

# ORIGINAL

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

In the matter of:

COMMONWEALTH EDISON COMPANY

(Byron Nuclear Power Station  
Units 1 & 2)

Docket No. 50-454 OL  
50-455 OL

Location: Rockford, Illinois

Pages: 8997 - 9225

Date: Thursday, July 26, 1984

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UNITED STATES OF AMERICA  
\* NUCLEAR REGULATORY COMMISSION  
BEFORE THE ATOMIC SAFETY & LICENSING BOARD

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: In the matter of: :  
: :  
7 COMMONWEALTH EDISON COMPANY, : Docket Nos. 50-454 OL  
: : 50-455 OL  
8 (Byron Nuclear Power Station, :  
Units 1 and 2) :  
9 :  
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Magistrate's Courtroom  
Federal Building  
211 South Court Street  
Rockford, Illinois

Thursday, July 26, 1984

The hearing in the above-entitled matter was  
convened at 9:00 a.m., pursuant to recess.

BEFORE:

JUDGE IVAN W. SMITH, Chairman  
Atomic Safety and Licensing Board  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

JUDGE A. DIXON CALLIHAN, Member  
Atomic Safety & Licensing Board  
U.S. Nuclear Regulatory Commission

JUDGE RICHARD F. COLE, Member  
Atomic Safety & Licensing Board  
U.S. Nuclear Regulatory Commission

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I N D E X

<u>WITNESSES:</u>	<u>BY:</u>	<u>DIRECT</u>	<u>CROSS</u>	<u>REDIRECT</u>	<u>RECROSS</u>
(Resumed)					
John L. Hansel	Mr. Cassel		9001		
	Mr. Gallo			9017	
	Mr. Cassel				9031
Anand Singh	) Mr. Gallo	9042			
John McLaughlin	) Ms. Judson		9057		
Richard French	) Mr. Wright		9130		
Ernest Branch	) Ms. Judson		9207		

<u>RECESSES:</u>	<u>Page:</u>
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<u>LAY-INS:</u>	<u>Following Page:</u>
Prepared Testimony R. French	9044
Prepared Testimony J. McLaughlin	9047
Prepared Testimony E. Branch	9051
Prepared Testimony A. Singh	9055

<u>EXHIBITS:</u>	<u>IDENTIFICATION</u>	<u>EVIDENCE</u>	<u>WITHDRAWN</u>
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P R O C E E D I N G S

1  
2 JUDGE SMITH: Good morning.

3 Are there any preliminary business?

4 MR. GALLO: From the Applicant.

5 MR. CASSEL: No, Judge.

6 MR. GALLO: Judge Smith, I've been informed  
7 by Mr. Cassel that he inadvertantly forgot to ask a couple  
8 of questions yesterday. He has one or two questions with  
9 respect to some notes that Mr. Hansel took, with respect  
10 to during the course of his review of the reinspection  
11 program. When he interviewed people and looked at files  
12 he wrote down and took notes of that process.

13 Mr. Cassel has one or two questions on those notes.

14 I also understand he has one question with  
15 respect to a draft report that Mr. Hassel prepared on the  
16 reinspection program, which he obtained in discovery.

17 And with that limited exception, I have no  
18 objection to him asking his questions at this time.

19 JUDGE SMITH: Okay.

20 MR. CASSEL: Judge, just for the record to be clear,  
21 I probably have more than one or two questions on the notes.  
22 I do only have one question on the draft report.

23 Whereupon,

24 JOHN L. HANSEL

25 resumed the stand and, having been previously duly sworn,  
was examined and testified as follows:

## 1 CROSS EXAMINATION (Resumed)

2 BY MR. CASSEL:

3 Q During the course of your review of the  
4 reinspection program, you took notes on your interviews  
5 and your document reviews and so forth, while you were at  
6 the Byron site, in your Edison's office and Sargent & Lundy's  
7 office. Is that correct?

8 A Yes.

9 Q And those notes were typed up and produced in  
10 typed up form from Isham, Lincoln & Beale to the Intervenors  
11 in this case?

12 A Yes. They were rather cryptic notes, just for  
13 my own benefit, I'd like to have you recognize.

14 Q In those notes, you noted a number of points of  
15 detail that were not included in the testimony which you  
16 filed in this proceeding. Is this correct?

17 A I'd have to -- maybe in summary -- I don't know.  
18 I'd have to be specific. It may be in summary.

19 Q All right. Mr. Hansel, do you have a copy of  
20 those typewritten notes there with you?

21 A I have some. I don't know if I have them all.

22 Q All right. Let me ask you to refer, if you can --  
23 do your pages have numbers at the bottom? Typed numbers at  
24 the bottom of your notes, Mr. Hansel?

25 A Some do, yes.

1 Q If you would please turn to page -- the heading  
2 on which is S & L. It's your notes to an interview  
3 apparently to a Mr. Larry Jacques, J-A-C-Q-U-E-S, according  
4 to your notes, of Sargent & Lundy. And the page number  
5 at the bottom of the page is page 4.

6 A I have that.

7 MR. GALLO: I don't have that.

8 MR. CASSEL: Would you like to look on with my  
9 copy? Would that be helpful?

10 MR. GALLO: Yes, thank you.

11 I'll just look on with Mr. Hansel.

12 BY MR. CASSEL:

13 Q Now, is this page entitled S&L with Mr. Larry  
14 Jacques name at the top, Mr. Hansel? Is this page your  
15 notes of an interview with Mr. Larry Jacques of Sargent  
16 & Lundy?

17 A It was with Mr. Jacques and also -- primarily  
18 Mr. Jacques, yes.

19 Q All right, now referring down to the bottom half  
20 of the page, it's entitled Engineering Evaluation, Three  
21 Phases. And under that are three numbered points. Do you  
22 see that part of the page?

23 A Yes.

24 Q And is that part of the page your notes on a  
25 discussion with Mr. Jacques, or someone else? If you know.

1 (Pause.)

2 A I don't believe this was with Mr. Jacques. This  
3 may have been with other Sargent & Lundy personnel.

4 Q I see. All right, now let's refer to paragraph  
5 number 2, under the engineering evaluation, three phases.

6 MR. CASSEL: Let me just inquire, would it be  
7 helpful -- I'm reading from this and I hadn't intended  
8 to introduce it as an exhibit. If it would be helpful  
9 to the Board, I could just bring my copy up there for you  
10 to look at. It's only a very brief portion we're talking  
11 about, whichever you'd prefer.

12 JUDGE SMITH: If it's going to be brief, why  
13 don't you just proceed.

14 MR. CASSEL: All right.

15 BY MR. CASSEL:

16 Q Under point number 2 it reads -- and I'll just  
17 read it out loud -- "Decided to use a statistical sample to  
18 select another group for weld maps and evaluation. 14  
19 additional PTL, 15 additional HECO, 22 for Peabody representing  
20 100 percent." And then comes the note which I want to  
21 ask you about.

22 And it says "NOTE: there were other welds, but  
23 contractors had gone ahead and repaired. Unable to evaluate."

24 Do you recall receiving that information from a  
25 Sargent & Lundy person who you were interviewing, Mr. Hansel?



1           A     I think that was a note to myself that I was  
2     unable to evaluate the material at that particular time,  
3     not the engineering evaluation, per se. But I wasn't able  
4     to go back and reconstruct enough of the information in the  
5     time that I had to do that.

6           Q     Because the contractors had gone ahead and  
7     repaired the welds? That was why you couldn't do your  
8     evaluation?

9           A     That, plus the notations that had been made  
10    on the paperwork over time. I was unable to put together  
11    a scenario of what had happened and in what sequence to do  
12    my evaluation, as best I can recall.

13          Q     Well, when you did your evaluation in the welds  
14    where you did review the paperwork, it wasn't necessary,  
15    was it, for you to go back and look at the actual welds?

16          A     No, I wasn't trying to infer that.

17          Q     And you didn't actually do that, in the papers  
18    that you did look at, did you? That is, you didn't actually --

19          A     I did look at some welds, but for a different  
20    purpose. It's best to look at the paper as it is without  
21    having gone through repairs and this type of thing and  
22    other annotations. I really -- you know, it's been sometime  
23    since I made that note. I think that particular note is  
24    unclear to me. I'm probably trying to tell myself that I  
25    was unable to do a good complete evaluation, a piece of that,

1 that day.

2 Q I see. Is the preceding page, in your notes  
3 in the stack that you have, headed at the top of the page  
4 George Margus, M-A-R-G-U-S, and noted at the bottom as  
5 page 3?

6 A No.

7 Q On your typewritten notes, do you have a page  
8 headed George Margus, with the number three typed at the  
9 bottom? If you have some difficulty finding it, why don't  
10 we just share this copy?

11 A A three at the bottom?

12 Q Typed number 3 at the bottom.

13 A I have that.

14 Q And is the name George M-A-R-G-U-S at the top of  
15 thepage?

16 A That should be Marcus.

17 Q It should be C-U-S?

18 A Yes.

19 Q All right. Is this page your notes of your  
20 interview with Mr. George Marcus of Commonwealth Edison  
21 Company?

22 A It's from discussions with Mr. Marcus, yes.

23 Q Let me refer your attention to the first large  
24 paragraph in the middle of the page, which I will read for  
25 the record. "Early in RIP --" and let me stop there. RIP

1 was your abbreviation for reinspection program, correct?

2 A Yes.

3 Q As opposed to your abbreviation for something  
4 that none of us want to introduce in this proceeding.

5 (Laughter.)

6 "Early in reinspection program -- contractors  
7 in some cases repaired hardware but did not document. In  
8 spite of this, SECO feels that to they have a good and accurate  
9 count on deficient inspections."

10 And there's more which doesn't seem to be  
11 directly relevant, but if you want to explain any relevance  
12 that you see, that's fine.

13 My question is with respect to the two sentences  
14 that I just read. Do those reflect your discussions with  
15 Mr. Marcus of Edison Company?

16 A Yes.

17 Q And did Mr. Marcus of Edison Company tell you,  
18 in substance, what is reflected there in your notes in those  
19 two sentences?

20 A I think -- let me try to help sort this out.  
21 You're probably working on the point that was discussed  
22 yesterday on this and Mr. Tuetken's testimony. Very, very  
23 early -- and I mean very early, like in the first week or  
24 so as I can recall from Mr. Marcus's discussion -- there was  
25 a very small number of repairs or deficiencies documented on

1 a Field Change Request. And they were repaired. It was  
2 caught very quickly by the Edison audit program and corrected.  
3 And they went back and then created the documentation for  
4 that. But it was purely a misunderstanding and it was caught  
5 very early and fixed.

6 To the best I can remember, that was what was  
7 being talked about here, that there is documentation in  
8 the records and anything, if found, was included in the  
9 reinspection program data base. The audit made sure of that.

10 Edison QA caught that and required it to be fixed.

11 Q So when your note here says repaired hardware  
12 but did not document, you're now saying they, in fact, did  
13 document?

14 A It was documented initially on an FCR, I believe,  
15 and I think that's a Field Change Request. But then they  
16 backed up and put that in the proper paperwork for the  
17 reinspection program and the data was included in the data  
18 base for the program.

19 Q And do you know whether an engineering evaluation  
20 was done to analyze the safety significance of that hardware  
21 that was repaired?

22 A To the best of my knowledge it would have been,  
23 because once it was into the reinspection program data base,  
24 then engineering was aware of all that data. So yes, I  
25 would say so.

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1           Q     Now referring back to the Sargent & Lundy page,  
2 where it said "NOTE: there were other welds but contractors  
3 had gone ahead and repaired." Do you know whether you  
4 intended, in your notes there, to be referring to the same  
5 phenomenon that you just described?

6           A     I believe so, but I'm not positive. It's been  
7 sometime since I took these notes. I didn't determine  
8 it to be a problem because apparently it had gotten fixed.  
9 I don't recall.

10          Q     Did you know what -- were you advised what  
11 contractors this problem related to?

12          A     No.

13          Q     Did you ask?

14          A     I think I did, but I don't recall right now who  
15 it was.

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mgc 2-1 1

2 Again, they had gotten it fixed, and I didn't  
3 bother to check it any further.

4 Q Let me refer your attention to another page  
5 of your typed up notes which has the number, 14, at the  
6 bottom.

7 A For who?

8 Q It has at the top of my copy "Audit Continued,  
9 ICI-HVAC." If it would be helpful and save us some time,  
10 maybe I might just go over the table with the witness,  
11 and Mr. Gallo, the witness and I can all look on, unless  
12 he can find it.

13 MR. GALLO: He's got it.

14 THE WITNESS: I have it.

15 BY MR. CASSEL:

16 Q Down at the bottom of the page, the third item  
17 up from the bottom says, quote, "PTL keeping tests in an  
18 unlocked desk. Moved as a result of this audit," close  
19 quote.

20 Do you know what audit that note refers to?

21 A There was an audit conducted by Mr. Shewski's  
22 auditors, who found that condition and got it corrected  
23 immediately.

24 Q Do you know how long that condition had  
25 persisted at Byron before it was corrected?

A I do not believe -- that was just during an

mgc 2-2 1

office rearrangement. I'm not certain. I did not probe  
2 it. I did hear a discussion among the auditors and  
3 Mr. Marcus, who was the lead auditor, and I think it was  
4 a short-term condition, but I'm not positive.

5 JUDGE SMITH: Is it clear what condition  
6 you're talking about?

7 MR. CASSEL: The tests being kept in an  
8 unlocked desk.

9 BY MR. CASSEL:

10 Q What were these tests, if you know?

11 A They were inspector recertification test  
12 examinations.

13 Q Thank you.

14 JUDGE SMITH: Was it the results or the draft  
15 test specimens?

16 THE WITNESS: Test specimens, not completed  
17 tests. Those were kept in personnel folders.

18 BY MR. CASSEL:

19 Q Immediately above that are three lines close  
20 together, the first of which reads, under the heading  
21 of "Blount," "Still not finished."

22 The first note reads, "Difficult to trace  
23 history from initial inspection to RIP."

24 What did you mean by that note?

25 A I'm trying to put myself in sequence of order

mgc 2-3

1 here, of who they're talking about. I am not certain,  
2 unless it follows directly the comment on Blount, but I'm  
3 not certain that it would be with Blount.

4 Q This is a note of your discussion with the  
5 Commonwealth Auditors, including Mr. Marcus?

6 A It was either that, or comments that I overheard  
7 in discussions between the auditors, yes.

8 Q The next line after that reads, "Training and  
9 qualification records prior to 6/82 -- not good."

10 Do you recall what that referred to?

11 A Again, I think we all knew that those records  
12 probably were not as neat and orderly and well-organized  
13 as they could have been prior to that period. Not that  
14 they didn't do the job and the construction assessment  
15 team had pointed that out, the very same point.

16 Q Now immediately under that line, there's another  
17 one that says, "Still not too good covering 6/82 to present."

18 Do you recall what you meant by that?

19 A No, I do not.

20 Q Can you refer now to a page numbered 8 at the  
21 bottom and headed "Powers-ASCO-Pope-Hunter" at the top?

22 A I do not have those notes with me.

23 Q All right. Let me bring that over to you at  
24 the table, then.

25 MR. CASSEL: For the record, I am now showing



mgc 2-4

1 the witness and his attorney, Mr. Gallo, the typed-up page  
2 numbered 8, headed "Powers-ASCO-Pope-Hunter" and the  
3 typed notes of Mr. Hansel, produced by Commonwealth Edison's  
4 lawyers.

5 (Document handed to witness.)

6 BY MR. CASSEL:

7 Q Referring to the note near the top of the page,  
8 Mr. Hansel, where it says "PTL -- Marv Tallent -- prob on  
9 rel of data."

10 Does that "prob on rel of data" mean problem  
11 on reliability of data?

12 A No. In discussing this, this was in the  
13 discussion with Mr. Tuetken when I got to the site. I  
14 wanted to know who some of the contacts were that I should  
15 begin with for the various contractors to begin gathering  
16 data, and he gave me the names of some people as you can  
17 see here, and in that particular case, he indicated that  
18 Mr. Tallent himself, as an individual, had difficulty with  
19 some of the data, not that the data was inaccurate, but  
20 he had difficulty -- he's not a well-organized type of an  
21 individual. He was telling me, "You're going to have to  
22 probe him deeper and really try to understand him," not a  
23 problem with data, just in his presentation.

24 Q Thank you, Mr. Hansel.

25 You also prepared in the course of your review

mgc 2-5

1 a draft report dated May 9, 1984, did you not?

2 A Yes.

3 Q And on page 19 of that report --

4 A I do not have a copy.

5 Q Oh, I'm sorry.

6 (Document indicated to witness.)

7 On page 19 of that report, you stated, quote,  
8 "In all of my reviews, I did not find any evidence of  
9 a contractor attempting to alter the reinspection program  
10 in their favor," close quote.

11 Does that remain your testimony today?

12 A Yes.

13 Q Were you present in the court during  
14 Mr. Shewski's cross-examination two days ago, Mr. Hansel?

15 A I was here during part of Mr. Shewski's  
16 testimony. I'm not sure I was here for all of it.

17 Q Did you review Mr. Shewski's testimony prior  
18 to today at any time?

19 A The prepared testimony?

20 Q Yes.

21 A Yes, but not in a lot of detail.

22 Q Do you recall the attachment to Mr. Shewski's  
23 testimony, indicating that PTL in at least one instance  
24 had attempted to override the results of the third-party  
25 review on visual weld inspections?

mgc 2-6 1

A I do not recall that.

2

Q Now yesterday --

3

JUDGE SMITH: What was the note that you undertake  
4 to contrast?

5

MR. CASSEL: I'm sorry, Judge?

6

JUDGE SMITH: You asked him a question about  
7 a draft of his letter. Let's go over that paragraph of his  
8 draft report as to which you are contrasting.

9

MR. CASSEL: You'd like the full paragraph from  
10 the draft report?

11

JUDGE SMITH: Yes. I want to know how, if I  
12 infer your purpose correctly, how the PTL attempt to  
13 override the third-party inspector contrasts with the part  
14 of his draft report, because that's what you are trying to  
15 do, isn't it?

16

MR. CASSEL: Yes. Perhaps not very artfully,  
17 but let me try to be somewhat clearer.

18

JUDGE SMITH: I would just like to hear the  
19 language of the draft report again.

20

MR. CASSEL: All right. I don't think I should  
21 read it without the witness being able to have it in  
22 from of him as well.

23

The language of the draft report reads, does  
24 it not, Mr. Hansel, "In all of my reviews, I did not find  
25 any evidence of a contractor attempting to alter the

mgc 2-7

1 reinspection program in their favor."

2 \* THE WITNESS: That's correct.

3 BY MR. CASSEL:

4 Q Now if you had found evidence of a contractor  
5 who had attempted to override the results of the third-  
6 party review, would you have made that same statement?

7 A If I had found evidence, I would have certainly  
8 investigated it to determine if I felt that they were  
9 trying to gain or alter the results, and I did not find  
10 anything. I looked very hard for that. In fact, I  
11 requested several extra pieces of data in my review just  
12 to look for that. I did not find it.

13 Q No one provided you with a copy of the audit  
14 report on PTL, which is attached to Mr. Shewski's  
15 testimony?

16 A I read a lot of material at the site and in the  
17 Commonwealth QA office in Chicago. I did not recall that  
18 specific instance. I read a number of audit reports and  
19 surveillance reports. I do not recall that one.

20 Q Mr. Hansel, yesterday do you recall Mr. Lewis  
21 asking you some questions about Table V-6 in his  
22 cross-examination?

23 A Yes.

24 Q Do you have your copy of the reinspection  
25 report there?

mqc 2-8

1 MR. GALLO: I object. He's now exceeded the  
2 bounds of the agreement. I did not have to allow this  
3 witness to subject himself to additional questions. I  
4 agreed to permit Mr. Cassel to ask questions on the notes  
5 and the reinspection report draft. Now he's going beyond  
6 that agreement. I object to any further recross at this  
7 time.

8 MR. CASSEL: I only had one question there,  
9 but I'll withdraw it. I think Mr. Gallo is making a fair  
10 point.

End 2

11 I will have an opportunity to recross Mr. Hansel  
12 after his redirect anyway. I can do it then.

13 MR. GALLO: We will see if my redirect opens  
14 that area up.  
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## REDIRECT EXAMINATION

\* BY MR. GALLO:

xxxx  
Q You were asked by Mr. Cassel yesterday with respect to -- one or more questions concerning your experience in the nuclear field. Do you recall those questions?

A I do.

Q In your judgment, is experience in the nuclear power field needed in order to perform evaluations like the one you performed of the Byron reinspection program?

A No.

Q Will you explain why not?

A To me you had a particular type of a situation here that required a well-qualified quality engineer who is familiar with corrective action techniques, how to solve problems, how to conduct an investigation.

And at least in my opinion, that is far more important than having somebody who is more familiar with nuclear power plants. Plus, familiarity with a nuclear power plant might well lead you off in the wrong direction in my type of an overview.

Q Why is that, Mr. Hansel?

A Well, you really need to concentrate more on the methodology, on the approach, on the amount of data that is gathered and how it is gathered, will it help you to define the problem, will it help you to sharpen your focus

mm2

1 on the problem if there, in fact, is a problem, will it  
2 tell you what the root causes are? Notice I said causes,  
3 there may be more than one. And it will also help you  
4 identify any side issues that you might want to look at  
5 in other detail.

6 So, I think that a quality engineer who is more  
7 in line with corrective action, problem solving, problem  
8 identification, can do a better type of a job here than  
9 somebody who has worked in the nuclear power industry.

10 Certainly, a little exposure doesn't hurt, and  
11 I have had that amount. I don't think it does me any harm.

12 Q Are you a quality engineer, Mr. Hansel?

13 A Yes.

14 Q How many years experience have you had?

15 A Directly in quality engineering I have worked as  
16 a quality engineer since about 1961. Since 1961. I did  
17 quality engineering work before that of a lesser degree.

18 I am a certified quality engineer with the  
19 American Society for Quality Control and a registered  
20 professional engineer in the State of California as a  
21 quality engineer.

22 Q Have you performed quality engineering in the  
23 NASA program?

24 A Yes. Extensively.

25 Q Can you give me one example of the application

mm3

1 of that expertise?

2 A As related to corrective action?

3 Q Yes.

4 A Well there are several. I would say -- only just  
5 to mention them -- if you want more detail I can go into them.

6 After the Apollo fire I headed up a team of  
7 experts and people to investigate some of the causes of  
8 that fire, and I also subsequent to that have headed up  
9 a number of other teams. Some of the more significant are  
10 investigations of failures on the tiles for the space shuttle  
11 orbiter. And also a rather extensive program in researching  
12 problems associated with what we call MUCK -- H-U-C-K --  
13 HUCK fasteners for soft rivets on wing assemblies for the  
14 space shuttle.

15 Q You mentioned the Apollo fire, that you headed up  
16 an investigation team on that. Is that correct?

17 A Yes, sir.

18 Q What do you mean by the Apollo fire?

19 A Well, when we had the Apollo fire on the launchpad  
20 in Florida and the three astronauts were killed, subsequent  
21 to that the NASA formed -- I think there were 11 teams in  
22 total. I headed up the team to look at quality control,  
23 quality assurance and all of the aspects of quality engineering,  
24 quality system and inspection techniques.

25 That activity took better than a year.



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1 Q What was the purpose of the effort, to  
2 improve the system or look for problems?

3 A To look for problems first, and then any  
4 shortcomings or shortfall we might have had in our  
5 procedures and instructions that were given at that time  
6 is one of the qualifications of instructors.

7 Subsequent to that, then, we went about  
8 developing improvements and developing a new set of  
9 criteria for future spacecraft.

10 Q Mr. Hansel, do you recall --

11 JUDGE SMITH: Excuse me. Were you responsible  
12 then for -- you identified an oxygen-rich environment  
13 as to its basic problems -- were you responsible for  
14 changing that?

15 THE WITNESS: I had an input to that. I was  
16 not responsible for making that change. But I had an  
17 input as to what the implications of any quality and/or  
18 reliability studies might have for an oxygen-rich  
19 environment.

20 End  
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1           In that particular case it was an engineering  
2 decision. We had very little impact on that, except for how the  
3 gases were protected on a cleanliness standpoint, or  
4 pressurization involving materials and systems and so forth.

5           BY MR. GALLO:

6           Q     In answer to one of Mr. Cassel's questions, you  
7 indicated during your review of the reinspection program  
8 that you didn't talk with any of the reinspectors. Is  
9 that correct?

10          A     That's correct.

11          Q     Why was that?

12          A     Well, my experience with inspectors in general  
13 is I didn't see a need -- had I talked with them I think  
14 they would have told me what I wanted to know. I don't feel  
15 like I would have gotten a true story. It's just by the  
16 nature of inspectors when they talk to management or  
17 engineering type folks. Unless they really know and it's  
18 a one-on-one, they're not going to -- they're going to play  
19 back what you want to hear. I didn't see a need for it.

20          Q     Don't you think if you had interviewed one or more  
21 reinspectors you might have found out whether or not they  
22 were reinspecting their own work or invoking the so-called  
23 buddy system?

24          A     They certainly wouldn't have told me that, either  
25 of those items. I don't think that they would share that

1 information with me, in any form.

2 Q , On the other hand, you testified that you did  
3 talk to a Level III third party inspector. Is that correct?

4 A Yes.

5 Q Why did you talk to him?

6 A I needed to understand the role of the third party  
7 inspector and how they were actually doing the third party  
8 inspection, the preparation of the weld maps, the records  
9 that they were keeping, the interface between them and the  
10 contractors, both on receiving information, the disposition  
11 of that information back to the contractors. I needed to  
12 understand that flow.

13 So it was necessary to get to a third party  
14 inspector.

15 Q You were asked a number of questions by Mr. Cassel  
16 about the use of statistics in establishing a sample plan  
17 for selecting the inspectors to be reinspectors. Do you  
18 recall that?

19 A Yes, I do.

20 Q Was the sample plan used to select the inspectors  
21 for reinspecting based on statistical techniques?

22 A No, it was based on engineering evaluation.

23 Q Do you mean engineering judgment?

24 A I'm sorry, engineering judgment.

25 Q So it was based on engineering judgment, rather than

1 statistical techniques? Is that your testimony?

2 A Yes.

3 Q Shouldn't statistical techniques have been used  
4 in this case?

5 A I don't think so. You needed a biased sample.  
6 You needed to identify -- you were after the identification  
7 of problems, if they did, in fact, exist and in most cases  
8 if you were going to have a problem of inspector  
9 certification, it would have happened early on, very soon  
10 after the individual was hired or certified.

11 And I think in this particular case that Edison  
12 did the right thing by selecting that initial 90 day  
13 period, because they concentrated on that. They also, I  
14 think, in the development of their sample, they provided for  
15 a good cross-section of contractors. They covered -- well,  
16 they covered the entire period of construction from '76  
17 to September of '82.

18 In the selection of contractors who were to be  
19 reinspected, if I can recall the percentage right, they hit  
20 inspectors who -- contractors who were responsible for 92  
21 or 93 percent of the total safety related work.

22 Another key point that struck me -- I've had little  
23 exposure to nuclear plants, but I've had enough exposure to  
24 know what some of the most troublesome areas have been. And  
25 I think they hit the contractors who could have -- who were

1 responsible for that type of work. I'm talking the  
2 attributes, that were included in the reinspection program.

3 So I might have given you a long answer, but I  
4 think that the thing that distinguished this one from other  
5 sampling plans is the necessity to concentrate on that early  
6 period.

7 Q Could a sampling plan based on statistical  
8 techniques have achieved that result?

9 A I don't think so. If you had picked inspectors  
10 at random througout the entire time period, by whatever  
11 method; be it a random number generator, birthdate, alphabeti-  
12 cally, or whatever; I think you would have covered the entire  
13 span of period, as they did. But in this case -- in that  
14 case, I think they had a good -- probably a good statistical  
15 basis by taking one, five, ten, 15 inspectors.

16 The thing that made it significant to me was the  
17 first 90 days. I think that's very key because inspectors --  
18 if you're going to have a problem, that would be when it  
19 would normally show up.

20 JUDGE SMITH: Mr. Gallo, before you leave that  
21 issue, that point, could I inquire. The tension between you  
22 and the Intervenors seems to be that you used engineering  
23 judgment instead of statistical techniques. And it's not  
24 clear to me, and I don't believe it's clear to most laymen,  
25 that you are talking about two positions at the opposite end

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1 of the spectrum. I don't see the sharp contrast. Do not  
2 statistical techniques sometimes use biased samples to arrive  
3 at conservative results?

4 THE WITNESS: Yes, you can bias samples.

5 JUDGE SMITH: If you have a result that you  
6 wish to assure to be conservative, a statistician might  
7 bias his techniques?

8 THE WITNESS: Yes, and that changes all of the  
9 assumptions that you can make from that sample.

10 JUDGE SMITH: So the fact that the inspectors were  
11 not selected entirely at random does not, in itself, take it  
12 out of the statistical discipline?

13 THE WITNESS: I'm sorry. Would you repeat that?

14 JUDGE SMITH: Well, I'm wondering just how the  
15 engineering judgment differs from a statistical technique  
16 in which the statistician wishes to arrive at a conservative  
17 result?

18 THE WITNESS: Let me take another approach.

19 JUDGE SMITH: How about asking the question for me?

20 THE WITNESS: Okay. I think that Edison did  
21 apply their knowledge of statistics, to some degree. Let  
22 me talk about that.

23 Mr. Del George, at least from the brief  
24 discussions I've had with him, has a fair understanding of  
25 statistics. I think when he and others, within Edison,

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1 developed that program that he probably had some of that in  
2 the back of his mind, even though he did not go through the  
3 methodology as a statistician would, to develop that plan.

4 I think the prudent thing that they did, when  
5 they were finished, when the plan was developed -- and I think  
6 it's in the report that they did -- that they then went back  
7 and looked to see if the sampling technique that they had  
8 devised was basically in general agreement with that  
9 Military Standard 105.

10 So I don't think statistics were totally out of  
11 it. I think it guided Mr. Del George's thinking to some  
12 degree, and I think he used it after the fact to say  
13 well, our approach and the conservatism we built in is  
14 on the conservative side. And he used Mil Standard 105  
15 as further justification for that, to tell him as an engineer  
16 he was right.

17 I don't know if I gave you the long way around  
18 or not.

19 JUDGE COLE: Mr. Hansel, most engineers have  
20 some training in statistics, do you agree, sir?

21 THE WITNESS: Yes, sir.

22 JUDGE COLE: In the employment of engineering  
23 judgment, that doesn't necessarily that statistics is not  
24 included in exercising their judgment?

25 THE WITNESS: That's right. That's what I was

1 trying to say. I'm sure Mr. Del George used some of that  
2 as he went through this engineering judgment.

3 JUDGE COLE: So the two approaches, the use of  
4 a purely statistical approach, an approach that might be  
5 used involving engineering judgment and whatever tools  
6 an engineer has at his disposal, aren't necessarily much  
7 different, are they?

8 THE WITNESS: That's right.

9 JUDGE COLE: Thank you.

10 BY MR. GALLO:

11 Q Mr. Hansel, should Commonwealth Edison have  
12 brought an outside contractor into the picture, to conduct  
13 the reinspection of the contractors at the Byron site,  
14 instead of using the contractors that were the subject of  
15 reinspection?

16 A No. It's always a possibility, but in this  
17 particular case again you had an area that you wanted to  
18 investigate which was the reinspection of inspector's  
19 previous work. To bring in another contractor, to try  
20 to familiarize him with the drawings and specifications of  
21 the hardware or the plant layout, probably would have caused  
22 more confusion and most likely would not have given you  
23 reliable results because of their unfamiliarity.

24 I don't think it was necessary.

25 Q Mr. Hansel, in the course of your profession,



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1 in discharging your day to day duties, as you describe them  
2 in your testimony, in working for the company -- I believe  
3 it's ERC, yes, Evaluation Research Corporation -- do you  
4 keep abreast of the studies, reports, and material appearing  
5 in periodicals in the field of Quality Assurance?

6 A Yes, I do.

7 Q How do you do that?

8 A Well, in addition to my job with Evaluation  
9 Research Corporation, I'm also President of the American  
10 Society for Quality Control. I worked in the society in  
11 the educational area since 1965. So I read extensively in  
12 various journals, magazines. I read as many books as I can  
13 get my hands on and have time to read, which is not a lot.

14 It's necessary because I also teach and lecture  
15 for the Society and must keep current information.

16 Q Do you read these journals on a regular basis?

17 A I read certain ones on a regular basis.

18 Q Which ones are those?

19 A I read Quality Progress, which is published  
20 by ASQC. I read the Journal of Quality Technology, which  
21 is published quarterly by ASQC. I also review all the  
22 material that is published by the Society's technical  
23 committee on standards, both in the U.S. and International.

24 Q Now these journals that you refer to, do they  
25 carry articles reporting on the studies of individuals, that

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1 Q So if some professional in the quality  
2 assurance area were to write a report based on the study  
3 he performed, and it was published, might it appear in  
4 one of these journals that you referred to?

5 A Yes. There's a good possibility. Anybody  
6 can submit articles for publication in either the  
7 Quality Progress Magazine or the Journal of Quality  
8 Technology.

9 Q Are either of these magazines considered to  
10 be peer magazines, like I believe the magazines of some  
11 scientists?

12 A Yes, I think both of these two I have mentioned  
13 are probably the standard-setters for the United States  
14 in the quality profession.

15 Q If you wanted to get a study that you performed  
16 published, would you seek one of these two magazines?

17 A Yes.

18 Q The type of study I was referring to, that I  
19 failed to specify in my question, was a quality assurance  
20 study.

21 A Yes.

22 MR. GALLO: may I have a moment, Your Honor?

23 (Counsel for Applicant confer.)

24 MR. GALLO: Your Honor, Mr. Cassel this  
25 morning asked one question with respect to a situation

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1 in Mr. Shewski's testimony involving PTL and an incident  
2 concerning the override of a third-party inspector's  
3 conclusion or judgment with respect to inspection.

4 Mr. Hansel was not provided -- he first  
5 indicated that he was not aware of the incident. He was  
6 not provided the documentation by Mr. Cassel, and was then  
7 asked a question with respect to it.

8 I would like to have the opportunity to have  
9 Mr. Hansel look at Mr. Shewski's testimony and the  
10 attachment to it that deals with this subject, then recall  
11 him and ask him whether or not he believes that this is an  
12 example of where a contractor is trying to influence and  
13 override the system.

14 JUDGE SMITH: You mean recall --

15 MR. GALLO: Mr. Hansel. Rather than take the  
16 time to give him the documentation now, I would like to  
17 excuse him after the recross and allow him to familiarize  
18 himself with the documentation and then recall him for  
19 that purpose.

20 JUDGE SMITH: Do you have any objection to that?

21 MR. CASSEL: No objection.

22 MR. GALLO: I have no further questions at  
23 this time.

24 JUDGE SMITH: Any further questions for  
25 Mr. Hassel?

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1 MR. LEWIS: Staff has no further questions.

2 MR. CASSEL: Judge, I'm not certain, but could  
3 I just check my notes? I may have one or two.

4 JUDGE SMITH: Yes, certainly.

5 In the meantime, will you be ready with your  
6 Sargenty & Lundy panel?

7 MR. GALLO: Yes.

8 JUDGE SMITH: I have discarded Mr. Leone's  
9 testimony, plus your effort to adapt Branch to Leone and  
10 substitute in its entirety Mr. Branch's testimony.

11 MR. GALLO: That's fine, Your Honor. That's  
12 what I had intended.

13 RE-CROSS EXAMINATION

14 BY MR. CASSEL:

15 Q Mr. Hansel, when you testified a few moments  
16 ago about the use of statistical techniques after the fact  
17 to show that the selection of the inspectors was adequate,  
18 were you referring to the sample of inspectors out of  
19 the population of inspectors, as opposed to the sample  
20 of inspections out of the population of inspections in  
21 their various attributes?

22 A I think that they used a reference back to the  
23 Military Standard to satisfy in their own minds that they  
24 had a sufficient number of inspectors included in the  
25 reinspection program.

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MR. CASSEL: No further questions.

2

JUDGE SMITH: Thank you, Mr. Hansel.

3

(Witness temporarily excused.)

4

MR. GALLO: May I proceed?

5

JUDGE SMITH: Yes.

6

MR. GALLO: Judge Smith, at this time, I would

7

like to call the next panel of witnesses from Sargent &

8

Lundy.

9

I just had a request for five minutes. Could

10

we have a short break at this point?

11

JUDGE SMITH: Certainly.

12

MR. GALLO: Thank you.

XXX 13

(Recess.)

End 5 14

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1 JUDGE SMITH: Mr. Lewis has a preliminary matter.

2 MR. LEWIS: Mr. Chairman, two brief items. I  
3 supplied to the Board just now, and the other parties have  
4 already received copies, but I did provide additional copies  
5 to Ms. Judson, a copy of the July 10, 1984 letter from  
6 Mr. Keppler to Mr. Reed of Commonwealth Edison Company,  
7 enclosing the SALP report covering the period of January  
8 1, 1983 through April 30th, 1984.

9 This is -- this is a Board Notification item. But  
10 I do not believe that the judges would yet have received  
11 their copies through their chain. I am providing it to you  
12 because in an earlier session this week, Mr. Cassel had  
13 indicated that he would be coming back to a motion, at some  
14 time, to you regarding that document and I wanted you to have  
15 it in front of you when you received that motion.

16 The second item is that on Tuesday, Chairman Smith  
17 discussed on the record the fact that I had provided to the  
18 Board and parties an affidavit of William L. Forney,  
19 formerly Senior Resident Inspector at Byron. At that time,  
20 Mr. Cassel had not yet seen the affidavit and said that he  
21 reserved the right to comment on it after he reviewed it.  
22 And the matter was left there.

23 I stated that we were providing it for the  
24 purposes of putting the Board and parties on notice of  
25 what might be perceived to be, by some person or persons,

1 a different professional opinion and that was being provided  
2 for that purpose.

3 It is my understanding that at the close of that  
4 discussion it was up to Mr. Cassel and other people to  
5 identify to the Staff whether or not anything further needed  
6 to be done with respect to this matter. And I would -- the  
7 Staff really needs to be advised, in that regard, as soon  
8 as possible, since our case in chief will be going on early  
9 next week.

10 JUDGE SMITH: Well, it was something more than  
11 that, Mr. Lewis. You also were informed that the Board  
12 doesn't really understand the difference between Mr. Forney's  
13 view and Region III, the panel's view.

14 We had hoped that perhaps Region III could explain  
15 Mr. Forney's view, if they had discussed it with him.  
16 Counsel for Commonwealth Edison has objected to that approach  
17 and at that point, we urged the parties to figure out an  
18 efficient and reliable means by which any significant  
19 difference of views, held by Mr. Forney, could be brought to  
20 the hearing. And apparently, there has been no progress  
21 along that line.

22 MR. LEWIS: Fine, Your Honor. We have not undertaken  
23 -- perhaps I'm jumping the gun a bit on this. I will  
24 discuss it with Mr. Cassel at the break, and Mr. Miller,  
25 whether or not there is some way we can agree to --

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1 JUDGE SMITH: We don't want to pointlessly bring  
2 Mr. Forney to the hearing, nor anybody, particularly busy  
3 nuclear inspectors who cannot be inspecting while they are  
4 in the hearing room.

5 MR. LEWIS: Thank you.

6 JUDGE SMITH: Mr. Gallo?

7 MR. GALLO: Thank you, Judge Smith.

8 Judge Smith, as a preliminary matter, I will  
9 undertake to summarize the testimony of the four  
10 witnesses on this panel for the benefit of the public and  
11 those in attendance here today.

12 There has been repeated references, by the  
13 witnesses who have testified already in this proceeding, to  
14 discrepancies that were noted by the reinspectors which  
15 were evaluated by Sargent & Lundy to determine their design  
16 significance.

17 These witnesses are representative of Sargent  
18 & Lundy and they are here to testify with respect to the  
19 nature of these evaluations and to explain the bases for  
20 their conclusions. And in particular, why none of the  
21 discrepant conditions observed by these various reinspectors  
22 had design significance.

23 The first witness is Mr. Richard French and he  
24 is seated behind this post. He has over 36 years of  
25 experience in the electrical engineering field and he is



1     testifying here today with respect to the discrepancies  
2     evaluated in the electrical engineering area, the electrical  
3     engineering construction area, for Hatfield. In other words,  
4     he is addressing, in particular, those discrepancies found  
5     in those attributes which have been labeled as objective  
6     attributes for Hatfield.

7             He explains, in his testimony, the various  
8     evaluation techniques that were used in evaluating these  
9     discrepancies, again, for Hatfield. And he concludes that  
10    based on the evaluation performed by people, by Sargent &  
11    Lundy, and I should point out that what Mr. French has  
12    done is reviewed the evaluation performed by electrical  
13    engineers in his department and determined them to be  
14    adequate and sufficient, based on his expertise as an  
15    electrical engineer.

16            And he has concluded that none of the discrepancies  
17    that he evaluated, involving the objective attributes for  
18    Hatfield Electric Company, had design significance. And he  
19    also concludes that the Hatfield work performed in the area  
20    covered by the attributes, that he evaluated, is adequate.

21            The second witness, who is seated at the other  
22    end of the table with the blue shirt is Mr. Branch. Mr.  
23    Branch has over 29 years of experience as a mechanical  
24    engineer. Mr. Branch is a supervisor in the mechanical  
25    engineering department of Sargent & Lundy and he is a member

1 of the ASME code committee, the provisions of which are  
2 pertinent to his testimony because they were used with  
3 respect to the evaluation of certain welds and certain  
4 pipe discrepancies.

5 His testimony deals with weld defects observed  
6 by these reinspectors for the Hunter Corporation. That is,  
7 these were welds that were produced by welders employed by  
8 the Hunter Corporation. And these are the welds, in  
9 particular, that are covered by the ASME code, as  
10 distinguished from welds produced by Hunter welders under  
11 the AWS code. He covers just the welds that were determined  
12 to be discrepant in the ASME area.

13 Mr. Branch also addresses those attributes which  
14 have been characterized as objective attributes for the  
15 Hunter Corporation. And he testifies with respect to the  
16 evaluations of those discrepant conditions observed by the  
17 reinspectors for the Hunter Corporation attributes, under  
18 the category called objective.

19 Mr. Branch is in a unique position because he  
20 was drafted late as a witness, after the testimony had already  
21 been prepared by Mr. Leone. Mr. Branch has reviewed Mr. Leone's  
22 testimony and he has adopted it as his own and he is  
23 testifying, with respect to this testimony, as his own  
24 testimony today.

25 Mr. Branch also concludes, with respect to the

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1 discrepancies evaluated by him that none have design  
2 significance and that, indeed, the Hunter work represented  
3 by those evaluations is adequate.

4 The third member of this trilogy is Mr. McLaughlin,  
5 who is seated in the middle of the table. Mr. McLaughlin  
6 has over 22 years as a structural engineer and is presently  
7 in charge of the Sargent & Lundy structural engineering  
8 department. Mr. McLaughlin has evaluated a sample of  
9 Hatfield welds which were determined to be discrepant by  
10 the reinspector. These welds deal with welds produced  
11 by Hatfield welders under the AWS code.

12 Mr. McLaughlin also addresses, in his testimony,  
13 discrepant welds produced by Hatfield -- I'm sorry, produced  
14 by Hunter, under the AWS code. So his testimony addresses  
15 weld defects for both Hatfield and Hunter, which are  
16 covered by the AWS code. That is shorthand for the American  
17 Welding Society code.

18 Mr. McLaughlin concludes that, based on the  
19 evaluations performed -- in the case of Hunter, 100 percent  
20 evaluation, in the case of Hatfield, a sample of the  
21 discrepant welds observed by the reinspectors, that none have  
22 design significance. He concludes that the reinspected work  
23 for both Hatfield and Hunter is adequate and he bases that  
24 conclusion on his own evaluation and the evaluations of  
25 Mr. French and his colleague, Mr. Branch.

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1                   These witnesses have focuses on Hunter and  
2 Hatfield because those are the two contractors which are  
3 the primary subject of the remanded proceeding. I have  
4 not mentioned PTL, Pittsburgh Testing Laboratory, because  
5 Pittsburgh Testing Laboratory essentially performed an  
6 inspection function and did not do any construction work,  
7 per se, itself. As explained in the testimony of Mr. French  
8 and Mr. Branch, certain PTL inspected work was performed  
9 by Hunter and Hatfield and have been included in their  
10 testimony.

11                   I should clarify that, that PTL played basically  
12 two roles, one role as a so-called overinspector and a second  
13 role as a first line or primary inspector. This is described  
14 in Mr. Shewski's prepared testimony. It is with respect to  
15 the latter category, that is the inspections that PTL  
16 performed as a first line inspector, that is the subject  
17 of the testimony of Mr. Branch and Mr. French.

18                   To be more clear, Hatfield and Hunter installed  
19 something called concrete expansion anchors. They were  
20 inspected for QC purposes by PTL. When it came time to  
21 reinspect, PTL reinspected those inspections or those  
22 inspectors that were sampled as a part of the reinspection  
23 program.

24                   I should point out, if I haven't already been  
25 clear, that Mr. McLaughlin concludes that the quality of the

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1 Hatfield and Hunter work generally is adequate, based on  
2 his own evaluation and that of his colleagues, Mr. French  
3 and Mr. Branch.

4 The fourth witness on the stand is Mr. A.K. Singh.  
5 Mr. A.K. Singh has experience in applying statistics in  
6 engineering evaluations and that is exactly what he has  
7 done in his testimony. He has applied the principles of  
8 statistics and probability theory, which he uses in his  
9 work as an engineer for Sargent & Lundy, to the results of  
10 the reinspection program.

11 And if I can use the term, this ex post facto,  
12 or this after the fact application of statistical principles  
13 and probability results of theory leads him to conclude, with  
14 a very high confidence level and reliability level, that  
15 the Hatfield and Hunter work meets the original design basis.

end6

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mgc 7-1

1 JUDGE SMITH: Thank you, Mr. Gallo. That is  
2 very helpful.

3 Mr. Gallo is responding to a recommendation  
4 by the Board that the written testimony be summarized for  
5 the benefit of the public and others who do not have a  
6 copy of the written testimony, which is the basis for the  
7 cross-examination. We could perhaps do this off the record  
8 and save the transcript, but in any event, the parties  
9 should be aware that these are informal summaries.  
10 Although they are helpful to us even, they are not available  
11 for proposed findings, nor will the Board make any findings  
12 on these summaries, these oral summaries.

13 MR. CASSEL: Does that mean we can't  
14 cross-examine Mr. Gallo, Judge?

15 (Laughter.)

16 JUDGE SMITH: Are you ready for your panel?

17 MR. GALLO: Yes.

18 Whereupon,

19 ERNEST B. BRANCH

20 JOHN M. MC LAUGHLIN

21 RICHARD X. FRENCH

22 ANAND K. SINGH

23 were called as witnesses on behalf of the Applicant and,  
24 having been first duly sworn, were examined and testified  
25 as follows:

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## 1 DIRECT EXAMINATION

2 BY MR. GALLO:

3 Q Mr. French, would you state your full name  
4 and address, business address, for the record?5 A (Witness French) My name is Richard X. French.  
6 My business address is 55 East Monroe, Chicago, Illinois.

7 Q By whom are you employed?

8 A I'm employed by Sargeny &amp; Lundy.

9 Q And what is your job responsibility at  
10 Sargent & Lundy?11 A My position at Sargent & Lundy is Manager of  
12 the Electrical Department.13 Q Have you had occasion to prepare testimony  
14 for this proceeding?

15 A Yes, I did.

16 Q Mr. French, I have in front of me a document  
17 containing 12 pages and it's titled "Testimony of Richard  
18 X. French," and I ask if this is the testimony you prepared  
19 for this proceeding?

20 A It is.

21 Q Are there any additions or corrections to  
22 your testimony?23 A One minor correction on page 10. In the  
24 third paragraph on page 10 at the end of the first line,  
25 the word "of" was omitted.

mgc 7-3

1 MR. CASSEL: I'm sorry. The word what, sir?

2 \* WITNESS FRENCH: Of, O F (spelling). It  
3 should read, "Fifty pieces of safety-related equipment."  
4 That's the only correction.

5 BY MR. GALLO:

6 Q Is your testimony accurate and complete, as  
7 corrected, to the best of your knowledge and belief?

8 A (Witness French) Yes, it is.

9 MR. GALLO: Your Honor, at this time, I would  
10 like to submit into evidence and incorporate into the  
11 transcript as if read the testimony of Richard X. French.  
12 I have a copy for the report for that purpose, with the  
13 correction noted.

14 JUDGE SMITH: Would you give me that correction  
15 again, please?

16 WITNESS FRENCH: It's on page 10, the first  
17 line of the third paragraph of that page, at the end of  
18 the line, the word "of" should be added to make the sentence  
19 complete.

20 MR. GALLO: I have made the offer into evidence  
21 of Mr. French's testimony.

22 JUDGE SMITH: Are there objections?

23 MR. CASSEL: No objection.

24 MR. LEWIS: No objection

25 JUDGE SMITH: The testimony is received.



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(The prepared testimony of Mr. Richard X. French

follows). \*

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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of )  
COMMONWEALTH EDISON COMPANY ) Docket Nos. 50-454-OL  
(Byron Station, Units 1 and 2) ) 50-455-OL

TESTIMONY OF RICHARD X. FRENCH

Q.1. Please state your full name and place of employment for the record.

A.1. Richard X. French, Sargent & Lundy, 55 East Monroe Street, Chicago, Illinois.

Q.2. Please describe your job responsibilities.

A.2. As a Partner in the firm and Manager of the Electrical Department, I am responsible for and coordinate all the electrical engineering and design for nuclear and fossil power plants and for transmission lines and substations for Sargent & Lundy. I initiate, review and authorize all Electrical Department standards, procedures, and reports, including those pertaining to technical administration and quality assurance. I am also responsible for and coordinate all power system analytical work.

Q.3. Please describe your educational background and work experience.

A.3. I graduated from Illinois Institute of Technology in 1948 with a B.S. degree in Electrical Engineering followed by graduate level courses in electrical and nuclear engineering. I have 36 years of experience in designing and engineering electrical systems for fossil and nuclear power plants, substations, and transmission lines and in making power system engineering studies.

I am a registered Professional Engineer in 17 states, including Illinois and in Alberta, Canada. Presently, I am a Senior Member of the Institute of Electrical and Electronics Engineers (IEEE) and current Past Chairman of the Power System Engineering Committee of the Power Engineering Society. I was formerly a member of the IEEE Rotating Machinery Working Group.

I have had extensive experience in the basic design and engineering of the electrical systems for power plants and substations. This work involved developing the basic electrical diagrams, determining requirements for specifications, analyzing proposals, and making recommendations for purchase and liaison with the client and suppliers. Projects on which I have worked include major power stations; large inter-connections, substations, and transmission lines.

I have written numerous technical papers and am the author of the Bulk Power Supply Economics section of the Mc Graw-Hill Standard Handbook for Electrical Engineers.

Q.4. Are you familiar with the Byron Reinspection Program?

A.4. Yes. That program was an effort by Commonwealth Edison Company to establish the qualification of certain Quality Control Inspectors who were employed at the construction site of the Byron Station. The results were also used as a basis for judgments on the quality of the construction work. The Reinspection Program is documented in a report which was issued by Edison in February, 1984.

Q.5. Were you involved in the preparation of the report?

A.5. My involvement consisted of directing the activities of engineers who work for me at Sargent & Lundy. They evaluated the design significance of various discrepancies associated with electrical construction work. However, I had no direct involvement in the preparation of these engineering evaluations.

Q.6. What is the purpose of your testimony?

A.6. My testimony addresses a portion of the engineering evaluation prepared as a part of the Reinspection Program by Sargent & Lundy engineers with respect to various discrepancies

identified during the reinspections of objective attributes of work performed by Hatfield Electric Company.

Q.7. Since your involvement in the Reinspection Program was minimal, how is it you are able to testify with respect to this matter?

A.7. I am a qualified electrical engineer with many years of experience in the engineering and design of the electrical features of both fossil and nuclear power stations. In this instance, I have read the Reinspection Program report. I have been thoroughly briefed with respect to the engineering evaluations performed by my people, and I have studied the underlying calculations and data. I understand and adopt that work. It represents highly competent work. It serves as the basis for my testimony.

Q.8. What work was performed by Hatfield Electric Company at Byron Station?

A.8. Hatfield installed all the components, materials and equipment associated with the electrical systems at Byron, including the installation of electrical equipment, cable tray and conduit and the pulling and terminating of cable. Hatfield also installed concrete expansion anchors which were initially inspected and reinspected by Pittsburgh Testing Laboratory (PTL). The evaluation of discrepancies identified for these anchors is included in my discussion of the Hatfield work.

Q.9. How was this work classified for reinspection?

A.9. The Hatfield work was divided into separate groups called attributes. These attributes included conduit installation, cable termination, cable tray and cable tray hanger installation, equipment modification, conduit as-built reconciliation, A-325 bolting and visual weld inspection. As explained in Mr. Del George's testimony, these attributes, which are described in Attachment B of his testimony, were then divided into objective and subjective attributes depending upon the degree of qualitative judgment inherent in the inspection activity. Visual weld inspection, which was the only attribute categorized as subjective, is discussed in the testimony of Mr. McLaughlin.

Q.10. How many reinspections of Hatfield objective attributes were conducted as part of the Reinspection Program?

A.10. There were 63,085 inspections of objective attributes performed as part of the reinspection program. Of these, 2840 were associated with concrete expansion anchors inspected by PTL.

Q.11. What were the results of these inspections?

A.11. There were 2153 discrepancies identified. Thirty-eight of these discrepancies were associated with concrete expansion

anchors. Most of the discrepancies were associated with conduit as-built reconciliation. These discrepancies consisted primarily of differences between the installed locations of conduit, conduit supports and junction boxes and the locations shown on the installation drawings.

Q.12. How were the discrepancies associated with the objective attributes evaluated?

A.12. For the 2,153 observed discrepancies, 1,713 evaluations were performed. The number of evaluations was less than the total number of discrepancies because some evaluations covered more than one discrepancy. The discrepancies were first compared with current design parameters and tolerances. This involved a comparison of installed component locations and dimensions with the corresponding locations, dimensions, and tolerances shown on the design drawings. The discrepancies found to be outside of design tolerances were evaluated either by engineering judgment or by engineering calculations.

Engineering judgment evaluations were performed in two ways, either a review of the component design function to determine whether the function of the component was affected by the discrepancy, or a comparison of the discrepancy to the current design to determine whether the discrepancy had design significance. Engineering calculations were used to resolve the remaining discrepancies.

Q.13. How many of the discrepancies were evaluated by comparison to the design parameters and tolerances?

A.13. Of the 1,713 evaluations, 1,244 were found to be within current design parameters and tolerances. The reason the reinspectors identified these as discrepancies was that the acceptance tolerances established for the Reinspection Program were more stringent than the tolerances indicated on the installation drawings.

Q.14. How many of the discrepancies were evaluated using engineering judgment?

A.14. Eighty evaluations of discrepancies were deemed acceptable by engineering judgment. Approximately two-thirds of these evaluations involved a review of the component design function to determine whether the function was impaired by the existence of the discrepancy. None of these discrepancies impaired component design function. The balance of the evaluations involved a comparison of the discrepancy to current design requirements to determine significance. None of the discrepancies were significant.

Q.15. How many of the discrepancies were evaluated using engineering calculations?

A.15. Of the 1,713 evaluations, 389 were analyzed by



revising the conduit support, junction box loading, and mounting detail design calculations. The variations in support locations and associated variations in loads were found to be acceptable.

Q.16. What does the engineering evaluation of the discrepancies identified in the Hatfield objective attributes demonstrate?

A.16. None of the evaluated discrepancies had design significance and therefore, they had no safety significance.

Q.17. What does the term "design significance" mean?

A.17. Design significance is a term referring to whether or not a discrepancy would cause a component or system to perform in a manner that is unacceptable relative to the design criteria. If the discrepancy would not cause a deviation beyond the design requirements, then it is said to not have design significance. For instance, a wiring discrepancy which did not alter the functioning of a control circuit would not have design significance. As I indicated, none of the Hatfield discrepancies discussed above had design significance.

Q.18. Were any additional reinspections conducted with respect to objective attributes of Hatfield Electric Company's work?

A.18. A supplemental program was established for the reinspection of certain Hatfield attributes and elements, namely, equipment setting, equipment modification, A-325 bolt installation and conduit support bolting. This program was established to provide further assurance that work in these areas was properly done and to complete the data base for attributes where the reinspection program samples were too small to permit meaningful reliability calculations.

Q.19. What was the nature of the supplemental reinspection program for equipment setting?

A.19. The settings of 50 randomly selected pieces of safety-related electrical equipment, out of a total of approximately 250, were inspected. There were 778 inspections associated with the 50 pieces of equipment, which identified 34 discrepancies. An evaluation of the discrepancies determined that none had design significance. The majority of the discrepancies consisted of equipment anchoring details with weld length and weld spacing deviations. The equipment anchoring details were determined to be adequate because of the conservatism used in the determination of design anchorage loads.

Q.20. What was the nature of the supplemental reinspection program for equipment modification?

A.20. Equipment modification work refers to changes in the wiring and components within electrical panels and switching equipment. There are numerous changes in the wiring of this equipment made by the owner and the manufacturer as well as by Hatfield. It would be very difficult to determine those discrepancies attributable to Hatfield. Therefore the supplemental reinspection covered all work done by the owner, the manufacturer and by Hatfield.

A 100% wiring inspection was performed for 50 pieces of safety-related equipment. These were randomly selected from a population of approximately 250. This wiring inspection included all of the elements of wiring installation. Inspection was performed on 1,850 elements associated with the 50 pieces of equipment and 44 discrepancies were identified. An evaluation of the discrepancies determined that none has design significance. The discrepancies were minor wiring variations that do not affect the functioning of the equipment.

Q.21. What was the nature of the supplement reinspection program for A-325 bolting?

A.21. A-325 bolts are used in the assembly of cable tray

riser supports. Out of a total of 169 supports using A-325 bolts, a sample of 50 supports was reinspected. A total of 295 bolts were inspected and 46 discrepancies were identified. The discrepancies represent bolts with torque less than the acceptance criteria. The design of the associated connections was reviewed and it was determined that the connections were structurally sound despite the lack of complete bolt torque. Therefore, the discrepancies were determined to have no design significance. However, all A-325 bolted connections were retorqued because of the unsatisfactory discrepancy rate.

Q.22. What was the nature of the supplement reinspection for conduit support bolting?

A.22. Out of approximately 25,000 conduit supports, 305 were randomly selected. These supports were reinspected for bolt torque. There were 34 discrepancies identified from a total of 1,008 conduit support bolts. The discrepancies were evaluated and determined to have no design significance.

Two missing conduit clamps were detected during the inspection. These missing clamps, upon evaluation, had no design significance. However, because these clamps were missing and a missing clamp at a critical location could have design significance, a walk-down was performed of all 8,532 critical clamp locations. Ten locations were found with

missing bolts or clamps. An evaluation of 9 of these cases showed that the discrepancies had no design significance. The remaining case is still under evaluation. Based on these results, a walk-down of the remaining accessible conduit clamps and bolts will be conducted.

Q.23. What conclusion about the reinspected Hatfield work can you draw from the evaluation of objective attribute discrepancies identified in the Reinspection Program and in the supplemental reinspections undertaken?

A.23. There were 66,981 inspections performed. These inspections covered an even greater number of individual items. Although 2,311 discrepancies were identified, none of the observed discrepancies had design significance. The quality of the work reinspected is adequate.

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BY MR. GALLO:

2 Q \* Mr. McLaughlin, would you state your full name  
3 and business address for the record?

4 A John M. McLaughlin, 55 East Monroe, Chicago,  
5 Illinois.

6 Q By whom are you employed, and what is your  
7 job responsibility?

8 A I am employed by Sargent & Lundy. I am the  
9 Manager of the Structural Department.

10 Q Did you have occasion to prepare testimony  
11 for this proceeding?

12 A Yes.

13 Q I am looking at a document entitled "Testimony  
14 of John M. McLaughlin," consisting of 17 pages and ten  
15 figures, and ask if this is the testimony prepared by you?

16 A Yes.

17 Q Are there any additions or corrections to your  
18 testimony?

19 A Yes. I have three corrections.

20 Q Take t'em slowly one at a time.

21 A The first is on page 10. It's in the second  
22 paragraph, the seventh line down. The sentence starts,  
23 "Convexity is only a --", and the word should have been  
24 "problem."

25 The second correction is on page 15. It's

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2 in the answer to Question -- Answer 21. It's the sixth  
3 line down, The sentence starts, "Twenty three welds..."  
4 There should have been a hyphen between "twenty" and "three."

5 The third correction is on page 17. It is  
6 at the end of the first paragraph, the second sentence up.  
7 The line starts, "Objective discrepancies..." The hyphen  
8 should come out. After "discrepancies," the following  
9 wording should be added: "and the 49 Hunter ASME  
10 discrepancies."

11 Q How would that line now read, Mr. McLaughlin?

12 A The line would now read, "Objective discrepancies,  
13 and the 49 Hunter ASME discrepancies, indicated that none  
14 of the...."

15 Q Does that complete your corrections?

16 A Yes, it does.

17 Q Is your testimony, as corrected, accurate and  
18 complete, to the best of your knowledge and belief?

19 A Yes.

20 MR. GALLO: Your Honor, at this time I would  
21 like to introduce into evidence the testimony of  
22 John M. McLaughlin and bind it into the transcript as if  
23 read. I have a copy for the reporter for that purpose  
24 with the corrections note.

25 JUDGE SMITH: Are there objections?

MR. CANCEL: No objection.

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1 MR. LEWIS: No objection.

2 \* Your Honor, I'm wondering, the testimony still  
3 makes reference to Mr. Leone as the author of the testimony  
4 on which Mr. McLaughlin relies. I don't know whether the  
5 record will be confused by that.

6 MR. GALLO: I thank Mr. Lewis for pointing that  
7 out.

8 BY MR. GALLO:

9 Q Mr. McLaughlin, should we make that correction  
10 on page 17?

11 MR. LEWIS: It appears a number of places,  
12 Mr. Gallo.

13 MR. GALLO: Your Honor, I will undertake to  
14 revise all the "Leone"s to "Branch"s for the copy of the  
15 testimony for incorporation into the record, if that's  
16 acceptable.

17 JUDGE SMITH: Yes.

18 MR. GALLO: Is Mr. McLaughlin's testimony  
19 received?

20 JUDGE SMITH: Yes, it is received.

21 (The prepared testimony of Mr. John M. McLaughlin  
22 follows.)  
23  
24  
25



UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION  
BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of )  
COMMONWEALTH EDISON COMPANY ) Docket Nos. 50-454-OL  
(Byron Station, Units 1 and 2) ) 50-455-OL

TESTIMONY OF JOHN M. MCLAUGHLIN

- Q.1. Please state your full name and place of employment for the record.
- A.1. John Michael McLaughlin, Sargent & Lundy, 55 East Monroe Street, Chicago, Illinois.
- Q.2. Please describe your job responsibilities.
- A.2. As a Partner in the firm and Manager of the Structural Department, I am responsible for and coordinate all the architectural, structural and civil engineering and design for nuclear and fossil power plants for Sargent & Lundy. I initiate, review, and authorize all Structural Department standards, procedures, and reports, including those pertaining to technical administration and quality assurance.
- Q.3. Please describe your educational background and work experience.

A.3. I graduated from Illinois Institute of Technology in 1958 with a B.S. degree in Civil Engineering. In 1970 I received a M.S. degree in Civil Engineering from IIT. I have 22 years of experience in the field of civil engineering, which includes civil-structural-architectural engineering and design work for fossil and nuclear power plants. My assignments have included 16 units with total capacity in excess of 10,000 M.W. I have also been involved with numerous studies involving nuclear and fossil power plant. Prior to joining Sargent & Lundy in 1964, I practiced civil engineering for a private firm and with the U.S. Air Force.

I am a registered Professional Engineer in 29 states including Illinois. I have, also, a separate Structural Engineering license in the State of Illinois and am licensed in Alberta, Canada, and Israel.

Presently, I am a member of the following organizations:

- American Concrete Institute
- American Institute of Steel Construction
- American Society of Civil Engineers
- Building Officials & Code Administrators International, Inc.
- Earthquake Engineering Research Institute
- Post-Tensioning Institute
- Seismological Society of America
- Structural Engineers Association of Illinois
- Structural Stability Research Council

Q.4. Are you familiar with the Byron Reinspection Program?

A.4. Yes. That program involves an effort by Commonwealth Edison Company to establish the qualification of certain Quality Control Inspectors who were employed at the construction site of the Byron Station. The results were also used to render a judgment on the quality of the construction work. The Reinspection Program is documented in a report which was issued by Edison in February, 1984.

Q.5. Were you involved in the preparation of the report?

A.5. I had only an indirect involvement. Engineers who work for me at Sargent & Lundy participated in the Reinspection Program, principally in the area of evaluating the design significance of various weld discrepancies identified during the reinspection program. However, I had no direct involvement in the preparation of these engineering evaluations.

Q.6. What is the purpose of your testimony?

A.6. My testimony addresses a portion of the engineering evaluations performed by Sargent & Lundy engineers with respect to certain weld discrepancies that were identified during the Reinspection Program. The welds of interest are those covered by the applicable provi-

sions of the American Welding Society (AWS) standard and produced by welders employed by Hatfield Electric Company and Hunter Corporation. Also, I state an opinion with respect to the quality of the work performed by Hatfield and Hunter.

Q.7. Since your involvement in the Reinspection Program was minimal, how is it you are able to testify with respect to this matter?

A.7. I am a qualified structural engineer with many years of experience in, among other things, the structural integrity of welded structures and components. In this instance, I have read the Reinspection Program report, I have been thoroughly briefed with respect to the engineering evaluations of the AWS welds performed by my people, and I have studied the underlying calculations and data for the Hatfield and Hunter evaluations. I understand and adopt that work. It represents highly competent work. It serves as the basis for my testimony.

Q.8. Does your testimony address all of the engineering evaluations of discrepant welds produced by Hatfield and Hunter?

- A.8. No, only those evaluations of discrepant welds covered by the AWS code. Evaluations involving the ASME code will be discussed by Mr. <sup>Branch</sup> ~~Leone~~ in his testimony.
- Q.9. What is the difference between the two codes?
- A.9. There are basically two codes that govern welding on nuclear power plants. The ASME code governs welding for piping and pressure vessels and the AWS code governs all other welding. All of Hatfield's welds captured in the Reinspection Program are covered by the AWS code. Twenty-seven percent of the Hunter welds are covered by the AWS code.
- Q.10. What was the nature of the welding work performed by Hatfield and Hunter?
- A.10. The Hatfield AWS welding covered by the reinspection program included conduit supports, junction box supports, cable tray supports, cable tray hold-down welds and auxiliary steel for electrical supports. Figure 1 depicts a typical cable tray support system. The circles on the Figure 1 are around areas that are welded connections. The vertical members are connected at the top by welding to either a plate embedded in concrete or a structural member (connection 1). The connection of the horizontal to vertical members is

also a welded connection (connection 2). Figure 2 is a detail of the connection of the horizontal to vertical connection. Figure 1 also shows the hold-down welds for the connection of the cable tray to the horizontal member (connection 3). Connection 1 in Figure 3 is the attachment of a vertical conduit support to a plate embedded in concrete or a structural steel member.

The Hunter AWS welding covered by the reinspection program included pipe supports and pipe restraints. Figure 4 is an example of the Hunter AWS connection for pipe support auxiliary steel. Figure 5 shows a pipe whip restraint and Figure 6 is a detail of the end connection of this restraint which is an example of the Hunter welding for this program.

- Q.11. How were the discrepant AWS welds produced by Hatfield and Hunter evaluated in the Reinspection Program?
- A.11. A program was established to evaluate the discrepant welds using either a sampling plan, as in the case of Hatfield, or a 100% evaluation plan, as in the case of Hunter. A sample of all of the discrepant welds for Hatfield was evaluated to determine whether the total population of discrepant welds had design signifi-

cance. For Hunter, all discrepant welds were evaluated to make this determination.

Q.12. What was the nature of the sampling plan used in the Reinspection Program to evaluate the Hatfield discrepant welds?

A.12. Of the 27,538 Hatfield welds which were subjected to reinspection during the original program, 1986 welds were identified with various discrepant conditions. A sample of 100 welds was taken from this group. The number of discrepant welds in the sample was later expanded by 69, for a total of 169, as a result of follow-up inspections which were conducted to answer NRC questions. An additional 187 discrepant welds were included as a part of the sample when, again in response to NRC questions, additional inspections were made of welds not initially covered by the Reinspection Program. Thus, the total sample for Hatfield comprised 356 discrepant welds.

Q.13. How was the sample of 356 discrepant welds selected?

A.13. The 356 discrepant welds were broken down into four categories. Fifty of the discrepant welds were randomly selected. An additional 50 were selected by a third party inspector and were identified as the worst

discrepant welds. This category included two welds with cracks. An additional 69 welds were selected on the basis of being highly stressed. Finally, 187 highly stressed welds were included in the sample as a result of the inspections conducted in response to NRC questions. One weld was cracked in this group.

Q.14. What does the term "highly stressed" mean as used in your previous answer?

A.14. "Highly stressed" means that there is a minimum design margin in the connection. The highly stressed welds that were evaluated as a part of the Hatfield sample were those welds where the difference or margin between the design load and the actual load was minimal. Thus, the sample included 256 welds, or over two-thirds of the total, that were located at connections where the greatest question existed concerning potentially significant design deficiencies.

Q.15. What does "margin" mean?

A.15. The concept of margin is one that is inherent in the engineering discipline. Engineers design a structure such that it is sufficiently strong to withstand the expected forces and stresses with spare or extra strength to account for uncertainties and contingencies. This extra strength is called margin.



Design margin is that margin imposed by engineers during the design process. For example, connections are designed in groups rather than individually. As a consequence, the force or load bearing capability for each connection is established on the basis of the most highly stressed connection. The actual stresses for most connections will be less than those established by the design process. The difference between the two is an example of design margin.

There is a second margin in the structural design of connections. This is the margin that the code writers put into the design process in the form of allowable stresses. The code writers typically attempt to obtain a margin of approximately two when they write the code. This means that a structure designed to a code could carry approximately twice the design load and not fail. It should be pointed out that in our detailed engineering evaluation we did not encroach on the code margin.

Q.16. How were the 356 discrepant welds evaluated?

A.16. The first step in the engineering evaluation was to acquire and review weld maps for the 356 discrepant welds. A weld map is similar to a blown up photograph

of a weld. It provides a detailed description and location of the discrepancy in the weld.

The review of the 356 weld maps indicated that 5 of the discrepant welds consisted of arc strikes, spatter and convexity. Arc strikes and spatter are cosmetic discrepancies and they would only create a strength problem if there were a large amount in a given weld. The weld maps indicated that the weld spatter and arc strikes were minimal. Convexity is only a problem<sup>b</sup> if the weld is subjected to fatigue loading, for example, cars passing over a bridge. Twenty thousand on and off loadings are required before a weld is considered subjected to fatigue loading. The welds on the structures under consideration are not subject to fatigue loading. These 5 weld discrepancies do not reduce the load carrying capacity of the weld, and therefore, they have no structural impact.

A detailed engineering evaluation based on the weld maps was conducted with respect to the remaining 351 discrepant welds to determine the effect of the discrepancy on the strength of the weld. It was determined that 162 welds had strength reductions of less than 10% and 186 discrepant welds had strength reductions equal to or greater than 10%. Three welds had

cracks. These results were used to re-examine the load capacity of the various connections.

Since the discrepant portion of the weld must be disregarded for evaluation purposes, it is necessary to recalculate the capacities of the connections. For example, if the weld map indicated that there was 1-1/2" of porosity in a 10" weld, we would recalculate the capacity of the connection on the basis of only 8-1/2" of weld. This is conservative in that there is probably no reduction at all in the capacity of the connection for this 1-1/2" of porosity. In the case of welds with cracks, no credit is given in the evaluation for the presence of the weld.

Once the revised capacities of the connections are determined, a further evaluation of their ability to withstand the expected loads or forces is performed. The forces on the connections are made up of two major loadings. The first is the dead weight or static load of the cables and the tray. The second is the seismic load on the connection.

With respect to the static load, we reviewed the cable loadings to confirm that the loads of the cables were less than that assumed in the original design. Because maximum or bounding loads were used in the

original design of the cable tray and conduit system, the actual loads are expected to be less than design loads. In each case where we calculated the actual load, we found it was less than the original design load.

We re-examined the seismic loading and did a more detailed seismic analysis to determine the amount of design margin in the original design. The seismic loading used in the original design of the cable tray and conduit system is based on a response spectra design method, a very conservative design assumption used in the nuclear industry. The re-evaluation of the seismic loading on the connections was based on a time history seismic analysis which is a more accurate determination of the seismic loading.

The detailed evaluations described above were conducted on all 356 discrepant welds. The results of these evaluations demonstrated that none of the discrepancies exceeded design margin and, accordingly, none had design or safety significance.

Q.17. Were any of the weld discrepancies of a recurring nature?

A.17. During our evaluation of the 356 discrepant welds, we found two examples of discrepancies that appeared to

be repetitive. The first was a gap problem caused by fitup of the horizontal and vertical cable tray members. Figure 7 is a sketch of a typical cable tray support. The gap occurred at the connection of the horizontal and vertical support members which is noted as connection 1 in Figure 7. Figure 8 is a detail of connection 1 in Figure 7 showing the gap. In some cases, the gap exceeded the AWS code allowable.

The second apparent recurring deficiency was the use of a partial penetration weld instead of a fillet weld, as called for in the design. Figure 9 is a sketch of a cable tray support with a diagonal member. The use of the partial penetration weld instead of the fillet weld occurred at connection 1 which is the connection between the diagonal and the vertical member. Figure 10 is a blowup of connection 1. Detail 1 in Figure 10 shows the weld called for in the original design. This shows that a fillet weld should have been used between the two members. Detail 2 is the connection that was actually provided in the field. This detail shows that a partial penetration weld was provided instead of a fillet weld.

Q.18. Please explain the test program that was developed to determine the significance of these two types of discrepancies.

A.18. In the case of the fitup gap between the horizontal and vertical member, ten test specimens which would resemble Figure 8 were prepared. Strength tests were performed where loads were applied to these joints. These tests showed that even though the AWS code required that the strength of this connection be reduced, there was no reduction in the joint capacity.

In the case of the partial penetration weld instead of the fillet weld, an actual connection was removed from the Byron Site. This connection was taken to a testing laboratory where the connection was sliced open with a saw. This process allowed a determination of the depth of penetration for the partial penetration weld. Based on the result of this testing, it was determined that the as-built partial penetration weld had less than a 10% reduction in capacity when compared to the original design.

Q.19. In your earlier testimony, you stated that 100% of the Hunter discrepant AWS welds were evaluated. Is that correct?

A.19. Yes, a total of 60 AWS welds produced by Hunter were evaluated.

Q.20. How were these welds evaluated?

A.20. These welds were evaluated by exactly the same procedure I previously described for the Hatfield discrepant welds.

Q.21. What were the results of the engineering evaluation of the 60 Hunter discrepant AWS welds?

A.21. Nineteen of the welds fell into the no structural impact category. As I explained previously, this category covers weld spatter, arc strikes and convexity, which do not reduce the load carrying capacity of the weld. Eighteen welds had a capacity reduction of less than 10%. Twenty<sup>three</sup> welds had a capacity reduction of 10% or more. The detailed engineering evaluation of the 60 discrepant welds indicated that none of the discrepancies exceeded design margin and, accordingly, none had design or safety significance.

Q.22. Are you familiar with the testimony of Messrs. <sup>Branch</sup> Leone and French?

A.22. Yes, their testimony explains the results, for Hatfield and Hunter, of the engineering evaluations performed with respect to discrepancies identified in objective attributes and certain welds covered by the ASME Code.

Q.23. Based on the testimony of Messrs. <sup>Branch</sup> Leone and French and your evaluation as described above, do you have an

opinion as to the quality of the Hunter and Hatfield work?

A.23. Yes. It is my professional judgment that the quality of the Hatfield and Hunter work on the Byron Station is adequate.

Q.24. What is the basis for that opinion?

A.24. My opinion is based on engineering judgment that relies on two significant elements. First, none of the discrepancies identified with respect to the Hatfield and Hunter work had design significance. Second, the existence of the conservative loadings and assumptions used in the design of the Byron Station and the margins inherent in that design, as explained in my prior responses to questions, provides the capacity for the design to compensate for unidentified discrepancies.

I should emphasize the first point by summarizing the results of the engineering evaluations. With respect to Hatfield AWS welding, I have looked at the engineering evaluations of the 356 weld discrepancies. These evaluations demonstrate that none of the deficiencies has design significance. I know that the makeup of the sample of 356 is highly biased to examine the most highly stressed welds in the reinspection



program. As explained previously, 50 of the welds were selected on the basis that they were the worst welds from a weld discrepancy standpoint. Two hundred and fifty-six welds were selected on the basis of being the most highly-stressed welds in the Reinspection Program. My judgment is further reinforced by the testing program that was undertaken to investigate two apparent recurring deficiencies. The test program showed that these deficiencies had only a minor reduction (less than 10% in one case and zero in the other) in the design capacity of the connection. With respect to Hunter AWS welding, I have reviewed the engineering evaluations of all 60 of the weld deficiencies. These evaluations indicated that none of the deficiencies has design significance. Finally, as explained by Messrs. <sup>Branch</sup> Leone and French, the engineering evaluation of the 2,273 Hatfield and 684 Hunter objective discrepancies <sup>and the 49 Hunter ASME discrepancies</sup> indicated that none of the discrepancies had design significance.

For these reasons, I am confident that the quality of the Hatfield and Hunter work at the Byron Station is adequate. Moreover, from a statistical standpoint it can further be stated with a 95% confidence level and, in general with a greater than 99% reliability, that all of the Hatfield and Hunter work in the plant meets the original design basis.

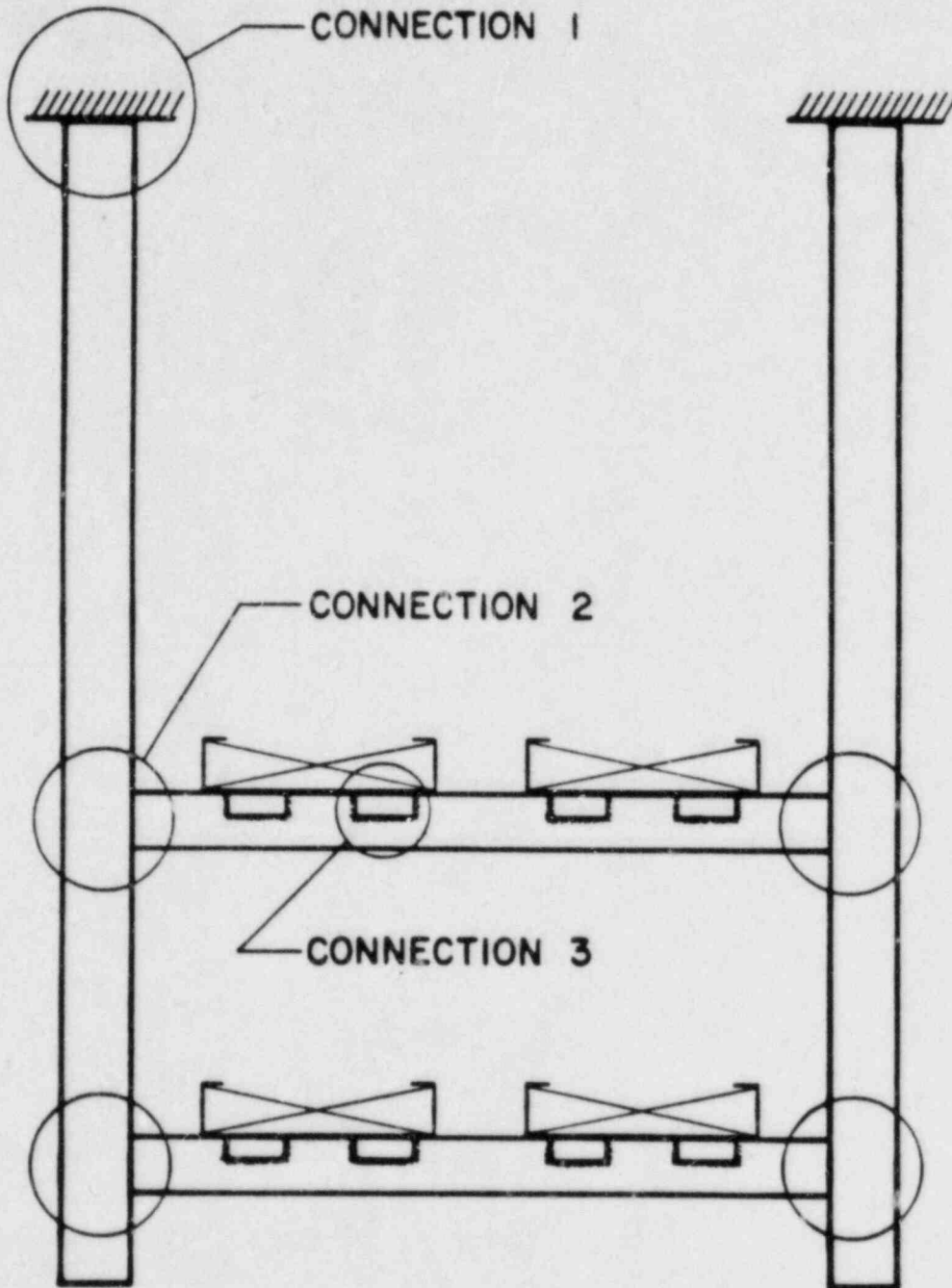
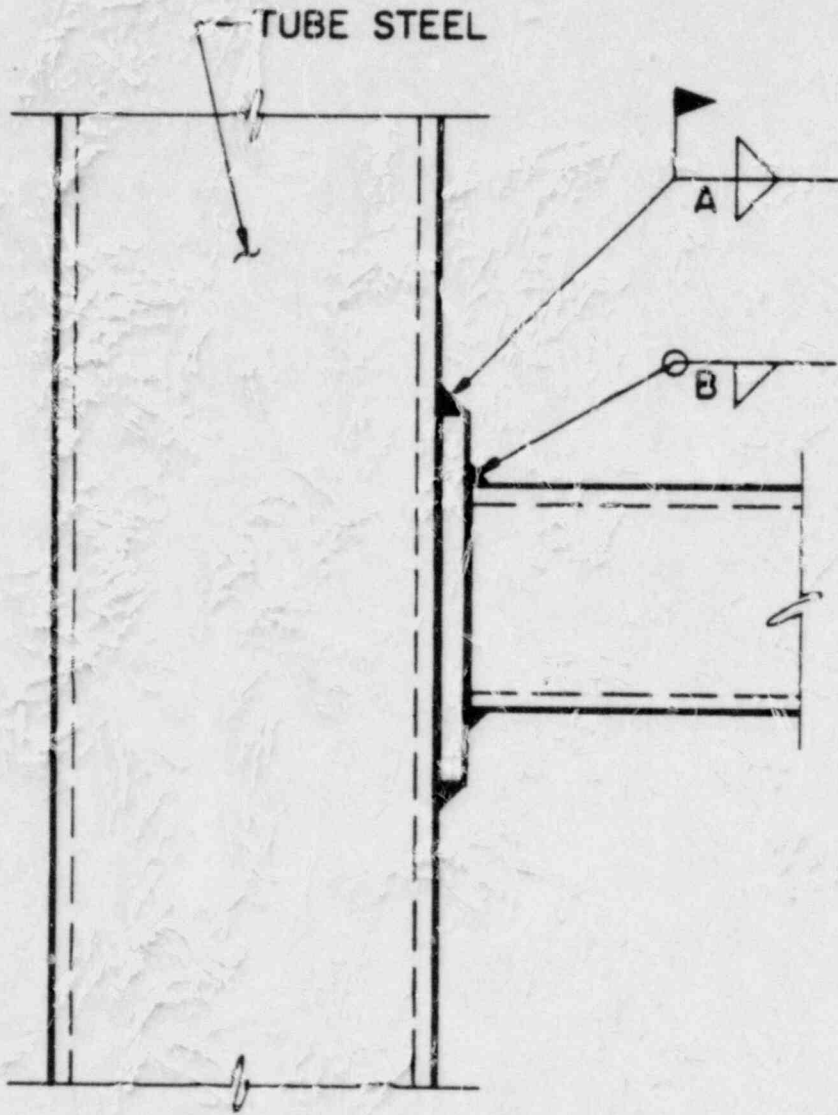
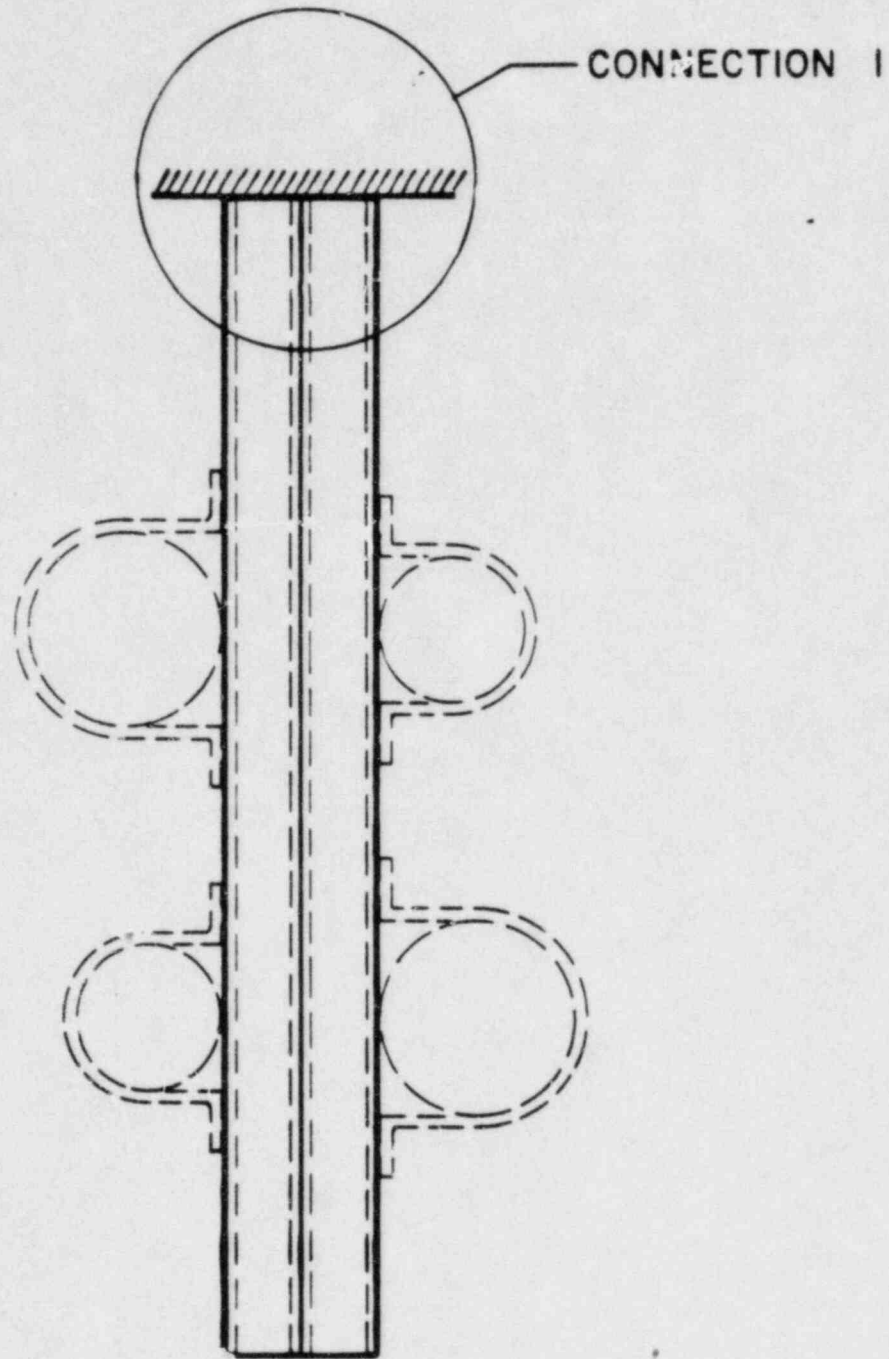


FIGURE 1  
HATFIELD AWS  
WELDING FOR CABLE TRAYS



**FIGURE 2**  
**HATFIELD AWS**  
**WELDED CONNECTION**  
**FOR CABLE TRAY SUPPORT**



**FIGURE 3**  
**HATFIELD AWS**  
**WELDING FOR CONDUIT SUPPORTS**

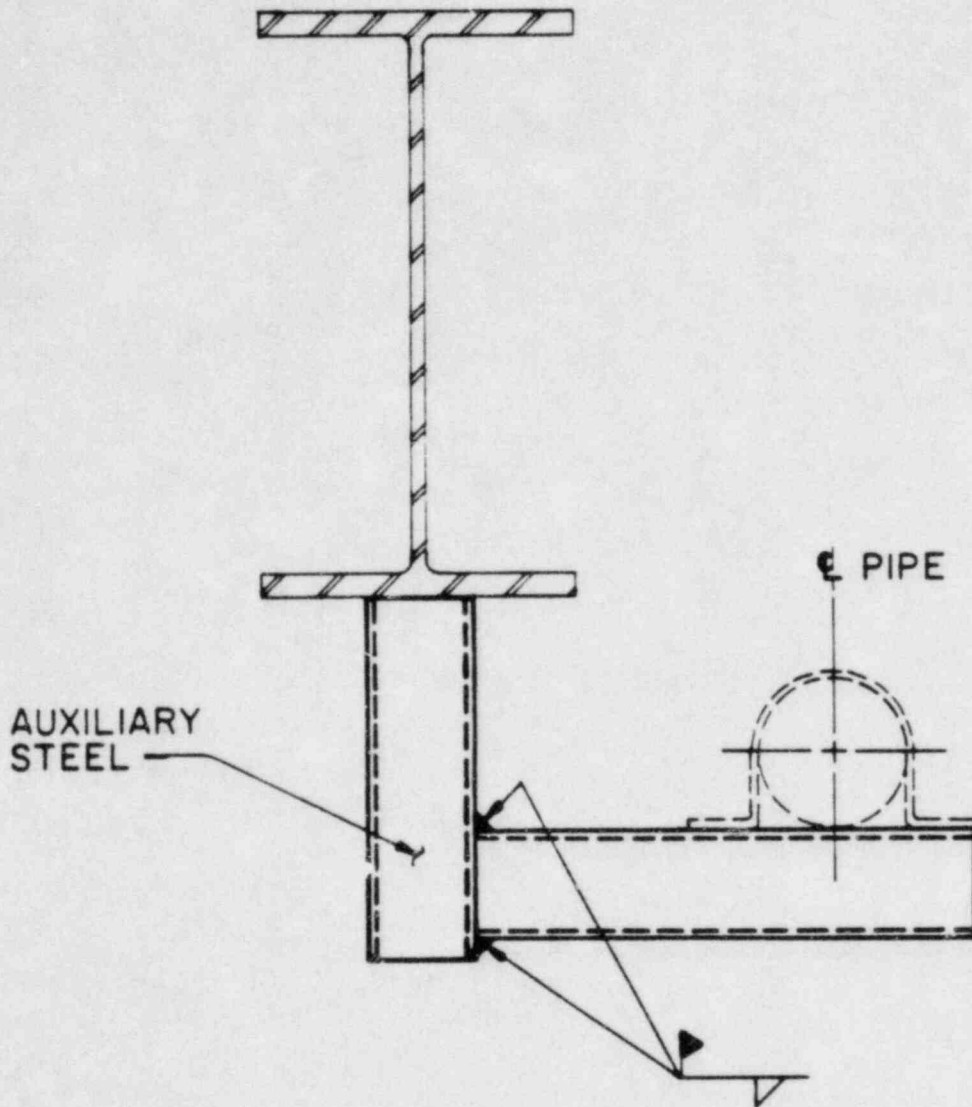


FIGURE 4  
HUNTER AWS WELDING FOR  
PIPE SUPPORT AUXILIARY STEEL

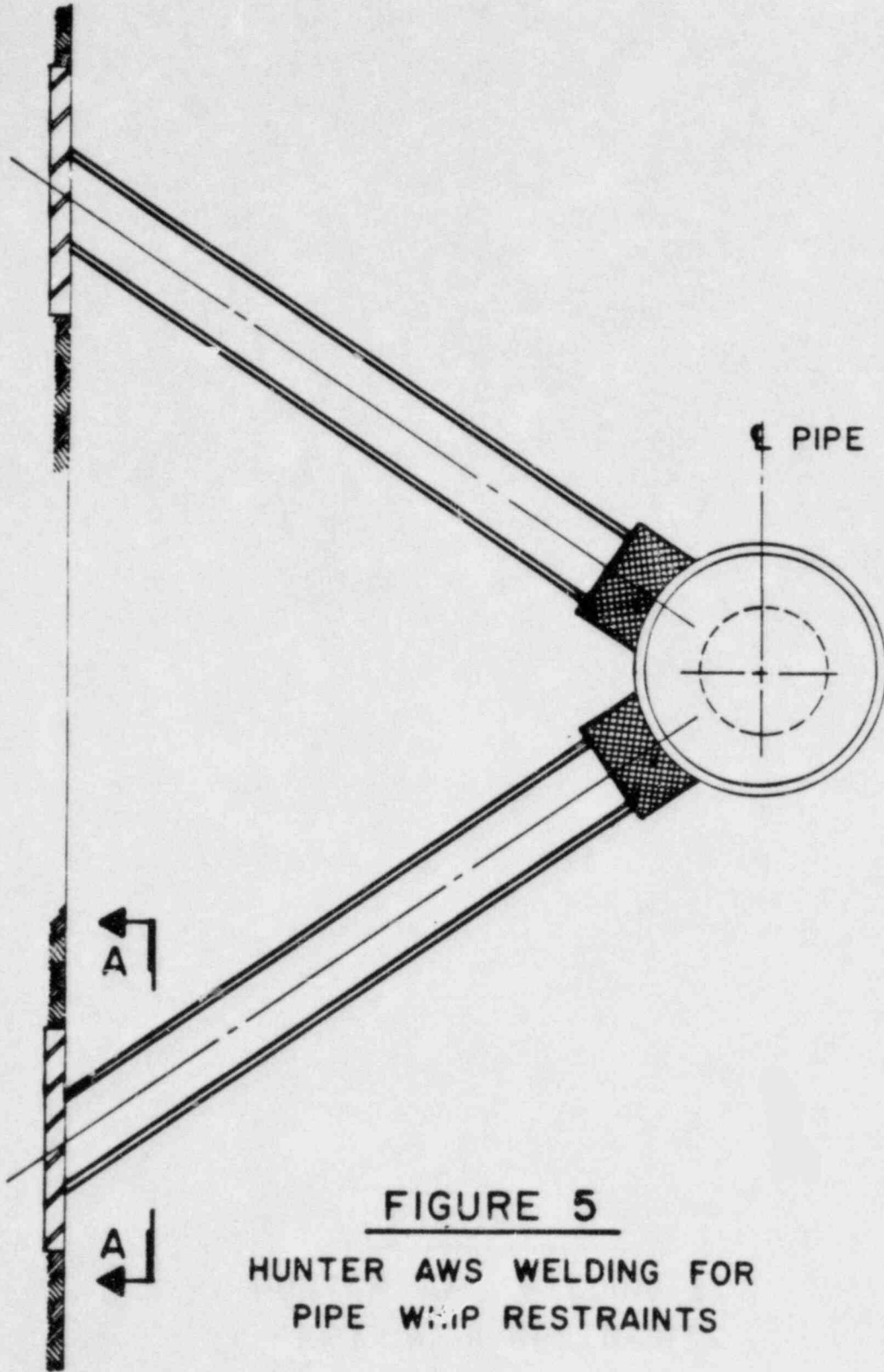
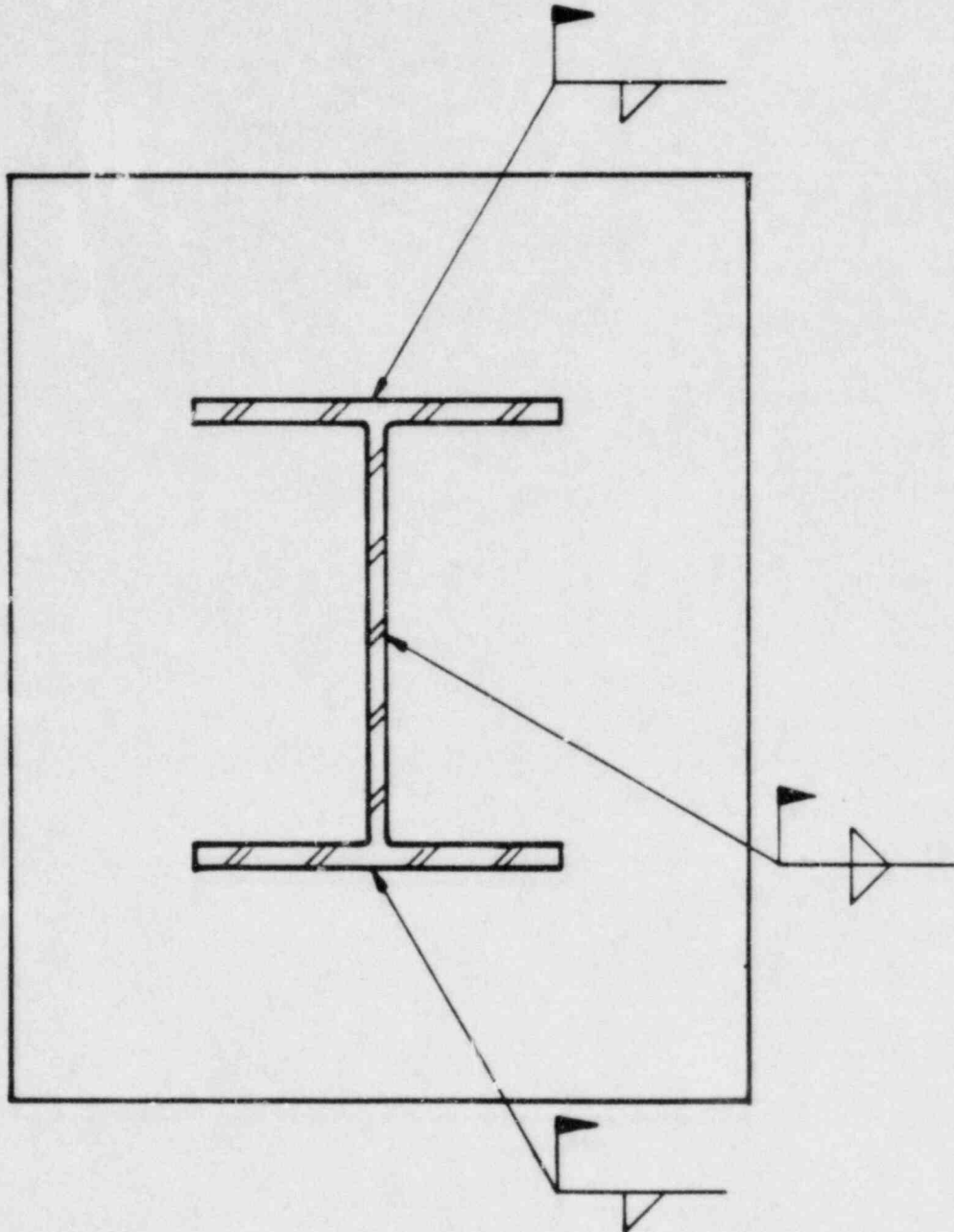


FIGURE 5  
HUNTER AWS WELDING FOR  
PIPE WHIP RESTRAINTS



**FIGURE 6**  
SECTION A-A OF FIGURE 8  
HUNTER AWS WELDING FOR  
PIPE WHIP RESTRAINTS

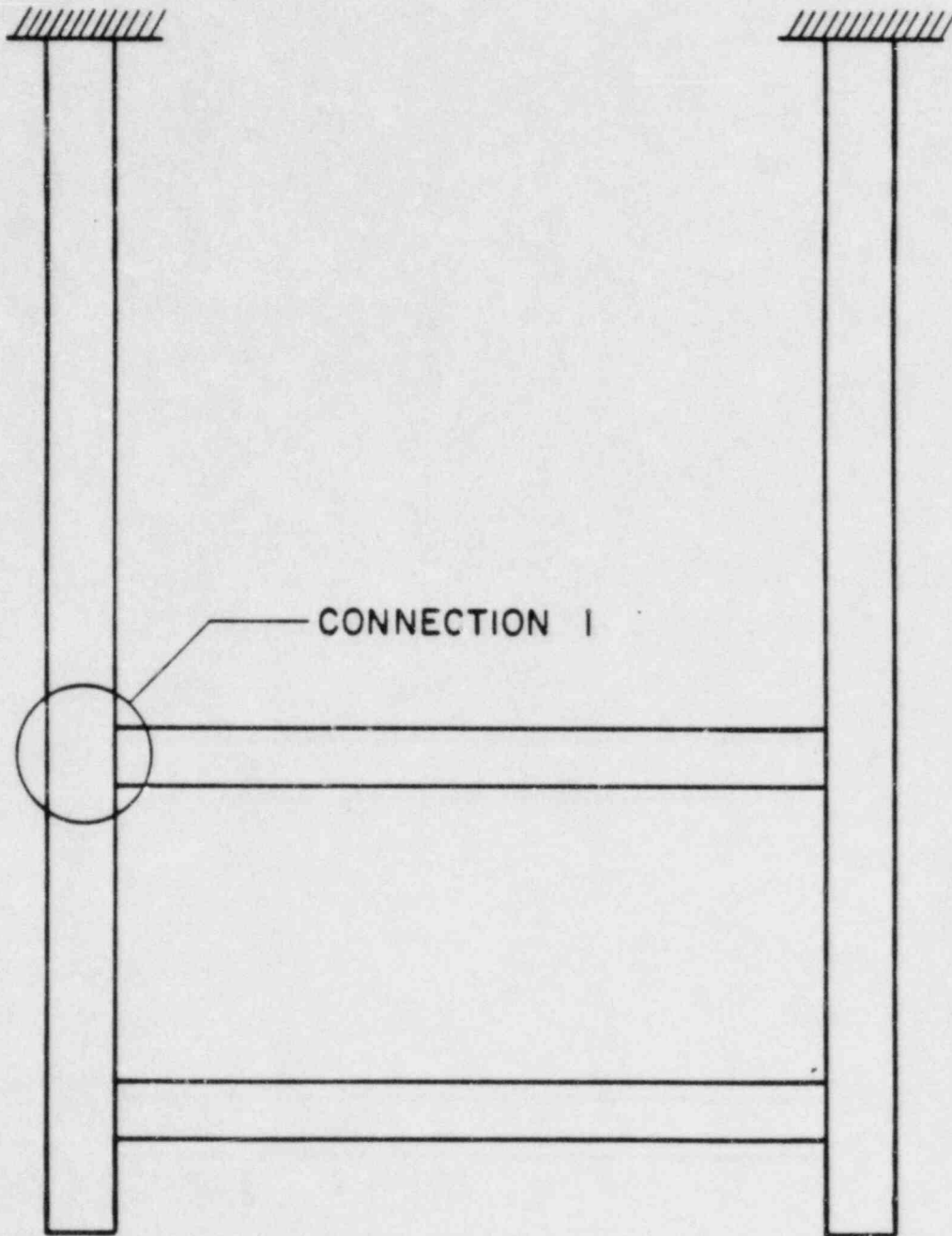


FIGURE 7  
HATFIELD AWS WELDING  
FOR CABLE TRAY SUPPORT



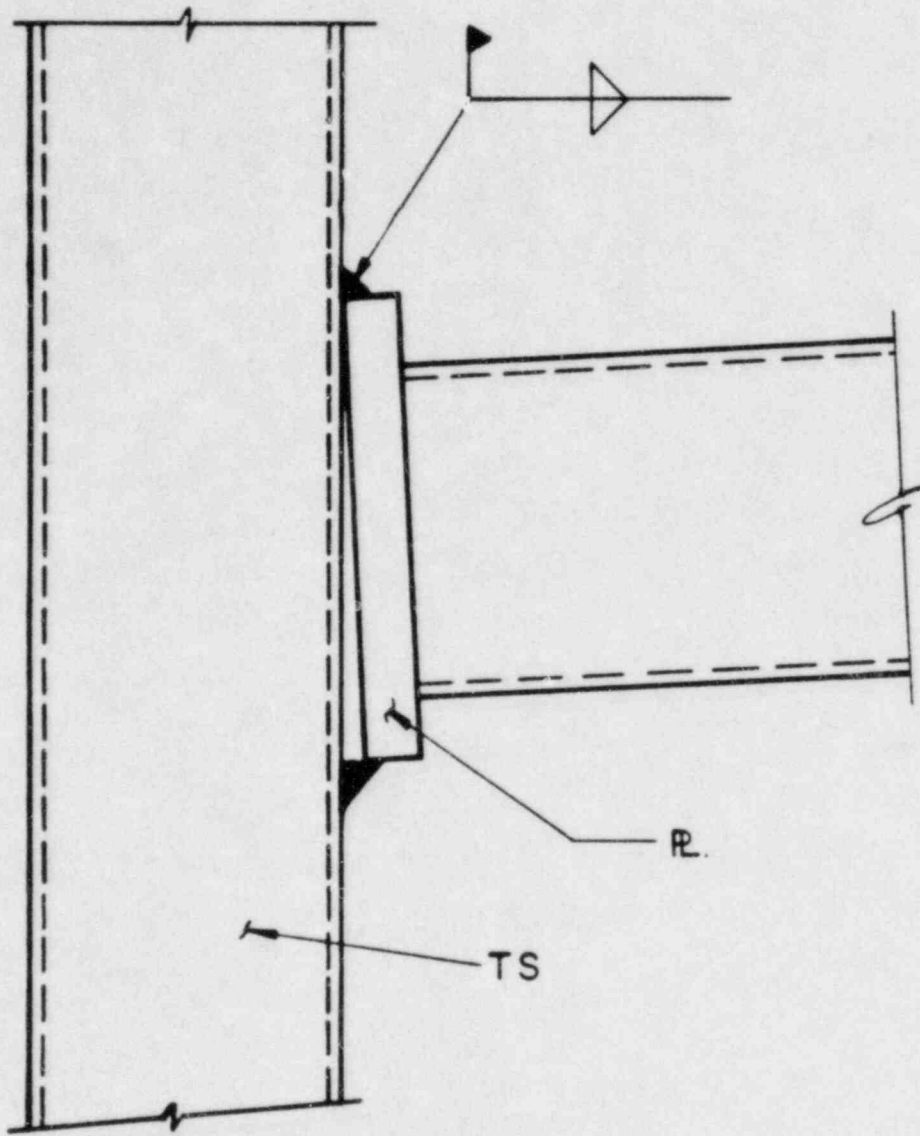


FIGURE 8

HATFIELD AWS WELDING  
WITH FIT-UP GAPS FOR  
CABLE TRAY SUPPORTS

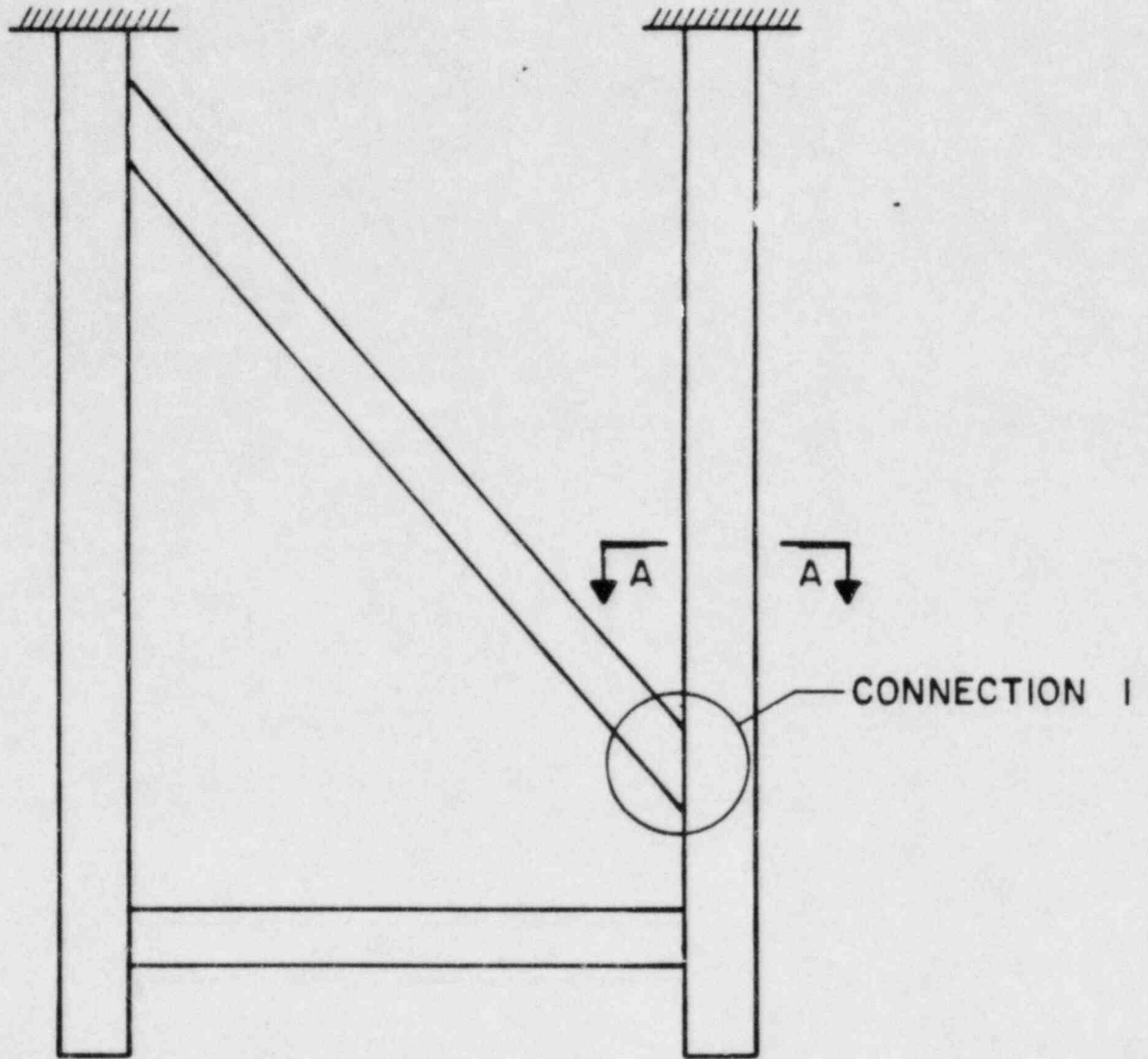
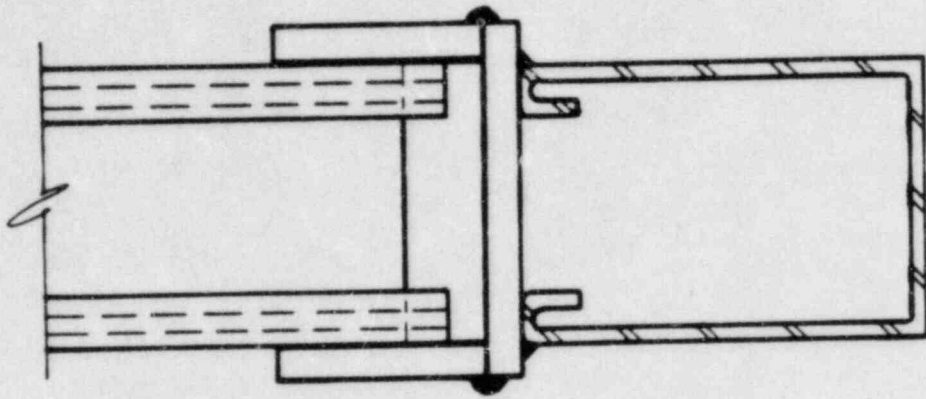
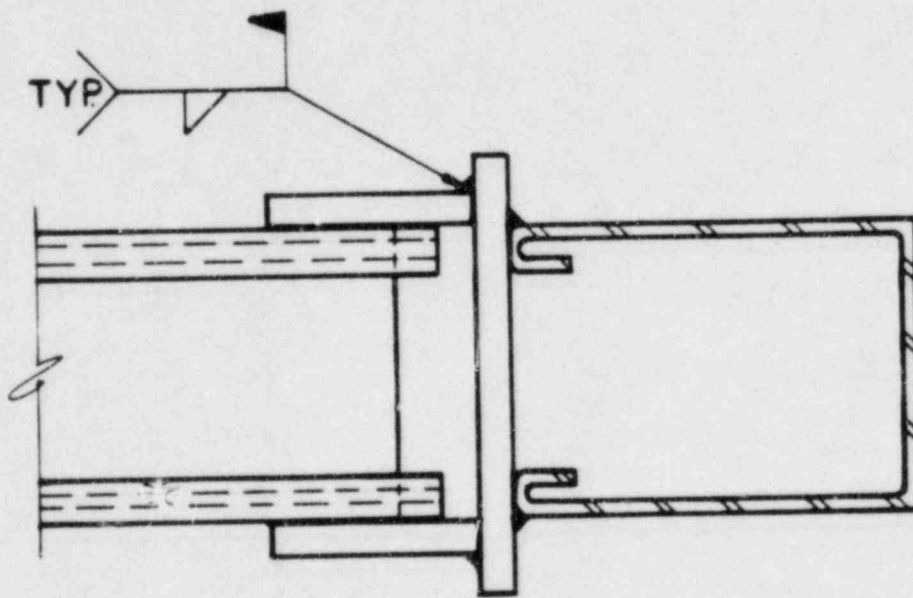


FIGURE 9  
HATFIELD AWS WELDING  
CABLE TRAY INTERNAL  
DIAGONAL CONNECTION



DETAIL 2



DETAIL 1

FIGURE 10  
SECTION A-A NOTED ON FIGURE 6  
HATFIELD AWS WELDING  
CABLE TRAY INTERNAL  
DIAGONAL CONNECTION

mgc 7-8

1 BY MR. GALLO:

2 Q \* Mr. Branch, would you state your full name and  
3 business address for the record?

4 A (Witness Branch) My name is Ernest B. Branch.  
5 The address is 55 East Monroe, Chicago.

6 Q By whom are you employed, and what is your  
7 job responsibility.

8 A Sargent & Lundy, and my job responsibility  
9 is Mechanical Design Director.

10 Q Did you have occasion to prepare and adopt  
11 testimony in this proceeding?

12 A Yes.

13 Q I am looking at a document entitled "Testimony  
14 of Ernest B. Branch," consisting of 14 pages and ask if  
15 this is the testimony that was either written by you or  
16 adopted by you for purposes of this proceeding?

17 A Yes, it is.

18 Q Can you identify those answers to the questions  
19 which you wrote yourself initially?

20 A Down through A.6. By the way, I just noticed  
21 that there is a typographical. We have two Qs instead of  
22 a Q and an A here. But down through the answer to  
23 Question 6 is what I had written myself.

24 Q And were the other answers to the questions  
25 remaining, answers to the questions, written by Mr. Leone?

mgc 7-9

- 1 A Yes.
- 2 Q Did you adopt that testimony as your own?
- 3 A Yes.
- 4 Q Was there any change to the testimony as you  
5 adopted it?
- 6 A Yes, there was, and I have the old version  
7 here, if I may refer to it.
- 8 Q Go right ahead.
- 9 A In the Question 11 and Answer 11 -- and that  
10 was on page 6 of the old document, page 7 of the new, --  
11 if you have the old one, you can see what I did.
- 12 Q I don't think we do. Why don't you tell us,  
13 first of all, what the Leone version -- how the Leone  
14 version read in the first sentence?
- 15 A Okay. The first sentence of the old version  
16 was, "The discrepancies were first compared with the  
17 current design parameters and tolerances or other  
18 documents in determining if they were acceptable on this  
19 basis."
- 20 Q And what change did you make?
- 21 A I changed "in" to "to" and "determining" to  
22 "determine."
- 23 Q So it now reads, "The discrepancies were first  
24 compared with the current design parameters and tolerances  
25 or other documents to determine if they were acceptable

mgc 7-10 1

on this basis"?

2

A \* Yes.

3

Q Did you make another change to this answer?

4

A Yes. In the second sentence of the same

5

answer, I struck a line out. The old version read, "The

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remaining discrepancies were evaluated by either

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engineering judgment, based upon comparison of the

8

discrepancies with design margins or by engineering

9

calculations," and I struck "based on comparison of the

10

discrepancies with design margins," so that it reads,

11

"The remaining discrepancies were evaluated by either

12

engineering judgment or by engineering calculations."

13

Q Mr. Branch, why did you make those changes?

14

A To clarify the process, the way I saw what

15

was done.

16

Q Aside from what you noted, are there any --

17

aside from the one item you noted, are there any additions

18

or corrections to your testimony?

19

A Only that I noticed this question -- the Q

20

was repeated twice, and it's Question 6, I believe.

21

Q All right. Is the testimony, as written and

22

adopted by you, accurate and complete, to the best of

23

your knowledge and belief?

24

A Yes, it is.

25

MR. GALLOR: At this time, I would like to

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1 introduce into evidence the testimony of Ernest B. Branch  
2 and have it incorporated into the transcript as if read,  
3 and I have a copy of the reporter for that purpose, with  
4 the items noted by Mr. Branch already incorporated in  
5 it.

6 JUDGE SMITH: Any objections.

7 MR. CASSEL: No objection.

8 MR. LEWIS: No objection.

9 JUDGE SMITH: The testimony is received.

10 (The prepared testimony of Mr. Ernest B. Branch  
11 follows.)

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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of )  
 )  
COMMONWEALTH EDISON COMPANY ) Docket Nos. 50-454-OL  
 ) 50-455-OL  
(Byron Station, Units 1 and 2 )

TESTIMONY OF ERNEST B. BRANCH

Q.1. Please state your full name and place of employment for the record.

A.1. My name is Ernest B. Branch. I am an Associate and Mechanical Design Director of Sargent & Lundy which is a Consulting Engineering Firm, located at 55 East Monroe, Chicago, Illinois 60603.

Q.2. Please describe your job responsibilities.

A.2. As Mechanical Design Director, I am responsible for the overall coordination and management of two of Sargent & Lundy's key mechanical divisions that have the responsibility for piping design and analysis. These divisions are the Mechanical Design & Drafting Division and the Engineering Mechanics Division. I am responsible for providing leadership, overall management, direction, supervisor



progress monitoring, and quality of design work for all of the projects under design at Sargent & Lundy.

Q.3. Please describe your educational background and work experience.

A.3. I am a 1964 graduate of Virginia Polytechnical Institute and State University with a Bachelor of Science Degree in Engineering Mechanics. I am a registered professional engineer in Illinois (1970). I have over 29 years of experience in power plant and marine propulsion plant design.

I started working for Sargent & Lundy in March of 1969 as the Supervisor of Piping Stress Analysis. Over the years, I have had increasing job responsibilities on both fossil fuel and nuclear generating station design projects and in the management of the Mechanical Department. My assignments have included Division Head of the newly formed Engineering Mechanics Division in 1970 and Mechanical Design Director in 1982. While at Sargent & Lundy, I have had direct design responsibility for piping systems for the following nuclear projects: Marble Hill - Unit 1, Zimmer - Unit 1, LaSalle - Units 1&2, Byron - Units 1&2, Braidwood - Units 1&2, Fermi - Unit 1, Zion - Units 1&2, Dresden - Units 2&3, Quad Cities - Units 1&2, and Clinton - Unit 1.

Prior to joining Sargent & Lundy, I was employed from 1955 to 1969 by the Newport News Shipbuilding and Dry

Dock Company in Newport News, Virginia. During that period of employment, I had engineering experience in the procurement of nuclear power plant components for ship board use, mechanical system startup and testing, and piping design and analysis. I was also engaged in various design activities for the USS Enterprise, nuclear power aircraft carrier CVAN65. I began my employment at Newport News as an apprentice piping designer and my last position was Senior Design Supervisor in the Nuclear New Design Division.

Over the years, I have been directly involved in the development of nuclear codes and standards. This involvement began with a charter membership of the ANSI B31.7 Nuclear Power Piping Code Task Group on Design that was founded in 1966. Subsequently, I was a charter member of the ASME Section III Piping Design Working Group founded in 1970. I later became Chairman of the Section III Piping Design Working Group for the period of 1975 to 1982.

I am currently a member of the Section Committee of the ASME Section III Boiler and Pressure Vessel Code (Code), which was applied in the evaluation of Hunter weld discrepancies. I am also a member of two subcommittees under the Code Section Committee, the Subgroup on Design and the Working Group on Piping. In addition, I am a member of the ASME Pressure Vessel Research Council -- Technical Committee on Piping Systems and I am Chairman of the Technical Committee Task Group on Industry Practice. I

have published numerous technical papers on Piping Design and Analysis.

Q.4. Are you familiar with the Byron Reinspection Program?

A.4. Yes, I was involved in the program in December of 1983 and January of 1984 as a Consultant in the preparation of the Report on the Byron QC Inspector Reinspection Program that was published in February of 1984. The consulting I provided was for Sargent & Lundy's activities associated with the engineering evaluations of the Hunter objective attribute discrepancies, including pipe ovality, and ASME subjective attribute discrepancies. I had some direct involvement in the preparation of these engineering evaluations but was not involved in every detail.

Q.5. Are you adopting the testimony of Donald L. Leone as previously filed.

A.5. Yes.

Q.6. On what basis do you adopt that testimony?

A Q.6. I have reviewed Mr. Leone's testimony concerning the engineering evaluations of the reinspection program by

Sargent & Lundy engineers with respect to various discrepancies identified by the reinspection of objective and subjective attributes of the work performed by Hunter Corp. As discussed above, I have been involved in the reinspection program and I have been thoroughly briefed by the responsible project team members. I have also reviewed the underlying calculations and data for the Hunter evaluations. I understand and adopt that work. Based on the foregoing, I adopt the testimony of Mr. Leone.

Q.7.           What work was performed by Hunter Corporation at Byron Station?

A.7.           Hunter was responsible for the installation of nearly all the mechanical systems at Byron. This work included installation of mechanical equipment and interconnective process piping and supports, and the supply of miscellaneous piping and welding materials.

Q.8.           How was this work classified for reinspection?

A.8.           The Hunter work fell into three basic categories involving hardware installation, related documentation and welding. Therefore, these areas were established

as attributes. The Hunter work was divided into objective and subjective attributes depending on the degree of qualitative judgment inherent in the inspection activity.

Each attribute consists of a number of elements. For example, the documentation attribute was subdivided into such inspection points as work process sheets, weld material requisition sheets, field inspection reports and discrepancy reports. A complete listing of this attribute and the hardware and welding attributes is shown on Attachment B of Mr. Del George's testimony.

Q.9. How many reinspections of these attributes were performed?

A.9. A total of 69,624 reinspections of objective attributes was performed as part of the Program. Another 1,886 Hunter installations of concrete expansion anchors were reinspected by PTL. Thus, the total reinspections of Hunter objective attributes equals 71,510. In addition, 3,725 reinspections of the subjective attribute, visual welding, were performed.

Q.10. What were the results of the reinspections of the objective attributes?

A.10. A total of 689 (approximately 1%) objective attributes was reported to be discrepant. Five of these discrepancies were associated with concrete expansion anchors reinspected by PTL. The 689 discrepancies involved 441 documentation and 248 hardware discrepancies.

Q.11. How were the discrepancies associated with the objective attributes evaluated?

A.11. The discrepancies were first compared with the current design parameters and tolerances or other documentation to determine if they were acceptable on this basis. The remaining discrepancies were evaluated by either engineering judgment or by engineering calculations. Evaluations by engineering judgment consisted of a review of the component design functions to determine whether the function of the component was affected by the discrepancy or consisted of a comparison of the discrepancy to the current design to determine whether the discrepancy had design significance. The third method of evaluation was by performing detailed engineering calculations.

Q.12. How many of the discrepancies associated with objective inspections were evaluated by comparison to the design parameters and tolerances?

A.12. A total of 614 (89%) discrepancies were evaluated in this manner. This included all 441 documentation discrepancies and 173 hardware discrepancies. Discrepancies evaluated typically included cosmetic flaws, minor dimensional errors, and documentation errors. The dimensional errors consisted primarily of minor as-built piping and pipe support dimensional errors or incomplete as-built information. Documentation errors consisted primarily of minor data entry errors and omissions on work reports and process sheets. These discrepancies were evaluated by reviewing corroborating information on the affected documents and other independent documents. The evaluation showed that all hardware discrepancies were within the current design parameters and tolerances. All documentation discrepancies were deemed acceptable based upon reviewing other corroborating documentation.

Q.13. How many of the discrepancies associated with objective inspections were evaluated using engineering judgment?

A.13. A total of 54 (8%) discrepancies were evaluated by engineering judgment with all discrepancies hardware related. Discrepancies evaluated included dimensional errors and omissions for piping, pipe supports and pipe whip restraints; hardware substitutions, minor configuration changes; and minor mechanical joint bolting deviations. None of these discrepancies impaired component design functions or had design significance.

Q.14. How many of the discrepancies associated with objective inspections were evaluated using detailed engineering calculations?

A.14. A total of 21 (3%) discrepancies were evaluated in this manner with all discrepancies hardware related. Discrepancies evaluated included 3 as-built pipe support dimensions, 4 concrete expansion anchors, 3 pipe whip restraints, and 11 small bore pipe bends with excessive ovality. These elements were originally established by engineering calculations and a new calculation was necessary in order to account for the identified discrepancy.

Q.15. What was the nature of the engineering evaluations with respect to pipe ovality?

A.15. Ovality is a measure of the pipe roundness at the point of bending. The 11 pipe bends exhibited average ovality values of 10.5%, which is in excess of the 8% limit of the American Society of Mechanical Engineers (ASME), Boiler and Pressure Vessel Code -- Section III, Nuclear Power Plant Components -- Division I (1974 Ed. Summer, 1975 Addenda). Accordingly, calculations were performed verifying the acceptability of the pipe wall thickness and flow area reductions allowed by the ASME Code. Stress intensification effects were evaluated as negligible since all of the pipe bends are five pipe diameters in radius.



Q.16. What does the engineering evaluation of the discrepancies in the objective work attributes performed by Hunter demonstrate?

A.16. The detailed evaluation of the Hunter objective discrepancies showed me that none of the discrepancies has any design significance and, hence, no safety significance.

Q.17. What does the term "design significance" mean?

A.17. Design significance is a term used to describe the relative importance of discrepancies. Design significance refers to those qualities necessary to meet established design criteria. These qualities vary depending on the aspect of the design being evaluated. A discrepancy that reduces the strength of a member, component or structure is only design significant if the strength is reduced below that required to meet design requirements. A discrepancy, such as a missing component or a material configuration change, is design significant only if the operation of the plant is affected. As I indicated, none of the Hunter discrepancies discussed above had design significance.

Q.18. How many welds produced by Hunter Corporation covered by the ASME Code were reinspected?

A.18. Of the 3,725 welds which were reinspected, 2,721

(approximately 73%) were covered by the ASME Code. Forty-nine discrepancies were observed in these welds.

Q.19. How were the 49 discrepant ASME welds evaluated?

A.19. The 49 ASME welds were grouped by type into large bore butt welds, socket and fillet welds, NF support welds, and pipe penetrations and reinforcing saddles. The welds then were evaluated to ASME Section III Code design criteria using three methods to determine whether the discrepant welds had design significance.

The initial method involved comparing the weld discrepancy with the current design parameters and tolerances and the ASME Code to determine if it was acceptable on that basis. For example, the visual welding reinspection criteria were too stringent in some cases (surface porosity) which exceeded code acceptance criteria. These reported discrepancies were determined to meet code design criteria and were, therefore, determined to be acceptable.

If resolution was not possible using the first approach, the next approach involved evaluation by engineering judgment based on a comparison of the weld discrepancy with design margins or the component design function. A determination was made whether the function of the component was affected by the weld discrepancy.

The final method of resolution of the weld discrepancy was an evaluation by detailed engineering calculation.

Q.20. Would you describe the analysis performed for the ASME weld discrepancies requiring engineering calculations?

A.20. All engineering calculations utilized ASME Code design criteria. Weld assessment calculations were performed with appropriate weld material reductions where a relevant discrepancy was located. Weld discrepancies involving ASME Class 1 piping were evaluated against the fatigue analysis for the piping system. There were only 3 ASME Class 1 discrepancies and all 3 involved undersized seal welds for threaded radiographic plugs, which are non-pressure retaining piping welds. For the socket welds which were reported to be undersized, ASME Code Case N-316 was used to establish the required fillet weld size on the basis of the socket minimum wall thickness.

Q.21. What were the results of the engineering evaluation of large bore piping butt welds which were discrepant?

A.21. A total of 3 discrepancies were reported. Two were within current design parameters and tolerances, and one was compared to design margins and determined to be acceptable by engineering judgment.

Q.22. What were the results of the engineering evaluation for socket and fillet discrepant welds?

A.22. A total of 30 discrepancies were reported. Three were within current design parameters and tolerances; four were compared to design margins and determined to be acceptable by engineering judgment; and 23 were evaluated by engineering calculation and met ASME Code design criteria. The majority of the calculations involved a simple arithmetic computation of the Code required fillet weld size.

Q.23. What were the results of the engineering evaluation for NF support discrepant welds?

A.23. A total of 14 discrepancies were reported. One was within current design parameters and tolerances, and 13 were reviewed by calculation and met ASME Code design criteria. The majority of the calculations involved recalculating the designed weld with consideration of the discrepancy accounted for and all welds were found to meet ASME Code design criteria.

Q.24. What were the results of the engineering evaluation for the discrepant welds for pipe penetration and reinforcing saddles?

A.24. A total of two discrepancies were reported. Both

were reviewed by engineering calculation and met ASME Code design criteria. Both welds were compared with actual design requirements and neither of the discrepancies were determined to have design significance.

Q.25. Did any of the 49 ASME discrepant weld joints fail to meet ASME Code design criteria?

A.25. No. In all cases, discrepant weld joints met, or exceeded, Code design criteria.

Q.26. What does the engineering evaluation of the weld discrepancies of work performed by Hunter demonstrate?

A.26. The engineering evaluation of all of the weld discrepancies showed that none of the weld discrepancies had any design significance and, hence, no safety significance. The quality of the work reinspected is adequate.

1 BY MR. GALLO:

2 Q , Mr. Singh, would you state your full name and  
3 address, for the record?

4 A (Witness Singh) My name is Anand K. Singh,  
5 55 East Monroe, Chicago, Illinois.

6 Q Would you spell your first name for the  
7 reporter?

8 A A-N-A-N-D.

9 Q By whom are you employed and what is your job  
10 responsibility?

11 A I'm employed by Sargent & Lundy. I'm Assistant  
12 Head of the Structural Analytical Division.

13 Q And as Assistant Head for the Structural Analytical  
14 Division, what are your job responsibilities, in that context?

15 A I supervise and coordinate the work of stress  
16 and probabilistic analysis sections and the dynamic analysis  
17 sections, in preparation of analytical studies, special  
18 problem analyses and computer program development.

19 Q Did you have occasion to prepare testimony for  
20 this proceeding?

21 A Yes.

22 Q I'm looking at a document entitled Testimony of  
23 A.K. Singh, which includes -- which consists of, rather,  
24 eight pages, and ask if this is the testimony that you  
25 prepared for this proceeding?

1 A It is.

2 MR. GALLO: Your Honor, when we filed Mr. Singh's  
3 testimony we inadvertantly omitted the resume of Mr. Singh  
4 that is referred to in his testimony. We have since  
5 passed out copies of his resume for the parties and the  
6 Board and I ask Mr. Singh if he has a copy of that resume?

7 WITNESS SINGH: I do.

8 BY MR. GALLO:

9 Q Is it attached to the copy of the testimony you  
10 have?

11 A (Witness Singh) That's correct.

12 Q Is it your resume?

13 A It's a list of publications, yes.

14 Q List of publications, so rather than characterizing  
15 it as a resume, it's really a list of publications, is that  
16 correct?

17 A That's correct.

18 Q Are there any additions or corrections to your  
19 testimony, Mr. Singh?

20 A Yes. In addition to the list of publications,  
21 on page 6 I wish to add an additional line at the end of  
22 paragraph 1.

23 Q Take it slowly.

24 A The addition is "It also establishes, with 95  
25 percent confidence, that greater than 99 percent of all

1 Hatfield subjective work --"

2 Q All right, stop there. Start again and read  
3 it more slowly.

4 JUDGE COLE: I've got "It" written down, also.

5 (Laughter.)

6 WITNESS SINGH: "It also establishes, with 95  
7 percent confidence, that greater than 99 percent of all  
8 Hatfield subjective work in the plant meets the design  
9 requirements."

10 JUDGE COLE: And where is that inserted?

11 WITNESS SINGH: That is inserted at the end of  
12 the first paragraph on page 6.

13 JUDGE SMITH: First partial paragraph?

14 WITNESS SINGH: First partial paragraph, sorry.

15 BY MR. GALLO:

16 Q By intent, does that complete your corrections,  
17 Mr. Singh?

18 A (Witness Singh) In addition to this, on page 4,  
19 there is mention to Mr. Leone's testimony. That should be  
20 changed to Mr. Branch's now that that has been changed. This  
21 is the second line on page 4.

22 Q Does that complete your corrections, Mr. Singh?

23 A That's right.

24 Q Is the testimony and attached list of publications  
25 accurate and complete, to the best of your knowledge and



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1 belief?

2 A , It is.

3 MR. GALLO: Your Honor, at this time I'd like  
4 to move into evidence the testimony and list of publications  
5 of Mr. Singh, and have it bound into the transcript, as  
6 if read. And I have a copy for the reporter with the  
7 corrections noted for that purpose.

8 JUDGE SMITH: Are there objections?

9 MR. LEWIS: No objection.

10 MR. CASSEL: No objection.

11 JUDGE SMITH: The testimony is received.

12 (The testimony of Anand K. Singh follows:)

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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of )  
COMMONWEALTH EDISON COMPANY ) Docket Nos. 50-454-OL  
(Byron Station, Units 1 and 2) ) 50-455-OL

TESTIMONY OF ANAND K. SINGH

Q.1. Please state your full name and place of employment for the record.

A.1. Anand K. Singh, Sargent & Lundy, 55 East Monroe Street, Chicago, Illinois.

Q.2. Please describe your job responsibilities.

A.2. I am Assistant Head of the Structural Analytical Division. In this capacity, I supervise and coordinate the work of the Stress and Probabilistic Analysis and the Dynamic Analysis Sections in preparation of analytical studies, special problem analyses, and computer program development.

Q.3. Please describe your educational background and work experience.

A.3. I have a Doctor in Philosophy and a Master of Science degree in Structural Engineering from the University

of Illinois at Champaign-Urbana. These degrees were awarded in 1972 and 1970, respectively. I am a registered professional engineer and a registered structural engineer in the State of Illinois. I am a member of the American Society of Civil Engineers (ASCE), and a member of the Seismic Analysis Committee of the ASCE Nuclear Structures and Materials Committee, a member of the Working Group on the Seismic Analysis of Safety of Class Structures of the ASCE Nuclear Standards Committee and a member of the ASCE Committee on Turbine Foundations. I have published numerous technical papers in the area of probabilistic analysis, seismic analysis and dynamic analysis of structures and piping. A list of my publications is attached to my testimony.

I joined Sargent & Lundy in 1972 as a Senior Engineering Analyst. I was responsible for the development and maintenance of computer programs for seismic and dynamic analyses of structures and piping and for performing and/or reviewing seismic analyses of nuclear power plant structures. In 1975, I was promoted to the position of Supervisor of the Dynamic Analysis Section responsible for seismic and dynamic analysis of structures and the development of computer programs for dynamic and seismic analysis. In 1979, I was pro-

moted to the position of Assistant Division Head. In that capacity, I supervise and coordinate the work of the Stress and Probabilistic analysis and the Dynamic Analysis Sections in preparation of analytical studies, special problem analyses, and computer program development. In 1980, I was made an associate of Sargent & Lundy.

Q.4. Are you familiar with the Byron Reinspection Program?

A.4. Yes. The reinspection program was developed by Commonwealth Edison Company to verify the effectiveness of former inspector certification practices and inspector qualification by re-examining, on a sampling basis, inspections performed by QC inspectors certified prior to 1982.

Q.5. Were you involved in the preparation of the report?

A.5. Yes. I was involved in preparing portions of the report dealing with work quality, including the section on inference of work quality from the reinspection program.

Q.6. What is the purpose of your testimony?

A.6. The purpose of my testimony is to apply principles of statistics and probability theory to the results of

the engineering evaluations discussed in the testimony of Messrs. McLaughlin, ~~Doone~~ and French.

Branch

Q.7. Would you summarize the results of the engineering evaluations to which you are applying your statistical analysis?

A.7. Yes. Their testimony explains that the results of engineering evaluations performed by Sargent & Lundy demonstrated that none of the 356 Hatfield Electric Company ("Hatfield") weld discrepancies analyzed or any of the 2,311 objective discrepancies analyzed had design significance. Similarly, the engineering evaluations demonstrated that none of the 109 Hunter Corporation ("Hunter") weld discrepancies or 689 Hunter objective discrepancies analyzed had design significance.

Q.8. Applying a statistical analysis to these results, what conclusions do you reach with respect to the total population of work performed by Hatfield and Hunter?

A.8. From a statistical standpoint, I conclude with a 95% confidence level that, in general, the work performed by Hatfield and Hunter meets the original design basis with a greater than 99% reliability.

Q.9. Please explain the basis for your conclusions.

A.9. The reliability for a work attribute can be defined as the proportion of work items in the total population of work for that attribute which has no discrepancies with design significance. A generally accepted statistical method for calculating such reliabilities is to compute reliabilities at 95% confidence level from the sampled data. Such a reliability represents a conservative estimate of the true reliability. It is conservative in the sense that there is a 95% chance that the true reliability is greater than the estimate. In the case where no discrepant items are observed in a random sample from a large population, the reliability at 95% confidence level can be calculated from the formula

$$R = 1 - \frac{2.9955}{n}$$

where

R = Reliability at 95% confidence level,

n = number of inspections in the random sample.

For Hatfield welding, approximately 28,000 welds were reinspected. This resulted in approximately 2,200 observed discrepancies. This shows that 8% of the Hatfield welds do not meet the conservative specifica-

tion requirements. From this population of approximately 2,200 welds, 356 welds were evaluated for the design significance of the observed discrepancies. This evaluation showed that none of the observed discrepancies had any design significance. By applying the above formula, this sampling evaluation establishes with 95% confidence that greater than 99% of all observed discrepancies do not have any design significance. It also establishes with 95% confidence that greater than 99% of all Hatfield subjective work in the plant meets the design requirements. For Hatfield objective attributes, approximately 67,000 items were reinspected. This resulted in approximately 2,300 observed discrepancies. All these observed discrepancies were evaluated for design significance. This evaluation showed that none of the observed discrepancies had any design significance. By applying the above formula, this sampling evaluation establishes with 95% confidence that, in general, greater than 99% of all Hatfield objective work in the plant meets the design requirements.

The actual reliability levels for each of the 10 objective attributes reinspected are shown in Table 1. The table shows that for 8 out of 10 attributes the reliability is greater than 99%. For the remaining two attributes, the reliability is computed as 98.9 and 96.3 percent.

For Hunter welding, a total of 3,725 welds (1,007 AWS and 2,718 ASME) were reinspected. Discrepancies were observed in 60 AWS welds and 4% ASME welds. These observed discrepancies were evaluated for their design significance. None of the observed discrepancies had any design significance. By applying the above formula, this sampling evaluation establishes with 95% confidence that more than 99% of all Hunter welds meet the design requirements.

For Hunter objective work, a total of 34,878 hardware items were reinspected. This resulted in 248 observed discrepancies. All these observed discrepancies were evaluated for their design significance. This evaluation showed that none of the observed discrepancies had any design significance. By applying the above formula, this sampling evaluation establishes with 95% confidence that more than 99% of all Hunter hardware work items meet the design requirements.



TABLE 1:  
CALCULATED RELIABILITIES FOR WORK OF HATFIELD

	<u>No. of Inspected Items</u>	<u>No. of Discrepancies with Design Significance</u>	<u>Reliability % at 95% Confidence Level</u>
<u>Objective Attributes</u>			
1. Conduit	2,793	0	99.9
2. Terminations	7,784	0	>99.9
3. Equipment setting	778	0	99.6
4. A325 Bolting	295	0	98.9
5. Equipment modification	1,850	0	99.8
6. Conduits as-built	44,777	0	>99.9
7. Pan hangers	4,776	0	>99.9
8. Pan	80	0	96.3
9. Conduit support bolting	1,008	0	99.7
10. Concrete expansion, anchor	2,840	0	99.9

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**Resume**  
**Anand K. Singh**

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**Publications:**

- "A Stochastic Model for Predicting Seismic Response of Light Secondary Systems" (coauthor A. H. S. Ang), Proceedings of the Fifth World Conference on Earthquake Engineering, Rome, 1973
- "Influence of Closely Spaced Modes in Response Spectrum Method of Analysis" (coauthors S. L. Chu and S. Singh), Proceedings, ASCE Specialty Conference on Structural Design of Nuclear Plant Facilities, Chicago, Illinois, December 1973
- "Stochastic Prediction of Maximum Seismic Response of Light Secondary Systems" (coauthor A. H. S. Ang), Nuclear Engineering and Design 29, pp. 218-230, 1974
- "Reliability Assessment of ASME Code Equations for Nuclear Components" (coauthor M. K. Ravindra), Reliability Engineering in Pressure Vessels and Piping, ASME, June 1975
- "Seismic Response of Pipelines on Friction Supports," (coauthor J. C. Anderson), Journal of the Engineering Mechanics Division, ASCE, EM2, pp. 275-291, April 1976
- "Inelastic Response of Nuclear Piping Subjected to Rupture Forces" (coauthor J. C. Anderson), Journal of Pressure Vessel Technology, ASME, pp. 98-104, May 1976
- "A Probabilistic Model for Seismic Analysis of Nuclear Plant Structures" (coauthor S. Singh), Paper K3/3, 4th International Conference on Structural Mechanics in Reactor Technology, San Francisco, California, August 15-19, 1977
- "Dynamic Analysis of Piping Systems Using Substructures" (coauthor V. Kumar), presented at the ASME Design Engineering Technical Conference, Chicago, Illinois, Preprint No. 77-DET-144, September 26-30, 1977
- "Technical Bases for the Use of the Square Root of the Sum of Squares (SRSS) Method for Combining Dynamic Loads for Mark II Plants" (coauthors S. W. Tagart and C. V. Subramanian), General Electric Company Report NEDE 24010, July 1977
- "Dynamic Analysis Using Modal Synthesis," Journal of the Power Division, ASCE, PO2, pp. 131-140, April 1978
- "Response Analysis Using Dynamic Influence Coefficients" (coauthors T. P. Khatua, N. A. Holmes and S. L. Chu),

**Publications, Continued**

Proceedings of the 7th Conference on Electronic Computation, American Society of Civil Engineers, St. Louis, Missouri, August 1979

"Structural Building Response Review" (coauthors T. I. Hsu and T. P. Khatua), NUREG/CR 1423, Vol. II, U.S. Nuclear Regulatory Commission, Washington, D.C., May 1980

"Prevention and Control of Vibrations," (coauthor D. E. Olson), presented at the General Engineering Conference, Chicago, Illinois, March 1980

"Vibration in Power Plant Structures and Piping" (coauthor D. E. Olson), Proceedings of the American Power Conference, Chicago, Illinois, April 1980

"Soil Structure Interaction Using Substructures" (coauthors T. I. Hsu and N. A. Holmes), Proceedings of the ASCE Specialty Conference, Civil Engineering and Nuclear Power, Knoxville, Tennessee, September 1980

"Evaluation of Soil Structure Interaction Methods" (coauthors T. I. Hsu, T. P. Khatua and S. L. Chu), presented at the second ASCE Engineering Mechanics Division Specialty Conference on Dynamic Response of Structures, Atlanta, Georgia, January 1981

"Seismic Analysis - Changing Considerations," Proceedings of the American Power Conference, Chicago, Illinois, April 1981

"An Integrated and Interactive Piping Analysis and Design Information System" (coauthor C. A. Podczewinski), Proceedings of the General Engineering Conference, Chicago, Illinois, March 1982

"Modeling Considerations for Pool Dynamic Analysis," (coauthor D. C. Gupta), paper to be presented at the International Workshop on Soil Structure Interaction: Practical Solutions for Static and Dynamic Loading, Durkee, India, October 10-14, 1983

"Use of Sampling in Nuclear Power Plant Applications," (coauthors M. Amin and P. Y. Wang), paper to be presented at the ASCE Speciality Conference on Probabilistic Mechanics and Structural Reliability, Berkeley, California, January 11-13, 1984

1 JUDGE SMITH: I might observe that Mr. Singh  
2 testified earlier in this proceeding on seismic issues and  
3 his resume is incorporated in his basic testimony.

4 MR. GALLO: I understand, from my co-counsel, that  
5 this list of publications is an update from what was  
6 submitted in the prior proceeding. Is that correct, Mr. Singh?

7 WITNESS SINGH: That is correct.

8 MR. GALLO: These witnesses are available for  
9 cross examination.

10 MR. CASSEL: Judge, just one procedural point  
11 again, on the shape of the table. Ms. Judson is going  
12 to be cross-examining Mr. Singh and we can't see Mr. Singh.  
13 We are planning to start with him. Might it make sense  
14 for perhaps one of the other witnesses to shift? Well, that's  
15 a little better.

16 JUDGE SMITH: We have also the problem of the  
17 reporter. I can see, from the cross-examination plan, that  
18 it will be Mr. Singh first, without anybody else being  
19 involved for some time. So if you change with him, he can  
20 be seen by everybody.

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21 I want to remind the parties that we do not retain  
22 the cross-examination plans, we dispose of them after the  
23 cross-examination and it's up to the parties to request and  
24 provide each other those plans.

25 MS. JUDSON: For the purpose of the record, I will

1 identify myself as Victoria A. Judson. I'm an attorney with  
2 BPI.

3 CROSS EXAMINATION

4 BY MS. JUDSON:

5 Q Mr. Singh, you're a structural engineer, is that  
6 correct?

7 A (Witness Singh) That's correct.

8 Q And much of your work is done in seismic analysis,  
9 is that correct?

10 A A fair amount of work is done in the seismic  
11 area, yes.

12 Q Are you an expert in statistics?

13 A I'm not an expert in statistics, but I do consider  
14 myself an expert in application of probability and statistics  
15 to engineering problems.

16 Q Are you an expert in sampling?

17 A I have done a fair amount -- have provided a fair  
18 amount of sampling plans for verification purposes, yes.

19 Q So you consider yourself an expert in sampling?

20 A In terms of engineering applications, yes.

21 Q You don't have a degree in statistics, do you?

22 A I do not have a degree in statistics. My degree  
23 is in structural engineering. However, as part of my  
24 dissertation, it was Application of Probability in Earthquake  
25 Response.

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1 Q Mr. Singh, you were involved in writing part  
2 of this reinspection report, weren't you?

3 A That's correct.

4 Q And what part did you work on?

5 A Section 7.

6 Q And what is the title of Section 7?

7 A Section 7 is quality of work.

8 Q And you wrote the first draft of portions of  
9 this section, is that correct?

10 A That is correct. I wrote portions of Section 7.

11 Q Now the sampling schemes of the Byron reinspection  
12 program was not designed on a formal statistical basis, was it?

13 A That's correct.

14 Q Mr. Singh, in your work on the reinspection  
15 program report, and in your testimony, you used a certain  
16 confidence level, didn't you?

17 A Yes.

18 Q Can you tell us what a confidence level is?

19 A Confidence level is defined in Section 2 of the  
20 report, and let me read from it. It's the probability that  
21 all components in the plant have a reliability equal to or  
22 greater than that computed based on the results of this  
23 sample of components inspected. This is on page -- it's  
24 Exhibit 2-1, page 4 of 4.

25 JUDGE SMITH: I would like to have that again,

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1 please, slowly.

2           \* WITNESS SINGH: The confidence level -- this is  
3 on Exhibit II-1, page 4 of 4. It's the last page of  
4 Section 2 on the report.

5           BY MS. JUDSON:

6           Q     Mr. Singh, did you decide to use a 95 percent  
7 confidence level or did someone else make that decision?

8           A     (Witness Singh) The decision to use the 95  
9 confidence level to computer reliabilities of the data,  
10 which came out of the reinspection program, was made by me.  
11 However, that has been a standard practice, to computer  
12 reliabilities at 95 percent confidence for application, so  
13 it is consistent with our practice.

14           JUDGE SMITH: Ms. Judson, I don't want to  
15 interrupt your testimony, but I would like to have a  
16 better understanding of confidence level before we proceed.

17           MS. JUDSON: Sure.

18           JUDGE SMITH: Your definition, given on  
19 Exhibit II-1, I will read it again. Confidence level, the  
20 probability that all components in the plant have reliability  
21 equal to or greater than that computed based on the results  
22 of a sample of components inspected.

23                     Now I have difficulty parsing that sentence. I  
24 don't know what the antecedent is to the second "that."  
25 Again, let me read. The probability that all components in

1 the plant have reliability equal to or greater than that.  
2 What is the antecedent of that word?

3 WITNESS SINGH: It's the reliability computed  
4 based on sample of components inspected. When we take a  
5 sample of the total population and computer the reliability,  
6 there is a certain amount of uncertainty associated with  
7 that reliability calculations. And what the confidence  
8 level tells us that we have, if we have a 95 percent  
9 confidence, which means 19 out of 20 times the computed  
10 reliability is going to be greater than or equal to what  
11 was based on the sample. There is a one out of 20 chance  
12 that it would be lower than that.

13 So it is trying to put -- when somebody says my  
14 reliability is 99 percent, the confidence tells how certain  
15 the person is on this computed number. And for the purposes  
16 of this report, we have quoted confidence at 95 percent.  
17 which means that 95 percent of the time the actual reliability  
18 is going to be greater than or equal to the numbers reported  
19 in this report.

20 JUDGE SMITH: Okay.

21 BY MS. JUDSON:

22 Q Mr. Singh, just so everyone is clear here, can  
23 you distinguish for us the difference between confidence  
24 level and reliability?

25 A (Witness Singh) The reliability is defined on the



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1 previous page. And for the purposes of this report, it's  
2 the probability that a component meets a specific acceptance  
3 criteria. And the specific acceptance criteria is the  
4 design basis allowable.

5 Q So to try to translate this into layman's terms,  
6 does the reliability basically tell you how safe the plant  
7 is and the confidence level how sure you are that your  
8 judgment about safety is right?

9 A I'll change the word safety to say that it tells  
10 you how many percent of the plant components meet the design  
11 criteria and the confidence is how sure I am when I tell you  
12 X percent meet the design criteria.

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mgc 9-1

1 Q So the reliability only tells you about the  
2 safety of a component that you inspected?

3 A As I stated earlier, the reliability tells me  
4 what is the chance that any given component in the plant  
5 meets the design criteria, and that is what this whole  
6 evaluation is all about.

7 We were trying to establish what is the  
8 quality of work, how many -- what percentage of the total  
9 components meet the minimum design criteria.

10 Q Would that include components that have no chance  
11 of being in your sample?

12 A I didn't understand the question.

13 Q Well, in selecting various samples -- for example,  
14 let's say a sample of attributes -- you have a certain  
15 population of attributes, and you were randomly choosing  
16 from those certain ones that you are going to reinspect.

17 Now let's assume we have some attributes which  
18 you couldn't reinspect; it's just not possible. So there  
19 is no chance that those attributes will be part of your  
20 sample.

21 Do your conclusions also apply to those  
22 attributes that have no chance of being in your sample?

23 A When you say "attributes," are you referring  
24 to components which did not get included in the sample?

25 A I'm referring to "attributes" in the way that

mgc 9-2

1 it is used in the reinspection report. How does that  
2 differ from components --

3 JUDGE SMITH: I think if you concentrate on  
4 her first question, she dropped it, but her first question  
5 was attributes that had no chance to be in the sample.  
6 They were not in the population available for sampling.

7 WITNESS SINGH: We have in the report -- we  
8 have determined that the respective qualifications and  
9 procedures that were used to inspect the attributes which  
10 were not captured specifically as part of this report were  
11 similar to those which were captured as part of this  
12 report.

13 Based on that logic, what we are saying is,  
14 that inferences which are derived for attributes listed  
15 in the report are also applicable to those that were not  
16 in the report and not part of the sampling.

17 BY MS. JUDSON:

18 Q So do your confidence levels and the reliability  
19 determinations apply to those attributes that had no  
20 chance of being included?

21 A (Witness Singh) What we have stated in the  
22 report are reliability numbers for attributes for which  
23 a sample was available. We have not listed any reliability  
24 numbers for attributes which were not specifically sampled.

25 The inference is derived, however, given

mgc 9-3

1 the various inspection programs, the various Commonwealth  
2 Edison QA programs, and the reliability numbers of the  
3 attributes which were actually sampled.

4 We are saying, given all these facts, we are  
5 inferring that the remaining population is also good.

6 Q Are you using statistics to make those  
7 inferences?

8 A The work quality argument is primarily an  
9 engineering judgment argument, an engineering judgment  
10 is being passed by Mr. McLaughlin, Mr. French, and  
11 Mr. Branch. It is based on their professional experience.  
12 It is based on their knowledge of design margins. It is  
13 based on their knowledge of code margins. It is based  
14 on their knowledge of observed discrepancies, and it is  
15 also based on the computed reliabilities.

16 The reliability calculations, like any other  
17 engineering calculations, are mathematical models which  
18 are being used to guide their engineering judgments. So  
19 there is no one item which is deciding or which is trying  
20 to come up with work quality.

21 JUDGE SMITH: In the answer before this one,  
22 you used the word "population." Do you recall the sense  
23 in which you used it?

24 WITNESS SINGH: I will have to go back to the  
25 question. But when I use the "population of attributes,"

mgc 9-4

1 I mean all attributes of that kind in the plant. When  
2 I use the word "population of all components in a plant,"  
3 it basically refers to the plant in total.

4 JUDGE SMITH: So you are not necessarily using  
5 the word "population" as being those attributes which were  
6 available to be captured in the sample.

7 WITNESS SINGH: The sample is a subset of the  
8 total population of that attribute. I will give you an  
9 example.

10 If we had -- we have inspected cable pan hangers.  
11 If I have 5000 hangers in the plant, then 5000 is the total  
12 population. If I sampled 500 of these, that's the sample.

13 JUDGE SMITH: The question I think that still  
14 is unresolved, and your example is very good, let's assume  
15 that you had 5000 hangers. You had 1000 attributes which  
16 were not recreatable, leaving 4000 hanger attributes  
17 available to be captured in the sample.

18 Is that the situation you are getting at?

19 MS. JUDSON: Yes.

20 JUDGE SMITH: How would you apply the word  
21 "population" in that example?

22 WITNESS SINGH: The population would be 5000.

23 JUDGE SMITH: I don't want to interfere with  
24 your cross-examination.

25 MS. JUDSON: Your Honor, that's fine. I think

mgc 9-5

1 it's good for all of us to understand these points and  
2 these concepts, and it's most helpful.

3 BY MS. JUDSON:

4 Q Mr. Singh, what if we have an attribute where  
5 it is not possible to reinspect even one observation? Is  
6 that included in your definition of "population"?

7 A (Witness Singh) In terms of the judgment which  
8 is being passed, yes, but that is not statistical. That  
9 is based on the engineering judgment of the gentleman  
10 sitting next to me.

11 JUDGE SMITH: Since there are two gentlemen --  
12 or is one a gentleman and --

13 (Laughter.)

14 JUDGE SMITH: Which one was that?

15 WITNESS SINGH: Gentlemen would be plural.

16 JUDGE SMITH: Oh, I see.

17 BY MS. JUDSON:

18 Q Just so we all understand, let's try to  
19 identify certain -- first, inspectors who had no chance of  
20 being in the reinspected sample.

21 Now isn't it true that of the 19 contractors,  
22 only eight had a chance of being in the sample?

23 A (Witness Singh) All reliability calculations  
24 which are being performed here are at the work quality  
25 level; they are not at the inspector level. And the

mgc 9=6

1 inferences which have been drawn off of contractors who  
2 are part of the reinspection program, which covered, if  
3 I recall right, almost 90 percent or 93 percent of the  
4 total work. There were three other contractors who had  
5 approximately three percent of the work, which were  
6 undergoing 100 percent reinspection, and again, the  
7 inference was, having gone through 100 percent reinspection  
8 by qualified people, their work would be good or adequate.

9 Q What about the five contractors discussed  
10 on Roman Numeral III-2, whose work was inaccessible or  
11 not recreatable?

12 A Again, you're talking a very small percentage  
13 of the total work. I believe that's approximately four  
14 percent.

15 Q Are your general statements applicable to these  
16 five contractors as well?

17 A Which statements.

18 Q Your conclusions.

19 A The conclusions are applicable to the  
20 contractors which were part of the reinspection program.

21 Q Your conclusion is stated in terms of  
22 specific reliability and confidence levels. Are those  
23 limited to the inspectors who were reinspected?

24 A No, there is no reliability calculation for  
25 the inspectors. The reliability calculations, as they are

mgc 9-7

1 listed in Exhibit VII-1, are for attributes which were  
2 actually sampled, and by definition, they are only for  
3 contractors who were part of the reinspection program and  
4 for which data was available. There is no other reliability  
5 numbers reported in this report.

6 Q And are you stating that your estimates of  
7 reliabilities for these attributes listed in Exhibit VII-1  
8 also apply to the attributes reinspected by the five  
9 contractors whose work was inaccessible or not recreatable?

10 A No, we are not saying that.

11 Q Just to clear up the record, I think I may  
12 have stated "reinspected" instead of "inspected." What  
13 I meant to say is that your determinations of reliability,  
14 you do not apply to the five contractors whose work was --  
15 whose initial inspections could not be reinspected; is  
16 that correct?

17 A What I've said is that the reliabilities that  
18 are computed and reported in Section VII are only for  
19 contractors that were part of the reinspection program and  
20 only for attributes for which samples, adequate samples  
21 were indeed taken, that no other reliability number is  
22 noted.

23 However, these reliability numbers are  
24 available to Mr. McLaughlin, Mr. French, and Mr. Branch  
25 to make a judgment on the total plant.



mgc 9-8

1 Q Now do these reliability numbers apply to  
2 inspections performed by inspectors who had done less  
3 than 50 reinspections or less than 25 for Pittsburgh  
4 Testing and Peabody Testing?

5 A As I said earlier, the work quality numbers  
6 reported are at the work item level, and any work item  
7 which was in the Commonwealth Edison data base, if  
8 part of this, as stated in earlier testimony by others,  
9 all inspections which were done, the reports automatically  
10 went into their data base, whether there was enough  
11 inspections or not.

12 So in that respect, everything in the  
13 Commonwealth Edison data base is part of this reliability  
14 calculation.

15 Q And everything that wasn't in the data base  
16 is not covered by your reliability calculation?

17 MR. GALLO: Objection.

18 MS. JUDSON: What's the basis.

19 MR. GALLO: I think it represents a tautology.  
20 Everything that wasn't in the data base wasn't included  
21 in his calculation?

22 MS. JUDSON: I just want to clarify the record.

23 BY MS. JUDSON:

24 Q Is that correct.

25 A (Witness Sing) I stated --

mgc 9-9

1 MR. GALLO: Hold it. There's an objection  
2 on the floor here. I'll be happy, I guess, to move things  
3 along, to withdraw the objection and let the witness  
4 answer again what is included in his reliability  
5 calculations.

6 MS. JUDSON: The question is what is not  
7 included, not what was included.

8 WITNESS SINGH: I can only tell you what was  
9 included. I do not know what is not included. I can  
10 tell you what's included. It's on the paper here. I can  
11 not tell you a list of things which were not included,  
12 because I don't know.

13 BY MS. JUDSON:

14 Q Did you read this entire reinspection report?

15 A (Witness Singh) This report?

16 Q Uh-huh.

17 A Yes.

18 Q So do you know certain things that are  
19 discussed in the report that are not included in the  
20 list of attributes for which you've given reliabilities?

21 MR. GALLO: Objection. That mischaracterizes  
22 his testimony. He has repeatedly testified that his  
23 reliability values are only applied with respect to  
24 attributes that were captured in the report and had  
25 sufficient samples upon which to make his value

mgc9-10

1 determinations.

2 \* It necessarily follows that if you don't  
3 measure up to those criteria, which is what Counsel  
4 is repeatedly questioning this witness about, that he has  
5 no reliability values there.

6 JUDGE SMITH: Do you agree with Mr. Gallo's  
7 characterization of the testimony?

8 MS. JUDSON: I would like to know if the  
9 witness agrees.

10 JUDGE SMITH: Excuse me. Would you answer.

11 MS. JUDSON: That is what I'm trying to  
12 determine from the witness.

13 WITNESS SINGH: I agree with what Mr. Gallo said.

14 MS. JUDSON: Thank you very much.

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1 JUDGE SMITH: You want a ruling on your objection?

2 \* (Laughter.)

3 BY MS. JUDSON:

4 Q Mr. Singh, back to the issue of the choice of  
5 a confidence level, would you ever select a higher confidence  
6 level for some type of item?

7 A (Witness Singh) We have done all of our calculations  
8 on 95 confidence and I would feel comfortable generating  
9 reliability numbers at that level, knowing how these  
10 numbers are being used. So I would -- I could do calculations  
11 at any confidence level, but in general if somebody had not  
12 told me to use any different confidence level, I would use  
13 95.

14 Q At your deposition, did I ask you a question, did  
15 you ever select a higher confidence level for some type of  
16 item? And did you answer no?

17 MR. GALLO: Objection, I think in fairness to the  
18 witness, he ought to be referred to where in the deposition.  
19 And I would like that information that counsel is referring to.

20 MS. JUDSON: Page 10, line 8.

21 MR. GALLO: Do you have it in front of you,  
22 Mr. Singh?

23 WITNESS SINGH: No, I don't have that. But I  
24 recall answering no to that specific question and my earlier  
25 answer is no different. I said I would compute at 95 percent

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1 confidence level unless somebody told me to computer some  
2 different number. I said I could computer at any number  
3 I wished. But if you were asking my judgment, I would do it  
4 at 95. And I took your question, at the deposition, to mean  
5 if I, on my own, would go out and do it at different levels.

6 BY MS. JUDSON:

7 Q That was the intention. Would you ever use a  
8 lower confidence level, using your own judgment?

9 A (Witness Singh) "Ever" is very difficult, but  
10 I would say in general I would not.

11 Q Now, is it standard practice in statistics to  
12 vary confidence levels according to the cost of being wrong?

13 MR. GALLO: If the witness understands that  
14 question, I won't object.

15 WITNESS SINGH: I stated earlier that when I say  
16 95, I have said that that is the confidence level we have been  
17 using. Our applications have been rather limited in the  
18 sense of sampling, has always been for quality verification,  
19 whether it be design quality verification, or whether it be  
20 construction quality verification. It is the verification  
21 scheme which we are getting in here and we have used 95 more  
22 often than not.

23 BY MS. JUDSON:

24 Q And do you know if, in statistics, it's a standard  
25 practice to vary the confidence level according to the

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1 importance of what is at stake, the risk of being incorrect  
2 as to reliability?

3 A (Witness Singh) Yes, you do do what I would call  
4 sensitivity analyses to see what is the effect of varying confidence.  
5 If the reliability numbers changed dramatically with the  
6 variation of confidence levels, yes, you would probably  
7 report numbers at several confidence levels. Here we have  
8 a case where the sample sizes are large and the difference  
9 in reliability numbers at 95 confidence and at 99 confidence  
10 are very much similar. There's not too much difference.

11 What it tells me that the reliability numbers are  
12 not sensitive to confidence intervals. I'll give you an example  
13 here. If I take a sample of 300, which is small, as far as the  
14 reinspection program is concerned, at 95 confidence it gives  
15 me a reliability of approximately 99. It is very close to  
16 99. At 99 confidence, it gets me reliability of 98.5. In  
17 the sense we're using these numbers, in the sense  
18 Messers. McLaughlin, French and Branch are using this number,  
19 it does not make any difference whether it's 99 or it's 98.5  
20 or for that matter even if it gets down to 96.

21 So I am saying yes, it's important to have numbers  
22 at different confidence levels. But then you're also assuming  
23 that the reliability numbers are sensitive to it. That's not  
24 the case here.

25 Q You say it's not the case, because your sample size

101b4

1 is large?

2 A That is correct. And the larger the sample size,  
3 the less sensitive are the reliabilities to the confidence  
4 interval, because you have a very high degree of confidence.

5 Q Are you talking about the sample size of the  
6 simple random sample?

7 A Yes. Simple -- it's a random sample and we're  
8 also talking sampling by attributes, whereby we are  
9 determining whether the sample is acceptable or not. There's  
10 only two choices.

11 Q Just so we're all clear how the confidence level  
12 concept works, if we had 20 nuclear plants and knew that  
13 95 percent confidence that the plants met safety standards,  
14 then we'd be pretty sure that one out of 20 wouldn't meet the  
15 standard, wouldn't we?

16 MR. GALLO: Objection. First, it's a hypothetical  
17 question which I see bears no relevance to the proceeding. If  
18 they're seeking clarification of an understanding of confidence  
19 level, I suggest that's not the objective. The objective,  
20 instead, is to be inflammatory and prejudicial to the client.  
21 I object to the question on all those grounds.

22 JUDGE SMITH: The difficulty is I don't believe  
23 there was good communication between the witness and counsel.  
24 Her question was put in terms of wouldn't you use greater  
25 confidence and perhaps greater reliability levels, wouldn't

101b5

1 you seek to achieve those, where there is a safety significance  
2 involved compared to a situation where it would not be.  
3 And I think that that concept was lost somewhere in the  
4 exchange because it came back as sensitivity and sensitivity,  
5 I thought, was taken at the beginning to mean sensitivity  
6 to the risk involved, and it wasn't. The sensitivity of  
7 confidence level to reliability.

8 So I think that the last few questions were awash.  
9 I just don't think that they produced anything.

10 WITNESS SINGH: Judge, may I point something out?  
11 When I was responding, I was responding to confidence level,  
12 which the counsel was pursuing. Reliability I did not say  
13 that one would not desire higher reliability levels. The  
14 question was specifically on confidence level and I  
15 repeatedly pointed out that confidence level is only giving  
16 an assurance on the computed reliability.

17 The safety significance or the cost significance  
18 or on the reliability. You need a very high reliability if  
19 you don't want to go wrong.

20 JUDGE SMITH: I didn't hear you give that answer,  
21 though.

22 WITNESS SINGH: I was responding to the question,  
23 which was strictly on confidence levels. But as I said --  
24 and this is why, on the last question, I was going to point  
25 out that she is asking questions on confidence and the example



1 she gave is confidence on nuclear plants. What she should  
2 really be saying is reliabilities because it's the reliability  
3 which has safety significance.

4 A confidence is only a level of confidence on the  
5 reliability number. So you need it high enough, but you don't  
6 need --

7 JUDGE COLE: You really have to consider both.

8 WITNESS SINGH: You have to consider both, that  
9 is correct. And what I have said is the reliability numbers  
10 which should be used to judge safety or design significance  
11 of these items is again subject to the clause that I'm giving  
12 this as 95 percent confidence. I have also stated that  
13 given these large sample sizes, the confidence level is not  
14 critical to this reliability, and I gave an example.

15 I said if I were to switch from 95 confidence to  
16 99, I'd change these numbers by perhaps half a percentage  
17 point.

18 JUDGE SMITH: And then you said, and this I do  
19 think was responsive, then you said but for the purpose for  
20 which the other engineers are using the results, it is  
21 not necessary.

22 WITNESS SINGH: I said this half percentage point  
23 deviation in reliability is not significant. And that is,  
24 again, I was bringing in the approximate nature of this  
25 analysis or the way this is being used. There is a lot of

1 judgment which goes in. And the point I was trying to point  
2 out was if I computed a reliability of 99.05 and on the next  
3 line I computed a reliability of 99.5. In the way these  
4 numbers are being used by others this small difference is  
5 not significant.

6 And by that what I meant, what I was inferring,  
7 is this is why the questions on confidence levels are really  
8 not important to the safety significance because the  
9 reliability is not that sensitive to what confidence level  
10 I have assumed in all these calculations.

11 BY MS. JUDSON:

12 Q So you are not saying that the confidence level is  
13 not important in general. You're saying that in this particular  
14 circumstance you feel that it is unimportant because the  
15 reliability isn't sensitive to the confidence level?

16 A (Witness Singh) I didn't say it was important  
17 or not important. I have said these reliability numbers have  
18 been reported at 95 percent confidence. People who are using  
19 these reliabilities to pass judgment know this. They also  
20 know, given the sample size, what is the sensitivity of  
21 these reliability numbers on the confidence level and they are  
22 using these facts in their judgment.

mgc11-1

1 Q Mr. Singh, you determined minimum sample size  
2 from Military Standard 105(d), didn't you?

3 A I can determine minimum sample size from  
4 Mil Standard 105(d). For purposes of the reinspection  
5 program, the data was already available when we went  
6 into these reliability calculations. So there was no  
7 minimum sample size determination made as part of the  
8 inspection program.

9 We applied or we said, if I were to go to  
10 the Military Standard 105(d) and had set up a sampling  
11 plan, it would have required X number of samples, and  
12 the actual samples gathered in the reinspection program  
13 happened to be much larger than what this minimum requirement  
14 is. And thereby, we have said that that is acceptable.  
15 But we did not set any standard or minimum number of  
16 samples to be taken as part of the reinspection program.

17 Q So you checked sample size against this  
18 Military Standard 105?

19 A I used the Military Standard as a basis to  
20 check whether the sample size was adequate or not.

21 Q And you use this standard often, do you?

22 A That's correct.

23 Q This standard is also used for procurement,  
24 isn't it?

25 A As best I know.

mgc11-2

1 Q Is it used in civilian use?

2 A We have used it several times.

3 Q Do consumers and producers use it in industry?

4 A They may. It is also an American Society of  
5 Quality Control ANSI standard, so I assume it's been used  
6 elsewhere in the industry. Otherwise, it would not have  
7 become an ANSI standard.

8 Q So it is used for manufacturing and producing  
9 goods and things like that?

10 A I would assume.

11 Q Making general products like shoes and boxes,  
12 whatever else?

13 MR. GALLO: Objection. Irrelevant. She's  
14 adequately tested the witness' knowledge with respect to  
15 the use of the standard. Any further questions --

16 MS. JUDSON: I withdraw the question.

17 BY MS. JUDSON:

18 Q Now in applying Military Standard 105(d), you  
19 chose a certain inspection level, didn't you?

20 A (Witness Singh) I have stated before, I did  
21 not apply the Military Standard per se to any one of these.

22 Q Let me rephrase the question. In checking to  
23 determine whether your sample size was adequate to make  
24 statistical judgments, you referred to Military Standard  
25 105(d), didn't you?

mgc11-3 1

A That's correct.

2

Q \* And in making this reference, you used a certain, quote, inspection level from that standard, didn't you?

3

4

5

A That's correct.

6

Q Could you explain to us what the different inspection levels are?

7

8

A I would have to read the definitions in the Military Standard. We generally used Level II or Level III, and Level II is the general inspection level. Level III is the more stringent inspection level.

9

10

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12

I would also like to point out, those levels are important if we are very close to the sample size given in the standard. Whereas the standard would call for sample sizes of perhaps 100, 200 or 300, we're talking sample sizes in the thousands. So what I'm saying is, yes, we used that Military Standard in trying to determine, but it was not that accurate an analysis.

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Here, we're talking samples in the thousands, and there, the requirement is in the hundreds. So these questions of levels and other items are not really significant to the type of numbers we have reported in this Exhibit VII-1.

20

21

22

23

24

Q But I am correct that there is a more stringent level that you did not use.

25

mgcll-4

1           A       Again, I would want the question clarified.  
2       Are we talking Exhibit VII-1?

3           Q       Let's look at Table VII-1, which refer to  
4       inspectors, not to attributes.

S2BU

5           MR. GALLO: Is there a question on the table?

6           JUDGE SMITH: I think you will have to restate  
7       your question.

8           BY MS. JUDSON:

9           Q       In determining that the table showed that the  
10       number of inspectors reinspected as part of the reinspection  
11       program is equal to or larger than that required by  
12       Military Standard 105(d), except for Peabody Testing, did  
13       you use Level II of the Military Standard?

14          A       (Witness Singh) That's correct.

15          MR. GALLO: Objection. This Table VII-1 deals  
16       with inspectors and not attributes. And I believe what  
17       Counsel has confused is the application of Military Standard  
18       105(d), applied by Mr. Del George in his testimony to  
19       determine whether the inspector sample was consistent with  
20       the guidelines in 105(d); therefore, this table is really  
21       not a part of this witness' testimony. It's beyond the  
22       scope of his direct testimony.

23          MS. JUDSON: Judge, I plan to get to that  
24       latter issue of why I think it's important to look at  
25       both inspectors and attributes. But it's also true that

mgcll-5

1 this witness wrote the section of the reinspection report,  
2 and I'm trying to determine the basis of this table from  
3 that report.

4 JUDGE SMITH: Then you are seeking leave to  
5 examine him beyond the scope of his testimony.

6 MS. JUDSON: The two are interrelated, as we  
7 believe will be shown as I go through my cross-examination.

8 JUDGE SMITH: I believe in his cross-examination,  
9 he has reaffirmed that his testimony excluded the  
10 reinspectors. I think you're going to have to come up front  
11 with a demonstration of relevance. Either that or seek  
12 leave with grounds.

13 MS. JUDSON: Then, Your Honor, I will explain  
14 why we believe it's relevant.

15 According to our understanding of Military  
16 Standard 105(d), the selections of observations or  
17 attributes have to be random. We believe as to the  
18 attributes here, the selection was clustered, so we are  
19 not dealing with a random sample, and the only thing that  
20 was randomly selected were inspectors. So it is important  
21 to determine how the selection of inspectors met Military  
22 Standard 105(d).

23 JUDGE SMITH: Objection overruled.

24 BY MS. JUDSON:

25 Q Mr. Singh, do you remember the question?

mgc11-6

1           A       (Witness Singh) You asked me whether these  
2 numbers are at Level II or not. And the answer is, yes,  
3 they are at Level II.

4           Q       And if we were to judge the adequacy of the  
5 size of the inspectors reinspected according to Level III  
6 of Military Standard 105(d), isn't it true that the size  
7 of the Blount Brothers reinspection is too small?

8           A       I don't have the Military Standard in front  
9 of me. But if you have looked it over, I would assume  
10 that you're looking at it right.

11                   I must point out one thing here. You are  
12 assuming that the Military Standard is, indeed, applicable  
13 to the selection of the inspectors. And my personal feeling  
14 is, it is not. It is a conservative application of a  
15 selection process.

16                   If you go through the Military Standard or any  
17 other random sample which is based -- what the basic  
18 assumption is, is that each of the items selected is  
19 independent. The inspectors, between them, inspectors  
20 at the contractor level, and then subdivided into objective  
21 and subjective attribute inspectors, these inspectors as  
22 a group -- this is a subset of the total inspectors. If  
23 I was talking Hatfield subjective inspectors, and there  
24 is numbers given in this report, we have X amount of them,  
25 these individuals as a group are not independent. They have



mgc11-7 1 undergone a structured training program. The whole purpose  
2 of that training program was to make their judgments  
3 the same.

4 So you are talking not independent items in  
5 this population, but you are talking a very dependent  
6 population. And the Military Standard sample sizes are  
7 not based for that type of sampling, and I'll give you  
8 an example.

9 If I were to devise a scheme where I could  
10 clone these inspectors, I only have to look at one, no  
11 matter how big the population is, to tell what others  
12 look like, whereas if everyone looked different, then I  
13 cannot say, looking at one. I have to do a minimum number  
14 of inspections to say I've got X confidence that this guy  
15 is six feet tall, or the whole population is six feet tall.  
16 Whereas if everybody was an exact clone, I don't have to  
17 look at others. I know that everybody else looks the same.

18 So I am saying, when you are saying that these  
19 do not meet Military Standard requirements at Level III,  
20 even though they meet at Level II, you are making an  
21 assumption that each inspector or his work performance  
22 is independent of the other inspectors, and I'm talking  
23 about at the contractor and the attribute level, and that  
24 is not true.

25 This example was given -- it was given just as

mqc11-8

1 a guide. But even if you were to assume independence,  
2 we still meet the criteria. It was not intended to say  
3 that because of this, everything else is okay.

4 Q So it's not true what is said on page VII-6  
5 that the adequacy of the sample sizes can be judged by  
6 comparison to those specified by Military Standard 105(d)?

7 A I have not said anything that is very different  
8 from this. I am saying that this is a conservative way of  
9 looking at the sample, and there is a degree of  
10 conservatism in here.

11 You could still judge it, knowing that it's  
12 conservative. You could still judge it. Any time you are  
13 making a judgment, you have to take the facts into account,  
14 and one of the facts in here is that it's a very  
15 conservative way of sampling.

End 11

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mgc12-1

1 Q So you are saying that Military Standard  
2 105(d) assumes that samples are all simple, random samples,  
3 and the choice of one item is independent of the selection  
4 of another to be included in the sample; is that correct?

5 A What it assumes is that -- and again, let me  
6 go into other assumptions which it has made.

7 Each trial -- and when we talk "trial" is --  
8 you pick up an inspector or a work item -- has only two  
9 outcomes, and that is what that standard deals with,  
10 sampling by attributes, and the outcome is, either the  
11 thing is good or no good. So that's one requirement.

12 The second requirement is that the probability  
13 of the occurrence of an event in each trial is a constant,  
14 which means that you are talking about a subset of  
15 population or you're taking samples from a population which  
16 is fairly homogenous, which means one person to the other  
17 person or one item to the other item has some common --  
18 either common work quality -- what I said is, each trial  
19 is constant, which I said the population could be termed  
20 as homogenous.

21 The last is that the trials are statistically  
22 independent, and this is where I said that at the inspector  
23 level, each inspector having gone through the same  
24 certification program, the whole intent of that  
25 certification program was to make -- to have these inspectors

mgcl2-2

1 make similar judgments under similar conditions. This  
2 qualifies the population as being statistically independent.  
3 And for that reason, I'm saying that the Mil Standard is  
4 not fully applicable to this inspector population.

5 Now that is not true for the work items.

6 MR. GALLO: Mr. Singh, did you mean  
7 statistically dependent or independent?

8 WITNESS SINGH: The inspector population, in  
9 this case, is statistically dependent, and this is why  
10 it does not meet the independence criteria. And for that  
11 reason, application of Mil Standard 105(d) would be very  
12 conservative.

13 BY MS. JUDSON:

14 Q But you believe that the probability of picking  
15 a certain attribute in the sample is independent from the  
16 probability of picking another attribute in the sample?

17 A (Witness Singh) I did not say that.

18 Q You did not say that?

19 A I thought your questions were at the inspector  
20 level.

21 Q They were, but then you shifted me to the  
22 inspection level, and I'm following your lead.

23 A All I said was that, in my opinion, the Mil  
24 Standard is not fully applicable at the inspector level,  
25 because inspectors, having gone through a structured

mgcl2-3

1 training program, are dependent or their quality is  
2 dependent on one another, whereas when you talk about  
3 work items -- I did not say "attribute;" I said "work  
4 item," which is the piece of work, a cable tray hanger  
5 between the two hangers or between end hangers -- we  
6 are assuming independence. And the reason we are assuming  
7 independence is that these items were worked on by  
8 qualified craftsmen; they were inspected by qualified  
9 inspectors. And I would, under normal circumstances, assume  
10 that the work quality is good.

11           However, we do find errors, a number of them.  
12 These are errors; these are due to human error which are  
13 random in nature, so the occurrence of error is what's  
14 independent between these different hangers, and for that  
15 reason, the sampling is applicable, because the intent of  
16 the sampling is to find these errors which are random.

17           JUDGE SMITH: Why don't you assign human error  
18 as a factor in the dependence or independence of the  
19 inspectors?

20           WITNESS SINGH: We could; however, we are going  
21 by -- let me back up.

22           Giving an example, if I had an approved  
23 qualification program of inspectors, all inspectors coming  
24 out of that qualified program, they are inspecting my  
25 plant, and the outcome of all this is an acceptable plant.

mgcl2-4

1 It does not say it does not require me to find what the  
2 error rate is. The error rate is implied in the training  
3 program, whereby you have tests, you have certain levels  
4 of confidence requirement, so that the error rate is  
5 sufficiently small. But there is no number that I know of  
6 that could be assigned to what error rate is acceptable  
7 or not acceptable.

8 JUDGE SMITH: My point was, you looked at the  
9 population of inspectors as having a large amount of --

10 WITNESS SINGH: Dependence.

11 JUDGE SMITH: Dependence because of similar  
12 training. Yet the work that they produce, you looked at  
13 as independent because of human error. The same inspectors  
14 possessing -- the same inspectors whom you found to be  
15 a homogenous group because of their training, you find the  
16 work they produce not to be, because of the human error  
17 of those very people.

18 WITNESS SINGH: There is a slight difference,  
19 and let me try to explain the difference.

20 If I were to -- the error we are talking at  
21 the work item level is error which these inspectors are  
22 making in their inspections or the worker is making in  
23 his work. Whereas, if you take the error on to the  
24 inspector population, this error is on the training program,  
25 that this training program is producing one bad inspector

mgcl2-5

1 out of twenty.

2 \* Do you get my point? So there is a difference.

3 JUDGE SMITH: I see.

4 BY MS. JUDSON:

5 Q Isn't it true that to apply Mil Standard 105(d),  
6 one should have a simple random sample?

7 A (Witness Singh) One should have a random sample,  
8 yes.

9 Q In that random sample, the probability of  
10 picking a certain inspection should be independent of the  
11 probability of picking any other inspection, isn't that  
12 correct?

13 A That's correct.

14 Q In this reinspection program, isn't it true  
15 that the sample of inspections are dependent on the sample  
16 of inspectors?

17 MR. GALLO: Objection. Counsel made a  
18 representation here that she was going to connect up this  
19 inquiry into what I considered Mr. Del George's testimony,  
20 inspector sampling. She's going to connect that up to  
21 work attributes. We've had a significant number of questions,  
22 and not one of them got into the work attributes and work  
23 quality questions testified to by this witness.

24 I believe she is really only cross-examining  
25 this witness with respect to Mr. Del George's testimony, and

mgcl2-6

1 she shouldn't be allowed to continue.

2 \* JUDGE SMITH: I thought we crossed that  
3 threshold in the last objection, and we overruled it.

4 Inasmuch as the attributes were selected by  
5 virtue of the selection of the inspectors, she demonstrated  
6 the relevance.

7 MR. GALLO: Well, I think she has to -- she has  
8 yet to connect up, as I recall her offer, that she thought  
9 that the sample size of these inspectors were clustered.  
10 I have yet to hear a question to get into that point, and  
11 I don't really see how she has connected up any of her  
12 questions to how this relationship -- it is true that the  
13 attributes are a function of the inspectors selected, but  
14 for purposes of this witness' testimony, she hasn't  
15 connected up how that in any way undercuts the judgments  
16 and conclusions arrived at by this witness with respect  
17 to the samples of the reinspection program on these  
18 attributes.

19 She is simply cross-examining along similar  
20 lines that could have been conducted with Mr. Del George.  
21 She is attacking the validity of the inspector selection.

22 MS. JUDSON: Judge, the question on the table  
23 was the first in a series that is supposed to connect up  
24 just this issue, and it dealt with inspections, not  
25 inspectors. So I am a bit puzzled as to his objection.



mgcl2-7

1 JUDGE SMITH: What is the question again, please?

2 \* MS. JUDSON: In the reinspection program,  
3 isn't it true that samples of inspections are dependent on  
4 the sample of inspectors?

5 MR. GALLO: I don't know what a sample of an  
6 inspection is? Are we talking inspection results as to  
7 inspectors, or discrepancies evaluated? I don't know.

8 JUDGE SMITH: My trouble with the question is,  
9 I thought the question could have been asked some time ago,  
10 and to that extent, I don't know how you differ.

11 MS. JUDSON: Let me try it with hypothetical.  
12 Maybe that would work a bit better and we can all understand  
13 what I'm trying to do here.

14 BY MS. JUDSON:

15 Q Mr. Singh, assume that Inspector No. 1 makes  
16 certain inspections, which we will call Inspections A, B, C  
17 and D. And there are another nine inspectors who also  
18 make inspections.

19 A (Witness Singh) A, B, C, D or E, F, G, H?

20 Q E, F, G, H onward. Now with a simple random  
21 sample, if I picked Observation A as the first observation  
22 in my sample, that would not -- excuse me -- Inspection A --  
23 that would not affect the probability that I would  
24 pick Inspection B as my next inspection in the sample;  
25 isn't that true?

mgcl2-8

1 A That's correct.

2 Q However, in this program, if I pick Inspection A  
3 as the first inspection in my sample, isn't it true that  
4 there's a 100 percent chance that I will get Inspection B,  
5 C and D?

6 A Only if all these were done within the first  
7 90 days, yes.

8 Q But if they were done within the first 90 days,  
9 I would automatically get all those in my sample, correct?

10 A That's correct.

11 Q So the reinspection program did not have the  
12 simple random sample of inspections, did it?

13 MR. GALLO: I'm going to object to the  
14 characterization, "simple random." The witness has  
15 corrected two or three times that it properly be  
16 characterized as "random."

17 JUDGE SMITH: You object to the word "simple"?

18 MR. GALLO: Yes. I don't know what it means.

19 JUDGE SMITH: I think probably at best, it's  
20 redundant.

21 MS. JUDSON: Fine.

22 BY MS. JUDSON:

23 Q So the reinspection program did not have  
24 a random sample of inspections, did it?

25 A (Witness Singh) It did not have a random sample

ngcl2-9

1 selected, if you were to select it based on random number  
2 generated? However, in our analysis and before we  
3 computed these reliability numbers, we did evaluate whether  
4 the sample which was actually collected as part of the  
5 reinspection program is, in fact, representative of the  
6 total population of each work attribute, and were there  
7 any biases.

8 We determined that the sample for each one of  
9 the attributes is, indeed, representative of that  
10 attribute population and that we could not find any bias  
11 which was exercised in selection of these samples. And  
12 for that reason, we have said or we concluded that for all  
13 practical purposes, the sample at the work item level was,  
14 indeed, random.

15 In addition to that, we also determined that  
16 the sample sizes are large compared to those which are  
17 normally used in sampling, and in these cases, whereas  
18 you would get under normal sampling procedures a sampling  
19 in the hundreds, we're talking samples in the thousands.  
20 We're talking samples which constitute five or ten percent  
21 or larger of the total population, and this is why we  
22 thought that, given the large sample, given that there were  
23 no biases which were exercised, except for some  
24 conservative biases which were exercised in selection of  
25 these samples, that the samples are representative.

mgc12-10

1                   When you look at the sample from the point of  
2 view of timeframe of construction, we also find that the  
3 sample occurs in the '76 to '82 timeframe, so all these  
4 facts lead us to conclude that even though the sample was  
5 not based on a random number generator, it indeed is  
6 random, and it indeed is representative.

7                   One other fact which you have not brought up  
8 is the quality of work -- there are two factors going  
9 in there, and that again, introduces randomness.

10                   The worker who constructed the component has  
11 built quality into that component. The inspector really  
12 is correcting this person's errors, so the inspector does  
13 contribute to quality, but again, the contribution is  
14 a partial contribution. So when we talk about work quality  
15 or quality of work items, we are talking more than just  
16 inspector. And for those reasons, we determined or  
17 concluded that it is indeed random, and we could use these  
18 formulas to compute reliabilities.

19                   Q       But it's clustered by inspector, isn't it?

20                   A       When you say "clustered," what do you mean?

21                   Q       I'm referring to the hypothetical that we  
22 went through before.

23                   A       I was answering the actual case.

24                   End 12  
25

1 Q So is it clustered by inspector?

2 \* MR. GALLO: Objection. The witness doesn't  
3 understand that question. She has to tie clustered by  
4 inspectors to some other concept in the area that she's  
5 questioning on.

6 JUDGE SMITH: I think that you probably have  
7 made your point, Ms. Judson. I think we know how the  
8 attributes ended up in the population to be inspected, and  
9 your observations about the method of selecting inspectors.

10 I don't know where you're going, beyond where  
11 you've already been.

12 Your cross-examination plan doesn't seem to  
13 demonstrate it. If you want him to agree that it's a bad  
14 way to do it, I don't think you better expect that.

15 (Laughter.)

16 MS. JUDSON: Too bad.

17 JUDGE COLE: You could always ask him that.

18 MS. JUDSON: Fine, Your Honor.

19 Also, just to help clarify for the judges, I  
20 have skipped around on my cross-examination plan, partly  
21 in response to various answers, but I can proceed.

22 JUDGE SMITH: I shouldn't assume where you're  
23 going. I just don't know where you're going. I think  
24 you've made your point. And if you have an additional  
25 point, well, proceed.

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1 MS. JUDSON: Fine.

2 For the record, we are distributing certain  
3 papers for illustrative purposes at this point in time.  
4 They are Edison's answers to BPI interrogatories 11-C and  
5 12-C.

6 (Document distributed to Board and parties.)

7 JUDGE SMITH: I'm sorry. I was in consultation  
8 with Dr. Cole. Were you addressing the Board?

9 MS. JUDSON: I was, on the record. I was just  
10 saying that we are handing out these at this time just for  
11 illustrative purposes. We're not offering them into  
12 evidence.

13 JUDGE SMITH: Okay, just give us a moment.

14 (Board conferring.)

15 MS. JUDSON: For the record, I will be referring  
16 to Commonwealth Edison answer to BPI interrogatory 11-C  
17 which has been distributed for reference purposes and has  
18 not been offered as an exhibit in the record at this time.

19 MR. LEWIS: Your Honor, shouldn't that be  
20 identified for the record in any event?

21 JUDGE SMITH: Only if you intend to offer it.

22 MR. LEWIS: Unless the document is going to be  
23 taken back after the questioning.

24 MR. CASSEL: It will be. It's just being  
25 identified for the record so that we can discuss it with this

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1 witness.

2 BY MS. JUDSON:

3 Q Mr. Singh, this document lists various  
4 inspections, the total number of inspections performed,  
5 the total number of reinspections performed, the inspectors  
6 of that particular attribute and the inspectors reinspected.  
7 Now previously, you mentioned that you were confident that  
8 there wouldn't be bias in the sample, in part because of  
9 the large number of reinspections, is that correct?

10 I'll withdraw that question.

11 As to Class 1 cable pan hangers, this document  
12 shows that there are 4,776 reinspections performed, is that  
13 correct?

14 A (Witness Singh) That's correct.

15 Q And that there were 22 inspectors of that  
16 particular attribute, is that correct?

17 A According to this list, yes.

18 Q And the number of inspectors reinspected was  
19 two, is that correct?

20 A Yes.

21 Q So that these 4,776 reinspections were all  
22 performed by only two inspectors, is that correct?

23 A According to this list.

24 Q According to the Military Standard 105-D, is the  
25 sample of two out of 22 adequate to meet a Level II inspection

1 level?

2 \* MR. GALLO: Objection. It seems to me that  
3 counsel, through this handout, is attempting to explore  
4 the same area that we went through excruciatingly in the  
5 last half hour. It started out -- the line that I objected  
6 to started out with reference to this table in report of  
7 inspectors. And she asked whether or not 105-D applied at  
8 a certain level -- III, I believe it was -- applied with  
9 respect to the sample size of the inspectors.

10 Now she's doing the same thing with this list,  
11 the same line of cross-examination, and it's cumulative.

12 (Board conferring.)

13 JUDGE SMITH: She may have generated the same  
14 broad-type information before, but now she's narrowing in  
15 on specific applications and she should be permitted to do  
16 that, although I'm not sure about your objection, as it  
17 relates to the Military Standard, if that was specific in  
18 your objection.

19 MR. GALLO: Pardon me?

20 JUDGE SMITH: I'm not sure I understood the  
21 reference to Level III objection.

22 MR. GALLO: That was for the purpose of trying  
23 to recollect, for the Board's memory, the connection that I  
24 was referring to in the past question.

25 MS. JUDSON: My question, then, was under Level II



1 whether the size would be adequate.

2           , WITNESS SINGH: Whether two is adequate out of  
3 22? The answer is no. However, you again -- in my opinion,  
4 there is no relationship between the 22, the two, and  
5 whether the sample is representative of the population or  
6 not. The evaluation we have done, at the work item level,  
7 does not consider this aspect of the problem, because  
8 it's not related.

9           The important question here is do these 46 --  
10 4776 reinspectors performed out of this 22 -- 22,000 total  
11 population, is this 4776 representative of the total  
12 population so that you could infer the quality of the total  
13 population by just looking at this 4776.

14           And secondly -- well, that's the goal. Now, in  
15 establishing whether it is representative or not you go back  
16 and you look at whether there were any biases exercised  
17 in selecting this, whether we selected the best 4776 or did  
18 we select the worst one.

19           Now what we have concluded and if this number is  
20 right, if we were to compute the probabilities using the  
21 formulas given, we would first establish whether this 4776  
22 is representative of 22,000. Is it an unbiased sample?  
23 And if that was true, we would compute the reliability.

24           If the answer to that question was no, these  
25 are the best ones, then obviously the reliability computed is

1 a wrong estimator for the whole population. It is true for  
2 this 4776, but it is not true for the whole population.

3 BY MS. JUDSON:

4 Q So you don't think that a certain inspector,  
5 who was a good inspector, is likely to do more good  
6 inspections, whereas a bad inspector is likely to do more  
7 bad inspections?

8 MR. GALLO: Objection. I object to the question  
9 on the grounds it's irrelevant and this whole line is  
10 irrelevant. As was established by this witness's last  
11 answer to the previous question, essentially he said that  
12 the sample was not established as a function of the  
13 number of inspectors or reinspectors. He took the sample  
14 size results and then he recognized, as counsel recognized,  
15 that there was a potential problem with just blindly accepting  
16 that sample.

17 So he related the sample against the total  
18 population to determine whether or not there was a sufficient  
19 population for sample purposes. And in that connection,  
20 consulted 105-D. But he also checked the sample to see  
21 whether or not it was representative and he checked to see  
22 whether there were any negative biases. He compensated  
23 for the very points that counsel is making their --

24 JUDGE SMITH: This is what I'm missing. Where  
25 is that compensation?

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1 MR. GALLO: I heard the witness -- well, he has  
2 not yet been asked how he looked at those biases, what  
3 those biases were, and how he dealt with them.

4 JUDGE SMITH: That's right.

5 JUDGE COLE: Dr. Singh, with respect to this  
6 same Class 1 cable pan handlers, the 4,776 reinspections that  
7 were performed. You were asked questions about possible  
8 bias in that number. And then you were referred to --  
9 that these total number of inspections were conducted by  
10 only two of the population of inspectors, 22.

11 If there were only one inspector, out of the 22,  
12 and he did 4,776 of the reinspections out of the total  
13 population of inspections, 22,000, would you consider that  
14 to be a bias in the population of reinspections performed?

15 WITNESS SINGH: Only if this inspector was  
16 not the norm. If this inspector either was outstanding, yes  
17 it's a negative bias. If this inspector was a poor  
18 inspector, yes.

19 JUDGE COLE: Well, it appears that these two  
20 inspectors performed over 20 percent, 10 percent of the  
21 inspector population, or 9 percent of the inspector population  
22 performed more than 20 percent of the inspections in that  
23 are. Did you look at that as a possible introduction of  
24 bias?

25 WITNESS SINGH: When we look at cable pan hangers,

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1 even though it appears as a single item, there is a variety  
2 of types of these hangers. There is a variety of connections,  
3 a variety of configurations. And what we looked at is does  
4 this population cover the various type of cable pan  
5 hangers in the plant.

6 And to us that was more critical than whether  
7 one inspector did it or five. Now the example you are  
8 quoting, I would agree with you. If there was only one,  
9 I would be more concerned than if there were five.

10 JUDGE COLE: But did you look at that aspect?

11 MR. SINGH: We did not look at that aspect. We  
12 were going by -- the aspect at the inspector level that  
13 we did look at was we did seek assurance from Commonwealth  
14 Edison that an inspector who was qualified in one objective  
15 attribute is also qualified in another and the training  
16 programs, for these various objective attributes, are  
17 similar. And the answer was yes, that if a person did well  
18 on an objective attribute number one, he would do well on  
19 attribute three, four, and five.

20 And in that respect, even though for this one  
21 attribute, there may be two inspectors, when you look at  
22 the total number of objective attributes which were actualiy  
23 inspected, it is self-compensating the way I look at it  
24 because the training and the qualification of these  
25 inspectors is the same. He's qualified to inspect any one

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1 of these items.

2 JUDGE COLE: Okay.

3 WITNESS SINGH: So it was looked at, in that  
4 respect. It was not looked whether two out of 22 is okay  
5 or not. It was not looked from that point of view, because  
6 we thought that was not -- if this was satisfied, it's all  
7 good. But as I stated earlier, we are looking at the data  
8 after the fact. We did not design the program to select  
9 only two.

10 JUDGE COLE: All right, sir. Thank you.

11 JUDGE CALLIHAN: Dr. Singh, have you said, in  
12 effect, that you assume capability of the inspectors to  
13 be --

14 WITNESS SINGH: I assume a minimum capability of the  
15 inspector, yes, at the work quality level. Between the  
16 worker and the inspector I did assume that the work quality  
17 is -- that the actual level is fairly homogenous, which means  
18 that you don't have one person doing everything wrong and  
19 the other guy doing everything right. And then you had  
20 the whole population in between.

21 What I have assumed is that between the worker  
22 and the inspector, the quality is fairly uniform. There would  
23 be deviations, but these are deviations from a uniform  
24 quality, as opposed to the quality being random.

25 JUDGE CALLIHAN: Did you make any inspection of

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1 credential personnel records of the inspectors in question?

2 , WITNESS SINGH: I personally did not, but I did  
3 confer with Mr. Tuetken and other Edison people to assure  
4 myself that indeed this was true. And I took their word,  
5 as opposed to physically examining the records.

6 JUDGE CALLIHAN: Thank you.

7 JUDGE SMITH: Counsel suggested then, that you  
8 compensated for the phenomenon when, in fact -- as I under  
9 stand your testimony -- you are of the view that the  
10 phenomenon is not significant because of the homogeneity of  
11 the inspectors. And if you assume that the inspectors are  
12 much alike, haven't you generated a lot of numbers here that  
13 really don't mean much? You know, if you're making an  
14 assumption that the inspectors are going to work alike, then  
15 what is the point in looking at all those inspections?

16 That's what you refer to as lack of sensitivity.  
17 You are making a very, very strong inference here that two  
18 out of 22 inspectors is adequate because of homogeneity in  
19 the inspectors. That same homogeneity should be produced in  
20 their work.

21 WITNESS SINGH: Just a minute. I did not say  
22 two out of 22 was adequate. What I said is we did not  
23 account for two over 22, per se. What we did look at was  
24 that the qualification of performance of inspectors, are they  
25 qualified for a variety of work attributes, which means a

new bu

131b11

1 person who is qualified for cable pan hangers, the first  
2 line, is qualified for the second line and perhaps the third  
3 and fourth line. And as a group, we have a bigger population  
4 which was sampled.

5 What you are looking at here is all Hatfield  
6 objective inspections, which are broken down into these  
7 attribute levels. We were looking at the Hatfield objective,  
8 the total attributes. And the reason we were looking at,  
9 we were told that the inspectors are qualified that way.

10 So I'm saying that two out of 22 may seem to be  
11 a small number, when you add the total up you are probably  
12 reaching this 20 percent goal, which was set as the level --  
13 if you're selecting every fifth, you are likely to have picked  
14 up four out of 22, thereabouts, four or five out of 22.  
15 So that aspect was considered.

16 I did not say it was insensitive. I just said  
17 it was considered in their evaluation.

18 The other thing, which I was pointing out is,  
19 that here we are looking at work quality and if I want to  
20 set up a plan of -- from scratch to determine quality of  
21 Class 1 cable pan hangers and given a population of 22,000  
22 we will see what the Mil Standard requirement is, probably  
23 closer to 3 to 500 samples.

24 We would generate these samples randomly from  
25 numbers 1 through 22,000. At that point, it's unlikely we

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1 would have gone in and said which worker did what and which  
2 inspector did what. We would not have gone to that level.  
3 And I'm saying given the data, we took the same approach.  
4 So we have done nothing different than what we would normally  
5 do, in setting up a work quality sample.

6 Now this additional information is available  
7 because of the way the reinspection program was set up, but  
8 normally you would not go and say who did what or how many  
9 times it was reworked. It becomes a very complicated sample,  
10 if we were to include all those items in here.

end13

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mgcl4-1

1 JUDGE CALLIHAN: You have at least implied on  
2 a couple of occasions, as I understand, that for your  
3 analysis, you took what you had, what you could get in  
4 the way of data, that this was sort of an after-the-fact  
5 look.

6 Speaking generally of the whole program, does  
7 that imply that had one foreseen the kind of analysis  
8 which you have now recorded at the outset, he might  
9 have structured the reinspection program differently and  
10 gotten a more representative sample of either work items  
11 or inspectors?

12 WITNESS SINGH: I don't really know whether  
13 the plan would be any different or how much different  
14 it would be. It probably would be somewhat different than  
15 what it was.

16 But what we did do is, we took the data which  
17 was available to us. We did go through an analysis to  
18 see, can we or can we not derive reliabilities, given this  
19 data, given the assumptions, given the limitations? And  
20 we came to the conclusion that what is reported in the  
21 report, we feel comfortable doing.

22 So it is more than just given this data, we  
23 had no other choice. We still had the choice of not  
24 doing anything, saying this data is just no good and we  
25 cannot report it.

mgc14-2

1                   When we did the analysis, we did find the  
2 data was credible, the data could be used, and we used  
3 the data in that respect.

4                   JUDGE CALLIHAN: Recognizing the risk of  
5 lifting it out of context, but to be specific, in the  
6 first item of the unnumbered potential Intervenor's  
7 exhibit, have you implied, at least, that two out of  
8 22 -- I'm sorry -- let me be more positive about it.

9                   In your opinion, in retrospect, are two  
10 inspectors for some 5000 items a good ratio?

11                   WITNESS SINGH: It is on the low side. I would  
12 have inspected -- well, three probably would have been  
13 all right, because we're talking 20 percent of the inspectors  
14 sampled, and now you're breaking it down into ten  
15 classifications. I'm not surprised with the two, but I  
16 would say that four would be the average number. Three  
17 probably is as good in terms of the numbers here.

18                   On thing which I think should also be  
19 recognized, if this population of 22,000 was taken as a  
20 population, and we had selected 50 random hangers for  
21 analysis or 500 for analysis, the number may not have been  
22 very different from two, if we were to strictly follow  
23 the Military Standard, because if I take it percentage-wise,  
24 it may very well have ended up at two or three. I don't  
25 know what the exact number was or would have been. But if

mgcl4-3

1 this were -- if the program was designed strictly to find  
2 quality of cable, Class I cable pan hangers with no ifs or  
3 buts, just a very narrow structured program, we would have  
4 done that -- population 22,000; select 500 random hangers;  
5 go out in the field, inspect the hangers, and classify them  
6 as good or bad, and then computed reliabilities based  
7 on the results. And the 22 people doing that, the total  
8 number may not be very different.

9 Now this one, I would say, if you look at each  
10 work item, it does look like the number of inspectors is  
11 low. But if you look at total objective attributes, which  
12 were actually looked at, and given that the requirements  
13 for these objective attributes is similar, I would say that  
14 it probably is still acceptable, even though for this one  
15 out of 21, there may be questions. And as I said, we did  
16 not look at this aspect in this detail.

17 JUDGE CALLIHAN: I have heard you say that  
18 4700 maybe is a bit high. But having gotten 4700, the two  
19 may be a bit low. But overall, it's not an unreasonable  
20 choice of number.

21 Is that what you just said?

22 WITNESS SINGH: I would have been happier with  
23 four. That's about all I would say -- three or four.

24 JUDGE CALLIHAN: All right.

25 MR. CASSEL: Judge, we have about --

mgcl4-4

1 (The Board confers.)

2 \* JUDGE SMITH: I have one more question.

3 Mr. Singh, looking at the total inspections  
4 performed -- that's 22,000 -- that is from -- what are  
5 we looking at 22,000 for?

6 WITNESS SINGH: We should have been looking  
7 at the 26,000.

8 JUDGE SMITH: So that's the wrong figure.

9 All right, now, through 8/31/82, it's almost  
10 27,000. From when?

11 WITNESS SINGH: From the start of construction,  
12 I would believe, which should be '76 or thereabouts.

13 JUDGE SMITH: Yet when we pick up two  
14 inspectors for three months, we see a very large proportion  
15 of that 27,000.

16 Would that be a suggestion statistically that  
17 those two inspectors are responsible for yet more than  
18 4776 out of that population of 27,000?

19 WITNESS SINGH: It does.

20 JUDGE SMITH: So chances are those inspectors  
21 inspected -- given that large number during that period,  
22 chances are those inspectors inspected perhaps a very  
23 large -- a greater proportion of the 27,000.

24 WITNESS SINGH: That's correct.

25 JUDGE SMITH: Therefore that representation of

mgcl4-5

1 their work -- I just lost my --

2 \* WITNESS SINGH: It's still appropriate. It's  
3 more appropriate.

4 JUDGE SMITH: It's more appropriate?

5 WITNESS SINGH: That's correct.

6 JUDGE SMITH: They could very well have done  
7 most of those --

8 WITNESS SINGH: In fact, this is one other  
9 thing I wanted to point out that I did not.

10 It is true that certain inspectors did one  
11 type of work more than others. So if you look at the  
12 attribute level, you will find one inspector to be doing  
13 a fairly high percentage of the total work.

14 JUDGE SMITH: It would be a fairly unusual  
15 circumstance indeed if you would find exactly during that  
16 period for those inspectors, that they did that kind of  
17 work and then quit and hadn't done any before.

18 WITNESS SINGH: I would agree.

19 The other thing I was pointing out, if you  
20 were taking a 20 percent sample, the number, the average  
21 number would have been four, if everybody did an equal  
22 amount of work. So two, it looks low, but you're only  
23 out by two from the average.

24 JUDGE SMITH: Would this be a good time to  
25 break for lunch?

mgcl4-6

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MS. JUDSON: Yes, it would, Your Honor.

\* JUDGE SMITH: Okay.

Let's break for lunch and return at 1:20.

(Whereupon, at 12:20 p.m., the hearing was recessed, to resume at 1:20 p.m. this same day.)

End 14



1 to review this document over the lunch break, I believe that  
2 all the testimony elicited with respect to this particular  
3 table lacks probative value and therefore should be stricken,  
4 including the prior testimony. Since this has not been  
5 admitted into evidence, we won't have to strike that.

6 But what I'm pointing to is striking the answers  
7 and questions based on this table. The basis for that  
8 position is twofold. For the inferences and points that  
9 counsel has been trying to make from this table, this table  
10 should have had a fifth column which, as the Judge -- Judge  
11 Smith yourself indicated, that we needed a column that  
12 indicated the percentage of the total inspections performed  
13 by the reinspectors captured in the reinspection program.

14 As you pointed out, it was possible that these  
15 two inspectors -- for example, for cable pan hangers -- may  
16 have inspected the total population. We don't know that  
17 because that's a statistic whose value isn't shown on this  
18 table.

19 Secondly, there is a column on the table that's  
20 called inspectors of attribute and it's a very key column  
21 because the relationship of inspectors reinspected is  
22 made to the column entitled inspectors of attribute.

23 I have reason to believe --

24 JUDGE SMITH: Would you repeat that last statement?

25 MR. GALLO: Yes, the relationship between inspectors



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1 reinspected, which is the fourth column or the last column  
2 on the document, to inspectors of attribute, which is the  
3 next to the last column on the document, has been used  
4 to try to demonstrate that the statistical reliability values  
5 calculated by Mr. Singh are inadequate or inappropriately  
6 biased because the sample taken is not representative because  
7 two, for example, again referring to cable pan hangers.

8 Two inspectors reinspected it in relation to  
9 22 inspectors of the attribute, is a small percentage of the  
10 total, and therefore an inference is created that perhaps  
11 these two inspectors had some peculiar technique in their  
12 inspection abilities that might have somehow skewed the  
13 representation or the representativeness of the sample for  
14 cable pan hangers.

15 I have reason to believe that this table, entitled  
16 -- or column entitled Inspectors of Attributes, is really a  
17 column of inspectors certified for inspection of this  
18 particular attribute, and not necessarily the number of  
19 inspectors that actually did the reinspection.

20 Two bases for that assertion is that --

21 JUDGE COLE: Excuse me. Did you mean to say the  
22 number of inspectors that were among these? The total number  
23 of inspectors included in the reinspection program?

24 MR. GALLO: Let me say it again.

25 We have 22 inspectors of attribute on cable pan

1 hangers shown. I believe that is not true, not accurate,  
2 that the 22 is 22 reinspectors qualified to inspect that  
3 attribute and that the number of reinspectors qualified  
4 is not the same as the number of reinspectors that  
5 inspected the inspectors for that attribute, so that it is  
6 some smaller number.

7 I don't know -- at the moment, I don't know how  
8 small.

9 The basis for that assertion on my part is the  
10 fact that, in Mr. Del George's testimony, he indicates there  
11 were only 86 inspectors who did the reinspection. If you  
12 total up that column, it's well over 200 -- it's 156.

13 JUDGE SMITH: Wait a minute. That's a  
14 non sequitur there.

15 JUDGE COLE: Are you saying that it should be the  
16 reinspectors of attribute?

17 MR. GALLO: I misspoke. It's inspectors who are  
18 qualified to inspect in this particular attribute. But it's  
19 not necessarily that, again looking at cable pan hangers,  
20 where we have 22. It does not necessarily follow that all  
21 22 inspectors who are qualified in that area actually did  
22 the inspections.

23 JUDGE SMITH: That's correct, but your next  
24 statement, I don't think is a logical sequence. And that  
25 is, for example, if you add up the inspectors in the column

1 you would arrive at -- I'm trying to paraphrase just what  
2 you said. , You came up to 86, or you had not arrived at 86.

3 MR. GALLO: I just didn't communicate properly.  
4 It comes up to 156.

5 JUDGE SMITH: That's right. There's only 86  
6 inspectors.

7 MR. GALLO: That's right. So that tells me  
8 what we have here is multiple -- we have one inspector, in  
9 each of these columns, for more than one attribute that  
10 they inspect.

11 JUDGE SMITH: Yes, right. Of course, there's  
12 no inference either way from these columns.

13 MR. GALLO: The second point is if you turn to  
14 the reinspection program report, and it's in Appendix F,  
15 and it's page F-19. And the table for Hatfield at the top  
16 of that page, you will see that if you run down the area  
17 of qualification, the third item from the bottom is called  
18 cable pan hangers.

19 And if you look at the next column, you will find  
20 22 inspectors qualified in the area. If you look in the  
21 next column, you will find two inspectors in the area that  
22 were reinspected. Those values correspond exactly to what  
23 is shown on Intervenor's document, the answer to interrogatory  
24 11-C. And this leads me to question, therefore, the  
25 accuracy of the column shown on the answer to interrogatory

1 11-C.

2 , If, in fact, 22 is the number of inspectors  
3 qualified in the area, but not the number of inspectors  
4 who did the inspection, we have information that is not  
5 representative. We have testimony that is not reliable  
6 when it's based on a relationship of 22 to 2, as shown for  
7 the first item, cable pan hangers.

8 So, to summarize, I believe that the table is  
9 deficient in two respects, the one that I have been  
10 explaining with respect to the column entitled, on Intervenor's  
11 document, Inspectors of Attributes. And the other deficiency  
12 is the fact that it should contain yet another column, which  
13 is totaled out number of total population for each attribute  
14 inspected by the inspector in the last column.

15 Until that kind of information is displayed,  
16 we really don't have -- and then the witness asked, with  
17 respect to the corrected information and the additional  
18 information, we really don't have probative and reliable  
19 evidence upon which this Board can make findings.

20 JUDGE COLE: Mr. Gallo, I didn't follow your  
21 argument there. It seems to me that Table Q 14-5 on page  
22 F-19 is consistent with what is in the seven page exhibit,  
23 the answer to BPI interrogatory 11-C.

24 MR. GALLO: That proves my point exactly. The  
25 title of the column, in table Q 14-5, is number of inspectors

151b7

1 qualified in the area, not number of inspectors who did the  
2 work in the area. The table on the Intervenor's document,  
3 that answer to interrogatory 11-C, is not headed up inspectors  
4 qualified in the area. It's headed up inspectors of  
5 attributes.

6 Now I have to confess that the question, if you  
7 had the question before you, I believe the question to the  
8 interrogatory asked for the number of inspectors of the  
9 attribute. I believe, when the information was compiled,  
10 in response to that interrogatory, they went to this table  
11 and took that information and failed to distinguish between  
12 inspectors qualified in the area and, in fact, the actual  
13 number of inspectors who did the inspection in the area.

14 The difference, I think, in the latter case, is  
15 less than 22.

end15

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mgcl6-1

1 MR. LEWIS: Mr. Chairman, it seems to me that  
2 that's the kind of item, if at such time as Mr. Gallo  
3 has information that shows that there is some significant  
4 difference between the number listed there and the number  
5 of inspectors who, in fact, did inspect that attribute,  
6 that that could be brought forward by the Applicant.  
7 But I fail to see how it undermines, for the present, the  
8 admissibility of this document.

9 MS. JUDSON: I will state for the record that  
10 the question asked as to that column was the number of  
11 inspectors inspecting this attribute in our interrogatory.

12 JUDGE SMITH: It's bringing a potential  
13 inaccuracy to our attention. We cannot knowingly accept  
14 evidence, notwithstanding how the problem arose, but  
15 we cannot knowingly accept evidence that is unreliable,  
16 no matter whose fault it is. We just can't do it.

17 That aspect of it, I think, can probably be  
18 remedied.

19 MR. GALLO: I'm sorry to interrupt. But since  
20 Applicant is responsible for this potential error, we, of  
21 course, would propose to investigate more fully than we  
22 have had the opportunity to do, and to make a correction,  
23 and furnish that information to Intervenors -- that is,  
24 if the correction is, indeed, appropriate, which I believe  
25 it is -- and then we will recall Mr. Singh, if they need

mgcl6-2

1 to ask some additional questions based on the revised table.

2 JUDGE SMITH: I would expect that when this  
3 actual number is learned, that it's not going to change  
4 the concept and the discussion much.

5 MR. GALLO: I guess in my conversations with  
6 the witness, it does not take much of a change to have  
7 him change his opinion with respect to the adequacy of  
8 the representativeness of the sample for cable pan hangers.

9 JUDGE SMITH: It it your memory of his testimony  
10 that he has found that an inadequate sample?

11 MR. GALLO: He has not found the sample  
12 inadequate, based on his testimony, but his testimony is  
13 that the relationship from 22 to 2 is something less than  
14 is desirable from his standpoint in terms of dealing with  
15 whether or not a bias was introduced into the sample by  
16 the fact that only two inspectors out of 22 were captured  
17 in the reinspection.

18 JUDGE SMITH: Certainly. If you think that  
19 you would have to recall him, if it turns out saying  
20 that there were only 18 inspectors who did it, I think it  
21 would be a waste of time. That will have to be your  
22 judgment to make.

23 So that part of the problem, then, need not  
24 concern us today, if the exhibit would otherwise be  
25 acceptable.

mqc16-3

1                   Then your other point is that it misses a  
2 concept, a thought, and it does. But that is often true  
3 of perfectly reliable items of evidence, that it tells  
4 a part of a story but not all of it. I think that there  
5 should be ways upon which you can establish, maybe even  
6 by alleging, I don't know, if you prefer, if you're  
7 concerned about the evidence taken out of context, the  
8 thought that you expressed about the inspectors inspecting  
9 more than just three months work.

10                   But this is relevant, and it is convenient, and  
11 it reduces to one place a point that they are entitled to  
12 make. They are entitled to make this point, no matter how  
13 valid you may think it is, or we may, but they are entitled  
14 to make it.

15                   So what I would recommend is that you do what  
16 you think you have to do to make the information accurate.

17                   MR. GALLO: Well, Judge Smith, the objection  
18 is not relevancy. It's probitive value of the information.  
19 I represent, based on my prior explanation, that I believe  
20 that the information shown in the column in the answer to  
21 the interrogatory under "Inspectors of Attribute" is  
22 in error, and the degree of error I can't say at this time.

23                   But if these numbers, indeed, do diminish,  
24 as I believe they will, it will change the entire tenor  
25 of the testimony of this witness.



mgcl6-4

1 JUDGE SMITH: True. I think you are going  
2 to prevail on that point. We will not knowingly accept  
3 inaccurate information.

4 MR. GALLO: All right. Now do I understand  
5 the Judge to be ruling that the answer to the interrogatory  
6 would be excluded, but that my motion to strike the prior  
7 testimony is denied?

8 JUDGE SMITH: No. I am saying you have  
9 created a problem. Now you are standing here throwing  
10 your problem at the Intervenors. And I thought at one time  
11 you suggested that because the problem was created by  
12 the utility, that the utility saw some obligation to correct  
13 it.

14 MR. GALLO: That's true. But in the meantime,  
15 I don't believe that this information should be admitted  
16 into the record.

17 JUDGE SMITH: Today, this moment?

18 MR. GALLO: Yes.

19 JUDGE SMITH: I agree.

20 Dr. Cole suggests that we could bring it in  
21 today or soon if the title is properly labeled, and then  
22 it would be accurate. However, that leaves, then,  
23 unsatisfied the Intervenors' request and entitlement to  
24 accurate information on this point.

25 MR. GALLO: But I would assume, then, that the

mgcl6-5

1 Intervenor would then believe that they would want the  
2 right information and reexamine on this point.

3 MR. CASSEL: I don't know if that's the case,  
4 Judge. Why don't we just defer a ruling on the  
5 admissibility of this until Mr. Gallo checks and finds  
6 out whether it is or is not accurate. It may be accurate;  
7 it may not be, from what we've heard now. And if he comes  
8 in with new information at that time, we can make a  
9 decision. But there is no need to rule now, based on his  
10 representations of a potential possible inaccuracy.

11 JUDGE SMITH: I suspect that we're going to  
12 find -- my recollection of the inspection methodology,  
13 this will be the number of inspectors qualified, and not  
14 the number of inspectors who actually did it.

15 So I think we should face the problem, if that  
16 is going to be the result.

17 So why don't you do this? Why don't we defer  
18 it, consider the possibility of coming back with an  
19 additional column with the actual number of inspectors, if  
20 that information is available? I see, for the purpose  
21 of this column, that the number of inspectors qualified  
22 may not be of much value, but it certainly is harmless.

23 And then with respect to your other point,  
24 I don't think you are going to want to produce the  
25 information as to how many inspectors -- excuse me -- how

mgcl6-6

1 many inspections of the attribute the inspectors  
2 reinspected -- inspected through August 31, 1982.  
3 That's probably going to be difficult information.

4 So I think that I recommend simply perhaps  
5 to have the whole story at one place, that a legend be  
6 placed at the bottom of the chart observing that phenomenon,  
7 and then as a consequence, there is going to be a great  
8 deal of uncertainty about the significance of this  
9 exhibit.

10 Nevertheless, I think it is relevant. I think  
11 it's not a question of whether it's probitive or not  
12 probitive. It's a question of how much reliance can be  
13 placed on it, how much weight. But it is information I  
14 believe that they are entitled to have.

15 So why don't you make a proposal? I think  
16 you probably have.

17 MR. GALLO: If I understand what the Judge has  
18 suggested and Mr. Cassel, is that we essentially suspend  
19 the offer of this answer to the interrogatory into evidence  
20 until we have had the opportunity to clarify the question  
21 of whether it's inspectors certified or actual inspectors,  
22 and provide that information. And in that spirit, I will  
23 also reserve my motion to strike.

24 JUDGE SMITH: Okay. That seems to be  
25 satisfactory to everybody.

mgcl6-7

1 Let's give it an identification.

2 \* MR. CASSEL: I believe that would be R-9  
3 for identification.

4 JUDGE SMITH: Are you withdrawing your offer  
5 now?

6 MR. CASSEL: We would like to defer it, Judge.  
7 There is a problem in timing here, and maybe we should  
8 clear it up on the record.

9 Professor Ericksen, our statistician, like all  
10 our other witnesses, has his testimony due August 13th.  
11 He was intending to rely on this information and will want  
12 to rely on the corrected information when it is provided.  
13 If it's not provided in time, it might require us to defer  
14 the filing of his testimony.

15 JUDGE SMITH: That's not my point. I'm just  
16 making a housekeeping decision. I don't want this exhibit  
17 to receive any identification number if it's not going to  
18 ultimately end up in evidence, and if it's not going to  
19 be rejected, which appears to be the case.

20 Since you are not offering it now, it should  
21 not have an identification number.

22 MR. CASSEL: Do you want us to retrieve the  
23 copies?

24 JUDGE SMITH: No, that's fine. But I don't  
25 want to have, for the very reasons that we're talking about

mgcl6-8

1 this very morning, I don't want to have a missing exhibit  
2 number. \*

3 MR. CASSEL: I see, fine.

4 JUDGE SMITH: Or a duplicate exhibit.

5 MR. CASSEL: It's been described on the record,  
6 then, adequately, and we will disregard the R number.

7 JUDGE SMITH: It's not R-9. It will be given  
8 an identification number at the time it's proposed -- it's  
9 offered for admission.

10 MR. CASSEL: But on the timing point that I  
11 raised, Judge, we do have a concern. I would think this  
12 is something that Edison can probably determine fairly  
13 promptly. I would hope so.

14 MR. GALLO: Judge Smith, I would undertake to  
15 determine how long it would take for us to gather this  
16 information and let Mr. Cassel know in the morning.

17 MR. CASSEL: Thank you.

18 Judge, if we could have about a minute break  
19 here, we have to do musical chairs for the lawyers, because  
20 we have different people for the other witnesses.

21 JUDGE SMITH: Who are you going to have next?

22 MR. CASSEL: Mr. Wright is going to be  
23 examining Mr. McLaughlin.

24 End 16  
25

1 (Pause.)

2 MR. WRIGHT: Your Honor, I'm Tim Wright. I'm an  
3 attorney for the BPI, representing the Intervenors.  
4 I filed my appearance papers yesterday, but for the record  
5 I'm admitted in the state bar of California, state bar of  
6 Illinois, member of the Northern District of Illinois  
7 District Court and also U.S. Court of Appeals, Seventh  
8 Circuit.

9 CROSS EXAMINATION (Cont.)

10 BY MR. WRIGHT:

11 Q How do you do, Mr. McLaughlin. Mr. McLaughlin,  
12 what are your specific duties and responsibilities with  
13 Sargent & Lundy?

14 A (Witness McLaughlin) I am the Manager of the  
15 Structural Department. I am responsible for all design  
16 activities that occur within the Structural Department.  
17 Specifically, I am responsible for approving criteria  
18 standards, design criteria, signing letters of recommendation  
19 on important issues.

20 Q Approximately how many people do you supervise,  
21 in your department?

22 A There are approximately 1150 people in the  
23 department.

24 Q Is one of your responsibilities signing off  
25 on engineering evaluations that are performed in your

1 department?

2 A , Are you referring to the activities involved  
3 in the reinspection program?

4 Q As part of your overall duties, yes.

5 A No, that's not one of my responsibilities.

6 Q With respect to the reinspection programs, is one  
7 of your duties signing off on engineering evaluations that  
8 are performed?

9 A No.

10 Q Did you do any work on the Zimmer plant?

11 MR. GALLO: Objection, irrelevant.

12 MR. WRIGHT: Your Honor, I'm addressing the  
13 witness's credibility and his background information, in  
14 addition to that.

15 JUDGE SMITH: For that purpose, I will overrule  
16 the objection.

17 MR. WRIGHT: Excuse me, Your Honor?

18 JUDGE SMITH: You may proceed, overruled.

19 WITNESS MC LAUGHLIN: I performed the same work  
20 on the Zimmer plant, that I described when you asked me  
21 what my duties and responsibilities were.

22 BY MR. WRIGHT:

23 Q Mr. McLaughlin, does that mean that you actually  
24 worked on the Zimmer plant?

25 A (Witness McLaughlin) No, that does not mean that.

171b3

1           Q     Did you supervise any people that did work on  
2 the Zimmer plant?

3           A     From the standpoint that I'm a manager of the  
4 department and responsible for all activities in the  
5 department, you can say that I supervised people on the  
6 Zimmer project. But the answer to, I think, the question  
7 you're asking, I did not work directly on the Zimmer  
8 project.

9           Q     Thank you. Now, exactly what was the nature of  
10 your involvement with this reinspection program?

11          A     The nature of my involvement was an overview  
12 function. The activity itself, the dispositioning of  
13 the discrepancy was performed by people that worked on the  
14 Byron project team, which are part of my department. I had  
15 no involvement in the original dispositioning of the  
16 discrepancies.

17                     At the time that this activity was completed, I  
18 looked at all the work that was performed. This included  
19 the data that we received from the field. I looked at that  
20 data. I discussed with the people that were doing the  
21 actual work criteria they were using -- criteria they were  
22 establishing in the dispositioning of the discrepancies. I  
23 looked at the results. I had numerous discussions with  
24 them about things in the calculations, items that were not  
25 clear. That's basically what I did. It was an overview



171b4

1 function. All the work was done before I became involved.

2 Q , So is it your testimony that you did not have  
3 any involvement with the implementation of the reinspection  
4 program?

5 A Right.

6 Q Did you have any involvement with the -- strike  
7 that.

8 You testified that you did subsequent review of  
9 the program, that was conducted by Sargent & Lundy people?

10 A Yes.

11 Q Did you review the engineering calculations in a  
12 reinspection program?

13 MR. GALLO: Objection. I assume that the question  
14 is targeted towards the calculations of this witness is  
15 testifying to. As I hear the question, he was just talking  
16 general, review the calculations. A lot of calculation is  
17 done with respect to the reinspection program. This  
18 witness is talking about a specific few calculations dealing  
19 with the disposition of certain weld discrepancies.

20 It seems to me we should get on that track,  
21 Mr. Chairman. Otherwise, I object that the questions are  
22 beyond the scope of this witness's testimony.

23 BY MR. WRIGHT:

24 Q Mr. McLaughlin, did you testify that you only  
25 reviewed weld calculations?

171b5

1           A       (Witness McLaughlin) Am I supposed to answer  
2 before the objection is --

3           MR. GALLO: I think he has withdrawn the last  
4 question and he's posed a new one.

5           WITNESS MC LAUGHLIN: I'm sorry. Could you  
6 repeat the question, please?

7           BY MR. WRIGHT:

8           Q       Was it your testimony that you only reviewed  
9 weld calculations that were produced by the engineers of  
10 Sargent & Lundy?

11          A       (Witness McLaughlin) No, Structural Engineers  
12 Review also did a review of cable trays, conduit hangers,  
13 expansion anchors, conduits. I also reviewed those  
14 calculations.

15          Q       Thank you, Mr. McLaughlin. Now, did you review  
16 the engineering calculations that the Sargent & Lundy  
17 engineering people came up with to disposition discrepant  
18 conditions?

19          MR. GALLO: Objection. The question is vague.  
20 What discrepant conditions are we talking about? All of them?

21          BY MR. WRIGHT:

22          Q       The discrepant conditions in the reinspection  
23 program.

24          A       (Witness McLaughlin) Let me tell you what I did.  
25 I think it will answer your question.

171b6

1 Q Okay. That will be fine.

2 A The calculational process at Sargent & Lundy,  
3 and I think it's the same at most firms, we have a preparer  
4 of the calcs, we have a reviewer of the calcs, we have  
5 an approver of the calcs. I performed none of those  
6 functions. I performed an overview function, where I sat  
7 down and looked at the calcs. I didn't go through them  
8 line by line.

9 I talked to the people that had worked on the calcs.  
10 I reviewed the assumptions they had made. I reviewed the  
11 results of the calcs. But I did not do what we term review,  
12 where the man signs on the calc sheet review, which means  
13 he's gone over line on the calc sheet. I did not do that  
14 function.

15 Q So in your written testimony, when you said you  
16 reviewed your calculations, you just looked at them?

17 MR. GALLO: Where, in the written testimony, is  
18 counsel referring to?

19 MR. WRIGHT: I think it's in the answer to  
20 question 1 -- strike that.

21 MR. GALLO: Answer 7.

22 BY MR. WRIGHT:

23 Q In your written testimony, in your answer to  
24 question 7, you stated that you reviewed the calculations.  
25 What did you mean by that?

171b7

1 A (Witness McLaughlin) I'm trying to find review.

2 JUDGE SMITH: That's not what he said.

3 BY MR. WRIGHT:

4 Q Strike that last question. You have testified  
5 you have studied the underlying calculations. What do you  
6 mean by studied the underlying calculations?

7 A (Witness McLaughlin) Studied -- I sat down with  
8 the people and the calculations together. I reviewed the  
9 data that we had received from the field. I reviewed the  
10 assumptions that we had made. I reviewed the process that was  
11 used in the calculations and I reviewed the result of the  
12 calculations.

13 Q In your review, did you actually rework any  
14 of the engineering calculations?

15 A No.

16 Q Approximately how many engineering calculations  
17 did you study?

18 A It seems like a million, but I'm sure it couldn't  
19 be that many. I didn't count them. So what I'm giving  
20 you is an approximation.

21 Q Okay.

22 A I would say that I had to have looked at least  
23 1000 calculations.

24 Q At least 1000 calculations. How many hours did  
25 it take you to look at those 1000 calculations?

171b8

1           A     The last time you asked me that question, I  
2 think the number I gave was too low. I believe, in the  
3 deposition, I gave a number of 30 hours. I've thought about  
4 that since then. I believe that the time I spent up to  
5 now has got to be over 100 hours.

6           Q     And that 100 hours was spent doing what?

7           A     Studying the calculations.

8           Q     Just the calculations? Is that your testimony?

9           A     Well, when I say the calculations, that's the  
10 data. It's the process I describe the data that comes in  
11 from the field plus what's in the calculations.

12          Q     As you stated, at our deposition -- do you  
13 remember the deposition that you took?

14          A     (Nodding affirmatively.)

15          Q     Do you remember the answer that you gave me when  
16 I asked you how many hours you spent reviewing the  
17 calculations?

18          A     I just told you that, 30 hours.

19          Q     30 hours. Now my question is, does the  
20 70 hours -- you've now given me 100 hours, is that correct?

21          A     Yes.

22          Q     Did that 70 hours occur between the last time  
23 -- since your deposition -- until today?

24          A     No, as I explained before, I believe that the  
25 answer that I gave you at the deposition was too low. You

1 want me to give you the breakdown?

2 Q No. What my question is is that at the time we  
3 took the deposition you were incorrect and, in fact, you  
4 had put in 100 hours at that time?

5 A No, I didn't mean that. I had probably put in  
6 60 hours, up to the time of the deposition. And I probably  
7 spent an additional 40 hours, since the deposition.

8 Q Okay.

end17

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mgc18-1

1 Q In that additional 40 hours that you put in  
2 since the time of your deposition, does that include  
3 the time that you sat in the hearings, in your new testimony?

4 A No.

5 Q You stated that you didn't work any -- you  
6 didn't rework any of the calculations; isn't that correct?

7 A Right.

8 Q When was the last time you actually worked,  
9 reworked or worked a weld calculation?

10 A Approximately twelve years ago, but during  
11 this review process, I did do a review of one calc, a  
12 detailed review. I went over it line by line, looked at  
13 each of the numbers, looked at each of the assumption,  
14 worked out the numbers mathematically. A review process  
15 is one step higher than a prepare process. So I did that.

16 Q Now did you do that between the time that  
17 your deposition was taken and today?

18 A Yes.

19 Q So that at the time your deposition was taken,  
20 you had not done a weld calculation for approximately  
21 twelve years; is that right?

22 A Right.

23 Q At the time you wrote your testimony, you had  
24 not performed a weld calculation for approximately twelve  
25 years; is that correct?

mgc18-2

1 A Yes.

2 Q \* Now if I may, Mr. McLaughlin, I would like to  
3 address your attention to page 6 of your written testimony.  
4 You testified to a program being established to evaluate  
5 discrepant welds, and that is in Question 11, in your  
6 answer to Question 11; is that correct?

7 A Yes.

8 Q Now can you tell me, why is there a  
9 difference in the sampling plan for Hunter and Hatfield?  
10 Hatfield had a sampling plan of 100 percent; is that correct?

11 A I don't know about the percentages. Hatfield  
12 had a sampling plan, and Hunter didn't.

13 Q Can you tell me why there is a difference in  
14 that approach for Hunter and Hatfield?

15 A I was not involved in the original reinspection  
16 program. I was not involved in the establishment of a  
17 sampling plan or not a sampling plan.

18 Q Was Sargent & Lundy involved in the design of  
19 the sampling plan?

20 A No.

21 Q Now on page 7 of your written testimony, in  
22 your reply to Question 13, you talk about 356 discrepant  
23 welds that were examined by Sargent & Lundy; is that correct?

24 A Yes, sir.

25 Q Now can you tell me how this sample amount was



mgcl8-3

1 determined?

2 \* MR. GALLO: Objection. Asked and answered.  
3 The answer to his question is set out in Answer 13 in  
4 rather graphic detail.

5 JUDGE SMITH: Well, you have raised the issue  
6 of whether on cross-examination you can ask the identical  
7 question on direct examination, and I don't know. I think  
8 he probably can.

9 MR. GALLO: It adds nothing to the record.

10 JUDGE SMITH: I don't think we ought to have  
11 very much of it.

12 MR. GALLO: I'll withdraw the objection.

13 WITNESS MC LAUGHLIN: The sampling plan of 356  
14 was broken down as follows: The first 50 were the worst  
15 welds, worst as defined from a field inspection Level III  
16 welding inspector's standpoint. It was his criteria as  
17 to what were the worst welds that were trapped in the  
18 reinspection program.

19 The second 50 were a random sample, completely  
20 random, of the discrepant welds.

21 The third 69 were highly stressed welds. The  
22 criteria for the selection was that they were highly  
23 stressed welds.

24 The remaining 187 of the 356 was in response  
25 to an NRC question about welds that were not trapped in the

mgc18-4

1 reinspection program. So there were two criteria for the  
2 third or the fourth segment, the 187. They had to be  
3 outside of the original reinspection program. They had to  
4 be by inspectors that were not trapped in the original  
5 reinspection program, and they also had to be highly  
6 stressed. They had two criteria.

7 BY MR. WRIGHT:

8 Q Okay. Now who selected the 50 worst welds?  
9 I believe you said they were Level III inspectors; is  
10 that correct?

11 A (Witness McLaughlin) Yes.

12 Q Who were those Level III inspectors?

13 A To the best of my knowledge -- again, I was  
14 not involved in this process -- but to the best of my  
15 knowledge, they were three Commonwealth Edison Company  
16 Level III inspectors.

17 Q Isn't it correct that in the first 50 welds,  
18 there were two cracked welds found?

19 A Yes.

20 Q Now do you regard a cracked weld as being one  
21 of the worst welds that you could find in a plant?

22 A If you just look at the weld, the weld itself,  
23 it's the worst you can find. But you have to make the  
24 distinction, if you have a connection with six welds and  
25 one of them is cracked, that's not as significant as a

mgcl8-5

1 connection with two welds and one of them is cracked.

2           \* So I'm not saying it isn't significant, but  
3 the location of the crack is important.

4           Q       But in answer to my question, you stated that  
5 a cracked weld is one of the worst welds that you could  
6 find in a plant; isn't that correct?

7           A       Yes, sir.

8           Q       And you also testified that the 50 worst welds  
9 were identified in the plant; is that correct?

10          A       Yes.

11          Q       You testified that in response to NRC  
12 questioning, an additon of 187 welds were added; is that  
13 correct?

14          A       Yes.

15          Q       Isn't it also correct that in athat 187 welds,  
16 there was another cracked weld found?

17          A       Yes. But you've got to remember that the 187  
18 were not in the original reinspection program. That was  
19 one of the criteria that I gave, that the 187 was in  
20 response to an NRC question about welders who were not  
21 trapped in the reinspection program, that they wanted  
22 more welders not trapped in the reinspection program. So  
23 what wasn't part of that program.

24                JUDGE COLE: It was a different population?

25                WITNESS MC LAUGHLIN: Yes. It wasn't part of

mgc18-6

1 the reinspection program.

2 \* BY MR. WRIGHT:

3 Q So the original 50 worst welds in the plant  
4 didn't include the entire plant?

5 A (Witness McLaughlin) I should clarify that.  
6 The reinspection program trapped 1986 discrepant welds.  
7 The 50 were part of the 1986. The 187 were in addition  
8 to the 1986.

9 Q Is there any data that would indicate that the  
10 356 discrepant welds that were evaluated by Sargent & Lundy  
11 were comparable to the overall population of welds in the  
12 plant by Hatfield and Hunter?

13 A I believe that the 356 is a biased sample of  
14 the welds from Hatfield & Hunger, from the standpoint  
15 that you have 50 of the worst welds, and you have 256  
16 highly stressed welds. That's a biased sample. That's  
17 not a random sample.

18 MR. GALLO: Point of clarification. The  
19 question and the answer talked about 356 welds from  
20 Hatfield and Hunter. They're only Hatfield welds.

21 Isn't that correct, Mr. McLaughlin?

22 WITNESS MC LAUGHLIN: Yes.

23 BY MR. WRIGHT:

24 Q Would your answer still be the same?

25 A (Witness McLaughlin) Yes. The answer is

mgcl8-7

1 the same, because on the Hunter welds, we dispositioned all  
2 of the weld discrepancies that were found.

3 Q And does that answer depend upon your  
4 engineering judgment?

5 A The fact that we dispositioned?

6 Q You stated that there was a bias in the  
7 selection of those welds, and you inferred that they would  
8 be representative of the Hatfield welds in the plant; is  
9 that correct?

10 A I said that they were biased. They were not  
11 a random selection of Hatfield welds. It was biased towards  
12 the worst and the most highly stressed.

13 Q In your opinion, would those 356 welds be  
14 representative of the remaining Hatfield welds in the plant?

15 A Are you just talking about the weld quality  
16 now?

17 Q Yes.

18 A Yes. It's my judgment that it's representative  
19 of the rest of the population of Hatfield welds.

20 JUDGE COLE: Wait a minute. I thought you said  
21 it was a biased sample, and they were the worst.

22 WITNESS MC LAUGHLIN: He's only talking about  
23 the quality of the weld now. It was biased from the  
24 standpoint that it was highly stressed. But whether the  
25 weld is highly stressed, that doesn't affect the quality

mgc18-8 1

2 of the weld. It affects, if you do an evaluation, the  
3 difficulty of getting it to pass the evaluation. The  
4 weld doesn't know it's highly stressed from a quality  
5 standpoint.

6 JUDGE SMITH: Okay. But were not these  
7 highly stressed welds also discrepant.

8 WITNESS MC LAUGHLIN: That's all we've been  
9 talking about.

10 JUDGE SMITH: Discrepant welds.

11 WITNESS MC LAUGHLIN: Yes, they're all discrepant.  
12 All the welds we are talking about were picked from the  
13 discrepant population, all 356.

14 JUDGE SMITH: All of the welds from Hatfield  
15 are discrepant?

16 WITNESS MC LAUGHLIN. Right -- no -- the 356  
17 that we evaluated, we're talking now about the welds  
18 that were detailed out and an engineering evaluation was  
19 done. There were 26,000 Hatfield welds in the program  
20 that were inspected.

21 JUDGE COLE: His question had to do with the  
22 26,000, as I understood it.

23 JUDGE SMITH: The transcript will demonstrate  
24 that his question did not limit the population to  
25 discrepant welds. So I think it's been clarified, but I  
think you'd better do it again.

mgc18-9

1 BY MR. WRIGHT:

2 Q \* Again, my question is with respect to those  
3 Hatfield welds.

4 JUDGE SMITH: Which Hatfield welds?

5 MR. WRIGHT: The 356 Hatfield welds.

6 BY MR. WRIGHT:

7 Q Is it your engineering judgment that those  
8 welds are representative of the totality of Hatfield welds  
9 at the plant?10 A (Witness McLaughlin) Oh, I understand now.  
11 No, they don't. Those are all discrepant  
12 welds.13 End 18  
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1 Q Is it your judgment that those welds are  
2 representative of the discrepant Hatfield welds in the plant?

3 A Yes. From a weld quality standpoint, that's  
4 what we're talking about, discrepancies in the welds from  
5 the weld quality standpoint.

6 Q Okay, you testified that on page 12 you  
7 re-examined the seismic load and did a more detailed analysis,  
8 isn't that correct?

9 A Yes, sir.

10 Q Now would you explain for us what that detailed  
11 analysis is?

12 A In the design of a nuclear power plant, it is  
13 industry practice to use a response spectra type analysis  
14 for the design of structures which would include cable trays,  
15 conduit hangers. Because of the nature of the analysis,  
16 it is a conservative analysis because it's a bounding analysis.  
17 It has to cover all the peaks. You have to widen the peaks.

18 That is done to save computer time, to save  
19 engineering time. When you do a re-evaluation program like  
20 this, you have the capability of going back and doing a  
21 time history analysis, which is a more exact seismic analysis  
22 and it will yield you more accurate seismic loading.

23 Q And if you had done the normal seismic analysis,  
24 would you have used a different allowable stress than you  
25 got in the history?



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1           A     The allowable stress has nothing to do with the  
2 analysis you used.

3           Q     Would you have used a different factor for your  
4 seismic stress?

5           A     No.

6           Q     Now, you stated that there were computer programs  
7 associated with this time history analysis?

8           A     Yes.

9           Q     Did you actually, yourself, did you run a computer  
10 program?

11          A     No.

12          Q     Do you know what elements are involved in this  
13 computer program?

14          A     Yes.

15          Q     Could you explain what they are?

16          A     Yes, the computer program that was used for the  
17 time history analysis is PIPYS, which is a general  
18 structural dynamic finite element program, which you input  
19 the time history motion. You input the properties of  
20 the structure or cable tray, or whatever it is you are  
21 evaluating.

22                     The program will then give you the seismic forces  
23 that the engineer uses to evaluate the structure or cable  
24 tray or conduit.

25          Q     You testified that 69 of the welds that you found

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1 were highly stressed welds, is that correct?

2 A No.

3 Q Well, would you tell us exactly what those 69  
4 welds, that were selected, were?

5 A What I said -- it's not the welds that we found.  
6 We had a population of 1986 discrepant welds. We looked,  
7 in our calculations, through the 1986 welds that were  
8 discrepant. We started out with discrepant welds. We looked  
9 for 69 out of those 1986 that were highly stressed and  
10 we then asked for weld maps of those 69 highly discrepant --  
11 of those 69 discrepant welds that were highly stressed.

12 Q Now is it correct that that was Sargent & Lundy  
13 people who actually selected those 69 highly stressed welds?

14 A We had to go through our calculations to see  
15 which ones were highly stressed.

16 Q Did you -- how many were actually highly stressed?

17 A All 69.

18 Q There were no other highly stressed welds within  
19 that population, within the reinspection program?

20 A Yes, we had 187 more.

21 Q And they were added by the NRC questions?

22 A Yes.

23 Q And that 187 and that 69 was the total amount  
24 of highly stressed welds?

25 A No, there was more highly stressed welds. We had

1 a certain population size that we were asked to look at.

2 Q So there were a number of highly stressed welds  
3 that you never looked at, isn't that correct?

4 A Some highly stressed welds.

5 Q Do you know how many that number is?

6 A No.

7 Q Mr. McLaughlin, isn't it true that the inspection  
8 program was initially -- was not initially designed to assure  
9 plant safety?

10 MR. GALLO: Objection. Testimony is clear that  
11 the reinspection program was designed to deal, in the first  
12 instance, with inspector qualification.

13 JUDGE SMITH: That may very well be, but I don't  
14 understand the basis for your objection.

15 MR. GALLO: That mischaracterizes the testimony  
16 of the previous witness, unless he's testing this witness's  
17 knowledge with this question.

18 MR. WRIGHT: I asked him whether or not it went  
19 to plant safety? He's indicated --

20 MR. GALLO: I'll object again on the grounds  
21 that plant safety is a vague term and has no meaning and  
22 the witness can't deal with "plant safety."

23 MR. WRIGHT: Then I'll rephrase my question,  
24 Your Honor.

25

1 BY MR. WRIGHT:

2 Q , Isn't it true that the reinspection program was  
3 not initially designed to assure work quality?

4 A (Witness McLaughlin) Yes.

5 Q Who made the decision that this plant would also  
6 speak to work quality?

7 A Commonwealth Edison Company.

8 Q At what point did they make this decision?

9 A I wasn't involved in the reinspection program.  
10 I don't know when that decision was made.

11 Q At what time frame was Sargent & Lundy brought  
12 in to do the engineering calculations, to justify plant  
13 quality?

14 A I can give you an educated guess on that. The  
15 original report went in in February and it contained  
16 evaluations of the discrepancies that were found. So I  
17 would assume it would be in the time frame from August of  
18 '83 to February of '84.

19 Q You testified that the cracked weld that was found  
20 in that group of 187 -- well, you testified that there was  
21 a cracked weld, is that correct?

22 A Yes.

23 Q Now could you give me the details on that weld,  
24 where it was located? In what piece of equipment?

25 A That cracked weld was a cable tray hold down weld.

1 It was a weld between the cable tray and the support for the  
2 cable tray. It would be one of the welds shown as one of  
3 the figures in my exhibit. It's exhibit -- Figure 1 is  
4 the weld noted connection 3. It's the hold down weld from  
5 the cable tray to the cable tray support.

6 Q Now, when you found that cracked weld, did you  
7 repair it?

8 MR. GALLO: Objection. The testimony of this  
9 witness is clear that he is a member of an engineering firm  
10 and they evaluate discrepancies. That was his job. He's  
11 not in the business of repairing matters. I think it's  
12 apparently, from the testimony that the question is  
13 improper.

14 MR. WRIGHT: I'll withdraw my question.

15 BY MR. WRIGHT:

16 Q Did you evaluate why it was cracked initially?

17 A (Witness McLaughlin) Sargent & Lundy's expertise  
18 is not in field inspection, and items of that nature.  
19 I have an opinion, as to why it's cracked, but that's not my  
20 area of expertise. I'll give you my opinion, if you want.

21 Q Please do.

22 A It's a very difficult weld to make. It's an  
23 overhead weld. It is too -- cable tray material is thin  
24 material. It's just a very difficult weld to make.

25 Q What was Sargent & Lundy's recommendation or

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1 evaluation regarding that weld?

2 A , Our evaluation was that the cracked weld did not  
3 create design significance. It was only one of several welds,  
4 cable tray hold down welds, in the cable tray systems. So  
5 the failure of one weld where you have multiple welds  
6 supporting the cable tray does not influence the design  
7 significance.

8 Q So is it your testimony that you evaluated each  
9 weld on its own and not with respect to the whole system?

10 MR. GALLO: Objection. The question is vague,  
11 to be unintelligible. He evaluated each weld on his own?  
12 I don't understand that. I'm sure the witness doesn't either.

13 MR. WRIGHT: I'll withdraw that question.

14 BY MR. WRIGHT:

15 Q Did you evaluate the other welds on that tray?

16 MR. GALLO: For purposes of evaluating the  
17 significance of the cracked weld? He only evaluated discrepant  
18 welds, as I understand it, Judge Smith. I don't know why  
19 he would evaluate the other welds, unless they were also  
20 discrepant welds.

21 BY MR. WRIGHT:

22 Q Did you evaluate the other welds in that tray for  
23 other possible discrepant conditions?

24 A (Witness McLaughlin) Can I tell you what we did  
25 do, and maybe that will answer your question?

1 Q Please, why don't you tell us what you did?

2 A When we received a cracked weld, what we'd do is  
3 we assume that that weld is not there. It has no strength.  
4 It's as though they forgot to put the weld in. We then take  
5 -- we take the cable tray. We take the supports and we  
6 put the loadings on the cable tray and the supports and we  
7 evaluate the remaining welds to see whether they are over-  
8 stressed because more load goes to the remaining weld.

9 So from the standpoint, did we evaluate the  
10 remaining welds, the answer is yes because the lack of that  
11 weld will increase the stress in the other welds.

12 Q And in so doing that evaluation, did Sargent &  
13 Lundy assume that there were no other defects in the remaining  
14 three welds?

15 A We didn't assume that. We checked the discrepancy  
16 reports to assure ourselves that there were no discrepancies  
17 in the other welds that this load got transferred to.

18 Q And what discrepancy reports did you review?

19 A The 1986 discrepancy reports that we received as a  
20 result of the reinspection program.

21 Q Do you know that the other three welds on that  
22 cable tray were within the population of welds that were  
23 inspected in the reinspection report?

24 MR. GALLO: Objection. I don't know that it's  
25 been established that there were only three other welds in

1 that cable tray.

2 MR. WRIGHT: He said there were three welds.

3 MR. GALLO: Perhaps I missed it.

4 JUDGE SMITH: I think you did.

5 WITNESS MC LAUGHLIN: What we did is exactly  
6 what I told you we did. We went to the discrepancy reports  
7 to assure ourselves that the welds that were receiving  
8 additional load because of the lack of this one weld were  
9 not in the 1986 discrepancies. That was all we could do.

10 BY MR. WRIGHT:

11 Q So it's very possible that the other three welds  
12 were not captured within the reinspection program, so therefore  
13 they wouldn't even appear in the discrepancy reports?

14 A That's possible.

15 Q That's possible?

16 A It's possible. It's also possible --

17 Q Did Sargent --

18 MR. GALLO: Let the witness finish his answer.

19 WITNESS MC LAUGHLIN: But it's also possible that  
20 they had no discrepancy.

21 BY MR. WRIGHT:

22 Q That's possible, but did Sargent & Lundy actually  
23 check or did Sargent & Lundy ask that the contractors check?

24 A (Witness McLaughlin) I told you exactly what we  
25 did. We looked at the 1986 discrepant welds to assure



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1 ourselves that the welds that this load got transferred to  
2 were not in the discrepancy report.

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1 Q Mr. McLaughlin, is that the method that you  
2 used each time you found a cracked weld?

3 A Yes. You have to realize that all these welds  
4 have been inspected. We are not talking about uninspected  
5 welds. We are talking about welds that have all been  
6 inspected. We would infer that if there were discrepancies  
7 in them, that we would know about them.

8 Q Weren't the cracked welds inspected initially?

9 A Yes.

10 Q Now, Mr. McLaughlin, how many Hunter welds did  
11 Sargent & Lundy evaluate that had a capacity reduction of  
12 over 10 percent?

13 MR. GALLO: Are we talking about discrepant  
14 Hunter welds?

15 MR. WRIGHT: I'll take that modification,  
16 Counsel.

17 WITNESS MC LAUGHLIN: Would you repeat the  
18 question, please?

19 BY MR. WRIGHT:

20 Q How many discrepant Hunter welds, did Sargent &  
21 Lundy evaluate that had a strength reduction of over 10  
22 percent?

23 A (Witness McLaughlin) 23.

24 Q Now as to the 23 welds that had a capacity  
25 reduction of 10 percent, did you evaluate those having no

mgc20-2

1 design or safety significance?

2 A \* We evaluated those 23 discrepant welds as having  
3 no design significance.

4 Q As having no design significance. Is that  
5 your testimony?

6 A Yes.

7 Q Did you not do an evaluation on safety  
8 significance?

9 A Safety significance is a lower level than  
10 design significance -- I'm sorry -- design significance  
11 is a lower level than safety significance. If you don't  
12 exceed design significance, there is no safety  
13 significance. So we never got past design significance.

14 Q Now in that population of 23 welds, were there  
15 welds that had a strength reduction over 15 percent?

16 A Yes.

17 Q Were there welds that had a strength reduction  
18 of over 20 percent?

19 A Yes.

20 Q Were there welds that had a strength reduction  
21 of over 50 percent?

22 A I'm trying to remember the worst reduction.  
23 I gather that would be what you would like to know.

24 Q Can you remember the worst reduction?

25 A I think the worst weld reduction was in the

mgc20-3

1 order of magnitude of 70 percent for Hunter. But I would  
2 also like to say that the interaction for that weld  
3 reduction was approximately 15 percent, which means that  
4 with the 70 percent strength reduction, we were still only  
5 approximately 50 percent stressed for that connection.

6 Q And it was your testimony that these reductions  
7 of at least 70 percent in strength had no design  
8 significance; is that correct?

9 A For the reason that I just told you, if the weld  
10 was only stressed to half of its capacity, it doesn't  
11 have any design significance.

12 Q Now how many of the discrepant Hatfield welds  
13 had a capacity reduction of over 10 percent?

14 A 186.

15 Q And where there welds that had a capacity  
16 reduction of over 50 percent?

17 A We had the cracked welds in the Hatfield  
18 population, so that, yes, we had.

19 Q What would be your worst case situation with  
20 respect to discrepant Hatfield welds?

21 A The worst case would be approximately a 90  
22 percent reduction. But again, the weld was evaluated,  
23 and it had no design significance. It did not exceed for  
24 the rest of the welds in that connection -- it did not  
25 exceed their allowable stresses.

mgc20-4

1 Q So it was your opinion -- strike that.

2 \* In Sargent & Lundy's evaluation, the Hatfield  
3 weld with over 90 percent reduction in strength had no  
4 design significance; is that correct?

5 A Yes, sir.

6 Q Do you remember when I asked you that question --  
7 do you remember the deposition?

8 A Yes.

9 Q Do you remember when I asked you that question?

10 A Yes.

11 Q Do you remember what your answer was as the  
12 worst case?

13 MR. GALLO: I don't remember. Where was it in  
14 the deposition?

15 WITNESS MR. MC LAUGHLIN: I think what you're  
16 referring to --

17 MR. WRIGHT: Page 55-56.

18 MR. GALLO: Thank you.

19 BY MR. WRIGHT

20 Q If you will look at page 56 of your deposition,  
21 the question, Line 13, was: "Were there any that had  
22 100 percent reduction?"

23 And what was your answer?

24 A (Witness McLaughlin) "Yes." Could I explain  
25 that?

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Q Please.

A \* If you are looking at -- if you are just looking at a weld all by itself, a cracked weld has 100 percent reduction.

Do you follow what I said? 100 percent?

When we calculated the numbers that I have given you, we have calculated the strength of the other welds, the impact of that weld on the connection.

Q And your calculation of the other welds would have been pursuant to the same methodology that you testified to earlier?

A Yes, sir.

Q That you were not sure that those welds might have been in the reinspection program in the first instance?

MR. GALLO: Objection. I don't know what that question has to do with methodology. It's mischaracterizing the witness' testimony. The witness' testimony explained the calculation or process that was used to evaluate the discrepancies.

JUDGE SMITH: I thought the question was clear to me. I think he is referring to assumed absence or strength reduction determine the stress on the other supporting welds, determine whether they were included in the discrepant group, and arrived at the conclusion of -- with respect to design significance.

mgc20-6

1 Is that what you had in mind?

2 \* MR. WRIGHT: Yes.

3 JUDGE SMITH: Is that what you understood the  
4 question to be?

5 WITNESS MC LAUGHLIN: Yes, sir.

6 JUDGE SMITH: Overruled.

7 WITNESS MC LAUGHLIN: The design process for  
8 these welds was the same as the design process that I  
9 previously described.

10 JUDGE SMITH: Let me ask a question for  
11 clarification.

12 Did you say that you assumed that the cracked  
13 welds were 100 percent reduction?

14 WITNESS MC LAUGHLIN: Yes, sir.

15 JUDGE SMITH: Other welds, you actually  
16 determined as close as possible the actual strength  
17 reduction?

18 WITNESS MC LAUGHLIN: Yes, sir.

19 JUDGE SMITH: Although a cracked weld may  
20 actually have something less than 100 percent?

21 WITNESS MC LAUGHLIN: Yes, sir.

22 BY MR. WRIGHT:

23 Q Now, Mr. McLaughlin, is this an accurate  
24 definition of design margin?

25 Design margin is the difference between the

mgc20-7

1 allowable stress by code used in the design and the actual  
2 stress due to the load.

3 A (Witness McLaughlin) Could you repeat that  
4 definition?

5 Q Design margin is the difference between the  
6 allowable stress by code used in a design and the actual  
7 stress due to the load?

8 A Design margin?

9 Q Yes.

10 A You are asking me about design margin. That  
11 appears to be -- I rarely see it written down and study  
12 it, but it appears to be -- the actual stress and the  
13 allowable stress?

14 Unless you're trying to trick me, it sounds  
15 like it.

16 Q I wouldn't try to trick you, Mr. McLaughlin.

17 MR. CASSEL: The Judge wouldn't let us. He  
18 already ruled we can't trick any witnesses in this case.  
19 And we've proved that.

20 BY MR. WRIGHT:

21 Q Now you didn't exceed any allowable stresses  
22 in your engineering evaluations; is that correct?

23 A (Witness McLaughlin) Yes.

24 Q It's correct that you did not exceed any  
25 allowable stresses?



mgc20-8

1 A Yes.

2 Q \* Are those allowable stresses by code?

3 A The basic code that we're talking about in  
4 most of the discussion we've had is the AISC Code,  
5 American Institute of Steel Construction. The AISC Code  
6 does not address allowable stresses or for nuclear plants,  
7 seismic loadings. So you have to go outside of the code  
8 to establish allowable stresses for nuclear plant seismic  
9 loading. This is done through regulatory positions that  
10 the NRC takes, Standard Review Guides that the NRC  
11 publishes, and the controlling document for the allowable  
12 stresses when you use seismic loading on a nuclear power  
13 plant is the FSAR, the Final Safety Analysis Report.

14 So the answer to your question is, you can't  
15 use AISC for seismic loading on nuclear power plants.

16 Q But the AISC would be -- if you will -- the  
17 modified code for nuclear power plants would be contained  
18 in the FSAR?

19 A Yes.

20 Q And you did not exceed those allowable stresses  
21 in the FSAR; is that your testimony?

22 A Yes.

23 Q With respect to those welds that are governed  
24 by the AWS Code, is it your testimony that you did not  
25 exceed the allowable stress per code?

mgc20-9

1 A Yes.

2 Q \* Is there an allowable overstress for safe  
3 shutdown earthquake conditions?

4 A You're getting into terminology that nobody  
5 is going to understand.

6 Q Will you explain it for us?

7 A Let me try to explain. The AISC Code gives  
8 allowable stresses for -- if this building were steel.  
9 So basically what you have to do is, you have to apply  
10 multipliers to the stresses that are given in the code to  
11 get them up to allowables when you design for the safe  
12 shutdown earthquake. Our multiplier would be approximately  
13 1.6 times the AISC allowable, but not to exceed .95 of  
14 the yield strength of the material.

15 Q Now would that be a code that you would have  
16 submitted to the NRC and would be contained in the FSAR?

17 A Yes.

18 Q Is there any other allowable overstress for  
19 earthquake conditions?

20 A I don't know what you mean.

21 Q Is there an operating earthquake condition?

22 A Yes.

23 Q And what would that allowable overstress be?

24 A AISC allowable. You're not allowed to exceed  
25 the AISC allowable for the operating basis earthquake.

mqc20-10 1

Q And what would that factor be?

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A 1.0

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JUDGE SMITH: Isn't there a regulatory relationship between the operating earthquake and the safe shutdown?

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WITNESS MC LAUGHLIN: In the design, again, of a structure like this, if you were designing a structure like this for seismic loading, the AISC code allows you to take 1.33 times the allowable for seismic.

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When you design a nuclear power plant, you're not allowed to use that 1.33. You have to go back to the normal allowable state. You're not allowed to increase it at all.

End 20 14

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1 BY MR. WRIGHT:

2 Q Is there a different value for design basis  
3 earthquake?

4 A (Witness McLaughlin) We only have the operating  
5 basis and safe shutdown earthquake.

6 Q So those values would be 1.0 and 1.6, is that  
7 correct?

8 A Yes.

9 Q And that's contained in the FSAR?

10 A Yes.

11 Q And you would not have exceeded those values,  
12 is that correct?

13 A Yes.

14 Q Now are there any other overstress factors allowed  
15 by the FSAR on code requirements?

16 MR. GALLO: Objection. The question is too vague  
17 and general to permit an answer. Codes are not defined and  
18 overstresses are not defined.

19 MR. WRIGHT: He's been answering the question  
20 all along.

21 MR. GALLO: But you're going to broaden it --  
22 you have now broadened it to any other code in the FSAR.

23 JUDGE SMITH: Can you answer the question?

24 WITNESS MC LAUGHLIN: I don't know where you're  
25 leading to.

1 JUDGE SMITH: Sustained.

2 BY MR. WRIGHT:

3 Q Is there an overstress factor for wind?

4 A (Witness McLaughlin) You're talking about tornado  
5 wind or normal?

6 Q Tornado wind.

7 A Yes, there is an overstress factor for tornado  
8 wind.

9 Q What would that value be?

10 MR. GALLO: Objection, irrelevant.

11 (Board conferring.)

12 JUDGE SMITH: Overruled. We won't allow very much  
13 inquiry along this line, but a limited amount. Do you have  
14 the question?

15 WITNESS MC LAUGHLIN: What's the allowable  
16 overstress for tornado wind?

17 BY MR. WRIGHT:

18 Q Yes.

19 A (Witness McLaughlin) You realize the structures  
20 we're talking about are concrete structures. When we're  
21 talking about tornado wind loading, but basically the  
22 order of magnitude of the overstress would be approximately  
23 1.6.

24 Q 1.6. Is the turbine building at the Byron plant  
25 concrete?

1 MR. GALLO: Objection, irrelevant.

2 MR. WRIGHT: He stated all the structures were  
3 concrete. There's a turbine building at the Byron plant.  
4 It's very relevant.

5 MR. GALLO: I see no connection, no foundation  
6 laid.

7 MR. WRIGHT: I'm laying the foundation, Judge.

8 JUDGE SMITH: You're not laying any foundation  
9 that is going to add anything to the record, in the case  
10 here. We are not going to --

11 MR. WRIGHT: Your Honor, the witness has testified  
12 that in no situation have they exceeded code designs.

13 JUDGE SMITH: Do you have some in mind that he  
14 may have exceeded? Ask him. We're not going to design a  
15 nuclear power plant in this hearing.

16 MR. WRIGHT: I've asked two that I think they have  
17 exceeded and I have others that I would like to add.

18 JUDGE SMITH: Go directly to them.

19 MR. WRIGHT: I'll go directly to them.

20 BY MR. WRIGHT:

21 Q Mr. McLaughlin, is there an overstress factor for  
22 as-built conditions?

23 MR. GALLO: Of what?

24 JUDGE SMITH: "As-built."  
25

1 BY MR. WRIGHT:

2 Q As-built conditions.

3 A (Witness McLaughlin) Could you expand on that  
4 a little please?

5 Q In the engineering calculations that were  
6 performed, with respect to the reinspection program, was  
7 there an overstress factor for as-built condition?

8 MR. GALLO: Objection. Are we talking about  
9 the connections that were the subject of the discrepant  
10 welds, which were evaluated by Mr. McLaughlin?

11 MR. WRIGHT: Weren't only discrepant welds  
12 evaluated in the reinspection program, or were there others?

13 MR. GALLO: No, there were other discrepancies  
14 re-evaluated.

15 JUDGE SMITH: I have assumed that all of these  
16 questions have relevance to discrepant welds.

17 MR. WRIGHT: They do have relevance.

18 WITNESS MC LAUGHLIN: Am I supposed to answer?

19 MR. GALLO: Do you have the question?

20 WITNESS MC LAUGHLIN: Could you ask the question  
21 again?

22 BY MR. WRIGHT:

23 Q My question is in the engineering evaluations  
24 performed by Sargent & Lundy, with respect to discrepant  
25 conditions in the reinspection program, was there an

211b5

1       overstress factor for as-built conditions?

2             A   (Witness McLaughlin) Let me answer what I think  
3       you're getting at.  If that's not it, you can tell me.

4             We have a normal design practice which is  
5       included in our design documents, our design criteria,  
6       for the plant, which states that in the original design of  
7       a plant, there will be no overstress allowed, when you  
8       are originally designing a structural component or a cable  
9       tray or whatever it is.

10            We also have a provision in that criteria, and  
11       this is not just for the reinspection program, this is for  
12       normal plant design.  If, after the original design is  
13       completed and something changes, loads go up, you get a  
14       non-conforming report, we have a provision where we go back  
15       and look at the certified mill test reports, and  
16       we allow the allowable stresses -- if the yield strength of  
17       the material that we are using is 10 percent higher, we will  
18       allow -- we indicate that they should increase their allowable  
19       stresses by that 10 percent.  They can't go past 10 percent.  
20       If the yield strength of the material goes up 15 percent, they're  
21       still only allowed to go to the 10 percent increases in the  
22       allowable stresses -- not the allowable, but the yield  
23       strength of the material.  They're allowed to increase the  
24       yield strength of the material.

25            I believe that's what you are --



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1 Q Yes, that is pretty much what I gave you. You  
2 stated that you didn't exceed the allowable stresses, as  
3 allowed by the code, is that correct?

4 A Yes.

5 Q And 1.0 is that factor, is that correct?

6 A Correct.

7 Q So if you went to a .95, that would have exceeded  
8 that factor?

9 A No. What we did is we used the actual yield  
10 strength of the material. The .95 is times the yield strength  
11 of the material. If the yield strength of the material goes  
12 up 10 percent, then your allowable stress goes up 10 percent.

13 Q And is that identified on the engineering calcula-  
14 tions?

15 A No. We have a design standard. It's identified  
16 in the design standards. It's a design standard that each  
17 engineer has.

18 Q And that's also identified in the FSAR?

19 A I believe it is. I'm not positive about that, but  
20 we have been audited on that by the NRC and they found that  
21 to be an acceptable design practice.

22 JUDGE SMITH: Let's take our mid-afternoon break.  
23 10 minutes, please.

24 (Recess.)

25

nd21

mgc22-1

1 MR. WRIGHT: Your Honor, at this time I would  
2 like to pass around a copy of a Sargent & Lundy document.  
3 I would represent that this is a copy of a document used  
4 in the Sargent & Lundy reinspection program. It was  
5 provided to our expert witness in discovery.

6 I would like to mark this as Exhibit No. R-9.

7 MR. CASSEL: This is 9. Our first attempt  
8 at 9 didn't make it.

9 (The document referred to  
10 was marked Intervenors'  
11 Exhibit No. R-9 for  
12 identification.)

13 BY MR. WRIGHT:

14 Q Mr. McLaughlin, do you recognize this as  
15 being one of the documents contained in those that were  
16 submitted to our expert witness by Sargent & Lundy?

17 A (Witness McLaughlin) I have no way of knowing.  
18 I have no basis for saying it wasn't.

19 Q You did review the calculations and the  
20 documents and the reinspection report by Sargent & Lundy.  
21 Did you testify to that?

22 A Yes.

23 MR. GALLO: I'm going to object at this point.  
24 I am going to object to any further questions based on  
25 R-9 until we know what -- who the contractor was that this

mgc22-2

1 evaluation applies to and the nature of the weld  
2 discrepancy -- not the nature of the weld discrepancy,  
3 but the name of the contractor that this evaluation applies  
4 to.

5 BY MR. WRIGHT:

6 Q Mr. McLaughlin, have you ever seen this document  
7 before?

8 A (Witness McLaughlin) I can't say that I have  
9 or I haven't. As I pointed out, --

10 MR. GALLO: Wait a minute. I've got an  
11 objection on the table. Apparently this was obtained by  
12 Intervenor's expert during the course of discovery -- during  
13 the course of time he was looking at Sargent & Lundy  
14 documents. If the knowledge in the questions I've asked is  
15 peculiarly within the knowledge of Intervenor's, then they  
16 should tell us which contractor this evaluation document  
17 applies to.

18 MR. WRIGHT: Your Honor, our indication is  
19 that it would belong to Hatfield, because it is control  
20 of an instrument line. Other than that, we would have  
21 no other knowledge. This was submitted to us in a discovery  
22 request, and on the face of the document, it didn't  
23 indicate what contractor it belonged to.

24 MR. GALLO: It was obviously taken, Your Honor,  
25 from one or more documents. There's a staple mark indicated

mgc22-3

1 on my copy, at least.

2 \* MR. WRIGHT: Your Honor, that staple -- I had  
3 a bunch of articles stapled together that I was going to  
4 present as exhibits. We merely took the first one off  
5 to start in an orderly fashion.

6 It merely contains general statements that  
7 would be applicable to any of the contractors, and we  
8 would merely ask that the witness identify that this is  
9 such.

10 JUDGE SMITH: I suspect the least of your  
11 problems is going to be the one that is raised by Mr. Gallo,  
12 as I judge by the witness' response that he doesn't know  
13 if he ever saw this document before.

14 However, based upon your preliminary reported  
15 description of the document, I will allow you to proceed.

16 BY MR. WRIGHT:

17 Q Mr. McLaughlin, this document addresses what  
18 is defined as a weld ratio. Is that your understanding  
19 of this document?

20 A (Witness McLaughlin) Can I make a comment?

21 Q Will you make a comment for us?

22 A This document indicates that it refers to  
23 M-5000 Series drawings, which would indicate that it was  
24 a mechanical contractor, not an electrical contractor.  
25 And I'm not sure that this was part of the reinspection

mgc22-4

1 and the documents that I reviewed for Hatfield and Hunter.

2 Q \* The project number is 4391/4392.

3 A It could be any one of the other contractors.

4 MR. GALLO: I'm going to object to any other  
5 questions based on this document, based on information  
6 that Mr. Wright is seeking to be furnished by the witness.

7 He's stated that he can tell by looking at  
8 this document that it deals with a mechanical contractor,  
9 and Hatfield Electric was an electrical contractor. So  
10 obviously this document is irrelevant to the Hatfield weld  
11 discrepancy evaluation.

12 JUDGE SMITH: Not obviously. It's quite possible,  
13 but not obviously. It could have general implications on  
14 weld design calculations. But I don't know.

15 I guess my problem is, this is awfully late  
16 in the day to be finding out about documents. There was  
17 a discovery period, and now we're groping around to find  
18 out what this document means, what possible relevance  
19 it has, and the hearing room is not the time or place  
20 for that.

21 MR. WRIGHT: Your Honor, I would simply want  
22 to establish what Sargent & Lundy's definition of the  
23 weld ratio is.

24 JUDGE SMITH: Why don't you ask him? We don't  
25 have to mess around with the document.

mgc22-5

1 BY MR. WRIGHT:

2 Q Mr. McLaughlin, would you agree that a weld  
3 ratio is equivalent to allowable load over the design load?

4 A (Witness McLaughlin) In my testimony, I don't  
5 use the word "weld ratio."

6 Q Will you define what a weld ratio is?

7 MR. GALLO: I am going to object again. If  
8 this is a mechanical contractor, the weld ratio being  
9 referred to is perhaps dealing with ASME Code requirements,  
10 which is outside the scope of Mr. McLaughlin's direct  
11 testimony.

12 JUDGE SMITH: I think he was following my  
13 suggestion that he pursue his line of questioning  
14 independent of the document.

15 MR. GALLO: I stand corrected, Your Honor.  
16 I will just object to the question on the same grounds.  
17 If you follow the question, you'll see that all he did  
18 was read what's written on the document and frame it as  
19 a question.

20 JUDGE SMITH: I don't care where he got the  
21 question. If the question is relevant and within the scope  
22 of the direct testimony, he can ask it.

23 WITNESS MC LAUGHLIN: Weld ratio is not a  
24 terminology that the structural people involved in this  
25 work would use. Interreaction is the term they would

mgc22-6

1 use. Percent reduction in capacity was used weld ratio  
2 is not a term --

3 JUDGE SMITH: Then it is not a term that is  
4 within the scope of your direct testimony?

5 WITNESS MC LAUGHLIN: That's right.

6 JUDGE SMITH: On that basis, I don't believe  
7 you should be allowed to continue.

8 MR. WRIGHT: Judge, he stated that he reviewed  
9 all Sargent & Lundy material with respect to the  
10 reinspection program.

11 MR. GALLO: He did not testify to that effect.

12 BY MR. WRIGHT:

13 Q Mr. McLaughlin, did you testify --

14 MR. GALLO: Wait a minute. He testified quite  
15 clearly, Your Honor, that he reviewed the discrepancy  
16 evaluations that were performed by Sargent & Lundy with  
17 respect to welds of Hatfield under the AWS Code and welds  
18 of Hunter under the AWS Code.

19 JUDGE SMITH: That's consistent with his  
20 written testimony, and as far as I know, there has been  
21 nothing inconsistent in his oral testimony.

22 BY MR. WRIGHT:

23 Q Mr. McLaughlin, did you state -- did you  
24 testify that Sargent & Lundy evaluated all the critically  
25 stressed welds for Hunter and Hatfield in the reinspection

mgc22-7

1 program?

2 A (Witness McLaughlin) What I stated was that  
3 I looked at the AWS welds, the AWS discrepant welds of  
4 Hatfield and Hunter.

5 JUDGE SMITH: And some were selected on the  
6 basis of being highly stressed.

7 WITNESS MC LAUGHLIN: Yes.

8 BY MR. WRIGHT:

9 Q I would address a question to the panel, since  
10 there are members of the panel who use ASME.

11 Do you use weld ratios? Any member of the  
12 panel may respond.

13 A (Witness Branch) I've never heard of the term.

14 Q Are you familiar with the concept of allowable  
15 stress over design stress?

16 A I've never used it.

17 Q Do you use a comparable term?

18 A That has no meaning to me.

19 Q Are you -- and this is addressed to any member  
20 of the panel -- familiar with Mark Robinson, an employee  
21 of Sargent & Lundy?

22 A (Witness McLaughlin) No.

23 A (Witness Branch) No.

24 Q Are you familiar with J. Musett of Sargent &  
25 Lundy?



mgc22-8

1 A (Witness McLaughlin) How do you spell the  
2 last name?

3 Q M U S E T T (spelling).

4 A (Witness Branch) No.

5 MR. CASSEL: It's basically the handwritten  
6 name in the upper righthand corner of this document under  
7 the "Approval" column.

8 WITNESS MC LAUGHLIN: I can't read the name  
9 under the "Approval" column.

10 BY MR. WRIGHT:

11 Q Mr. McLaughlin, do these project numbers  
12 indicate that this document came from the reinspection  
13 number?

14 A (Witness McLaughlin) Those project numbers  
15 indicate that this is work from Byron. It doesn't  
16 necessarily mean it was part of the reinspection program.

17 Q Are there any numbers that would indicate  
18 that it was part of the reinspection program?

19 A I don't think so.

20 Q Would any member of the panel know if there  
21 were any numbers that would indicate that these documents  
22 are part of the reinspection program?

23 MR. GALLO: Objection. This line of  
24 questioning is immaterial to the proceeding in this  
25 case. He is conducting discovery, essentially.

mgc22-9

1 JUDGE SMITH: That's right. We lapsed back  
2 into the use of the document when you told you weren't  
3 permitted to use it.

4 Excuse me. Now you have changed, and you have  
5 addressed the questions to the entire panel?

6 MR. WRIGHT: Yes.

7 JUDGE SMITH: I lost that nuance.

8 MR. CASSEL: Judge, we're at somewhat of a  
9 disadvantage here.

10 JUDGE SMITH: Pass that around.

11 You've already looked at it, and none of  
12 you can identify it?

13 Forget the document.

14 MR. CASSEL: We asked our expert to review  
15 documents relating to the reinspection program. They  
16 are purportedly produced for his review, and then it  
17 seems that no one in the Sargent & Lundy panel that is  
18 called as witnesses even knows what the documents are  
19 or any way to identify them as having come from the  
20 reinspection program.

21 You may have to call someone as a witness and  
22 ask him, what are the documents that you made available  
23 to us in response to our request to have our expert  
24 review the reinspection program documents.

25 He certainly can't identify them. He just

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received them from Sargent & Lundy.

2           \* JUDGE SMITH: If you succeed in getting  
3 somebody to identify this document, what are you going  
4 to use it for?

5           I'm telling you, it's too late for discovery  
6 in this case.

7           MR. CASSEL: This document doesn't need to be  
8 used. We are just looking at a definition that is used  
9 on other calculations which we have. But nobody on the  
10 panel has ever heard of the term.

11          JUDGE SMITH: I'd begin to wonder about it.

12          MR. CASSEL: I'm beginning to wonder about it,  
13 Judge, but it seems to me --

14          JUDGE SMITH: As a matter of fact, you're  
15 seeing a mystery here. I see no mystery. If the term  
16 were so well-known by everybody, why would the author  
17 of this document have to state what he meant by weld ratio?  
18 Obviously, it's an anomalous use of anomalous term. I don't  
19 think you're going anyplace.

20                 See, there at the bottom, his asterisk?  
21 Apparently the term is so out of the ordinary that here  
22 is an ordinary working document, and he had to invent  
23 a term, and he had to explain what the term means.

24                 BY MR. WRIGHT:

25                 Q       Mr. McLaughlin, is it true that when you build

mgc22-11

1 to code, you build to the allowable stress over your  
2 design stress?

3 MR. GALLO: Can I have that question back?

4 MR. WRIGHT: Let me restate the question.

5 BY MR. WRIGHT:

6 Q Is code -- is the AWS Code equivalent to the  
7 allowable stress over design stress?

8 A (Witness McLaughlin) From a structural  
9 engineering standpoint, we talk about actual stresses and  
10 we talk about allowable stresses.

11 Q Okay. So from a structural engineering  
12 standpoint, is code equivalent to allowable stress over  
13 actual stress?

14 A No. I just explained to you. All I can tell  
15 you is what I just told you. The code gives you an  
16 allowable stress.

17 Q Right.

18 A The engineer calculates an actual stress. He  
19 compares the actual stress to the allowable stress.

20 Q Now if your actual stress is above your  
21 allowable stress, is that equivalent to exceeding code?

22 A Yes.

23 Q And you have testified earlier that you have  
24 never exceeded code; is that correct?

25 A Yes.

mgc22-12

1 MR. WRIGHT: Judge, I would like to represent  
2 that this is a copy of another Sargent & Lundy document --

3 JUDGE SMITH: Have you offered this document?

4 MR. WRIGHT: This is a separate one. I am  
5 withdrawing the document.

6 (The document previously marked  
7 Intervenors' Exhibit No. R-9  
8 for identification was  
9 withdrawn.)

10 MR. WRIGHT: I would like to mark this one as  
11 Exhibit 10. I represent this is a document submitted to  
12 us from Sargent & Lundy.

13 (Document distributed to Board, parties and  
14 witnesses.)

15 (The document referred to  
16 was marked Intervenors'  
17 Exhibit No. R-10 for  
18 identification.)

19 BY MR. WRIGHT:

20 Q Mr. McLaughlin, have you ever seen this  
21 document before?

22 A (Witness McLaughlin) I don't know.

23 Q Has anybody on the panel ever seen this  
24 document before?

25 A (Witness Branch) No.

mgc22-13

1 A (Witness French) No.

2 A (Witness Singh) No.

3 Q Do any members of the panel know what this  
4 document is?

5 A (Witness McLaughlin) Could I make a comment  
6 that might clarify something?

7 We put a lot of information in a room for your  
8 expert witness. All of it did not relate to the  
9 reinspection program. If a calc book was half reinspection  
10 program and half not reinspection program, we didn't take  
11 the calc book apart. The fact that he took something out  
12 of our office and made a copy of something from our office  
13 does not necessarily mean it was part of the reinspection  
14 program. It doesn't necessarily mean it applied to  
15 PTL, Hatfield or Hunter, and it doesn't necessarily mean  
16 because we know he took information from non-Category I  
17 structures, and the reinspection program was not applicable  
18 to non-Category I structures. .

19 JUDGE SMITH: Mr. Miller, what was the result  
20 of your offer to have technical advice available to their  
21 experts on matter such as this?

22 MR. MILLER: Well, sir, we did have a meeting  
23 that was attended by everyone sitting at Intervenor's  
24 counsel table, everybody sitting on the witness panel,  
25 Mr. Gallo and myself, Mr. Del George, and a number of other

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2 Sargent & Lundy engineers. The meeting lasted approximately,  
3 I'd say about four, four and a half hours. And while it  
4 had some technical content to it, it was after Mr. Stokes  
5 had had an opportunity to review some but not all of the  
6 documents that he requested. .

7 It's also my recollection that Mr. Stokes had  
8 asked for and was given access to documents of general  
9 applicability to Sargent & Lundy engineering calculations,  
10 such as computer programs and other such documents, because  
11 he wished to understand some of the bases that were  
12 common to engineering evaluations for the reinspection  
13 program discrepancies, and that applied across the board  
14 as far as Sargent & Lundy is concerned.

15 I will say that I believe that that meeting  
16 was before Mr. McLaughlin's deposition was taken.

17 MR. CASSEL: It was after. You deposed him  
18 on Tuesday.

19 Judge, apparently the problem is that a lot  
20 of documents were mixed up, including reinspection program  
21 documents and documents not from the reinspection program.

22 WITNESS MC LAUGHLIN: They weren't mixed up.  
23 They weren't mixed up.

24 MR. CASSEL: Not mixed up, organized, but  
25 there were two different kinds of documents in the same  
batch with nothing that we could tell which ones were from

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mgc22-15

1 the reinspection program and which ones were not.

2           And we have been assuming, apparently  
3 erroneously, that some of these calculation are from  
4 the reinspection program.

5           Now if they're not, what we will just have to  
6 do is pull a bunch of them in discovery between now and  
7 direct testimony, submit an interrogatory, I guess, or  
8 informally ask a lot of question about which ones were  
9 in the reinspection program.

10           Just so we can get to the bottom of this, is  
11 there nothing on the reinspection program calculations  
12 to indicate which calculations come from the reinspection  
13 program and which do not?

14           WITNESS MC LAUGHLIN: Mr. Singh indicates that  
15 the 6908 number indicates it's part of the reinspection  
16 program.

17           MR. CASSEL: Does every document in the  
18 reinspection program have a 6908 number on it?

19           WITNESS MC LAUGHLIN: I'm not sure.

20           WITNESS SINGH: I cannot answer you.

21           MR. CASSEL: This one is from the reinspection  
22 program.

23           WITNESS MC LAUGHLIN: Based on his saying that  
24 6908 is the reinspection program. But it doesn't say that  
25 it's from Hatfield, Hunter or PTL.



mgc22-16

1 WITNESS SINGH: I think one other thing that  
2 you have to recognize, the first page you passed out had --  
3 it was page 1 of 293, and it is difficult to figure out  
4 which document it came from, and there are several  
5 documents.

6 MR. GALLO: The point here, Judge, is that  
7 these evaluations are not done anonymously. They are --  
8 they identify the discrepancy with a contractor. It was  
9 just in this case, apparently, when the documents were  
10 extracted from the Sargent & Lundy documentation for  
11 Xeroxing, that additional information as to who the  
12 contractor was was not also taken.

13 WITNESS MC LAUGHLIN: If you had the total  
14 calculation, you can tell which contractor it was. It  
15 could be weld maps from the contractor -- I mean, if you  
16 had the total package of calculations.

End 22

17  
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25

1                   MR. CASSEL: Judge, it might be helpful if I  
2 just tried about a handful of questions here. I think  
3 we'll get to the bottom quickly and find out there isn't  
4 a problem and pass it on.

5                   BY MR. CASSEL:

6                   Q     Mr. McLaughlin, assuming -- not assuming. We've  
7 now had Mr. Singh state this is a document from the  
8 reinspection program and Sargent & Lundy has done safety  
9 design significance analysis of the reinspection program  
10 and not found a single defect with any design significance  
11 at Byron. Is that correct?

12                  A     (Witness McLaughlin) I'm testifying to the AWS  
13 welds, discrepant welds, for Hatfield and Hunter. That's  
14 my direct testimony.

15                  Q     That was your direct testimony. Did you not,  
16 on cross-examination earlier today, indicate that your  
17 review had been broader than what you testified to in your  
18 direct?

19                  A     Yes.

20                  Q     Now this word here, this phrase in the middle of  
21 the page, "weld ratios," next to the parenthetical phrase  
22 allowable load over Rev. E load. Do you know what that might  
23 mean or what it means?

24                  A     That's the same thing we just spent five minutes  
25 on the previous page talking about.

231b2

1 Q Do you know what Rev. E load would mean?

2 A Revision E load of something. It's impossible  
3 to speculate with one page out of a calculation. It appears  
4 as though this is part of a 293 page calculation. You can't  
5 take a page out of any calculation and ask somebody what it  
6 means.

7 Q You couldn't say, then, whether that Rev. E load  
8 relates to the actual load, as opposed to the allowable  
9 load that you read?

10 MR. GALLO: Objection. The witness has already  
11 testified that the one page is meaningless, no inferences  
12 or information can be drawn for it. Any further questions,  
13 therefore, are improper for that reason.

14 JUDGE SMITH: You are right, Mr. Gallo. I would  
15 like to see it established cleanly, but these witnesses  
16 simply cannot help. And if that's the case and the  
17 Intervenors have had a thorough chance to explore their  
18 helpfulness. But you've drawn a blank now on every question.

19 Go ahead and ask some more.

20 MR. CASSEL: We will be at the bottom very  
21 quickly on this, Judge.

22 BY MR. CASSEL:

23 Q No member of the panel is of the view that  
24 that phrase refers to allowable load over some definition of  
25 actual load?

1           A       (Witness McLaughlin) One of the problems is it's  
2 reversed. It's supposed to be the Revision E load over  
3 the allowable load. The smaller load always goes on top.  
4 The allowable load is always on the bottom.

5           MR. CASSEL: Well, I think that pretty clearly  
6 tells us that whoever knows what he meant in this document  
7 is not sitting at the panel, and I don't think we should  
8 take the Board's time any further to pursue this line of  
9 documents.

10          JUDGE SMITH: So are you withdrawing R-10?

11                               (The document previously  
12                               marked for identification as  
13                               Intervenor's Exhibit R-10 was  
14                               withdrawn from evidence.)

15          MR. CASSEL: Judge, what I was about to say is  
16 that Mr. Stokes believes that he was advised the only  
17 calculations he was being permitted to see were Hatfield,  
18 Hunter and PTL calculations from the reinspection program.  
19 And that in reviewing these calculations, he therefore  
20 assumed that they were Hatfield, Hunter, or PTL calculations  
21 from the reinspection program and noneother.

22               We therefore assumed that all of these documents  
23 would be relevant and that at least one witness on the panel  
24 -- perhaps not Mr. McLaughlin -- because they divided up the  
25 turf, would be able to testify with respect to all of the

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1 documents involved for those three contractors in the  
2 reinspection program.

3 Now perhaps Mr. Stokes misunderstood the  
4 representations that were made to him by the counsel for  
5 Commonwealth Edison, but that is the premise on which we came  
6 into this cross-examination, that these were relevant documents  
7 relating to those three contractors.

8 MR. MILLER: We would have to go back and check,  
9 Your Honor, because it was a written request from the  
10 Intervenor that was supplemented orally by Mr. Stokes from  
11 time to time, as he was in Sargent & Lundy's offices. We  
12 tried to be completely responsive to him.

13 Perhaps when Mr. Stokes takes the stand he will  
14 be able to say that these are Hatfield, Hunter, PTL documents,  
15 but it is apparent from this examination, which has  
16 now gone on for about 35 minutes, that nobody here who is  
17 present --

18 WITNESS MC LAUGHLIN: I'd like to add one other  
19 thing. The calculation books are very clearly marked in  
20 an index in the front, as to what is in the calculation  
21 report. And if you're looking for something in the calc  
22 book, in the front there's a table of contents and it tells  
23 you exactly what's in there.

24 JUDGE SMITH: That being the case, there simply  
25 is no use taking up more of the hearing time to try to unravel

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1 this. It can be determined, I assume, by a phone call or two,  
2 where these documents came from. Or perhaps by Mr. Stokes.  
3 I don't know.

4 But I think enough of our time has been spent  
5 on it.

6 MR. CASSEL: I would agree, Judge Smith.

7 (Pause.)

8 BY MR. WRIGHT:

9 Q Mr. McLaughlin, on page 12 of your testimony,  
10 you referred to a repetitive gap problem, is that correct?

11 A (Witness McLaughlin) Page 12?

12 Q Yes, sir.

13 A I don't think that's the right page. Oh, it's  
14 on 13.

15 Q 12 and 13. That's where your answer starts.

16 A Right.

17 Q Could you explain to us what that repetitive  
18 gap problem is? Or was?

19 A Yes. Figure 7 attached to my testimony shows an  
20 elevation view of a cable tray support system. The cable  
21 trays themselves are not there. They would be in the center,  
22 and I have a circle around connection one.

23 Turn to Figure 8, the next page. You will see  
24 that we have drawn an exaggerated blow up of the gap that is  
25 there, between the horizontal member of the cable tray and

1 the vertical member of the cable tray. That's the gap  
2 problem that I refer to on the testimony.

3 Q Were there other gap problems that you found in  
4 your review of Sargent & Lundy's evaluation?

5 A Other types?

6 Q Other types of gap problems?

7 A The only type that we found was this type on  
8 the cable tray system, between the horizontal and vertical  
9 members.

10 Q And you testified that that gap sometimes  
11 exceeded the code, isn't that correct?

12 A Yes, sir.

13 Q But it was also your testimony that exceeding  
14 the code was not design significant. Isn't that correct?

15 A No, that's not what my testimony said.

16 Q Would you explain it to us?

17 A What the testimony said was when we evaluated  
18 this condition, we found that even with the gaps there was  
19 no design significance. Further -- this answer further points  
20 out that because this was a recurring problem, it was  
21 decided that it would be beneficial to do tests. We did  
22 not believe that the reductions that we were assigning  
23 to this gap problem were realistic. We felt that they were  
24 too conservative, the reductions in our calculations that we  
25 were assigning to it.

1           We were able to show, in our calculations --  
2 even with the reductions following the code, even with the  
3 reductions there were. But we felt it would be beneficial  
4 for everyone if we did a test of this situation to see how  
5 it actually tested. And we tested ten of these joints,  
6 full scale joints, to failure and we proved that with the  
7 gap there was no actual alternate reduction in capacity of  
8 the joint.

9           Q     Now how did you verify that this gap problem  
10 didn't occur in other places?

11          A     We didn't verify it. That's why we did the test.

12          Q     Okay. And you said you performed tests with  
13 reductions according to the code?

14          A     No.

15          Q     You did not perform the reductions according to the  
16 code?

17               MR. GALLO: Wait a minute. Objection --

18               MR. WRIGHT: Wait a minute.

19               BY MR. WRIGHT:

20          Q     You just stated that in addition to the ten  
21 models that you also performed the reduction according to  
22 code. Wasn't that your testimony?

23          A     (Witness McLaughlin) What I said was that in  
24 evaluating this discrepancy we reduced -- in our calculations  
25 we reduced the capacity of the connection in accordance



1 with the code. And we were able to show that even with  
2 the reduced connection capacity that they were still below  
3 design allowables.

4 Further we did a test, ten tests, to show that  
5 the reductions we had applied in our calculations were  
6 too conservative, that we didn't really get a reduction when  
7 we tested these connections to failure.

8 JUDGE COLE: You actually, structurally, tested?

9 WITNESS MC LAUGHLIN: Pulled them. Destroyed them.

10 BY MR. WRIGHT:

11 Q How many did you destroy like that?

12 A (Witness McLaughlin) Ten.

13 Q I'm confused. Please try to help me out. In  
14 your answer to question number 18, did you testify that the  
15 ten test specimens which resemble Figure 8 were prepared?  
16 And didn't you further testify that these were models?

17 A No, that isn't what it says. Ten test specimens,  
18 which would resemble Figure 8, were prepared. Strength  
19 tests were performed where loads were applied to these joints.

20 Q These were ten actual joints, they were not models,  
21 is that correct?

22 A No, they were taken to a testing lab and they were  
23 tested to the structure.

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1           Q     Mr. McLaughlin, in your review of the Sargent  
2     & Lundy evaluations, with respect to the reinspection  
3     program, did you find in certain situations an item was  
4     dispositioned as having no design significance without  
5     a calculation?

6           MR. GALLO:  Objection.  I want it clear -- I  
7     would like to establish, Judge Smith, clearly on this  
8     record when counsel repeatedly refers to calculations  
9     reviewed by Mr. McLaughlin, performed under or in accordance  
10    with the reinspection program, that he is referring to the  
11    evaluations or calculations that Mr. McLaughlin reviewed  
12    for purposes of his testimony.

13           Are all these questions, as posed by counsel,  
14    limited by that definition?

15           JUDGE SMITH:  I understood that at the beginning.  
16    I think perhaps he has been careless in using the verb there.  
17    But I think we have all understood what was meant.

18           MR. GALLO:  With that understanding, I withdraw  
19    the objection.

20           JUDGE SMITH:  You have, haven't you?

21           WITNESS MC LAUGHLIN:  That's the way I've been  
22    responding.  Could you repeat that question?

23           BY MR. WRIGHT:

24           Q     Yes.  My question went to in your review of the  
25    Sargent & Lundy material, that you testified that you

1 reviewed, did you find where Sargent & Lundy engineers  
2 had determined that there was no safety significance -- no  
3 design significance of a discrepant condition and there was  
4 no calculation to verify that?

5 A (Witness McLaughlin) I didn't find that.

6 Q Mr. McLaughlin, are you familiar with the NRC  
7 Report 22-19?

8 A No.

9 JUDGE CALLIHAN: Would it be possible to have a  
10 title of the report, just for the record?

11 MR. WRIGHT: Just one second.

12 This is Inspector's Report 22-19. It's contained  
13 in the deposition of Mr. Muffet, and that's the only  
14 reference we have to it.

15 JUDGE SMITH: It's an Inspection Report, an NRC  
16 Inspection Report.

17 MR. LEWIS: That's not a number that correlates  
18 with any numbering system that I'm aware of, for NRC  
19 Inspection Reports.

20 MR. WRIGHT: The whole reference is on page 33  
21 of Mr. Muffet's deposition and it's called Discrepancy,  
22 Hatfield Electric, 121, Inspector's Report 22-19.

23 JUDGE CALLIHAN: Perchance, was the date given?

24 MR. WRIGHT: There is no date given.

25 JUDGE SMITH: You identified it as an NRC report?

1 MR. WRIGHT: I've been corrected. This is a  
2 Hatfield Electric report, Inspector's Report.

3 MR. LEWIS: It sounds to me like it's an Inspector's  
4 Report, either Commonwealth Edison or a contractor.

5 BY MR. WRIGHT:

6 Q Are you familiar with that discrepancy report  
7 from Hatfield Electric 121?

8 A (Witness McLaughlin) No, sir.

9 Q In your direct testimony, you testified that in  
10 the case of a partial -- where a partial penetration weld  
11 was used instead of a fillet weld, that the actual connection  
12 was removed for testing, is that correct?

13 A Yes.

14 Q Why was only that one connection removed?

15 A That was the worst connection.

16 Q Was it your engineering judgment that that one  
17 connection was representative of the other such cases in  
18 the Byron plant?

19 A It was our engineering judgment that that  
20 represented the worst case that we were aware of, that we  
21 could find, that would give possibly the worst results.

22 Q What was that engineering judgment based on?

23 A Well, it was based on two things. It was based  
24 on looking at the weld maps that were available to us. It  
25 was also based on the judgment that -- we couldn't see how

1 you could get a worst case than that.

2 Q , Mr. McLaughlin, were you in the hearing yesterday  
3 when Mr. Tuetken was testifying?

4 A I was in and out of the hearing. What time of  
5 the day?

6 Q Well, let me tell you what he testified about  
7 and I'd like to know did you hear this testimony. He  
8 talked about the fact that a number of discrepant conditions  
9 were repaired before they were evaluated by Sargent & Lundy.

10 A I wasn't in the hearing room.

11 Q Do you know whether or not that actually took  
12 place?

13 A I have no personal knowledge of that. I heard  
14 people that were there discussing it. I have no knowledge  
15 of whether they were or they weren't repaired.

16 Q Does anyone on the panel have that knowledge?

17 A (Witness Singh) I don't.

18 A (Witness Branch) Not personally. I've heard  
19 it discussed.

20 A (Witness French) No.

21 Q You heard it discussed?

22 A (Witness Branch) The same as Mr. McLaughlin.

23 Q Did you also hear Mr. Tuetken testify that  
24 approximately 50 percent were repaired before Sargent & Lundy  
25 did the engineering evaluation?

1           A     Are you asking me?

2           Q     Yes.

3           A     I think I heard that.

4           Q     Did you also hear that the majority of those  
5 were ASME welds?

6           A     No, I didn't hear them say that.

7           Q     Mr. McLaughlin, in your review of the evaluations  
8 performed of the discrepant conditions by engineers at  
9 Sargent & Lundy for the reinspection report, did you  
10 come across evaluations of data or assumptions that would  
11 indicate that welds were repaired before the engineers  
12 evaluated them?

13          A     (Witness McLaughlin) Yes, the AWS welds for Hunter  
14 were repaired, but we did receive information on the welds  
15 that was descriptive enough that we could do calculations  
16 to determine what the capacity of the weld was, the connections  
17 were, before they were repaired.

18          Q     What information did you receive?

19          A     It was -- I'm not sure of what the terminology,  
20 probably weld traveler is the correct terminology, but the  
21 weld traveler gave the type of discrepancy, the length  
22 of discrepancy, the depth of the discrepancy. It gave  
23 enough information, such that the engineer could discard  
24 those parts of the welds that were discrepant and come up  
25 with the calculation of the remaining capacity of the

1 connection.

2 Q , Did that weld traveler also indicate that that  
3 weld was repaired?

4 A Yes, we knew -- well, I'm not sure whether the  
5 weld traveler indicated the weld was repaired. We knew  
6 the weld was repaired because we asked for weld maps and  
7 we were told that the weld had already been repaired so that  
8 we couldn't get weld maps. I'm not sure whether the  
9 actual document that we got said that, but we were aware  
10 that the weld had been repaired.

11 Q Is it your testimony that the documents that  
12 you reviewed showed -- well, you had weld traveler maps.  
13 But they didn't show that the item was repaired?

14 A What I'm saying is I don't know whether it said  
15 it or it didn't say it, but we knew -- S&L knew -- that  
16 the welds had been repaired because we had asked for weld  
17 maps and had been told that the weld had been repaired  
18 before we did our calculations.

19 Q Why did you ask for weld maps?

20 A Why did we ask for them, because that's what  
21 we ask for on all the discrepant welds that we evaluate.

22 Q For what purpose?

23 A So that we can make a calculation as to the  
24 capacity of the connection before it is repaired.

25 Q And the Hunter provided you with weld maps?

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1           A     No. Hunter provided us with the weld traveler  
2 that the inspector had made prior to the repair of the  
3 weld. The weld traveler had sufficient information on it  
4 that we could make a calculation as to capacity of the  
5 weld before it was repaired.

6           Q     Did it give you as much information as a weld  
7 map would have given you?

8           A     No. A weld map can actually improve the  
9 capacity of the weld. They will typically put down welds  
10 that are longer than we specify and they will typically put  
11 down welds that are greater thickness than we specify.  
12 So by obtaining a weld map, you have the advantage of the  
13 additional conservatism that a welder puts into it.

14                     If you don't get a weld map, if you just get the  
15 traveler with the discrepancy, you have to assume that the  
16 rest of the weld is as you specified, the right length,  
17 the right thickness whereas on a weld map you'll actually  
18 get more thickness and you'll get more length.

19           Q     So is that assumption that you make, is that  
20 engineering --

21           A     I haven't made any assumption. I've gotten  
22 the information on the weld traveler.

end24

23  
24  
25



1 MR. WRIGHT: I have no further questions, Judge.

2 JUDGE COLE: Just one question. Your comment  
3 about using the weld map and your statement that you  
4 usually find what the welder actually did, in many instances,  
5 exceeds the specifications so that you wind up with more  
6 weld material and subsequently a possibly stronger joint.  
7 What has been your experience with that? Is this very common?  
8 Is this in 75 percent of the weld maps, or is this a common  
9 occurrence, in 90 percent of them?

10 WITNESS MC LAUGHLIN: I would say just based on  
11 my personal knowledge that probably of the weld maps we  
12 had, 50 percent of them -- obviously when we get a weld map  
13 there's a discrepancy in the weld that we have to take out,  
14 but I would say in 50 percent of it there are other aspects  
15 of the weld, the height of the weld, the length of the weld,  
16 that might not compensate for what's taken out. But they  
17 are larger than what we specified.

18 JUDGE COLE: In more than 50 percent? More than  
19 50 percent it overcomes the deficiency?

20 WITNESS MC LAUGHLIN: I didn't say that. It  
21 might not overcome the deficiency, but it allows us to get  
22 back part of the weld.

23 JUDGE COLE: Okay, thank you.

24 JUDGE SMITH: Next witness.

25 MR. CASSEL: Can we have about a five minute break,

1 because Ms. Judson is prepared to examine Messers. Branch  
2 and French?

3 JUDGE SMITH: All right.

4 (Recess.)

5 JUDGE SMITH: On the record.

6 MR. CASSEL: Judge, we have one more question for  
7 Mr. McLaughlin, if we might.

8 JUDGE SMITH: All right.

9 BY MR. WRIGHT:

10 Q Mr. McLaughlin, would you pick up your deposition  
11 and turn to page 49? Did you not -- at your deposition,  
12 didn't you indicate that the ten test specimens were  
13 models?

14 A (Witness McLaughlin) If you go to the next page,  
15 I said full sized.

16 Q And would you read down a couple of more questions?  
17 I asked the questions who prepared the models. And what  
18 was your answer?

19 A I didn't correct you. Why don't you define what  
20 you mean by model?

21 Q I don't have any further questions.

22 I didn't understand it. I thought you told me  
23 that there were no models. And at your deposition you told  
24 me models were constructed.

25 A No. When you asked me about -- your question at

1 the bottom of page 49, they made up models and tested them.  
2 And my answer was full sized. Now you can call it a full  
3 sized model if you want, but once it becomes full sized,  
4 it's not normally a model anymore. Models are usually to  
5 scale, half sized, three-quarter sized, sixteenth sized.

6 I thought by saying full sized, I thought I  
7 had clarified that it wasn't a model.

8 I obviously wasn't --

9 MR. WRIGHT: I don't have any further questions,  
10 Mr. McLaughlin, thank you.

11 JUDGE SMITH: Proceed.

12 BY MS. JUDSON:

13 Q Good afternoon, Mr. French.

14 MR. GALLO: Before you proceed, counsel, could  
15 we have Mr. French scoot over there?

16 (Pause.)

17 MR. GALLO: Thank you.

18 BY MS. JUDSON:

19 Q Mr. French, you are the manager of the Electrical  
20 Department at Sargent & Lundy, is that correct?

21 A (Witness French) That's right.

22 Q You do not do electrical design work, do you?

23 A As the manager of the Electrical Department, I  
24 do not do any direct design work. Through my career, though,  
25 I have done considerable amount of design work, as I progressed

1 up in the organization.

2 Q And you perform calculations only occasionally,  
3 is that correct?

4 A At the present time, as manager of the department,  
5 I only occasionally make a calculation. That's true.

6 Q I'm now going to focus on your involvement with  
7 the Byron reinspection program. You spent approximately  
8 25 hours reviewing electrical engineering evaluations  
9 relating to Hatfield's electrical engineering work, is  
10 that correct?

11 A At the time -- I don't know which document you're  
12 referring to, but at the time you're referring to I did,  
13 at that time, spend about 25 hours. Subsequently, I've  
14 spent about another 15 hours, maybe. So at the moment --  
15 again, I didn't keep a record of it, but roughly would be  
16 about 40 hours.

17 Q So this was after you had written your testimony,  
18 is that correct?

19 A I spent about five, six, seven of those hours  
20 before writing the testimony, and the remainder of it after.

21 (Pause.)

22 Q Now am I correct that neither you nor your  
23 employees actually conducted reinspections?

24 A Neither I nor any of my employees did any  
25 inspections or reinspections. We do engineering work, not

1 inspection work.

2 Q So you merely evaluated reinspection reports that  
3 were sent to you?

4 A That's correct.

5 Q Now you personally did not look at all evaluation  
6 reports concerning Hatfield's electrical engineering work,  
7 did you?

8 A I did not look at all of them, no.

9 Q Referring to answer 21 in your prefiled testimony,  
10 on page 11 at the top of the page, you state "Out of a total  
11 of 169 supports, using A325 bolts, a sample of 50 supports  
12 was reinspected." Is that correct?

13 A That's what it says, yes.

14 Q Do you know how the 50 A325 supports were chosen  
15 for reinspection?

16 A I do not know how the specific -- would you  
17 repeat the question, please?

18 Q Do you know how the 50 supports were chosen for  
19 reinspection?

20 A No, I really do not know how they were chosen.

21 Q In your answer 22, you state that "Out of  
22 approximately 25,000 conduit supports, 305 were randomly  
23 selected." Do you know why 305 were selected?

24 A No, I was not involved in the reinspection program  
25 and that choice was undoubtedly made as part of the

1 reinspection program. So I have n' knowledge of why it was  
2 305.

3 Q So you also don't know if this 305 is representative  
4 of the 25,000, is that correct?

5 A If they selected 325 conduit supports, they had  
6 to be representative, because there's just not that wide  
7 a range of conduit supports. I presume they were selected  
8 by some random method. If they were selected by any sort  
9 of a random method, that would have had to have covered the  
10 range of conduit supports that are used.

11 JUDGE COLE: Mr. French, in response to question  
12 22, you state that 305 were randomly selected. Do you know  
13 how they were selected?

14 MR. FRENCH: I have been advised that all of these  
15 selection processes were random in some nature, but I was  
16 not involved in it and it's secondhand information to me.  
17 I'm merely repeating what I have been told.

18 JUDGE COLE: Okay.

19 BY MS. JUDSON:

20 Q Did you state, at your deposition, beginning at  
21 page 30, that as to electrical equipment settings, equipment  
22 was listed by equipment number, and then every fifth  
23 was chosen?

24 A (Witness French) I found the position on the  
25 deposition here. If you will recall, I was unsure of my

1 answer to that question. It was a choice between a  
2 random number selection procedure, which is what I started  
3 to say, and then I changed it and said no it was taking  
4 every so many out of a list. I'm afraid I was overimpressed  
5 by the selection of inspectors which was done by order in  
6 the list.

7 I have subsequently asked the people who were  
8 involved in that and they have confirmed that I gave you a  
9 wrong answer, that they did use a random number selecting  
10 system, to select the pieces of equipment.

11 Q And that is solely for equipment settings. You're  
12 unaware of how they chose the other samples that we were  
13 previously discussing, is that correct?

14 A No, that's not correct. There was another  
15 attribute that had to do with equipment and they used --  
16 you recall, in my deposition, I did say that one set of  
17 50 pieces of equipment was selected. That same set was used  
18 for both attributes.

19 Q But this testimony refers only to the electrical  
20 equipment, not to the supports using A325 bolts, nor the  
21 conduits. Is that correct?

22 A That's true. This was for the two attributes  
23 called equipment setting and equipment modifications.

24 Q And as to the supports using A325 bolts on the  
25 conduit supports, you don't know how they were randomly

1 selected?

2 A I do not know.

3 Q Did you write answer A7 to your testimony?

4 A I wrote the whole testimony, so I must have  
5 written A7.

6 Q Did you write it independently?

7 A I'm not sure I understand what you mean by  
8 independently.

9 Q You wrote this A7?

10 A Yes.

11 Q Do you happen to know why the phrasing is so  
12 similar to Mr. McLaughlin's A7 and to Mr. Leone's A6 as  
13 it was originally filed?

14 A I was brought into the -- what do they call this?  
15 MR. GALLO: Witness roster.

16 WITNESS FRENCH: Yes, I became a witness after  
17 Mr. Leone had gone through the witness process. As I  
18 understand it, initially he was to cover both the mechanical  
19 and electrical aspects. It was later decided that it should  
20 be split. When I started to write my testimony, I read  
21 through his and therefore the rudimentary parts of it, such  
22 as my position with the company and this particular one,  
23 I used his manuscript as a guide.

24 I just changed the words where it was appropriate.  
25 So I imagine it does look like some of his.



1 BY MS. JUDSON:

2 Q , Mr. French, at Sargent & Lundy do you set up  
3 project teams to work on particular projects?

4 A (Witness French) Yes, we do.

5 Q Did the Byron project have a project team?

6 A It did.

7 Q Was the reinspection project accomplished by  
8 members of the Byron project team?

9 A The reinspection evaluation work was done by  
10 members of the Byron project team.

11 Q And were the people from the electrical department,  
12 who worked on the reinspection program, a subset of the Byron  
13 project team?

14 A Yes, you could call them that.

15 Q Is it correct that the reinspection program, as  
16 originally designed, was not intended to be used as a basis  
17 for judgment on the quality of construction work?

18 A I believe that is written in the reinspection report  
19 and I believe that to be true, yes.

20 Q I will now refer you to your answer A18. In your  
21 answer to A18, you provide reasons why a supplemental program  
22 was established for certain attributes, is that correct?

23 A Yes.

24 Q Do you know of any other reasons why such a program  
25 was established?

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1 A No, I know of no other reasons.

2 Q \* Do you know whether the NRC advised or directed  
3 Edison to establish such a program?

4 A You mean the supplementary?

5 Q Yes.

6 A I do not know any of the reason for it. My  
7 involvement started with the review of the evaluations.

8 Q I now refer you to the supplement to the report  
9 on the Byron QC reinspection program, page SIII-1.

10 In the bottom paragraph on that page, you state  
11 that the only deviation which resulted in a significant  
12 reduction of strength was a hold-down weld detailed for  
13 4160-volt switchgear; is that correct?

14 A Correct.

15 Q Were all switchgears reinspected?

16 A We are now in the supplementary area, not in  
17 the reinspection program area. All switchgear was not  
18 reinspected and was not in the supplementary program, I  
19 should say.

20 I should expand on that and make sure it's  
21 clear now. The 50 pieces of electrical equipment that  
22 was selected included some of every type of electrical  
23 equipment in the plant. 4160-volt switchgear is one of  
24 about six different types. So while it didn't cover all  
25 of the 4160-volt switchgear, it did cover some of them and

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1 some of all the other types.

2 Q Some but not all?

3 A Some but not all.

4 Q Now in one detail weld on the two short sides  
5 of a four-sided weld was omitted; is that correct?

6 A Yes, that's correct.

7 Q And in order to evaluate the overall effect of  
8 this discrepancy, you assumed that all of the 4160-volt  
9 switchgear had this same discrepancy; is that correct?

10 MR. GALLO: Objection. I don't see any  
11 purpose in reading the reinspection report or the  
12 supplemental report to the reinspection program and asking  
13 this witness if that's what it says. It serves no useful  
14 purpose.

15 MS. JUDSON: I'm merely trying to lay my  
16 foundation for the questions that shall follow, to make  
17 it clearer to the individuals present.

18 MR. GALLO: I'll withdraw the objection.

19 WITNESS FRENCH: I can answer that very clearly.  
20 I'll expand. I think I can get right to the bottom without  
21 more questions.

22 The 4160-volt switchgear consists of cubicles  
23 which are about two and a half feet wide and six feet deep  
24 and seven feet tall. The way they are attached is that  
25 there are holes approximately three quarters of an inch by

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1 one inch in size. Six of these holes in the bottom of  
2 the switchgear cubicle. The bottom is steel, steel plate.  
3 In the floor there are embedded other steel members, and  
4 these holes and the holes in the bottom plate of the  
5 switchgear cubicle sit over the steel that is embedded in  
6 the floor.

7 The way the attachment is made is, a welder  
8 places a weld bead around the small holes to weld the  
9 bottom plate of the switchgear to the embedded steel.  
10 The discrepancy here was that instead of welding around  
11 all four sides, he had welded down just the two long sides.  
12 Therefore, he had not complied with the exact specified  
13 way of mounting the switchgear.

14 Now the 4160-volt switchgear cubicle that I  
15 mentioned is one of a series of those cubicles, which are  
16 all -- they're actually all in line and attached to each  
17 other. There could be anywhere from 10 to 15 of these  
18 cubicles, all mounted in line, attached to each other.

19 Each cubicle has these six holes in it for  
20 the welding.

21 Now what this says is, that in order to be  
22 conservative in this analysis, since we had not looked  
23 at each cubicle, the analysis was made on the assumption  
24 that all of the cubicles had the shorter welds in them.  
25 Again, that was a matter of not knowing the condition of

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2 the remainder. So we made the worst case assumption that  
3 they were, all deficient in the welding.

4 Now with that assumption, an analysis was made  
5 to see if there was adequate strength in the mounting with  
6 that deficiency in all of the cubicles, and it was found  
7 that there was adequate strength, even though all four  
8 sides had not been welded.

9 Another thing you have to realize is that  
10 the welding at the corner of a small hole like that tends  
11 to go around the corner, so while you think that three-  
12 quarters of an inch of welding was missing on each end,  
13 why that's not quite the case.

14 There was a reduction. The analysis showed  
15 that even with the reduction, there was adequate strength  
16 left.

17 BY MS. JUDSON:

18 Q You may have misspoke, or perhaps I misheard  
19 you.

20 Did you say that you assumed that only the  
21 two short sides were done or the two long sides?

22 A (Witness French) We knew that the two long  
23 sides were done. The two short sides were the ones that  
24 had been omitted.

25 Q Did you do any analysis assuming that welds  
were omitted on the two long sides?

mgc26-5

1           A        Did we do any analysis assuming that the welds  
2 had been omitted on the long sides? Why would we do that?  
3 We had the discrepancy report stating that it was the two  
4 short sides that were missing.

5           Q        But you didn't inspect every 4160-volt  
6 switchgear, so you cannot be certain that in other  
7 circumstances they may not have omitted the welds on the  
8 long side, can you?

9           MR. GALLO: Objection. There seems to be  
10 a misapprehension as to the role that Mr. French plays,  
11 on the part of Counsel, and you are misleading with respect  
12 to the record.

13           Mr. French takes the discrepancy as reported,  
14 and then evaluates it. He does not go out and look for  
15 new discrepancies in the switchgear that he's talking about.  
16 He simply takes the discrepancy report as reported and  
17 evaluates it in that fashion.

18           JUDGE SMITH: He has explained that in the  
19 answer. He already answered the question, the answer being,  
20 why would he be doing that?

21           WITNESS FRENCH: I would like to explain it a  
22 little bit, Judge.

23           In the way the cubicle is set, the small holes  
24 are lined up in the same direction. There are six of them,  
25 three on each side. And it's just beyond -- it's not

mgc26-6

1 conceivable that a man would make welds this way as he  
2 goes into the cubicle on one cubicle, and then on the  
3 other one, for some reason, start going crossways.

4 First of all, making the welds lengthwise  
5 is much easier. This is, as I say, about a two and a half  
6 foot wide cubicle. You've got to crawl in there to do it.  
7 So I -- again, I see no reason to conjecture that they  
8 would have been made differently in any other cubicles.

9 BY MS. JUDSON:

10 Q And there would be no reason to conjecture  
11 that a different individual might have only done those  
12 short sides and not the long sides?

13 A (Witness French) It would be pure speculation.  
14 But again, I say I see no -- I would have no reason to  
15 question that, really.

16 Again, I would like to state, the high  
17 degree of conservatism in the analysis, we assumed that  
18 all the cubicles had inadequate welding. There's a high  
19 probability that the other cubicles were actually welded  
20 properly. When we get into these evaluations, we tend  
21 to bend over backwards to make sure that we are getting a  
22 conservative result.

23 Q But you base your result on the discrepancies  
24 that you found, even though not all 4160-volt switchgear  
25 had been inspected.

mgc26-7

- 1 A That's correct.
- 2 Q So it's possible that there may have been some  
3 other type in a volt switchgear that was not reinspected;  
4 is that true?
- 5 A I would say that is always true.
- 6 Q Could you tell us how thick the plate is on  
7 which these welds were made?
- 8 A I do not know exactly. It's three-sixteenths  
9 of an inch approximately. That's the bottom plate of  
10 the switchgear; the plate on the floor is probably thicker  
11 than that.
- 12 Q Now on page SIII-2, you discussed A-325  
13 bolting; is that correct?
- 14 A That's correct. I don't discuss it; the  
15 report does.
- 16 Q Your testimony covers these bolts, though;  
17 is that correct?
- 18 A I did have testimony concerning bolts, yes.
- 19 Q These are the same bolts that were reinspected  
20 in the supplemental program, right?
- 21 A Right.
- 22 Q Okay. Now of the 46 bolts that were reinspected,  
23 295 did not meet acceptance criteria; is that correct?
- 24 A No, that's not correct. 295 were inspected, and  
25 46 did not meet the criteria. You have the numbers



mgc26-8

1 reversed, I believe.

2 Q Thank you. Excuse me.

3 MR. CASSEL: That would have been a startling  
4 finding.

5 (Laughter.)

6 BY MS. JUDSON:

7 Q So about 16 percent didn't meet the criteria?

8 A (Witness French) My mental arithmetic is not  
9 that good, but somewhere on that order, yes.

10 Q Why was all Hatfield A-325 bolting retorqued?

11 A The reinspection program -- first of all, I  
12 really do not know firsthand why all of the 325 bolts were  
13 retorqued. I had nothing to do with the reinspection or  
14 the decision to retorque them.

15 Now I could make a guess at it, if you would  
16 like to have me make a guess.

17 Q Not if you don't know. I assume you also  
18 don't know how much it cost to retorque them.

19 A I have no idea what the cost would be.

20 JUDGE SMITH: How do they inspect for torquing?  
21 Put a torque wrench on them?

22 WITNESS FRENCH: They have a calibrated  
23 torque wrench which they --

24 JUDGE SMITH: They already have the wrench on  
25 the bolt?

mgc26-9

1 WITNESS FRENCH: It's simply a wrench with  
2 a calibrated dial on it and a flexible handle, so as  
3 you pull the wrench, the torque is registered on a scale  
4 on the wrench, and you watch it as you push it tighter  
5 where the torque is read higher. You get to the point,  
6 the specified point, you stop twisting the nut.

7 JUDGE SMITH: Right. But once you have observed  
8 the torque exists, could you not simply continue to torque  
9 until it meets the specifications?

10 WITNESS FRENCH: Well, that's what a workman  
11 would normally do. He would have a specified torque that  
12 he tried to obtain. He'd keep torquing until he reached  
13 that point.

14 JUDGE SMITH: My point was, I would assume an  
15 inspector going out and applying a torque wrench to a bolt,  
16 noting that it was undertorqued, having the torque wrench  
17 there and is in a position where, with very little extra  
18 cost, could bring it up to torque.

19 WITNESS FRENCH: I can see reasons why he  
20 wouldn't, but I'll defer to Mr. McLaughlin, who knows  
21 more about that area than I do.

22 WITNESS MC LAUGHLIN: The method of torquing  
23 the bolt initially is not with a torque wrench. It's done  
24 by what is called turn-of-the-nut method. In other words,  
25 he snugs the bolt up snug tight. Then he turns it a

mgc26-10 1

specific number of rotations based on the diameter of  
the bolt. So he doesn't really install it with a torque  
wrench. The inspector uses the torque wrench to come  
out to verify that he has turned it that turn after it  
is snugged tight.

End 26 6

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1 MR. GALLO: How much further does counsel have?  
2 I'm not trying to rush you. I'm just curious.

3 MS. JUDSON: Probably about another 40 minutes.  
4 Would you rather resume tomorrow?

5 MR. GALLO: Is that the preference of the Board?

6 MR. LEWIS: Is that 40 minutes with Mr. French?

7 MR. GALLO: Then more for Mr. Branch, is that  
8 correct?

9 MR. MILLER: Before we go off the record, Judge,  
10 I've now had a chance to have the Intervenor's document request  
11 to Commonwealth Edison Company. What was requested and what  
12 was provided to Mr. Stokes, the Intervenor's expert, were  
13 all engineering evaluations connected with the reinspection  
14 program. The request was not limited to Hatfield, Hunter,  
15 and PTL, nor was the response limited.

16 MR. CASSEL: You're not representing that you  
17 provided items other than the reinspection program, except  
18 insofar as they were bound in the same book?

19 MR. MILLER: Only insofar as they were bound in  
20 the same book and as they were requested by Mr. Stokes.  
21 I previously referred to certain computer programs that were  
22 not necessarily limited in their application to the  
23 reinspection program.

24 MR. CASSEL: But with regard to specific calculations,  
25 you're not representing that you provided specific calculations

271b2

1 on other matters, except insofar as they were bound in the  
2 same book?

3 MR. MILLER: That's my understanding.

4 JUDGE SMITH: Anything further on the record?

5 MR. MILLER: No, sir.

6 JUDGE SMITH: All right, then we're off the record.

7 (Whereupon, at 5:00 p.m., the hearing was recessed,  
8 to resume at 9:00 a.m. on Friday, July 27, 1984.)

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CERTIFICATE OF PROCEEDINGS

1  
2  
3 This is to certify that the attached proceedings before the  
4 NRC COMMISSION,

5 In the matter of: Commonwealth Edison Company  
6 Byron Nuclear Power Station

7 Date of Proceeding: Thursday, July 26, 1984

8 Place of Proceeding: Rockford, Illinois

9 were held as herein appears, and that this is the original  
10 transcript for the file of the Commission.

11 Mimie Meltzer  
12 Official Reporter - Typed

13 *Mimie Meltzer*  
14 Official Reporter - Signature