

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
BEFORE THE ATOMIC SAFETY AND LICENSING BOARD
DOCKETED
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: In the matter of: :
: : :
COMMONWEALTH EDISON COMPANY, : Docket Nos. 50-454 OL
: : 50-455 OL
Byron Nuclear Power Station, :
(Units 1 and 2) :
: :
-----X

51st Floor Conference Room
Isham, Lincoln & Beale
Three First National Plaza
Chicago, Illinois 60602

Friday, August 17, 1984

DEPOSITION OF:

CHARLES CLEVELAND STORES
VOLUME II

Ann Riley & Associates

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Chicago, Illinois 60602
Friday, August 17, 1984

DEPOSITION OF:

CHARLES CLEVELAND STOKES,

called for examination by counsel for the Applicant,
Commonwealth Edison Company, pursuant to notice and
agreement of counsel, in the offices of Isham, Lincoln &
Beale, commencing at approximately 9:45 o'clock, a.m.,
before ANN RILEY, a Notary Public and court reporter.

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Clearcrase
257-03101

1 APPEARANCES OF COUNSEL:

2 For the Applicant Commonwealth Edison Company:

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9 For the Joint Intervenors:

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11 Business and Professional People for the
12 Public Interest
13 109 North Dearborn Street
14 Chicago, Illinois 60602

15
16 ALSO APPEARING:

17 Robert Hooks

18 Lou Del George

19 James Muffett
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C O N T E N T S

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WITNESS:

Examination by:

Page:

CHARLES CLEVELAND
STOKES

Mr. Wright

4

Mr. Gallo

7

Mr. Lewis

162

Mr. Cassel

170

mgcl-1

P R O C E E D I N G S

1
2 MR. GALLO: This is the second deposition of
3 Mr. Charles Stokes, being scheduled in accordance with
4 the agreement of the parties, and I think we will refer
5 to this deposition officially as the second deposition
6 of Mr. Charles Stokes.

7 Whereupon,

8 CHARLES CLEVELAND STOKES,
9 was called as a witness and, having been first duly sworn,
10 was examined and testified as follows:

11 MR. GALLO: Mr. Cassel, you have some corrections,
12 or Mr. Wright, do you have some corrections you want to
13 make to the testimony?

14 MR. WRIGHT: Yes, we do.

EXAMINATION

15 BY MR. WRIGHT:

16 Q Turn to page 4 of your prefiled testimony. Do
17 you have any corrections to page 4?

18 A Yes, I do.

19 Q And what are those corrections?

20 A In roughly the middle of the top question, it
21 says in my review, I have reworked a number of engineering
22

mgcl-2

1 calculations. It should state, "In my review, I have
2 reworked aspects of a number of engineering calculations."

3 MR. GALLO: Wait a minute. I missed that.
4 What line are you talking about on page 4?

5 THE WITNESS: It's roughly the middle of the page.

6 MR. CASSEL: It's the twelfth line, Jim. We're
7 on page 4, line 12.

8 THE WITNESS: That should be "aspects of a
9 number of engineering calculations."

10 BY MR. WRIGHT:

11 Q Now, Mr. Stokes, why are you making these
12 corrections?

13 A Because the documentation I reviewed, I only
14 had parts of the calculations. I did not have the entire
15 calculation to review, and therefore I only reviewed
16 aspects of the calculations.

17 Q Okay, Mr. Stokes, do you have any corrections
18 on page 10 of your prefiled testimony?

19 A Yes, I do.

20 Q And what are those corrections?

21 A It's the bottom of the second paragraph of
22 question -- or Answer 12. "The result would be an

1 allowable stress larger than allowed by code," rather than
2 "the higher" -- it would be higher, but it's also clearer.

3 MR. GALLO: Do you want to repeat that
4 correction?

5 THE WITNESS: "The result would be an allowable
6 stress larger than allowed by code."

7 BY MR. WRIGHT:

8 Q Now, Mr. Stokes, why are you making that
9 correction?

10 A Well, the answer as stated is correct, but it's
11 not precise enough. It's more correct with the change
12 that's made.

13 Q Okay. Now, Mr. Stokes, do you have any corrections
14 on page 26?

15 A Yes.

16 Q And what are those corrections?

17 A Well, after the 200 -- after the KL/R in the
18 first paragraph, and the 300, the foot and feet should
19 be canceled. The 200 does not have a units term.

20 MR. GALLO: I didn't understand the correction.
21 Do you want to -- just tell us what the correction is.

22 THE WITNESS: KL/R is 200, period -- exceeded

mgcl-4

1 the 200, period. One I noted was 300, period.

2 MR. GALLO: So you have deleted "feet" from the
3 third line, and you've deleted "feet" from the fifth line;
4 is that it?

5 THE WITNESS: And "foot" on the third line at
6 the end.

7 MR. GALLO: Oh, okay.

8 BY MR. WRIGHT:

9 Q Now, again, Mr. Stokes, why have you made
10 these corrections?

11 A As I said, the factor is unitless. This section
12 of the testimony was typed up at my direction, but
13 inadvertently overlooked. It was handled by my attorneys,
14 and undoubtedly there was a misunderstanding as to that
15 section of the testimony.

16 Q Are there any other corrections that you have to
17 make to your testimony?

18 A No.

19 MR. WRIGHT: Okay, Joe, I think that ends our
20 portion.

21 EXAMINATION

22 BY MR. GALLO:

23 Q Mr. Stokes, would you state your full name and

mgcl-5

1 business address for the record?

2 A It's Charles Cleveland Stokes. As I have stated
3 earlier, I have no specific business address. I use my
4 permanent residence address as such -- Route 1, Box 223,
5 Cottonwood, Alabama.

6 Q And is the organization you are with called
7 P-S Associates?

8 MR. WRIGHT: Joe, let me just ask a question
9 before we proceed with this. A lot of the information
10 we've gone into in the first deposition, and to that extent,
11 it's repetitive, and if we're just seeking a little
12 background information to get us started, I think that's
13 contained in the first deposition.

14 If there's any other reason for these questions,
15 I would like some type of an explanation.

16 MR. GALLO: Well, I just want to affirm that
17 P-S Associates operates out of the address he just gave me.
18 I don't know if that's in the first deposition or not.

19 MR. WRIGHT: I think it is.

20 MR. GALLO: Well, I'd like to get an answer to
21 the question, in any event.

22 THE WITNESS: The question is if P-S Associates

mgcl-6

1 works out of that address?

2 MR. GALLO: Yes, I know.

3 BY MR. GALLO:

4 Q But is that the name of your organization, that
5 you're with, as indicated in Answer 2 to your testimony?

6 A I am a member of P-S Associates, or that is an
7 organization which I belong to, yes.

8 Q All right. Well, does P-S Associates have a
9 business address?

10 A No.

11 Q Your testimony says that you graduated from
12 Auburn University in 1975 with a BCE degree. What do
13 those letters stand for?

14 A Bachelor of Civil Engineering.

15 Q Was that a four-year curriculum at Auburn?

16 A It was.

17 Q And if I understand your testimony, this is your
18 only engineering degree?

19 A It is.

20 Q Did you take any course work at Auburn in the
21 field of structural dynamics?

22 A I did.

23

24

End-1

mgc2-1

1 Q What was that course work?

2 A I took structural mechanics, dynamics, strength
3 of materials, steel design, concrete design ---

4 Q Wait a minute. Wait a minute. You're going too
5 fast.

6 You say you took structural dynamics?

7 MR. CASSEL: No. He said structural mechanics.
8 Then he said dynamics.

9 BY MR. GALLO:

10 Q I'm sorry I interrupted you, but go a little
11 slower.

12 A Structural mechanics, dynamics, as an ME course.

13 Q Okay.

14 A Strength of materials. Three different courses
15 in structural analysis. One of the final courses in that
16 area was structural analysis. The first two were subparts
17 of structural analysis.

18 Q Can you remember what those were?

19 A Not specifically, no. They were involved with
20 structural design, but leading up to structural analysis
21 as a whole, and then structural steel design, concrete
22 design, foundation design as a structure, and I consider a

mgc2-2

1 course which might be excluded from structures per se,
2 but applicable to structures, soil analysis and a soil
3 stabilization course.

4 Q Now I take it that these are the names of
5 individual courses that you took while you were enrolled
6 in Engineering School at Auburn; is that correct?

7 A Yes, the three that I listed as a group in
8 structural analysis, I didn't break down to names, but
9 the rest of the course names per se.

10 Q But you are telling me that in the structural
11 analysis area, you took three courses, the last being
12 structural analysis?

13 A Yes.

14 Q Now you say you took a course called "Dynamics,"
15 and what did that involve?

16 A It was an ME course in dynamic loading, dynamic
17 forces and the use of those forces in calculations and
18 stresses.

19 Q And involving what design?

20 A Anything -- structural, aerospace, any mechanical
21 component, machinery -- any item.

22 Q So this course work -- this particular course was a

mgc2-3

1 course in structural dynamics; is that right?

2 A It was mechanical dynamics.

3 Q Mechanical dynamics?

4 A Yes.

5 Q Did you take any course work in seismic analysis?

6 A No.

7 Q Now I've got a series of questions I want to ask
8 you about your work experience.

9 Based on my review of your testimony, it appears
10 that you worked for two and a half years as a draftsman
11 and detailer for Southern Services; is that correct?

12 MR. WRIGHT: Objection. Joe, this is the
13 second part of the testimony. In the first part, these
14 questions were asked and answered, and that's the basis of
15 my objection.

16 MR. GALLO: Okay. Objection noted.

17 MR. CASSEL: Well, I think we may go farther than
18 that, Joe. Is there a need to go -- you know, this
19 material -- his resume was available at the first
20 deposition. All these things were listed. I forget whether
21 it was you or Mike that asked this series of questions
22 about this whole area.

mgc2-4

1 MR. GALLO: Well, the resume was made available
2 just prior to the deposition starting last time.
3 Mike Miller took the deposition, and it was an illegible
4 copy for the most part. I don't recall that these
5 questions were asked just in the way I am about to ask
6 them. In any event, I want to ask them, unless you are
7 going to instruct the witness not to answer them.

8 You can object on whatever grounds you see fit,
9 but I want to ask the questions, and I expect answers.

10 MR. CASSEL: Well, I may want to instruct the
11 witness not to go over again the same ground that was gone
12 over before. It's unusual, as you know, to make a witness
13 available for a second deposition in a case. We are doing
14 it here, because he now has prefiled testimony.

15 MR. GALLO: Well, I guess we're going to get in
16 an argument, then. What do you mean, it's unusual,
17 because the unusual circumstances stem from the fact that
18 you weren't prepared and able to go forward at the time
19 the schedule was set by the Board, due to the fact that
20 you just couldn't get your witnesses together and get it
21 done. The understanding was that we would have a second
22 deposition; isn't that right?

mgc2-5

1 MR. CASSEL: The understanding was that we would
2 make him available for a second deposition, based on his
3 prefiled testimony, which was the reason --

4 MR. GALLO: And I am asking questions from his
5 prefiled testimony.

6 I'm sorry. Go ahead.

7 MR. CASSEL: If you have a particular area or
8 point that you think was not sufficiently addressed in
9 the first deposition -- we don't want to be unreasonable,
10 but I don't think any of us want to sit here and spend the
11 same two hours that Mike spent the first time.

12 To the extent that resume was illegible,
13 Charles explained the answers in the first deposition.

14 MR. GALLO: Well, be that as it may, these are
15 the questions I want to ask and as I believe it's
16 appropriate to ask them, and you will just have to take
17 whatever action you think is necessary.

18 MR. CASSEL: Well, let me tell you what our
19 position is. Our position is, if you can give us a
20 particular reasons why you need to go over this same
21 territory again, a particular line of inquiry you want
22 to pursue that wasn't pursued before, we'll entertain that.

mgc2-6

1 But otherwise we will instruct the witness not to answer
2 a whole series of questions about his resume, which was
3 extensively answered in the last deposition.

4 MR. GALLO: Well, I don't think I have to
5 justify and establish a reason why I want to conduct this
6 line. I think it's an appropriate line, and I intend
7 to ask the questions.

8 MR. CASSEL: Well, I'm telling you right now,
9 we will instruct the witness not to answer any questions
10 about his work background, unless you can state a
11 specific reason how this goes beyond the first deposition
12 or --

13 MR. GALLO: I don't have that burden. You have
14 that burden. My recollection is, I have a question here,
15 "What is a detailer?" That question wasn't asked, and
16 I'm about to ask it.

17 MR. CASSEL: All right. Well, we'll listen to
18 them one by one.

19 MR. GALLO: All right.

20 BY MR. GALLO:

21 Q Let me start again with the question prior to
22 that time -- am I reading your testimony correctly,

m g2-7

1 Mr. Stokes -- that you worked for two and a half years
2 for Southern Services as a draftsman and detailer,
3 approximately?

4 MR. CASSEL: I am going to object to that
5 question and instruct the witness not to answer that. That
6 was specifically asked and answered at the last deposition.

7 MR. GALLO: You are instructing the witness
8 not to answer?

9 MR. CASSEL: That's right.

10 BY MR. GALLO:

11 Q Mr. Stokes, what is a detailer?

12 A A detailer is one who has responsibility for
13 doing certain aspects of a design. He does do design
14 work, but he's a member of the drafting department.
15 Typically he would be considered a designer in the drafting
16 department, rather than a draftsman.

17 Q Do I understand, then, a detailer is a higher
18 level of competence than a draftsman in the order at
19 Southern Services?

20 A Yes.

21 Q All right. So the draftsman, then -- what
22 were your duties as a draftsman for Southern Services?

m gc2-8

1 A Well, as a draftsman, I did neat line
2 reinforcing drawings for concrete, neat line drawings for
3 structural steel. I did the rebar takeoffs, figured the
4 splice lengths required for embedment, and I did do some
5 detailing as a draftsman, in that I detailed rebar
6 around openings, expansions. I detailed molded connections.

7 Q All right. I'm sorry to interrupt, but I want
8 to try to get the record clear.

9 My question was limited to draftsman. I'm
10 going to ask you about detailing, but I have some
11 follow-up questions about your duties as a draftsman,
12 based on the terms you just used in your answer.

13 When you said you did neat line drawings for
14 concrete and structural steel, what does "neat line
15 drawing" mean?

16 A It's the line diagram showing the extremities
17 of the concrete in the poured condition, locations of
18 openings. It shows embedded items, placements, locations,
19 the item numbers, the slope on the concrete for drainage.

20 Q These are all noted on the drawings?

21 A Yes.

22 Q What kind of drawings would these be?

mgc2-9

1 A Neat line drawings.

2 Q They are called neat line drawings?

3 A The specific title.

4 Q And what are they used for?

5 A Building the rebarsupporting structures, forming
6 the concrete, decking the pit if it's below ground, grading
7 for pouring the concrete, all --

8 Q And what are rebar takeoffs?

9 A A rebar takeoff is a listing of the steel
10 straight lengths, bent pieces, the necessary pins
11 required to form the piece. It lists the tonnage, the
12 sizes of steel, the tonnage per size. It may list a
13 few other items, but that's basically it -- the strength
14 of the steel required in the rebar.

15 Q What kind of structures were involved with these
16 particular drawings that you were working on?

17 A I worked on both fossil facilities and nuclear
18 facilities -- neat line drawings and rebar drawings.

19 Q Can you be a little more specific as to what
20 elements of these facilities you were involved with in
21 this work? Take the fossil first.

22 A Well, over the timeframe that I was doing this

mgc2-10

1 work, I worked on, I believe, the main slab for Miller.

2 Q What is Miller?

3 A It's the Miller steam plant. It's a fossil
4 plant. It's called Miller steam plant, but it's a fossil
5 plant.

6 I worked on pool boxes, miscellaneous outdoor
7 structures on Farley nuclear plant.

8 Q Can you identify one of those structures for me?
9 You called it an outdoor structure.

10 A Well, one of the type things I worked on was
11 the pumproom, the box. It was ---

12 Q The pumproom box?

13 A Yes.

14 Q Did this involve safety-related equipment, do
15 you know?

16 A Yes, it did.

17 Q Explain to me the difference, then, between
18 a draftsman and a detailer.

19 A Well, a draftsman typically may do some detail
20 functions, whereas a detailer, that's classified a
21 detailer, specifically does nothing but detail functions.

22 Our designers at Southern Services when I was

End 2

mgc3-1

1 there were primarily responsible for doing detailing. But
2 as a draftsman, I was not just a draftsman, in that
3 I was there as a co-op, and engineer co-op, and so I was
4 allowed to do detailing functions that normally the
5 designer would do as training in the co-op function.

6 Q Can you explain to me what that program was?
7 I am referring to the engineer co-op program.

8 A The program is set up, allows a student to
9 attend college one semester or one quarter and then work
10 with the company. The work in the company is geared towards
11 what he will be doing upon his completion. In other words,
12 he'll be working in the same aspect as his degree would
13 be -- civil engineering. It would be in functions -- the
14 duties he would be assigned would be functions that would
15 be important to make that person, that graduate, a better
16 engineer upon graduation, knowing what should go in a
17 drawing, neat line, reinforcing, how to detail rebar,
18 detail molded connections, draft a document -- necessary
19 training for an engineer after graduation, in that if he
20 was to review that document, he should first have done it
21 to know what was on it.

22 The tasks varied from semester to semester. As I

mgc3-2

1 said, every other semester I was in school, and every other
2 semester I was at work. I was rotated around the various
3 departments from the concrete fossil, structural steel
4 department, to nuclear concrete and nuclear steel department.
5 That's the way Southern Services is set up.

6 Q So if I understand your testimony, you worked
7 one semester and didn't go to school and then went to
8 school the next semester but didn't work?

9 Did I understand that correctly?

10 A I didn't go to school, but I was going to school
11 for my degree, and while I was co-oping I took courses
12 at Birmingham, the University of Birmingham, an extension
13 of Alabama, at night.

14 Q Were these engineering courses?

15 A Yes.

16 Q Well, just for my information, when did you then
17 first enroll at Auburn?

18 A I transferred to Auburn in the fall of -- let's
19 see, I believe I went in early -- the fall of '70.
20 I would have to look back at records. I attended a
21 junior college before I went to Auburn.

22 Q What junior college did you attend?

1 A George C. Wallace State Technical Junior College
2 in Dothan, Alabama.

3 Q How many years were you there?

4 A It's more like quarters, but roughly four, I
5 think.

6 Q Four quarters?

7 A Yes.

8 Q Then you transferred to Auburn from out of that
9 school?

10 A Yes.

11 Q Did you transfer directly into the Auburn
12 Engineering School?

13 A No, I didn't.

14 Q Can you explain why not?

15 A Well, when I first started college, I started
16 in aerospace engineering. The aerospace had roughly
17 20,000 men laid off one year after I was in school. I also
18 was sick. It changed my aspects toward life and what I
19 felt I wanted to do with my life.

20 I attended a drafting department course at
21 George C. Wallace for six months. As a result, I decided
22 I'd be an architect. I transferred to Auburn in the

mgc3-4

1 architectural department. In the late fall of '70 or '71,
2 I'm not sure.

3 Q I see. So you essentially started out afresh
4 in either the fall of '70 or '71 at Auburn, is that it?

5 A Not exactly. All the course work I had taken
6 for aerospace was more advanced than the course work for
7 the architectural department. The courses applied, though,
8 in the case of technical electives in the architectural
9 curriculum, and what that did was it upset my schedule.
10 and to counter that upset, I took courses in the building
11 technology curriculum and was working on a double degree.

12 Q I see. Now after you graduated in May of '75,
13 you became an assistant engineer at Southern Services;
14 is that correct?

15 A Yes.

16 Q Your testimony indicates that you designed
17 outdoor structures on the Miller steam plant. What were
18 those outdoor structures?

19 A Right after I graduated, I worked on the ash
20 trench system, which was a system of structures. It was
21 primarily a trench, concrete canal. It also involved
22 road structures which were in compliance with ASSHO.

mgc3-5

- 1 Q With what?
- 2 A Bridges, basically.
- 3 Q What was the term you just used?
- 4 A ASSHO.
- 5 Q Spell that, please.
- 6 A It's ASSHO -- A S S H O (spelling acronym), I
7 believe. It's American -- that may even be an incorrect
8 one. It's basically the Highway Department code
9 requirements.
- 10 Q For the state of Alabama?
- 11 A Yes. And I think the federal government
12 requirements were met.
- 13 Q All right. I'm sorry I interrupted you. You
14 said that you were involved in the design of a concrete
15 canal trench system and road work?
- 16 A Yes, the road work. I also did piers and
17 abutments for a pipe bridge that spanned a creek. I did
18 the concrete piers and abutments for a bridge for trucks
19 which carried wet fly-ash to the storage pond or dump
20 area. I basically handled structures at various locations
21 along the piping system from that point on to the storage
22 facility, supporting structures, kick blocks for that

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mgc3-6

1 system. I designed the abutments and piers for a
2 rail coal-unloading bridge that spanned that tunnel or that
3 trench for the coal-unloader at the plant.

4 I designed a roadway to facilitate transportation
5 of the wet fly-ash trucks from the transfer point from
6 where the ash was separated from the slurry, so that the
7 trucks could cross the bridge to this storage facility
8 without making a very sharp turn.

9 I worked on makeup water lines offsite, thrust
10 blocks, cut-and-fill drainage, and other things. There
11 was many other things I did.

12 Q Let's return to the concrete canal or trench
13 system. What exactly were your design responsibilities
14 there?

15 A It was designed to withstand side loading from
16 soil and water pressure, large cranes sitting next to
17 this structure, surcharge from trucks, because many of the
18 canals ran right next to the road structures. On top of
19 that, it was designed for these large soil-moving machinery
20 loads as surcharge.

21 Q Did you do all the design work yourself?

22 A I did it, and it was checked by another engineer.

mgc3-7

1 Q But you were the principal engineer in charge
2 of this design; is that --

3 A Yes.

4 Q Then in -- and I take it again, all these items
5 you enumerated involved structures associated with the
6 Miller steam plant, correct, the ones you just --

7 A The ones I just, yes, yes.

8 Q Then in July of '78, if I understand your testimony
9 correctly, you were promoted to an engineer classification
10 called Engineer Roman II?

11 MR. CASSEL: Wait a minute.

12 THE WITNESS: This is my resume, and it's coming
13 off my testimony, but it's a little bit different.

14 MR. CASSEL: I want to check your resume, though.
15 It's from your testimony, page 10. I just wanted to see
16 if it was on your resume.

17 THE WITNESS: Well, the thing with my resume --
18 okay.

19 MR. GALLO: Do you have the question?

20 THE WITNESS: Would you repeat it?

21 BY MR. GALLO:

22 Q Were you promoted to an engineer classification,

mgc3-8

1 Roman II, in July of '70 while you were working at
2 Southern Services?

3 A Yes.

4 MR. GALLO: Can I go off the record?

5 (Discussion off the record.)

6 MR. GALLO: Let's go back on the record.

7 (Discussion off the record.)

8 MR. GALLO: All right, let's go on the record.

9 BY MR. GALLO:

10 Q Mr. Stokes, during the time that you were working
11 at Southern Services as an Engineer Classification Roman
12 Numeral II, you indicate in your testimony that you
13 performed what is called NRC 79-02 analyses. Just what
14 is that type of analysis?

15 A Well, actually it was NRC Bulletin 79-02 and
16 79-14 analyses. It's analyses to meet the requirements
17 of those two bulletins. 79-02 is anchor bolts, I believe,
18 specifically anchor bolts, and 79-14 was baseplate.
19 The analysis primarily required a complete reanalysis
20 of structures.

21 Q So the record is not confused, tell me what
22 type of analysis you did with respect to 79-14.

mgc4-1

1 A I performed STRUDL calculations, the structural
2 steel stiffness calculations, stress calculations,
3 calculations on the plates.

4 Q What was the purpose of these calculations?

5 A To ensure that components were within code
6 allowables.

7 Q And is the component we're talking about the
8 baseplate?

9 A It was primarily geared to the baseplates, but
10 as I said, we redid the entire structure for this work.

11 Q When you use the term "entire structure," what
12 are you talking about?

13 A It covered every component from the point of
14 attachment to the pipe down to the plate and the bolts.
15 We reverified the entire structure. The attachment
16 hardware that was purchased was reverified. The load
17 capacity, the stiffness, the flexibility of the system
18 was reverified in complete, in effect, in performing
19 these calculations, which were specifically bolts and
20 plates. We redid the entire work that had been done.

21 Q Now where were these plates and bolts located?

22 A In the Farley nuclear power plant.

mgc4-2

1 Q Was it in the turbine building or the containment
2 building or where?

3 A The stuff I worked on was containment, main
4 steam, all over the auxiliary building. Predominantly
5 all I worked on was containment. A lot of this stuff
6 was Westinghouse's original scope that we redid ourselves.
7 Westinghouse kept the whip restraints. I don't remember
8 working on any whip restraints during that time, although
9 I think I did do some field work for Westinghouse as to
10 determining whether or not something would work for them.

11 Q What was the purpose of these baseplates?

12 A Baseplates were the transferring load mechanism
13 between the structure and the bolts to the concrete
14 structure or supporting structure.

15 Q So on the one end you had the building structure
16 and at the other, the baseplates. Were they embedded in the
17 concrete for the building structure; is that it?

18 A The ones that were embedded in concrete were
19 not part of this program. 79-02 limited the work to those
20 with expansion type anchors, I believe.

21 Q We're talking 79-14 now?

22 A Yes.

mgc4-3

1 Q And the baseplates, what is attached to the
2 baseplates? You told me one end is the structure. What
3 is attached on the other end?

4 A There's nothing. It sits on concrete.

5 Q What are they used for?

6 A To transfer load to the concrete.

7 Q What component sits on the baseplate, if any?

8 A The structure that's attached to the plate,
9 small-bore, large-bore piping systems, HVAC, electrical
10 conduit structures. Primarily this work that I worked on
11 here was all large and small-bore piping systems.

12 Q All right. I guess that was the source of the
13 confusion. When you use the term "structure," you are
14 referring to both the building and the equipment components;
15 is that right?

16 A It is both the structures, yes. One is -- I
17 use 'structure,' if it's the overall building structure
18 as a structure, and I use "piping support structure" as
19 a structure. HVAC supporting steel is a structure and
20 electrical conduit supporting steel, all the way including
21 the building is all one continuous structure, as far as I
22 am concerned, if that clarifies what I was trying to say.

mgc4-4

1 Q Now what did you do, what type of analysis did
2 you perform under I&E Bulletin 79-02?

3 A Well, they were mixed. Both functions were
4 performed at the same time. I verified that the anchor
5 bolts were acceptable, that the loads being transferred
6 to them through these plates from the structure. I verified
7 that the concrete could take the load from these anchor
8 bolts.

9 Q All right. You testified that you redesigned
10 the precipitators structural steel on the Miller steam
11 plant. Can you tell me what a precipitator is?

12 A Well, I said when I was co-op, I worked on the
13 ash trench system. That system primarily originated from
14 the precipitator. The precipitator is an electrostatic
15 precipitator. All the smoke and exhaust from the plant
16 went through the precipitators before going to the stacks.
17 The precipitators electrostatically removed the fly-ash
18 particulates down to a certain criteria. It was rinsed or
19 transferred to water, a slurry system, which was actually
20 pumped from the precipitator area out to the storage
21 facility. It's a very large machine, very large.

22 Q You indicate that you were involved in the design

mgc4-5

1 of the structural steel aspects of the precipitator. Can
2 you explain to me what those aspects were?

3 A Well, basically like I said, the precipitator is
4 a large structure. I'll give you some dimensions. It's
5 maybe 400 feet tall. It's 400 feet high, 200 wide, 400 long.
6 It's large enough for a football field, roughly. The
7 structural steel then is like a very large building. It's
8 built to enclose all the equipment and support it for
9 this --

10 Q That's all right. Did you do the design work
11 for the structural steel?

12 A The initial design work was done by someone else.

13 Q And what design work did you do?

14 A Well, when I was assigned to the project, they
15 wanted to enclose the roof. They wanted to put a crane
16 on top of the roof to remove certain very heavy objects.
17 They didn't want to bring around one of these big boom
18 cranes to lift things off every time, and so they were
19 wanting to add a crane on it. My job was to redo the
20 structural steel analysis for the frame to determine the
21 loads from this new support, the new structure, to design
22 it for the wind loads at the plant. It had to be designed

mgc4-6

1 to withstand a thermal expansion of the precipitator
2 steel as it heated up to nearly 500 degrees or higher,
3 and at the same time I had to determine the locations on
4 the precipitator itself that we could attach this structure,
5 because the structural steel itself did not go up to that
6 level. The top two 40 feet or so was precipitator entirely.
7 There was no structural steel there.

8 And I had to review the precipitator drawings
9 to determine where it could support the loads I was
10 talking about putting on it. I spent some time in doing
11 that analysis.

12 Q What code did you design to?

13 A The structural steel was designed to the AISC
14 Code. STRUDL was used, as had been used in the original
15 analysis. The STRUDL design code check was used to
16 facilitate verifying that each member was capable of taking
17 the stresses. In STRUDL, the thermal loads from the
18 expansion were used to force the frame to stretch. It was
19 used on the analysis of the roof to force the side members
20 to expand outward against the bolts which were attached
21 to the precipitator.

22 The reason for it was the precipitator grew out,

mgc4-7

1 and there was no assurance that the frame on top would
2 expand equally. We did the thermal expansion laterally.
3 It displaced the frame, and the frame was verified for
4 the loads, and the connections were designed to take that
5 load component at the precipitator location.

6 Q STRUDL is S T R U D L (spelling)?

7 A Yes.

8 Q That's a computer code?

9 A Yes.

10 Q And this is what you were talking about, applying
11 this computer code in the design work you did?

12 A Yes.

13 Q Were you involved in the development of the
14 computer code?

15 A No.

16 Q This design analysis for the structural steel
17 on the precipitator that you performed, did it involve
18 any seismic analysis that you performed?

19 A Not on the precipitator at Miller, no.

20 Q You also testified that you performed some design
21 work involving structural steel of the coal conveyors
22 for a fossil plant called Scherer, S C H E R E R (spelling).

mgc4-8

1 Can you explain to me what your design
2 responsibilities were in that effort?

3 A To design the structural steel again. It was a
4 conveyor system that went from the building, which was
5 roughly a couple of hundred feet off the ground level. The
6 system went from that grade, transferred -- it was a slope
7 structure, went down to grade. It was a series of vents
8 and towers in between to support the ends of these frames.
9 It, too, was enclosed.

10 Q Was STRUDL used on that work?

11 A No, it wasn't.

12 Q Was any computer code used for assistance in that
13 work?

14 A Not in the steel design, no.

15 Q Did the steel design for this conveyor involve
16 any seismic analysis?

17 A Not on the fossil plant; no, it didn't.

18 Q Then your testimony indicates that you left
19 Southern Services in May 1980, and you went to work for
20 Bechtel. And your testimony indicates that you performed
21 analyses for Bechtel. Again, they're called 79-02 and
22 79-14 analyses.

mgc4-9

1 I assume -- and correct me, if I'm wrong -- that
2 these are the same as the ones we just finished discussing
3 that you performed with Southern Services; is that correct?

4 A They were similar in the respect that they were
5 79-02 and 79-14, but Bechtel had their own requirements
6 for meeting those bulletins, which differed from the
7 requirements of Southern Services, so they were different.

8 Q But the I&E Bulletins were the same.

9 A Yes.

10 Q Now as I understand your testimony, you left
11 Bechtel in October of '80, and as I understand it, you
12 went to work for Nuclear Services then; is that correct?

13 A Yes. That's --

14 Q You indicate that you worked on Zimmer. What
15 was the nature of your work on Zimmer?

16 A Reverification, I believe, primarily. The
17 structure was already there. We reanalyzed the entire
18 structure, the pipe supports.

19 Q You're going to have to help now. What kind
20 of structures?

21 A Pipe supports, the work that Quadrex was working
22 on for Sargent & Lundy was geared to the small-bore piping

mgc4-10

1 systems predominantly. There was some large-bore work,
2 given to us to do.

3 I also did pipe stress calculations in relation
4 to that work.

5 Q Now we're talking Zimmer, right?

6 A Yes. I was -- well, Quadrex, in the office,
7 they had decided to form a special team that could do pipe
8 stress and pipe support calculations to resolve several
9 systems in the field. It seemed several lines had been
10 run at some distance from any supporting structure, and
11 it was very difficult for the stress group to decide where
12 to put supporting steel, because they primarily didn't have
13 hanger background, and in any case, I was part of the
14 special team that was taught in-house pipe support and
15 pipe stress design and then sent to the field.

16 Q I see. Now you have to bear with me because
17 I don't understand this engineering analysis very well.

18 When you did these small-bore piping and pipe
19 stress analyses, just how did you perform these
20 calculations? Did you develop the loads, or were those
21 loads given to you by someone else? I'm trying to pinpoint
22 just exactly what your responsibility was.

mgc4-11

1 A Well, the loads were determined in relation to
2 the pipe supports by a stress group. Now the group that
3 did that for us in the work we were doing on Zimmer at
4 Quadrex was another Quadrex group. Later, I became sort
5 of a part of that group and part of the pipe stress group.
6 And for part of the work, I generated my own pipe stress
7 loads and did the analysis of the structure, but for the
8 most part, it was just me taking loads that were given
9 to me and designing the structure or reverifying the
10 structure for adequacy.

11 Q How did you accomplish that? Can you explain to
12 me how you accomplished that?

13 A It was the use of hand calculations and computer
14 analysis.

15 Q And what kinds of loads were furnished to you?
16 What kinds of loads are we talking about? Static loads,
17 dynamic loads, which one?

18 A Both.

19 Q Did it include seismic loads, too?

20 A Yes.

21 Q What computer code was involved?

22 A I believe in doing the computer analysis, a program

mgc4-12

1 called PIPSYS, but I wasn't in that group, and I'm just
2 relying on memory of the system they used, but I believe
3 it was PIPSYS.

4 Q P I P S Y (spelling)?

5 A Yes.

6 MR. LEWIS: S Y S (spelling).

7 MR. GALLO: Excuse me? What did you say it was?

8 MR. MUFFETT: P I P S Y S (spelling).

9 BY MR. GALLO:

10 Q Were you involved in the development of this
11 particular computer code?

12 A Oh, no.

13 Q Your testimony indicates that you were assigned
14 to LaSalle. Did you actually do any work for Quadrex on
15 LaSalle?

16 A Yes, I did.

17 Q And what was that work?

18 A Computer analysis.

19 Q You'll have to elaborate more.

20 A Piping systems, pipe supports.

21 Q The same sort of work you just described for
22 Zimmer?

End 4

mgc5-1

1 A Yes. I was primarily running SAGS, computer
2 runs on structures.

3 Q What was the name of this code?

4 A SAGS -- S A G S (spelling).

5 Q And what function did this computer code serve?

6 A It's similar to STRUDL. It generated stress
7 levels.

8 Q Did you work on the development of this code?

9 A No.

10 Q Was your work similar then to Zimmer? You were
11 given loads, and then you calculated -- determined whether
12 or not the pipe supports were adequate to meet those loads?

13 A Yes. That part of it, I was given loads, yes.

14 Q Did you do any other work at LaSalle besides
15 analyzing pipe supports?

16 A No.

17 Q After you left Zimmer -- I'm sorry -- strike that.
18 After you left Quadrex, you went to work for
19 Lawrence Livermore Laboratory, correct?

20 A Yes.

21 Q Your testimony indicates that you were a stress
22 analyst on the injector to the advanced test accelerator?

mgc5-2

1 A On the advanced test accelerator.

2 Q What is the advanced test accelerator?

3 A Basically it's a particle beam injector, but I
4 don't think I should get into the ramifications of how it
5 works or anything, because it's part of the Department
6 of Energy's research contract with the lab, and I do believe
7 I signed an agreement to the effect that I wouldn't really
8 go beyond what I think I've listed in my resume or in this
9 document in any discussion of what I did.

10 Q Well, was it classified defense work?

11 A I was asked if I had ever been rated as a defense
12 security rating. I'm not aware that it's banned.

13 Q Well, I've asked the question poorly. Did your
14 work on the advanced test accelerator involve classified
15 work?

16 A In some respects, yes.

17 Q Was the research work classified that was involved
18 with this particular facility?

19 A I don't think the research is classified, because
20 it's been listed in a lot of magazines.

21 Q That's what I thought.

22 A The work I did on the design of the instrument

mgc5-3

1 itself I don't believe was -- I've never seen in a magazine.
2 They've got some discussion as to how it works, but not
3 to the knowledge level that I hold.

4 Q Well, can you tell me what the advanced test
5 accelerator does? What is its function?

6 MR. CASSEL: Before you answer that -- Joe, --

7 THE WITNESS: I did. I've said it already.
8 It's a particle accelerator. The injector creates the
9 particles that are --

10 BY MR GALLO:

11 Q Is it involved in the research of high-energy
12 physics?

13 A Yes, among other things.

14 Q Now your testimony indicates that you were the
15 test analyst on the injector to this machine. What is
16 the injector?

17 MR. CASSEL: I'm just concerned about getting
18 into any areas that may be --

19 (The witness and counsel confer.)

20 THE WITNESS: I'm not going to go beyond what
21 I've already said. It created the particles that were
22 injected -- electrons, protons. I mean, I'm not going to

mgc5-4

1 get into how it did it. I'm not going to describe it in
2 more detail. I'm just going to say that it created those
3 particles for acceleration by an accelerator.

4 If you want to know more about how it works,
5 I suggest you call the lab and ask them for a tour.

6 BY MP. GALLO:

7 Q Do you know how it works?

8 A Yes, I do. Most definitely.

9 Q Now you indicate in your testimony that you were
10 a stress analyst. Just what did your job responsibilities
11 involve as a stress analyst?

12 MR. CASSEL: To the extent you can say without
13 breaching any confidentiality.

14 THE WITNESS: Well, there was a mechanical
15 designer who did basic layouts for the components. It
16 was also a group project by Physics and other groups for
17 the component shapes. So initially there was some drawing
18 made up of a component. I analyzed that drawing, shape,
19 object, for the loads that would be exerted on it from
20 the machine -- electrical, mechanical, pressure, vacuum,
21 lack of pressure, radiation, seismic load. I analyzed
22 that component for every possible load that could be applied

mgc5-5

1 to that component in California.

2 BY MR. GALLO:

3 Q Did you define those loads, or were they given
4 to you by some other group?

5 A I defined those loads predominantly. I was given
6 the magnitude of the electrical field that would be
7 exerted on them by the Electrical Department. The Physics
8 Department specified certain other criteria that they had
9 to comply with, but I generated the loads myself.

10 Q And did you generate the seismic loads yourself,
11 too?

12 A Yes.

13 Q How did you do that?

14 MR. CASSEL: Are we getting into a confidential
15 area with that question?

16 THE WITNESS: No. It's a UBC, at the University
17 of California --

18 MR. GALLO: I would like to state for the record
19 that it's my belief that what we're talking about is a
20 part of the Department of Energy's high-energy physics
21 program, which is unclassified, and the only thing one has
22 to concern oneself about is whether or not it involves

mgc5-6

1 proprietary information, and most DOE work does not involve
2 proprietary information. Otherwise it would not be a
3 national laboratory.

4 MR. CASSEL: I have no reason to agree or disagree
5 with your belief, Joe. I'm not familiar with the program.
6 I'm only concerned that I want the witness to be very
7 careful that he doesn't go beyond any agreement that he may
8 have signed, whether it's based on proprietary or security
9 or whatever. He's not charged with knowing what the basis
10 for the agreement was.

11 MR. GALLO: Let's establish that for the record.

12 BY MR. GALLO:

13 Q Did you sign some kind of agreement when you left
14 LLL?

15 A I think I signed some when I started at LLL.

16 Q What was the nature of the agreement?

17 A It had to do with drawings, calculations,
18 references to this instrument. No removal, taking nothing
19 with me. I don't believe I -- I'm not sure if it stated
20 I shouldn't discuss it.

21 Q Do you remember whether or not it was a
22 confidentiality agreement that barred you from talking

mgc5-7

1 about certain things?

2 A At this moment, no, I can't say that it barred
3 me from discussing it. It's on my resume.

4 Q All right.

5 A But I don't think they want me to sit down and
6 draw the parts out and build -- you know, show you how
7 to build one yourself. If that's what you mean by
8 confidential, I think they want me to keep it in my head.
9 I don't think they'd want Russia knowing how they built
10 theirs, if that's what you mean. I think that's confidential,
11 yes.

12 Q Well, Mr. Stokes, do you or do you not know
13 whether the work you were involved with was classified?
14 I submit to you that --

15 A It wasn't classified as top security classified,
16 if that's what you're getting at.

17 Q Was it classified as restricted data?

18 A It was restricted, yes.

19 Q It was restricted data, as that term is used by
20 the Department of Energy?

21 A I don't know what you're saying, "by the
22 Department of Energy." I was working for the lab, and it

mgc5-8

1 was restricted as to how the lab could use it when I left
2 the lab.

3 Q Now you say you signed this agreement when you
4 took the job at the lab. Did you sign another one when
5 you left the lab?

6 A I'm not aware. I don't remember signing one, no.

7 Q Do you have a copy of this agreement?

8 A No.

9 Q All right. Let's get back to the definition of
10 the seismic loads for the stress analyses you did. I asked
11 you the question how you performed -- how you determined
12 or defined the seismic loads that you used in your
13 analysis. Can you tell me that?

14 A I consulted the UBC, the Uniform Building Code,
15 which is used in California to discuss the seismic loadings.

16 Q So you went to the Uniform Building Code. And
17 did it have a load value that you took out of the code
18 and used in your analyses?

19 A It had equations for deriving the loads.

20 Q And that was the load that you used, then, in
21 your analysis or -- strike that.

22 That was the load that was used in your stress

mgc5-9

1 analysis for the injector?

2 A I may have factored the load myself, but --

3 Q What do you mean by "factored the load?"

4 A I may have added an additional margin or safety
5 factor of my own to the load rating to ensure that the
6 component's integrity would not be damaged.

7 Q Do you remember whether or not you did?

8 A At this time, I can't say for sure, no.

9 Q After you left Lawrence Livermore Laboratory,
10 you went to work for Reactors Control, Incorporated.
11 According to your testimony, you worked on control rod
12 design systems for Grand Gulf.

13 MR. CASSEL: Control rod drive systems, I think
14 it says, Joe, not design systems.

15 MR. GALLO: You're correct. Let me restate the
16 question.

17 BY MR. GALLO:

18 Q What was the nature of your work with respect
19 to the control rod drive system that you worked on at Grand
20 Gulf?

21 A I was hired as an interface between the Hanger
22 Group, which was handling the -- the Hanger Group was RCI.

mgc5-10

1 They had in-house personnel doing hangers. I was an
2 interface with the Piping Analysis Group, which was being
3 done -- or I was contracted to a firm that all I know is
4 by an acronym, ECHO. I was hired to perform field functions
5 for those two groups, and primarily to interface between
6 the two groups as to whether or not a support could or
7 could not be built at a location as affecting stress to
8 the pipe and as to whether or not, from a hanger analysis
9 approach, could or could not be built.

10 My background in both stress and supports was
11 the primary reason for me being given that position. I
12 resolved problems when Stress requested a hanger that
13 couldn't go where they wanted it because of hanger
14 configuration problems, by suggesting different locations,
15 based on my stress analysis background, which would be
16 accepted on a point-blank basis.

17 I was responsible for verifying the system's
18 flexibility, that the surge from the pressure suppression
19 pool, deflection of the slab it sat on, could be taken
20 without jeopardizing the system.

21 I was responsible for verification that there
22 is no non-safety-related system or component within the

Oblique
Clearbase
5% cutout

mgc5-11

1 vicinity of those Class I lines which would interfere
2 with that line in a seismic event. I basically was like
3 the mother to that system. I did a lot of things to ensure
4 its integrity.

5 Q Now if I understand what you just told me,
6 you are talking about supports for piping systems; is that
7 correct?

8 A It's the control rods, their piping systems.
9 They're three-quarter, one, two-inch lines, inch and a half
10 lines that control the drive lines. I don't remember if
11 they have water or air. It seems like they were water-
12 filled. Water was used as the hydraulic medium in that
13 plant.

14 Q And these piping systems, are they located inside
15 containment?

16 A Yes.

17 Q And if I understand your function, if a support,
18 piping support, was required to be installed at a certain
19 location and there was something in the way, an
20 obstruction, and it couldn't be located there, then it was
21 your job to make a recommendation as to where it might be
22 located?

BU3

mgc5-12

1 A That was one of my functions.

2 Q How did you go about making that determination?

3 A I relied on the years I've spent in engineering,
4 the training, the knowledge I've gained.

5 Q Did you conduct any kind of analysis to determine
6 that you had selected the right location?

7 A It was based primarily on experience, background
8 knowledge of the system operation. I basically -- basically
9 pipe systems are an intuitive analysis approach. If
10 you've got a restraint on one end, the pipe is thermally
11 growing somewhere, it has to grow to the other end. If
12 it's restrained on two ends, you have to have sufficient
13 offset to allow it to deflect at both locations.

14 There's many aspects to making that kind of a
15 determination, but basically it was walking the system
16 down, looking at it, looking at how it was restrained,
17 looking at its attributes, how it was designed initially,
18 getting a feel for how it moved when it's heated or
19 exposed to certain load displacements of certain types,
20 and then making a decision. And they wanted someone who
21 had enough experience to make that decision and suggest
22 that location and not have it turned down, not have to do

mgc5-13

1 it three or four dozen times. They wanted it one time and
2 one time only.

3 Q Well, after you located or determined the location
4 for a particular pipe support, did you do an analysis to
5 determine whether or not it would withstand the loads it
6 would see?

7 A I didn't do the analysis. ECHO was responsible
8 for doing the computer analysis.

9 Q Another organization did it?

10 A Yes.

11 Q Now you indicated to me that aside from siting
12 these hangers or pipe supports, you did other things while
13 you were involved with the control rod drive system at
14 Grand Gulf. What was another thing?

15 A We walked the existing support structures down,
16 as-built them, sent those back to the home office for
17 computer input code generation, verified span lengths
18 between supports. I walked the system. We verified the
19 system and documented it.

20 Q You determined that the as-built condition was
21 consistent with the design; is that --

22 A No. We generated our own drawings. We didn't

mgc5-14

1 care what was on the original design. We as-built it
2 as it was there, period, irregardless of what was there
3 on the original design.

4 Q So you recorded the as-built condition on drawings
5 and sent those to your home office?

6 A Yes.

7 Q Did you have any other job responsibilities
8 besides the two we just mentioned?

9 A I worked with the Hanger Group in suggesting that
10 certain loads be placed on different hangers, by requesting
11 that Stress not hang a support in a certain location.

12 I also assisted the Hanger Group in suggesting
13 ways of design that they could do in the field, based
14 on constraints of construction which the office wasn't
15 knowledgeable of.

16 I generated ECNs eventually, Engineering Change
17 Notices, modifying the structural steel on the supports to
18 the configurations necessary to comply with both the
19 Stress Group requirements and Hanger requirements, and they
20 were issued from the field, and I worked with the
21 Construction Department, because in many cases some of the
22 stuff we wanted to do, I had to get their inputs because

End 5

1 of constraints of space and visibility of whether it could
2 be done, and I also worked with the QA Inspection
3 Department, because they were working on other parts of the
4 systems we were assigned to.

5 I said I was primarily working in the control
6 rod drive system. I also assisted other engineers in
7 other groups which were working all throughout the Reactor
8 Controls' work. I resolved interferences on drainage lines
9 that were jeopardizing the systems. Quite a few other
10 functions.

11 Q Now you left Reactor Controls, Incorporated, and
12 then went to work for Bechtel and was assigned to the
13 Diablo Canyon plant; is that correct?

14 A I was assigned to the Diablo plant when I went
15 with Bechtel, yes. Actually it was with PG&E.

16 Q Did you do the same kind of support work you've
17 just described for Grand Gulf and Diablo Canyon?

18 A No. I performed calculations similar to what
19 I did in the office, as well as providing the same functions
20 which I provided at Grand Gulf for the most part.

21 Q What calculations in the office are you referring
22 to?

mgc6-2

1 A Computer analysis, hand analysis, pipe analysis.

2 Q These were analyses of the supports to determine
3 whether or not they could withstand the loads that had
4 been determined?

5 A Yes.

6 Q Did you define these loads, or were they
7 furnished to you by others?

8 A In some cases I determined the loads, as I had
9 at Zimmer for the Zimmer plant.

10 Q What loads did you determine?

11 A Piping loads.

12 Q What loads on the piping? Did you determine the
13 static loads?

14 A Static, thermal, thermal accident, seismic.

15 Q You determined the seismic?

16 MR. CASSEL: Had you finished your answer to
17 that question?

18 THE WITNESS: Yes.

19 BY MR. GALLO:

20 Q For Diablo Canyon, is it my understanding that
21 you defined the seismic loads for the piping systems that
22 you were involved with?

mgc6-3

1 A I derived the seismic loads for some of the
2 systems, yes. I didn't say all of them.

3 Q How did you do it for the ones that you did do it
4 for?

5 A How did I do it?

6 Q Yes.

7 A I determined the location in the plant of the
8 system. The system was within a certain span requirement
9 which dictated the flexibility of the system and frequency,
10 used the seismic acceleration curves for that particular
11 area of the plant to determine the acceleration of that
12 component, based on its frequency or damping factors for
13 the structures attached, and then applied the accelerations
14 for the structure, generated the seismic forces.

15 Q Now did you develop the seismic acceleration
16 curve yourself?

17 A No.

18 Q Who did that?

19 A I believe they were generated by a company called
20 Blume & Associates.

21 Q B L U M E (spelling)?

22 A I saw that frequently on the forms, yes.

23
24
25

mgc6-4

1 Q Did you develop the accelerations for the
2 building itself?

3 A No.

4 Q That was furnished to you by others?

5 A Yes.

6 Q So I understand you took this information out
7 of documents that were furnished to you and then conducted
8 the seismic calculations; is that correct?

9 A Yes.

10 Q Now, Mr. Stokes, in your work experience, have
11 you ever performed a structural dynamic analysis of a
12 reinforced concrete building?

13 A Yes.

14 Q And can you tell me what building you performed
15 that analysis for?

16 A I believe it had to do with the structure that
17 was supporting the injector at the lab. I did some work
18 on the review of that building.

19 Q Well, did you do it or -- yes or no?

20 A I didn't do the original design of that building,
21 no.

22 Q I guess I'm confused by your answer. Are you

mgc6-5

1 telling me that while you were working at Lawrence
2 Livermore Lab that you performed the structural dynamic
3 analysis on a reinforced concrete building?

4 A Not at the lab, not on the building per se.
5 On the components that I was working on, which were steel,
6 and they came off the concrete, so I had to do some
7 analysis, but it wasn't directly related to the building --
8 the design.

9 Q Have you ever performed any dynamic modeling on
10 a reinforced concrete structure?

11 A I have performed computer modeling for dynamic
12 load cases of concrete and steel at various times, yes.

13 Q Now I'm talking about reinforced concrete
14 structures.

15 A Yes.

16 Q You said you did computer modeling?

17 A Yes.

18 Q Could you identify what type of modeling you
19 are referring to?

20 A Well, a computer model for seismic could be a
21 very detailed analysis of the structure itself. If it was
22 a column, it could be simply a stick model, a cantilever

mgc6-6

1 stick model. All you need is to generate a displacement
2 and check the frequency of it. You don't really need
3 a computer model for simple cantilever. You can do it by
4 hand calculations.

5 For a complex structure, boxed structure,
6 something with shear walls and reinforcings of different
7 natures and shapes, you could do it simplistically using
8 a hand analysis, but to get a much better feel for what's
9 happening, a computer analysis would be required.

10 Q Have you ever done that?

11 A Yes.

12 Q Where did you do that?

13 A I did some work at Southern Services before
14 I ever started working as a consultant.

15 Q So while you were at Southern Services, you did
16 some dynamic modeling of a reinforced concrete structure?

17 A Yes.

18 Q Now could you tell me when this occurred?

19 A Not specifically, no.

20 Q Can you identify the structure?

21 A The actual item? Not at this time. I've done
22 an awful lot of things over the years.

mgc6-7

1 Q But you're sure you've done dynamic modeling
2 of a reinforced concrete structure?

3 A Yes. And steel structures.

4 Q Do you consider yourself an expert in the field
5 of structural engineering?

6 A You'd have to define "expert." I'm sorry.
7 I don't consider myself an expert in my term of the
8 knowledge of the word "expert." I'm not sure that if I
9 lived to be a hundred and I continued to work in the field,
10 I'll ever consider myself an expert. Some other people
11 might consider me an expert, based on my knowledge of what
12 I've done and background. But to be real honest, I don't
13 consider myself an expert at anything. I'm not sure
14 that there is such a thing, if you want to know the truth
15 of the matter.

16 MR. CASSEL: What was the field that you
17 identified just then, Joe, in your question?

18 MR. GALLO: Structural engineering.

19 BY MR. GALLO:

20 Q Can you tell me what NRC Reg Guide 1.60 is?

21 A 1.60?

22 Q Yes.

mgc6-8

- 1 A Not right off the top of my head.
- 2 Q Have you finished your answer?
- 3 A Yes.
- 4 Q Does the term "rock site" mean anything to you?
- 5 A Rock site? S I T E (spelling)?
- 6 Q Yes.
- 7 A The two words mean something to me, and as used
8 in conjunction, they mean something to me, yes.
- 9 Q Can you tell me what they mean to you?
- 10 A It means the site is rocky, I would assume,
11 rather than being sandy or some other structure.
- 12 Q Have you ever been involved in determining the
13 seismic response spectra for a reinforced concrete
14 structure?
- 15 A For determining the spectra? No.
- 16 Q For any kind of structure?
- 17 A I've never done any spectra generation.
- 18 Q Do you know what the SSE for Byron is?
- 19 A Safe shutdown earthquake is what SSE stands for
20 in most places.
- 21 Q Yes.
- 22 A Do I know what it is specifically?

mgc6-9

1 Q Do you know what the g value is?

2 A Not right off the top of my head.

3 Q Do you know what it is for the operating basis
4 earthquake?

5 A No, not right off the top of my head.

6 Q All right, Mr. Stokes, we're going to make
7 Mr. Cassel happy. We're going to get off your professional
8 qualifications.

9 MR. GALLO: Let's take a short break.

10 (Recess.)

11 MR. GALLO: Let's go back on the record.

12 BY MR. GALLO:

13 Q I have a series of questions I want to ask you
14 about your testimony, Mr. Stokes. but first I want to make
15 sure that I understand the thrust of the testimony. I am
16 going to characterize it, and you please correct me if
17 I'm wrong.

18 Does your testimony raise questions concerning
19 the general design criterion assumptions used by Sargent &
20 Lunder in the design of the Bryon plant?

21 A That's the whole question?

22 Q Yes.

End 6

mgc7-1

1 A Raise questions about?

2 Q Yes. Do you want me to repeat the question for
3 you?

4 A I believe my testimony is that I have questions
5 about -- not raise questions about. I have questions about.

6 Q You have questions about the general design
7 criterion assumptions used by S&L with respect to the
8 design of the Byron plant?

9 A Yes. Yes, some of them.

10 Q Well, you are questioning generally the adequacy
11 of the design assumptions and design criteria, as you have
12 explained it in your testimony; is that correct?

13 A Yes.

14 Q Would I also be correct in concluding that
15 because, in your judgment, inadequacies exist with respect
16 to the design criteria and assumptions used by Sargent &
17 Lundy, that you believe an independent design review should
18 be conducted at Byron?

19 A At this time, that's my belief; yes, sir.

20 Q All right. In Answer 10 of your testimony,
21 you refer to a design document, and I believe it's clearly
22 a Sargent & Lundy design document.

mgc7-2

1 Can you tell me what your understanding is of
2 the purpose of that document?

3 A The purpose of that document, as explained in
4 that document, I believe was that it would be the working
5 document for the Engineering Department, developing the FSAR
6 requirements into a working document to be applied, but that
7 it would not exceed the FSAR requirements nor change any
8 of the FSAR requirements, that it was to be specifically
9 a document geared to meeting the FSAR requirements for the
10 design of the plant.

11 Q Is that the general design document, then, that
12 was used at Byron, as you understand it?

13 A Yes.

14 Q Now you point to several shortcomings, as you've
15 said, in this document in your testimony. I have a series
16 of questions with respect to those.

17 On page 9, what you identify as Point 1, you
18 refer to a mistake that occurs in the formula, Section 12.2.4.
19 Can you tell me what type of design work is covered by
20 Section 12.2.4?

21 A Yes. The area is subgrade walls in structures.
22 I believe that's the section. When I read this, I should

mgc7-3

1 state, Section 12 has a specific title, and I wasn't
2 looking at the title so much, but the formula applies to,
3 I believe, a subgrade wall.

4 Q This would be the design of concrete structures
5 below grade; is that correct?

6 A Yes.

7 Q Now do you know what contractor at the Byron
8 site did the work involving the pouring of the concrete
9 for these structures governed by Section 12.2.4?

10 A Not really. I don't.

11 Q And to your knowledge, you just don't know who
12 did this work; is that correct?

13 A I know who did the design work, S&L. I don't
14 know what contractor actually built those structures in the
15 field or all the structures, if it was one contractor or
16 multiple contractors, if that's what you're looking for.

17 Q All right. Turning the page, you refer in
18 Answer 12 to Section 19.5.d. Do you know what design
19 work this particular section concerns?

20 MR. CASSEL: Objection. It's answered right
21 there in the answer, to the extent the witness knows.

22 THE WITNESS: Yes.

mgc7-4

1 BY MR. GALLO:

2 Q Well, is it involved -- is my understanding
3 correct that it involves the concrete turbine foundation?

4 A Yes.

5 Q And are you concerned with the torsional stresses
6 to that foundation?

7 A I am concerned with the equation, and that is
8 concerning the torsional stresses, so yes.

9 Q Do you know whether or not this is safety-related
10 work?

11 A The turbine foundation?

12 Q Yes.

13 A I believe it is safety-related, but I can't
14 guarantee that at this time.

15 Q But you believe it is?

16 A Yes.

17 Q Do you know what contractor at the Byron site
18 did this work?

19 A Again, I don't know who would have built the
20 turbine pedestals themselves, no.

21 Q The bottom of -- the last paragraph in your
22 Answer 12, you refer to Section 32.3.2, and you state that

mgc7-5

1 this section relates to buried piping.

2 Could you define better for me what you mean by
3 buried pipe?

4 A Section 32 is concerned with buried piping. That's
5 piping that's had a hole dug for it, and dirt or gravel
6 or some kind of fill material placed on top of it. I don't
7 believe that section covered buried piping in the relation
8 that it was encased in concrete, but I'd have to review
9 the section to get any more specific.

10 Q Do you know whether or not this buried piping
11 covered by this section involved safety-related work?

12 A Not specifically, no.

13 Q Does that mean you don't know, or it doesn't
14 involve safety-related work?

15 A I can't say. Some of the things I raised here
16 were not safety-related. I simply went through the
17 procedures and pulled out things which were questionable
18 from just visual contact, and then I reviewed it in a
19 document to ensure that it was incorrect. I never intended
20 here to be strictly safety-related items. This item
21 could be safety-related. There are some systems that may
22 be, just like I said --

mgc7-6

1 Q But at the moment, you just don't know?

2 A No, sir. Specific knowledge, no.

3 Q Do you know who the contractor was who installed
4 the buried piping covered by this section?

5 A No, I don't.

6 Q Now you refer again to buried piping in Answer 14,
7 and you also refer to the section that covers this buried
8 piping, 32.4.2. Is this the same type of buried piping
9 covered by the previous section that we just finished
10 discussing?

11 A It's in Section 32. I would assume it's the same,
12 yes.

13 Q Do you know whether or not this piping is
14 safety-related?

15 A I'm afraid I don't, no.

16 Q Do you know who the contractor was who installed
17 this buried piping?

18 A No, not at this time.

19 Q Mr. Stokes, I think perhaps in Answer 14 there
20 may be another typographical error. Is the reference
21 to "Attachment 1," should that be "Attachment 2."

22 A In 14?

mgc7-7

1 Q Answer 14.

2 MR. CASSEL: The next to the last line there.

3 THE WITNESS: Yes, it should. Yes, Attachment 2,
4 not 1. 1 is my resume. I'm sorry about that.

5 BY MR. GALLO:

6 Q Now in this sentence it refers to what we've
7 now corrected to be Attachment 2. You refer to other
8 apparent errors that are listed on the attachment. I am
9 just getting Attachment 2 out for my own use.

10 First of all, did you prepare this document?

11 A Yes, I did.

12 Q Now are you suggesting by your testimony that
13 beyond the items that you've already testified to in your
14 testimony -- and I think you've numbered them 1 through 6 --
15 that these other items also represent errors or deficiencies
16 in the design criteria used by Sargent & Lundy?

17 A Some do. Some were placed on this list as
18 being the section that caused me the concern about others.
19 So in some respects, it is -- the other things are
20 deficiencies, errors, oversights, whatever you would like
21 to term them, but some of the things are -- well, for
22 instance, take the fifth one down, Section 18.1.1 on

mgc7-8

1 Attachment 2.

2 MR. CASSEL: That's the fifth one down on page
3 2 of Attachment 2?

4 THE WITNESS: Yes. Section 18.1.1. It says,
5 "All design assumptions, methods, references and materials
6 shall be defined for each area of design using standard
7 calculational summary sheets." That, in itself, is not
8 an error, not a deficiency. If anything, it's what should
9 have been done. Other listings here indicate that wasn't
10 done in all cases, or other aspects of my testimony state
11 that it wasn't done.

12 BY MR. GALLO:

13 Q All right. Let's take that one. What other
14 aspects of your testimony indicate that this wasn't
15 done?

16 A Well, in my deposition earlier, I stated there
17 was a phone conversation that was not documented. Specifically
18 in my testimony at this state, it would be, on these
19 items listed here --

20 Q In Attachment 2?

21 A In Attachment 2.

22 Q Can you tell me what item that is?

mgc7-9

1 A Well, these are all the S&L procedures.

2 I'm sorry. There won't be any here, because
3 the things I'm discussing here would be in the calculations.
4 That would have to be a listing of the calculational
5 deficiencies instead of the S&L procedural --

6 Q Are these calculational procedures you just
7 referred to, are they contained in your testimony?

8 A At the moment, I think I didn't raise any. I
9 think I omitted them. I can't remember a specific example
10 where I did mention any calculations. I know in my haste
11 to do this, I may have just simply omitted things that I had
12 initially planned to put in my testimony.

13 There are others beyond what's in my testimony.

14 MR. GALLO: All right. This is a good break
15 point for me. Why don't we just break for the noon lunch
16 and come back at one o'clock?

17 MR. CASSEL: Fine.

18 MR. GALLO: Okay.

19 (Whereupon, at 11:50 a.m., the taking of the
20 deposition was recessed, to reconvene at 1:00 p.m. this
21 same day.)
22

mgc8-1

1 AFTERNOON SESSION

2 (1:10 p.m.)

3 Whereupon,

4 CHARLES CLEVELAND STOKES

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

7 EXAMINATION (CONTINUED)

8 BY MR. GALLO:

9 Q Mr. Stokes, referring to Answer 15, does
10 Section 34.2 deal with the general subject of the
11 installation of embedded plates?12 A I'm not sure if that's the overall topic for 34.
13 I would assume it was, the way the rest of the document
14 was structured.

15 Q All right. What are these plates embedded in?

16 A The plates are not embedded. They're -- well,
17 they're recessed in concrete when it's poured. The
18 attachments on the back of the plate are embedded in
19 the concrete. Studs are embedded in concrete.

20 Q What are the plates used for?

21 A Attaching various components in the plant to
22 the foundation.

mgc8-2

1 Q Do you know what contractor installed these
2 plates at the Byron site?

3 A No, I don't.

4 Q In your Answer No. 17, you say that you saw a
5 12-inch line that had a strut to the embed plate on the
6 wall. Can you tell me what 12-inch line you are referring
7 to?

8 A This was the Saturday that I come in to the NRC
9 Judges, and it was -- we stopped at this location, and
10 it was pointed out and discussed in thorough detail. I
11 attempted to write down the line number, and I did write
12 down a number, but I don't believe I have it with me. I
13 didn't put it in the statement because I felt it was
14 obvious to enough people that were present that day that
15 I wouldn't have to have it, and I'm not sure the number
16 I had would be valid for the line anyway.

17 Q Do you know what kind of line it was?

18 A I don't remember what system it was on, no.

19 Q Where was it in the plant?

20 A You're asking the wrong person. I wasn't leading
21 the trip. It was in the auxiliary building, I believe,
22 but not having a lot of familiarity with the plant, I couldn't

Estech
Gledcrase

mgc8-3

1 say, because I wasn't -- I was led, so to speak, to the
2 point, and that's all I can say.

3 Q What type of strut was it?

4 A I don't know who made it, if that's what you mean.

5 Q Just a steel beam?

6 A Well, it was made out of a combination of pipe,
7 a couple of swivel connections, a threaded section, some
8 nuts, I believe. There was a pipe clamp, an end bracket
9 for attaching it to the steel, a pin.

10 Q You say in your Answer 17, in the third sentence,
11 you indicate that if there were a large load on the strut,
12 then you could conceive of a problem.

13 Do you know whether or not there was, in fact,
14 a large load calculated for that particular strut?

15 A No, I don't. I base that statement on the fact
16 that the large strut would not have been required, had it
17 not been such a large load. They could have used a much
18 smaller strut to take the load, and I based it on my
19 previous knowledge of how large the strut was and the
20 load ratings for various components, and estimated the
21 load for that structure based on that.

22 Q You say you estimated the loading for that

Glean & Erase

85% cotton

mgc8-4

1 structure?

2 A Yes.

3 Q And what was that estimate? 15 to 20 kips?

4 A Yes. I would guess the load would have been
5 that magnitude or more.

6 Q And this observation is based solely on your
7 visual observation of this strut?

8 A That and the pipe, how big the pipe was and the
9 location to the elbow which was very close by. Various
10 factors. But I was very -- I tried to be on the
11 conservative side of that estimate.

12 Q Did you see other examples such as this when
13 you toured the plant?

14 A I didn't actually get to tour the plant in the
15 way that I like to say it, and for that reason, I didn't
16 see any more on the tour that I was on that day, no.

17 I'd like to add a few lines to that. The tour
18 was a quite fast-paced tour, just watching where I was
19 walking and trying to keep up with the group required my
20 utmost attention. I tried to get the tour slowed down,
21 so that I could actually sort of stroll along and look
22 outside of along where I was standing. That was not

mgc8-5

1 possible.

2 It appeared that the tour was structured more
3 for the Judges, and that they wanted to keep it at a very
4 fast pace for them. For that reason, I didn't see any more.

5 Q The tour that you're referring to is the one that
6 the Judges requested be conducted for them during the
7 hearings at the last session?

8 A Yes.

9 Q Let's assume that your visual observation is
10 correct, that the load on this particular strut and baseplate
11 appears to be 15 to 20 kips. Do you know whether or not
12 that particular strut and baseplate -- embed plate, I should
13 say -- could withstand the safe shutdown earthquake for
14 Byron at the load that you estimated?

15 A On my past experience, if that's the load, the
16 anchor bolts embedded in the concrete would pull out if
17 the concrete or the allowable stresses would be exceeded at
18 that point, at some point below that, even if they were
19 immediately under it or off to one end of it, and I would
20 say, based on my experience, that I would question that
21 particular embed capability of taking that load, yes.

22 Q Do you know whether or not the safe shutdown

mgc8-6

1 earthquake for Byron could generate that load at that
2 point?

3 A No, I've not done enough research to determine
4 that.

5 Q Let's refer to Attachment 3. Before we do that,
6 I have another question I want to ask you about your
7 Answer 17.

8 Do you know -- again referring you to the
9 strut and embed plate that you observed in the field ---
10 do you know what the type or the size of the studs were on
11 the back of the plate for that particular location?

12 A In relation to the section that we discussed
13 earlier, 30 -- under the embed loading plat design section,
14 which I can't seem to find at the moment --

15 Q 34.2.

16 A Yes, I believe that's it.

17 It appeared to me that in the structural analysis,
18 there is only one size bolting used for a specific width
19 plate. They used three-quarter-inch plate of nine inch
20 width. They put studs on it in a particular pattern at
21 a particular spacing. There was no variance in that,
22 according to the criteria. There is a six-inch plate that

mgc8-7

1 was a half inch thick, and the stud pattern on it was
2 varied, but what was on the nine-inch plate, it was
3 staggered from one side to the other. There was a specific
4 size stud used on that plate, and according to the criteria,
5 both type plates were designed for the exact same loads,
6 10 and 12 kips, I believe.

7 Q So you are assuming that the studs around the
8 plate --

9 A Were exactly as the criteria require them to be
10 for the width of that plate, yes.

11 Q And that's based on your reading of the
12 Criterion, Section 34.2?

13 A Yes. Not seeing a calculation, just seeing the
14 criteria.

15 Q All right. Now let's try Attachment 3.

16 Now did you write this document, at least the
17 first page of Attachment 3?

18 A I prepared it, yes, sir.

19 Q All right. And the balance of the page that is
20 Attachment 3, where did they come from?

21 A I believe they were prepared by me or typed from
22 a document and prepared by me.

mgc8-8

1 Q Are you sure?

2 A Oh, wait a minute. No. It appears to be a --
3 oh, it's copies of a document, DC-ST-03-BY/BR. Those are
4 the specific sections that are referenced in the document
5 on Attachment 3 that I've noted. It shows exactly how
6 they're stated, listed and so forth.

7 Q Now looking at the first sheet of Attachment 3,
8 you've got various section numbers listed in the next to the
9 lefthand margin, and then there are statements appearing
10 after each section number.

11 What is the significance of these statements?
12 Perhaps I'll let you take them one at a time for you to
13 answer them adequately.

14 A Well, the significance to me -- in some cases
15 I spelled it out, like, "Section 37.2. No definitive
16 statement that torsional stresses should be checked."

17 If you look at Section 37.2, it says these
18 eccentricities can cause torsional shear and warping
19 eccentricities. Now it lets you know that they are
20 concerned about this, because they state it, and the
21 problem with it is, there's no definitive statement as to
22 how you should approach this torsional shear and warping

mgc8-9

1 stresses or whether or not you should check for it. It just
2 says these can cause problems.

3 Q Do you think this statement should contain that
4 statement?

5 A This one or subsections of this, which the later
6 sections, if you look at 37.2.1.g.2.C, 37.2.1.g.3.C, all
7 the C's seem to be torsional analysis not required, so they
8 did address it. They said you don't have to address it,
9 basically is what the bottomline came to -- the total
10 section.

11 Q So did that cause you some concern, then?

12 A Yes, it did.

13 Q What is your concern?

14 A That they were neglected.

15 Q They should have been considered; is that right?

16 A They should have been considered as to the level
17 of criticalness as to the allowable stresses that they
18 could have affected.

19 Q Looking at the second item on the first page
20 of Attachment 3, you indicate a statement that says,
21 "Deflection and rotation of primary structural steel
22 ignored in deflection check," and then there's in

mgc8-10

1 parentheses a question mark, and then the words, "Members
2 with pinned ends."

3 What does that mean? What did you intend by
4 this question mark?

5 A It's a question mark. It's a question to myself.
6 This was made up to flag things to me. Everything on here
7 was a question. If you want to know the truth of the
8 matter, in most respects one way or the other, in this
9 particular case, I already knew what it was, because I just
10 wanted to have it there for future reference. But in any
11 case, the question, "Members with pinned ends," indicates
12 that I questioned whether the absolute ignoring of
13 deflection was valid for members with pinned end connections,
14 primarily structural steel. That's what the section is
15 addressing. Pinned end connections cannot take any
16 deflection and rotation in the torsional aspect of the
17 word, and the absolute omission of any deflection check,
18 omitted to check whether the member could even take that
19 kind of loading, and the end connections would have been
20 the place to check. I have seen pin-connected members that
21 have to be modified to fully-welded moment connections
22 because the torsional loadings were so great. The thing

mgc8-11

1 failed with pin connections.

2 Q Did you determine this to be a problem at Byron?

3 A It's in the criteria. It indicates a problem
4 could exist at Byron. But no, I haven't been able to visit
5 the plant often enough or enough magnitude to review enough
6 supports and end-connected members to determine whether
7 or not they exist and it is a problem.

8 Q Have you concluded that the fact that the
9 deflection check is ignored, as you characterize it, in
10 Section 37.2.1.f, does that constitute a design inadequacy,
11 in your opinion?

12 A It does, if they had attachments to pin-connected
13 beams. They could cause rotation of that beam.

14 Q Well, is or isn't it a design inadequacy. Can't
15 you tell from looking at the design document?

16 MR. CASSEL: Objection. Asked and answered.
17 He just answered the identical question.

18 MR. GALLO: No. He said "if," and that's not
19 giving me an answer to the question. In any event, I was
20 not satisfied.

21 THE WITNESS: If there are no rotational forces
22 applied to pin-connected beams, then, no, there is no problem.

mgc8-12

1 The problem is, that was completely ignored in any review
2 program, and there could be rotational loads to beams with
3 pin connections. And in answer to that question, it would
4 be a problem.

5 BY MR. GALLO:

6 Q All right. Well, let's identify what kind of
7 problem we're talking about. Are we talking about a design
8 problem or a hardware problem at this point?

9 A It would be both. It would be a design problem,
10 because it is oversight of design. It would be a hardware
11 problem, because it would affect the hardware.

12 Q So if I look at paragraph (f) on the third page
13 of Attachment 3, based on what you just testified, I can
14 conclude that you believe this statement in paragraph (f)
15 constitutes a design deficiency, because it says that the
16 deflection and rotation of primary structural steel framing
17 may be ignored?

18 A That's right. I believe. I was sort of
19 reading when you said that.

20 MR. CASSEL: Would you like to have the question
21 reread?

22 THE WITNESS: I would like to have it reread,

End 8

mgc9-1

1 because I was reading Section 37 to see what the title
2 of Section 37 was about.

3 MR. GALLO: I'll restate the question.

4 THE WITNESS: 37.2.1 is written against Section (f),
5 and it says, "Safety-related Hangers." That's the main
6 category that (f) is attached to.

7 Now there's a main category for 37 as a whole,
8 but because that specific section was written against
9 safety-related hangers, I do have a safety problem with
10 that statement being in that section, but I would still
11 like to read the question you stated that I answered to
12 while I was reading it.

13 MR. GALLO: I'll restate the question.

14 BY MR. GALLO:

15 Q You believe that Section (f) appearing on the third
16 page of Attachment 3 contains a design deficiency because
17 it permit --

18 MR. CASSEL: Design sufficiency?

19 MR. GALLO: Deficiency -- because it permits
20 deflection and rotation of the primary structural steel
21 framing to be ignored?

22 THE WITNESS: Yes. I would say it is an oversight.

mgc9-2

1 The components should have been checked. The components
2 should have been verified that didn't have pin connections
3 or could take those kind of loadings, irregardless of
4 whether they ignored the displacement or rotation in their
5 displacement of the support point, which is the piping.

6 BY MR. GALLO:

7 Q So the design statement is incorrect as written?

8 A It's not sufficient as written.

9 Q All right. Now is this particular item referred
10 to anywhere in your testimony?

11 A Section (f)?

12 Q Yes. The one we have been just talking about.

13 A 37.2.1? Yes, it's Attachment 3, second item.
14 Section 37.2.1.f, "Deflection and rotation of primary
15 structural steel ignored in deflection check. Question
16 members with pinned ends." That's the section we're
17 discussing.

18 Q And where in your -- here it is.

19 Then I am to interpret that each of these --
20 strike that.

21 Am I to interpret that each of these items
22 listed on the first page of Attachment 3 set forth what

mgc9-3

1 you believe to be a design deficiency in the sections
2 indicated?

3 A The way it's stated, it's a design deficiency,
4 yes.

5 Q Each and every one of them?

6 A No. One of them is not. 37.2.1.g.2.C.

7 Q Wait a minute. Don't go too fast now.

8 A It's the sixth one down from the top. It says,
9 "Torsion included here. Question logic." That's the only
10 one I know of that I remember does include torsion, and I
11 put down a comment, "Question logic." I simply am
12 questioning why they put it in one section. They omitted
13 it in infinitely more sections, when in reality, it is
14 my experience in design that if I tried to memorize this
15 document and design something, I would remember all the
16 times torsion is to be ignored. I would never remember that
17 one section where it's supposed to be included.

18 Q But you consider that section to be adequate, then?
19 That's why you pointed this out for me?

20 A Yes, that says it should be included. I consider
21 that adequate.

22 Q Are there any others, or are they all examples

mgc9-4

1 of design deficiencies?

2 A Let's see. 37.2.1.g.5. Based on that one line,
3 I don't find that a deficiency, but the subsections of it
4 make that one line a very questionable item still.

5 36.2.1.g.5 says, "Exact analysis must be
6 performed for loads greater than 20 kips." I questioned
7 what it would do for loads less than 20 kips, but then
8 the ABC breakdown at the end of 37.2.1.g.5, if you limit
9 it to the first three under that section, it says, "Assume
10 all masses lumped at shear center. Axial self-weight may
11 be ignored. Torsional analysis not required." So it
12 appears to me that they liked 20 kips, to include torsion,
13 you don't include self-weight, you don't include the
14 eccentricities of joints, but above 20 you do.

15 Now if that indeed is what was done, I have no
16 question about above 20 kips, but I have a question for
17 everything below 20 kips.

18 You see what I'm saying?

19 Q Do you believe, then, that the Section 37.2.1.g.5
20 is deficient because it doesn't address what should be
21 done below 20 kips?

22 A Well, it says it should be ignored, from what

mgc9-5

1 I gather. It doesn't say that in all that many words, but
2 I would assume that from what it says, that it would be
3 ignored, based on the 5.C torsion analysis not required.

4 Q Based on your review, do you find this section
5 and its subsections, A, B and C, adequate for loads greater
6 than 20 kips?

7 A If they indeed do an exact analysis, yes.

8 Q Do you have any information that indicates that
9 they have not done an exact analysis in this area?

10 A Some, yes.

11 Q Can you be more specific. What information do
12 you have?

13 A Well, in my review SEISHANG documentation in
14 Sargent & Lundy's office, the program itself omits these
15 things, and you don't have to -- there's no way to do an
16 exact analysis using SEISHANG from what I gathered. The
17 program itself is written to ignore these things. Without
18 further review, I am not going to say that it does in all
19 cases, but there was some comment that it could as-built
20 a hanger -- you could do an as-built analysis. In that
21 case, maybe it does include them, but from right this
22 minute, I question whether SEISHANG, the way it's written,

mgc9-6

1 just doesn't do it for anything, period. It --

2 Q What's the name of this code you're referring
3 to?

4 A SEISHANG, S E I S H A N G (spelling). It's
5 a program in Sargent & Lundy's proprietary group which
6 is used to run HVAC piping, electrical conduit, and many
7 other structures.

8 Q And to your knowledge, that code was developed
9 using, among other things, the design criterion represented
10 by Section 37.2.1.g.5?

11 MR. CASSEL: Objection. You said "code." I
12 think you mean program.

13 MR. GALLO: Same thing, isn't it? Isn't a code
14 and a program the same thing? You and I are communicating
15 that way.

16 THE WITNESS: I consider a code different from
17 this. This is criteria that's set up by the company.

18 BY MR. GALLO:

19 Q I'm not sure I could pronounce it.

20 A I was going to agree with your question anyway,
21 because it sounded to me like you --

22 Q Well, let me ask you, we have now confused the

1 record. I am referring to the SEISHANG code.

2 A The computer code.

3 Q And my question was, based on your evaluation of
4 this code, is it your understanding that it is based on,
5 among other things, the design criterion represented by
6 Section 37.2.1.g.5?

7 A Is SEISHANG written to comply with this? Is
8 that --

9 Q Yes. Is it based on that section?

10 A SEISHANG is used for safety-related components.
11 That would imply that from Section 37.2.1 from the previous
12 page, that it was safety-related hangers, and the fact that
13 this section is written for safety-related hangers and
14 SEISHANG performs safety-related hangers, knowing what I
15 read in the review of SEISHANG, I would have at the moment
16 a lot of questions concerning whether it meets this section
17 at all or any of these sections here.

18 Q But based on your review of the code, it's
19 supposed to meet this section; is that correct?

20 A From what I gathered, it should have met the
21 requirements for safety-related components, if it was used
22 to do safety-related, which it was, according to the

documentation.

Q What does this code model?

A The structures.

Q For what purpose?

A Determining stresses.

Q For what loads?

A The input loads.

Q For what forces?

A Loads from the piping. If there's piping attached to it. That's from the HVAC. If HVAC's attached to it. Loads from conduit if conduit is attached to it.

Q What kind of dynamic loads are we talking about?

A Seismic.

Q These are the seismic loads?

A Yes.

Q So that the SEISHANG computer code is the code that models the ground motion through the building to the various hangers; is that correct?

A No.

Q No?

A The only thing I know SEISHANG does is, it has curves or tables in it as a data base. It computes,

1 I guess, the frequency of the structure and determines the
2 acceleration from those curves, just like you would going
3 into the tables yourself. It doesn't model and do the
4 whole analysis from generation point to generation point.
5 It takes input that's already been generated and uses it.

6 Q And you say you evaluated the input data to this
7 code during your review in Sargent & Lundy's office?

8 A Evaluated the input data to this code? I read
9 the documentation as to what was required for input. I
10 didn't read through that as much as I read through the
11 documentation and assumptions of how it worked. In other
12 words, the programmer's intent, the way he set it up to
13 function. It doesn't matter what you put into it later.
14 Those primary assumptions that he put into it at the
15 beginning of the write-up govern everything that's ever
16 done by it. You can't overwrite it. You can't improve
17 on it unless you change the computer code. Those assumptions
18 are written in that code.

19 Q These are what? The mathematical equations that
20 form a part of the program?

21 A The equations that he would use would have been
22 written into it. The assumptions might have also been

1 written in.

2 Q Can you identify for me one assumption that you
3 reviewed?

4 A Well, one thing the documentation said was
5 omitted was, it said that strut members were designed as
6 pinned-end truss members. That would state that there is
7 nothing but an axial compressive load placed on a strut
8 member. There is no account for moments, no rotation or
9 whatever of the joint. There didn't appear any lateral
10 shear or horizontal shear, and it's strictly the axial
11 or compressive loads. And that indicates that they didn't
12 include the eccentricity of the joint or the torsional
13 effects or any of that.

14 Q As required by this section of the criteria that
15 you have referenced here in Attachment 3?

16 A Yes, right. 37.

17 Q Let's see if I can summarize. I want to be fair.
18 As I understand it, the first page of
19 Attachment 3 are examples, are statements of design
20 deficiencies, with the exception of one section, and it's
21 37.2.1.g.2.C. The rest are statements of design
22 sufficiency -- I'm sorry -- design deficiencies for one

1 reason or another?

2 MR. CASSEL: Just to be clear, you were going
3 down that list, Charlie, in answer to his earlier
4 question. Have you reached the bottom of the list?

5 THE WITNESS: Yes. The only question was the
6 "above 20 kips" section. That should be omitted if they
7 did an exact analysis above 20. I didn't intend to -- if
8 they did an exact analysis, I have no question about that
9 statement.

10 MR. GALLO: Let's go off the record for a minute.

11 (Discussion off the record.)

12 BY MR. GALLO:

13 Q Attachment 4. Now if I locate your Answer 20,
14 which appears on page 13 of your testimony, you indicate
15 that you have other concerns with the Sargent & Lundy
16 design criteria, and these concerns are listed in
17 Attachment 4.

18 Now are these -- and you at one point call them
19 potential problem areas -- my question is, have you
20 determined whether or not these matters listed on
21 Attachment 4 are design deficiencies or design inadequacies?

22 MR. CASSEL: Objection. That's answered in

End 9

BU5

1 Answer 20, Joe. It says right there, "I have questions
2 which have not been resolved."

3 BY MR. GALLO:

4 Q So these are unresolved concerns on your part,
5 Mr. Stokes?

6 A Yes. As far as I can -- yes.

7 Q Now let's turn to Attachment 4. Let's look at
8 the first item. Can you tell me just what that item is?

9 A Well, in reviewing the documents, I had a
10 procedure I went through. I read everything several times.
11 In this case, this particular letter was an NRC letter to
12 Commonwealth Edison, and on page 9, there's an Item No. 3,
13 and under that item they are discussing cable splicing.
14 And in this particular document they're discussing end-line
15 splices.

16 And the question here, to me, came from another
17 document concerning a butt connector review program that
18 I was familiar with. In reviewing the documents in the
19 butt connector program, they were supposed to review 100
20 percent of the butt connectors.

21 Q Let me interrupt you for a minute, and I'll let
22 you continue.

Sketch
Gear Drive

1 re you telling me now what this item on page 9,
2 No. 3, is about, or have you changed the subject?

3 A Yes. No, no. I'm telling you why I put that
4 down here.

5 Q All right. Go ahead.

6 A In reading the butt connector program, it was
7 not obvious that the problem was addressed as to crimp
8 connectors versus a soldered type connection or I-joint.
9 In butt connectors, the whole write-up that I had seen was
10 about the crimp connectors, whether or not it had been
11 crimped by the right tool or whether or not there was
12 enough pressure on it and stuff.

13 Well, I have enough background with electrical
14 stuff to know that end-line splices are equally made
15 with crimp connectors, and the thing that seemed to appear
16 here to me is, the end-line splices were being omitted
17 because they were not butt connectors, and to me, end-line
18 splices or crimp connectors are as critical in this
19 butt review program as the butt review program stuff they
20 reviewed.

21 They omitted -- the program should have been a
22 crimp connector faulty installation review program, which

1 would have covered end-line splice connections of crimp
2 connectors, butt connectors, and any other kind of
3 connector.

4 But the crimp connector, in this one letter, to me
5 led a question of whether they even looked at end-line
6 splices or anything.

7 Q Now you say the end-line splices were omitted,
8 and you refer to "they" omitted them. Who are you
9 referring to?

10 A I said it appears they were omitted.

11 Q You mean the NRC omitted these?

12 A Well, they were omitted by CECo or whoever
13 was to do this 100 percent review of butt connectors.
14 The whole problem was not butt connectors; it was crimp
15 connectors, and the program should have been 100 percent
16 review of crimp connectors, not butt connectors. And had
17 that been the case, there would have been some end-line
18 crimp connectors in the program.

19 None of the documentation I read -- and I mean
20 none of it -- came flat out and said end-line splices
21 were included because they're crimp connectors.

22 And so my conclusion is, none of the end-line

Splice
Clear Erase
257-0010

1 splices were included in that review. Only butt connectors
2 were included in that review.

3 Q Now what was the purpose of the NRC letter that
4 you referred to, the one dated May 31, 1983?

5 A I can't remember.

6 Q You can't remember that? Did it deal with an
7 item of noncompliance?

8 A It seems like it was. They were several
9 documents that I reviewed, and more than likely, it was
10 an inspection report of a noncompliance item. Yes, that's
11 one thing.

12 Q But you don't recall right now?

13 A No, I can't tell you for sure.

14 Q Do you recall whether or not it dealt with
15 end-line splices or not?

16 A That particular write-up of that document did --
17 was written about an end-line splice penetration. I can't
18 remember exactly what the discussion was or, at this
19 moment, if it was explained.

20 Q And this one letter triggered this entire concern
21 that you have just described?

22 A There's another letter, I believe.

1 Q Can you remember where that is, what letter that
2 was?

3 A Not at the moment. I'd have to look back through
4 most of the letters that I looked at, but it was listed
5 in another document as being a problem, too.

6 Q Do you remember that document?

7 A Or it was written about also -- no, I can't
8 remember the letter number or the date of the letter or
9 anything at this moment. If you would wish it, I can
10 determine that.

11 Q No, that's all right. Did you attempt to gather
12 all the documentation that might exist on this question
13 by asking Sargent & Lundy for it or Commonwealth Edison?

14 A In the production of documents, we've asked
15 for everything that's has been ever written on this plant,
16 I believe, in relation to the review program, and I
17 believe they've supplied everything that's possible to be
18 supplied. But if that's not the case, maybe I should make
19 the request now that any additional information be given
20 me on this subject.

21 Q The time for discovery is past, Mr. Stokes. But
22 you made a statement in your previous testimony that in all

1 the documentation that you looked at, you didn't see this
2 matter addressed anyplace, the matter of -- is it in-splices
3 or end-splices?

4 A End splices.

5 Q I N or E N D (spelling)?

6 A E N D (spelling).

7 Q End splices addressed anywhere. And I'm trying
8 to determine --

9 MR. CASSEL: Wait a minute. That's not what he
10 said, Joe.

11 THE WITNESS: Could you refer me to where you're
12 getting this from?

13 BY MR. GALLO:

14 Q I'd written a note while you were testifying
15 about something that was omitted from a program as being
16 end splices; is that correct?

17 A I said there were end-line splices, as far as
18 I could tell, in the butt review program -- were omitted.
19 There was a butt review program, as far as the documentation
20 I've seen. There was supposed to be 100 percent review of
21 butt connectors.

22 Q You mean butt splices?

1 A Butt splices.

2 Q I see. And you saw documentation on this
3 question?

4 A On butt splices or butt connectors. I didn't
5 see any on end-line splices.

6 Q And it's the end-line splices you're concerned
7 about. Okay.

8 A I'm concerned about crimp connectors, period.
9 They could be end-line, butt or wherever located. That's
10 not my concern. It's review of crimp connectors.

11 Q All right. And I guess what I've lost the thread
12 of is whether you have not seen any documentation on butt
13 splices or end-line splices or both.

14 A I've seen lots of letters on reviewing butt
15 connectors or butt splices. I've seen a few, I think, NRC
16 inspection comments about faulty end-line splices at
17 penetrations. End-line splices don't necessarily exist
18 at all penetrations. They exist end line, wherever they
19 want to splice a cable. For that reason, the addressments
20 or letters I've seen only address certain connectors in that
21 end-line splice category. At penetrations, they did not
22 address the end-line splices totally as to crimp problems.

1 Q But you cannot identify right now any correspondence
2 that you specifically have in mind?

3 A Other than this one letter on butt end-line
4 splices. That's the only one I have written down here at
5 the moment. There was another one or two, I remember. I
6 didn't want to write down redundancy when I was doing this.
7 I'm sorry. I was attempting not to --

8 Q Let me ask you this question. Did this letter
9 of May 31, 1983, from the NRC specifically address a
10 problem with end-line splicing, or did it just trigger a
11 memory response in your head that caused you to say, "Aha,
12 here's a potential problem," as you've explained it here.

13 A Well, it addressed a problem with that particular
14 type of one, NRC-363 with an end-line splice at the
15 penetration. That one is addressed by that letter. Now --

16 Q Does the letter raise the --

17 MR. CASSEL: Let him answer the question.

18 THE WITNESS: It did raise -- it didn't raise
19 something I'm familiar with. It raises something that
20 everyone here should be familiar with.

21 After reading the butt connector letter
22 documentation, the whole butt letter or butt splice issue
23 is not butt splices; it's crimp connectors. All you have

1 to do is read all that documentation, then read through
2 all the other stuff, and you see that end-line splices
3 are -- they come in very sporadically with being deficiencies
4 at penetrations, but you don't see any documentation as
5 to end-line splice connectors.

6 BY MR. GALLO:

7 Q Did this letter address that point?

8 A I don't believe it addressed the totality,
9 except at penetrations. I think it was specific
10 penetrations, but I can't give you a more definitive
11 statement. I'd have to pull the letter out and reread it
12 again.

13 Q All right. The next item deals with another
14 NRC letter.

15 A Yes.

16 Q And do you remember, was this the letter
17 referring to a -- well, I guess you've indicated for me
18 right in the title, it referred to the integrated design
19 inspection; is that correct?

20 A That was on the letter, and that's where --
21 so it was integrated design inspection program, yes.

22 Q And this particular letter deals with the

1 activities of Sargent & Lundy?

2 A Yes, among others, but primarily Sargent & Lundy
3 because the -- if you read paragraph 2 or page 2, the
4 second paragraph, this write-up was a discussion of an
5 inspection done as to calculations concerning, I believe,
6 the auxiliary feedwater pump motor evaluation, environmental
7 evaluation, and the write-up was concerning Sargent & Lundy's
8 analysis of the environmental acceptability of this room
9 for the pump and its environment, because it seems this
10 pump was critical to the safe shutdown.

11 And the question with this that came up to me
12 was, they discussed everything in the calc, but they
13 relied on an assumption. It was that HVAC could take the
14 heat load, which they probably did a calc on that, but --

15 Q Who is "they"?

16 MR. CASSEL: Let him finish the question. You
17 can ask that question when he completes his answer, Joe,
18 but he's entitled to give you an answer. If it's ambiguous,
19 you are entitled to ask him what he means, but don't keep
20 interrupting.

21 MR. GALLO: The record is getting confused.
22 I want a clear delineation of what is in the letter versus

1 what you have superimposed based on your experience and
2 judgment.

3 MR. CASSEL: You can get that clear delineation
4 by asking one question at a time, Joe, but it's just basic
5 courtesy, among other things, to let the witness finish
6 his answer.

7 MR. GALLO: I think I'm entitled to just get
8 an answer to the question. I've been pretty lenient in
9 letting him ramble on. But I think here is the time to
10 draw the line.

11 THE WITNESS: Well, I'm sorry.

12 BY MR. GALLO:

13 Q Let's look at the next item. This again is an
14 NRC letter dated June 6, 1984, and you refer to page 12,
15 paragraph 3.

16 A Yes.

17 Q And you talk about the failure of cables
18 attributable to elongation of cable installation. What
19 was the nature of this problem?

20 A It appears they had over exceeded the cable
21 pull and tension load in this letter, and they had attempted
22 to verify the adequacy of the installation, because they

1 wanted to re-pull the cable and put it in some other place.
2 Undoubtedly they had removed it or something.

3 The documentation I received was very brief so --
4 but the whole thing was, they sent a piece of the cable
5 back to Okonite to test. It had passed the same test
6 before being sent to the plant. In Okonite's write-up,
7 they state, as a result, in this letter, that they attribute
8 the failure of the cable to elongation of cable insulation,
9 because it failed the test the second time.

10 Q Mr. Stokes, aren't these first four items where
11 you refer to NRC letters merely matters that have been
12 identified by the NRC Staff through Region III and remedied
13 by Commonwealth Edison in response to the NRC Staff?

14 A The Staff has raised these questions to some
15 extent. Whether or not the solution has been completely
16 documented and is acceptable is another question that I
17 can't answer, because I haven't, as you say, seen everything.
18 I'm only one person. I haven't had the time to read
19 absolutely everything. I don't have a -- I don't have a
20 limitless brain. But in any case, that question is still
21 a question to me from other documents. That document
22 doesn't state specifically that that one was corrected.

23 Q Aren't you just piggybacking your concern to the

1 NRC Staff's concern here?

2 A Let's say I'm not piggybacking; I'm asking
3 concerning questions that they may not have addressed, and
4 if they had, then there would be no question as to what
5 I'm asking.

6 Q Now who is "they"?

7 A The NRC. Now I mean if they addressed everything
8 that I would like addressed, you can say it's piggybacking.

9 Q And what is your judgment on that? Have they
10 addressed everything you'd like to address in these letters?

11 A I don't know.

12 Q You don't know? All right.

13 What is this fifth item that talks about --
14 starts out, "Review of Drawing 6E-0-3393E"? What is that
15 item?

End 10

16

17

18

19

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22

1 A It's a Sargent & Lundy document. That's the
2 drawing number of it.

3 Q Now this is a potential concern. What is the
4 nature of the concern?

5 A There is a load table on this. It's very
6 briefly described. There's a load table on -- these
7 documents are concerning steel conduit installation and
8 design.

9 Anyway, there is a load table for steel conduit
10 or this document. It's specifically called out, load table,
11 steel conduit.

12 I compared that load table with the load table
13 for steel conduit in the unistrut catalogue, which I had,
14 which statement at the bottom stated it was in compliance
15 with the '71 version of the National Electrical Code. The
16 numbers for the weights in that table in the unistrut
17 catalogue were larger than the numbers in the table of
18 Sargent & Lundy's drawing. The -- this may be answered, and
19 I'll go ahead and throw this in.

20 In the Sargent & Lundy documentation, they
21 stated they used an '83 National Electrical Code. If in the
22 '83 version, which I haven't had time to look, the loads are

1 what is in this table, and all the components listed in this
2 table or the weights for these components were purchased
3 in compliance with the '83 Electrical Code, I wouldn't
4 have any question with this if those things happened.

5 But the problem with this, as far as I see it,
6 is unless the '83 version lists the same load table values,
7 Sargent & Lundy's values appear to be below what the National
8 Electrical Code requires. Now --

9 Q Have you made this comparison?

10 A Yeah, I compared the tables.

11 Q So you compared the table in the unistrut
12 catalogue with the table shown on this drawing?

13 A Yes.

14 Q And you concluded that the load table on the
15 drawing is inadequate because it doesn't coincide with the
16 unistrut catalogue table?

17 A I didn't decide that it was inadequate. I said
18 if the table was per the '83 code, and the '83 code is
19 identical to the table, then I only have one other question.
20 That would be whether or not the components put in the plant
21 were per the '83 code instead of the '71, when purchased.
22 I can't -- beyond that I'm saying it's a question. There's a

1 lot of things I haven't had time to look at.

2 Q Then you don't know whether or not this table is
3 in the '83 code?

4 A Well, if it was in the '81, I would presuppose
5 it's in the '83, but I don't know for sure it's in the '83.

6 MR. CASSEL: You said it was in the '81. You
7 mean in the '71?

8 THE WITNESS: The '71.

9 BY MR. GALLO:

10 Q What's the last item on the page? It refers to
11 an EPRI document.

12 A The same document could have been listed up with
13 the butt splices or the end line -- not that, pulling, the
14 cable pulling, the third one down, elongation.

15 I just happen to maybe think it could be weird
16 that I was reading this EPRI document, but I was looking
17 through the EPRI document to see at one time what was
18 relevant for some other work I was doing as a reference
19 source, and I happened to read this one section concerning
20 cable section lengths. And the thing that keyed my mind
21 here, and I remembered, was the fact that there are three
22 stress modes which cable is subjected to during elongation:

1 Tension and elongation, torsion and side-wall (bearing)
2 pressure and bends.

3 And then later when I was reading the documentation
4 on cable pulling, this same article and memory came back,
5 and I pulled it out to make sure that it was stating what I
6 remembered.

7 This article is not a problem itself because it
8 addresses factors that should have been addressed in pulling
9 cable. The equations determining safe pulling loads and so
10 forth. This section is here to go back to the elongation
11 program and cable overtensioning, pulling overtensioning,
12 which is a fairly substantial problem at Byron, as I under-
13 stand, from reading all the letters and NRC documentation
14 and stuff.

15 There is a few other things that go with this,
16 that they're not linked right in another, but there's a
17 question in a document concerning conduit installation.

18 Q Before you leave the EPRI documents --

19 A Okay, we'll take them one at a time. Sorry.

20 Q What you're telling me is that this really does
21 not represent a potential concern, this is simply a statement,
22 if I can use the word, of criteria against which you would

1 review other documentation on Byron?

2 A Yes, which I have reviewed other documentation
3 on Byron.

4 Q Now let's turn to the second sheet of Attachment
5 4, and the second item. It says, referring to NDE examination
6 reports for Hunter, it says minimum pipe wall thickness not
7 met. Repair performed.

8 What is the nature of this potential problem?

9 A I was reviewing NDE examination reports in the
10 field which were given to me in relation to the reinspection
11 program. Specifically several DRs and some other NDE
12 exams.

13 Q What are DRs?

14 A Discrepancy reports.

15 Q Okay.

16 A There were some in some DRs and there were some
17 loose NDE exams which were given to me or supplied in the
18 documentation. When I reviewed these NDE reports, there
19 was several that indicated there were repairs as a result
20 of the NDE exam which if they're repaired, it is not a
21 problem with those repaired, but it's a question that I've
22 been told several different things during this program. I

1 was told that, one, they were reviewing certain things
2 inspected in the plant. NDE is something that can be
3 reinspected by doing another NDE exam.

4 When I raised this with Sargent & Lund, I believe
5 on a Wednesday some number of weeks ago, I was told in that
6 meeting NDE exams were never in question in the reverification
7 and were omitted.

8 In reviewing all the documentation on PTL,
9 including the reinspection report, I find that PTL was
10 responsible for all NDE exams, but they had the worst
11 failure or worst inspector qualification record --

12 Q Mr. Stokes, you are rambling now.

13 A Well, I'm sorry.

14 Q The question that I asked you was what was the
15 nature of the potential concern that you had in the second
16 item, and I repeat, it says minimum pipe wall thickness
17 not met. Repair performed.

18 Now what is the concern or potential concern that
19 statement represents?

20 A It has two:

21 One, the repair performed, if it was part of the
22 reinspection program, would have been significant from

11-7

1 safety and from design.

2 The fact that Sargent & Lundy made the statement
3 that there was nothing safety or design-significant reviewed
4 in this program is contradicted by this line here in some
5 respect.

6 Q All right.

7 A Beyond that, it expands the question of whether
8 NDE as a whole should have been questioned as an attribute
9 when I was told it was omitted.

10 Q All right. If I understood your testimony just
11 now, you are suggesting that the fact that this minimum
12 pipe wall thickness was repaired contradicts the Sargent &
13 Lundy testimony that none of the reinspection program
14 discrepancies had design significance; is that correct?

15 A Well, it does to me if, as I said, that repair
16 was performed due to an inspection during the reinspection
17 program.

18 Q What discrepancy are we talking about here?

19 A I'd have to thumb back through several documents.
20 There's several where they repaired stuff. They're NDE
21 reports, I didn't write the numbers down. If you'd like
22 those at a future date, I can give them later, but I don't

1 know them right off the top of my head. There's three or
2 four, maybe more than that.

3 Q We'll accept the proposition that certain of
4 the discrepancies were repaired that were the subject --
5 let me state that again.

6 We'll accept the proposition that certain of
7 the discrepancies that were subject to the Sargent & Lundy
8 evaluation were in fact repaired. I think we can agree on
9 that.

10 A Oh, we can? Okay. Thank you.

11 Q My question is, is it your testimony that since
12 they were prepared -- repaired, rather, that meant that
13 the Sargent & Lundy testimony indicating that none of the
14 discrepancies including those repaired, had design
15 significance was contradictory?

16 A If they didn't have design significance, I
17 wouldn't have repaired it. There is a definite question
18 there.

19 Q So you think there is a correlation between
20 design significance and repair?

21 A Well, I've got a question about why they were
22 repairing it, if it's not design-significant or safety-

1 significant. Otherwise, why go to the expense of fixing it,
2 if it's capable of taking the design loads?

3 Q Maybe I misunderstood your prior testimony, but
4 I thought you were saying that the fact that it was repaired
5 indicated definitely that this was a contradiction in the
6 Sargent & Lundy position?

7 MR. WRIGHT: Objection, Joe. I think that was
8 your testimony.

9 MR. GALLO: Well, he will correct me if I'm
10 wrong.

11 THE WITNESS: I don't think I said definitely
12 anything in this whole testimony so far that I can say
13 beyond a doubt that it says anything. I am saying that it
14 cast a question of what Sargent & Lundy has said.

15 BY MR. GALLO:

16 Q All right. If your prior testimony was that it
17 did definitely cast doubt, you are now changing that?

18 MR. CASSEL: Objection. That's --

19 THE WITNESS: It still casts doubt, but if it
20 definitely casts doubt, I'll change that.

21 BY MR. GALLO:

22 Q Okay. Fair enough.

1 What is this item on computer printouts by
2 inspector for Hunter Corporation?

3 A Oh, boy. There's a bunch of computer printouts
4 that I reviewed and I have copies of, even though I didn't
5 really want them myself. But they are listed by inspector.
6 The inspector numbers here are listed. The document ID
7 number is what is shown on the documents. Those things
8 appear to be the work that the inspector did on a
9 computerized basis. It listed what was reinspected, what
10 was inaccessible, what was not accessible. There was
11 quite a few things on it.

12 The thing that -- I initially didn't even care
13 to look at them, and I finally reviewed them primarily for
14 what was inaccessible, and that is why that's listed here.

15 For instance, the first inspector says
16 inaccessible due to a lot of retrofit on feedwater system.
17 Now in reviewing the Hatfield work on ASME qualified
18 components --

19 Q I thought this was Hunter.

20 A Hunter. Okay, Hunter. Yeah, Hunter was ASME.
21 In the documentation that I reviewed, I think it was
22 BRP-1 or something like that, the calculations that Mr.

1 Branch testified to concerning a review of ASME and piping,
2 Hunter system stuff, that documentation, when I reviewed it
3 only included two feedwater system problems.

4 This documentation allowed me to compare the
5 actual problem with what's on this list of feedwater stuff
6 that this guy was listing as inaccessible. The two that
7 were reviewed in the 49 or so that were reviewed did not
8 include any of this feedwater stuff that was inaccessible
9 here due to retrofit.

10 The other thing is, this retrofit was not clear
11 if it was being retrofitted right that minute, or if it had
12 been retrofitted since inspected, and that interfered with
13 the reinspection from the original inspector. That was not
14 clear. That one thing is not really -- is a question,
15 because I wonder about that feedwater stuff that was not
16 reviewed.

17 The third one --

18 Q I'm sorry, I was just going to --

19 A The third one is obvious. I highlighted the
20 word "cleanliness" and "hydro test." Hydro test is a very
21 limited timeframe as affecting anything. You can
22 reschedule an inspection three weeks after the hydro or a week

1 before the hydro. It is simply a scheduling problem when
2 you let hydro interfere with an accessibility of an item,
3 just hydro.

4 Cleanliness. The word "cleanliness" implies
5 that it's filthy, you can't visually see it or inspect it.
6 There is a category that was omitted from the inspection
7 called housekeeping, and I assume housekeeping is an ongoing
8 practice of keeping things clean. But to make something
9 inaccessible because it's so filthy, when you could go
10 out and clean it, if that's indeed the way this was written,
11 says why did they not look at this? It's not reasonable
12 for them to say it's filthy, we won't look at it.

13 Q Let me ask you --

14 A The fourth one, the same thing.

15 Q I'll let you go to the fourth one in a minute.

16 But do you have these documents that you've
17 referred to here?

18 A Yes, I've got the whole file. They're stamped.
19 They were Xeroxed by Mr. Gayley before giving them to me.
20 Your office should have a copy.

21 Q These are the accurate numbers for these things
22 here?

1 A Yes. I double-checked them since this was
2 done.

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1 Q This list of items, then, is a series of
2 potential concerns on your part?

3 A It's concerns concerning the attributes associated
4 with the review, yes. They are not all-inclusive, I should
5 state, too. I only listed four here. It would have been a
6 quite lot longer list. I tried to list the different
7 categories like hot functional, cleanliness, hydro. I
8 didn't try to redo those over and over for different
9 inspectors.

10 There were other inspectors with cleanliness
11 problems.

12 MR. GALLO: Can we go off the record for a
13 minute?

14 (Discussion off the record.)

15 BY MR. GALLO:

16 Q Mr. Stokes, I believe I interrupted you. You
17 were about to address this item in the middle of the
18 page that starts out Table 38.2-1. Where did that table
19 come from?

20 A You didn't interrupt me. I wasn't --

21 MR. WRIGHT: Objection, Joe. I think you
22 interrupted him when he was going to the fourth part. I
don't think he actually got onto that point yet.

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#12-2

1 THE WITNESS: You interrupted me when I was on
2 Inspector 1313, which was the third inspector for hot
3 functional.

4 MR. GALLO:

5 Q You mentioned cleanliness. I thought you had
6 covered that point.

7 A I didn't cover hot functional. Hot functional
8 and hydro were quite similar, but they were listed as two
9 different problems with inaccessibility. It can be -- I
10 mean there's hot functional going on the other day when we
11 toured the plant. It was warm, but not impossible to
12 perform an inspection, I don't believe, just because of this
13 statement, hot functional, without a much more definitive
14 statement, that casts that question, yes.

15 Q All right. Now turning to the item that starts
16 out Table 38.2-1, what document is that table from?

17 A I believe it is from the first document which
18 we were discussing, the main Sargent & Lundy criteria.
19 Structural project design criteria, Byron-Braidwood. It's
20 the only document, to my memory, that went up to 38. It
21 actually, I think, went a little bit beyond 38.

22 Q The next line refers to -- the next three lines

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1 start out -- well, indeed, if you look at the rest of the
2 page, each line seems to start out "omitted."

3 A Yes.

4 Q What does that mean?

5 A Just that.

6 Q Omitted from what?

7 A All procedurals that I reviewed, everything that
8 was given to me, supplied to me, there was absolutely no
9 section, no drawing, no nothing concerning through-bolt
10 design criteria. There was no flare bevel or bevel weld
11 radius tube steel specified.

12 In other words, there was no table as to what the
13 radius would be for the design team to use for various tube
14 sizes. There was omitted no as-building, 10 percent over-
15 stress factor, and I limit that.

16 Now there was one document that covered that. It
17 was -- this one line was not in the main criteria. It was
18 not in the DC-ST-03-BY/BR document. There was a proprietary
19 document that I was allowed to review that included
20 several comments on both 10 percent overstress, zero percent
21 overstress, 33 percent overstress, and actual -- just --
22 you could fail one member every so often of a certain type
comment. But at the moment I can't give you that document's
number.

1 Q So what you are telling me is that where
2 "omitted" appears, the subject that you describe is not
3 covered in any of the documents you reviewed, with the
4 exception that you just noted?

5 A Yes, that's true. It wasn't in anything I saw.

6 Q You indicate that there was nothing on flare
7 bevel welds and bevel -- I'm sorry, flare bevel weld radius
8 and tube steel?

9 A I said there was no procedure.

10 Q I see.

11 A Design criteria procedure --

12 Q Go ahead, what is Attachment 7?

13 A Well, that's probably one I included for another
14 point, and I was just fixing to -- yes. I'm not sure just
15 what that is. It's like I said -- or if I didn't say it,
16 I'll say it now, it's marked safety-related, it's got no
17 calc number, no revision. It's not reviewed, not approved,
18 it has no client, no project, project number. This thing is
19 -- was almost, as far as I can tell, untraceable. But it
20 had -- and this copy is as terrible as my copy had. In
21 comparing several sheets of this thing, I was able to
22 determine this number at the top, the 117.57. It's something

1 STD 117.57. I couldn't even determine who prepared it. If
2 you can read that, boy, I could use you.

3 I could determine on secondary pages what --
4 who did it. It's got Shenean as the preparer. Still not
5 reviewed and not approved, but here he finally did stick in
6 something that helped me a little. It was CECO, Byron-
7 Braidwood, and some numbers.

8 I still have not really found out anything about
9 this document. It's concerning weld reviews. It's obvious
10 from the write-up -- undercut -- boy, that looks like
11 reinspection stuff. You've got the 10 percent reduction,
12 you've got undercut and different sketches, and what really
13 caught my attention when I got through this document was it
14 gets over and it didn't even have a page number. It has a
15 nice picture of tubing intersecting plate, and it calls out
16 the weld symbol for the tube-to-plate weld, R(E) with a bevel
17 weld.

18 What really caught my attention, after talking
19 to Sargent & Lundy that Wednesday several weeks ago was the
20 next page concerning flare bevel groove welds, and it appears
21 that whoever prepared this did some research, and it states
22 typical field measurements indicate the actual radius is
between T and 2.5 T, where T is the tube wall thickness.

1 Therefore the design assumption of R equals 2 T, an
2 effective throat equal to 5/16ths R per AWS D-1.1 is not
3 applicable.

4 Now, that states everything in a nutshell as
5 far as I am concerned. I, on Wednesday discussed an
6 allegation which I raised at Diablo, and I had absolutely
7 no proof that it would go anywhere where, and all of a sudden
8 I was reading through this documentation and dumped in my lap
9 was a flat-out statement by somebody at Sargent & Lundy
10 stating that their design assumption of R equal 2 T is not
11 applicable to this work, and that there is T-radius steel in
12 the plant.

13 They make that statement, but they don't sign it.
14 I guess it was Shenean.

15 But, in any case, this thing in fact did all the
16 research that I needed, that I wanted to do in the field. I
17 wanted to measure stuff when I got my field trip, if I ever
18 got one that I could go on when I wasn't too busy.

19 This document did all my review work. It says
20 flat-out everything that's been assumed by Sargent & Lundy,
21 if it was based on their design assumption of R equal 2 T is
22 not applicable to Byron. Now --

12-7

1 Q Okay, are you finished?

2 A Yeah, I think that's plenty.

3 Q So I guess based on your testimony, this whole
4 question of flare bevel weld was not omitted from the
5 documentation you looked at?

6 A It was not -- I said it was omitted from
7 procedures, criteria.

8 Q And this doesn't qualify as any of that, Attachment
9 7 I'm referring to?

10 A No, it doesn't, because I don't know if this
11 thing has been destroyed by -- well, I know it wasn't
12 destroyed, because they gave me a copy of it somehow. But
13 what it does tell me, because it's not reviewed and not
14 approved, that somebody undoubtedly didn't ever want to use
15 this thing.

16 But, then, on the other hand, the stuff that
17 follows the flare bevel stuff on thin plate sheet welding,
18 D-1.381, and the transverse loading on the weld calcs, it
19 appeared in the calculations I saw, they used these numbers
20 as the capacities for the welds which says they should have
21 been reviewed and approved. But it wasn't.

22 So I've got a contradictory attitude here. I've

1 got numbers being used out of this document without it
2 being finalized and approved or anything, and then I've got
3 on the other hand stuff that would have been very useful in
4 expanding, if anything, the review to all these joints
5 that this guy is making the statement are in question, and
6 I've never seen anything expanding the review to these
7 joints. So that's where I stand.

8 Q All right.

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1 MR. GALLO: Can we go off the record for a
2 moment?

3 (Discussion off the record.)

4 BY MR. GALLO:

5 Q Let's refer to Attachment 6, Mr. Stokes, in the
6 -- well, you tell me what Attachment 6 is. The first page
7 is a page of a letter to Mr. Reed of Commonwealth Edison
8 dated January 30, 1984, and what is the second page?

9 A It's a letter out of this document. If you note,
10 the first page is F-1 and the second page is F-13. I
11 didn't even feel we should Xerox this at all and supply it
12 as an attachment, because I felt all NRC letters and
13 transmissions would be acceptable as -- in evidence already.

14 In any case, we did Xerox the first page just to
15 show that it links it to the page on 11 with the F number
16 coding system.

17 Q So the second page of Attachment 6 is --

18 A Attachment 6, it's that letter containing --
19 it's an inspection report, basically, is what that letter was
20 on.

21 Q So page F-13?

22 A Uh-huh.

1 Q I see.

2 A There was an inspection report.

3 Q If I turn to page F-13, really your second
4 sheet of Attachment 6, and I look under the item that you
5 have starred, there is a reference to a drawing detail
6 called DV-164. And if I look in the finding, there is a
7 reference to DV-162.

8 A Uh-huh.

9 Q Do you understand this to mean that what is at
10 issue here is the drawing detail DV-162?

11 A No, the allegation reads in quotes:

12 "General surveillance of this project
13 illustrates that approximately 90 percent of the B welds
14 on that drawing are 1/8th undersize where tube steel has
15 been used. In most cases this represents a 40 percent
16 decrease in size and 55 percent in strength."

17 It was obvious to me by reading that -- maybe
18 incorrectly -- that they were discussing flare bevel welds
19 on tubing which someone had made an allegation against the
20 flare bevels being undersized 1/8th of an inch, which is
21 quite similar to the allegation I raised at Diablo Canyon
22 in the relation of quarter inch fillet welds and requested --

1 or not fillet, flare bevel was expected, and only 1/8th was
2 installed.

3 Q Do you know whether or not there's a drawing
4 detail called DV-164?

5 A No, I'm not even familiar with what DV-164 or 162
6 or anything is. It wasn't in part -- it wasn't in the
7 document.

8 Q It's my understanding then that you just assumed
9 that the welding involving the tube steel in this allegation
10 was flare bevel type welding; is that correct?

11 A I did, yes. I may have incorrectly. That
12 would be the same quote, almost identical.

13 Q Mr. Stokes, I'm going to show you a drawing
14 prepared by Sargent & Lundy which has on it drawing detail
15 DV-162. We have marked the area for you.

16 MR. CASSEL: Did you say this was 164 or 162?

17 MR. GALLO: 162.

18 BY MR. GALLO:

19 Q It's -- where is the drawing number on this thing?

20 MR. HOOKS: Right here.

21 BY MR. GALLO:

22 Q This is Drawing No. 6E-O-3292. Is that right?

1 MR. HOOKS: Yes.

2 BY MR. GALLO:

3 Q And on this drawing is detail DV-162. I wonder,
4 Mr. Stokes, if you can take the NRC description of the B
5 weld that they are talking about and look at the drawing
6 detail DV-162 and tell me whether or not the weld shown
7 as the B weld is the flare bevel weld or a fillet weld.

8 A The B weld here is a fillet, which wouldn't
9 apply to a flare bevel, no. So, thank you.

10 Q Did that change your reliance on this Attachment 6
11 for purposes of your answer?

12 A Well, it could be extracted from the documentation
13 as far as I'm concerned. If I had presupposed that the
14 allegation was tube steel, flare bevel welds was the issue
15 here, if that's the -- since you've shown me that it's not,
16 it's obvious that I'm raising the issue for myself, as per
17 the attachment after this, 7.

18 Q All right.

19 A I thought it had already been raised. I'm sorry.
20 It's something new.

21 Q Let's turn to your Answer 29. It's on page 20.
22 If I understand this answer, Mr. Stokes, you

1 have questions on calculations and assumptions found in
2 Calculation Book 19.1.2, and then your subsequent
3 questions and answers that appear deal with, by my count,
4 four of those items.

5 Let me make it easy for you. By my comparison,
6 you have not addressed Section 19, pages 1 through 5, and
7 Section 21, page 113 and my first question is -- maybe you
8 want a change to check that out to see whether my evaluation
9 is correct?

10 A I think I sort of looked through it the other
11 night, and I noticed that what you are saying is true. I
12 didn't --

13 Q Well, are there problems in Section 19, pages
14 1 through 5, and Section 21, page 113?

15 A I believe there are, yes. I think I checked out
16 all the numbers per a list that I had.

17 Q But they're not included in your testimony?

18 A In haste -- I'm sorry, I didn't include
19 absolutely everything that I found. I intend, and I had
20 planned on supplying a list to both CECO and the NRC at
21 some point when I get it completely finalized. I'd like to
22 be able to strike some of the things before I give it to

1 them. But this list, as I have said already, or will state,
2 is not absolutely everything. In some haste there's been a
3 few things omitted. I stated that, I think, a little earlier
4 in relation to the -- I don't think I included the document
5 on the telephone conversation that was not documented.

6 There was a few others that now that I'm thinking
7 back along the calculational side of things, I didn't
8 include in haste, but they weren't technical as much as
9 documentational issues that are QA-oriented. So. . .

10 Q Now, as I understand, the item that you referred
11 to in your Answer 30, is this a -- first of all, did this
12 involve a discrepancy that was detected during the course
13 of the Byron reinspection program?

14 MR. CASSEL: I'm sorry, Joe, you said Answer 30
15 we're now on?

16 MR. GALLO: Yes.

17 THE WITNESS: Was it detected during the Byron
18 reinspection program?

19 BY MR. GALLO:

20 Q Is this a discrepancy that was detected during
21 the Byron reinspection program?

22 A Well, the weld inspection sheets that I reviewed,
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1 which were supplied here, they were in Section 2.1, page 5,
2 I believe. Yes. And the calc was actually in Section 4.1,
3 page 7 to 11.

4 According to those documents, this was reinspected
5 in connection with PTL's scope of work.

6 Q Did the calculation that you reviewed -- was that
7 an evaluation of the discrepancy by Sargent & Lundy?

8 A Yes. These documents, all the calc books, are
9 Sargent & Lundy's, by the way.

10 Q Do you know what contractor at the site -- I
11 mean what Byron contractor -- let me strike that and start
12 again.

13 Do you know what contractor doing the work at
14 the Byron Station produced this particular weld?

15 A Produced it? No. Whose scope it came under in
16 the review? PTL.

17 Q PTL did the inspection; is that correct?

18 A Yes. Well, it was in their scope of the review
19 program. I don't know who actually did the weld to start
20 with.

21 Q PTL didn't do any welding; isn't that true?

22 A They inspected stuff, though.

1 Q All right. If I were to ask you this same series
2 of questions with respect to Answers 31, 32 and 33, would
3 you in essence give me the same answers? Namely, that
4 there are discrepancies detected during the reinspection
5 program, but you don't know which contractor produced the
6 welds?

7 A That's true, I don't. I just know they were in
8 PTL's scope of the reinspection program, which is what I was
9 supposed to review.

10 MR. GALLO: Well, we just saved perhaps 10 minutes.
11 I just got a poke.

12 (Laughter.)

13 (Pause.)

14 BY MR. GALLO:

15 Q Turning to your very last answer in your
16 testimony, this document you refer to, Drawing 6E-3393E,
17 is that a Sargent & Lundy drawing used for design purposes?

18 A Yes, I believe it was design installation --
19 initial design.

20 Q Do you know for what component?

21 A Category 1 conduit supports. There's a series
22 of these drawings. This is the only one I listed, but the

1 whole package, which was supplied to me, is 6E-3393A, it
2 went almos^t through the alphabet. It missed several letters
3 at the end and then came back AA and BB, I believe, if my
4 memory serves me correct. It was quite a substantial
5 package of drawings on this particular --

6 Q On page 26 of your testimony, you refer to the
7 unistrut catalogue. Is it your understanding that Sargent
8 & Lundy uses the design tables that are contained in the
9 unistrut catalogue for design purposes?

10 A It's not my understanding. It's sort of obvious
11 from the questions I raised concerning KL/R that they may
12 have used unistrut, .8 for the K factor, which would make
13 quite a substantial change in the table that I was looking
14 at, and the correctness of it for end connections.

15 And so whether or not they used it specifically,
16 I can't say, but it appeared that they may have relied very
17 heavily in the unistrut catalogue on the .8 factor, and
18 possibly the KL/R is listed for that factor, instead of
19 doing their own analysis of KL/R for the actual conditions
20 in this table.

21 That was the explanation I reasoned out on my
22 own, but I can't go beyond that.

1 Q You say again on page 26 that you reviewed many
2 designs that exceeded the 200 factor.

3 A Yes.

4 Q Can you identify these designs for me?

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[Faint, illegible handwritten text, possibly bleed-through from the reverse side of the page]

14-1

1 A Not specifically. That was in relation to the
2 field trip that I went on with the Judges. In that trip,
3 the first thing that I -- we was looking at electrical
4 stuff, and the first thing they carried us to was all these
5 tray supports that were extremely long off the ceiling,
6 and I remember asking one of the CECO people -- I think it
7 was, how long one of these members was, because I wasn't
8 sure I could estimate it halfway decently, and he said,
9 "Eighteen feet."

10 Q I don't want to interrupt you, but I thought
11 we were talking about conduit supports in these answers on
12 page 26.

13 A Well, these are conduits in HVAC -- not HVAC --
14 cable trays are conduit supports. That's what we were
15 looking at in the field, a lot of cable tray supports,
16 extremely long members off the ceiling. If I said HVAC,
17 I'm sorry. The same supports, by the documents I saw,
18 could have HVAC as well as cable trays on the same
19 structure. And if I said just strictly HVAC, I'm sorry.
20 There would have been a combination of those two, maybe
21 just one or the other. The ones we saw in the field that
22 I'm specifically referring to in that statement -- I believe

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1 ll were cable trays, but I can't say for sure. They didn't
2 have any HVAC on them.

3 Q Now I'm confused by your testimony. On page 26,
4 you say that you reviewed many designs that exceeded the
5 200 factor. And what I'm confused about is whether you
6 actually reviewed documents that exceeded this factor, or
7 it was based on your tour with the Judges that day and
8 you observed these during your tour.

9 A Some of both. The documents that I start out with,
10 the table indicates that the table is incorrect. That
11 indicates that many supports designed by that table would
12 be, in effect, incorrect.

13 On visiting the field, to continue, in
14 extrapolating this, I visually saw many that exceeded and
15 complied with this table. I actually saw them. They were
16 shown to me, and they fit that table exactly.

17 On top of that, in the calculations which I have
18 reviewed, which were towards the weld's end, which only
19 was one very minor part of these things, there was
20 reference by sketches of the configuration in the structure.
21 You can say I presupposed that many of those structures
22 are shown with the in excess of 200 KL/R, because in

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1 many cases the lengths of these members were not indicated,
2 and I'd have to actually compare, if I knew the hanger
3 number, back to the drawings. It's a very difficult thing
4 for me to try to trace all this stuff back and forth. All
5 I can say is, I reviewed those three things, and the same
6 problem is obvious in all three -- the field trip, the
7 document, and in the calculations.

8 Q Let me see if I follow you. Based on your
9 review of the table that is discussed on page 25 of your
10 testimony, you conclude that the table is inadequate, and
11 then based on your field trip with the Judges, you actually
12 observed designs where the factor of 200 was exceeded.

13 Is that a fair statement?

14 A In my opinion, I saw stuff. I didn't need a
15 tapemeasure and a ladder to get up and do a real detailed
16 dimensional check. But just off of judgment, I would say
17 they exceed well over 200.

18 Q All right. Are you familiar with the testimony
19 of Ernest Branch?

20 A I have read Mr. Branch's testimony, yes.

21 Q Are you aware that he evaluated 49 discrepancies
22 involving ASME welds?

mgcl4-4

1 A Yes, I referred to that earlier in my statement
2 when I was talking about thin wall.

3 Q Did you review any of those calculations during
4 your review at Sargent & Lundy?

5 A Many didn't have calculations. I've got the
6 document which was given to me. Maybe it's not complete,
7 but there's three documents given to me -- BRP-1, BRP-1(a)
8 and another document, I think BRP-3. I won't guarantee
9 that last one, but it's a listing of all those things
10 reviewed.

11 In many cases, they were simply stated "Accept-
12 able," with no calc at all.

13 Q We're talking about the 49 ASME welds?

14 A Yes, yes. There was a little pipe wall thinness
15 calculation. I don't think that part was in the calc,
16 though, the pipe wall thinness. But they referred to the
17 thickness requirements and what was calculated as being
18 the requirement. I wasn't sure there was an actual
19 document where they sat down and said the thickness and
20 the pressure and all this stuff, and they came up with a
21 number. I didn't see that, no.

22 Q It's Mr. Branch's testimony that 49 ASME welds,

14-5

1 which were detected with discrepancies during the
2 reinspection program, were evaluated for their design
3 significance, and that none had design significance.

4 And I am asking if you, in your review at
5 Sargent & Lundy, looked at any of those evaluations?

6 A I looked at those three documents, and they
7 were --

8 Q Were those evaluations in there, in those three
9 documents, to your knowledge?

10 A I can't say it was completely there. There was
11 an evaluation in there, yes, as well as the entire listing
12 of all of the welds.

13 Q Do you know whether the evaluations that Mr. Branch
14 was referring to are the same as what you reviewed?

15 A I have no way of knowing what Mr. Branch reviewed.
16 He's never supplied me with a list of what he actually
17 looked at. If I made a statement on what he reviewed,
18 I would have to presuppose that -- make an assumption on
19 that basis, and I'm sorry, I can't do that.

20 Q So you don't know whether you reviewed the 49
21 ASME discrepant weld evaluations that Branch testified to
22 or not?

14-6

1 MR. WRIGHT: Objection. I think that's answered
2 in his Answer 36.

3 THE WITNESS: The document was covering the 49
4 ASME. If there's 49 more, what can I say?

5 BY MR. GALLO:

6 Q No. I'm talking about the ones that Mr. Branch
7 testified to.

8 A Again, he only testified to 49 ASME welds. This
9 document specifically addresses 49 ASME welds. Unless
10 there's more than 49 and more than one document, I have
11 no -- you know, I can only say I assume this document
12 covers the same 49 he reviewed.

13 Q This is not a trick question, Mr. Stokes. It's
14 my understanding that to meet your request for a review
15 of documents, that Sargent & Lundy made available, among
16 other documents, all the calculational books that dealt
17 with these 49 discrepant welds, and I'm just asking
18 whether or not you reviewed those.

19 A If they did, then I reviewed them, at least in
20 their office on a very quick scan-type basis, and I believe
21 the document that I've got a copy of, these 49, is the
22 entire package, but --

mgc 14-7 1

2 Q Did you note any deficiencies in those
evaluations?

3 A Did I mention any in this testimony? I don't
4 believe I did. I think there is a few comments I had
5 on them that may have been something that I felt was not
6 that important. The 49 I looked at, there was -- yes,
7 there was. I'll back up.

8 The question before 37, the one you omitted,
9 discusses whether any Sargent & Lundy calculations for the
10 reinspection program had caused concern, and I list BRP-1,
11 okay? So I answered it in that question. There's two
12 welds, 62 and 63 which were accepted, despite the fact that
13 the accuracy of the gauges supplied for measuring the welds
14 was only 1/64th of an inch.

15 The actual numbers shown in this calc indicate
16 that this thing fails, period. The only way they got it
17 over was they used the 1/64th accuracy to say, "Well, we
18 assume this gauge was out of tolerance, and we boost it
19 over." So that caused concern. But that was related to
20 weld gauges used in inspecting.

21 Other than that, in those two, I can't remember
22 any more.

mgcl4-8

1 Q Go ahead. I'm sorry.

2 Doesn't this comment on the top of page 25 go to
3 the question of the adequacy of the inspection, as opposed
4 to the adequacy of Sargent & Lundy's discrepancy evaluation?

5 A It cannot go to both. It goes to the adequacy of
6 the inspection, in that the gauges in question here,
7 the documentation that I saw, letters from the supplier --
8 his own comments are, "These gauges are only general
9 quality accuracy, and if you need a more accurate gauge
10 then you should use something else, specifically machine
11 shop type gauges."

12 So it goes to as to what equipment was supplied
13 to these guys to do the calculations to determine the
14 accuracy or validity of these errors, and then it goes
15 to the assumptions on Sargent & Lundy's part to get these
16 things out of any significant level category, instead
17 of assuming that the gauge was above tolerance that was
18 used to measure it on the one hand, and below tolerance
19 on the other hand -- 1/64th and 1/64th, which would have
20 been 1/32nd, and added that to their difference -- would
21 have been even more out of scope. Now --

22 Q You think they -- let me see if I understand what

14-9

1 you're telling me. You're telling me that the dimension
2 of the discrepancy was understated in this instance?

3 A It could have been.

4 Q And that therefore this adversely affected the
5 evaluation of these two weld discrepancies performed by
6 Sargent & Lundy?

7 A It could affect not only those, but many. When
8 you have only an accuracy of 1/64th of an inch, and that's
9 plus or minus accuracy, and you arbitrarily assume that
10 everything you measure is perfect, with that you're --
11 if you use the exact same gauge from here to here to here
12 to here to here in every evaluation that was evaluated
13 in the very first place, then you can say, "Well, this
14 gauge is inaccurate, but the inaccuracy is identical to
15 what was used at the beginning, so the determination has
16 no effect." But when the inaccuracy of the gauge is not
17 consistently applied to the same location of measurement,
18 then you have a plus with a minus, a plus plus, or a
19 minus minus.

20 In the worst case, this plus minus, that's using
21 a low tolerance, say, at the end, undersize with an
22 oversize at the beginning, you get two unconservative

14-10

1 factors.

2 Q All right. Let me ask you this question.

3 Were Welds 11-A and 33 -- I think those are
4 the shorthand terms that I can use -- referred to at the
5 top of page 25 of your testimony, were those designated
6 as discrepant welds?

7 A They were in this batch of discrepant ASME welds
8 which were reviewed by Sargent & Lundy in BRP-1, yes.

9 Q And did you check those particular evaluations
10 to determine whether or not Sargent & Lundy performed them
11 adequately?

12 A Well, from BRP-1, the evaluation appeared to be
13 inadequate.

14 Q Based on this criticism?

15 A Yes.

16 Q Any other reason why it might be inadequate?

17 A Not to my knowledge. I didn't see any pipe wall
18 thickness calculations in this package.

19 Q All right. That's two out of the 49. Did you
20 find any inadequacies in Sargent & Lundy's evaluation of
21 the other 47 ASME weld discrepancies?

End 14

1 A I don't believe so. As I said, there may be other
2 minor problems I saw with those, because they were
3 assumptions, primarily. That's one of the problems. The
4 problem I saw with a lot of this is they assumed there was
5 no problem, if you want to get down to the bottom line.
6 There's a whole bunch of that in everything I've seen, and
7 that's assuming that whatever is there is okay, flat,
8 right off the beginning. They never did a calc, they didn't
9 do no load comparisons, nothing. It was just assumed okay.

10 Now that's a problem as far as I see it,
11 across the board. A problem is a problem. If you want to
12 know the truth.

13 Other than that -- and I'd say that makes up
14 half of the 49 or more.

15 Q Now what was the nature of the ASME weld
16 evaluations performed by Sargent & Lundy? What did they do?

17 A Well, from what I could determine from this
18 document, the nature of the problems primarily were
19 insufficient weld thickness. It appeared they had done a
20 calculation to determine minimum pipe wall thickness. That
21 was not part of the package, and I assumed maybe the guy
22 just did it on a rough sheet of paper. As far as I know, I

1 didn't get any of that documentation either. Otherwise --

2 Q Didn't they evaluate the effect of the
3 discrepancy on the pipe?

4 A They evaluated pipe wall thickness required by
5 what was there. They made a statement.

6 Q Didn't they conduct a calculation to determine
7 whether or not the wall thickness was adequate?

8 A I just said they compared the calculated wall
9 thickness with what was there. I didn't see no calc in
10 this document.

11 Q You didn't see any calculation?

12 A No.

13 Q So you think they just eyeballed it and guessed?

14 A No, I don't know. I assume the guy did a
15 calculation somewhere else and included it in this document.
16 I didn't see it so I don't have any -- had I seen the calc,
17 I would not have the sufficient documentation to question
18 the pressure, the temperature, and a lot of other factors
19 that would have went into it.

20 There's no way I can draw a conclusion beyond
21 what I'm stating, because to do the detailed type review
22 you're asking is, first I would have to run the pipe analysis

1 myself, after rewalking the entire system to determine its
2 adequacy from that standpoint.

3 Q I'm only asking if you checked the Sargent &
4 Lundy calculation.

5 A I checked what I saw and what -- I can't go
6 beyond what's in BRP-1, 1-A, 3. On the ASME stuff, that's
7 the only documents I saw, I have knowledge of, that
8 discussed ASME issues.

9 Q Now Mr. Branch also testified with respect to
10 his evaluation of certain discrepancies involving what are
11 called in the reinspection program objective attributes of
12 Hunter. Did you review any of those evaluations?

13 A Yes. I've got a document that says objective
14 attributes of Hunter, as far as I know. Parts of it, I'll
15 say that. I've got copies of parts of that document.

16 Q Did that document address the so-called hardware
17 discrepancies for the objective attributes for Hunter, do
18 you know?

19 A I can't remember exactly what was in those
20 documents, whether it was just strictly welds. I think it
21 was primarily welds, from what I can remember. Whether it
22 was hardware, I can't be specific. I consider everything

1 hardware, structures, attachments. I would assume so.

2 Q Are you familiar with the testimony of Richard
3 French?

4 A Yes.

5 Q Now, Mr. French's testimony addresses various
6 reinspection attributes for Hatfield, and they are called
7 in the reinspection program objective attributes.

8 Did you review any documentation involving
9 the discrepancies noted during the reinspection program of
10 these attributes?

11 A Hatfield?

12 Q Yes.

13 A Yes, I've got copies again of excerpts out of
14 Hatfield books.

15 Q All right. I may be unclear in my question.
16 I'm really referring to Sargent & Lundy evaluation of
17 the design significance of the discrepancies noted in the
18 Hatfield objective attributes.

19 Did you review any of those Sargent & Lundy
20 evaluations?

21 A Yes, I think I did, but I'd have to consult
22 with everything that I've got. But just off the top of my

1 head, I have documents on Hatfield, PTL and Hunter. I can't
2 say I had both objective and subjective in both categories.
3 I tried to pull parts of documents supplied to me.

4 One of the documents which was sort of in question,
5 I believe, in the hearings under McLaughlin's testimony,
6 came out was Mr. McLaughlin --

7 Q I'm just talking French now. We're talking
8 objective attributes for Hatfield-French testimony.

9 A I would say I've seen it. I can't really be
10 specific.

11 Q Can you tell me if you recall, if you note any
12 disagreement with any of the Sargent & Lundy evaluations of
13 the discrepancies that are categorized under the objective
14 attributes for Hatfield?

15 A Mr. French's testimony to Hatfield concerns
16 cable support trays, and I have got quite a few concerns
17 with the Hatfield calculations on those issues, yes. If
18 you'd be more specific about what was in the document,
19 whether it was cable tray or whatnot. I can remember that,
20 because that's primarily what I was looking at, was the body.
21 Many didn't have right across the top "this is Hatfield."
22 It had Book 119-2. You had to go back to an index to find

1 out who in the hell it applied to, and it varied from one
2 little section to another.

3 I remember looking at plenty of calculations
4 on conduit and HVAC supports that I have a whole bunch of
5 questions about, yes. I didn't include those here, I'm sorry.

6 MR. WRIGHT: Joe, how long do you intend to go
7 to finish him?

8 MR. GALLO: I probably can finish up in about 15
9 minutes.

10 MR. WRIGHT: Okay.

11 THE WITNESS: But, yes, there's a lot of things
12 in that category.

13 BY MR. GALLO:

14 Q Did you review any of the AWS weld calculations
15 performed by Sargent & Lundy with respect to the evaluation
16 of discrepancies of Hatfield and Hunter AWS welds?

17 A Yes, quite a few. That's primarily the review
18 program, was welds. There was very few things outside of
19 welding that was in question from what I saw. A few beam
20 connections, which were again welding; a few bolted
21 connections; anchor bolts.

22 Q Did you review any of the Sargent & Lundy

1 evaluations of the 356 Hatfield AWS welds testified to by
2 McLaughlin?

3 A Again, I don't have a list of what Mr. McLaughlin
4 included in his 356 to compare it to the documentation I
5 have. But just going on what was supplied to me and what I
6 have seen, I would assume that I've at least looked at part
7 of the 356 Mr. McLaughlin testified to, yes.

8 Q Again, do you recall any disagreement with those
9 evaluations that you --

10 A I'm sure there's got to be a few in there. I
11 had disagreements with quite a few of his calculations, but I
12 didn't have enough time to include absolutely every calc
13 that I looked at, that I had a question on.

14 The other thing is I didn't have time to go back
15 and redo a lot of the calcs that I had done preliminary stuff
16 on and had a question over to verify that I was correct.
17 And so I omitted stuff like that. I'm sorry, I --

18 Q You don't have to apologize. That's not needed.

19 So you're telling me you noted disagreement with
20 certain of the Sargent & Lundy evaluations of the 356
21 Hatfield AWS welds, but you didn't note those in your
22 testimony that you filed in this case; is that correct?

end 15

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A That's correct. I didn't have time. I'm sorry.
(Pause.)

Esbeck
Gleason
25% COTTON

1 Q All right. Page 4 of your testimony, Mr. Stokes.
2 You've -- are you on page 4?

3 A Yes.

4 Q I'm looking at the sentence that you corrected
5 in response to a question from Mr. Wright. You say you
6 reworked the aspects of a number of engineering calculations.
7 Are these hand calculations that you performed yourself?

8 A Well, no, I said in my review I reworked aspects
9 of a number--when I reviewed some of these calculations I
10 was just talking about, I performed rough calcs on sticky
11 tab sheets which I stuck right on the calc itself for future
12 reference. I have not had time to go back and look at my
13 calculations or the other calculation.

14 Q What does the term "rework" mean here?

15 A I used it like rework as far as reinspection,
16 re-evaluate, requalify. It's Sargent & Lundy's work, it's
17 the work they did, as far as qualifying the safety
18 significance, design significance of the joint.

19 Q Did you run an independent calculation yourself
20 when you did this, or do Stokes calculations exist? That's
21 my question.

22 A There's notes on sticky tabs that exist, yes.

1 Those are not, if you want to say Stokes calculations.
2 They are rough calculations. In other words, I used those
3 to draw the conclusion that there was possible error in what
4 had been done in that aspect of the calc. They're not --
5 as far as Stokes calculations, I have an engineering paper
6 that I do a calc on and it's a very formal type thing.

7 MR. GALLO: Can we get copies of what he's
8 referring to?

9 MR. CASSEL: Do you have those here in town,
10 Charlie, the sticky tabs?

11 THE WITNESS: I don't think I have all of them, no.

12 MR. CASSEL: Do you have any of them?

13 THE WITNESS: I'd have to look through. There
14 are boxes of stuff. I can't say.

15 MR. CASSEL: Could you do that over the weekend?

16 THE WITNESS: Yeah, I can do it, because I
17 planned on redoing some of those, anyway, just to verify it
18 for the hearing, and so if you'd like, I could give you copies
19 of not only the sticky tabs, but written up what I find out
20 over the weekend.

21 MR. GALLO: No, I'm just looking for what you've
22 already done. I'm not asking you to do additional work.

1 THE WITNESS: Well, I'm going to.

2 MR. CASSEL: He's going to, anyway.

3 THE WITNESS: See, I've committed to it on my own
4 so you won't be asking for anything.

5 MR. CASSEL: We'll be happy to supply as many of
6 the sticky tabs as Charlie can find over the weekend. Do
7 you want us to just give them to you at the hearing in
8 Rockford, or give them to you at the office on Monday?

9 MR. GALLO: No, Monday would be fine.

10 MR. CASSEL: But are you going to be here at
11 the office on Monday?

12 MR. LEWIS: Could you copy us on the sticky tabs,
13 if possible?

14 MR. CASSEL: The question is, do you want them
15 here or in Rockford?

16 MR. GALLO: We'll get them at the hearing in
17 Rockford.

18 (Discussion off the record.)

19 MR. GALLO: All right, let's go back on the
20 record.

21 During the off-the-record conversation, Mr.
22 Cassel agreed to have Mr. Stokes furnish the sticky tabs and

1 the underlying documents referred to in our earlier colloquy
2 at the hearing to commence on Monday morning -- or Monday
3 afternoon.

4 MR. CASSEL: To the extent they are physically
5 here in Chicago. If any of them are physically in California,
6 we won't have them by Monday.

7 THE WITNESS: We won't have them at all, because
8 some of the stuff when I pulled it to Xerox it, just to make
9 these attachments, I removed the sticky tabs. I didn't put
10 them back on. They're still on the Xerox machine. And when I
11 got through, I didn't want to go through it, and I threw them
12 away.

13 MR. GALLO: To the extent they exist here in
14 Chicago.

15 (Discussion off the record.)

16 BY MR. GALLO:

17 Q One last question. I believe this gets us back
18 to the course work you took at Auburn.

19 A Okay.

20 Q I believe I asked you whether or not you took a
21 dynamics course and you said you did.

22 A Yes.

1 Q Is this a required course or an elective?

2 A It was required at Auburn. At some schools it
3 would probably have been elective. The BCE curriculum per
4 se has many much more technical requirements in the program
5 than a B.S. in Civil would.

6 Q I see.

7 A But it was a required course.

8 Q Now did this required course concerning dynamics,
9 did that deal with structural dynamics?

10 A Yes, it did. Vibration, motors, bodies in space,
11 quite a few different aspects of dynamic properties of
12 structures.

13 Q Did it deal with the dynamics of structures
14 like reinforced concrete structures -- not steel structures,
15 concrete structures?

16 A The course was more geared not to the designing
17 of concrete and its vibration, but the kinetic energy
18 transfer dynamic equilibrium states associated with that
19 movement which would apply to any material based on its
20 properties.

21 Q Do you remember what year at engineering school
22 this course was offered? First year, second year?

1 A No, it was -- what year out of the curriculum, I
2 can't say at the moment. I think it was the third year,
3 junior level. The problem with me, as I've already stated,
4 is I was in architecture and then transferred to civil, and
5 I was a junior almost when I started the engineering. I was --
6 you know, I -- for me, it was a junior level course, or above.

7 MR. GALLO: That's all the questions I have.

8 MR. LEWIS: We want to take a short break and see
9 if we have anything. Five minutes.

10 (Recess.)

end 16

17-1

EXAMINATION

BY MR. LEWIS:

Q We just have a few loose ends we wanted to tie up. Mr. Gallo has been so effective that I find myself left with little.

MR. GALLO: I'm going to let you go first next time.

MR. CASSEL: Mr. Lewis is one of your finest Staff members.

BY MR. LEWIS:

Q Mr. Stokes, I'd like you to look at Attachment 2-F to your testimony. 2-F is simply a one-page excerpt from the Sargent & Lundy design document that we've been talking about.

Have you located it?

A Oh, yes. Okay.

Q I'd like to direct your attention to the last sentence on that page which reads, "A separate embedded plate design shall be made where applied loads exceed the capacity of the grid plate."

A Yes, I see that. I read that earlier.

Q You testified earlier that you were concerned

17-2

1 about the loads that might be exerted on embed plates, and
2 I believe you were talking about struts or other members.

3 A Yes.

4 Q When you read this sentence at the bottom of
5 2-F, did that indicate to you that the type of analysis
6 that you felt should be done would, in fact, be done where
7 applied loads exceed the capacity of the grid plate?

8 A If the person was aware of that one line,
9 my experience in this whole little narrative here on embed
10 plates, that plates typically are designed for use without
11 knowledge of what's going to go there in many cases. The
12 fact that the thing was on the plate indicated two things
13 from visual. There was a fairly large weld to the embed
14 plate which had, you could tell, heated the concrete on
15 the edge. The attachment was as wide as the plate almost,
16 which the plate had to be a six-inch plate. There was a
17 problem with overheating of that half-inch plate, because
18 it appeared they had put on quite substantial fillet
19 weld, and then on top of that, you had a very sizeable
20 attachment for the width of the plate, and whether or not
21 this calculation indicates that it should be redone before
22 you attach it, and the guy who did that analysis or did that

17-3 1 support was aware of this at the moment, I'm sort of in
2 question whether that analysis was performed for that
3 particular one.

4 But -- is that clear?

5 Q Well, to some extent. Let me ask you this. In
6 other words, if I correctly understand you, you are
7 concerned that maybe the person who would do this
8 calculation perhaps would not be aware of this provision?
9 Is that part of what you --

10 A Yes. And the calc's book size is almost of the
11 book, in the early part of the book, there was a series of
12 written documents such as what is attached here to my
13 testimony, explaining assumptions, what's relevant, what's
14 not relevant, such as the undercut discussion. It's
15 obvious to me that in this review it was likely they hired
16 people such as myself without any prior Sargent & Lundy
17 experience to do with the work, because I heard there had
18 been a layoff some fews months ago before the review was
19 required, and the people may not have had this document,
20 the criteria document. In other words, it may have existed,
21 but it was something they weren't exposed to due to the
22 rush of doing these recalculations.

17-4

1 But in any case, I got the impression that the
2 people who did these evaluations in some cases did not
3 know what's in this criteria, and that was obvious by other
4 things other than just this.

5 Q I'm sorry. I didn't mean to cut you off.

6 A I know. I was going to quit with that.

7 Q Well, assuming that these Sargent & Lundy -- the
8 individual who would do this calculation was aware of this
9 instruction, would it then address the concern that you
10 had raised?

11 A If he was aware of the instruction and evaluated
12 it, based on that line, it would change that, yes.

13 Q Now if you could look at Attachment 10 to your
14 testimony, the third page of that excerpt from the 1983
15 NRC annual report, --

16 A Oh, yes.

17 Q -- the discussion of water hammer.

18 A I remember that very well.

19 Q There is a statement under "Water Hammer" which
20 says, "The frequency of occurrence," meaning occurrence
21 of the water hammer, "incidence is low, and damage has
22 generally been limited to piping supports."

17-5

1 Is that statement the source of your statement --
2 I don't have the exact answer in your testimony, but in
3 your testimony, you speak of piping supports as being
4 subjected to fatigue, stress.

5 A I quoted that last line almost in detail in one
6 of the answers. I can't remember each one.

7 Q Is it Answer 26? Yes, your testimony on page 18
8 in Answer 26 states that you refer to the NRC annual
9 report.

10 A Yes.

11 Q And you refer to the excerpt on water hammer,
12 and you say there that the NRC report speaks of water
13 hammer, and then you say, "A condition that causes
14 fatigue loading."

15 A Yes.

16 Q What was the basis for your assertion that
17 piping supports are affected by fatigue loading?

18 A They are affected by dynamic loading. Water
19 hammer is the dynamic loading. Seismic loading is
20 dynamic. I've been in some operating plants, you know,
21 that the pipe -- fluid runs through it and it vibrates
22 from one side of the support to the other, rattling quite

1 noisily. That load reversal is just that -- load
2 reversal. The fact it hits one side and hits the other
3 side is an operational load reversal.

4 Q Is that what you meant when you said fatigue
5 loading?

6 A Part of it. Cycling time. It would be over 40
7 years significant. You'd have to sit there and count how
8 many times a second it changes and then multiply it over
9 a few years. But water hammer is part of that, too. You
10 have to take into account how many times a year. You can
11 estimate valve closures are going to occur and these other
12 issues that will cause the extreme magnitude of loading
13 that water hammer causes.

14 For instance, when I was at Southern Services,
15 in my earlier discussion of what I was doing, I said I
16 worked on the makeup water lines offsite from Miller steam
17 plant. In doing those thrust blocks that I alluded to,
18 I had to consult with the ASME department expert on water
19 hammer. He told me that I had to design for the lines
20 for approximately ten times what the design load was to
21 account for water hammer loads, they were that much larger.

22 I, instead of doing that, after I tried to redo

1 the analysis to get supports that would take the loads
2 for these 24-inch lines -- when I found I had an extreme
3 problem with designing something for that magnitude of
4 load, I looked at the piping analysis layout drawings,
5 and I found out that there was potential for a surge tank.

6 Now one of the courses that no one asked me about
7 here is pipe flow theory and fluid flow theory. I took
8 courses in that, too, by the way. And I'm aware that
9 another alternative between designing for loads is to put
10 a suppression tank on it or a surge tank or a few other
11 little goodies that can take out that load.

12 Well, it just so seems that they have this tank
13 potential, but they didn't want to use it. They were
14 keeping it as an ace in the hole, and I negotiated to have
15 the loads reduced, based on that surge tank and have
16 it installed, rather than have them design thrust loads
17 and then have them put the tank in later.

18 So from that respect, I'm quite familiar with
19 piping thrust loads, water hammer, and jet impingement and
20 a lot of other stuff.

21 Q Mr. Stokes, do you know what position the NRC
22 has taken? There is a reference in the annual report that

End 17

18-1

1 you referred to doing your report, do you know whether
2 the NRC has required any hardware changes as a result of --

3 A Yes. According to the article, their
4 requiring changing of valves to reduce closure times
5 was part of it. I don't remember anything else, but that
6 was the one thing I remember from it, and that with some
7 certain systems rather than maybe the entire plant.

8 Q But focusing on supports on hangers, because
9 that was what your Answer 26 was one --

10 A It concerns stresses to hangers. Yes, specifically
11 the bolting aspects.

12 Q Right. Do you know whether or not the NRC
13 has required any changes to hanger supports as a result
14 of water hammer considerations?

15 A Changing of supports? Could you clarify that
16 for me? Specifically what kind of changes?

17 Q Whether or not, as a result of --

18 A Are you talking about an I&E Bulletin maybe?

19 Q Well, it could have been, I suppose, by an I&E
20 Bulletin.

21 A Oh, boy.

22 MR. WRIGHT: Steve, can I ask you to restate that

1 question?

2 MR. LEWIS: I'll be happy to.

3 BY MR. LEWIS:

4 Q Do you know whether or not as a result of the
5 investigation of water hammer currents in nuclear power
6 plants, which is discussed in this excerpt from the annual
7 report, the NRC has required any changes or redesigns to
8 be done to pipe hangers because of the concern over the
9 loads imposed by the water hammer phenomenon?

10 A I'm not aware of them requiring any changes in
11 the design of the hangers as a result. The thing I'm aware
12 of is the valve change closure time.

13 MR. LEWIS: Thank you. That's all I have.

14 EXAMINATION

15 BY MR. CASSEL:

16 Q Charlie, just a few questions on redirect.

17 Do you recall Mr. Gallo asking you this morning
18 about whether your testimony raised concerns about the
19 design adequacy of Byron?

20 A Yes, I remember that question.

21 Q Does your testimony also raise concerns other
22 than the design adequacy?

1 A Yes, it does.

2 Q Do you recall Mr. Gallo also asking you whether
3 your testimony recommended an independent design review?

4 A Yes.

5 Q And are you aware of the fact that Bechtel has
6 been conducting an independent design review for Byron?

7 A Recently I became aware, yes.

8 Q Have the results of that review been supplied
9 to you or, to your knowledge, been supplied to Intervenors
10 in this case?

11 A No, it's not been supplied, to my knowledge, to
12 anyone including myself.

13 Q Does your testimony also recommend an independent
14 review of the safety-significance of the discrepancies
15 found in the reinspection program?

16 A Yes. My testimony is geared to everything that's
17 been done in the reinspection program, from the verification
18 aspects of the program to the design calculations, the
19 safety-significant aspects, all areas.

20 MR. CASSEL: I have no further questions.

21 MR. GALLO: I have no questions.

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(Whereupon, at 3:50 p.m., the taking of
the deposition was concluded.)

(Witness' signature waived,
pursuant to agreement.)

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STATE OF MARYLAND :

COUNTY OF MONTGOMERY :

I, ANN RILEY, a Notary Public in and for
Montgomery County, Maryland do hereby certify that I
reported the deposition of CHARLES CLEVELAND STOKES, the
witness herein.

I further certify that the foregoing 172 pages
contains a true and accurate transcription of the answers
given to the questions herein asked.

I further certify that said transcription was
done either by me or under my personal supervision.

I further certify that I have no interest,
financial or otherwise, in the outcome of this litigation.

Given under my hand and seal of office this
17th day of August, 1984.


Ann Riley

My Commission Expires:
July 1, 1986