they had decided in the interim that they were going to use, I don't know, a C-13 fire barrier, as a random number.

JUDGE KELLEY: Right.

MR. EDDLEMAN: And you could say to me well it doesn't say in this contention the C-13 fire barrier is inadequate. Okay. A door is a part of the fire barrier. It doesn't say the door is inadequate, it doesn't say the wall is inadequate, it doesn't say the ceiling is inadequate, it says the fire barriers.

You talk about spread of a fire, okay. You could obviously try to detail in that all of the possible ways that a fire would spread and you get a contention the length of the Encyclopedia Britainnica --

JUDGE KELLEY: We wouldn't want that.

MR. EDDLEMAN: I understand, and that is the Catch-22 of this.

JUDGE KELLEY: Well I don't think it is a Catch-22, Mr. Eddleman, I really don't.

Let me ask: Could ycu, for the record, clarify this? To what extent was the text of this negotiation negotiated?

MR. EDDLEMAN: It was renegotiated --

JUDGE KELLEY: Renegotiated.

MR. EDDLEMAN: -- the original text was admitted by the Board over objections.

JUDGE KELLEY: All right.

MR. EDDLEMAN: And it was renegotiated in July, June...

MR. O'NEILL: In July we negotiated for almost a day and managed to change two sentences.

JUDGE KELLEY: But you filed a version somewhat revised last July.

MR. EDDLEMAN: And the revisions, I believe, are the last sentence and the discussion of cable trays that Mr. O'Neill referred to which I believe is the sentence crossing over from pages five and six in the Staff testimony we have here.

JUDGE KELLEY: Okay.

We have worked this one over pretty well, I think --

MRS. MOORE: Your Honor --

MR. O'NEILL: Mr. Chairman, could I respond to --

JUDGE KELLEY: Mr. O'Neill can respond; Mrs. Moore can have a say here and then we are going to move on.

MR. O'NEILL: I just want to respond to two points.

Mr. Eddleman stated thatthe FSAR said that all doors would be rated and tested. That was not true. The FSAR never stated that all doors would be tested. They certainly will be rated and, as Mrs. Serbanescu testified, in some cases you get an equivalency and for all of these doors we will have a certification from the vendor they are equivalent to a three-hour fire rated tested door.

One way to demonstrate to the Staff that a door is properly rated is to get a UL label that it is a tested door and there are other ways of doing it and for 24 doors we will do it a different way.

I would also like to briefly respond to the point that Mr. Eddleman is making about the jurisdiction of this Board to oversee the implementation of the program.

As the Commission has stated a number of times, perhaps best back in the case of Duquesne Light Company, Beaver Valley Power Station Unit 2 in ALAB 240, 8 AEC 829 at 839, 1974 in the Appeal Board decision, the Licensing Board is not required to supervise the implementation of a

program once it has been demonstrated that the program itself is adequate.

And I believe that what Mr. Eddleman is suggesting is that this Board needs to insure that the Staff has checked off on the implementation of every aspect of the program. We would never be able to get through hearings before a plant goes into commercial operation if that were indeed the case.

JUDGE KELLEY: Okay. There is also -- I understand your point, but there is a corollary principle, as there usually is, having to do with resolving on the record issues properly raised; the AEC's review of ALAB 188, if I am not mistaken, bears on that where it appeared that the Appeal Board was just going to leave some things to Staff resolution. The AEC said No, you can't do that, this is a fairly debatable matter, you are going to have to reopen.

So you do get back into a debate, it seems to me, what is implementation, what's mechanical stuff as opposed to what is pretty important and complicated and ought to be looked at.

Mrs. Moore.

MRS. MOORE: Yes. I just wanted to respond to one of Mr. Eddleman's points.

He said he could not have raised the fire door issue as part of his contention because the FSAR wasn't clear about

it. However, in November 1983 the SER was very clear about it. It left it as an open item and it discussed that open item.

And it seems to me that any time after that he had the ability to raise this specific issue, and in the negotiations, which the Staff was not a part of so I can't speak to the negotiations at all, he could have raised the issue of the adequacy of the fire doors.

We did not interpret the contention as including the adequacy of given fire doors.

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JUDGE KELLEY: Very well.

Let's assume though that the Board decides that it thinks otherwise, it does not agree with you on that. Do you agree that if we think the record is sufficient, based on what the Applicants have put in it by Mrs. Serbanescu principally, we go ahead and decide this fire door question without a Staff position. Do we need that?

MRS. MOOPE: I think that you could decide it on the grounds that the Applicant has the burden of proof. If you believe you have enough to make an informed judgment on this issue, you could decide the issue, subject of course to motions to reopen by any party once the record is closed.

If our review were to turn up something that we thought the Board should hear, we could move to reopen the record.

JUDGE KELLEY: We don't regard it as a terribly desirable way to do business. We would much rather have the Staff's position, but if other things indicate that it is only fair to go ahead and decide, at least as an abstract proposition, we don't have to have a Staff position on such an issue, do we? I think that is what you're saying.

MRS. MOORE: I think that's correct, your Honor.

JUDGE KELLEY: Excuse me just a minute.

(The Board conferring.)

JUDGE KELLEY: Back on the record.

BY JUDGE CARPENTER:

Q If we can leave the legal aspects for a minute and come back to the technical aspects, I would like to get Staff's view about Applicants' proposal that they resolve this issue of demonstrating the acceptability of the fire doors by requiring the vendors to certify that they are equivalent in some way or adequate in some way.

What constraints are there on vendors doing this in a responsible way?

A (Witness Eberly) Right.

We normally would not accept that on face value. We would want to see the actual detailed drawings of the doors. I am sure you are aware that vendors would provide you with the certification that you request. That's why we look at UL labelled fire doors for third party verification.

And if we can't get that then we would take the manufacturer's certificate as long as we have an opportunity to look at the materials and construction of the door and the design of the door, and to verify things like you are not utilizing aluminum components where you should be using steel, and so on.

The approach that the Applicants are taking is a common approach. It is what most utilities have to do for these special purpose doors, and as far as our approving them, it is simply a matter of our sitting down and looking at design drawings to verify that we are satisfied with the

details of construction.

The special purpose doors are normally very heavy, bullet-resistant and missile-proof and therefore they do have a degree of fire protection built in.

BY JUDGE KELLEY:

Q Well, I'd agree it would seem to me they might be a remarkably fire resistant door. But to come back to the mechanics in the sense of the Board simply looking to see that there was a program in place and being comfortable with the quality of that program, is it your testimony that it is not just the Applicants getting the vendors to supply this certification but it also includes Staff review of the vendor's certification?

A That's correct.

Q I think we are back where we started from in terms of the mechanics of resolving this open item.

Thank you.

MRS. MOORE: Your Honor, I would just like to point out briefly that the Staff's position on this issue is set forth in the SER at page 9.5.1-48, if that would help the Board at some later date.

JUDGE KELLEY: The position on the doors?

MRS. MOORE: On the fire doors.

JUDGE KELLEY: Excuse me.

I don't have an SER in front of me but my

understanding was that at least to some extent-- Well, your testimony says qualificatior of fire doors is an open item, and that's what we've been talking about.

Are you saying that the SER closes it?

MRS. MOORE: No, sir.

JUDGE KELLEY: What does it say?

MRS. MOORE: What I'm saying is that--

JUDGE KELLEY: It just says it's open?

MRS. MOORE: The discussion of the fire doors is an open item.

JUDGE KELLEY: Okay. Right. Fine.

MRS. MOORE: Perhaps the witness, if I showed him the SER, could address the Staff position if you'd like.

JUDGE KELLEY: I think I understand it. I just thought when you were referring to that it sounded like you had some different position.

MRS. MOORE: No, no, I'm sorry.

JUDGE KELLEY: Okay.

MRS. MOORE: We set forth positions on open items as well.

JUDGE KELLEY: Thank you. I understand.

I wonder if I could just go back to the beginning in a sense and try to tie up something.

BY JUDGE KELLEY:

Q I am referring once more to Criterion 3 of the

general design criteria, the first sentence. I think you are familiar with that. We have read it into the record enough times. I will read it again.

"Structural systems and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions."

In your review of plants' fire safety programs, do you regard that sentence that I just read as requiring your consideration of the possible effects of simultaneous, two or more independently-caused fires?

A (Witness Eberly) No.

A (Witness Ferguson) No.

Q And why not?

A The "fires" -- plural, we are talking about different types of fires, transient combustibles, in situ combustibles, oil, cables, that sort of thing.

We have set up the guidelines based on one fire within a fire area, a rather severe fire. We do look at things which, associated with an event, if it could cause multiple fires.

For instance in the reactor coolant pump, during our reviews we got considering the reactor coolant pump oil system, which is usually non-seismic. It is setting above the hot reactor coolant. Therefore, it there are any leaks

they would drip on the pipes and you start a fire that way.

We started out in looking at individual pumps, then considered a seismic event which may cause leaks in all pumps at the same time so you'd have fires-- We'll say if there were four pumps there would be four simultaneous fires, and therefore put out guidelines and requirements that would prevent that sort of thing.

So if there are events that can be logically expected to cause multiple fires they should be considered, but not independent events in different sides of the room.

Q Are those kinds of events covered in the analysis typically, the event that can cause multiple fires that is reasonably to be expected?

A In the earlier days-- I don't recall any such thing specifically in the Harris plant. In the earlier reviews where we were going out and looking at operating plants, we looked at that sort of thing. It was the type of things like can a fire in one area then progress to another area through the ventilation system that requires a fire damper to prevent that sort of thing? Can it go through the drains, so you're looking at do they have common drains, and that sort of thing, out the door and flow down to another area? That is usually looked at.

The guidelines now require the fire door to be there, the fire damper to be there, and so forth, so that is

sort of preventive. And the guidelines then say well, if you separate something by a three-hour barrier that is adequate protection.

If you said well, then, you have to postulate a simultaneous fire on each side of that three-hour barrier you have negated the protection, and then of course you put in another one somewhere and another simultaneous fire on the opposite side of that, and then essentially you have no protection anywhere in the plant if you keep progressively postulating simultaneous fires every time you put in a fire area.

Q Does your view that you needn't look at or analyze in any detail, I take it, simultaneous, independently caused fires rest, in any significant part, upon a judgment by you that that is a rather unlikely event?

A Yes, but there are no numbers put on that.

Q There aren't any numbers.

A No.

Q It's an--

A Essentially you have administrative controls to prevent the accumulation of combustibles and control of ignition sources throughout the plant, so to get the kind of fire we're talking about that you need protection for in the first place, you have to have a breakdown of that. And nobody has looked at well, what if you have a simultaneous

breakdown in two locations, and that sort of thing.

No, we have not looked at that, and we would assume it would be-- Well, certainly it is a much lower event than one fire, and the one fire is a fairly low event in the first place.

Q Any numbers on how low an event that is, one fire? A significant fire?

You can just add up fires and divide by reactor years some something to get some numbers I suppose.

A Well, going that way you get things in the order of 10 to the minus 3 somewhere in the plant; that type of thing. And when people get into the PRAs, then it gets back to dividing up the plant and the number of rooms, and dividing up the room and the number of areas where you have to have the fire in order to create a problem in the first place.

Obviously, taking a room like this, if you had a small fire in the middle of the room, it wouldn't do too much. If you had a small fire underneath the drapery or that sort of thing, it would do something else.

But just taking numbers of fires versus reactor years, it is in the order of 10 to the minus 3.

Q Okay.

In your experience in reviewing fires for NRC, do you know of any case of simultaneous, independently-caused fires in a reactor, a commercial reactor?

A That actually occurred?

Q Yes.

A No.

Q Okay.

JUDGE KELLEY: Mr. Eddleman, anything else?

MR. EDDLEMAN: I guess I need to ask a few questions about the Board's questions if I may.

JUDGE KELLEY: Surely.

MR. EDDLEMAN: Let me also clarify. I may have misspoken about the first thing Mr. O'Neill commented about a while ago.

What I meant to say was that "rated" means "tested."

Anyway, let me turn to the panel.

FURTHER CROSS-EXAMINATION

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BY MR. EDDLEMAN:

Q Gentlemen, I believe that-- Let me ask you this: Is there any reason why you couldn't take the various kinds of special doors at the Harris plant and test them by the standard tests for fire door ratings?

A (Witness Eberly) Yes, there is. They are too big to fit into the test furnace, or too heavy to put into the assembly.

Q Well, couldn't you just make a stronger assembly?

A Then you wouldn't have a standard test furnace and the result -- you would really have nothing to compare them to because you would have a specialized piece of apparatus now.

Q Well, I don't quite understand that answer.

It is stated in you-all's testimony, is it not, that you test a 180-square-foot section of wall material for fire barrier, is it not?

A Right.

Q Well, that's pretty big. I mean that's 18 by 10, in one example, is it not?

A Well, that's the opening of the test furnace. To clarify that, that's the maximum opening of the test furnace that the penetration seals or whatever it is you're testing is installed in.

I believe the limitation of the test furnace for fire doors is 8 by 10 feet.

Q All right.

Well, how many of these doors are bigger than 8 by 10 feet?

A I couldn't address that.

Q Well, couldn't--

A Typically that's the problem, why you can't test them.

Q That they are bigger than 8 by 10 feet?

A Yes.

Q That's your testimony.

MRS. MOORE: Your Honor, the witness answered the question. I believe that comment should be stricken.

MR. EDDLEMAN: I will withdraw it. I don't care.

BY MR. EDDLEMAN:

Q Now as to this strength business, I still can't understand that. Why does the furnace have to be any stronger? Don't you just have to support the doors from the bottom during this test?

End 3

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A. (Witness Eberly) The door is mounted in the side of the furnace and if you look at these missile resistant or bullet proof doors they are steel doors several inches thick, weigh may hundred pounds. And I don't believe that the fire test furnace is capable of retaining them.

Q. Well, I still don't understand why you -- I mean, what difference does it make to the test because you've explained that test as applying certain temperatures over the service of the door from the other side. And you've said there were no requirements on the insulation for the furnace that you knew of. What difference does it make if you put a little bit thicker or stronger wall or set of blocks or something, whatever it takes, to hold that door up, outside the furnace, under the fire door, I mean under the special door.

A. Well, it probably makes a big difference, is that the test furnace is a standard piece of apparatus. And if you change it, whatsoever, the results you get in the fire test aren't comparable to what you would normally have.

Q. Well, I can't understand why if the BTU input from the other side doesn't make any difference, it seems to me that the total heat delivered on a surface has a lot to do with how hot it gets and how it might catch on fire. If that doesn't make any difference, as I believe you've testified, and the insulation level of the furnace doesn't make any

difference, why in the world would a structure, which might be of nominal or very low insulating value, or outside the furnace just to hold up this door, make any difference.

MRS. MOORE: Your Honor, I'm going to object. Mr. Eberly has answered Mr. Eddleman's question and it sounds more at this point that he's arguing with the witness than actually at cross examination.

JUDGE KELLEY: Mr. Eddleman?

MR. EDDLEMAN: Well, I'm asking him why, in the light of the other things he's explained, his position is right? I don't think I have to agree with him.

JUDGE KELLEY: You don't have to agree with him. Are you saying that your question is really new?

MR. EDDLEMAN: I think so.

JUDGE KELLEY: Okay, and what was it?

MR. EDDLEMAN: Well, maybe I should back up and rephrase and see if I can get the new aspect out front and see if we still get an objection.

JUDGE KELLEY: Okay.

BY MR. EDDLEMAN:

Q. What part of the specification of the standard test furnace has to do with the support of the door or fire barrier being tested in it?

A. (Witness Eberly) Well, I'm not aware that there is anything in the specification addressing that. But to

discuss a little bit more on your consideration there of the support of the door, say we did put these heavier doors on the test furnace. And in order to put them in there, we had to provide some sort of tracing for the door on the furnace. When you heat up the door, you're going to get a certain thermal expansion. The bracing may cause it to fail much more rapidly than were the bracing not there.

So you cannot rely enough to predict accurate results.

I'm not saying it's impossible to do. I'm saying that the results cannot be correlated to standard fire tests.

Q. So there's no way to make your standard fire tests on one of these things, is that what you're saying?

A. Primarily.

Q. Well not, let me ask you this then, because you've also talked about analysis:

Are there sort of standard tables or engineering data on the strength of steels and so on, at various temperatures?

A. Yes, there are.

Q. Well, can you not then analyze from the time-temperature curve for a steel door, if we're talking about the big solid steel assembly, the likelihood that that steel is going to collapse under its own weight or otherwise warp,

this kind of thing?

A. That's correct. Some Applicants have taken that approach to calculate the thermal expansion of the door in contrast to the thermal expansion of the door frame and, looking at the hinge points and securing points to make sure that the door doesn't warp and permit the passage of flame.

Q. Well, now, you're talking about expansion there. What I'm talking about is the loss of strength of the material itself, either of the hinge or the frame or the door under the influence of these temperatures that are in the standard time temperature curve of the E-119.

A. That's right. But you have to look at both, both problems enter into it.

Q. Okay. Both at the same time?

A. Right.

Q. Okay.

I believe you said you expected to finish your walkdown two or three months prior to licensing. Do you have a particular timeframe in mind or like, if the plant's delayed, will you still try to finish within two or three months of whenever it's delayed to?

A. It depends on the cause of the delay. We have to be fairly flexible on this one. If they had a stop work order or something or they gave up for six months, there's no point in going out until they gear back up and get the plant ready.

Q. Mr. Ferguson, in your discussion of simultaneous fires you're talking about, if you have a fire on both sides of the fire barrier and the fire barrier is no good, would simultaneous fires necessarily have to occur in adjacent fire areas?

A. (Witness Ferguson) No, I was just going with a hypothetical postulation.

Q. All right.

A. I mean, the requirements as they are could be met by, let's say, a new plant design if you divide the plant in half and put a three-hour barrier between both halves of the plant.

Q. So you'd only have two fire areas?

A. Right. Then you would go arbitrarily and postulate a fire on either side. And the same way if you arbitrarily postulate a fire in two different places. We have the control room and we have the remote checked on panel which should take care of a fire in the control room. And if you arbitrarily postulate a fire in the control room and at the location of the remote shutdown panel at one time, you have no protection.

Similary, if you divide the plant into divisional switch gear rooms, divisional cable spreading room and so forth.

Q. Now it's true whether it were postulated or in the

event of an actual set of two fires, you only have two trains that you're protecting, if one fire hits each train, then you have no protection for it?

A. That's correct.

Q. Okay.

I believe you said you did consider simultaneous fires of the same cause when you reviewed?

A. If there was an event that could logically lead to simultaneous fires they should be considered.

Q. Did either of you gentlemen review the Harris reactor coolant pumps against this possibility oil fires from a seismic cause or other cause?

A. (Witness Eberly) No.

JUDGE KELLEY: We're going to have Panels throughout here and this raises a point. Maybe we ought to just verify and resolve one way or the other. I know I've been in cases with panels where the rule was that members of panels can consult but they ought to do it on the record, and other cases like this one where no one has raised the point and they've gone ahead and consulted off the record as a practical matter. And gone ahead and given an answer. And I don't think the Board has a strong feeling on it one way or the other. Do the parties want to comment on that?

These are the Staff's witnesses, maybe I will ask Mrs. Moore first. Do you think two or more members of

a panel should be able to consult just between themselves or should all consultation be on the record just like the testimony.

MRS. MOORE: I think that I would have no objection to the two witnesses consulting.

JUDGE KELLEY: Off the record?

MRS. MOORE: As they have today, yes, off the record.

JUDGE KELLEY: Okay. No objection. Do you care very strongly one way or the other?

MRS. MOORE: Under the circumstances, I don't care.

JUDGE KELLEY: Mr. O'Neill?

MR. O'NEILL: On occasion it will be helpful for the two witnesses to decide who is in the better position and to answer the question or if they have papers and notes between them to shuffle it back and forth. I don't think that sort of consultation need to burden the record with that type of consultation. I think it's fine.

JUDGE KELLEY: To leave it off? Mr. Eddleman?

MR. EDDLEMAN: Judge, I don't have any panels, of course, but with respect to the other panels that I'm having to deal with here, I think that the point would be that it takes about the same amount of time to say it on the record, if it's really harmless consultation, it doesn't hurt. And if it's not, then I darn well want it on the record. So, you know, I'm not trying to make any implications

about this. I think that would just, you know, have you got this, have you got that. But, I think if it's harmless, it's much better to show that the discussion is harmless by having it in the record. It's usually brief. Have you got the such-and-such paper; do you want to take that or should I, this sort of thing. I don't see any reason why an extra sentence in the record is going to make a lot of difference. But if somebody says, you know, well, hey, we have to cover this up, don't we, or something like that, you know, I want them to have to say it on the record or not at all.

JUDGE KELLEY: I guess the prospect of running up our stenographic bill shouldn't be controlling.

MR. EDDLEMAN: How much do you charge per sentence?

JUDGE KELLEY: Is it possible to compromise here and just tell the witnesses if you want to talk about who's got the page, leave it off the record, but if you're really having a discussion about the merits of the question, put it on. Is that a workable approach? Mr. Eddleman?

That leaves it to the Panel to decide and we just don't worry about it beyond that.

MR. EDDLEMAN: Well, but you give me a problem because I don't know what they're saying.

JUDGE KELLEY: Well, that's true and it's just a question of, you know, how far you're willing to trust somebody, that's all.

MR. EDDLEMAN: Well, I think as a cross examiner, I should take the position regardless of the actual trustworthiness of the people, which is for them to establish -- in other words, I shouldn't just take everything on faith.

JUDGE KELLEY: I didn't mean to impute to you, actual distrust of anybody. I'm just playing along with this. It's sort of a rule of reason.

MR. EDDLEMAN: Well, that's what I'm saying, my reason is, as I've said before, if it's really harmless, and you have it on the record, that proves it's harmless. I don't have any way to prove it otherwise; I think I'm safer if it's proved.

JUDGE KELLEY: Okay. Just briefly, any comments from the other parties on letting the witness, in effect, decide what to put on and what to leave off?

Mrs. Moore?

MRS. MOORE: Your Honor, I think, as I said, under these circumstances I really don't have an objection which way -- or I don't have a strong view which way it goes, but I think that maybe we should have something established for the witnesses guidelines so that -- I'm not sure I want to put that burden on them.

JUDGE KELLEY: Okay, I understand. Mr. O'Neill, any thought on that? Is that practical, or not? Maybe it's not.

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MR. O'NEILL: Mr. Chairman, our Panels have been instructed not to have substantive discussions because the cross examiner can just ask the question, what did you just say, was that a substantive issue, if he felt it was important. As a practical matter, that's how we instruct our panels. If they want to look at each other to see who's the best person to answer the question, I don't see any reason for that to be on the record, and I think the suggestion that you made is very workable, and we endorse it.

JUDGE KELLEY: Okay.

MR. EDDLEMAN: Judge, if I may comment on that, I think that's going to burden the record a lot more because I'm not going to know what they just said and if it's more than a couple of words then in order to be safe I'd have to say, what did you just say and then they'd have to say it again, which makes the record at least twice as long.

JUDGE KELLEY: Well, on that note, why don't we have a cup of coffee; ten minute break?

(Recess)

End 4

JUDGE KELLEY: Back on the record.

An administrative announcement. We plan to stop today at a quarter to five to permit some of us to catch airplanes going north, and we thought we should mention that. I mentioned it last night informally, but I will say it this morning on the record to make sure everybody knows.

Judge Carpenter has a conflicting commitment. He is going to have to leave about an hour before then. Judge Bright and I will carry on as a quorum in the last hour. Judge Carpenter will be reading the transcript later on.

On the question that we were--

MRS. MOORE: Your Honor, could I interrupt before you get to substantive matters?

What we need also if you could is a time for lunch because we have to make some arrangements, and the Staff would like to know what time you intend to break for lunch.

JUDGE KELLEY: What time would you like to break for lunch?

MRS. MOORE: I have no preference as long as I can have a definite time so we can tell people.

JUDGE KELLEY: Well, we just came back. Let's see. What about 12:30?

MRS. MOORE: That's fine. Thank you.

JUDGE KELLEY: At 12:30 we will break for lunch

for an hour.

Now the question we were talking about before the break, that was whether any consultations between witnesses on a panel ought to be on the record or whether they could be off the record, or whether there could be accommodation of the two. We heard some varying viewpoints, and we are ruling that substantive discussions of the issues ought to be on the record.

That can, incidentally, be useful, just an interchange between two or more witnesses rather than their taking turns on a microphone. If you want to talk about something before taking a position, feel free to do it. But if it is substantive, we would want that on the record.

Other kinds of discussions we assume principally of a housekeeping nature such as lend me your copy of the Standard Review Plan, or have you seen page 5, or whatever, we don't think that the record needs to be -- important as those discussions are, the record does not need to be cluttered with them because they are non-substantive.

And we are going to trust the witnesses. We will instruct them at the outset briefly about that distinction, and we are just going to trust the witnesses to make that distinction.

We know in that connection that although we have been listening to panels in this case since last June, this

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is the first time the matter has come up. We don't think it is a matter of terrific importance, but as long as it has, that's the way we've decided to slice it.

So from now on, we will be giving just a brief instruction to the panel people when they come on, and we'll go on from there.

I think Mr. Eddleman was in recross when we got on that point.

MR. EDDLEMAN: Yes, your Honor.

JUDGE KELLEY: Go ahead.

MR. EDDLEMAN: I would like at this time, in regard to the discussion of fire doors that we had earlier this morning, to call the Board's attention to transcript pages 4713 and following, which basically says that the-- I just want to note it for your information.

It basically says, by the Staff witnesses, that when they--

> "....get a final submittal from the Applicants telling us 'Here are the fire doors we will use,' then we will have to go through the entire qualifications of the doors."

And they say it includes all doors and fire barriers.

So it appears that that has not been done yet, and that is what I wanted to call your attention to.

JUDGE KELLEY: Thank you.

BY MR. EDDLEMAN:

Q Gentlemen, I don't know if this is an allowable question. May I ask, Mr. Ferguson, what did you say before the break?

A (Witness Ferguson) I was just trying to clarify or add to -- and I should have directed it to the record, I think, just to add to Mr. Eberly's response to your question whether we considered simultaneous fires from the reactor coolant pumps.

His answer was "No," and I agreed that no, we did not consider fires as such. We considered the potential for fires, and have required the reactor coolant oil collection system to prevent such fires, and we have approved that aspect of the design. So we have considered the potential for those fires to occur and have required preventive measures be added to the plant to prevent such fires.

Q Are those preventive measures discussed in the SER?

A Yes, they are, under the "Containment" Section 9. It is under Section 9.5.1.6, entitled "Fire Protection of Specific Plant Areas."

The first subheading is "Containment." It is discussed in the second paragraph there. That's on page 9-53 of the SER.

Q Thank you very much.

MR. EDDLEMAN: I have no further questions at this time.

WITNESS EBERLY: For the record, could I clarify?

Mr. Ferguson was reading a memorandum from the Division of Engineering to the Division of Licensing. The actual page numbers in the SER may be different.

BY MR. EDDLEMAN:

Q Would the section number be the same?

A (Witness Eberly) Perhaps our Counsel can help us with that. It would be the section on "Containment."

MRS. MOORE: That section begins on page 9-52.

JUDGE KELLEY: Okay.

Mrs. Moore?

MRS. MOORE: I have several questions on redirect, your Honor.

JUDGE KELLEY: Okay.

REDIRECT EXAMINATION

BY MRS. MOORE:

Q Mr. Eberly, could you state for the record the position of the Staff with regard to the open item of fire doors as set forth in the SER, and explain the position?

A (Witness Eberly) Yes.

In our SER we gave the Applicants three options on fire doors. The first option was to have a

nationally-recognized testing laboratory perform an engineering review of the manufacturer's certified doors and door frames, and certify that the door and door frames provide the required fire resistance rating.

The second option was to test a replica as-installed door assembly by a nationally-recognized testing laboratory to determine the door's rating.

The third option was to replace the manufacturer's labelled doors and door frames with Underwriters Laboratory rated items.

At the time we wrote this open item, this covered all doors in the plant. Since then, in the October 10th letter, the Applicant has come back and committed to provide UL-rated fire doors with the exception of special purpose doors.

Because the list has been narrowed down to just those several special purpose doors, we can perform the engineering review ourselves and we don't have to require an independent laboratory to do this review.

At the time of the open item, considering that it covered all the fire doors in the plant, we didn't have that time option available.

Q Now, Mr. Eberly, yesterday you referred to nine deviations concerning cables and equipment in the Safe Shutdown Analysis. These deviations are also discussed in

Answer 22 to your testimony, are they not?

A Yes, they are.

Q Where are these deviations approved?

A Currently they are in a memorandum from the Division of Engineering to the Division of Licensing dated August 6th, 1984, and they will be incorporated in a future Supplement to the SER.

Q Mr. Eberly, yesterday you were asked a line of questions concerning the smoke removal philosophy discussed by the Applicants' witness in her supplemental testimony.

In your answers to those questions you referred to a system which is used in other nuclear power plants. Could you explain that answer, please?

A Yes. At the time the question was asked, it was my understanding of the question, "Is the HVAC system provided by the Applicants similar to that used in other plants?" And that's what I intended when I made that remark.

I did not mean that the fire dampers at the Harris plant were different than in other plants.

In regard to the fire dampers, I would have to say that I concur with Mr. Ferguson's response yesterday that in his opinion, the dampers are not 100 percent leak-tight, and they are for the prevention of the spread of fire, not necessarily smoke.

MRS. MOORE: The Staff has no further questions,

your Honor.

JUDGE KELLEY: Thank you.

MR. EDDLEMAN: No questions.

JUDGE KELLEY: Okay.

Gentlemen, that brings us to the conclusion of this questioning process. We very much appreciate your coming and your attention and information. Thank you very much. You are excused.

(Witness panel excused.)

JUDGE KELLEY: The Board wants to make a further ruling on the question whether Criterion 3 of the general design criteria in its opinion contemplates the analysis or consideration of simultaneous fires from an independent cause.

We made what we characterized in the middle of yesterday as a tenative ruling based on what we had heard so far, that it did not, and I won't repeat the bases for that ruling.

We simply want to add that as we said then, we did want to hear something about Staff practice and something about the background of Appendix R as those factors might bear on this question, and we have now heard some useful information on that from these witnesses. And it seems to us it reinforces our tentative conclusion that Criterion 3 does not contemplate simultaneous,

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independently-caused fires.

Particularly the background of Appendix R and where it came from and where it is now seems to reinforce the conclusion.

We did not feel that the grammatical analysis of the bare words of Criterion 3 and indeed, the single and plural analysis or some of the other things pointed to really yielded a definite answer. But the background of Appendix R may be an illustration of the dictum that a page of history is worth a volume of logic.

It seems to us then that that is the way we should read it, and we do read it, and that is our ruling on that legal question.

Does that bring us then to the conclusion of Contention 116?

MRS. MOORE: Yes, your Honor.

JUDGE KELLEY: I think it does.

Anything else, Mr. O'Neill?

MR. O'NEILL: We do have an outstanding motion with respect to the receipt into evidence of some exhibits proposed by Mr. Eddleman.

JUDGE KELLEY: 2 through 9.

MR. O'NEILL: That's correct.

JUDGE KELLEY: All right.

We wanted to look at yesterday's transcript, which

WRB/eb10

we did not get done over the last break.

I did not mean in the sense of closing the record, but just moving on to the next point, acknowledging that we have that ruling to make, and we'll do it probably after lunch.

Could we then move on to the-- I guess it is a panel we'll be hearing from first on Number 9.

MR. O'NEILL: May I suggest we go off the record for a few minutes while we get them set up?

JUDGE KELLEY: Surely.

Off the record.

(Discussion off the record.)

JUDGE KELLEY: Back on the record.

Mr. O'Neill.

MR. O'NEILL: Mr. Chairman, I have given three copies of a document which was filed with the prefiled testimony on Contention 9 on August 31st, 1984, which I would ask be identified and marked as Applicants' Exhibit 8, the Final Safety Analysis Report, Section 3.11, and Appendix 3.11A, on the Environmental Qualification of Electrical Equipment.

I would just ask now that that be marked for identification.

JUDGE KELLEY: It is so marked.

MR. O'NEILL: Thank you.

(Whereupon, FSAR, Section 3.11 and App. 3.11A were marked as Applicants' Exhibit 8 for identification.)

MR. O'NEILL: Applicants then call to the stand Mr. Richard B. Miller and Dr. Thomas W. Dakin.

JUDGE KELLEY: Gentlemen, good morning.

Whereupon,

RICHARD B. MILLER

and

THOMAS W. DAKIN

were called as witnesses and, having been first duly sworn, were examined and testified as follows:

DIRECT EXAMINATION

BY MR. O'NEILL:

Q Dr. Dakin, will you please state for the record your name and present position?

A (Witness Dakin) My name is Thomas W. Dakin. I am a semi-retired part-time consultant for the Westinghouse Research Laboratory.

Q Mr. Miller, would you please state your name and position for the record?

A (Witness Miller) Richard B. Miller. I am a principal engineer in the Nuclear Safety Department at Westinghouse.

WRB/eb12

MR. O'NEILL: Mr. Chairman, the professional qualifications of Mr. Miller are set forth in a separate piece of prefiled testimony. Mr. Eddleman has stipulated that he will reserve cross-examination on Mr. Miller's qualifications until that piece of testimony comes up.

JUDGE KELLEY: All right.

MR. O'NEILL: Dr. Dakin's qualifications are in the piece of testimony that I will now identify.

JUDGE KELLEY: All right.

BY MR. O'NEILL:

Q Dr. Dakin and Mr. Miller, do you have before you the prefiled testimony dated August 31, 1984, that was filed with the Board and the parties in this proceeding?

A (Chorus of "Yes.")

Q Mr. Miller, will you please identify that document for the record?

A (Witness Miller) It is titled "Applicants' Testimony of Richard B. Miller and Thomas W. Dakin in Response to Eddleman Contention 9C (Thermal Aging of RTDs)."

Q And does that document consist of 15 pages of questions and answers, and Attachment A, which are the publications of Dr. Dakin, consisting of three pages, a Figure 1, a Figure 2, and a Figure 3?

A Yes, it does.

Q Gentlemen, was this testimony prepared by you or

under your supervision?

A Yes.

A (Witness Dakin) It was.

Q And do your responses to specific questions as to which of the two of you have responded, are they designated by your initials next to the answer?

A Yes.

A (Witness Miller) Yes, they are.

Q Dr. Dakin, do you have any changes or corrections or clarifications to make to any of your answers?

A (Witness Dakin) I have a clarification to make with regard to the proportional statement on page 8 where it says, about in the middle of the page, indented: The log Ln to the base E of the time is proportional to minus E over k/T.

This is correct insofar as it is a proportional statement, but if you were to derive it from the equation, the Arrhenius equation for the rate on the previous page, keeping it as an equation, the sign in front of the E in both cases would have to be plus.

However, in the graphing of this type of data up it is very conventional to graph it versus the negative of the reciprocal of the Kelvin temperature as is done in the Figure C. That's why it is in the paper, because this corresponds to the way the data is usually graphed for a

matter of convenience which allows the actual Centigrade temperature to increase on the abcissa rather than decrease if it were the positive figure, positive of the reciprocal of the absolute temperature.

Q Thank you, Dr. Dakin.

Mr. Miller, do you have any changes or corrections to make to your prefiled answers?

A (Witness Miller) Yes, there is one correction.

On page 11 in my response to Question 20, the seventh line down has an FSAR reference, 3.11.4.4. It should be 3.11.4.1.

Q Dr. Dakin, with the clarification that you made, is the testimony as prefiled as identified previously true and accurate to the best of your knowledge, information and belief?

A (Witness Dakin) It is.

Q Mr. Miller, with the one change that you have made, is this testimony true and accurate to the best of your knowledge and belief?

A (Witness Miller) Yes.

MR. O'NEILL: Mr. Chairman, I would move that the Applicants' testimony of Richard B. Miller and Thomas W. Dakin in response to Eddleman Contention 9C, including Attachment A and Figures 1, 2 and 3, be bound into the record as if read, and be received into evidence.

MR. EDDLEMAN: I object, in a narrow way, to Question 26 which occurs on page 13.

This asks Dr. Dakin to briefly summarize the Sandia report, and since I don't believe he wrote it, I think that the only proper way to say that would be something like "Please briefly summarize your view of the Sandia report."

End 5

MR. O'NEILL: Mr. Chairman, I believe Dr. Dakin is capable of summarizing a report and that certainly the testimony indicates that it's his summary and not Sandia's summary.

JUDGE KELLEY: Well, if not, this colloquoy will so, that objection is overruled.

Any other objection?

MR. EDDLEMAN: None.

JUDGE KELLEY: Okay. Motion granted.

(Whereupon, Applicant's 8, having been previously marked for identification, was received in evidence.)

(The document follows:)

August 31, 1984

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
CAROLINA POWER & LIGHT COMPANY and NORTH CAROLINA EASTERN MUNICIPAL POWER AGENCY	)	Docket No. 50-400 OL
	)	
	)	
(Shearon Harris Nuclear Power Plant)	)	
	)	

APPLICANTS' TESTIMONY OF RICHARD B. MILLER AND THOMAS W. DAKIN IN RESPONSE TO EDDLEMAN CONTENTION 9C (THERMAL AGING OF RTDS)

Q.1 Please state your names.

A.1 Richard B. Miller and Thomas W. Dakin.

Q.2 Mr. Miller, are your address, present occupation, employer, educational background and professional work experience described elsewhere in the record of this proceeding?

A.2 (RBM) Yes. The relevant information is provided in "Applicants' Testimony of Robert W. Prunty, Peter M. Yandow and Richard B. Miller in Response to Eddleman Contention 9A (ITT-Barton Pressure Transmitters)."

Q.3 Please elabcrate on your professional experience that is directly relevant to the testimony which you are presenting regarding thermal aging of RTDs at the Shearon Harris Nuclear Power Plant ("SHNPP").

A.3 (RBM) I have participated directly in the development of Westinghouse testing methodology which includes accelerated thermal aging. This involved discussions with research facilities and other industry sources to determine which method of accelerated thermal aging would be most appropriate for our programs.

Q.4 Dr. Dakin, please state your address, present occupation, educational background, and professional experience, including that directly relevant to the testimony which you are presenting regarding thermal aging of RTDs at the SHNPP.

A.4 (TWD) My business address is Westinghouse Research and Development Center, Pittsburgh, Pa. 15235. I am retired, but still serve as a consultant to Westinghouse. My advanced education led to an A.B., summa cum laude, in Chemistry at the

University of Minnesota in 1935, an M.S. in Physical Chemistry from Michigan State University in 1938, and a Ph.D. in Physical Chemistry in 1941 at Harvard University. I started as a research fellow in the field of electrical insulation at the Westinghouse Research Laboratory in 1941, advancing to a group leader in 1946, section manager about 1950, and Department Manager about 1965.

My research activities and the research activities of those reporting to me at Westinghouse concentrated on the electrical behavior and electrical and thermal aging of insulation both in service and in laboratory tests simulating service environment conditions.

My first important paper relating to insulation aging was published in 1948 in the Transactions of the American Institute of Electrical Engineers ("AIEE") under the title "Electrical Insulation Deterioration Treated as a Chemical Rate Process." That particular paper has been very widely referenced in the electrical journals. Starting about 1950 I participated in a variety of working groups and committees in the AIEE - (later to become the IEEE), to formulate accelerated aging test standards. I also presented and published papers relating to accelerated aging tests. Most if not all of the precautions regarding application of accelerated aging mentioned in the Sandia Report referenced in Contention 9C (NUREG/CR-1466, SAND 79-1561) and other precautions also were discussed in my papers. A partial listing of my publications, including papers

dealing with thermal aging and accelerated life testing, is attached hereto as Attachment A.

I was elected a Fellow of the IEEE in 1968, received the Westinghouse Order of Merit in 1979, was awarded the first distinguished Technical Achievement Award of the IEEE Electrical Insulation Society in about 1980, and this year received an IEEE Centennial Medal of the Society. From 1968 to 1980 I was the principal U.S. representative in electrical insulation to CIGRE, the Conference International Grand Reseaux Electrique.

Q.5 What is the purpose of this testimony?

A.5 (RBM, TWD) The purpose of this testimony is to respond to Eddleman Contention 9C, which states:

> It has not been demonstrated that the RTDs have been qualified in that the Arrhenius thermal aging methodology employed is not adequate to reflect the actual effects of exposures to temperatures of normal operation and accidents over the times the RTDs could be exposed to those temperatures. (Ref. NUREG/CR-1466, SAND 79-1561, Predicting Life Expectancy of Complex Equipment Using Accelerated Aging Techniques.)

Q.6 Mr. Miller and Dr. Dakin, how is your testimony organized?

A.6 (RBM, TWD) Our testimony describes RTDs and their functions at SHNPP, and the Westinghouse RTD qualification program. It includes a discussion of the Arrhenius thermal aging methodology as applied in the environmental qualification of SHNPP RTDs. Our testimony also reviews the Sandia Report referenced in Contention 9C, NUREG/CR-1466, and presents our

conclusions as to the applicability of that Report to the SHNPP RTDs.

Q.7 Mr. Miller, what is an RTD?

A.7 (RBM) An RTD, a resistance temperature detector, is an instrument used to measure temperature in which the primary element, a resistance wire, has a well-defined resistance-temperature relationship. The primary element in the RTDs used at SHNPP is a platinum wire. Signal conditioning equipment is used to detect and amplify changes in the resistance of the platinum element which correspond to changes in temperature. These RTD signals are used in plant instrumentation systems.

Q.8 What types of RTDs are used at SHNPP, how many of each type are used, and where are they located?

A.8 (RBM) The RTDs used at SHNPP are manufactured by the RdF Corporation. Eighteen Model 21204 RTDs are directly immersed in bypass lines to the reactor coolant system. There are three coolant loops at the SHNPP and these eighteen RTDs are used to measure the "hot leg" and "cold leg" temperature in each loop. These RTDs are directly immersed to provide rapid time response measurements for use in the reactor protection and control systems.

Six Model 21205 RTDs are installed in wells located in the reactor coolant system piping to provide measurement of the hot and cold leg temperature in each loop for use in monitoring plant conditions.

The construction of these two types of RTDs is almost identical. The primary difference is in the length of the sheath inserted into the piping system. (See Figures 1 and 2 attached hereto.)

Q.9 What safety functions do the RTDs perform?

A.9 (RBM) Six Model 21204 RTDs provide signals to the reactor protection system used for reactor shutdown functions. A setpoint based on a loop average temperature is compared to the difference in temperature between the hot and cold leg in the same loop to determine if a low Departure from Nucleate Boiling Ratio (DNBR) or overpower situation could be developing which requires corrective action. Six Model 21204 RTDs are installed spares for the reactor protection system. The remaining six RTDs are used for control functions.

The six Model 21205 RTDs provide the control room operator with information on plant conditions, such as those used in maintaining pressure-temperature relationships during plant cooldown.

Q.10 Describe briefly the construction of the RTDs, including any age-sensitive materials in the RTD assemblies.

A.10 (RBM) The complete RTD assembly, illustrated in Figures 1 and 2, consists of a platinum element contained inside the tip of a sheath, and the necessary wire and supports which allow connection to a cable system through which signals are transmitted outside the containment building. A stainless steel sheath protects the element and wire over that portion

inserted in the pipe. A stainless steel bellows hose protects external wires from moisture penetration and physical damage. (A helium leak test assures the adequacy of the moisture barrier provided by the bellows hose.)

The portion of the RTD inserted in the primary system piping contains no age-sensitive materials. The organic materials in the external cable and cable interface are epoxy potting material and silicone varnish cable coating. The epoxy potting material is located to the right of the Swagelok nut in Figure 1 and to the right of the adapter and Inconel spring in Figure 2.

Q.11 Does the silicone varnish on the RTD cable lead perform a safety function?

A.11 (RBM) No. The silicone varnish is only used in the manufacturing process to prevent the fiberglass insulation on the cable from fraying during the manufacturing process. It is not required for the RTD to perform its safety function.

Q.12 Does the epoxy potting at the cable-probe interface perform a safety function?

A.12 (RBM) Yes. The safety function that the epoxy potting material at the cable-probe interface provides is that of mechanical support and insulation for the wires at this point.

Q.13 What is thermal aging?

A.13 (RBM) Thermal aging involves a temperature dependent chemical process that can lead to changes in properties of organic materials over a period of time.

Q.14 What is accelerated thermal aging, and why is it necessary?

A.14 (RBM) Since real time aging is not practical over the long time periods for which most electrical equipment must be environmentally qualified for nuclear power plant application, accelerated processes have been developed to simulate a defined life over a much shorter period of time.

Q.15 Is accelerated thermal aging addressed by current regulatory requirements?

A.15 (RBM) Yes. 10 C.F.R. 50.49(e)(5) requires that "[e]quipment qualified by test must be preconditioned by natural or artifical (accelerated) aging to its end-of-installed life condition." (Emphasis added.)

Q.16 Dr. Dakin, what is the Arrhenius methodology of thermal aging?

A.16 (TWD) The Arrhenius methodology is based on the premise that deterioration of materials in service is due to chemical reactions. These reactions occur internally, sometimes between components of the material and sometimes with compounds in the environment such as oxygen or water vapor. It is widely-known that chemical reactions occur more rapidly at increased temperature. Arrhenius in the last century showed theoretically that the temperature dependence of chemical reactions followed an exponential equation:

$$\text{rate} \sim \exp(-E/kT) \sim \text{a constant/time}$$

where T is the Kelvin temperature (degrees C +273);

E is the activation energy of the chemical reaction (electron volts); and

k is the Boltzmann gas constant (electron volts/ degrees Kelvin).

The activation energy is characteristic of the material and the significant chemical change. This equation provides the theoretical basis for accelerated aging tests.

It is postulated that there is a consistent correlation between the amount of physical change and the amount of chemical reaction. Therefore the time to reach a selected amount of physical change will vary according to the Arrhenius equation, rearranged as follows:

$$\text{time to reach a specified change} \sim \exp(-E/kT)$$

Usually this equation is changed to the logarithmic form:

$$\text{Ln(time)} \sim (-E/kT) = (-E/k)/T$$

and the logarithms of times to change are graphed versus reciprocal Kelvin temperature, as illustrated by Figure 3 (attached hereto), which is based on electrical tests of an epoxy resin laminate after aging. The quantity, E/k, is the slope of the graph. The value of E, the activation energy, ranges between about 0.5 to 1.5 electron volts depending on the material and the significant chemical reaction of interest. The times to reach a specified level of deterioration (in this example 50% of the original dielectric strength) are graphed. Such data are extrapolated down to expected continuous service

temperatures to predict the time to reach the specified level of deterioration.

Other than actually testing materials and systems for the expected years of actual service, this is the most logical scientific way of predicting that they will be reliable. Usually accelerated type tests of materials are made extending up to one or two years. After the linearity of the Arrhenius graph is confirmed for a material, then short time more accelerated tests are acceptable to evaluate small changes in materials or application condition.

The electrical power industry has been very diligent in pursuing this type of testing to ensure reliability of new or improved materials and systems, and generally the experience has been excellent in confirming the predictions.

Q.17 Mr. Miller, has the NRC Staff approved the Arrhenius method for environmental qualification of electrical equipment in nuclear power plant applications?

A.17 (RBM) Yes. The NRC Staff, in Section 4(4) of NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety Related Electrical Equipment," states: "The Arrhenius methodology is considered an acceptable method of addressing accelerated aging." Most recently, in Regulatory Guide 1.89 (Rev. 1), "Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants" (June 1984), the Staff endorsed the use of this method. In addition, the Westinghouse qualification methodology

described in WCAP-8587, "Methodology for Qualifying Westinghouse WRD Supplied NSSS Safety Related Electrical Equipment," has been accepted by the NRC. "Safety Evaluaton Report of Westinghouse Equipment Qualification Documentation WCAP 8587, WCAP 8587 Supplement 1, WCAP 8687 Supplement 2, and WCAP 9714: Seismic and Environmental Qualification of Safety Related Electrical Equipment" (November 10, 1983). The accelerated thermal aging techniques discussed in WCAP-8587 are based on Arrhenius methodology.

Q.18 Describe briefly how and for what period of time the RTDs for SHNPP were environmentally qualified.

A.18 (RBM) The overall RTD qualification program includes thermal aging, thermal cycling, irradiation aging, and vibration aging, as part of the preconditioning process. In addition to and following the normal thermal aging, the RTDs are temperature cycled to account for the effects of expected plant heatup and cooldown cycles. They are also exposed to radiation simulating normal operation and accident conditions as well as vibration simulating the effects of pipe and flow vibration. This generic preconditioning process simulates a minimum 20 year life for the RTDs installed in the bypass lines and a minimum 10 years for the RTDs installed in the wells. After this preconditioning the RTDs are subjected to the effects of a seismic event and a high energy line break environment.

Q.19 Please describe how the Arrhenius method was applied in the environmental qualification of the RTDs for SHNPP.

A.19 (RBM) Since the epoxy is the only safety-related age sensitive material used in the RTDs, the activation energy for this material was selected. Using the Arrhenius equations and the ambient temperature at the cable interface, an aging temperature was calculated which would simulate the desired life at an accelerated rate and not inadvertently degrade the material due to the high temperature alone.

Q.20 What is the ambient temperature at the cable interface to which the RTDs will be exposed during normal operating conditions, and how was it determined?

A.20 (RBM) The ambient temperature at the cable interface is equal to the normal ambient temperature in this region plus the expected temperature rise associated with heat transfer to this interface from the reactor coolant system. The normal ambient temperature surrounding the cable interface portion of the RTD assembly was determined by Carolina Power & Light Company to be 120°F (approximately 50°C). FSAR § ~~3.11.4.4.~~ 3.11.4.1 In addition, Westinghouse performed heat transfer calculations to determine the temperature rise expected at this interface which accounts for heat transfer from the reactor coolant system. The temperature rise will be limited to 50°C as long as a minimum air velocity is maintained. Therefore, using a normal ambient temperature of 50°C and the expected temperature rise of 50°C, the temperature to which the RTDs will be exposed is 100°C.

Q.21 What was the activation energy used to calculate the temperature to which the equipment was exposed during qualification testing and to calculate the time duration of the test?

A.21 (TWD) Since the epoxy performs structural and insulating functions, an activation energy of 0.98 electron volts was selected, which is consistent with these parameters. This selection of 0.98 electron volts was a conservative choice based on an examination of a large amount of test data on epoxy resin systems.

Q.22 Was the Arrhenius method used to simulate accident conditions as well as normal operating conditions?

A.22 (RBM) Yes, but only in the post-accident period. The first day following a high energy line break is simulated in real time and temperature. Following the first day of testing the remaining post-accident period is simulated by accelerated thermal aging. Westinghouse employs a standard accident profile which uses a conservative 0.5 electron volt activation energy to calculate the time/temperature relationship during this period. The RTDs were subjected to this generic profile.

Q.23 What were the results of the accelerated thermal aging portion of the qualification testing for SHNPP RTDs?

A.23 (RBM) After the accelerated thermal aging portion of the qualification test was completed, certain tests were performed. These tests were calibration checks at 32°F, 525°F and 625°F as well as insulation resistance measurements. No degradation of the RTDs was detected during these tests.

Q.24 Has the NRC Staff accepted Westinghouse's qualification testing of the RTDs used at SHNPP?

A.24 (RBM) Yes. As I indicated in response to Q.17, the Westinghouse qualification programs for electrical equipment, including safety-related RTDs, have been accepted by the NRC Staff on a generic basis. The NRC Staff specifically approved the qualification of RTDs. This generic testing envelopes the environmental conditions, including temperatures, for which the SHNPP RTDs must be qualified.

Q.25 Dr. Dakin, are you familiar with NUREG/CR-1466, entitled "Predicting Life Expectancy and Simulating Age of Complex Equipment using Accelerated Aging Techniques," first published by Sandia National Laboratories as a consultant's report to the NRC ("Sandia Report")?

A.25 (TWD) Yes.

Q.26 Please briefly summarize the Sandia Report.

A.26 (TWD) The Sandia Report discusses the application of the Arrhenius relation of temperature to aging much as I have outlined in answering Q.16. This report discusses the usefulness of the Arrhenius relation in accelerated aging tests but also discusses possible conditions which would invalidate the use of this relation for extrapolation from accelerated aging tests. The report points out the need for a single chemical reaction to control the aging of the material over the whole temperature range from accelerated test temperatures down to service temperatures. If, for example, moisture diffusion were

controlling at lower temperatures, this would change the slope of the Arrhenius type graph to a lower slope and predict a shorter failure time than predicted by extrapolating high temperature tests. I have cautioned against such effects in several of my own papers from the first one on this subject in 1948 and later ones up to about 1960.

Q.27 Which type of testing does the Sandia Report primarily address, qualification testing or materials testing?

A.27 (TWD) This Sandia Report discusses primarily materials testing.

Q.28 In the materials testing of the epoxy used in the SHNPP RTDs, did the epoxy exhibit an Arrhenius dependence on temperature?

A.28 (TWD) Yes.

Q.29 What implications does this have for qualification testing of the RTDs?

A.29 (TWD) It indicates that the qualification test is a satisfactory confirmation of the long-term useful life of the epoxy resin.

Q.30 Do any of the "predictive difficulties" discussed in the Sandia Report apply to the epoxy used in the SHNPP RTDs?

A.30 (TWD) None of the predictive difficulties discussed in the Sandia Report applies because the insulation system of the RTD connector and cable is sealed against moisture, so that diffusion of moisture is prevented. Moisture diffusion is the only potentially invalidating condition, referred to in the

Sandia Report, that could apply to the accelerated thermal aging of RTDs. Further, epoxy resins are not known to be sensitive to moisture effects as was the polyurethane cited in the Sandia Report.

Q.31 Dr. Dakin, in your opinion, does the Sandia Report support in any way the allegation in Eddleman Contention 9C that the "Arrhenius thermal aging methodology is not adequate to reflect the actual effects of exposure to temperatures of normal operation and accidents over the times the RTDs could be exposed to those temperatures"?

A.31 (TWD) No. Indeed, the Sandia Report (at page 47) concludes that "[a]ccelerated aging techniques offer the best opportunity for predicting lifetimes or simulating life of complex equipment."

Q.32 What is your conclusion concerning the application of the Arrhenius method to the qualfication of the SHNPP RTDs?

A.32 (TWD) My conclusion is that the Arrhenius method is satisfactory for simulating the thermal aging of the organic materials in the qualification of the SHNPP RTDs.

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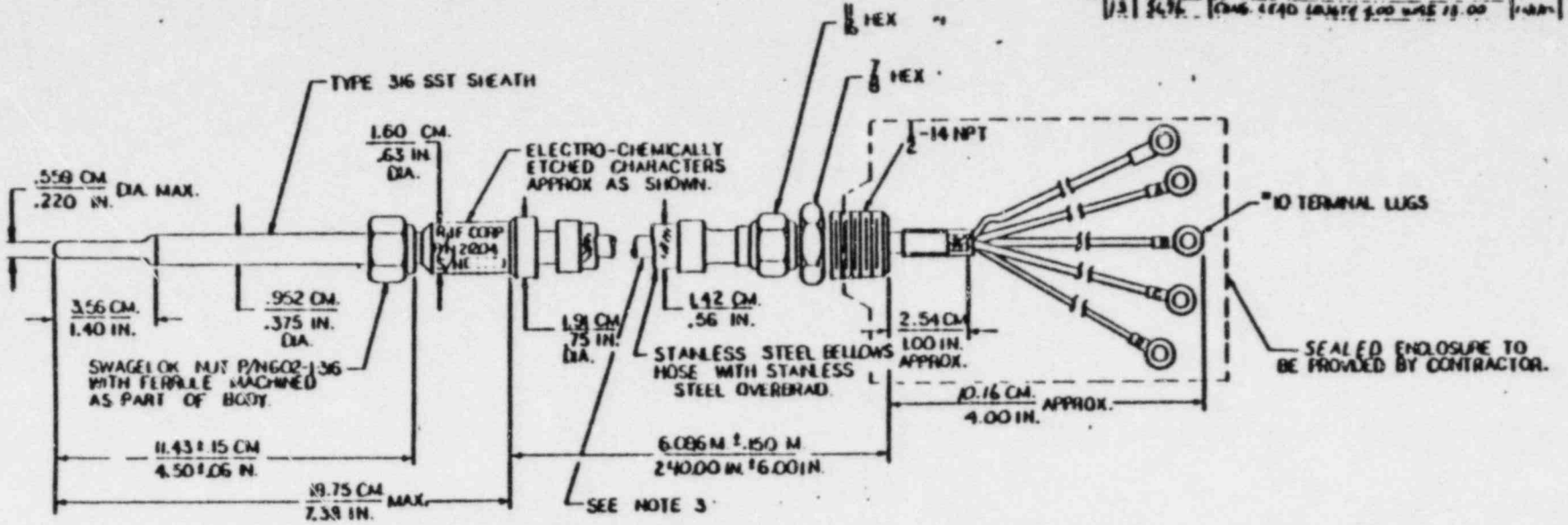
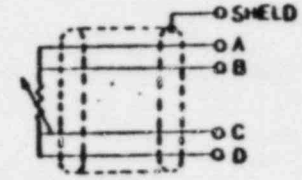
REVISIONS				
SYM	ECO	DESCRIPTION	DATE	APPROVED
10	5276	REDRAWN & REV. .220 DIA MAX.	2-3-82	[illegible]
11	5517	LEAD WAS 4.00, 6.00 IN WAS 10 FT	[illegible]	
12	5624	CONF. CENTER DIMENSIONS [illegible]	[illegible]	
13	5696	CONF. LEAD LENGTH 4.00 WAS 10.00	[illegible]	



RdF Corp.
23 Elm Ave.
Hudson, N.H.

DATA SUBMITTAL

Date DEC 8 1982



SCHEMATIC DIAGRAM

NOTES:

1) ELEMENT: REF. GRADE PLATINUM.

2) RESISTANCE: 200.15 ± 1.50 Ω AT 32°F.

3) 4 CONDUCTOR, #22 STRANDED NICKEL PLATED COPPER, MICA TAPE, INSULATED WITH GLASS BRAID, 304 SST OVERBRAID, MICA TAPE GLASS BRAID, SILICONE VARNISH IMPREGNATED OVERJACKET. CABLE IS PROTECTED BY A STAINLESS STEEL BELLOWS HOSE WITH OVERBRAID.

4) ACCEPTANCE TEST PER T-10350.

CONTROLLED DRAWING
Change only with customer approval

ITEM NO	QTY REQ'D PER ASSY	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	REF DESIG	MATERIAL OR NOTE	SPECIFICATION	ITEM NO
LIST OF MATERIALS							

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS ARE IN INCHES
DO NOT SCALE DRAWING
REMOVE ALL BURRS AND BREAK ALL SHARP EDGES
TOLERANCES ON DIMENSIONS
XX ± .03 ANGLES ± 1°
AND ± .010 FRACTIONS ± 1/64

DRAWN		4/14/82
CHECK		
ENGR	R. [illegible]	4/15/82
APPROVED		

MATERIAL
FINISH

NEXT ASSY | USED ON
APPLICATION

RdF Corporation HUDSON, N.H.

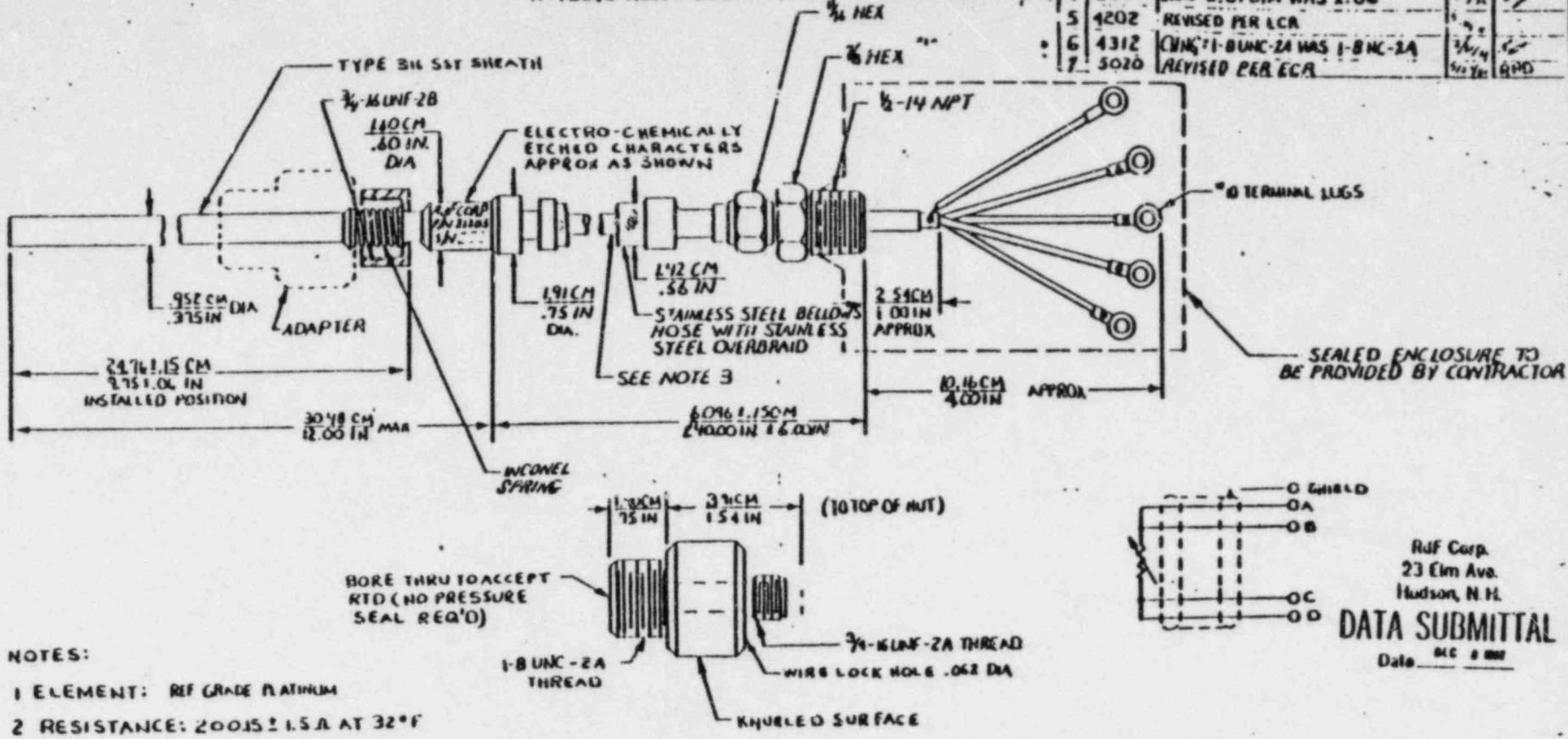
COOLANT BYPASS RTD (PLATINUM) Direct Immersion

CODE IDENT NO	DWG NO	REV
02000	C 2204	13

SCALE 1/1 SHEET 1 OF 1

Figure 1

REVISIONS				
SYM	ECO	DESCRIPTION	DATE	APPROVED
8		REDRAWN WITH CHANGE		
9	3559	CHG: 63DIA WAS 43DIA		
4	3644	CHG: 2.87 DIM WAS 2.66		
5	4202	REVISED PER ECA		
6	4312	CHG: 1-8UNC-2A WAS 1-8NC-2A		
7	5020	REVISED PER ECA		
8	5082	REVISED PER		
9	5276	CHG CABLE LENGTH TOL. PROPOSED		
10	5517	1800 WAS 400, 24010 WAS 20.00 FT		
11	5629	CHG SEALED ENCLOSURE WAS NOT PART		
12	5676	CHG LEAD LENGTH 400 WAS 18.00		



RdF Corp.
23 Elm Ave.
Hudson, N.H.

DATA SUBMITTAL

Date DEC 8 1981

NOTES:

1 ELEMENT: REF GRADE PLATINUM

2 RESISTANCE: 200.15 ± 1.5 Ω AT 32°F

3 4 CONDUCTOR, #22 STRANDED NICKEL PLATED COPPER, MICA TAPE INSULATED WITH GLASS BRAID, 304 SST OVERBRAID, MICA TAPE GLASS BRAID, SILICONE VARNISH IMPREGNATED OVER JACKET. CABLE IS INDIRECTED BY A STAINLESS STEEL BELLOWS HOSE WITH OVERBRAID

4 ACCEPTANCE TEST PER T-10350

CONTROLLED DRAWING
Change only with customer approval

ITEM NO	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	NO REQ'D PER ASSY	MATERIAL OR SIZE	SPECIFICATION

LIST OF MATERIALS

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS ARE IN INCHES
DO NOT SCALE DRAWING
REMOVE ALL BURRS AND BREAK ALL SHARP EDGES
TOLERANCES ON DIMENSIONS
.XX ± .03 ANGLES ± 1°
.XXX ± .010 FRACTIONS ± 1/64

DRAWN
CHECK
ENGR
APPROVED
MATERIAL
FINISH

NEXT ASSY | USED ON
APPLICATION

RdF CORPORATION HUDSON, N.H.

COOLANT RTD (PLATINUM)

DWG CENT NO	SIZE	DWG NO	REV
02009	C	21205	12

SCALE 1/1 SHEET 1 OF 1

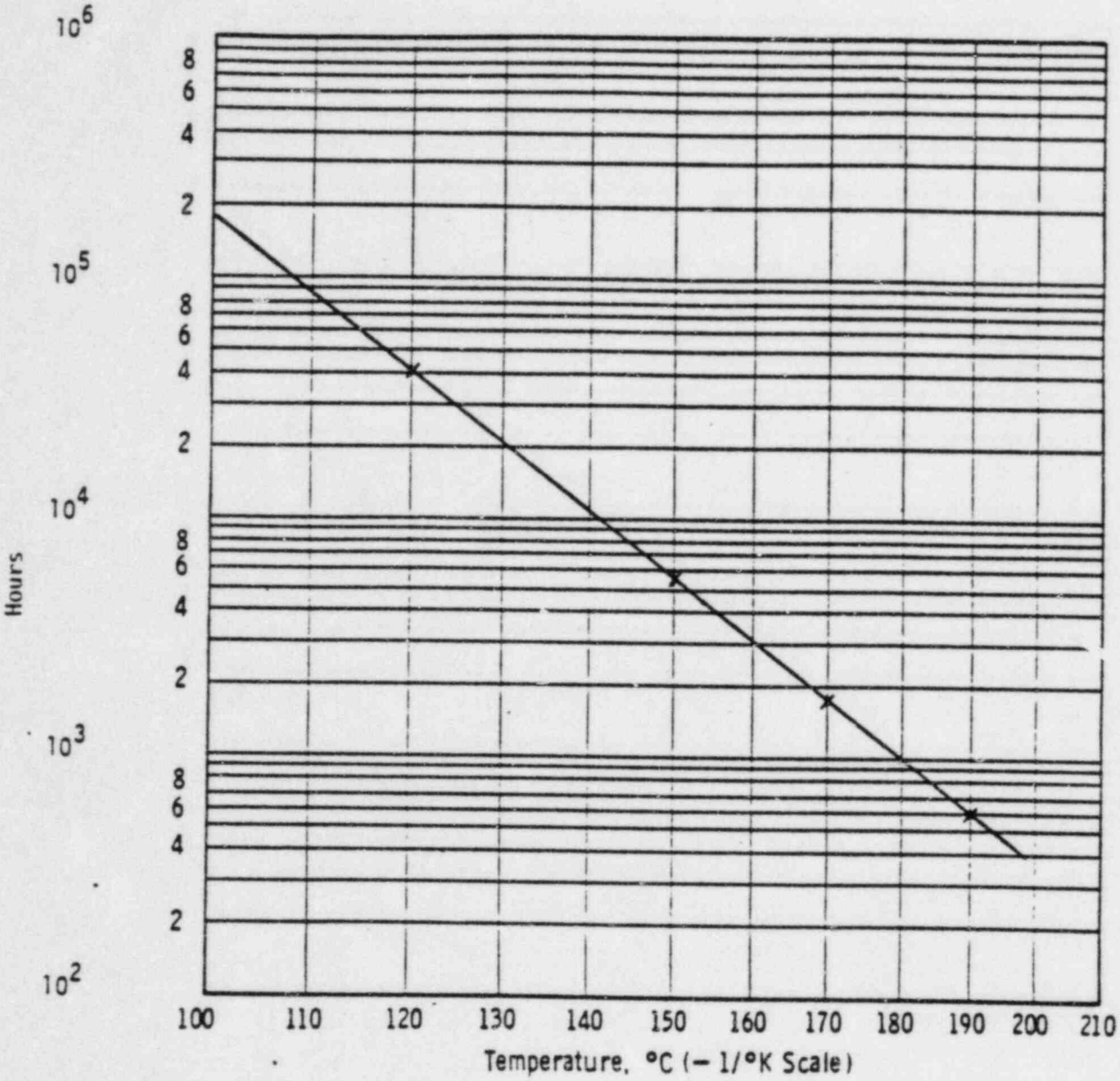


Figure 3. Time to Reach 50% Dielectric Strength of an Epoxy Laminate (Grade FR4, 1/16")

Data from UD-NEMA Report 821

BY MR. O'NEILL:

Q. Will you please provide a brief summary of your statement?

A. (Witness Miller) My testimony discusses the application of these RTDs to the Shearon Harris plant. It also describes the Westinghouse generic qualification program for these RTDs and the manner in which the Arrhenius methodology is utilized for the qualification program.

Q. Thank you, Mr. Miller.

Dr. Dakin, will you please summmarize your part of this testimony?

A. (Dr. Dakin) My discussion describes the operation of the Arrhenius methodology in the assumptions lying behind it.

MR. O'NEILL: These gentlemen are available for cross examination.

JUDGE KELLEY: Okay.

Mr. Eddleman?

MR. EDDLEMAN: May I have a moment, please?

JUDGE KELLEY: Sure.

(Pause.)

CROSS EXAMINATION

BY MR. EDDLEMAN:

Q. Gentlemen, first with respect to the answers being

given by each of you under your initials, have both of you read all this testimony?

A. (Witness Dakin) We have, at least I have.

Q. Have you, Mr. Miller?

A. (Witness Miller) Yes, I read it.

Q. Okay.

Are there any answers given by either of you with which the other one disagrees?

A. No, as best as my background is able to support -- I have reviewed Dr. Dakin's testimony, I am not an expert in Arrhenius methodology, so I understand what he has written. That's as far as I can go.

Q. Dr. Dakin, have you reviewed Mr. Miller's answers?

A. (Witness Dakin) I cooperated with Mr. Miller and we discussed this testimony before and I think I understand what he has said and I agree with his statements, and my own, of course.

Q. All right.

Mr. Miller, if you will refer to the first page of the testimony which I don't believe has a number on it, but it's behind the cover sheet. In your answer 3 you state you have participated directly in the development of Westinghouse testing methodology which includes accelerated thermal aging.

Did you participate directly in the development of the testing methodology for these RTDs?

A. (Witness Miller) Yes.

Q. Okay.

And how was that methodology developed?

A. We have a generic qualification methodology that is really the basis for all of our qualification programs. And when these RTDs were allowed to be tested, we applied that methodology to the program.

Q. Okay.

Now, by generic methodology, do you mean that it applies to the qualification of anything?

A. Yes.

Q. All right.

Well now, when you develope a methodology for testing a particular component like an RTD, you then have to get some specific tests and methods, do you not?

A. I'm not sure I understand the question.

Q. Well, what I'm saying is -- well, let me rephrase.

Is there a distinction between this generic methodology which you would use for making tests for anything and the specific methodology that is used to test these RTDs?

A. The only distinction might be in the selection

of certain parameters based on their location in the plant, the materials used in the product, things of that nature.

Q. What sort of parameters would those be?

A. Well, a temperature parameter, the location of the plant, the radiation dose it might see in that location.

Q. Are those the only two variables that would change?

A. No, they are examples. There are seismic response spectra that would change based on location in the plant. It's possible that the temperatures for high energy line breaks might change, although we do a very conservative generic test. So it's unlikely that would chance.

Q. I see.

Do you give any consideration to the effect of cycling through different temperatures as the plant operates that is heating up and cooling down?

A. Yes. That's part of the program for these RTDs.

Q. What number of cycles of type of cycles are included in the program for these RTDs, say, per year of plant operation that you simulate?

A. As best I can recall, it's on the order of five per year.

Q. That would be five startups a year?

A. Yes, we consider that very conservative. I believe

there were 100 cycles done to simulate a 20-year qualifying life.

Q. Are you familiar with the number of startups per year that have been experienced by actual operating nuclear plants?

A. I don't have that at my fingertips, no. These are numbers that we estimate.

Q. Not actual data?

A. No. I can't say it's based on actual data.

Q. All right.

Dr. Dakin, I can't resist asking this and I caution you it is somewhat facetious. You say you are retired. Have you been thermally aged yourself?

MR. O'NEILL: Objection.

MR. EDDLEMAN: I'll withdraw it.

BY MR. EDDLEMAN:

Q. Dr. Dakin, you say on page 2, continuing with your qualifications, that you started working as a research fellow on electrical insulation with Westinghouse research laboratory in 1941. And I gather that you worked with Westinghouse through to your retirement, is that correct?

A. (Witness Dakin) That's correct.

Q. All right, sir.

You refer, in the middle of that page, to a paper of yours published in 1948, "Electrical insulation

deterioration treated at a chemical rate process." Can you define or explain what the chemical rate process is, sir?

A. It is a process which involves chemical reaction going on at some defined rate.

Q. And how do you define the rates of those chemical reactions?

A. This has to be defined in terms of the concentration change of some component in the reaction.

Q. All right. So the reaction rate depends on the concentration of some component or perhaps components in the reaction?

A. It could be that.

Q. Okay.

Where you have more than -- well, let me ask you a couple of things about this.

First, is it possible for a single chemical component to degrade by more than one reaction?

A. Yes.

Q. Okay. And where you have two or more components may there also be two or more reactions going on as they interact?

A. It's possible but they are seldom at the same rate. One is usually faster than the other?

Q. So they generally would be different rates?

A. Yes.

Q. All right.

You state that you presented and published papers related to accelerated aging tests. Now, back in your list of publications at the back of this testimony these, I believe, are indicated with an asterisk?

A. They are, yes.

Q. Okay.

Now, your reference 35, it's entitled, "Chemical rate phenomena in the deterioration of electrical insulation." Does this paper concern -- or did this paper concern the same kind of chemical rate phenomena that we've been discussing here?

A. I think so. I unfortunately didn't bring that particular paper. Yes, that was a conference paper.

Q. Okay.

A. It was not widely published. It was presented and copies were given to those who attended this particular conference.

Q. I see, sir.

We have one on comparison of test procedures for thermal life testing of the varnished glass cloth, reference 45. There's not anything like that in these RTDs, is there?

A. Well, there is something similar however it's not important in the application. The glass robing that goes

around the wires in the cable from the RTD is impregnated with a varnish, a silicone varnish, and there is some analogy between that an the glass cloth.

Q. Both being made out of glass fibers, is that it?

A. Yes, that's right.

Q. Okay.

Now, the insulation of the cable is actually made of this glass material, right?

A. Yes -- well, yes. And the varnish.

Q. Right, okay.

A. Then you also have on your last page of papers three that are asterisked as dealing with thermal aging accelerated life testing and one of these is the theory of aging in electrical insulating material, an IEEEconference paper of 1970, correct?

A. Yes.

Q. Okay.

Now, this theory, would that include the Arrhenius theory, the theory that underlies this methodology?

A. Yes. This particular paper was just an elaboration of some other things that I published. And perhaps a few additional thoughts. But it's generally on that subject.

Q. All right, sir.

Now, let's see. You say most, if not all, the precautions regarding application of accelerated aging

mentioned in the Sandia report NUREG CR 1466, I'm on page 2 of your testimony, and other precautions also were discussed in my paper. Now, my first question about that is which of the precautions of the Sandia report were discussed in your papers, Doctor?

A. The publication referred particularly to the possibility of two different chemical reactions predominating at different temperature ranges. Which is -- here the chemical reaction of diffusion, that's really not precisely a chemical reaction but it's been classified together with chemical reactions because the temperature dependence of diffusion is simular to that of a chemical reaction.

Q. And diffusion would also reflect the concentrations of possible reactants that a deteriorating insulation might be exposed to, correct?

A. I think it was said somewhere else in the same document that diffusion, if it is controlled, controlling part of the reaction is more likely to occur, at lower temperatures. I mean, more likely to predominate in the rate.

Q. All right.

Now, are those the precautions that are discussed in your paper that are also referenced in NUREG CR 1466, Doctor?

A. I don't have that document here and I'm not sure whether I have seen it or not.

WRB/Pp 11

Q. By "that document" do you mean your papers or do you mean --

A. No. The NUREG --

Q. You don't have NUREG with you?

A. No.

Q. Okay.

But you do make the statement about what is discussed in your papers and what is discussed in this NUREG?

A. Yes.

Q. All right.

Now, you also mention other precautions being discussed in your papers. What are some of those other precautions, Doctor?

End 6

#7 WRBwbl

A. Well, there can be in a complex system like a resin or an insulation system, there are questions also of the failure criteria, or the measure by which you measure the deterioration; for example, the deterioration of an industrial laminate, for example. An epoxy laminate, for example, can be measured in several different ways. Its structural strength can be measured or its electric strengths, or even its flexibility could be measured.

There are a variety of tests that could be made in all of these systems that can be a measure of the deterioration of the material. In some cases one type of test is more relevant to the application than the other, and that would then be the criterion for deterioration to an unacceptable level.

Q. Would it be true, then, as to these other precautions that you would want to choose the most limiting measure of deterioration in order to validate the qualification of a piece of material?

A. Insofar as this can be anticipated this is usually what is done.

Q. Okay.

And the way you would anticipate that would include various experiments on the material, various tests on it, reviewing data on similar materials, looking at the chemistry and physics of it, things like that?

WRBwb2

A. Well, some of that would occur. I think the first thing that should be considered is the requirements on the material in the application.

Q. What it has to do to perform its function?

A. Yes.

Q. Okay.

And then would you look at the most limiting deterioration modes or measurements as to its ability to perform that function?

A. That is correct.

Q. All right.

As to deterioration caused by diffusion, anything that might crack a material or cause the surface area to be increased, or pock it, make pock marks in it, something like that, could potentially increase the diffusion rate of various things it's exposed to into it, could it not?

A. Possibly. But the diffusion is usually a factor that is one step to another. In other words, diffusion may prevent a reaction if the reacting component -- for example, air, oxygen: it has to get to the material, or get into the material to cause the reaction; oxidation, for example.

Q. Right.

A. Therefore, in some cases, diffusion may be the limiting step in several successive steps leading to the degradation.

WRBwb3

Q. All right.

Now, the limiting step would be the one that controls the rate of degradation; correct?

A. That is correct.

Q. Okay.

A. In fact, that is the basis for the application of the Arrhenius method in complex systems. In fact, I said that in numerous publications and presentations, that you can only deal with a complex system by making a simple assumption and then testing whether that assumption is correct.

Q. But you would have to test whether your simplification were correct, wouldn't you?

A. Not always. I mean, logic prevails here sometimes.

Q. Okay.

Doctor, would it be an equally acceptable methodology to actually perform tests of the various steps and reaction rates, and so on, that were possible in degrading material, and analyze the results of those tests or experiments in order to deal with a complex system?

A. It is certainly, I would say, possible, but an extremely complex and tedious and unacceptable method of approach.

Q. Is it unacceptable because it is so complex and tedious?

A. Yes, that's true. We wouldn't have any use of

WRBwb4

this Arrhenius methodology if we had to look at every possible step and examine it separately from all the other steps. We would be back twenty years.

Q. All right.

If I may refer you gentlemen to your Answer 6 on pages 3 and 4. This is basically an overview of how your testimony is set up; is that correct?

A. (Witness Miller) Yes.

Q. Okay.

You then go on, Mr. Miller, to describe an RTD, a resistance temperature detector.

Now, what kind of temperatures are measured with this RTD?

A. Maximum temperature would be on the order of 650 degrees Fahrenheit.

Q. Would the detector be expected to fail above that temperature?

A. No; that is the maximum temperature in the hot leg of the plant.

Q. Normally; right?

A. Normally.

Q. Is the RTD intended to be able to accurately measure temperatures above 650 Fahrenheit?

A. For the wide range application the maximum range is 700 degrees.

WRBwb5

Q. All right.

And that's the absolute upper limit of the use of these things; they can just tell you up to 700, or say we're stuck at 700?

A. No; it's not the usable range of the RTD, but it is the maximum temperature that you will read on a control board, for instance, from this RTD.

Q. In other words, even if the temperature of the RTD were, say, 1000 Fahrenheit, it would read 700 on the board?

A. Yes, or slightly above. It would certainly peg the meter, yes.

Q. Okay. That is, push it to its maximum?

A. Yes.

Q. Okay.

Now, the resistance temperature relationship of this wire is established by experiment; correct?

A. Each RTD is calibrated.

Q. You actually take known temperatures and measure the resistance of the various temperatures for the wires in each RTD?

A. Yes. There is a series of points where that is done, and a curve is calculated over the entire range.

Q. And are there sort of limits of variation, or can you adjust the signal processing to account for any

WRBwb6

variation in this resistance temperature curve?

A. Each RTD will be slightly different, and the downstream signal processing will be adjusted to accommodate that, yes.

Q. So it's basically custom matched to each RTD in place?

A. There's a slight difference, yes.

Q. So that involves some kind of programming or adjustment of-- By "downstream," I take it you mean back toward the control panel, the readout?

A. Yes.

Q. --that some adjustment of that is necessary for each RDT when they're installed?

A. Yes.

Q. Okay.

And if the RTDs were replaced you'd have to re-adjust for the new RTDs going in; right?

A. There would be a slight adjustment, yes.

Q. Is any of the signal conditioning equipment that you talk about here on page 4 actually inside the RTD assembly?

A. No.

Q. Okay.

So basically you put a voltage and current in across that wire, and it produces a resistance, and then you

WRBwb7

take the output -- that is, what comes out, having gone through that resistance from the RTD, and then you go off someplace else and do your signal conditioning; right?

A. Yes.

Q. Okay.

You refer in your Answer 8 to the RDF Corporation. Is this related to Westinghouse in any way? Is it a subsidiary?

A. No.

Q. What kind of quality control is specified for the RTDs in their manufacturing?

A. There are certain release points specified in any quality control program. I believe the primary one here would be on the calibration of the RTDs.

Q. Okay.

In other words, to make sure that the calibration of the resistance temperature curve was accurate?

A. Was done according to approved procedures, yes.

Q. Okay.

Well, doesn't the approved procedure specify some range of accuracy that will be necessary?

A. Yes.

Q. Okay.

About what is that range? What's the margin of error on these things?

A. Each calibration point is specified as .02 degrees Fahrenheit, and the total calculation then would yield an accuracy on the order of .2 degrees Fahrenheit.

Q. Okay.

So at each point when you measure the physical resistance the temperature there has got to be determined between within .02 degrees Fahrenheit?

A. Only at the actual calibration points. That accuracy really establishes the accuracy of the facility itself.

Q. Calibration facility?

A. Yes, at the vendor. The total calculation on a curve would define the accuracy of the individual RTD, which is .2 degrees Fahrenheit.

Q. Okay.

You can test it in practice against some other kind of temperature measuring equipment and see that that accuracy is confirmed?

MR. O'NEILL: Objection, Mr. Chairman, to this line of questioning. It has been going on for some time now about the accuracy of RTDs quality control. This is a very narrow issue that we're discussing. It is the Arrhenius methodology for thermal testing for environmental qualification of RTDs, and, tc that extent, two organic compounds in the RTD. This line of questioning is not at all

AGB agb2

relevant to rhis contention, and given the number of witnesses and the time constraints, we might focus on the issues that are really relevant.

MR. EDDLEMAN: I'm basically done with this line, but I would say that I think it is relevant in terms of establishing what kind of accuracy these things have, or have to have, to then say what kind of deterioration might be significant. That's where I'm going.

JUDGE KELLEY: Is one more question going to do it?

MR. EDDLEMAN: I think so.

BY MR. EDDLEMAN:

Q Do you recall the question?

JUDGE KELLEY: You can restate it. And then move on to some other line.

MR. EDDLEMAN: Okay.

WITNESS DAKIN: Pardon me; may I interject?

Regarding a statement that you made, I think you repeated this accuracy, and I think Mr. Miller said it was .2 degrees; right?

MR. EDDLEMAN: --for the overall...

WITNESS DAKIN: But you said .02.

BY MR. EDDLEMAN:

Q I thought that each point he said on this measurement was established as .02 with an overall accuracy of the instrument itself as .2.

A. (Witness Miller) Each calibration point is 02, yes.

Q. And the overall --

A. And the overall after the curve is calculated would be .2 degrees Fahrenheit.

Q. Okay.

Now the bypass lines into which these things are inserted, are they actually physically connected to the reactor coolant system?

A. Yes.

Q. How close are they to it, where the RTDs were set?

A. I don't actually know the physical dimension of the bypass line, I assume it is relatively close to the main coolant system.

Q. What you are doing is measuring the temperature of the main coolant, right?

A. Yes.

Q. And you would want to measure it close to the source, correct?

A. Yes.

Q. And it says: "These RTDs are directly immersed...," that means in water, correct?

A. Yes.

Q. And it says that they are used "...to provide rapid time response measurements for use in the

reactor protection and control systems."

Does that include automatic controls as well as notifying the operators?

A. Yes.

Q. If these things were in error, could that lead to problems with the operator response to the control functions?

A. I'm not sure what you mean by "operator's response to the control functions."

Q. Let me split this into two questions:

If there were an error or a failure of the RTDs, could that lead to erroneous or improper response of control functions that they tie into directly?

A. It would depend on the nature of the failure. The control system in the plant auctioneers signals from each of the three loops to perform the control function. So the system is set up to anticipate perhaps one failure without adversely affecting the control system.

Q. All right.

Now as to the indications to the operators, those could be off if the RTDs that were the source of the basic information had failed, correct?

MR. O'NEILL: Objection. Mr. Chairman, again I am going to object to this line of questioning. The contention is a very narrow one with respect to the thermal

aging methodology employed in environmental qualification of RTD's.

The use of the temperatures that these RTDs send to the control room and how the operators respond to it and anything along the lines of the last series of questions is outside the scope of this very narrow contention.

MR. EDDLEMAN: I will drop this part here because I think I have established what I needed to.

Let me just ask to tie it up though --

JUDGE KELLEY: I am going to sustain the objection. Just go on to the next one. I don't think it has anything to do with this contention.

MR. EDDLEMAN: All right.

BY MR. EDDLEMAN:

Q Gentlemen, this contention is about the environmental qualification of these RTDs, correct?

A. (Witness Miller) It is about the thermal aging procedures used, yes, as I understand it.

Q Let me see if I can find my copy of....

Do you gentlemen have a copy of Contention 9?

MR. O'NEILL: Mr. Chairman, to help Mr. Eddleman out, on page three of their testimony 9C is quoted.

MR. EDDLEMAN: I am referring to the entire contention.

BY MR. EDDLEMAN:

Q Do you have a copy of that available to you?

A (Witness Miller) Not in front of me I do not.

MR. EDDLEMAN: I think it is in the record elsewhere so I will just drop that and then go on -- or will be in the record.

BY MR. EDDLEMAN:

Q Now the temperature of the reactor coolant on the hot leg side, I think you said, was a maximum of about 650, Mr. Miller, correct?

A (Witness Miller) That could be a maximum, yes. I estimated the number.

Q What is a typical operating temperature on the hot leg of a plant like Shearon Harris?

A I believe the range of the hot leg RTD, the range that you would read out would be the maximum of 620 to 630 degrees Fahrenheit.

So I would say a fair estimate of the maximum would be in the low-600s somewhere.

Q All right.

What about the cold leg?

A It is below 550, probably 540, 530.

Q All right.

Now are equal numbers of these 18 RTDs in the hot legs and the cold legs -- and is it nine on the hot legs and nine on the cold legs?

A. Yes.

Q. Then you also say there are six of a slightly different model RTD installed in wells located in the reactor coolant system piping.

Now do these wells go actually into the primary coolant loop?

A. Yes.

Q. So those six are even more directly exposed to the primary coolant than the others?

A. I am not sure I understand your meaning. The wide range RTDs are installed in wells. They are not exposed to the actual fluid; bypass line RTDs are exposed to the actual fluid.

Q. Let me see if I understand this.

Is the well itself some kind of an enclosure that extends into the fluid and then these six RTDs are mounted inside those wells?

A. Yes, that's true.

Q. And what is between the RTD and the fluid, is it metal, is it metal and then air or...

A. It is primarily metal. There might be a slight air interface depending on how well the RTD fits into the well.

Q. Okay.

Is the RTD designed to fit pretty closely into these

wells?

A. Yes. It is not required to have a very rapid time response. The wide range are used for monitoring functions only.

Q. Let me be sure I'm not confused again. The wide range ones are the first 18 or the last 6?

A. The last 6.

Q. So would it be proper to refer to the first ones as the narrow range ones?

A. Yes.

Q. But both would have the same basics that we discussed above about the primary element and the signal conditioning and so on, correct?

A. Yes.

Q. Now at the top of page 5 you then say that the construction is shown in figures one and two attached to your testimony, correct?

A. Yes.

Q. Let me ask you -- first though, Dr. Dakin, you were talking about radiation as an effect. Where these RTDs are is an area of radiation from the primary coolant, is it not?

A. (Witness Dakin) I think that Mr. Miller's very qualified to answer that

Q. Mr. Miller, can you answer?

A. (Witness Miller) Yes.

Q. The answer is yes?

A. The answer is yes.

Q. Now, let's turn to figure one, please, first, if we may.

Now, I gather that this is somewhat reduced from the actual blueprints -- I'm having a little trouble reading up in the top of the corner of that, but Mr. Miller, are you familiar with the times or the revisions of this blueprint?

A. Familiar with times, did you say?

Q. Times -- when it was revised. What I'm getting at is, does this blueprint represent the actual current version of the RTD's which are installed at the Harris plant?

A. Yes.

Q. Okay, and these are physically installed now?

A. I don't have that information as to whether they're physically installed right now, no.

Q. Okay, but they're the ones that -- have they been delivered to the Harris plant, do you know that?

A. To the best of my knowledge, yes.

Q. Okay, but do you have specific knowledge?

A. No, I do not ship the RTDs.

Q. All right.

Now, if we go through this thing from the right

/pp 3

side, you have a set of terminal lugs coming out of it, there appear to be five, is that --

A. That's true.

Q. Okay.

There are actually five?

A. Yes.

Q. Okay.

And they then tie in to an approximately one-inch assembly which appears to go into a threaded fitting; is that correct?

A. The threaded fitting is the end of the conduit that's covering the cable. I believe the one-inch that you're referring to is the cable.

Q. Okay. That's the end of the cable sticking out there with the connector to these terminal lugs?

A. Yes.

Q. It's a multi-wire cable?

A. At this point, yes.

Q. All right.

Now, how is that cable insulated?

A. Described in note 3, insulated with a glass braid.

Q. Okay.

Dr. Dakin, this is the glass braid we were talking about earlier?

A. (Witness Dakin) Yes.

pp 4

Q. Now then, are the next things back from that threaded fitting other electrical fittings on the conduit, as we go back to the left of this diagram?

A. Not electrical fittings. It is a mechanical fitting, the conduit, yes.

Q. Mechanical fittings on the physical electrical conduit?

A. Yes.

Q. Okay.

Now,is all that part of the RTD or is that just a covering of the cable that comes out of it?

A. We term this whole assembly the RTD.

Q. Okay.

Is the whole assembly put through the qualification test?

A. Yes.

Q. Now, the length of that section there appears to be 240 inches plus or minus 6 inches or approximately 20 feet, correct?

A. Yes.

Q. Okay.

And then at the end of that 20 feet, we come up to a part labeled RDF Corporation P/N 21204?

A. Yes, that's engraved on there.

Q. Now, at that pointisthat part of the RTD actually

exposed to the coolant, when the application requires that?

A No.

Q All right.

We then move into kind of another section of the RTD. Is that a mechanical connection and locknut there?

A This is a Swagelok nut, yes.

Q Are all these things made of stainless steel, the metal parts that we have been dealing with here?

A Yes.

Q Is it all Type 316 as shown on the diagram up there toward the top?

A The immersed part-- I don't recall if the stainless steel bellows is identified as the conduit on the cable, that covers the cable. I don't recall it.

Q Now do I take it from your answer that the immersed part then is beyond that locknut?

A Yes.

Q So that that little thing that sort of looks like an old-fashioned thermometer sticking out there, that is the immersed part of the RTD. Right?

A Yes.

Q And at the very end it indicates a diameter of .220 inches.

MR. O'NEILL: Objection. This line of questioning is objectionable, one, because it is self-evident. We put this particular diagram in for the benefit of anyone who did not know what an RTD looked like, and there it is. And asking questions with respect to it as "Are those five terminal lugs?" and everyone looking at it and saying "Yes," as we went through this is objectionable as repetitious and it just takes time.

The second objection is that this contention goes to the environmental qualification by thermal aging of two organic substances or materials on these RTDs. And all of the questions about the lug nuts and whether the little thermometer is inserted into the well is simply irrelevant for purposes of getting to this issue.

JUDGE KELLEY: Mr. Eddleman.

MR. EDDLEMAN: I think that when we are talking about things like temperature transfer through a complex part and various methods of deterioration and thermal expansion and all these sorts of things that Dr. Dakin said you'd need to consider in qualification that is worth getting a clear description, clearer than just anybody could read from this thing, necessarily into the record.

I am willing to drop that last question and go

on to what Mr. O'Neill seems to be pointing at, which is the epoxy part of this at this point.

JUDGE KELLEY: I think what is appropriate here may be a general observation.

I think Mr. O'Neill's point about much of this being self-evident is well-taken. Where in particular something like a dimension is shown and then you say "Isn't this .220?" and everybody can see that, I think that is a waste of time. So I think a lot of these-- The questioning on what this diagram means could have been a lot shorter than it was.

We have done it now but for the future, the Board is going to ask you to bear in mind that much of this material is, if not crystal clear, then reasonably clear. And we think that given that we have got 25 adults in the room, it is a lot of wasted time when you add it all up to go over each point.

As to the second part of it, I think we will have to take that piece by piece.

We would like to take a short break because we are dividing the time between now and 12:30, and 12:30 is too far away. So why don't we take about five minutes and then come back and then we'll go to 12:30.

Could we see Mr. Eddleman and Counsel at the table for a moment informally?

(Recess.)

JUDGE KELLEY: Back on the record.

MR. O'NEILL: Mr. Chairman, I would like to correct one thing on the record.

There was some confusion. Mr. Eddleman asked some questions referring to what was referred to in our testimony as the Sandia report by its NUREG number. Dr. Dakin was not familiar with that NUREG number and answered some questions which indicated he was not familiar with that NUREG.

He is indeed familiar with the Sandia report, and Mr. Eddleman and I discussed that, and we will refer to it as the Sandia report, and any testimony in the record should clarify that the Sandia report is the NUREG and Dr. Dakin certainly has read it.

JUDGE KELLEY: Thank you. I think that clear it up.

All right, Mr. Eddleman.

BY MR. EDDLEMAN:

Q Dr. Dakin, the Sandia report is described by its NUREG number on page 2 of your testimony, is it not?

A (Witness Dakin) Yes.

Q And do you have that report with you now?

A I have it here, yes.

Q Okay.

Now I had asked you before I think which

precautions mentioned in the Sandia report were discussed in your papers, and you have already described some of those.

Are there others that come to your mind on looking at the report?

A They are the principal ones. If you have-- You can have-- This was stated 30 or 40 years ago, that if you have parallel reactions, one is always going to go faster than the other, and usually that one will be the one that controls the thing.

Sometimes they both cause deterioration but it is seldom that parallel reactions ever lead to a difference in slope with increasing or decreasing temperature.

The problem comes up primarily where you have reactions that occur in sequence, one of which is maybe slower than the others. It is like a bottleneck on a highway; if we have a lot of fast cars and then come to the bottleneck and everything slows down, although in chemical systems, in insulation systems, it is usually the case, though, that in some higher temperatures, certain reactions go faster than others. At lower temperatures if the activation energy is high, they may go slower.

So that's the concept that makes it possible to treat, in a relatively simple way, complex systems. But you have to realize that sometimes, in a few cases, that there may be this sort of thing happening, and the NUREG Sandia

report points this out.

But I have already pointed this out and repeated it in many meetings, and it is understood by most people. So the Sandia report is sort of old hat.

Q To you, Doctor. Is that right?

A That is correct.

Q Did you put the sorts of precautions that you talk about in your papers into this Westinghouse generic methodology for setting up test procedures?

A Only in reviewing afterward. Only in reviewing the method that had been set up by my colleague, Mr. Miller, did this point -- was this point considered because I was not participating with Mr. Miller in the stages of setting -- applying this method to the systems that he's been dealing with.

It was only after the things were set up that I reviewed it.

Q Okay.

Mr. Miller, I can ask. Do your generic procedures for setting up testhing methodology incorporate the precautions that Dr. Dakin has been talking about here with respect to the Sandia report and his papers -- and his papers?

A (Witness Miller) Just to clarify what our generic procedures do, we rely on materials testing for the selection

of activation energy for our test program. So our test program is not designed to test materials, it is designed to test assemblies, so we rely on previous testing to establish the guidelines.

Q Well, does that mean that, say, for establishing a guideline of whether the Arrhenius method works for certain insulation that you compare an accelerated aged sample to a sample that had actually been aged under the same conditions for, say, 40 years?

A No, we would use the results of materials testing that established Arrhenius plots for the materials that we're using.

I read the Sandia report as applying to those types of tests, materials tests, not assemblies of electrical equipment.

Q Well, when you test the assembly you are testing all the materials in it. Correct?

A Yes.

Q Okay.

Dr. Dakin, again having gotten ahold of a copy of this Sandia NUREG report, do you have anything to add to the other precautions that you discuss on page 2 of the joint testimony or in your papers that may not have been in the Sandia report beyond what your discussion was earlier?

MR. O'NEILL: Mr. Eddleman, I don't understand

that question. Could you please repeat it?

MR. EDDLEMAN: It is the same kind of question that I asked him about the precautions that had been mentioned in the Sandia report that were in his papers.

And I said now that you have gotten ahold of a copy of the Sandia report, do you have anything to add to that?

And then there is another statement here. He says, "There were other precautions that were also discussed in my papers."

BY MR. EDDLEMAN:

Q And I am saying now that you have got a copy of the Sandia report, Dr. Dakin, do you have anything to add to that answer that you gave about other precautions?

A (Witness Dakin) The specific one that I might mention, which I don't think is necessarily relevant to this particular application to the RTDs is that in testing systems you sometimes change the measurement criterion, either-- Well, for example, you mentioned cycling.

If the number of cycles were a function of temperature then that might change the result. In other words that's a factor, say, like a test procedure or a qualification. And if the number of cycles change, depending upon the temperature of accelerated testing, then that may affect the slope in some -- it has been seen to affect the

slope.

But it hasn't occurred often and I don't think it is a problem in this application.

Q Okay.

Have you reviewed the thermal cycles used in the testing of these RTDs, Dr. Dakin?

A I have heard this from Mr. Miller and I think that the amount of cycling that goes on is very minimal for this particular application.

Q So five cycles a year in this application would be a minimal amount of cycling in your opinion?

A That is correct.

Q The cycling does put some vertical stresses on materials, does it not?

A It probably does. I don't think they are particularly significant in this particular RTD.

Q All right.

What-- Strike that, please.

Dr. Dakin, may we turn to the prepared testimony on page 7?

Beginning there with Question and Answer 16, you discuss the Arrhenius methodology a little bit.

The Arrhenius temperature dependence of chemical reactions, is the rate in that the rate of reaction, down at the bottom of the page in that equation?

Do you have that in front of you?

A Yes.

Q Looking at that equation, is "rate" over on the left side the reaction rate, that is, how fast the chemical reaction is going?

A That is correct. However, the rate that is measurable and is significant insofar as the system is concerned, or the insulation material, is some thing that is proportional to that. In other words, the application of the methodology implies that there's a proportionality between the chemical composition and its changes and a physical effect that you can observe.

Q All right.

And these little squiggle lines like the one that appears between "rate" and "EXP" in that equation, those mean proportional?

A That is correct, yes.

Q So if I am translating this into English, it says that the rate of the reaction is proportional to the exponential function of the quantity in parentheses there, negative E/KT.

Now in that "E" is the energy?

A That is an energy. It is commonly referred to as the activation energy.

Q Okay.

And this is the same activation energy that Mr. Miller said was measured experimentally for these methods. Correct?

A That is correct.

Q Okay.

Now "K" there is a physical constant. Correct?

A That is correct.

Q A Boltsmann constant?

A Yes.

Q Okay.

MR. O'NEILL: Mr. Chairman, if Mr. Eddleman would turn the page, all these terms are defined and are spelled.

MR. EDDLEMAN: I'm sorry.

B10

Q Now when it says, Dr. Dakin, if we can turn over to page 8, it says up there after the terms are defined:

"The activation energy is characteristic of the material and the significant chemical change."

End o

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Take 10

Does that mean that for each kind of chemical change that you'd have in a material, you might have a different activation energy but this is the dominant one?

A. (Witness Dakin) That is correct.

Q. And going back to your bottleneck analogy, that is the one that determines the overall rate of change?

A. Yes.

Q. And do those activation energies differ with temperature at all?

A. Normally they don't and it is assumed that they are constant over the temperature range of which we are operating between accelerated temperature and any service temperature. This has been found to be experimentally correct in most cases.

Q. All right.

Do you know whether experiments to verify that were done on the epoxy that is used in these RTDs?

A. The verification of this constancy usually is a fit to a log time versus reciprocal calvin temperature graph. If the experimental data fall on a straight line on such a graph such as in figure C there, in our testimony, then it is assumed that this activation energy is constant.

MR. O'NEILL: Mr. Chairman, just for the record, Dr. Dakin said figure C. I believe he was referring to figure 3 which is attached to his testimony.

BY MR. EDDLEMAN:

Q. That is correct.

And Doctor, if we may refer to figure 3 which, I believe is the last page attached to your joint testimony here, I take it that this is actual test data of the number of hours specified here?

A. (Witness Dakin) Those are actual experimental data. They are taken from NEMA, a NEMA report, which -- it was a project at the University of Delaware to test a lot of epoxy and other laminates, aging tests. And the data -- our graph is a function of time. The di-electric strength or flexual strength is measured as a function of time and from these curves data points were taken at specified levels of the initial di-electrical or flexual strength.

And those are the points that are plotted.

Q. All right.

Now, by points that are plotted, do you refer to these little cross marks on the dark line on that figure?

A. That is correct.

Q. Okay, so we have one at 40,000 hours up on the left?

A. Yes. It's five years, approximately.

Q. Correct.

A. Yes.

Q. And the lowest one, I believe, comes down to 600 hours, which is a little less than a month, right?

A. That is correct.

Q. Okay.

Now what particular epoxy -- well, it shows a grade of epoxy laminate, is this the identical epoxy laminate that's used in these RTDs?

A. No, it is not.

Q. Do you know if tests were actually done in this University of Delaware project or anywhere else on the exact epoxy laminate used on the Harris RTDs?

A. No, this particular epoxy was not tested in this particular way. But similar epoxies of similar chemical structure, quite a variety of them, have been tested by the University of Delaware laboratory and are reported in the data from this project.

Q. And you just picked out one of them for an illustration here, is that correct?

A. That is correct.

Q. Okay.

A. However, data on similar ones don't vary too much from that.

Q. All right.

Now, it appears to me that there is virtually no variation off this curve at all, Doctor. When you see experimental data that comes out that perfect, does it strike you as a little unusual?

A. Well, I think that -- I wouldn't say it's unusual. It doesn't happen as often as it does otherwise. Because usually the data is somewhat more scattered. But there was no contriving -- I plotted this curve myself, and I looked at four other curves, which plotted the di-electric strength as a function of time. There were a series of measurements and I just picked off the value where it went through 50 percent of the original value.

Q. Okay.

And you plotted this one yourself?

A. Yes.

Q. Okay.

Now, if took those data, did you also pick off, say a 25 percent of a 75 percent value and plot those?

A That is often done. And there exists papers and publications giving this type of data.

Q. All right.

Is this NEMA report a proprietary report of any sort, do you know?

A. I don't think so.

Q. All right, thank you.

Dr. Dakin, as long as we're back here at the back, I wanted to ask one thing about these epoxies with reference to figure 1. And Mr. Miller may be the best person, but either of the Panel who knows, please answer.

On this diagram, where is the epoxy that we're talking about? Where is it located?

A. (Witness Miller) It is described in the testimony in answer to question 10 on page 6.

Q. Okay.

It says, "The organic materials in the external cable and cable interface." Now, on this diagram, where does the cable interface begin from the end that actually sticks into the fluid on this one?

A. The cable, if you are referring to the part that's covered with the glass braid as the cable --

Q. Well, I'm asking about the part that has the epoxy in it. Is there epoxy in the cable interface also?

A. The epoxy is at the point where the cable interface takes place.

Q. So the interface is made out of epoxy, is that what you're saying?

A. Well, it's the protective coating, if you want to call it that, at the interface.

Q. All right. It's coated with epoxy at the interface.

A. Well, it's actually filled with epoxy at the joint where the cable is connected to the wires that come from the tip of the RTD.

Q. So the cable comes in and connects to some wires that are coming right out of the RTD there, where it says

RDF Corporation, i s that where that is?

A. It is right in that location, yes.

Q. Okay.

And that is where the epoxy first is, it fills that connection up, correct?

A. Yes.

Q. Okay.

And where else is epoxy along this diagram?

A. That's the only spot.

Q. Right there at that seal? Not at the other end of that cable?

A. No.

Q. Now, if we look just briefly over at figure 2, and is the cable interface also in that little part marked RDF Corporation on that one?

A. Yes.

Q. Okay.

And on this one likewise, is there no other place along there that epoxy is used?

A. That's true.

Q. Now, the glass braid covers the whole cable from that point back to the other end, in both cases, back to the end where the lugs are?

A. Yes.

Q. Okay.

Now, I'd like to come back to Dr. Dakin again, if I might. Doctor, I believe you said that thermal aging could involve more than one temperature dependent process at a time, am I right about that?

A. (Witness Dakin) Yes.

Q. All right, sir.

Let's see. Let's come back to your page 8, if we could. We analyzed deterioration by these chemical or other means. We're actually talking about a physical change like, say, deterioration of insulating value or physical deterioration of the seal, are we not?

A. That is correct.

Q. And that would result from the chemical reaction or reactions in other things that the material is actually exposed to?

A. Yes.

Q. Okay.

And what you're trying to do is simulate that over a 40-year normal operating life plus, I think it's a year under accident conditions, is that correct?

A. Yes.

Pardon me, I don't think that the 40 years is correct. It is qualified for 20 years.

Mr. Miller, isn't that correct?

A. (Witness Miller) In this particular instance, the

maximum qualified life is 20 years. That is what happened to be selected for this program, yes.

Q. In the plant -- Mr. Miller, if you are still the right person, please answer -- in the plant, it's -- I don't know if it is designed life, but the kind of life that you use in these qualification tests, typically would be 40 years, wouldn't it?

A. Not necessarily, no. We're required to define a qualified life or class 1-A electrical equipment.

Q. Well, I'm not asking you about the equipment. I'm asking you about the plant. The plant life's 40 years?

A. Yes, but that does not necessarily mean to me that this RTD has to be 40 years. That's where I'm confused.

Q. All right.

So you've only qualified it for 20 years?

A. For the one for the bypass line, that's true, yes.

Q. What about the others?

A. The wide range RTDs are qualified in our generic program for 10 years.

Q. Ten years?

A. Yes.

Q. Is that mentioned anyplace in your testimony?

A. Yes.

Q. Okay. I don't need to look it up, I'll just take your answer. I'm trying to save time.

In the Delaware tests that were done in which you drew some data from to make your figure 3, did any of that work involve trying to figure out what actual chemical reactions or diffusion or other physical processes were going on in that material?

A. (Witness Dakin) No, this was rather an empirical type of approach that was done there. It was sponsored by the NEMA, the National Electrical Manufacturer's Association to rate these materials for use in electrical equipment.

Q. Were those NEMA tests done in a radiation field and with cycling and done of the manner in which these RTDs would be exposed?

A. There may have been some of them done this way. I'm not familiar with all of the data from this project. But the ones that I've seen and been referencing were not done with -- well, cycling usually occurred because in order to test the materials they had to cycle them. But radiation, so far as I know, in these specific tests was not present.

Q. What about the moisture levels to which these samples in these NEMA tests were exposed?

A. The moisture levels were not controlled so far as I know. However, if you're aging in an oven in an elevated temperature, the absorption of moisture is very minimal.

Q. It tends to dry it out, doesn't it?

A. Yes.

Q All right. Thank you, Doctor.

On page 9 you say:

"After the linearity of the Arrhenius graph is confirmed for a material, then short time more accelerated tests are acceptable to evaluate small changes in materials or application condition."

Is the change of going from two to 20 years a small change in your opinion?

A The data, much of it, goes beyond two years of actual testing. In fact you pointed out in Figure 3 there that the lowest data point was five years.

Q On that one, right.

A And it is conventional to accelerate or to extrapolate to those extents, unless you have a good reason for believing that it is not going to be a problem.

Q By "those extents" do you mean like from five years to 20 years or from--

A No, from one or two years to 20 years is common in the industry.

Q Now--

A What really is done in the industry in this kind of testing, tests usually are done for at least about a year before a material is put into service, and the tests are continued to confirm that-- I mean they may go five years

beyond -- I mean four years more in the actual testing after they've decided that the material may be acceptable. This is the practice in the industry.

Q Let me ask you this:

You are talking about linearity being confirmed for material on that page. Have you ever taken samples of material from an actual operating nuclear reactor or a reactor that has operated, something that might have been taken out for replacement or something like that, and tested the deterioration of that material to see whether it corresponded to this Arrhenius result?

A I think that has been done. The only case I can cite actually had to do with this RTD here because the RTD, after having been exposed to the accelerated qualification aging under Mr. Miller here, was recently cut open and the epoxy was examined. And it was in very good condition, very strong. And there was no-- This was a qualitative examination.

Q It was not a chemical examination?

A No.

Q Of its physical properties?

A Its physical properties. It appeared to be intact and looking as well as it did when it was put in.

Q It was an examination really of its appearance then?

A Well, and poking it, and things like that.

Q But you didn't actually measure its --

A No, I didn't do that. One of Mr. Miller's colleagues did this.

Q Okay.

And this sample you're referring to is the one that was put through the accelerated aging test. Right?

A That is correct.

Q Okay.

I'm trying to find the rest of Dr. Dakin's statements in here if I can.

I believe, Dr. Dakin, that you take up again with the answers about Question 25 on page 13.

The Sandia report there is identified by its NUREG number first. Correct?

A Yes. But I am not an alphabet man myself. I have become familiar with it only as the Sandia report even though it has the NUREG number on it.

Q You didn't prepare the question, you just prepared the answer.

A That is correct.

Q What is the date of this report?

A I don't see the date here. It was not too long ago.

Q Okay. In any event, the report can speak for

itself about what the date was. I don't want to take your time up just digging for it.

A It is not on the first page of it.

Q Does it happen to have a contract on it, a Sand number?

A Yes. It was supported by the U. S. Department of Energy under contract Number DAC04-76-DP00789.

Q That is a number I think we can easily forget. What I was wondering is does it have an Sand number on it? Does it say NUREG/CR-1466? Does it have a Sand--

A Yes, it has at the top "Sand 79-1561."

Do you not have the Sandia report there?

Q I don't have it with me. That is one of the problems with putting you guys on earlier, but I'm trying to do that for your convenience.

Doctor, you said that report -- in Answer 26 you said that report:

> "....discusses possible conditions which would invalidate the use of this (Arrhenius) relation for extrapolation from accelerated aging tests."

Now the extrapolation is what we just discussed a minute ago. Correct?

A Yes.

Q Okay.

The extrapolation over a factor of 10 in time, say, from two years to 20 years. Correct?

A Yes.

Q And the Arrhenius relation is this relation of the rate being proportional to negative E/KT that you've mentioned earlier.

A Yes.

Q Okay.

Are the possible conditions that the report discussed, the Sandia report, all covered in your previous papers on this--

A I think most of them are, similar conditions.

These conditions, as I say in my testimony, do not appear to exist in the RTDs because they are sealed and the insulation materials, both the silicon and the epoxy, are not as exposed to absorption of moisture from the atmosphere.

Q Are you familiar with any studies of moisture intrusion made by Sandia or for the NRC?

A No, but we have made such studies on some of our own equipment in Westinghouse.

Q Have you done a study on-- Has Westinghouse done a study -- let me ask both of you -- on moisture intrusion on these RTDs?

A I haven't.

A (Witness Miller) I'm not sure I understand the question.

Q Has Westinghouse made a study of moisture intrusion into the cable or cable connector end where the epoxy is on these RTDs?

A I don't really understand the word "study." I guess we have required these cable leads to be sealed.

Q ANd you haven't studied the conditions under which moisture actually might get in those seals?

A I can't anticipate the conditions because we require them to be sealed. That's true.

Q Seals on at least some electrical equipment do fail in your experience, don't they?

A Well, the reason we require these to be sealed is to protect the cable from the moisture.

Q All right.

And how is the sealing accomplished?

A That's at the discretion of the customer.

Q By "customer" do you mean the utility or CP&L in this case?

A Yes.

If you'll refer to the drawing,--

Q Yes, sir.

A -- for instance on Figure 1, we have indicated on there the sealed enclosure should be provided around the

lead wires to the right of the drawing there.

Q I see.

And that's on the back end of it where the terminal lugs come out.

A Yes. And that essentially would seal the cables.

Q All right.

And the same would be true on Drawing 2 for this little dashed enclosure there on the right side of that one?

A Yes.

Q Figure 2 I mean.

JUDGE CARPENTER: Mr. Eddleman, I hate to interrupt but we promised Staff that we would break for lunch at 12:30.

MR. EDDLEMAN: This is a good time, Judge.

Over the lunch break I would like you to consider the following:

I believe the testimony says that for epoxy resins there is no evidence that moisture reactions have any pertinence whatsoever.

This line of questioning about seals for moisture with respect to epoxy potting compound I don't see as making a very useful record. I would like you to think about that before we resume.

MR. EDDLEMAN: Okay.

JUDGE KELLEY: We will take an hour for lunch.

(Whereupon, at 12:32 p.m., the hearing in the above-entitled matter was recessed to reconvene at 1:32 p.m. the same day.)

AFTERNOON SESSION

(1:34 p.m.)

JUDGE KELLEY: We are back on the record. We have got a ruling on one pending matter and I would like to note a couple of procedural things and other things of that nature that might be noted now in the expectation as we get up towards quitting time and people may be anxious to leave and not interested in talking about things like this.

We had already said that we would stop today at quarter of 5:00. We intend -- to repeat about next week: we will be here Tuesday, Wednesday and Thursday. We may be here Friday. We had, at least a tentative offer of the Bankruptcy Court next Friday in town. There seems to be some sentiment that that is a better place to meet.

I was going to check with the Judge's secretary again the middle of next week and I will let you know what they have to say.

But there is a chance, if the parties would rather be in Raleigh, that we might do that next Friday. We can poll you the middle of next week.

On Tuesday, we would like to start here at 9:30 rather than 9:00, simply because those of us from Washington can get a plane along about 8:00 that gets in about 8:50, if it is on time, and that would enable

us to be here at 9:30.

I think we can assume that that is usually more or less on time, it may be a few minutes late because that is kind of a crowded time of day at National, but rather than come down here a whole extra day that is what we would like to do and I know there are others of you who may want to do the same, so that is what we want to do on Tuesday.

Just to repeat the open items that we are aware of for Tuesday: we have a pending motion to change the emergency planning schedule and that really depends upon whether other parties can respond or whether we can poll people by then.

Are you in that process, Mr. Baxter?

MR. BAXTER: Well I discussed it briefly with Mr. Runkle and Mr. Eddleman yesterday, but as to Dr. Wilson and Mr. Reed, I think I am going to have to wait until they receive the motion in the mail. It was mailed from Washington yesterday, so I may not have gotten around to everybody by Tuesday morning.

JUDGE KELLEY: I guess time isn't of the essence. We would like to speak to it sometime next week, whenever. Why don't you just let us know when we have a response from everybody? I suppose written responses will get served and maybe they can be transmitted

to some extent through other Intervenors, I don't know.

But whenever you think that we are ready to talk about it, just let us know and we can docket it at that point.

The other thing is this FOI response concerning SALP IV. I believe Mr. Barth said that a final response was expected next Monday, is that right?

MRS. MOORE: Yes, that's correct, your Honor.

JUDGE KELLEY: And it might be obvious, perhaps it is not necessary to say, but if there is such a response Monday could you bring along some copies on Tuesday?

MRS. MOORE: We will try, your Honor. It will depend I think a little bit on when the document actually issues out of Washington. Because we are now scheduled to leave Washington on Monday around noontime, and if they haven't issued it at that point we wouldn't be able to do it, but we will get it down here as soon as we can.

JUDGE KELLEY: Okay. I think assuming we can get it here Tuesday or Wednesday, we might as well wait until we see what that actually says before we try to talk about the subject. But we would expect then to hear from the parties and make some procedural disposition of how that is to be dealt with.

The ruling that we have concerns Mr. Eddleman's proposed exhibit numbers 2 through 9, I believe it is --

MR. EDDLEMAN: Yes.

JUDGE KELLEY: - and I am referring to those Xerox copies of the portion of the 1981 fire protection code.

That was argued yesterday and there were objections from the Staff and Applicant basically on the ground that they argued that the fire code was irrelevant and pointed out that Mrs. Serbanescu had testified to that effect. We acknowledge that testimony.

In making this ruling, we are assuming that the applicability of those code provisions is arguable at least, and what we are going to do is what we suggested we might do yesterday at page 4577 of the transcript:

We are going to allow those exhibits in, Eddleman 2 through 9 for a limited purpose. Not for general evidentiary value but for the purpose of demonstrating that there is indeed such a code and that these are authentic Xerox copies -- we don't hear anybody suggesting they are not authentic -- and that they say what they say.

We are not letting them in for the broader purpose of proving any particular technical issue on the merits. To give an example, that code may say that

tanks shouldn't be bigger than 660 gallons and the doors ought to be three feet thick; letting that code in doesn't prove that proposition one way or the other, it simply proves that some code authority thinks that.

We are also going to allow the Staff and Applicants, if they wish to do so, to put in for the sake of context other parts of that same code which might shed some meaning on the question of applicability: definitional sections, things of that sort.

We would then have before us the sections that any party considers pertinent -- not to say applicable -- and we can decide in that light whether they are applicable or whether they are not.

And if we decide they are not applicable, that will be the end of that. And if we decide that they are, we can then consider whether the record that we have developed is adequate to address the significance of that applicability or whether it is not. And we won't attempt to cross that bridge at this time. But for the narrow purpose I have described, we will allow them in.

(Whereupon, the documents previously marked for identification as Eddleman Exhibits 2 through 9 were received in evidence.)

JUDGE KELLEY: Is that clear?

MR. EDDLEMAN: I am not sure I fully understand it, I think I do. I can look it up in the transcript.

I would like, to the extent that it may be necessary, to just make formally the offer of proof of those exhibits to the extent that they weren't admitted for evidence of --

JUDGE KELLEY: I don't think it would be because in letting them in for the purpose we are letting them in, it gets them in the record. And the only purpose of an offer of proof is to get in front of an appellate body what it is you wanted to get in.

MR. EDDLEMAN: I see.

JUDGE KELLEY: Well it is there, they can see it.

MR. EDDLEMAN: I am covered both ways.

JUDGE KELLEY: Right. In that sense.

Any questions?

MR. O'NEILL: With respect to any other sections of the code that we might want to reference, could that be done with proposed findings if we want to deal with that issue and attach to them a page or two out of the definitions?

JUDGE KELLEY: That is probably the simplest way. Yes, you don't have to come in with a counterexhibit next week, you can go ahead and look at the code and see what you think you might want to put in, but I think

maybe the simplest way would be in findings.

MR. O'NEILL: Thank you.

JUDGE KELLEY: Okay.

Is there anything else we should raise right now apart from the coming testimony of this panel in the expectation we might not want to -- might have trouble finding time for anything else toward the end today?

(No response.)

JUDGE KELLEY: Okay. Seeing no hands, Mr. Eddleman, do you want to resume?

MR. EDDLEMAN: I am trying to take most of Dr. Dakin first and I think I am just about done unless I have forgotten something significant. At any rate, I think we are going to be okay with getting Dr. Dakin free at the end of today.

JUDGE KELLEY: Fine, we appreciate that.

Whereupon,

RICHARD B. MILLER

and

THOMAS W. DAKIN

were recalled as witnesses and, having been previously duly sworn, testified further as follows.

CROSS-EXAMINATION (Continued)

BY MR. EDDLEMAN:

Q. Gentlemen, do you have a copy of Applicant's

Exhibit 8 available to you?

A. (Witness Miller) I am not sure I know what it is, no.

(Document handed to witness panel.)

A. We do now.

Q. Okay.

This is Section 3.11 in Appendix 3.11A on environmental qualification of electric equipment from the Shearon Harris Final Safety Analysis Report, isn't that what it says on its cover?

A. Yes.

Q. Just for completeness, did either of you gentlemen play any role in preparing this FSAR?

A. (Witness Dakin) I didn't.

A. (Witness Miller) Westinghouse does prepare drafts of this, yes, so it is quite possible that I did.

Q. I would like to refer you gentlemen to -- I think it is the next to the back sheet, although my copy is printed on fronts and backs -- if you come in from the back, I think you can find it easier, page 3.11B-19.

A. (Witness Dakin) This only goes up through 3.11A.

Q. I see. There is a typo on this, I beg your pardon, gentlemen. On my copy, the very last sheet is 3.11A-21, is it not?

A. Yes.

Q. All right.

Now if you will turn back, the facing sheet opposite before that appears to have down at the bottom 3.11B-19, is that correct?

A. (Witness Miller) Yes.

A. (Witness Dakin) Yes.

Q. In think in light of looking at the pages around it that that is a typo and the page really should be numbered 3.11A-19.

But be that as it may, it is in this document, is it not?

A. (Witness Miller) Yes.

A. (Witness Dakin) Yes.

Q. Now on the page that is now numbered 3.11B-19 in Amendment Number 16 -- Let me ask you if you have had a chance to familiarize yourself with the fact that Appendix 3.11A, of which this is a part, is the comparison between the NUREG 0588 guidance and what the Harris Nuclear Power Plant program does for environmental qualification of electrical equipment?

A. (Witness Miller) Yes, that is what it is.

Q. Now on this particular page B-19, if I can just refer to the last few letters and numbers down at the bottom, does it refer to the arrhenius methodology?

A. It does.

Q. All right.

And on the right side by the number 4.4 it says:

"In general, arrhenius methodology and other aging methods (when used) are supported by type test and supplementary analysis."

Correct?

A. Correct.

Q. Have either of you gentlemen reviewed any type tests or supplementary analyses supporting the use of arrheius methodology for these RTDs?

A. No, I haven't.

A. (Witness Dakin) Can you elaborate, what is a type test in this context?

Q. Doctor, I'm not sure I know. I'm not the expert.

But can I take it that you haven't reviewed anything that said it was a type test for the Harris RTDs?

A. That is correct.

Q. What about supplementary analysis, have you seen anything labeled supplementary analysis, Dr. Dakin, in your review?

A. Since becoming associated with this problem I have done a little bit of supplementary analysis, yes,

of the tests that have been made and the application of the arrhenius methodology to the RTDs.

Q. Apart from the analysis you have done yourself, have you seen any other supplementary --

A. No.

Q. Now as to the analysis you have done, was that in connection with this testimony?

A. Well I think it was some preparation for it, yes.

Q. Okay.

I guess what I am trying to distinguish is whether that was for the information that is kept by the Staff -- I mean, by the power plant or the Applicants for the NRC Staff to audit on the qualification of this equipment or whether it was in connection with your testimony here?

A. No, what I have done is purely informal and is in my position only except what I might have told Mr. Miller.

Q. Does that complete your answer?

A. (Witness Dakin nodding affirmatively.)

Q. Dr. Dakin, what assumption, if any, is made in the arrhenius thermal aging methodology for the Harris RTDs concerning the integrity of the seals that protect the epoxy in them?

A. I have not been related to that problem of the seals.

Q. Okay.

Are you aware of any tests on RTDs that have been in-service in Westinghouse-designed nuclear reactors for periods of 20 years?

A. No.

Q. All right.

MR. EDDLEMAN: Subject to check with my memory, I think that is all I have for Dr. Dakin.

But please feel free to respond to anything else when I am asking Mr. Miller.

JUDGE KELLEY: Let me just clarify then.

You heard our discussion earlier, Doctor, and I want to at least get through with your part today; you wanted to go back home. That is understandable. Mr. Miller will be back, in any event, on another panel.

Gentlemen, ladies, should be simply go ahead with Mr. Eddleman's cross?

How much time do you think it would take to finish with Mr. Miller as well, roughly?

MR. EDDLEMAN: I think I could very likely finish with him by, oh, say 4:00 or thereabouts.

JUDGE KELLEY: What I was thinking of, obviously, is we could go that way and then have the other part of

of the questioning and hopefully get the whole thing done by a quarter of 5:00, or we could stop at this point and put questions to Dr. Dakin and finish up with his questioning.

It seems to me if you were sure you were going to be done by 3:00 we ought to do the first. If you think you might be up until 4:00, maybe it gets a little risky.

What do you prefer?

MR. EDDLEMAN: I think that under the circumstances you have described, maybe we had better have everybody else go ahead with Dr. Dakin now and I will still try to wrap the whole panel up by a quarter of 5:00 for the record; you know, get my part of it done so that we can if possible. I am not committing to absolutely be able to do it but I will try.

JUDGE KELLEY: Mr. O'Neill, what do you think?

MR. O'NEILL: Either way is fine with me.

JUDGE KELLEY: Okay.

Mrs. Moore?

MRS. MOORE: Either way is fine.

JUDGE KELLEY: I think we would prefer to go ahead and put questions to Dr. Dakin and then go back to Mr. Miller. Let's see, it would be the Staff next on questions for Dr. Dakin.

MRS. MOORE: I have no questions, your Honor.

JUDGE KELLEY: Okay.

Board?

EXAMINATION BY THE BOARD

BY JUDGE CARPENTER:

Q. Dr. Dakin, a few minutes ago in response to Mr. Eddleman's question, you said that you hadn't addressed the problem of seals in this temperature sensor.

What kind of problems with seals are there?

A. (Witness Dakin) Well I am not an expert on seals, but I can imagine if there is any organic material involved in a gasket or something like that, presumably there could be. If it is a metal-to-metal seal, I don't see any problem that is concerned with my interest.

Q. I thought your answer was that in your mind there were problems but you hadn't addressed them?

A. I didn't mean to imply that there were problems. I only said that there could be a problem. I mean, all seals are somewhat vulnerable, I think, just like door seals on fire doors and things like that.

Q. In your mind, are there seal problems which could affect the qualification of this device over its qualified life of five or ten years?

A. I can't be very specific because I haven't been informed of the specific nature of the seal that is to be provided at the end of the cable. This is, I

understand, a function of the utility, isn't it?

I don't know what kind of a seal they have there, so I can't discuss it.

Q. What environmental characteristics would the seal be sealing against?

A. Moisture, possibly -- particularly moisture and possibly air.

There is a large degree of protection for the epoxy by the fact that air ingression is prevented, along with the moisture. So oxidation would be reduced and the life would be prolonged as a result of that, over what it would be if you had it out in the air, even without moisture.

Q. Are you telling me that this device might age more rapidly if the seals were degraded; or if the qualification depends on the integrity of the seals?

A. It is my opinion that the seals are very important to the integrity of the system. However, I don't think they -- their failure wouldn't necessarily be fatal because there are other degrees -- I mean the requirement on the epoxy is not too important. Tests in air on similar epoxies indicate they have a satisfactory life in air.

Q. I thought that was what had been implied in previous questioning and that's why I was surprised that

sealing integrity was a critical problem.

Since the tests had been run in air with no seals, why suddenly seals were important.

A. There are other factors that could enter in here and to be specific, we know that if we have temperature cycling and a seal doesn't -- isn't intact that moisture could come in at lower temperatures and, for example, it might get absorbed on the filler that is used in the epoxy and reduce the resistivity and things like that, as well as perhaps reacting more than it would if you didn't have the moisture there.

All I am saying is it is important to have a good seal there: that the system won't be very secure without it, questions could be raised if it weren't there.

Q. I am trying to get some feel for how this impacts the environmental qualification of these devices under the terms of the Nuclear Regulatory Commission environmental qualification program; not in the abstract, but in the regulatory sense.

A. I think that some further analysis would have to be made of this particular question and perhaps additional tests if the seal were questionable.

Q. Thank you. I would like to leave that line.

Can you tell me what epoxy is in chemical terms?

A. It starts out -- it is an organic compound which has a cyclic ring, a three-member ring in the structure of two carbons and an oxygen. This is known as an epoxy compound.

And when it is reacted with a catalyst, this causes linkages between the individual molecules and forms a high polymer. The catalyst is usually used in a minor quantity compared to the epoxy part of the system and it is also reactive in the molecule during the polymerization.

Epoxies have been around for probably 30 years or so and they are widely used and have been very much more reliable--particularly in structures that have a requirement for mechanical integrity--and they have better aging characteristics than many other resins with the exception of silicone. They are strong, too, mechnically.

Q. If we could go back to looking at epoxy in chemical terms, I was curious to know as to whether it is understood what is occurring at a molecular level as the di-electric strength is decreased as epoxies are heated to high temperatures.

A. There are two things that go on: you get, in some cases, an additional cross-linking which causes a shrinkage and cracking of the material and also you get evaporation going on.

For example, in the case of epoxy castings, similar to this one here, aged in air there is a weight loss. In fact, the criterion for measure of their degradation is a weight loss on the order of 16 percent. I could give you some figures if you are interested.

In other words, in times on the order of -- well let me --

Q. I was asking about mechanisms, not detail --

A. A mechanism.

The mechanism of cross-linking usually involves the interposition of oxygen between -- it usually occurs with oxidation -- well, it happens with paints --

Q. I am not talking about paints now, I am talking about epoxy.

A. It happens with most resins that you get additional cross-linking of these chains, molecular chains which causes them to come together and shrink. The whole structure shrinks a little bit -- not usually overall, but it shrinks and you get cracking of the material.

This is one thing that causes the dielectric strength to go down, as well as the weight loss. This occurs usually in microcracks penetrating from the surface. That is the oxidation mechanism.

As a result of this oxidation process you also sometimes get smaller molecules splitting off like happens

with many organic materials when they oxidize it; you you form water and carbon dioxide and things like that, which causes a weight loss, an evaporation of small components that are split off by the oxidation or additional self-reaction.

Q. So is it fair to summarize what you just said that the decrease in dielectric strength with time as a function of temperature is primarily based on properties of the epoxy, not based on the supply of some reactants other than oxygen?

A. The --

Q. Specifically is water involved in the reactants that cause the change --

A. This can perhaps affect the rate. I have not seen much data on reaction of epoxies in moist atmospheres; they tend to be more resistant to water than certain other polymers like polyesters, they are quite rapidly degraded in hot, moist atmospheres.

But the epoxies are somewhat more resistant to water reaction than some other.... I think it is a combination of several different reactions that occur to cause the epoxy to degrade: one is the additional cross-linking and the other is the splitting off of smaller fragments of the molecules which evaporate.

Q. If you will turn to page 15 of your prefiled

testimony.

A. Yes.

Q. The first full sentence on page 15 reads:

Further, epoxy resins are not known to be sensitive to moisture effects as was the polyurethane cited in the Sandia Report."

A. This is a correct statement.

Q. However, in response to my previous question I thought you told me that water could be involved in epoxy --

A. It could, but to a much less degree than with other resins. I mean it could be involved but it is to a lesser degree than resins like the polyurethane or polyester. It is a matter of degree.

Q. So that your statement on page 15 is not based on any expectations, consideration of processes at the molecular level but rather that no one has measured the moisture effects on epoxies, is that right, it is strictly empirical?

A. There is additional effects of moisture that are not related to the epoxy alone. Moisture, for example, is absorbed -- this particular casting resin has a high degree of filler in it, I think it is silicate. In fact, it has a coefficient of expansion, according to

manufacturer, similar to copper as a result of this silicate filler with the epoxy. And it also has a high thermal conductivity.

Moisture, if it is there to a significant level, can be absorbed on this filler and the the resistivity would decline with time sufficient to cause a change in the calibrations of the RTDs. I mean, it is effects of that nature that are probably more important in the case of the moisture in the system.

Have I made myself clear?

But surely there is an additional effect to a minor extent for the epoxy compared to other materials or other resins.

Q That is the question, whether you would expect the acclerated aging to be equivalent to normal aging in both cases and the presence of moisture, or whether the presence of moisture might cause the aging to be different?

A I don't think that we have very good, specific information on the aging of epoxies under conditions of moisture at accelerated temperatures.

We know there is a small effect but it is not -- I mean it is not zero, but I don't have in my recollection a very good measure of this.

I doubt if it is important in this occasion.

I think the bigger effect, if there is moisture intrusion, is going to be these other factors such as the absorption on the silicate filler and even the glass on the cable.

Q. So your point is that the seal barrier would cause, in addition to any effects that might be hypothesized on the epoxy, would cause failure of the temperature sensor through different mechanisms?

A. That is my opinion, that the effect of moisture is not so much on the degradation of the epoxy -- although I wouldn't say that it was zero, I think there is certainly some of it.

Q. Well the issue is whether it is large enough to be considered in the sense that the Sandia Report talks about considering it with respect to polyurethane.

A. Well polyurethanes are a different animal, I mean, a different resin, which react with water, like polyesters and some other resins.

Q. So do I take it that the essence of your statement on page 15 of your testimony is that the effects are very much smaller than polyurethane --

A. Very much smaller.

Q. -- but it could not be stated to be zero.

A. No.

Q. Thank you.

Leaving that line, I would like to ask why, in

your Figure 3, you provide information on this epoxy laminate instead of on the filled epoxy which is to be used in this device.

Is there data for the actual epoxy in question in existence?

A. I do not have any data on this particular epoxy that is used in the RTD.

We do have data on weight loss of casting resins similar to this but not this particular one.

Q. Is the activation energy known for this material?

A. For which material?

Q. For the material that is in question here in the temperature sensor.

A. I think we have a sort of a packet on it because of the similarity to data on similar resins.

(Pause.)

The value that has been used by Mr. Miller for the activation energy I think is on the low end of the values that are reported for the other epoxies that are similar that have been tested. So that in that sense it is quite conservative.

Q. How do you measure activation energies?

A. You can get one of these off one of these charts like Figure C here.

(Witness Dakin displaying document.)

Q Do you know of any other way?

A No.

Q So rather than having any experimental data from the materials department on this particular epoxy, an assumed value is chosen which is thought to be conservative?

A That is correct.

There is another factor which maybe ought to be considered that presents some additional security and that is that we do have the manufacturer of the data that was obtained -- in fact the manufacturer of this is the Emerson Cummings Company and the particular casting resin is Stycast 2762 FP.

And their brochure or leaflet describing its characteristics says it is, in quote:

"For 500 degree F-260 C use."

And they also say, I think it is 600 F, that it is good for a short time in the same bulletin.

So that this indicates it is quite a stable material. And certainly probably as good as or better than all of the other resins of a similar type that we have tested -- or have been tested.

Q I would like to keep us focused within the allegation that Mr. Eddleman has made here in his contention, that the concerns expressed in the Sandia Report about the

limitations of accelerating the aging by simply heating the material might not be applicable to the epoxy because of the kind of difficulties that you have alluded to in your publications of reactions which are important at low temperatures which are not important at high temperatures and therefore the overall effects are different, not just rates but kind of reaction or the nature of reaction changes.

A. I think I indicated this morning -- maybe I wasn't making it clear, but the basis for that statement was that the data presented in the Sandia Report was for a material which was quite moisture sensitive.

And the reason that it was -- that the activation energy changed at low temperatures was because at lower temperatures it was being controlled by the rate at which the water was diffusing into the resin while, if we have a seal, we don't have that condition in this RTD.

And even if we did have some moisture penetration, the reaction of the water -- moisture -- with the epoxy would be very, very much slower than it is with this urethane resin.

So my logic and reasoning indicates that it is not a problem, that moisture diffusion rate would affect it at low temperatures.

Q. Fine. Thank you very much.

(The Board conferring.)

JUDGE KELLEY: Mr. Eddleman, we are back to you.

MR. EDDLEMAN: Okay.

Is this questions --

JUDGE KELLEY: Arising out of Judge Carpenter's essentially, if you have any.

MR. EDDLEMAN: Yes, I think I do have a number.

CROSS-EXAMINATION ON BOARD QUESTIONS

BY MR. EDDLEMAN:

Q Dr. Dakin -- I am trying to locate....

(Pause.)

I believe it is on page eight of your testimony, down toward the bottom under the two equations there is continuing discussion. It says:

"The quantity, E/k is the slope of the graph."

A (Witness Dakin) Yes.

Q Now is that true, for example, in the graph of Figure 3?

A Yes.

Q All right.

Now I think you said that using an E at the low end of the range was conservative, did you not?

A Yes.

Q. Well since "k" is a constant, the lower the "E" is, the lower the slope is, correct?

A. The lower the "E" the lower the slope, yes.

Q. Okay.

When you use the data without knowing the activation energy of the epoxy used, how do you decide where to start your slope from?

A. The start is the temperature and time point which is used in the qualification exposure test, is that not right, Mr. Miller?

A. (Witness Miller) Yes.

Q. Okay.

Now I believe you mentioned the possibility of absorption of moisture on the glass cable -- glass insulation in the cable of this RTD.

Would the presence of moisture in that insulation tend to degrade its insulating capabilities?

A. (Witness Dakin) I don't think it would be a problem so far as that because you have -- I think it would be more likely to affect insulation resistance of the system and this could affect the calibration.

Do you want to confirm that, Mr. Miller?

A. (Witness Miller) Yes, that's true.

Q. Is there a degradation curve for the cable insulation that is part of the qualification of this

piece of equipment?

A. (Witness Dakin) State that again?

Q. I said "degradation curve," which may not be the right term, but is there data on the degradation with time of the RTD cable insulation in the environmental qualification of this piece of equipment, the RTD?

A. On the whole system, I don't think this has been measured, not a curve, the qualification. There is an exposure of the cable which is spelled out by the standards -- or actually spelled out by the testimony of Mr. Miller here.

Q. Okay.

And beyond that you don't have any additional information on it?

A. No.

Q. Okay.

I believe when Judge Carpenter began his questioning he asked you about a qualified life of five or ten years. Is the qualified life of these things actually 20 years as you understand it?

A. That is the objective, yes.

Q. I think you said that the presence of oxygen if the seal failed was more likely to degrade the epoxy than moisture was, is that correct?

A. I think that is probably true. We know that the

degradation of the epoxy involves oxidation. And we also know that the epoxy -- I don't have specific data but I think some of my colleagues have it -- that the epoxy is more stable in a sealed system, I mean, where there is no oxygen or a minimal amount.

Q. And I believe you told Judge Carpenter that this oxidation -- that oxidation of epoxy led to microcracking or was caused in part by microcracking, is that correct?

A. Yes.

Q. Do those microcracks then permit further diffusion of oxygen into the epoxy?

A. Exactly.

Q. Okay.

A. I would like to point out, though, in connection with this cracking of the epoxy, while it does degrade the epoxy, the requirements on the epoxy in this application are very minimal. It doesn't have to withstand any voltage except the few volts that are applied during the measurement of the temperature of the RTD.

So it requires almost no dielectric strength, all it needs is a spacer. So it could endure a considerable amount of cracking without harming its function as an RTD, even if there were oxygen.

Now the other effect which was mentioned and which I am sure Mr. Miller is fully aware of is the effect of moisture on the insulation resistance which might -- and I don't have a measure of that, I mean this hasn't been calculated in my work -- how low the insulation resistance has to go before it affects the calibration.

Q. Would those microcracks also provide a pathway for the diffusion of moisture if it were present near the epoxy?

A. Yes. But aside from the insulation resistance I don't think there is a problem because the mechanical requirements are very minimal and the electrical requirements are very minimal, with the exception of maintenance of the resistance.

Q. What resistance does this epoxy start off with?

A. It is very high, probably hundreds of megaohms.

Q. Okay.

A. -- or more.

Q. Is there any catalyst left in the epoxy when it is made?

A. No, I think all of the catalysts usually react with the -- or most of it, I wouldn't say every molecule but probably most of it reacts with the other components, the epoxies. I mean this would show up.

If this were not the case, you would have considerable more weight loss than is actually measured when you heat it up, because the initial components are much more volatile.

Q. So the initial weight loss would come considerably from this catalyst, is that --

A. Yes, any residual molecules that weren't polymerized into the main polymer.

Q. Are there conditions --

A. Some of these are removed, of course, during the curing of the resin.

Q. Are there conditions of heat under which an epoxy might break down by dissociating, by reversing the catalyzed reaction?

A. I don't think this occurs with epoxies.

MR. EDDLEMAN: That is everything I have for him.

JUDGE KELLEY: Thank you.

Redirect?

MR. O'NEILL: No.

JUDGE KELLEY: Why don't we take a short break, five or ten minutes?

(Recess.)

JUDGE KELLEY: Back on the record.

Mr. Eddleman?

FURTHER CROSS-EXAMINATION

BY MR. EDDLEMAN:

Q. Mr. Miller, is the environment inside the Shearon Harris containment moist?

A. (Witness Miller) I am not sure what the definition of "moist" is, I guess.

Q. Does it tend to be an area of fairly high humidity, water and steam, that sort of thing?

A. I wouldn't classify it as "steam." I would imagine the humidity is relatively high, yes.

Q. All right.

And that would be true, in general, in operating nuclear power plants?

A. Yes.

Q. And surely under the accident condition of a LOCA or a main steam line break you would get quite a bit of moisture inside the containment, couldn't you?

A. Yes.

Q. Okay.

I would like to -- In your testimony you refer to a likely operating temperature for these RTDs, do you not?

A. Are you speaking of ambient temperature?

We have previously discussed the fluid temperature, I believe.

Q. Yes, we have.

So I am talking about now -- there is am ambient temperature out in the air away from the fluid, right?

A. Yes.

Q. And then there is the temperature of the fluid, and somewhere in-between those two is the RTD, correct?

A. Yes.

Q. And I believe you have estimated what is a 50 degree Celsius temperature rise on top of a 50 degree Celsius ambient temperature, is that correct?

A. That's true.

Q. Okay.

Now the RTD as laid out in these Figures 1 and 2 is a pretty long gadget, I mean the cable attached is about 20 feet, right?

A. Yes.

Q. Now let me first ask you: Was the configuration, the actual layout of that cable and the RTD into position the same in the qualification tests as it would be when it was installed into one of the loops, of the legs of the Harris plant?

A. The temperature at the tip of the RDT I think was maintained at somewhere around 400 degrees or in that range rather than the 600 degrees that it could possibly attain.

Q. I believe you said the normal hot leg temperature would be in the low 600's and the normal cold leg temperature would be in the low 500's Fahrenheit, didn't you?

A. Yes.

Q. What I am trying to get at is something about heat transfer.

It's true generally, is it not, that if you are transferring heat from a higher temperature it tends to go toward things that it is connected to or it can get to at a lower temperature?

A. Yes.

Q. And when these RTDs that actually do stick into fluid are immersed in that fluid on the business end, I want to say, or the part that we discussed before in Figures 1 and 2 that is actually immersed, that would be directly exposed to the coolant temperature, correct?

A. Yes.

Q. Now please correct me if I am wrong: would heat flow through the RTD itself seem to come mostly through that metal body and locknut if it were heading back toward the epoxy and the rest of the assembly?

A. I would assume so, yes.

Q. Do you know how thick that metal body of the part that is immersed is?

A. Not right offhand I don't, no.

Q. It doesn't appear to be shown on the Figure 1 that I have --

A. No.

Q. -- and let me look on Figure 2. I don't believe it is on there either.

But I would just ask you if you could see a place to show me how thick it is if you see?

A. No.

Q. All right.

The heat flow would come through that metal -- Type 316 stainless steel doesn't have very high resistance to heat flow, does it?

A. I'm not that versed in heat transfer, but I believe you are correct.

Q. You could look that up in a standard table of transfer of heat coefficients, could you not?

A. Yes.

Q. And the heat transfer through metals is rapid compared to most other materials, is it not?

A. Yes.

Q. Now you said the tip was maintained at about 400 F in the qualification tests --

A. I said it was maintained at 400 degrees F during the high energy line break tests. I thought that was your question at the time.

Q. Okay. I beg your pardon. Now that's that part.

Now in the part that is kind of the normal operation test what temperature is the tip maintained at?

A. I believe the whole RTD was aged in an oven at 400 degrees Fahrenheit.

Q. Now is that the line break test?

A. No, that's the aging, thermal aging test.

Q. You aged the whole thing, the whole 20 foot assembly?

A. Yes.

Q. I'm just a little curious here, you talk about the tests: is there a reason why you didn't append the actual test results or test data to your testimony?

A. No particular reason, no.

Q. Now when you heat -- in the high energy line break part of the test, is there any difference between how hot the tip is heated and the rest of the RTD, any difference in the conditions they are exposed to?

A. Well the rest of the RTD will see the effects of the high energy line break, the part of the RTD that is outside of the pipe.

That is the only reason for the difference there.

Q. Now the tip that we are talking about -- just to be sure I would know what it means -- is the part that extends beyond the locknut on both of these?

A. To the left-hand side of the drawing, yes.

Q. Now to go back into -- I believe Dr. Dakin may have covered this, but when you tested the RTD in an oven for thermal aging, was there any appreciable level of moisture in the oven during that test?

A. I would doubt it.

Q. Was it measured during the test?

A. The level of moisture?

Q. Yes.

A. No.

Q. When you described the construction of the RTD beginning, I think, in answer ten on page five of your testimony, the platinum elements inside the tip that we have been discussing, is the temperature inside there essentially the same as the outside temperature, is that how it works?

A. I would assume so, yes.

Q. So at least as far as the inside of that stainless steel tip, the temperature inside and outside are pretty close to the same?

A. Yes.

Q. Okay.

So you would basically have the full fluid temperature up against the locknut?

A. Yes.

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Q Okay.

The helium leak test that you refer to on page 6, is that done before the RTD is installed or after installation?

A The helium leak test I am referring to is done at the factory by the vendor to ensure the integrity of the protecting conduit there.

Q Okay.

So if it got a pinhole poked in it or something like that in the plant, it might not be detected?

A Is that a question?

Q Yes, a question.

A That is a possibility, I guess, yes.

Q In your answer as to what thermal aging is, would you agree with Dr. Dakin that there could be several different processes going on in thermal aging, several different chemical or physical processes?

A Yes.

Q All right.

A I would also agree, then, that there is usually one predominant one.

Q Okay.

How long was the aging actually done on the RTDs to be used at the Harris plant in the qualification test?

A I believe it was 11 days.

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Q 11 days at 400 Fahrenheit?

A 400 degrees Fahrenheit, yes.

Q And then the accident simulation came after that?

A Yes.

Q Okay.

A Not immediately afterwards, but in the test sequence it does come after that, yes.

Q Please explain to me what the sequence is and what intervenes between those two.

A I have gone through the test sequence here in the testimony.

(Pause.)

It is Question and Answer 18. I talk about thermal aging and thermal cycling and radiation testing and vibration aging.

Q Okay.

A After that there is a seismic test and then the high energy line break.

Q Do I take it that these first sets of qualifications that are laid out there are sequential?

A That is true, yes.

MR. EDDLEMAN: Judge, this brings up an awful problem.

JUDGE KELLEY: I am sorry to hear it.

MR. EDDLEMAN: At least I appear to be stuck, and

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I will ask Applicant's counsel about this.

As I recall, when we were negotiating these contentions, I was informed that the tests of this sort were done simultaneously: that is, under radiation and thermal stress, moisture, all at the same time.

JUDGE KELLEY: And this leads to what problem? Are you surprised by this statement? Is that what it is?

MR. EDDLEMAN: Yes. A, surprise, and, B, specification of the contentions. See, I specified relying in good faith on that, and that gives me a problem. I don't know what I can do about it at this point, but I would just like to bring it up.

JUDGE KELLEY: Sure. We will see what Mr. O'Neill wants to say.

MR. O'NEILL: I will simply respond that the only thing we can imagine he is talking about is that in one of the meetings there was a discussion of a particular LOCA test in which this does occur simultaneously. Perhaps that is what he is talking about.

JUDGE KELLEY: It occurs simultaneously with what?

MR. O'NEILL: All of the different aging, cycling, and radiation aging occurs during one test --

JUDGE KELLEY: So you start the aging, and it takes 11 days, and during those 11 days you do all sorts of other things, is that the idea? Is that what "simultaneous"

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means?

MR. O'NEILL: There's two different ways of doing it. One is sequential, and one is throughout the period of the test everything occurs all at once.

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JUDGE KELLEY: Just a minute.

(The Board conferring.)

MR. O'NEILL: Setting that aside, I don't see what the problem is.

(The Board continuing to confer.)

JUDGE KELLEY: I would defer to Dr. Carpenter on further exploration of this problem.

JUDGE CARPENTER: Mr. Eddleman, would you state the problem again, please?

MR. EDDLEMAN: My understanding was, and I don't have my notes here to directly dispute Mr. O'Neill's characterization, I just would note that his memory of what I've done has been off some times in the past. But my recollection was that I have here--

MR. O'NEILL: I object to that characterization, before we go any further.

JUDGE KELLEY: I think that the objection is well taken. Let's assume everybody's good faith, and just see if we can't work this out in practical terms.

MR. EDDLEMAN: I didn't assume a lack of good faith.

JUDGE KELLEY: I sounded like it.

MR. EDDLEMAN: I'm sorry, Judge: I didn't mean that. My memory is faulty, too, at times.

All I'm saying is, without referring to my notes

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I can't say for sure one way or another, you know, what happened that I might have a note of.

But my recollection was, and I'll say it, you know, on the basis that I may, too, be in error, but I don't think I am. My understanding was that all of these qualification tests were done on a simultaneous basis: okay? If this is done sequentially, then it may impact them.

I can explore it with the witness. But I just think I've been thrown off here. I mean, this may be just an example of the old saying: You fooled me once, shame on me. But I just want to--

JUDGE KELLEY: How does it affect the wording of the contention?

MR. EDDLEMAN: Well, if I had realized that it was not simultaneous, then.... I think Contention 9 starts off with "...representative of the actual conditions to which things will be exposed in the following ways:" And these things are split out. And I wouldn't have split off, for example, the vibration issue from this: the radiation issue I had even understood from the way Dr. Dakin was talking earlier that it was irradiated simultaneous with the thermal aging test. Maybe I'm wrong about that. Anyway, I asked him about it, and he said whatever the transcript reflects that he said.

But it's a different sort of thing. I would have

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agreed to specify the contention differently if I'd been fully aware of this.

Now, I'm not raising it for something to do about it, because I don't know what to do about it.

JUDGE KELLEY: Excuse me just a minute.

(The Board conferring.)

MR. O'NEILL: Judge Kelley, I have something that may shed some more light on this.

JUDGE KELLEY: All right.

MR. O'NEILL: We are reviewing some answers to interrogatories back in April of 1984, Applicants' response to Wells Eddleman's general interrogatories, interrogatories Contentions 9, 11, 41, 45, 116, 132(c)(2), dated April 17, 1984, page 24.

Response to Interrogatory 9-11(b): "Are there any items that must be environmentally qualified for several conditions, e.g., radiation, steam spray and impact, which were not tested under all those conditions at once? Please identify each such item and describe which items were not so tested.

"Response: Generally the electric equipment at Shearon Harris Nuclear Power Plant which must be qualified to accident conditions is not tested under all postulated conditions simultaneously. Paragraph 2.3 of NUREG-0588 permits sequential testing, and such

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testing is standard industry practice. However, most equipment is tested under several conditions simultaneously. The test methods for particular items of electrical equipment are included in the equipment qualification packages, a sample of which will be produced for inspection and copying."

I think that answers the question as to what, at least in writing, we responded to Mr. Eddleman to that particular point.

MR. EDDLEMAN: Well, it says it both ways.

Did you actually produce the RTD package to me? I can't recall.

MR. O'NEILL: Yes.

MR. EDDLEMAN: This is something I would have gone home on the weekend and looked up, if these guys hadn't come on out of order. So it's my fault.

JUDGE KELLEY: Let me ask you this, just in practical terms.

We accept that you had one notion in your mind, however it got there, about how these things were done, and now you're told it's done a somewhat different way. Is that something you can reasonably explore in ten or fifteen minutes of questioning?

MR. EDDLEMAN: I think so. I don't think it's going to make any difference about getting done with these

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gentlemen this afternoo I may have to bring Dr. Dakin back into it a little bit, though.

JUDGE KELLEY: Okay. But just in terms of giving you an opportunity to fill in this area, which you indicate came up as something of a surprise this afternoon, anyway.

Why don't you go ahead, then, along those lines, and see where that takes us.

MR. EDDLEMAN: All right. Since I have some kind of general knowledge about this I don't need so much time to prepare, I think I can just go ahead.

JUDGE KELLEY: Fine.

BY MR. EDDLEMAN:

Q Now, is the sequence, Mr. Miller, as stated there in your answer, there is first thermal aging, then thermal cycling, then irradiation aging, then vibration aging, and then the temperature cycle for -- let's see.... And then the high energy line break LOCA. Is that correct? Is that the sequence?

A (Witness Miller) I think you omitted the seismic testing.

Q All right.

A It occurs prior to the high energy line break test.

Q I'm just trying to look in here. I don't seem to see the word "seismic." Is it that my eyes are going out on

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me, or is that not in Answer 18?

A The last line.

Q "Subject to a seismic event and a high energy line break environment."

Is that also sequential, seismic first and then high energy line break?

A Yes.

Q Okay.

Isn't it true that in actual plant operation the RTDs installed on these main coolant lines or the attached piping would be subject simultaneously to the thermal aging, some thermal cycling, irradiation and vibration all at once?

A Yes.

Q Okay.

Is it possible to test for these things simultaneously?

A I suppose anything is possible. I don't know of any facility that can do this at the present time.

Q Well, when you test for the LOCA do you test them simultaneously? --that is, for radiation and steam and temperature and all that sort of thing?

A The radiation is not done simultaneously, no. Of course the temperature, the steam-- Of course, it is a steam test, so you have the humidity and temperature and pressure.

2 AGBwrb

A Yes.

Q All right.

How many were tested? Was it one sample, or were there a bunch of them?

A As best I can recall, there were three samples of each type that we described here, the narrow range and the wide range.

Q Three samples of each of two types?

A Yes.

Q Okay.

Were there any failures in any of these tests?

A No.

Q Westinghouse conducted the tests?

A Yes.

Q All right.

Were the tests under your supervision? I'm trying to get at how directly involved you were.

A No; we have test engineers and test technicians that perform the tests.

Q And you would receive reports from them?

A Yes.

Q Is that how you relate to this?

A Yes.

Q Are these tests subject to Westinghouse's own QA or audit requirements?

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A Yes.

Q Now, to go back to this sequential business for a moment: What sort of effects-- Dr. Dakin, maybe you'd be the one to answer this. What sort of effects can irradiation have on epoxy?

A (Witness Dakin) It's possible to degrade any organic material with radiation, a sufficient amount of it.

Q All right.

A I mean, it's a matter of degree.

These epoxeys, however, are relatively, as resins go, are relatively resistant to radiation.

Q Well, are you familiar with the amount of irradiation that would be used in testing these RTDs, Dr. Dakin?

A I'm not an expert on radiation effects. I've been involved with sequential testing like he's done here, but I don't really know how much simultaneous testing has been done.

For one thing, it's very difficult to do, to make a furnace that is also next to a nuclear radiation source that has humidity in it and everything. It's very difficult, practically, to do this sort of thing.

Q I guess it might be easier to have the accident, but it might not be easier on the rest of us around.

A There may be, but I'm not familiar with any

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experiments that have shown specifically the difference between simultaneous versus sequential aging.

Q Might one reason for that be that there just aren't very many of these simultaneous tests done?

A I suspect that's the case, based on-- Because I started out once to do this, and I was frustrated. --I mean, in being able to.

Q By the practical difficulties; right?

A Yes.

Q Dr. Dakin, I believe in some earlier responses you talked about the ability of thermal cycling to possibly stress or maybe crack materials, and then we talked about the -- Judge Carpenter talked about the microcracking and oxidation of these epoxeys with you.

Can irradiation cause cracking or affect the diffusion of oxygen into epoxeys, do your knowledge?

A I have not seen it happend with epoxeys, myself. It may happen.

I have seen it happen with some silicone rubber insulated cables.

Q Well, wouldn't it be more conservative to do all these things that might cause cracking or diffusion, to the extent that they do, like thermal cycling and vibration, for example, and perhaps irradiation, before you went through your thermal aging?

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A I think that's a debatable matter, which should come first. Because one philosophy is that the thermal aging degrades it to the extent where these other factors will make it more vulnerable.

Q Okay.

So it's sort of a question of whether you take the thermal degradation and see if that makes it crack more or degrade more under thermal cycling, irradiation and vibration, or whether you vibrate it and thermally cycle it and irradiate it, and then see whether thermal aging then degrades it more; is that the point we're getting at?

A I guess so.

One think I think I should repeat, which I didn't do before, and that is that regardless of the effect of these factors, the requirements for this epoxy are minimal. I mean, you have some wires that are cast — they're not even in a position to move very much. I mean, they're cast tightly into a tube, essentially, over a length of a few inches, 1 to 1-1/2 inches, something like that.

So even if you do get cracking in this thing, I don't think it's going to fail. I mean, it would have to be a very severe cracking, because the whole space is filled up with resin, and you haven't lost much. —resin and filler; you mustn't forget that aspect of the thing; that you have essentially a compacted system here with wire embedded in

2 AGBwrb

this filled resin.

If it cracks, so what? I mean, it's not going to fail.

Q This may be for Mr. Miller, but either one of you who knows: Are the wires themselves as they go through this resin -- is it a bare wire inside the resin, or is there an insulated wire that goes through the resin?

A (Witness Miller) I don't recall if it's insulated at that point or not. There's a header assembly that's installed there with pins, and the wires are attached to those pins.

I don't honestly recall whether it's insulatedl at that point or not. They're separated with the epoxy for sure.

Q The header assembly that you're talking about, would that be inside the -- I'm trying to find the term you use for what I've been calling the business end of this RTD. --inside the sheath?

A The header I'm speaking about is in the same area as we were discussing earlier, where the epoxy is, under the engraving on the RTD.

Q I am looking at Figure 1 here.

A Yes. Do you see the engraving where it says "RDF Corporation?"

Q Right.

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A The header assembly would be installed there. The epoxy would be filled on top of the header assembly.

Q Now, by "on top of," do you mean to the right on this diagram?

A Yes, that's correct.

Q Does the epoxy go all the way through the lock nut there, or is it just inside that part that has got the engraving on it?

A It is just inside that part.

Q I see.

Now, what is inside the sheath there in the lock nut section, other than that platinum wire and the wires attached to it?

A Those are inorganic filler of some sort. I don't recall exactly what it is.

Q It's inorganic.

Is that filler mentioned in your discussion of what's in the RTD?

A No; I think we must mention the two organic materials that are contained in the complete assembly.

Q I understand you have a concern about deterioration, that it's more for the organic materials.

But what I'm getting at is, for heat transfer purposes the nature of that inorganic filler might be important.

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A Yes, that's true.

Q Okay.

But you don't know what it is?

A We have it identified. I just don't remember right now what it is.

Q Do you think you could possibly get that information?

A Yes.

Q Dr. Dakin, you didn't happen to know what that inorganic filler is?

A (Witness Dakin) This is in the epoxy you are talking about?

Q No, not the expoxy, Doctor, this inorganic filler that Mr. Miller has been referring to. You don't happen to know what it is just off-hand, do you?

A I rather suspect it may be magnesium but I'm not sure. Magnesia is used in clorox type piers, you know, the kind you have on your range, and they pack it in there.

Q Magnesia? You mean magnesium oxide?

A That's right.

Q Okay.

Mr. Miller, I don't expect you to be able to dig this up today but I think you are going to be back with us next week anyway. Could you try to produce that then?

A (Witness Miller) Yes.

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Q All right.

In the vibration testing, is the -- how is the vibration applied to this thing? Do you clamp the sheaf end of it and shake it the way the pipe would vibrate, or how do you do that?

A That's a pretty fair description, yes.

Q Now when that is done is the cable end of this assembly suspended in the way that it would be in the actual plant?

A As far as to the point of the first anchor on the cable, yes, that would be true.

Q Okay.

Does that first anchor hold the cable firmly in place?

A Yes.

Q All right.

How far back is that, do you know?

A Not exactly. I would estimate 18 inches or so, or perhaps more.

Q What I am trying to get at here is the kind of physical stress that vibration would impose on this epoxy and whether, if it were cracking, it could -- that vibrational stress pulling along the cable itself, that if the wires were right in the epoxy, could begin to loosen them and form a pathway for the intrusion or diffusion of

1 AGBeb

moisture and so on.

Do you think that would be possible?

A I mentioned earlier that we try to run the most conservative test sequence, and that is why vibration aging is the last part.

Q In other words, so you think you've got it degraded as much as this thermal stress will get it, and these other things, and then you try to see if it will shake loose?

A Yes.

Q Okay.

You did say that the other possibility I was asking about was possible, didn't you? I'm just-- That is, vibration could cause a pathway for additional diffusion and so on into it, into the epoxy?

A I don't see how it's possible with the end sealed, no.

Are you talking about just the epoxy cracking, or the seal-- There is an external seal to this still.

Q Now you're talking about the external seal back at the lug end of the cable?

A Yes.

Q Now what kind of external seal is used on this during these tests?

A During the tests, the only time it is necessary

AGBeb

to really seal it is during the high energy line break test.

Q During the steam exposure?

A Yes. The conduit is just run through the chamber wall and attached to the wall.

Q So you just run it into the wall with a moisture-tight seal at that point?

A Yes.

Q But it is just left loose during the other tests?

A Yes.

Q On page 11, Mr. Miller, -- I'm going to leave the simultaneous stuff now but if I think of something else I will try to come back to it.

On page 11, down toward the bottom, you say:

"The temperature rise will be limited to 50 degrees Celsius as long as the minimum air velocity is maintained."

What air velocity is maintained? What is that minimum air velocity?

A In our generic program that would be approximately five feet per second.

Q Okay.

That's 300 feet per minute, isn't it? Sixty seconds in a minute.

A That sounds right.

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Q At any rate we can multiply the feet per second by 60 and get feet per minute, couldn't we?

A Yes.

Q Compared to most air conditioning systems that is pretty fast velocity, isn't it?

A I don't think so, no. I think it is fairly typical.

Q All right.

But that is the minimum to maintain 50 degrees Celsius temperature rise?

A Yes.

Q The temperature— You said that that minimum air velocity has to be maintained. How would it be maintained?

A Usually by the containment ventilation system.

Q Okay.

And do you know what the actual velocity maintained around these pipes by the Harris ventilation system is supposed to be?

A I don't know exactly. They have told me recently that they have confirmed that some of them do indeed have five feet or more, and they suspect that some are less.

Q If it were less, then the temperature rise could be more than 50 Celsius. Right?

A That's true.

Q Mr. Miller,— Oh, I guess it is actually

AGBeb

Dr. Dakin. I seem to have overlooked a Dakin answer here to Number 21.

Dr. Dakin, do you have Answer 21 on page 12 in front of you?

A (Witness Dakin) Yes.

Q I believe the Judges and I have already been over most of this with you.

The activation energy that you selected here is not in any way the actual activation energy of the epoxy used in the Harris RTDs, is it?

A What do you mean, "in any way"?

Q Well, it is not the actual one because there is no actual one. Correct? You haven't measured the actual one, the actual activation energy of that epoxy for the Harris--

A For this specific epoxy, no, but we have values for -- we have values for quite a few similar epoxies.

Q And the similarity is--

A This is on the low end of that range.

Q Okay.

So this is low activation energy for this type, that is, having this type of structural and insulating properties?

A It isn't the lowest but it's conservatively-- I mean it is toward the low end.

AGBeb

Q All right.

What is the lowest of similar epoxies, do you know?

A Oh, something like .91, .95; in that range. It depends. This value of the activation energy, if you get it from some of these tests out of the NEMA report, varies depending upon the way the test is made.

However, if you're testing the dielectric strength of the laminate, the value is somewhat lower than it is -- or significantly lower than it is -- maybe 10 or 15 percent lower than it is with testing the flexual strength.

I think it is reasonable to think that the flexual strength values may be closer to the requirement because what this -- the function of this epoxy in this cable is mechanical more than it is electrical because it doesn't have to stand any significant voltage.

Q All right.

When you discussed the voltage in that RTD, is that the normal operating voltage, to your knowledge? Do you know what the operating voltage is?

A Oh, I don't know exactly but it is on the order of a volt or two. It is very low.

Q Mr. Miller, can you confirm that?

A (Witness Miller) Yes, there is a constant current source that provides current to this RTD and that

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is normally on the order of one milliamp, so it is a millivolt reading that you are taking from the RTD.

Q With respect to your Answer 22, Mr. Miller, about the Arrhenius method being used for actual conditions, that is done after the first day. The accelerated thermal aging for the rest of the post-accident period is accomplished in how much time?

A Approximately two weeks.

Q All right.

And the period being simulated is a year less a day?

A No, not one year, no. The simulation here for the wide range RTDs would be on the order of four months post-accident.

Q It is not required to go a year after the accident and test?

A No.

Q Now on this you say:

"Westinghouse employes a standard accident profile which uses the 0.5 electron volt activation energy."

That's about half as much as the value that is given by Dr. Dakin in Answer 21. Correct?

A Yes.

Q All right.

AGBeb

A (Witness Dakin) Mr. Eddleman, could you repeat that question so I might think about it?

Q I asked him if the 0.5 electron volt activation energy in his Answer 22 was about half of the 0.98 electron volts given in your Answer 21.

A A very conservative value was selected.

Q You're saying the lower it is the more conservative it is?

A Very much so. That should be clear. That is why I bought the point up.

Q In your Answer 24, Mr. Miller, you say:

"The NRC Staff specifically approved the qualification of RTDs."

Does that include the qualification of these particular RTDs?

A (Witness Miller) Yes. The test reports on these RTDs were part of the Staff's review, yes.

Q The Staff reviewed these particular reports and approved them?

A Yes.

MR. EDDLEMAN: May I have just a minute?

(Pause.)

I believe that completes my questions for this panel. Thank you very much.

JUDGE KELLEY: Thank you, Mr. Eddleman.

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Mrs. Moore.

MRS. MOORE: Staff has no questions, your Honor.

FURTHER EXAMINATION BY THE BOARD

BY JUDGE CARPENTER:

Q Mr. Miller, if you would turn to page 10 of your prefiled testimony, please?

A (Witness Miller) Yes.

Q I am looking at your statement at the next-to-the-last sentence in Answer 18, which states:

"The generic preconditioning process simulates a minimum 20-year life and a minimum of 10 years for those installed in the wells."

What is the difference?

A It is primarily a radiation exposure difference. The wide-range RTDs, because of the nature of their installation, do see a higher radiation dose and accordingly, the qualified life is based on that primarily for the wide range.

Q And during these tests have you actually been able to make some of these devices fail either through radiation or overheating or what-have-you?

A No.

Q So when you say that it is primarily the radiation--

A It is a test concern. Qualified life is an

2 AGBeb

objective in a qualification program so we set up the program to obtain a certain qualified life. And the radiation dose for the wide range, those get relatively high so it becomes a test problem.

Q So it is a test problem. It is an experimental inconvenience rather than--

A Yes, it has nothing to do with the quality of the product or anything like that. It is not a limitation on the product.

Q The NRC doesn't have any requirements about this, the ten years--

A About the qualified life?

Q Yes.

A Not that I'm aware of, just that we identify one. That is a requirement.

Q Thank you. I will ask Staff about this. Thank you.

JUDGE KELLEY: Anything further, Mr. Eddleman?

MR. EDDLEMAN: Just on that point.

FURTHER RECROSS-EXAMINATION

BY MR. EDDLEMAN:

Q Is the Harris plant going to have to replace these things at the end of their qualified lives, regardless?

A (Witness Miller) Regardless....

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Q In other words, if it is only qualified for 10 years or 20 years, does that mean at the end of that period for an RTD in service it will have to be replaced?

A That's the only alternative I know of now. There may be some monitoring done to establish actual operating temperatures that could extend that, or something done like that.

But if you go on the basis of our program, that would be the case, yes.

Q What you said about temperature would apply equally to things like irradiation and so on?

A Yes.

Q Okay.

MR. EDDLEMAN: That's all.

JUDGE KELLEY: Thank you.

Redirect?

MR. O'NEILL: Yes, a couple of questions.

REDIRECT EXAMINATION

BY MR. O'NEILL:

Q Mr. Miller, testimony indicates that these RTD assemblies would be sealed. Are these seals manufactured by Westinghouse?

A (Witness Miller) It is my understanding at the Shearon Harris plant they will not be, no.

Q Do you know what kind of seals that the

1 AGBeb

Applicants plan to use with the Westinghouse RTDs?

A I have been informed that they are using a Conax seal from a similar application that Conax manufactures.

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Q Do you know whether the seals will also have to be environmentally qualified?

A Yes, they will.

Q Suppose a seal broke and moisture did intrude into an RTD. Would there be any way of — would there be any indications of a failure during maintenance or inspection?

A Yes, it would certainly show up on the calibration. The insulation and resistance of the cable would drop, and if it dropped significantly you would pick it up on a calibration check.

Q Dr. Dakin, one question for you: There was considerable academic discussion with respect to failure mechanisms of epoxies in a moisture environment.

If there were a failure of the seal and moisture were to intrude into the RTD and influence the epoxy, how long would it take, in your opinion, for there to be any appreciable degradation?

A (Witness Dakin) You mean additional degradation beyond what would occur without the moisture, is that what your question is?

Q Yes, it is.

A I doubt if you would see any effect on the integrity of the epoxy beyond a few years anyway.

MR. O'NEILL: No further questions.

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JUDGE KELLEY: Thank you.

Gentlemen, that concludes the questioning --

MR. EDDLEMAN: Excuse me.

JUDGE KELLEY: -- I thought.

MR. EDDLEMAN: I do have an opportunity to ask on --

JUDGE KELLEY: Yes, fair enough. Go ahead.

RECROSS-EXAMINATION

BY MR. EDDLEMAN:

Q Mr. Miller, is the recalibration done at fixed intervals for these RTDs?

A (Witness Miller) I believe the technical specifications of the plant would require them at refueling.

Q And that would be done by CP&L's people in accordance with their quality assurance or quality control plans?

A I would assume so, yes.

Q The maintenance specifications for these RTDs would also -- inspection specifications would also be up to CP&L?

A Yes.

Q You have mentioned the change in cable resistance.

Could you in fact measure the resistance of the cable on one of those RTDs independent of the platinum wire?

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A Yes. The insulation resistance would be measured -- really it is a measurement from the lead, cable lead all the way down to the platinum wire which is at the tip and against the sheath of the RTD.

Q You measure resistance from a contact on the cable at one end and a contact on the outside of the sheath at the other end?

A It wouldn't have to be at the other end, it is the same end. You are actually measuring it between the one wire and the sheath.

Q Okay.

MR. EDDLEMAN: That's it.

JUDGE KELLEY: Anything else?

WITNESS DAKIN: Mr. Chairman, I would like to have read back to me the answer that I gave with regard to -- I want to be sure it is correct -- to your question that you just posed about the effect of the moisture on the epoxy, just so I.

JUDGE KELLEY: I think we can check it out.

(Discussion off the record.)

WITNESS DAKIN: Can I take care of it this way --

JUDGE KELLEY: Go ahead.

WITNESS DAKIN: -- by restating my answer.

It is my opinion, based on what I know about the reaction of epoxy with moisture, that no significant

AGBagb

integrity damage would occur until after a few years.

MR. O'NEILL: That was in response to my question --

WITNESS DAKIN: That is a qualitative -- That's my -- I am restating my answer to your question.

MR. O'NEILL: And that question was assuming there is a failure of the seal and moisture does get to the epoxy.

WITNESS DAKIN: Yes.

JUDGE KELLEY: Mr. Eddleman?

MR. EDDLEMAN: Yes.

FURTHER RECROSS-EXAMINATION

BY MR. EDDLEMAN:

Q Dr. Dakin, I just have to ask you for a further clarification:

In that term "reaction," are you talking about chemical reaction or the absorption of moisture that you discussed for the epoxy earlier?

A (Witness Dakin) I was referring to the chemical reaction.

Q Thank you.

JUDGE KELLEY: Okay.

WITNESS DAKIN: The basis for this opinion is that epoxy -- there are commercial transformers embedded in epoxy resin that are operating in an outdoor environment --

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not in the rain, but under exposure to the atmosphere where they could see lots of moisture from humidity and so on. And they are working very well.

JUDGE KELLEY: Thank you.

(Pause.)

JUDGE KELLEY: Thank you, gentlemen. We appreciate your being with us, your attention to the questions and your responsiveness.

Mr. Miller, we will look forward to seeing you again next week, but you are excused for now.

Thank you, Dr. Dakin.

MR. O'NEILL: Mr. Chairman, while we are on the record, I would like to thank the Board and the parties for making this accomodation in the schedule so that Dr. Dakin could --

JUDGE KELLEY: Sure. We would try to do likewise in similar circumstances.

Let's take a short break and then we can move on to the next panel.

(Recess.)

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JUDGE KELLEY: We are back on the record. I will just remind you, although I am sure you don't need it, that it is 10 of 4. We are going to start at quarter of 5. So it is little less than an hour that we have left. But we can get at least a start on 9 and 9B with the next panel.

MR. O'NEILL: Applicants call to the stand Mr. Robert Pronty and Mr. Peter Yandow.

JUDGE KELLEY: Good afternoon, gentlemen.

Whereupon,

ROBERT W. PRONTY, JR.

and

PETER M. YANDOW

were called as witnesses and, after having been first duly sworn, were examined and testified on their oath as follows:

DIRECT EXAMINATION

BY MR. O'NEILL:

Q Would each of you gentlemen, just for the record, state your full name and your position with Carolina Power and Light Company?

A (Witness Pronty) Robert W. Pronty, Jr., principal engineer at the Harris plant engineering section.

A (Witness Yandow) Peter M. Yandow, senior engineer, Harris plant engineering section.

Q Gentlemen, do you have before you two documents that were prefiled on August 31, 1984 with the Board and

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parties in response to Eddleman Contention 9 and specifically the second document in response to Eddleman Contention 9B?

A (Witness Pronty) I do.

A (Witness Yandow) I do.

Q Mr. Pronty, for the record, would you please identify each of these two pieces of testimony?

A (Witness Pronty) The first is Applicant's testimony of Robert W. Pronty and Peter M. Yandow in response to Eddleman Contention 9, Environmental Qualification of Environmental Equipment. The second is Applicant's testimony of Robert W. Pronty and Peter M. Yandow in response to Eddleman Contention 9B, Limitorque Valve Operators.

Q Mr. Pronty, does --

MR. EDDLEMAN: Wait a second. Are we going to do 9B now --

MR. O'NEILL: On the schedule both of them come on at the same time.

Mr. Chairman, I might add, if there's some confusion. The first piece is simply an introductory piece which allows Mr. Pronty and Mr. Yandow to introduce themselves and to very briefly, for purposes of an overview, say what the Environmental Qualification program is. The piece on 9B actually addresses one of the contentions. We

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aren't offering the whole Environmental Qualification program for cross examination, but those aspects of the contention that are subject to litigation.

MR. EDDLEMAN: What I was concerned about -- I see the schedule. But Mr. O'Neill and I had had a little off-the-record discussion about how much cross I would have and I made him an answer that was contemplating just this testimony about 9 and not the 9B part. So, it'll be a little different on 9B.

BY MR. O'NEILL: Fine.

JUDGE KELLEY: Okay. But I think the way you describe 9 is consistent with our understanding. Go ahead.

BY MR. O'NEILL:

Q Mr. Pronty, with respect to the first document you identified, does that consist of 12 pages of questions a answers?

A (Witness Pronty) Yes, it does.

Q And with respect to the second document you identified addressing Contention 9B, does that consist of 14 pages of questions and answers and figures 1, 2, 3, and 4?

A Yes, it does.

Q I ask both of you gentlemen if this testimony was prepared by you or under your supervision?

A Yes, it was.

A (Witness Yandow) Yes, it was.

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Q Do you have any changes or corrections to make to either of these two statements?

A (Witness Pronty) No.

A (Witness Yandow) No.

Q Are they two statements that have been identified true and accurate to the best of your knowledge, information and belief?

A (Witness Pronty) They are.

A (Witness Yandow) They are.

Q Mr. Pronty, would you please look at page 10 of the introductory statement?

Is there a blank on page 10 at the answer to question 11?

A Yes, there is.

Q Should that blank be filled in with the numeral 8 to describe Applicant's Exhibit 8, which has been previously identified?

A Yes, it should.

MR. O'NEILL: Mr. Chairman, at this time I move that Applicant's testimony of Robert W. Pronty and Peter M. Yandow in response to Eddleman Contention 9, Environmental Qualification Electrical Equipment, followed by Applicant's testimony of Robert W. Pronty and Peter M. Yandow in response to Eddleman Contention 9B on Limitorque Valve Operators, including figures 1, 2, 3 and 4

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be incorporated into the record as if read and received into evidence.

JUDGE KELLEY: Motion granted.

(The document follows:)

August 31, 1984

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

In the Matter of	)	
	)	
CAROLINA POWER & LIGHT COMPANY	)	Docket No. 50-400 OL
and NORTH CAROLINA EASTERN	)	
MUNICIPAL POWER AGENCY	)	
	)	
(Shearon Harris Nuclear Power	)	
Plant)	)	

APPLICANTS' TESTIMONY OF ROBERT W. PRUNTY AND PETER M. YANDOW IN RESPONSE TO EDDLEMAN CONTENTION 9 (ENVIRONMENTAL QUALIFICATION OF ELECTRICAL EQUIPMENT)

Q.1 Please state your names.

A.1 Robert W. Prunty and Peter M. Yandow.

Q.2 Mr. Prunty, please state your address, present occupation and employer.

A.2 (RWP) I am employed by Carolina Power & Light Company ("CP&L") as a Principal Engineer in the Electrical and Instrumentation and Control ("I&C") areas. My business address is the Shearon Harris Nuclear Power Plant ("SHNPP"), P.O. Box 101, New Hill, North Carolina 27562.

Q.3 State your educational background and professional work experience.

A.3 (RWP) I graduated from the University of South Carolina in 1971 with a Bachelor of Science degree in Electrical Engineering. I have worked in the nuclear field for 13 years.

Upon graduation, I entered the U.S. Navy as a commissioned officer through the Naval ROTC program. I attended the Naval Nuclear Power School at Bainbridge, Maryland, and qualified as Engineering Officer of the Watch ("EOOW") at the operational Nuclear Power Training Unit reactor in Windsor, Connecticut. Upon completion of this one-year training program, I attended the Navy's basic submarine school and was assigned to the USS Flasher, an attack submarine in Pearl Harbor, Hawaii. In 22 months on board I qualified as EOOW and Officer of the Deck ("OOD"), earning my submarine "Dolphins".

I then attended the advanced submarine school for six months and was assigned to the U.S.S. Daniel Boone, a ballistic missile nuclear submarine, spending 16 months of my two-year tour in the Portsmouth, New Hampshire, Naval Shipyard during a major overhaul. While on the U.S.S. Daniel Boone, I requalified as EOOW and OOD, and also successfully completed a comprehensive oral and written examination administered by Naval Reactors in Washington, D.C. to become certified as Chief Engineer of a nuclear vessel. My work and watchstanding experience on both ships covered the entire array of electrical, I&C, and mechanical systems operation and interaction.

For the next two years I was assigned as an officer instructor at the Naval Nuclear Power School, now located in Orlando, Florida, teaching integrated plant operations, tying together the theoretical knowledge of reactor physics, accident analysis, and classical engineering with the overall operation of a nuclear power plant. I became division director during the second half of my tour.

In mid-1979 I came to work for CP&L as a Senior Engineer in the electrical discipline at the corporate offices in Raleigh, North Carolina. In late 1979 I was made lead electrical engineer of the newly formed Harris Plant Engineering Section ("HPES") which was established at the SHNPP site. I have subsequently been promoted to Project Engineer and Principal Engineer. I am responsible for technical interface with Ebasco in the areas of design and design change control; for field

interface in the area of design problem and constructability resolution; for commercial interface with Ebasco, Westinghouse, and numerous SHNPP equipment vendors; for operational interface and operability problem resolution with plant start-up and operations personnel; for quality assurance and regulatory interface with both internal and external groups interacting with CP&L; and for the Environmental Qualification Program at the SHNPP.

I am a registered professional engineer in the State of Florida and am a member of the Institute of Electrical and Electronics Engineers ("IEEE") and Tau Beta Pi professional engineering society.

Q.4 Please elaborate on your professional experience that is directly relevant to the testimony which you are presenting regarding environmental qualification of electrical equipment at the SHNPP.

A.4 (RWP) I have been directly involved in environmental qualification since my assignment as lead electrical engineer of the newly formed HPES in December 1979. I was responsible for the establishment of the SHNPP Environmental Qualification Program and am integrally involved with formulating the SHNPP compliance with 10 C.F.R. § 50.49, NUREG-0588, and other NRC regulatory directives. Additionally, I am the technical supervisor of the Instrumentation and Control Group and until recently was also technical supervisor of the Electrical Group. These two groups specify and procure a majority of the

equipment covered by the Environmental Qualification regulations.

Q.5 Mr. Yandow, please state your address, present occupation and employer.

A.5 (PMY) I am employed by Carolina Power & Light Company as an Electrical Engineer. My business address is Shearon Harris Nuclear Power Plant, P.O. Box 101, New Hill, North Carolina 27562.

Q.6 State your educational background and professional work experience.

A.6 (PMY) I have a Bachelor of Science in Electrical Engineering from Northeastern University in Boston, Massachusetts.

I have worked in the nuclear power field for 10 years. This does not include co-operative engineering work during my years as a student. After graduation from Northeastern in 1974, I worked for Stone & Webster Engineering Corporation in Boston, Massachusetts in the Controls Group. I was a trainee in their career development program which included three-month assignments in various parts of the company on various projects. After Stone & Webster engineering, I worked for Combustion Engineering in the Instrument and Controls Design Group. Combustion Engineering is a nuclear steam supply system manufacturer located in Windsor, Connecticut. During this time I was responsible for backfits on five operating nuclear unit reactor protection systems. This included setpoint calculations of instrument loops.

In 1978 I was employed by the Yankee Atomic Electric Company in Framingham, Massachusetts. Yankee Atomic Electric Company is a design engineering consultant for a group of northeastern utilities. In this assignment I worked in the Instrument and Control Engineering Group as a engineer. In 1979, I was involved in the first backfits following the issuance of NRC Bulletins 79-01, 79-01A, 79-01B (on environmental qualification concerns) and NUREG-0737 (TMI Action Plan). Before leaving I was Senior Engineer in charge of Instrument and Control Design at Yankee for the Maine Yankee Atomic Power Plant in Wiscasset, Maine. This included on-site work during two refuelings and support for several others.

In 1983, I joined CP&L as a Senior Engineer in the Instrument & Control Engineering Group at SHNPP. I am currently responsible for the Environmental Qualification Program at the SHNPP.

Q.7 Please elaborate on your professional experience that is directly relevant to the testimony which you are presenting regarding environmental qualification of electrical equipment at the SHNPP.

A.7 (PMY) During my ten years of work experience I have worked in the Instrument and Control Area as an electrical engineer. Because the first items of concern in the Equipment Qualification Area were on electrical equipment, I was assigned responsibility to address these concerns. This included training on equipment qualification terminology and techniques

in the equipment qualification field. I have contributed to utility responses to NRC environmental qualification concerns (Bulletins 79-01, 79-01A, 79-01B, and NUREG-0588). This includes equipment selection, specification writing, purchasing and installation in operating plants. During the last year I have been assigned to coordinate the environmental qualification effort at the SHNPP. This involves coordination of the efforts of our architect engineer, Ebasco, and NSSS supplier, Westinghouse Electric Corporation, with respect to the CP&L program at the SHNPP. I also coordinate and work on NRC Information Notices and Bulletin Responses for the Instrument and Control Group of the Harris Plant Engineering Section.

Q.8 What is the purpose of this testimony?

A.8 (RWP, PMY) The purpose of this testimony is to describe briefly the program for environmental qualification of electrical equipment at the SHNPP, so that we may place in context our testimony and the testimony of Applicants' other witnesses which will address specific allegations found in Eddleman Contention 9. Contention 9 states, in its entirety:

> The program for environmental qualification of electrical equipment at Shearon Harris is inadequate for the following reasons:
>
> A. The proposed resolution and vendor's modification for ITT-Barton transmitters has not been shown to be adequate. (Ref. IE Information Notices 81-29, 82-52 and 83-72).
>
> B. There is not sufficient assurance that the concerns with Limitorque valve operators identified in IE Information Notice 83-72 (except for Items C2, C5 and C7) have been adequately resolved.

C. It has not been demonstrated that the RTDs have been qualified in that the Arrhenius thermal aging methodology employed is not adequate to reflect the actual effects of exposures to temperatures of normal operation and accidents over the times the RTDs could be exposed to those temperatures. (Ref. NUREG/CR-1466, SAND-79-1561, Predicting Life Expectancy of Complex Equipment Using Accelerated Aging Techniques.)

D. The qualification of instrument cables did not include adequate consideration and analysis of leakage currents resulting from the radiation environment. These leakage currents could cause degradation of signal quality and/or spurious signals in Harris instrument cables.

E. There is not sufficient assurance that the physical orientation of equipment in testing is the same as the physical orientation of equipment installed.

F. The effects of radiation on lubricants and seals have not been adequately addressed in the environmental qualification program.

G. There is inadequate assurance that failure to report all results of environmental qualification tests, including failures, has been brought to light in connection with electrical equipment installed in Harris. This includes past test failures of equipment which subsequently passes an EQ test and test failures of equipment which is said to be qualified by similarity. (Ref. Item 2, Page 5, L. D. Bustard et al., Annual Report: Equipment Qualification Inspection Program, Sandia National Laboratories, FY83).

Q.9 What is the purpose of the program for environmental qualification of electrical equipment at the SHNPP?

A.9 (RWP, PMY) Equipment that is relied on to perform a necessary safety function must be demonstrated to be capable of maintaining functional operability under all service conditions postulated to occur during its installed life for the time it is required to operate. The purpose of the environmental qualification program for electrical equipment at the SHNPP is to ensure all safety-related electrical equipment and other electrical equipment important to safety is qualified to be capable of performing its safety functions in the environment postulated for design basis events. Environmental conditions include temperature, pressure, humidity, radiation, chemicals, and submergence.

Q.10 What regulatory requirements apply to Applicants' environmental qualification program?

A.10 (RWP, PMY) The Commission's regulations at 10 C.F.R. § 50.49 establish requirements for environmental qualification of electrical equipment important to safety. Equipment "important to safety" includes safety-related electrical equipment and nonsafety-related electrical equipment whose failure under postulated environmental conditions could prevent satisfactory accomplishment of safety functions by safety-related equipment. At the SHNPP, all equipment "important to safety" is safety-related. In general, environmental qualification is required to meet General Design Criteria 1, 2, 4 and 23 of Appendix A, and Sections III and XI of Appendix B, to 10 C.F.R. Part 50. Staff guidance for meeting the regulatory requirements in 10

C.F.R. § 50.49 is provided in NUREG-0588 (Revision 1), "Interim Staff Position on Environmental Qualification of Safety Related Electrical Equipment."

Q.11 Where is Applicants' environmental qualification program described?

A.11 (RWP, PMY) Applicants' environmental qualification program is described in some detail in the Shearon Harris Nuclear Power Plant Final Safety Analysis Report ("FSAR") at Section 3.11. FSAR Appendix 3.11A compares Applicants' procedures for environmental qualification of electrical equipment with NUREG-0588. FSAR Section 3.11 and Appendix 3.11A are Applicants' Exhibit 8.

Q.12 In general, how do Applicants ensure electrical equipment is qualified to withstand postulated harsh environments?

A.12 (RWP, PMY) Applicants' program for environmental qualification of electrical equipment is designed in accordance with 10 C.F.R. § 50.49 and NUREG-0588 (which is endorsed by 10 C.F.R. § 50.49(k)). The principal elements of Applicants' program to meet Section 50.49 include:

(1) Identify on the Master List all electrical equipment required to be environmentally qualifed.

(2) Identify environmental parameters at equipment locations, e.g., radiation, temperature, humidity.

(3) Specify equipment for the appropriate environmental parameters in accordance with applicable NRC regulations and guidance and industry standards.

(4) Evaluate vendor proposals for meeting the specifications and evaluate vendor test plans prior to testing.

(5) Review vendor environmental qualification reports.

(6) Assemble Environmental Qualification Packages containing all required documentation.

(7) Prepare documentation for NRC Staff audit, including:

(a) Environmental Qualification Program Report;

(b) Master List;

(c) Component Evaluation Sheets;

(d) Environmental Qualification Packages.

(8) Respond to any Staff audit findings and requests for additional information.

(9) Qualify all equipment prior to fuel load.

(10) Monitor NRC and other studies, reports and Information Notices, IE Bulletins, vendor information and other industry experience for applicability to the SHNPP.

Q.13 How have Applicants organized their direct case in response to Eddleman Contention 9?

A.13 (RWP, PMY) Applicants are presenting a separate piece of testimony on each of the seven specific allegations in Eddleman Contention 9, as follows:

1. "Applicants' Testimony of Robert W. Prunty, Peter M. Yandow and Richard B. Miller in in response to Eddleman Contention 9A (ITT-Barton Transmitters)."

2. "Applicants' Testimony of Robert W. Prunty and Peter M. Yandow in Response to Eddleman Contention 9B (Limitorque Valve Operators)."

3. "Applicants' Testimony of Richard B. Miller and Thomas W. Dakin in Response to Eddleman Contention 9C (Thermal Aging of RTDs)."

4. "Applicants' Testimony of Richard M. Bucci and Edwin J. Pagan in Response to Eddleman Contention 9D (Instrument Cables)."

5. "Applicants' Testimony of Richard M. Bucci, Edwin J. Pagan and Edward M. McLean in Response to Eddleman Contention 9E (Physical Orientation of Equipment)."

6. "Applicants' Testimony of Richard M. Bucci, Edwin J. Pagan and Peter M. Yandow in Response to Eddleman Contention 9F (Lubricants and Seals)."

7. "Applicants' Testimony of Robert W. Prunty, Richard M. Bucci, Edwin J. Pagan and Kumar V. Hate in Response to Eddleman Contention 9G (Type Test Reporting)."

August 31, 1984

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

In the Matter of	)	
	)	
CAROLINA POWER & LIGHT COMPANY	)	Docket No. 50-400 OL
and NORTH CAROLINA EASTERN	)	
MUNICIPAL POWER AGENCY	)	
	)	
(Shearon Harris Nuclear Power	)	
Plant)	)	

APPLICANTS' TESTIMONY OF ROBERT W. PRUNTY AND PETER M. YANDOW IN RESPONSE TO EDDLEMAN CONTENTION 9B (LIMITORQUE VALVE OPERATORS)

Q.1 Please state your names.

A.1 Robert W. Prunty and Peter M. Yandow.

Q.2 Mr. Prunty and Mr. Yandow, are your addresses, occupations, employers, educational backgrounds and professional work experiences described elsewhere in the record of this proceeding?

A.2 (RWP, PMY) Yes, the relevant infcrmation is provided in "Applicants' Testimony of Robert W. Prunty and Peter M. Yandow in Response to Eddleman Contention 9 (Environmental Qualification of Electrical Equipment)."

Q.3 What is the purpose of this testimony?

A.3 (RWP, PMY) The purpose of this testimony is to respond to Eddleman Contention 9B, which states:

> There is not sufficient assurance that the concerns with Limitorque valve operators identified in IE Information Notice 83-72 (except for Items C2, C5 and C7) have been adequately addressed.

Q.4 How is your testimony organized?

A.4 (RWP, PMY) First, we provide background information on Limitorque valve operators, including a description of a valve operator and an explanation of the safety functions performed by Limitorque valve operators at SHNPP. Second, we summarize the concerns relating to Limitorque valve operators contained in IE Information Notice 83-72, and describe generally CP&L's field verification program to address those concerns referenced in Eddleman Contention 9B. Third, we discuss in turn each of the following concerns about Limitorque valve

operators referenced in Eddleman Contention 9B: (1) qualification and rating of terminal blocks, (2) qualification of motor insulation material, (3) installation orientation, (4) installation of drain plugs, (5) lack of agreement between purchase order and qualification files and installed components, and (6) qualification of O-rings. With respect to each of these concerns, we describe the concern and the actions CP&L is taking to resolve it.

Q.5 Mr. Yandow, what is a valve operator?

A.5 (PMY) A valve operator (or actuator) is a component of a valve which causes it to open or close. Limitorque valve operators contain electrical motors which, through a series of mechanical gears, cause the valve to change position. Examples of types of valves which use Limitorque operators at SHNPP are globe valves, butterfly valves and gate valves. A typical gate valve with a Limitorque operator is shown in Figure 1 (attached hereto). Figure 2 (attached hereto) provides a more detailed picture of a Limitorque operator.

Q.6 Are Limitorque valve operators used at SHNPP?

A.6 (PMY) Limitorque valve operators are used on a number of valves which perform safety-related functions at SHNPP. Those functions include: isolation of the reactor containment, isolation of the reactor coolant system pressure boundary, operation of the emergency core cooling system, and operation of emergency safeguard systems. Limitorque valve operators are found in various locations in the reactor containment and the reactor auxiliary building.

Q.7 How did CP&L become aware of the concerns about Limitorque valve operators reported in IE Information Notice 83-72?

A.7 (RWP) CP&L, as the holder of a construction permit for SHNPP, receives IE Information Notices issued by the NRC. IE Information Notice 83-72 was received by CP&L's Nuclear Licensing Department and was distributed to the Harris Plant Engineering Section ("HPES") for evaluation.

Q.8 What were the results of CP&L's evaluation of the concerns raised in IE Information Notice 83-72?

A.8 (PMY) Equipment Environmental Qualification Notice No. 24 of IE Information Notice 83-72 (October 28, 1983) provides information on deficiencies related to Limitorque valve operators at Consumer Power Company's Midland Plant, Units 1 and 2 ("Midland"). These deficiencies were construction deficiencies reported to the NRC Staff pursuant to 10 C.F.R. § 50.55(e) by The Bechtel Associates Professional Corporation ("Bechtel"), the Architect/Engineer for Midland.

After reviewing the Information Notice, CP&L contacted the Limitorque Corporation ("Limitorque") for additional information in order to determine possible applicability of the Information Notice to SHNPP. Limitorque in its written response stated that, with one possible exception, all of the deficiencies found at Midland were plant specific. Most of the Midland specific deficiencies were the result of lack of information concerning qualification of the operators on the part of

Midland personnel, rather than hardware deficiencies. The other Midland specific deficiency was a field related problem. The only deficiency which possibly was not limited to Midland was the use of unqualified terminal blocks in some operators supplied to Westinghouse. However, Limitorque indicated that Westinghouse had undertaken to identify and replace all unqualified terminal blocks. Therefore, Limitorque did not recommend that any corrective action be taken by CP&L as a result of IE Information Notice 83-72.

Nevertheless, CP&L is in the process of implementing a field verification program for the 16 active, safety-related valves with Limitorque operators located inside containment at SHNPP. The inspections will be conducted by equipment qualification personnel. The field verification program will provide additional assurance that unqualified terminal blocks, and each of the other concerns raised in Eddleman Contention 9B, have been adequately addressed for SHNPP. The results of the field verification program, and CP&L's evaluation of the those results, will be documented in the environmental qualification packages for the valves of concern.

Q.9 Please describe the concerns at Midland relating to Limitorque terminal blocks.

A.9 (PMY) Items A, B and C9 of IE Information Notice 83-72 were all deficiencies at Midland relating to Limitorque terminal blocks. Item A concerns underrated terminal blocks. While replacing a damaged terminal block on a Limitorque

operator, Bechtel discovered that some of the terminal blocks used for the termination of the leads from the 460-volt motor were rated less than 460 volts. The underrated terminal blocks could have prevented the valves from performing their safety function, and also posed a safety hazard to plant personnel.

According to Limitorque, Bechtel in 1979 had requested that Limitorque replace the terminal blocks in a certain group of operators for the purpose of providing additional terminal points. When the Limitorque field service representative ran out of factory supplied terminal blocks, he obtained additional terminal blocks locally. These terminal blocks were not rated for 460 volt service. Following identification of the error, Limitorque inspected all the operators whose terminal blocks had been replaced, and replaced those that were underrated with terminal blocks rated for 460 volts. To confirm that the underrated terminal blocks were limited to this particular group of operators, Limitorque inspected a random sample of its other operators at Midland and found no other instances of underrated terminal blocks.

Item C9 of IE Information Notice 83-72 involved Midland personnel's inability to identify terminal blocks in the low voltage control circuits of Limitorque operators. Limitorque conducted a random inspection of its operators at Midland and found all control terminal blocks inspected to be identifiable and suitable for their application. Limitorque then instructed Midland personnel on how to identify the terminal blocks by using vendor supplied catalog data sheets.

Item B of IE Information Notice 83-72 was a deficiency at Midland involving the use of unqualified terminal blocks in some Limitorque operators. The terminal blocks in question were Buchanan 0824 nylon terminal blocks, which have never been type tested. In addition, tests have shown that nylon experiences 25 percent degradation at a radiation dose of 4.7 x 10E6 rads. Some Limitorque operators at SHNPP are located in areas that could receive a total integrated dose of greater than 4.7 x 10E6 rads. Limitorque has stated that Buchanan 0824 terminal blocks were used exclusively on operators provided to Westinghouse. Westinghouse has supplied valves with Limitorque operators to SHNPP. However, Westinghouse has notified CP&L that none of those operators has Buchanan 0824 terminal blocks.

Q.10 Is CP&L taking any action to address terminal blocks in Limitorque operators?

A.10 (PMY) As discussed above, CP&L has developed and is in the process of implementing a field verification program for Limitorque valve operators. Active, safety-related Limitorque valve operators located inside containment at SHNPP will be inspected.

Limitorque has provided CP&L with the particular dimensions of the types of terminal blocks which were tested with the valve operators supplied to SHNPP. Those terminal blocks include Buchanan types 0524 and 0222, Marathon types 300 and 1600, Curtis type L, and General Electric type EB-5. Field verification of the terminal blocks consists of measuring the

dimensions of the power and nonpower lead terminal blocks, including the point-to-point distances of the terminal screws, and comparing these measurements with the vendor supplied information. (See, for example, Figures 3 and 4, attached hereto.) To date, all terminal blocks inspected have been environmentally qualified. Any unqualified terminal blocks found will be replaced with qualified terminal blocks.

Q.11 Please describe the concern at Midland involving Limitorque motor insulation material.

A.11 (PMY) Item C1 of IE Information Notice 83-72 concerns identification by Bechtel of Class H insulated motors inside the containment at Midland, for which the motor nameplate ambient temperature rating was 50°C. Bechtel stated that it was not aware that Class H insulated motors had been type tested and found environmentally qualified for inside containment in accordance with the applicable IEEE standard.

Limitorque has explained that prior to the adoption of the Class RH nomenclature for motors whose insulation material is qualified for inside containment, motors of this design characteristically were nameplated as Class H. However, Limitorque must review its records on each Class H insulated motor to confirm that the motor is constructed with a Class RH insulation system. The results of Limitorque's review for Midland Class H motors located inside containment showed that all the motors were properly qualified.

Q.12 What action is CP&L taking to address Limitorque motor insulation material?

A.12 (PMY) CP&L requested Limitorque to conduct a review of its records on valve operators located inside containment at SHNPP. Limitorque's review indicated that the valve operator motors for SHNPP have qualified insulation.

In addition, CP&L is checking Limitorque motor ratings on the nameplates as part of its field verification program. Serial numbers for any motors indicating Class H insulation will be provided to Limitorque in order that Limitorque can confirm that RH insulation was used. To date, all motor insulation material has been identified to be RH. Any valve operator motor found to be unqualified for inside containment will be replaced with a qualified motor.

Q.13 Please describe the concern relating to installation orientation of Limitorque valve operators at Midland.

A.13 (PMY) Item C3 of IE Information Notice 83-72 was based on Bechtel's observation of Limitorque operators installed in various orientations at Midland. Bechtel did not know whether the operators were qualified for all installation orientations.

Limitorque Qualification Report B-0058 provides recommendations for installing Limitorque valve operators. Limitorque recommends against mounting the operator in a position where either the motor or the limit switch compartment is directly beneath the gear case. There is a remote possibility

that a random seal failure could occur, resulting in lubricant leaking into the electrical enclosures and possibly impairing the operability of the equipment.

Q.14 What action is CP&L taking to address installation orientation of Limitorque valve operators?

A.14 (PMY) CP&L and its Architect/Engineer follow specified procedures to assure proper installation orientation of safety-related electrical equipment, including Limitorque valve operators.

CP&L's field verification program for Limitorque valve operators also includes a check of installation orientation. So far, no deviations from Limitorque's recommended orientations have been identified. Orientation of any valve operators installed incorrectly will be modified to conform to Limitorque's recommendations.

Q.15 Please describe the concern relating to installation of drain plugs in Limitorque valve operators at Midland.

A.15 (PMY) Item C4 includes two related concerns having to do with proper drainage of the valve operator motors. The first was that motor drain plugs (T-drains) were not always in place. The second was that orientation of the operators did not always result in the drain holes being at the lowest point of the operator as installed. Bechtel did not know whether either of these facts was relevant to the environmental qualification of the operators.

Limitorque has informed CP&L that valve operators qualified for inside containment require the installation of motor drain plugs in order to prevent possible moisture buildup in the motor. The drain plugs must be installed in the two lowest drain plug locations. These locations will vary depending on the installation orientation, as determined by SHNPP installation design drawings. Therefore, the drain plugs are placed in the limit switch compartment, with installation instructions, at time of shipment of the operators by Limitorque.

Q.16 What action is CP&L taking to address installation of motor drain plugs?

A.16 (PMY) Installation orientation of Limitorque valve operators is addressed above with respect to Item C3.

To ensure the proper documentation and inspection of the drain plugs, CP&L HPES has specifically instructed construction personnel via a site design document to install the drain plugs. The design document is now part of the work package used to install the equipment. A special note also has been added to the installation design drawing used along with the work package by construction personnel. This note directs the person installing the drain plugs to install them at the lowest oriented points in the motor. Proper installation of the drain plugs will be independently verified in the field by the on-site quality inspection organization. In addition, proper installation will be checked as part of the field verification program for Limitorque valve operators.

Q.17 What was the concern at Midland relating to purchase order and qualification files agreeing with installed components, and what action is CP&L taking to address it?

A.17 (PMY) Item C6 of IE Information Notice 83-72 simply states that "[i]nformation obtained from purchase order files and qualification files does not agree with the installed components."

As part of the procurement process for safety-related electrical equipment at SHNPP, the design engineering organizations at Ebasco and CP&L review the equipment qualification documentation against the requirements contained in the purchase order and specifications for the equipment in order to determine compliance with those requirements. The equipment itself is inspected: (1) prior to shipment, (2) upon receipt at the site, and (3) after installation, in order to verify that the equipment agrees with the purchase order, specifications and other design documents.

CP&L's field verification program for Limitorque valve operators will provide additional assurance that the installed valve operators are identical to those which have been environmentally qualified for SHNPP, as documented in the purchase orders and environmental qualification packages.

Q.18 Please describe the concern regarding qualification of O-rings.

A.18 (PMY) Item C8 of IE Information Notice 83-72 questions the qualification of O-rings used in the Limitorque valve operators at Midland.

The vendor test reports which describe qualification testing of Limitorque valve operators, both for inside and outside containment, identify O-rings as components included in the tests. O-rings thus are qualified as an integral part of the equipment.

Limitorque's valve operator assembly control system, as described to CP&L by Limitorque, assures that the proper O-rings are used in the assembly of each type of valve operator. All components for an operator being assembled are collected in one assembly area. Each component is inspected to affirm that it is the correct type. O-rings are marked by Limitorque with a color code, which facilitates proper identification.

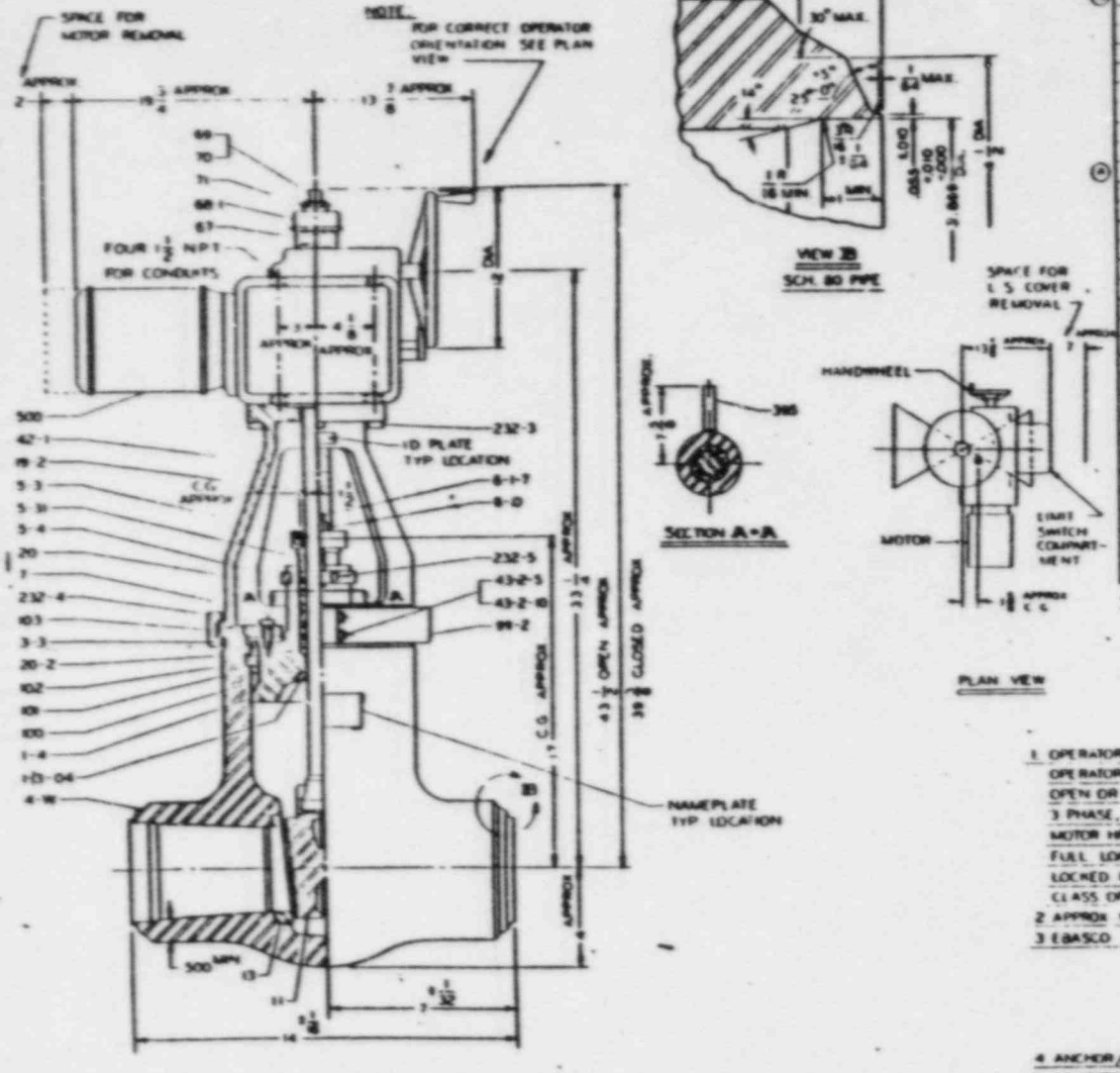
Q.19 What action is CP&L taking to address qualification of O-rings?

A.19 (PMY) For the reasons stated above, CP&L does not believe that Item 8 of IE Information Notice 83-72 raises a potential concern for SHNPP. Further, O-rings cannot be identified without disassembling the operator. However, if the field verification program identifies any components of an operator for which qualification appears questionable, the operator will be disassembled and all questionable components of the operator, including any unidentifiable O-rings, will be replaced.

Q.20 In conclusion, is there reasonable assurance that the above concerns with Limitorque valve operators identified in IE

Information Notice 83-72 have been adequately addressed by the environmental qualification program for SHNPP?

A.20 (RWP, PMY) Yes.



PARTS LIST

PART NO	NO REQ'D	PART NAME	MATERIAL
1-3-04	1	STOP RING WITH STELLITE	SA 515 GRADE 70
1-4	1	BONNET	SA 105 GRADE 2
3-3	1	CANOPY RING	SA 106 GRADE B
4-W	1	WELD ENDS BODY	SA 216 GRADE WCB
5-3	1	FOLLOWER FLANGE	A 36
5-31	1	FOLLOWER GLAND	A 582 TYPE 416
5-4	1	GLAND CLAMP	A 36
6-1-7	2	FOLLOWER BOLTS	A 193 GRADE B7
6-10	2	FOLLOWER NUTS	A 194 GRADE 2H
7	1	LANTERN GLAND	A 582 TYPE 416
11	1	DISC WITH STELLITE	SA 216 GRADE WCB
13	2	SEAT RINGS WITH STELLITE	SA 519 GRADE 1026
19-2	1	STEM	A 582 TYPE 416 COND T
20	1 SET	UPPER PACKING	JOHN CRANE 187 I
20-2	1 SET	LOWER PACKING	JOHN CRANE 187 I
42-1	1	YOKE	A 216 GRADE WCB
43-2-5	2	YOKE CLAMP STUDS	A 193 GRADE B7
43-2-10	4	YOKE CLAMP NUTS	A 194 GRADE 2H
67	1	STEM PROTE[illegible]	COMMERCIAL STEEL
68-1	1	PIPE CAP	COMMERCIAL IRON
69	1	INDICATOR ROD	A 582 TYPE 416 COND T
70	1	JAM NUT	A 165 TYPE NS
71	1	SERVICE ENTRANCE CONNECTOR	STEEL AND RUBBER
99-2	1	YOKE CLAMP	A 36
100	1	PRESSURE SEAL GASKET	COMMERCIAL IRON
101	1	SPACER RING	A 510 GRADE 1015
102	1	GASKET RETAINING RING	SA 105 GRADE 2
103	1	BONNET RETAINING RING	A 36
232-3	4	LIMITORQUE CAP SCREWS	A 574
232-4	8	BONNET CAP SCREWS	COMMERCIAL STEEL
232-5	2	GLAND CAP SCREWS	A 574
385	1	LEAKOFF PIPE	SA 106 GRADE B
500	1	LIMITORQUE OPERATOR	COMMERCIAL

A		ADDED NOTE 5	
A1		[illegible]	
B		REVISED DIMENSIONS - NOTE 1	
B1		REVISED BILL NOS. - NOTE 1	
B2		ADDED NOTE 3	
B3		ADDED 7/8 AND 7/16 DIMENSIONS	
C		ROTATED OPERATOR 90° AND ADDED NOTE	

NOTES

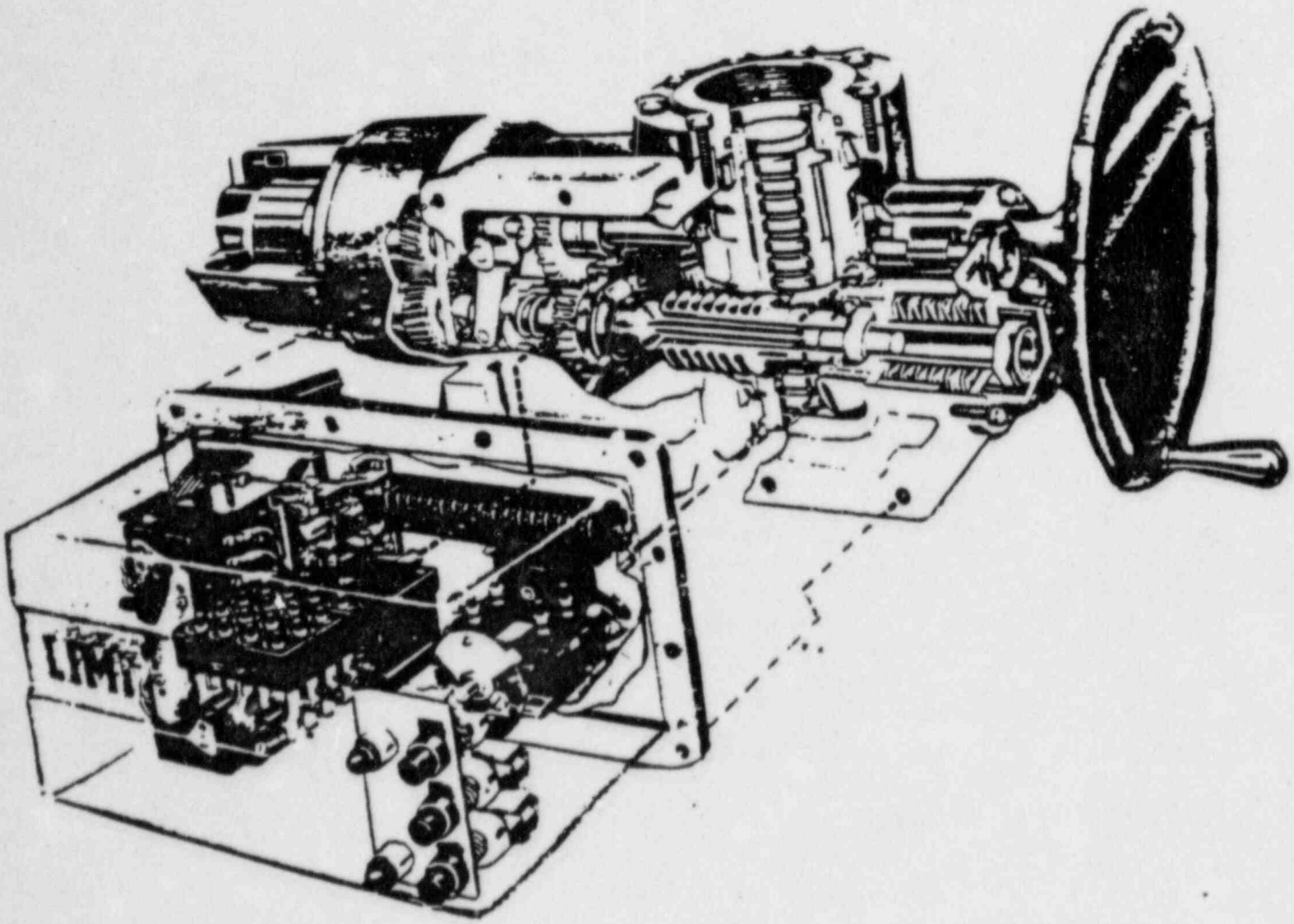
1. OPERATOR MANUFACTURER = PHILA GEAR CORP.
   OPERATOR SIZE = SMB-00 WITH 15 FT LB MOTOR
   OPEN OR CLOSING TIME = 24 SECONDS
   3 PHASE, 60 CYCLES, 460 VOLTS
   MOTOR HP = 1 RPM = 1800
   FULL LOAD AMPS = 2.8
   LOCKED ROTOR AMPS = 16
   CLASS OF INSULATION = B
2. APPROX WEIGHT = 440 LBS.
3. EBASCO TAG NO. 2AF-V105A-1 2AF-V1185B-1
   2AF-V105A-2 2AF-V1185B-2
   2AF-V195A-1 2AF-V1175B-1
   2AF-V195A-2 2AF-V1175B-2
   2AF-V235A-1 2AF-V1185B-1
   2AF-V235A-2 2AF-V1185B-2
4. ANCHOR/DARLING 50 E5796 ITEM 1.
5. LIMITORQUE OPERATOR DWG. 02-403-0002-3 REV E
   LIMITORQUE WIRING DIAGRAM 15-477-3421-3 REV A

EBASCO SERVICES INC.
SHEARON HARRIS 1 AND 2
EBASCO PO NY-435003

4" 900 WELDING ENDS, CARBON STEEL, FLEX WEDGE GATE VALVE WITH SMB-00 LIMITORQUE OPERATOR

94-13576 C

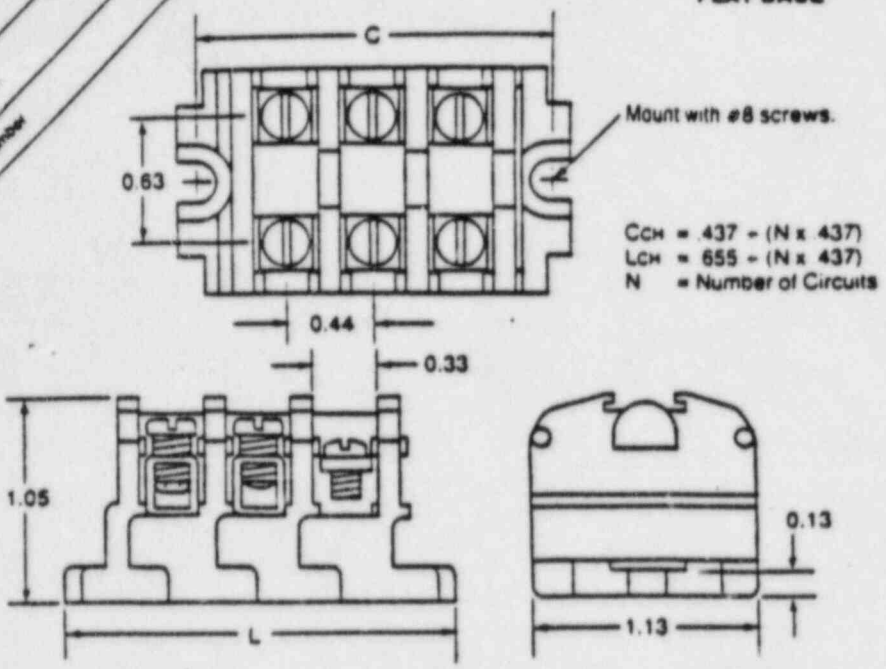
Figure 2



Accessories

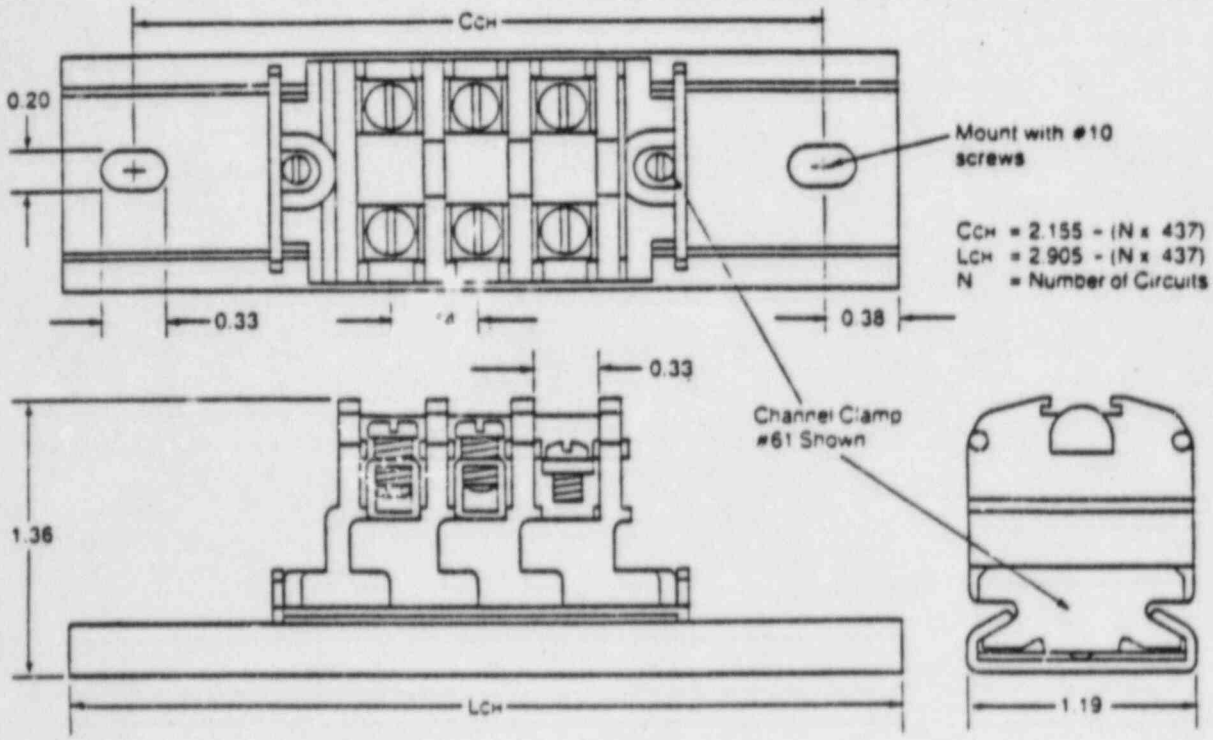
	Standard Package	Catalog Number
Vinyl Marking Strip Use #65 holding plug	25 ft. Coil	50
Elevated Marking Strip	18 in.	52
Nylon Holding Plug For marking strip	100 plugs	65
Marking Pen Black ink	12 pens	99

FLAT BASE



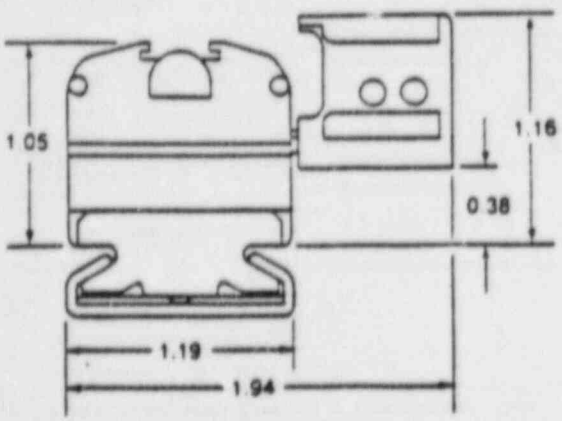
C_{CH} = .437 - (N x .437)
L_{CH} = .655 - (N x .437)
N = Number of Circuits

DOVETAIL BASE MOUNTED ON STANDARD #60 CHANNEL



C_{CH} = 2.155 - (N x .437)
L_{CH} = 2.905 - (N x .437)
N = Number of Circuits

SECTIONAL FANNING STRIPS



Scale 1:1

Controlead BULLETIN

MARATHON special products

4

MEDIUM DUTY

DIMENSIONS: 300 Series

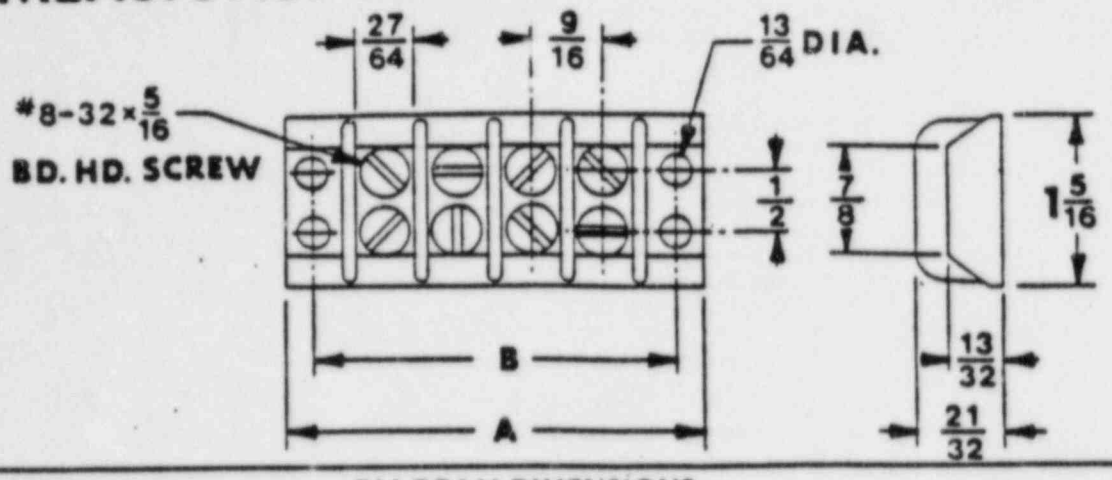


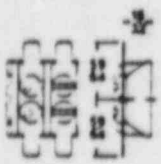
DIAGRAM DIMENSIONS

NO. OF TERM.	DIMENSIONS A	DIMENSIONS B	NO. OF TERM.	DIMENSIONS A	DIMENSIONS B
1	1-17/32	1-1/8	13	8-9/32	7-7/8
2	2-3/32	1-11/16	14	8-27/32	8-7/16
3	2-21/32	2-1/4	15	9-13/32	9
4	3-7/32	2-13/16	16	9-31/32	9-9/16
5	3-25/32	3-3/8	17	10-17/32	10-1/8
6	4-11/32	3-15/16	18	11-3/32	10-11/16
7	4-29/32	4-1/2	19	11-21/32	11-1/4
8	5-15/32	5-1/16	20	12-7/32	11-13/16
0	6-1/32	5-5/8	21	12-25/32	12-3/8
10	6-19/32	6-3/16	22	13-11/32	12-15/16
11	7-5/32	6-3/4	23	13-29/32	13-1/2
12	7-23/32	7-5/16	24	14-15/32	14-1/16

(Catalog dimensions are for guidance only and are not to be construed as inspection standards.)

DIMENSIONS ON STANDARD MODIFICATIONS

F1



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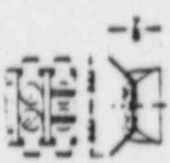
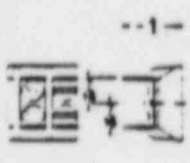


F3



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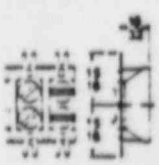
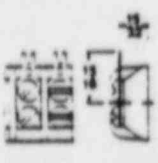
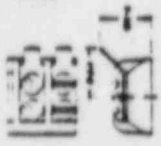


HS

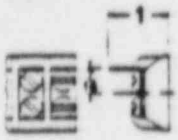


HF1

HF2



HF3

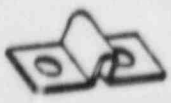


L

LWW

SPECIAL ORDER MODIFICATIONS

(Consult Factory)



LL

SPECIAL ORDER MODIFICATIONS DEFINITIONS

LL—Line to line jumper

PRINTED BLOCKS, MARKING STRIPS AND COVERS REFER TO BULLETIN 4-20.

Subject to change without notice.

MARATHON SPECIAL PRODUCTS
DIVISION OF MARATHON ELECTRIC
BOWLING GREEN, OHIO 43402

1 AGBpp

BY MR. O'NEILL:

Q Gentlemen, do you have before you the document that has been previously identified as Applicant's Exhibit 8?

A (Witness Pronty) Yes, we do.

A (Witness Yandow) Yes, we do.

Q Does the document consist of Section 3.11 and Appendix 3.11A, of the Harris Final Safety Analysis Report?

A (Witness Pronty) Yes, it does.

A (Witness Yandow) Yes.

Q And are sections of Applicant's Exhibit 8 periodically referenced throughout your testimony?

A (Witness Pronty) Yes, it is.

A (Witness Yandow) Yes, they are.

MR. O'NEILL: At this time, Applicant's move that Applicant's Exhibit 8 be received into evidence.

JUDGE KELLEY: Motion granted.

(Whereupon, the document previously marked as Applicant's Exhibit 8 for identification was received into evidence.)

BY MR. O'NEILL:

Q Mr. Pronty, would you please summarize the testimony that you and Mr. Yandow are sponsoring here today?

A (Witness Pronty) The purpose of this testimony

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is to describe briefly the Applicant's program for environmental qualification of electrical equipment at Shearon Harris and to address the specific allegations found in Eddleman Contention 9 so that Applicant's can demonstrate to this Board that Shearon Harris meets the requirements of the Code of Federal Regulations and the Regulatory Guidance provided by the NRC and that the health and safety of the general public is assured.

The Applicant's environmental qualification program is established. It is designed to meet the requirements of 10CFR 50.49 and the regulatory positions of NUREG 0588, category 2. The program includes identifying equipment required to be qualified, identifying the environmental parameters, specifying and procuring the equipment, establishing a master list of qualified equipment, evaluating better qualification reports, and preparing qualification files for NRC review and audit.

The seven specific subcontentions deal with A. ITT Barton transmittor modifications, B. Limitorque valve operator concerns, C. RTD thermal aging, D. instrumental cable leakage current, E. physical orientation of installed equipment, F. radiation effects on lubricants and seals, and G. vendor failure to report test failures.

Subcontention 9C has already been addressed by Mr. Miller and Dr. Dakin.

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The next contention that we will address is Eddleman Contention 9B. The purpose of this testimony is to respond to the contention that concerns with Limitorque valve operators identified in IEE information notice 83-72, have not been adequately addressed and to assure this Board that the Applicant's have established a program to insure proper qualification and operability of the valve operators.

We provide background information on the Limitorque valve operator, summarize the concerns with these operators, describe our field verification to address those concerns, and discuss in turn the specific concerns referenced in this contention.

These concerns are: 1. Qualification and rating of terminal blocks, 2. Qualification of motor insulation material, 3. Installation orientation, 4. Installation of drain plugs, 5. Lack of agreement between documentation and installed components, and 6. Qualification O-rings.

In each case we describe the actions that we are taking and have taken. These actions clearly show that Applicants have satisfactorily addressed the concerns of this contention and the Applicants feel there is not a problem with the Limitorque valve operators at Shearon Harris.

Q Thank you, Mr. Pronty.

Mr. Yandow, do you have anything to add to the

1 AGEpp

prefiled statement of August 31, 1984, with respect to the implementation of Applicant's program regarding the Limitorque valve operators?

A (Witness Yandow) Yes, I do.

The Applicant's field verification program, as described in Applicant's testimony on Limitorque valves, consists of three parts.

Part 1 verified safety related active valves installed in the reactor containment building. No deficiencies were found.

Part 2 is verified safety related active valves installed in the main steam tunnel in the reactor auxiliary building, no deficiencies have been found.

The two verifications discussed above consist of the following elements: One, measurement of installed terminal blocks in comparison of those measurements to the vendor supply data. Two, verification of motor insulation type using motor nameplate data. Three, installation orientation. Four, installation of drain plugs. Five, verification of serial numbers and valve identification data. Six, visual inspection of internal components for color and material type as specified by Limitorque.

Part 3 of the Applicant's verification program, will include the remaining safety related active valves installed in all harsh environment areas. The scope of the

1 AGBpp

inspections will be defined using information available from Limitorque and Shearon Harris.

The above verification program clearly indicates that the Applicant's environmental qualification program has addressed the concerns raised in information notice 83-72 and that notice is not applicable to Shearon Harris.

Q Thank you, Mr. Yandow.

MR. O'NEILL: This Panel is available for cross examination.

JUDGE KELLEY: Thank you.

CROSS EXAMINATION

BY MR. EDDLEMAN:

Q Mr. Yandow, did you file any supplemental testimony concerning the matters that you were just talking about?

A (Witness Yandow) No.

Q So we don't have anything in writing about that, just what you said here?

A That is correct.

Q All right.

As to these -- I'm just going to try to cover it now, if I can. I hadn't really planned to go into that at this point but I think I had better while it is fresher in my mind, because I won't have a transcript on Tuesday.

The inspections of --

1 AGBpp

JUDGE KELLEY: Mr. Eddleman?

MR. EDDLEMAN: Sir?

JUDGE KELLEY: I suppose I could loan you mine on Tuesday if you would rather go at it that way.

MR. EDDLEMAN: That might help, thank you.

JUDGE KELLEY: Whatever you prefer, but you can assume that you can borrow mine Tuesday morning.

MR. EDDLEMAN: Okay. I think I might ask him one or two questions, basic ones, and I will take you up on your kind offer. I think there might be a basis for a motion to strike but if this is really new information I am not going to do it.

BY MR. EDDLEMAN:

Q Mr. Yandow, as to the Limitorques in harsh environments in the Harris plant, is that all of the remaining Limitorques that haven't been inspected yet?

A (Witness Yandow) Part 3, yes.

Q Is there going to be 100 percent inspection of these valves?

A Yes, sir.

Q Is it going to tear them down to the extent that you can check all six subitems of Contention 9B?

A If those six subitems are particular to these valves.

Q Applicable, you mean?

2 AGBpp

A Applicable, I'm sorry, yes.

Q Okay.

The information that you just gave in your answers, is that all information that's been discovered by you since August 31st?

A None of the information that I've offered here is anything new. It was in our prefiled testimony.

Q It was in the prefiled?

A The areas where we will address, yes. This is just the results of that look.

Q Oh, I see what you mean. You said in your prefiles you were going to take a look, right. And now you are saying we have taken a look since August 31 and here is what we've found?

A That is correct.

Q Okay.

Mr. Pronty, if we could turn to page 3 of your testimony on Contention 9 at the bottom of the first paragraph and, describing your experience on these nuclear submarines, you say it covered the entire array of electrical I and C which, I take it, is instrumentation and control?

A (Witness Pronty) That is correct.

Q Correct?

A Correct.

1 AGBpp

Q Now, does that mean that you dealt with interactions as well as operations of all of these things together, that is electrical, I and C, and mechanical?

A From a watch standard standpoint, you deal with the effects that actions and certain systems have on others, yes.

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Q As a watch stander, you would have the responsibility for handling these systems?

A Yes, I would.

Q What I am trying to explore here is, I think you used the words watch stander viewpoint or perspective. Did you from an engineering perspective study or deal with these interactions between all these different kinds of systems or among them?

A Yes, as referenced on page two, I attended both nuclear power school and training on an operational naval training reaction, which is a one year training program, which has extensive background into the workings of all of the systems and practical watchstanding experience, you actually qualify as a watch stander on the operating plant at the completion of that one year training period. So it includes extensive engineering work in that area.

Q Okay.

And that engineering work would deal with interactions of electrical I&C and mechanical systems with these naval nuclear plants?

A That's correct.

Q Bear with me a moment.

(Pause.)

Were you licensed as a reactor operator in your naval work?

2 AGBagb

A We are qualified as engineering officers of the watch, which is the supervisory watch station, and on a nuclear vessel that would allow you to be able to actually sit at the panel, reactor plant control panel on a nuclear vessel. It does not carry the same licensing connotation that you do in the commercial world. I am not a licensed operator commercially.

Q Normally when you were watch standing you would have somebody under you, right?

A That's right.

Q -- who would actually be sitting at the control of the reactor?

A That's right.

Q But you would be in charge?

A That's right.

Q Are these systems, electrical I&C and mechanical, of these Navy reactors generally the same as you find on a plant like the Shearon Harris plant?

A The basic systems are similar, yes. There aren't as many of them. However the basic operation and many of the subcomponents are similar in basic operation.

Q You mean there are less of them on the Navy reactors?

A That's right.

Q Then down at the bottom of page three, the bottom

2 AGBagb

paragraph, you say you came to work at CP&L as a senior engineer in the electrical discipline in the corporate offices in mid-1979.

I gather that was after you got out of the Navy?

A That's correct.

Q You started in in electrical work and then you were made lead engineer -- lead electrical engineer for this Harris Plant Engineering Section.

Was this formation of this Harris Engineering Section, did that have anything to do with the aftermath of the Three Mile Island accident in 1979?

MR. O'NEILL: Objection. That question has no relevance to the testimony we have before us today.

MR. EDDLEMAN: I will drop that question and move on to another matter, if I might.

JUDGE KELLEY: All right.

MR. EDDLEMAN: I think I can possibly tie this in in a more direct way.

BY MR. EDDLEMAN:

Q The environmental qualification program requirements, were they changed in any way after the Three Mile Island accident?

A (Witness Prunty) Subsequent to the Three Mile Island accident some new regulations came out, a new information bulletin from the Staff on regulatory

1 AGBagb

guidance, so there was some additional emphasis placed on equipment qualification.

Q What was that regulatory guidance that you are referring to there?

A I. Bulletin 79-01B, NUREG 0588 and, of course, recently the equipment qualification rule, 10 CFR Part 50.49.

Q And 50.49 is after 0588?

It is the first version, right?

A That's right.

Q I am just trying to....

You describe on there, on pages three and four, quite a lot of responsibilities and the last one is for the environmental qualification program at the Harris plant.

Were all the other responsibilities sort of higher in your work assignment list than the EQ program?

A No, the EQ program was one facet in my job assignment. It got the attention that it required.

Q In your answer four, dropping down on page four, you say you have been "...directly involved in environmental qualification...."

Does that mean that you actually do the EQ qualification tests?

A No.

Q Let's see, it says you were "...responsible for

1 AGBagb

the establishment..." of the Harris EQ program.

Was that a responsibility that was assigned to you when you changed jobs in late '79 -- or changed descriptions?

A Yes, it was.

Q And then when 50-49 came along you picked that up and all of the other requirements that were added to the EQ program became your responsibility because you were in charge of the EQ program, is that right?

A That's correct.

Q And as you describe along there there are some other concurrent supervisory jobs that you have done while you were doing all that, right?

A That's right.

Q Now the two groups that you are talking about there, the last line of page four and then over on page five, "...specify and procure a majority of the equipment covered by t' EQ regulations."

Let me ask you: you are familiar, are you not, with all of the pieces of Contention 9 as it is being dealt with in this proceeding?

A Yes, I am.

Q Did the people under your direction specify and procure all of the equipment that is dealt with in those pieces of Contention 9 that we are dealing with?

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A The Limitorque operators were specified by the valve manufacturer in most cases. They are an appendage which operates the valve. The electrical or instrumentation and control people would not have bought those operators.

Q Are you saying that that wouldn't have been their job to buy them or if it had been their choice they wouldn't have bought those valves?

A They were procured with the valves. That's just the way the purchase order was written.

Q But they didn't specify use Limitorques or don't use Limitorques?

A I don't believe so. I don't have direct knowledge of the original procurement.

All of the other items on there appear to be items that would fall under my supervision in a technical role.

Q Okay.

Have all of those for use at the Harris plant actually been procured now, all of those items within those parts of Contention 9 that you mentioned?

A There have been some items under each category, yes. There is still some miscellaneous instrumentation which is still being purchased at this time. That may add to the scope of these various items, but we do have items of these types.

1 AGBagb

Q So you have some of all of the types on-site but you don't have all of them, is that what you are saying?

A That's right.

Q Mr. Yandow, just a little bit about your qualifications, since that comes up next here.

MR. EDDLEMAN: Excuse me a minute. May I have a moment to confer?

(Counsel conferring.)

BY MR. EDDLEMAN:

Q Mr. Yandow, in your co-operative work in your answer six on page five, was that co-operative work in nuclear power?

A (Witness Yandow) It was on a nuclear power job, yes.

Q Were you an engineer on the job or a concrete pourer or what?

A I worked in the engineering office as an aide to the engineers since I did not have my engineering degree at that time.

Q And what were you working on there?

A I was working under the Control Systems Group on computer programming, predicting control system functions and that type of operation.

Q Predicting how a control system would work, correct?

1 AGBagb

A That's correct.

Q Was that for the Westinghouse plant design or --

A This was at Stone and Webster Engineering.

Q But was it oriented toward a specific design of a plant?

A Because I was in the career development program, I worked on several. I worked on the North Anna unit, and I believe I worked on one of the Millstone units but I am not sure exactly which one.

Q And then later on when you worked for Combustion Engineering, you were responsible for backfits on reactor protection systems.

Were these backfits involved in environmental qualification?

A It was one of the areas that we had to look at. If we took something or replaced something in an existing system, we had to make sure it was at least environmentally qualified to the standards that the original system was built to or to new standards, if required.

Q To your knowledge, were all of the things that were installed in that way environmentally qualified to current standards or the applicable standards?

A Yes, I believe so.

Q When you discuss on page six Bulletin 79-01, 79-01A and also NUREG-0737, the TMI action plan, I believe

1 AGBagb

these three were not among the EQ things that Mr. Prunty mentioned earlier, am I right?

A There were certain parts of it that were involved with environmental qualification.

Q Certain parts of these others were also involved with EQ?

A Yes.

Q Do you know whether those parts of those others would also apply to the Harris plant EQ program?

A Since the issuance of the new rule, I believe that all of these have been enveloped by that new rule.

Q Okay.

And you have just been working with CP&L here on Harris since 1983?

A Correct.

Q Since it is so close, what month in '83 if I might ask?

A I believe it was in May.

Q So you have been working on Harris about a year and a half?

A That's correct.

Q And you are currently responsible for the EQ program at the Harris plant.

Did you start off with that responsibility when you came to CP&L?

A Yes, sir.

Q Mr. Prunty, did his appointment change your responsibility for the EQ program?

A (Witness Prunty) When I first came to the program I was a lead engineer and, as my testimony noted, I was subsequently promoted and needed to have a lead engineer now handle a little of the more detailed aspects of the program so he was hired to be that lead engineer.

Q So you are still in charge of the program and he has the equivalent of your old job as regards environmental qualification?

A That's correct.

Q Mr. Yandow, do you have other responsibilities besides the EQ program, or is that your total job?

A (Witness Yandow) That is my primary responsibility. I do have a few other duties in the instrumentation and control section.

Q How much of your time do they take up?

A The other functions?

Q Yes, sir.

A About 10 percent.

Q Mr. Prunty, in your answer seven down at the bottom of page six you say:

"Because the first items of concern in the equipment qualification area were on

1 AGBagb

electrical equipment...."

Does this refer to environmental qualification as we are referring to here?

A (Witness Prunty) That is Mr. Yandow's answer.

Q I'm sorry.

Mr. Yandow?

A (Witness Yandow) Could you repeat the question?

Q Certainly. For some reason -- and I even had your initials in front of me -- but I thought it was Mr. Prunty's answer.

At the bottom of page six in your answer seven, you say:

"Because the first items of concern in the equipment qualification area were on electrical equipment, I was assigned responsibility to address these concerns."

Now is this the same thing as environmental qualification that we are talking about here, is that what you were working on?

A Yes.

Q When you were assigned that responsibility, do you mean with CP&L or with your previous employers also?

A I had responsibilities for environmental qualification on my other jobs, but also at Harris.

Q The reason for your assignment at Harris is

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because of your involvement in electrical equipment, is that -- am I getting that right? It means you are an electrical engineer, that's why you do it?

I may be a little bit confused.

A I am an electrical engineer by training but I have been trained in the instrument and control area of electrical engineering, since it is not a specific training.

2 AGBwrb

Then, the training on equipment qualification, terminology and techniques, is that training you conduct for other people? --at the bottom of page 6 and over on page 7?

A I have-- By the job function I have certainly assisted people in learning about equipment qualification, but what I meant here was I've taken several industrial courses on equipment qualification.

Q Have any of those been from the NRC?

A I'm aware that the NRC was in attendance in one of them, but I'm not sure that they've sponsored any.

Q Now, I may be getting a little confused. When you say you've contributed to utility responses to NRC environmental qualification concerns, and you list those same four items-- I take it back: they're not the same: they're 7901, 7901A and 7901B, the bulletins, and NUREG-0588. Was that before you came to CP&L?

A No, this is after I came to Harris.

Q When was 5049 put in place?

A February of '83, I believe.

Q Okay.

Now, I'm a little confused by your earlier answer. I thought you said that once 5049 came in it enveloped all these other things. Were you still clearing up a backlog of these things on your job?

A No, we used these other bulletins and NUREGs to

2 AGBwrb

provide guidance in our program.

Q Well, does 5049 require compliance with those bulletins and that particular NUREG?

A Not directly, although it does reference NUREG-0588.

Q If indirectly, how, please?

A Well, some of the items that you are required to do in the equipment qualification program, environmental qualification program, require you to go back to look at some of the requirements that were the other bulletins and notices, and the ways that they were met.

Speaking like in case of -- there's a thing called the component evaluation sheet which we fill out on all our equipment, and that format, or something like it, came out of 79.01(b). And we were using that in that instance.

Q I guess my confusion was that the sentence on the top of page 7, or at least part of my confusion was that that says "Responses to environmental qualification concerns," and I wouldn't have defined a format or something like that as a concern.

Can you explain as to 0588 -- I think you're under Revision 1, now; is that correct?

A That's correct.

Q Which requirements of 0588 would apply to -- or which parts of 0588 would you say are requirements under

3 AGBwrb

50497

If you want to be specific I can talk about the Limitorque valves there, but....

A I believe if you look at our Applicants' Exhibit 8, Appendix 3-11(a), we give a section-by-section description of our compliance with the different sections of 0588, Category 2.

Q Let me refer to that, please.

This is this item-by-item comparison?

A Yes.

Q And so since this is in evidence, for any item that comes within Contention 9, I can just look in there for some of these requirements that might be applicable to it; correct?

A That's correct.

Q Okay.

And all of these requirements that-- I'm sorry; you've answered that question.

Let me back off a second here.

Gentlemen, did you participate in the preparation of Applicants' responses to interrogatories on Contention 9?

A (Witness Prunty) Yes, I participated in them.

A (Witness Yandow) Yes.

Q Both of you did.

Mr. Prunty, were you the affiant for some of them?

1 AGBwrb

A (Witness Prunty) Not on Contention 9.

Q Are you familiar, Mr. Prunty, with the questions and answers?

A Yes, I'm generally familiar.

Q Has the actual, I'll say applicants' review and acceptance of the environmental qualification reports for all the equipment at Harris covered by Contention 9, been completed yet? I mean, covered by Contention 9 as we're dealing with it here.

A (Witness Yandow) I can't say that, no.

Q Okay.

Do you know which items haven't been fully accepted?

A Give me a second.

Q Sure.

(Pause.)

A Well, there's really only three that are equipment-specific, and of the three we've accepted two fully. We've reviewed the third but we haven't finished the review.

Q Okay.

Which are the two, and then what's the third, please?

A The Barton issue, we've finished the review of that report and found it acceptable for Shearon Harris.

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The RTD reports we have reviewed and found acceptable. The Limitorque reports we're still working on.

Q Do you have all the reports on Limitorques?

A To the best of my knowledge, yes.

Q Okay.

One of the interrogatory responses indicates that all test failures of equipment required to be environmentally qualified must be documented by the vendor.

Would a vendor who had conducted a EQ test on one of these items covered by Contention 9 as we now have it, have to notify you, the power plant -- a power plant that's using those items, if a test failure occurred?

MR. O'NEILL: Mr. Chairman, I object to asking this question at this time. There's a whole contention that gets into that issue, 9G, on type test reporting. And that's the whole purpose of that issue. It seems to me the record would be a little bit clearer if we deal with the issues as they come along, and Mr. Prunty will be there on that panel as well.

MR. EDDLEMAN: Well, one of the things I'm trying to get at is whether there have been any failure in some of these other areas, and I don't know if that is covered by 9G or not1.

JUDGE KELLEY: I thought Mr. O'Neill is indicating that it is.

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MR. O'NEILL: Well, the question, as I understood it, was with respect to type tests and any failures as addressed in 9g. Now, with respect to Limitorque values or Barton transmitters, that is issue is specifically defined, and we're not opening up this contention to any questions about any failure of the whole environmental qualification program. We're dealing with the issues as they're set out here.

JUDGE KELLEY: Sustained. Deal with it under 9g.

MR. EDDLEMAN: All right.

BY MR. EDDLEMAN:

Q Do the Limitorque values and the other things -- other specific items of equipment as specified or dealt with in Contentions 9a through 9f, have to be qualified for a harsh environment if they are located in one?

A (Witness Prunty) If they perform a safety function in that harsh environment and are required to mitigate or prevent an accident, then they would be qualified for that environment.

Q They would have to be, wouldn't they?

A Yes, they would.

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Q To your knowledge, has the Applicant's definition of harsh environment changed since the interrogatory responses on Contention 9 were put out last April?

A I don't recall exactly.

Q Do you have a copy of those responses there, sir?

A I've got some of them, which --

Q On Contention 9. I would hope you would have the ones on Contention 9 dated April 17, 1984?

A Yes, I have that one. Where are you?

Q Page number 16, if you have got the same page numbers that were in my copy that I got. Down at the bottom 9-3B?

A Yes. That is still our definition of harsh environment.

Q I would like to read it and just have you check me. A harsh environment is "an environment with a significant change (increase in pertinent environmental stress factors) due to a design basis event, such as, loss of coolant accident, main steam line break or high energy line break, including a significant increase in radiation due to recirculation of containment sump fluid." That's the whole definition there, right?

A That's correct.

Q And then the interrogatory response goes on to say that, "neither 10CFR50 Appendix A, 10CFR5049 or NUREG

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0588 defines harsh environment, however, 10CFR50.49C defines mild environment," correct?

A That's correct.

Q We might continue here on 9-4. A response, same page we went over to. It says there that "environmental qualification of electrical equipment will initially be achieved prior to fuel load." Are you having any problems meeting that schedule of fuel load as in June of '85?

A I'm not able to address the entire schedule.

Q Well, let's say, the items covered by Contention 9 here, let's keep to that?

A The environmental qualification program is proceeding toward that end.

Q In other words, if the plant turned out to be ready to load fuel on the 1st of June, '85, you'd have the EQ done by then, as far as you know. Is that what you're saying?

A As far as I know, we would be ready to support fuel loading in June of '85.

A (Witness Yandow) I might add that if there were any equipment that would not be qualified we would provide a justification for interim operation. But there is no equipment that I am aware of that we will need for.

Q Okay.

May I turn to the response 9-7A on page 20 here?

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Do you have that?

A (Witness Pronty) Yes.

A (Witness Yandow) Yes.

Q The question is asked, "Do you believe there are any inadequacies in SER Section 3.11 that is the safety evaluation report?" The answer is that Applicants do not believe so. Do you still believe that?

A (Witness Pronty) --

MR. O'NEILL: Objection. Mr. Chairman, this question by its term goes to the entire environmental qualification program. I believe we are going far afield now of the specific issues that have been admitted for litigation, to start asking about whether these gentlemen believe there are any inadequacies with respect to the entire program.

MR. EDDLEMAN: I think it has been asked and answered and what I'm going to follow on is to ask about open items in SER 3.11 that relate to these parts of Contention 9.

JUDGE KELLEY: It is 20 minutes of 5. I think the objection has a general observation and is well taken. We do have to keep within the parameters of this contention. If you want to tie in open items that relate to various subparts of the contention, then we can take that as it goes.

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Let me ask just in terms of how you plan to go about this. You are now into questions about -- questions arising out of discovery, right?

MR. EDDLEMAN: Yes.

JUDGE KELLEY: And is that conceptually tied to testimony on Contention 9, the introductory piece, or are we through with Contention 9, the introductory piece of testimony?

MR. EDDLEMAN: I am taking it that we are -- Contention 9, the introductory part is, as I understand it, sort of an overview. It basically is an introduction that applies to all of these things. Now, I've got one problem in that the discovery was done and ended as I recall -- you know, cut off by the date as specified by the Board's order -- before we went through and respecified Contention 9. So if I ask him, well, the question says so-and-so, is that still true, sometimes the questions will be a good bit broader than the specification we got. But, in every case when I'm going to ask something like that, I'll tie it in to the specifications we have now as I go on. I'm not going to just say, this is broad, and then I'm going to get broader. I'm going to say, this question and, now, how does that apply to what we're doing here?

JUDGE KELLEY: Well, I think I understand what you're saying and, I'm still not clear about the

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architecture of all this.

I mean, I've read the testimony, the introductory piece on 9. It's an overview, that's true. It seems to me that it's cast deliberately in very general terms. Statements are made that one could hardly argue with. There doesn't seem to me to be much to cross about, once you get past the qualifications.

Now, it may be that what you just talked about, that that's valid enough questioning under these various parts. I'm wondering whether we're going to end up doing it twice, if you start tying in those broad questions to subparts and then we have panels on subparts and we go back over the same ground.

If so, I'm kind of concerned about that.

MR. EDDLEMAN: I don't intend to go over it in -- in other words -- for example, if we get an answer that there's open items related to, say, 9X, okay, that's all the farther I'll go with these guys and then when the next panel comes up --

JUDGE KELLEY: Until you get to the next panel.

MR. EDDLEMAN: -- the panel comes up on 9X, I'm going to say, what about the open items that this panel identified.

JUDGE KELLEY: Okay. Just so we know where we are. Are you about done with the introductory part, you

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about ready to move on to Limitorque valves, when we get in on --

MR. EDDLEMAN: Yes. Yes, I'm about done. What I planned to do was start up the Limitorques Tuesday.

JUDGE KELLEY: Okay.

Well, I think we might as well stop. Anything else that needs to be raised or said before Tuesday morning?

MR. EDDLEMAN: Does that mean the objection is sustained?

JUDGE KELLEY: Well, I think you said, correctly, it had been asked and answered, and then you were going to go on to particulars, so I guess I'm overruling it, in effect, but I'm expressing a concern that's consistent with the objection.

MR. EDDLEMAN: Well, I understand that, but what I'm --

JUDGE KELLEY: Clear enough for Friday afternoon?

MR. EDDLEMAN: Yes, sir. Clear enough for late Friday afternoon. But I had one more question along this line before I was through.

JUDGE KELLEY: Short one?

MR. EDDLEMAN: Yes.

JUDGE KELLEY: Go ahead.

BY MR. EDDLEMAN:

Q The question is, of the open items in SER 3.11,

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which apply to the parts of Contention 9 that we're dealing with here, gentlemen?

A (Witness Pronty) What is the question?

Q As to the open items in safety evaluation report section 3.11 which apply to the parts of Contention 9, that is A through G or any of them that we are dealing with here?

JUDGE KELLEY: That is something the gentleman could answer first thing Monday morning. He has got to go down a bunch of lists, I take it?

MR. EDDLEMAN: If they have to take some time, it'll be fine if they answer it Monday -- Tuesday, I mean.

JUDGE KELLEY: Let's do it that way.

Anything else that's -- if Mr. Pronty can come back with the answer on Tuesday morning, we don't want to ruin your weekend, but it might take longer than we want to spend right now.

Anything else that has to be brought up right now?

MR. RUNKLE: I had one thing real quick.

JUDGE KELLEY: Okay.

MR. RUNKLE: It was on the limited appearance hearing on Tuesday evening. It's still on for 7:30?

JUDGE KELLEY: I'm glad you mentioned that. Tuesday evening. It got a couple of lines in the paper the other day. We would only suggest that among the Intervenor

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groups, particularly our people who want to come and say something, I hope that you will spread the word to the extent you can.

MR. RUNKLE: It is to be starting --

JUDGE KELLEY: 7:30 right here.

MR. RUNKLE: Will there be an ending time?

JUDGE KELLEY: 7:30 to 9:30, five minutes apiece, first come, first serve. We'll make a list as people come in, they'll sign up and that's the order in which they speak.

MR. RUNKLE: And that'll cut it off at 9:30 even if other --

JUDGE KELLEY: We'll run a little over if there are a whole bunch of people here. We can go a little longer. It's not that tight.

MR. RUNKLE: I had just been asked this question.

JUDGE KELLEY: Okay.

If nothing else, we're adjourned until 9:30 Tuesday morning.

Whereupon, at 4:47 p.m., the hearing was adjourned, to reconvene at 9:30 a.m., Tuesday, October 23, 1984, at this same place.)

CERTIFICATE OF OFFICIAL REPORTER

This is to certify that the attached proceedings before the UNITED STATES NUCLEAR REGULATORY COMMISSION in the matter of:

NAME OF PROCEEDING:

CAROLINA POWER AND LIGHT COMPANY
and NORTH CAROLINA EASTERN MUNICIPAL
POWER AGENCY

(Shearon Harris Nuclear Power Plant,
Units 1 and 2)

DOCKET NO.: 50-400-OL & 50-401-OL

PLACE: Apex, North Carolina

DATE: October 19, 1984

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission.

Anne G. Bloom William R. Bloom
(Sigt)

(TYPED)
Anne G. Bloom & William R. Bloom
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