

ORIGINAL UNITED STATES
NUCLEAR REGULATORY COMMISSION

IN THE MATTER OF:

DOCKET NO: 50-456 OL
50-457 OL

COMMONWEALTH EDISON COMPANY

(Braidwood Station, Units 1 and 2)

LOCATION: CHICAGO, ILLINOIS

PAGES: 14354 - 14471

DATE: FRIDAY, OCTOBER 10, 1986

*TR. 0101
Return to Docket Service
1121 - H St.*

ACE-FEDERAL REPORTERS, INC.

Official Reporters
444 North Capitol Street
Washington, D.C. 20001
(202) 347-3700

8610170230 861010
PDR ADOCK 05000456
T PDR

NATIONWIDE COVERAGE

1
2 UNITED STATES OF AMERICA
3 NUCLEAR REGULATORY COMMISSION
4 BEFORE THE ATOMIC SAFETY AND LICENSING BOARD
5

6 -----x
7 In the Matter of: :
8 COMMONWEALTH EDISON COMPANY : Docket No. 50-456
9 (Braidwood Station, Units 1 : 50-457
and 2) :
10 -----x

11 Page: 14,354 - 14471

12 United States District Court House
13 Courtroom 1919
14 Chicago, Illinois 60604

15 Friday, October 10, 1986

16 The hearing in the above-entitled matter reconvened
17 at 8:00 A. M.

18 BEFORE:

19 JUDGE HERBERT GROSSMAN, Chairman
20 Atomic Safety and Licensing Board
21 U. S. Nuclear Regulatory Commission
Washington, D. C.

22 JUDGE RICHARD F. COLE, Member,
23 Atomic Safety and Licensing Board
24 U. S. Nuclear Regulatory Commission
Washington, D. C.

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

1 Washington, D. C.

2 APPEARANCES:

3 On behalf of the Applicant:

4 MICHAEL I. MILLER, ESQ.
5 PHILIP P. STEPTOE, III, ESQ.
6 Isham, Lincoln & Beale
7 Three First National Plaza
8 Chicago, Illinois 60602

9 On behalf of the Nuclear Regulatory
10 Commission Staff:

11 GREGORY ALAN BERRY, ESQ.
12 ELAINE I. CHAN, ESQ.
13 U. S. Nuclear Regulatory Commission
14 7335 Old Georgetown Road
15 Bethesda, Maryland 20014

16 On behalf of the Intervenor:

17 ROBERT GUILD, ESQ.
18
19
20
21
22
23
24
25

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24

EXHIBIT INDEX	MARKED	RECEIVED
Intervenor's Exhibit No. 162	14417	14471

TESTIMONY OF

THOMAS B. THORSELL
KENNETH THOMAS KOSTALL

CROSS EXAMINATION
(Continued)
BY MR. GUILD:

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24

1 JUDGE GROSSMAN: We're back in session.

2 This is the 73rd day of hearing.

3 We concluded yesterday's session with Mr. Guild's
4 cross examination of the panel.

5 Mr. Guild, could you please continue.

6 MR. GUILD: Thank you, Mr. Chairman.

7 Good morning, gentlemen.

8 BY MR. GUILD:

9 Q Let's turn to the document that's been received as
10 Intervenors' 161, Sargent & Lundy procedures for
11 evaluation of BCAP CSR discrepancies.

12 You have that document before you, gentlemen?

13 A (WITNESS KOSTAL) Yes, sir.

14 Q Now, the first section of that document, Objectives 1.1,
15 A, "To verify" -- and I'm taking that language -- that
16 term from the preceding paragraph -- "A, No programmatic
17 design significant problems exist in the construction of
18 the Braidwood Station which have not been identified and
19 addressed."

20 It's clear that Sargent & Lundy had already taken a
21 position on that question, in part, prior to undertaking
22 its role in BCAP?

23 A (WITNESS KOSTAL) That's not correct.

24 What this is is just a redefinition of the

1 objectives of the BCAP program which are defined in the
2 BCAP document.

3 Q Well, that may or may not be what it is, but that's not
4 exactly what my question was, Mr. Kostal.

5 Let me see if I can be a little clearer.

6 Sargent & Lundy, because it had a continuing
7 responsibility as we discussed yesterday, had certainly
8 taken a position that, up to the point when the BCAP
9 program began, there were no programmatic design
10 significant discrepancies that had not been addressed or
11 identified, in whole or in part? You had taken that
12 position, hadn't you?

13 A (WITNESS KOSTAL) We have not taken either position.

14 What we've -- what our position has been is we will
15 assess anything -- or any discrepancy that arises at the
16 Braidwood Station, and we will determine whether or not,
17 through that assessment, the element can carry its
18 design loads, and make a recommendation, if it can't
19 carry its design load, as a corrective action.

20 Q Well, sir, it is clear, though, that to the extent that
21 discrepancies were referred to you, to the extent that
22 questions were referred to you for interpretation of
23 your design specifications, to the extent that
24 throughout the process Sargent & Lundy, during the

1 course of its normal duties from Day 1 with the
2 Braidwood project, looked at structures, systems and
3 components, you had already concluded that there were no
4 programmatic design significant discrepancies at the
5 time you undertook your BCAP responsibilities?

6 A (WITNESS KOSTAL) At the time we undertook the BCAP
7 responsibilities, all the corrective actions required
8 for NCR's, up to that point in time, had been addressed.
9 There were no outstanding corrective actions which would
10 lead us to believe that there was -- there was any
11 significant problems at the site.

12 Q Indeed. All right, sir.

13 You had already taken that position.

14 B, Objective B of BCAP, "On site contractor's
15 procedures governing ongoing safety-related construction
16 and quality assurance activities addressed all
17 applicable design and regulatory requirements."

18 To the extent that Sargent & Lundy, through the
19 process you described yesterday, had already reviewed
20 contractor procedures that had been sent to you by
21 Commonwealth Edison Company or the contractors
22 themselves, you had already taken the position that
23 represents Objective 2, that no design significant
24 programmatic problems existed with those procedures?

1 A (WITNESS KOSTAL) Well, Objective 2 has nothing to do
2 with design significance. Objective 3 does.

3 Q All right. You are absolutely right. I misstated that.

4 You had already taken the position reflected in
5 Objective B, and that is, that the site procedures met
6 all applicable design and regulatory requirements to the
7 extent you reviewed them?

8 A (WITNESS KOSTAL) To the extent of the procedures we
9 reviewed, they met the requirements that were imposed in
10 our specifications.

11 Q All right, sir.

12 A (WITNESS KOSTAL) Whether those problems met all the
13 other quality objectives, we assume that those
14 procedures were reviewed for those quality objectives as
15 part of Commonwealth Edison's scope of work.

16 Q All right sir.

17 So to the extent -- let me agree that you reviewed
18 those procedures, the ones submitted to you, again, to
19 determine that they met applicable design requirements.

20 I'm breaking down that last phrase, "design and
21 regulatory requirements," focusing on design
22 requirements.

23 You did that, didn't you?

24 A (WITNESS KOSTAL) Yes, sir.

1 Q You had already done that and made up your mind on that
2 question --

3 A (WITNESS KOSTAL) That's correct.

4 Q -- when you undertook your BCAP responsibilities?

5 And to the extent, on Item C, that Sargent & Lundy
6 had any responsibility for reviewing or advising on
7 ongoing corrective action programs, significant
8 corrective actions for past construction problems, you
9 had already reached the determination, before you
10 undertook your BCAP responsibilities, that those
11 significant corrective actions would be adequately
12 implemented and documented?

13 A (WITNESS KOSTAL) That's correct.

14 Q All right, sir.

15 So with that understanding, Sargent & Lundy then
16 has a defined role in BCAP, and that document sets
17 forth, in part, what that role is.

18 Let's look at the next page, please, sir, under
19 "Methods of Analysis, 1.2."

20 Phase I, I take it, reflects the engineering
21 evaluation of the observations that are referred to on a
22 case-by-case basis?

23 A (WITNESS KOSTAL) That's correct.

24 Q All right.

1 Now, Phase II I'm a little less clear about. I can
2 read what it states there, but can you tell me -- well,
3 first of all, did you do Phase II?

4 A (WITNESS KOSTAL) Yes, sir.

5 Q All right.

6 "It will consist of a trending review of all
7 observations in a population to determine if
8 programmatic construction discrepancies exist."

9 Now, I'm a little unclear about this, this trending
10 business.

11 Did you trend all of the observations or did you
12 only trend the design significant observations which, of
13 course, there were none of as you concluded?

14 A (WITNESS KOSTAL) We trended the observations that were
15 notable.

16 Q You trended the notable observations. All right, sir.

17 Now, that trending of notable observations, is that
18 reflected in some report or document?

19 A (WITNESS KOSTAL) It's reflected in documents we
20 prepared for BCAP, which were provided to BCAP, on our
21 scope of work.

22 Q Maybe I better be clear.

23 What is that scope of work?

24 A (WITNESS KOSTAL) Our scope of work was to review, as

1 defined here, each of the discrepancies that were sent
2 to us in observations and to determine whether or not
3 those discrepancies were design significant.

4 We were then to review the results of that
5 evaluation to determine if there were any trends which
6 we believe were programmatic and which we felt required
7 then further evaluation on the part of Commonwealth
8 Edison for future corrective action.

9 (Indicating.)

10 Q I see.

11 Well, perhaps this has slipped through my efforts
12 at rather -- a rather speedy attempt to understand what
13 BCAP consisted of, but I hadn't run into those
14 documents.

15 They certainly were made available. I just hadn't
16 seen them.

17 What was the problem of that trending review? Did
18 you recommend any further action, Mr. Kostal?

19 A (WITNESS KOSTAL) Yes, sir; and that's defined in the
20 BCAP report, the results of the trending review.

21 There were follow-on corrective -- corrective
22 actions.

23 For example, the missing clamps. We found --

24 Q Conduit.

1 A (WITNESS KOSTAL) Missing conduit clamps. Excuse me,
2 sir.

3 We found what we believe to be a concern relative
4 to missing conduit clamps.

5 There was a walkdown program initiated to determine
6 the presence of missing conduit clamps throughout the
7 plant.

8 Q Okay.

9 JUDGE GROSSMAN: Excuse me.

10 These are the straps that you are talking about,
11 the wall straps that are --

12 A (WITNESS KOSTAL) No. These are the straps that attach
13 a conduit to a vertical member that's supported, let's
14 say, off of a ceiling.

15 It's a Unistrut member where there's a little C
16 clamp which was drawn in the picture yesterday.

17 Rather than attached to a wall, it's attached to a
18 vertically supported cantilever Unistrut section.

19 JUDGE GROSSMAN: I'm sorry. I interrupted
20 your answer and you were telling further what had --

21 A (WITNESS KOSTAL) In addition, we recommended that
22 stiffeners attached to structural steel members be
23 reviewed.

24 We found, in the process of reviewing for hangers

1 associated with supporting junction boxes, which are
2 then supported off the structural steel, there is a
3 requirement that stiffeners be installed in certain
4 instances, and we found missing stiffeners in this
5 program, and felt that that was a trend that required
6 further review, and there's a walkdown that was done to
7 review for stiffeners.

8 BY MR. GUILD:

9 Q All right, sir.

10 Now, it sounds that, indeed, these two subjects are
11 mentioned in one of your gentlemen's testimony.

12 Mr. Thorsell, I believe you point to both these
13 programs?

14 A (WITNESS THORSELL) Yes, sir.

15 Q All right, sir. We'll return to those in a moment.

16 Now, you understand those two walkdown programs'
17 recommendations for further corrective action are the
18 product of Sargent & Lundy's Phase II trending review of
19 your observations?

20 A (WITNESS KOSTAL) Right.

21 Q All right, sir.

22 A (WITNESS KOSTAL) And the others are defined in the
23 BCAP final report.

24 Q So I see. Perhaps I could direct my attention to what

1 those are and I'll return to those at a later point.

2 But what other products were there of Sargent &
3 Lundy's Phase II trending review by way of
4 recommendations?

5 A (WITNESS KOSTAL) These were in our populations outside
6 of electrical area.

7 Q That's okay. Then I'll search the report.

8 Those are the two areas, the stiffeners and the
9 conduit straps -- conduit clamps for which Sargent &
10 Lundy's trending review supported a recommendation for
11 further corrective action in the electrical area?

12 A (WITNESS THORSELL) Perhaps could I clarify that?

13 It wasn't limited to just the conduit straps. It
14 was a review of the attachment of conduits to support.

15 There was one discrepancy in which a conduit was
16 attached to a different support, and so it was a
17 combination of whether the clamp was present, properly
18 attaching the conduits to the support, and whether the
19 conduit was attached to the proper support.

20 Q All right, sir.

21 Conduit attachments and the stiffeners for the
22 junction box -- on junction box mounting supports, those
23 two subjects?

24 A (WITNESS THORSELL) Actually, it's more general than

1 junction box mounting.

2 The discrepancies were identified for junction box
3 mounting. The program -- the corrective action was to
4 address equipment in general.

5 Q Equipment. All right, sir.

6 We'll return to that later, then.

7 Now, turn to the next page, if you would,
8 gentlemen, please, in Intervenor's 161, under "Sample
9 Selection."

10 Now, at 2.2.1, there is the identification of the
11 element of the samples denoted, highly-stressed
12 elements, more highly-stressed items, and Sargent &
13 Lundy provided BCAP Task Force a list of more
14 highly-stressed items within the electrical population,
15 and those were limited to cable pan hangers; correct?

16 A (WITNESS KOSTAL) We provided -- yes, we provided the
17 list for cable pan hangers.

18 We also provided a list for conduits, which were --
19 and we also provided a list of certain equipment.

20 Q Well, sir, I thought I understood -- and perhaps it was
21 my mishearing -- that stress, in effect, was only a
22 significant consideration for cable pan hangers in the
23 electrical population and that, indeed, it was only in
24 the cable pan hanger population that BCAP resorted to

1 the more highly-stressed sampling technique?

2 A (WITNESS KOSTAL) That's correct.

3 These other lists were provided for use in their
4 engineering judgment portion of the sample.

5 It just provided a -- these were not to the same
6 level of stress that the conduit -- that the cable pan
7 hangers were, but they represented the most highly
8 stressed, even though they were stressed to a much
9 lesser extent than this population, so by definition,
10 this is the highly-stressed population of cable pan
11 hangers.

12 (Indicating.)

13 If I could give you a characterization. In this
14 procedure, highly stressed is defined as an item which
15 is equal to an interaction value or a margin of 20
16 percent, not to exceed 20 percent, meaning if the
17 item -- the item design still had a margin of safety of
18 20 percent, that was the cutoff for highly stressed.

19 In the population of conduit hangers, a
20 highly-stressed element would be -- the list that we
21 gave them would have a cutoff value of 50 percent,
22 approximately, 40 to 50 percent, so there's a
23 significant additional margin in each of the conduit
24 hangers.

1 Q Then how about for junction boxes:

2 What was the margin?

3 A (WITNESS KOSTAL) There was no list given for junction
4 boxes.

5 Q I'm sorry. Did you say equipment?

6 I think I misheard you.

7 A (WITNESS KOSTAL) Equipment. We gave them a list of
8 equipment that was safety-related equipment that was in
9 elevations of the plant where the seismic levels are
10 higher, and, therefore, subject to higher stresses, not
11 necessarily -- not necessarily high stress as we're
12 defining it here.

13 Well, it is, in fact, defined here; but it is just
14 the highest-stressed elements that we have, the
15 highest-stressed equipment that we have, even though
16 they are not considered highly stressed by this
17 definition.

18 Q Did you quantify the interaction coefficients for the
19 equipment that comprised the list of more stressed
20 items?

21 A (WITNESS KOSTAL) No. There -- that was based on
22 judgment, providing them the list of equipment that was
23 in higher elevations of the plant that had, obviously,
24 the higher seismic levels.

1 Q All right, sir. While it may be obvious to you, it
2 isn't obvious to me.

3 The higher up in the plant you get in a seismic
4 event, the more subject the item is to seismic loading;
5 is that a --

6 A (WITNESS KOSTAL) Right.

7 Q -- correct understanding?

8 So you tend to look at -- one major element of
9 stress on any component is the stress that is associated
10 with the projected influences under seismic loadings.

11 You tend to have more of those loadings at higher
12 elevations in the plant?

13 A (WITNESS KOSTAL) Correct.

14 Q That applies to any kind of component?

15 A (WITNESS KOSTAL) Any component.

16 Q All right, sir.

17 It also applies -- when you are talking about cable
18 pan hangers, for example, the ones that are the more
19 highly-stressed items, all other things being equal --
20 by that I mean, identical cable pan hangers -- would be
21 subject to greater stresses at higher elevations in the
22 plant?

23 A (WITNESS KOSTAL) Yes, everything else being equal,
24 they would be.

1 Q All right, sir.

2 Well, let's talk a moment about this point.

3 The interaction coefficient that is referred to in
4 2.2.1, highly-stressed elements, a portion of your
5 procedure, Intervenors' 161, is it, in effect, the
6 reciprocal of the safety margin value that is calculated
7 when you make your design significance evaluation?

8 A (WITNESS KOSTAL) Yes, sir.

9 Q Now, just so we're clear:

10 That value -- the computation of that value is
11 described at Section 3.3, entitled "Design Margin,"
12 further in this exhibit?

13 A (WITNESS KOSTAL) In 3.3, the second paragraph, it just
14 indicates that the interaction -- that the interaction
15 coefficient cannot exceed 1, meaning 1 is equal to a
16 safety margin of 1.

17 Q All right, sir.

18 The definition is given, though, of design margin
19 in the preceding paragraph, and I quote, "The design
20 margin is a measure of the excess capacity remaining in
21 the component, determined as the ratio of the design
22 basis allowable stress to the actual as-built stress."

23 A (WITNESS KOSTAL) But that's not what an interaction
24 coefficient is.

1 An interaction coefficient is the state of stress
2 that exists in the member as compared to the allowable
3 stress for the member calculated.

4 This is nothing but a definition defining the --
5 I'm sorry. I stand corrected. You are right.

6 Q All right, sir.

7 What I want to understand, though, is you used the
8 term design margin when you make calculations for design
9 significance. We're going to turn to that later.

10 But that design margin is identified as MS?

11 A (WITNESS KOSTAL) SM.

12 Q The other way around, you are right.

13 SM?

14 A Safety --

15 Q S sub M or SM?

16 A (WITNESS KOSTAL) It's just written SM, safety margin.

17 Q Safety margin. All right sir.

18 Safety margin is expressed as a value.

19 And for all cases where you -- after you have
20 performed your calculations, refined your calculations,
21 that value exceeded 1, 1.03, 1.9, 2, 3, 4, et cetera,
22 that value reflects the remaining safety margin in the
23 as-built condition of the item?

24 A (WITNESS KOSTAL) That's correct.

1 Q All right.

2 Now, how does that value, the SM, compare to the
3 value for the interaction coefficient? Are those
4 reciprocals?

5 A (WITNESS KOSTAL) That's correct. You perform your
6 analysis, and the resultant analysis is an interaction
7 coefficient. You get the reciprocal of the interaction
8 coefficient, and that tells you what the remaining
9 design margin is.

10 So in the calculations, you will always see the
11 interaction coefficient value first and the safety
12 margin second.

13 (Indicating.)

14 Q Fine. All right, sir.

15 So when you -- in the more highly-stressed items
16 analysis or identification, you are essentially
17 expressing the safety margin that exists in the item if
18 as built to design specifications?

19 A (WITNESS KOSTAL) That's correct.

20 Q Now, let's talk about how that safety margin in the
21 as-designed conditions varies for these populations.

22 Let's talk about, first, cable pan hanger
23 population.

24 That was the area where, indeed, you found items

1 that met your definition of highly stressed, and that
2 was that their safety margin -- there were items whose
3 safety margin was 20 percent or less?

4 A (WITNESS KOSTAL) The definition of highly stressed is
5 where there is a -- it exceeds the allowable stress
6 anywhere between 0 and 20 percent.

7 Q All right, sir.

8 Now, how many cable pan hangers, in their as -- in
9 their as-designed condition, met that definition of
10 exceeding their safety margin by less than 20 -- 20
11 percent or less?

12 A (WITNESS KOSTAL) I'd like to -- I have to briefly
13 explain a hanger and what we defined as high-level
14 stresses in the hanger.

15 A cable pan hanger is made up of various
16 components. There are member elements, which are
17 vertical and horizontal, and there are connections.
18 Each of those elements is individually designed. Each
19 of those elements has to maintain total allowable,
20 therefore, they have to have an interaction value less
21 than 1 or they have to have some safety margin.

22 In defining a highly-stressed hanger, you define
23 the most critical element in the hanger as being highly
24 stressed.

1 What we defined -- what we did in providing the
2 definition of highly stressed that exceeded an
3 interaction .8, we reviewed all the hangers and all the
4 individual elements within the hangers to look at those
5 elements where they exceeded an interaction of .8, and
6 in that case, we had approximately -- I don't know the
7 exact number, but it's in the range of a thousand to
8 1,500 hangers defined as being highly stressed, which is
9 the definition of an interaction exceeding .8.

10 Q Or a safety margin of less than 20 percent?

11 A (WITNESS KOSTAL) Or a safety margin of less than 20
12 percent.

13 Q All right, sir.

14 Now, again, to help break this out for a lawyer who
15 doesn't -- who is, at best, a folk engineer trying to
16 understand this stuff, if we're talking about the area
17 of the plant where there are cable pan hangers that is
18 the first cut for looking to identify more
19 highly-stressed items -- again, we're talking about the
20 higher elevations in the plant -- and where would those
21 elevations be, Mr. Kostal, at the Braidwood Station?

22 A (WITNESS KOSTAL) Well, let me -- to answer your
23 question, we did not make a first cut on cable pan
24 hangers.

1 We have an individual computer run on every single
2 cable pan hanger, and we reviewed the computer runs to
3 determine the interaction values, not where they were
4 located in the plant but the whole population of all the
5 hangers which are individually analyzed.

6 Q All right, sir.

7 Well, I thought you told me the other day that, in
8 effect, you knew where you were going to find them and
9 that you made a search of the records based on the
10 elevations because of the phenomenon that you just
11 described to me, and that is, the seismic stresses being
12 greater higher up in the plant.

13 A (WITNESS KOSTAL) What I defined to you the other day
14 was if all things were equal, you would find them in the
15 upper elevations in the plant.

16 Given that all things are not equal, the only place
17 you can find them is through the individual analysis of
18 the given hangers.

19 Q All right, sir

20 Well, bear with me for a moment in understanding
21 your explanation now.

22 Assuming all things were equal, assuming we have a
23 series of identical hangers that are in different
24 elevations in the plant, what's the elevation at the

1 Braidwood Station that would be subject to the greatest
2 stresses because of the seismic phenomenon that you have
3 identified?

4 A (WITNESS KOSTAL) Again, let me recharacterize.

5 If we designed every element to meet the code --
6 the computer program optimizes design of the given
7 hanger and connections such that it takes into account
8 the different variables that exist at each elevation, so
9 if everything was equal, we would have the same state of
10 stress in every single hanger, the same interaction
11 value irrespective of elevation.

12 Q That wasn't my question, though.

13 Please do correct me if I'm just misstating
14 something, because I don't want the record to be in
15 error.

16 Let's assume we have the same identical hanger --
17 all right -- the same details, the same hanger, the same
18 configuration, but it is installed at different
19 elevations in the plant -- all right -- so it doesn't
20 take into account the different seismic forces at
21 various elevations. Bear with me in my assumption now.

22 Where would the elevation be that was subject to
23 the greatest seismic stress?

24 A (WITNESS KOSTAL) Given your assumption that the member

1 sizes are the same, all the dead loads are the same, the
2 geometry is the same, and with those assumptions, the
3 highest elevation in the plant is where the highest
4 seismic response sector exists, which is at the
5 elevation of the roof, which is in the 460, 470 range.

6 Q All right.

7 A (WITNESS KOSTAL) That's in the auxiliary building.

8 If you go in the containment building, it would be
9 up at the dome -- it would be up higher in the
10 containment near the polar plane.

11 (Indicating.)

12 Q All right.

13 Now, I appreciate your bearing with me. Now let's
14 return to what your analysis identified as the more
15 highly-stressed items in the cable pan hanger
16 population.

17 Were any of those more highly-stressed items of
18 1,000 to 1,500, with the safety margin of less than 20
19 percent -- were any of them in elevations 460 to 470 of
20 the aux building or at the top of the containment near
21 the polar plane?

22 A (WITNESS KOSTAL) I did not review that data base to
23 determine that.

24 Q All right.

1 You don't know the answer to that question?

2 A (WITNESS KOSTAL) I can't say effectually.

3 I would presume there are some.

4 Q All right.

5 Mr. Thorsell, do you know?

6 A (WITNESS THORSELL) No, sir, I do not.

7 MR. GUILD: Mr. Chairman, perhaps I can solve
8 this problem more in detail off the record, and I'll
9 certainly try; but during discussions in the proceeding
10 of this hearing, I talked with Mr. Kostal and counsel
11 about this question of more highly stressed cable pan
12 hanger samples.

13 I am interested in pursuing this matter. I don't
14 want to waste hearing time to do so.

15 I understood there was an outstanding request there
16 be some description of what that population was; and
17 perhaps if I can simply get a commitment from counsel --
18 we can discuss that matter off the record -- then I'll
19 pursue it.

20 MR. STEPTOE: We'll certainly commit to
21 discussing it off the record, Judge Grossman; but that
22 was the one request that Mr. Guild made during the
23 course of informal discovery that we declined to comply
24 with.

1 He wanted essentially a written response to an
2 informal interrogatory, and we just decided that that
3 wasn't appropriate.

4 We had given an oral explanation I believe that was
5 adequate.

6 I don't really see the relevance of this line of
7 inquiry.

8 Now, if Mr. Guild wants to know -- for example --
9 if he wants to have a list, the list that Sargent &
10 Lundy gave to BCAP, that's fine, but I think that the
11 minutia of how that list was generated, the computer
12 program that generated it, it doesn't seem particularly
13 relevant to the issues of QC Inspector harassment.

14 MR. GUILD: Well, to the extent this rebuttal
15 case has any relevance at all, Mr. Chairman -- and I
16 frankly can think of some arguments to the contrary --
17 but it really is Edison's rebuttal, I would say -- I
18 would suggest that if they are going to rely on this
19 case for rebuttal or case in chief, whatever you want to
20 call it, that they are obligated to defend it.

21 Now, with that understanding -- I really didn't
22 know we had a -- we are at loggerheads at this point,
23 but I would, then, request through the Chair that
24 Applicant be directed to produce the list of more

1 highly-stressed items that were identified in each of
2 the electrical populations.

3 If it's not a meaningful document in the sense that
4 I guess I just get a list of numbers that don't mean
5 anything, it will simply call for another round of
6 requests for explanation.

7 So I would suggest, Mr. Chairman, that it might be
8 appropriate that Applicant produce that list and
9 accompany it with some explanation so that the list is
10 intelligible.

11 JUDGE GROSSMAN: Well, I don't understand,
12 Mr. Steptoe, what you are objecting to, because Mr.
13 Guild is not now asking for a written explanation, which
14 is apparently what you objected to.

15 MR. STEPTOE: I thought he was, Judge
16 Grossman.

17 We have no problem with providing lists.

18 JUDGE GROSSMAN: I understand -- well, the
19 list you are not objecting to.

20 It was having a written explanation.

21 MR. STEPTOE: That's correct.

22 JUDGE GROSSMAN: Okay. Now, I understand
23 he's asking for the lists and an oral explanation off
24 the record to save us hearing time; is that correct, Mr.

1 Guild?

2 MR. GUILD: Yes, that would suit me.

3 JUDGE GROSSMAN: You would have no objection
4 to that?

5 MR. STEPTOE: No.

6 JUDGE GROSSMAN: Did you wish that right now,
7 Mr. Guild?

8 MR. GUILD: No, sir. That would be fine if
9 we can simply have that made available at Applicant's
10 convenience.

11 MR. STEPTOE: Sure.

12 JUDGE COLE: Sometime before the end of the
13 hearing.

14 MR. STEPTOE: I don't know whether I've got
15 the records in the room.

16 MR. GUILD: If he has them in the room, that
17 would be fine, Judge, but I assumed they didn't.

18 I'm not trying to be unreasonable in the matter.

19 JUDGE GROSSMAN: I just wanted to know if you
20 wanted a recess to do it now.

21 But you are not thinking of doing it immediately?

22 MR. GUILD: No, sir.

23 JUDGE GROSSMAN: So I understand there's no
24 disagreement.

1 There will be the list produced, and/or lists, and
2 informal explanations, and we'll go on to another
3 subject now then.

4 BY MR. GUILD:

5 Q Just to round this point out, Mr. Kostal, how many items
6 were in the more highly stressed identified
7 subpopulation of conduits --

8 A (WITNESS KOSTAL) I don't know.

9 Q -- or, I guess, conduit hangers?

10 Is that what they were, conduit hangers?

11 A (WITNESS KOSTAL) Yes.

12 Q And how many items were there in the subpopulation more
13 highly-stressed pieces of safety-related equipment?

14 A (WITNESS KOSTAL) Around 20.

15 Q How many of those items -- the more highly-stressed
16 equipment items, how many of them were BCAP CSR sample
17 items?

18 A (WITNESS KOSTAL) I don't know those statistics.

19 Q Do you know if any are?

20 A (WITNESS KOSTAL) I could find out. I just don't have
21 it with me.

22 Q All right, sir.

23 How many of the conduit hangers, the more
24 highly-stressed conduit hanger items, made the CSR

1 sample list?

2 A (WITNESS KOSTAL) I don't know that, either.

3 Q With respect to cable pan hangers, you know it was sent
4 over, and I think the record reflects what the selection
5 was.

6 A (WITNESS KOSTAL) 68.

7 Q 68. All right, sir.

8 Now, would you tell me what stress means as you use
9 the term in your -- in the Sargent & Lundy procedure for
10 evaluation of BCAP discrepancies?

11 A (WITNESS KOSTAL) Stress is a unit of measure. It
12 basically defines the -- for example, in steel, it's a
13 unit of measure defining kips per square inch.

14 Q What's a kip?

15 A (WITNESS KOSTAL) That's a thousand pounds.

16 Q All right.

17 A (WITNESS KOSTAL) And you take that unit of measure,
18 stress, and you compare it with a unit of measure of
19 allowable stress, which is also defined in the code as
20 kips per square inch.

21 (Indicating.)

22 Q For steel?

23 A (WITNESS KOSTAL) For steel.

24 Q All right.

1 Well, let's talk about what's stress in the other
2 relevant applications for purposes of evaluating the
3 significance of electrical observations.

4 A (WITNESS KOSTAL) All the electrical observations are
5 steel. They have the same definition.

6 Q All right, sir. That's helpful.

7 JUDGE GROSSMAN: I'm sorry.

8 The same what?

9 A (WITNESS KOSTAL) They have the same definition. They
10 are steel components.

11 They are different types of steel, but they are
12 steel components.

13 BY MR. GUILD:

14 Q If we were talking about, by contrast, concrete
15 expansion anchors, we would be talking about stress as
16 it applied to the loadings on concrete?

17 A (WITNESS KOSTAL) That's correct.

18 Q And that would be different?

19 A (WITNESS KOSTAL) That's correct.

20 Q Well, how about --

21 A (WITNESS KOSTAL) Well, stress would be the same. It's
22 just the unit of measure --

23 Q Unit of measure.

24 A (WITNESS KOSTAL) It's a different element, so you would

1 have a different allowable.

2 Q All right, sir.

3 Well, how about cables:

4 They are not steel, are they?

5 A (WITNESS THORSELL) Stress is not a factor in the
6 evaluation of cable discrepancies for BCAP.

7 Q I'm sorry, Mr. Thorsell.

8 Have you finished?

9 A (WITNESS THORSELL) For BCAP.

10 Q For BCAP.

11 Well, stress is a value -- well, stress is an
12 aspect of design specifications relative to cables, is
13 it not?

14 A (WITNESS THORSELL) No, sir.

15 Q Well, sir, you have specifications for maximum pulling
16 tension on cables, don't you?

17 A (WITNESS THORSELL) No, sir.

18 Specifications define the functional requirements
19 of the cable.

20 I'm speaking in terms of specifications that
21 Sargent & Lundy prepares for procurement of cable to be
22 used in construction of the plant.

23 Now, the cable manufacturer will provide an
24 allowable pulling tension, which is a factor that enters

1 into the installation of the cable, and that allowable
2 pulling tension is based on the properties of the copper
3 conductor as well as the properties of the insulation.

4 But stress in the context of code allowable
5 stresses or calculated stresses doesn't enter into the
6 design or installation of cable per se.

7 There are other types of stresses associated with
8 cable, such as voltage stresses and voltage stresses on
9 the dielectric material that is used for cable
10 insulation, but that's a totally different subject than
11 the type of stress that Mr. Kostal was speaking about.

12 Q Well, I really don't want to limit the discussion to the
13 type of stress that Mr. Kostal happened to have been
14 speaking of.

15 The fact of the matter is stress is a factor in the
16 design specifications as they relate to materials other
17 than steel in the electrical population, and, in this
18 case, cable.

19 Whether you considered them or not in BCAP is maybe
20 the issue, but it --

21 A (WITNESS THORSELL) Well, let me see if I can clarify it
22 for you.

23 In the case of structures or cable pan hangers,
24 Sargent & Lundy is the designer of those components, and

1 Sargent & Lundy takes into account the stresses in the
2 materials used to design those components so that we can
3 assure that the stresses to which those components are
4 subjected are within the allowable material stresses.

5 In the case of cable, Sargent & Lundy is not the
6 designer of cable. The cable is designed by a cable
7 manufacturer.

8 Q Well, let me interrupt you, Mr. Thorsell, to see if we
9 can cut this short.

10 The fact of the matter is Sargent & Lundy was the
11 source of consideration. Whether BCAP considered them
12 or not, you just identified two aspects in which stress
13 has a bearing on the design of cable.

14 The first was pulling tension, and there are limit
15 specifications identified by the manufacturer, and the
16 second is stress from the electrical standpoint, voltage
17 stress?

18 A (WITNESS THORSELL) Right; which is also a factor that
19 is within the realm of the cable manufacturer.

20 Q All right, sir.

21 And there's a further consideration to stress on
22 cable, and they have to do with parameters involving
23 minimum bending and training radius specifications?

24 A (WITNESS THORSELL) That relates to stress on the

1 dielectric.

2 Q All right, sir. We'll return to that subject in a
3 minute.

4 Now that we've gone a little bit beyond steel, are
5 there any other materials, aside from steel and aside
6 from cables, where stress is a consideration in
7 establishing the design criteria within the electrical
8 population?

9 A (WITNESS THORSELL) There are various materials that
10 will be used in the manufacture of equipment, and these
11 materials could be subjected either to physical stresses
12 or various types of voltage stresses.

13 However, those were not within the realm of BCAP,
14 because the role of the electrical installation
15 contractor is merely to mount equipment and make
16 connections to equipment, so any of the internals of the
17 equipment that may be subjected to various types of
18 stresses would be within the realm of the equipment
19 manufacturer.

20 Q And generally speaking, BCAP did not look at
21 vendor-supplied components or work?

22 A (WITNESS THORSELL) Correct, in general.

23 Q Can you give me a specific example of non-steel
24 materials that would be -- where there are stress

1 considerations in electrical equipment?

2 A (WITNESS THORSELL) The terminal blocks in a piece of
3 equipment are made of a dielectric material that has to
4 provide insulation between the various terminals.

5 Q Is it a plastic?

6 A (WITNESS THORSELL) Yes.

7 There's a terminal block on the table.

8 Q We had a chance to look at it the other day with
9 Mr. --

10 A (WITNESS THORSELL) Yes, sir.

11 Q -- Wozniak?

12 A (WITNESS THORSELL) Yes, sir.

13 Q Black plastic?

14 A (WITNESS THORSELL) Yes.

15 Q All right, sir.

16 Do any other materials come to mind in equipment?

17 A (WITNESS THORSELL) Others -- there's numerous
18 components that go into various pieces of equipment that
19 would be subjected to various types of physical forces
20 as well as electric force.

21 MR. STEPTOE: Excuse me, Mr. Thorsell.

22 Can you keep your voice up? I'm having a hard time
23 hearing you.

24 A (WITNESS THORSELL) Okay. Do you want me to repeat

1 that?

2 MR. STEPTOE: No.

3 A (WITNESS THORSELL) Okay.

4 MR. STEPTOE: I didn't mean to interrupt.
5 I'm sorry.

6 MR. GUILD: That's helpful.

7 BY MR. GUILD:

8 Q There are numerous other materials.

9 And what are those, sir?

10 A (WITNESS THORSELL) I don't think I could begin to list
11 them; that there's numerous materials that go into a
12 motor, for example, or into a circuit breaker or a
13 switch gear or an assembly, and various types of metals,
14 plastics. It's a rather extensive list.

15 Q All right, sir.

16 JUDGE GROSSMAN: Okay, Mr. Guild.

17 I don't think it's worth pursuing. I don't think
18 that involves this case.

19 BY MR. GUILD:

20 Q The fact of the matter is --

21 MR. GUILD: I agree, Mr. Chairman.

22 BY MR. GUILD:

23 Q The fact of the matter is, Mr. Thorsell, stresses on
24 those materials were simply not evaluated by Sargeant &

1 Lundy when they did their design significance evaluation
2 of BCAP discrepancies?

3 A (WITNESS THORSELL) BCAP discrepancies did not affect
4 those materials, either.

5 Q The answer to my question is no?

6 A (WITNESS THORSELL) No, we did not do an evaluation of
7 those.

8 Q Now --

9 JUDGE GROSSMAN: By the way, in your
10 summarization, you said cable and steel, and I believe
11 Mr. Kostal also mentioned the concrete for the straps.

12 Now, were there any other materials to which the
13 cable supports or conduit supports were attached other
14 than either steel or concrete?

15 A (WITNESS KOSTAL) No, sir.

16 BY MR. GUILD:

17 Q Now, Mr. Kostal and Mr. Thorsell, please, let's return
18 to 3.0 of the Sargent & Lundy procedure, Intervenors
19 Exhibit 161.

20 Evaluations are categorized into four levels of
21 capacity reduction, and that's X, Y, Z and D.

22 Now, those categorizations, the X, Y and Z
23 categorizations, are based on the computation of a
24 capacity reduction factor, the R value; is that correct?

1 A (WITNESS KOSTAL) Not X.

2 Q For X you don't make that calculation?

3 A (WITNESS KOSTAL) Correct.

4 Q For X, you judge, on the basis of your engineering
5 judgment, that it is consistent with design requirements
6 and, therefore, no R need be calculated?

7 A (WITNESS KOSTAL) Correct.

8 Q All right, sir. Understood.

9 Y and Z, then, you make an R value calculation.

10 R is calculated pursuant to Section 3.2. That
11 follows two pages later in the procedure. "R equals
12 governing properties of as-built component," numerator;
13 "governing properties of as-designed component,"
14 denominator, to calculate the ratio and get your R
15 value; correct?

16 A (WITNESS KOSTAL) Correct.

17 Q Now, you were helpful, Mr. Kostal, the other day in
18 giving me some examples of how you make this calculation
19 in the structural area.

20 Perhaps you could do a repeat performance for the
21 Board and parties.

22 Let's take the case of a weldment where there's an
23 underlength condition identified in the field by a BCAP
24 observation.

1 Perhaps, if I could ask you to illustrate the point
2 on the chart, it might be helpful.

3 A (WITNESS KOSTAL) If I could make a suggestion.

4 Q Yes.

5 A (WITNESS KOSTAL) As part of the procedure, that you
6 only attached the first few pages, there is a page that
7 gives you an explanation as well as an example in this
8 procedure.

9 It may save a lot of time; but I'd be happy to go
10 through --

11 Q Well, why don't you show it to me. I didn't mean to
12 leave anything out that would be helpful, and that's
13 probably something that would be.

14 A (WITNESS KOSTAL) It's the example I presented to you
15 last Thursday.

16 Q Yes, it is.

17 Perhaps --

18 MR. GUILD: Counsel, I have no objection to
19 including that as part of this exhibit or marking it as
20 a separate exhibit, but perhaps I simply deleted it to
21 save paper.

22 If the witness could still summarize that process
23 on the easel, I'd appreciate it.

24 A (WITNESS KOSTAL) In essence, if we have a weld --

1 let's say we're having a -- for example, this is an
2 embedded plate and we're attaching what I would call a
3 cantilever piece of tube steel, of which there would be
4 a load applied, so there is going to be a weld here.

5 (Indicating.)

6 MR. GUILD: Could you keep your voice up, Mr.
7 Kostal, so we can hear.

8 A I'm sorry.

9 If I draw a cross section, what we're going to be
10 looking at is this embedded plate and this piece of tube
11 steel and this fillet weld.

12 (Indicating.)

13 If you look down at that fillet weld, it has a
14 certain length, a certain size.

15 In this case, we'll define this as 10 inches and
16 we'll define this as 1 inch, so it's a 1 inch fillet
17 weld.

18 (Indicating.)

19 Now, let's assume we have a defect somewhere in
20 that weld or some type of discrepancy where we lose a
21 portion of that which is equal to 2 inches by a
22 half-inch. So the as-built area is equal to 9 inches.
23 We lost 1 inch out of 10 inches.

24 (Indicating.)

1 The as built is 10 inches. R value is as built
2 over as designed, which is 9 over 10, equal to .9.

3 (Indicating.)

4 BY MR. GUILD:

5 Q All right, sir.

6 In what category, then, would that defect, the
7 defect where there was a 1 square inch reduction in the
8 effective area of a 10 square inch fillet weld, be on
9 the basis of the R value calculation?

10 A (WITNESS KOSTAL) In that particular example, we would
11 classify that as a Y. It's not less than .9.

12 Q All right.

13 And in that case, since its R is not less than .9,
14 that discrepant condition would receive no further
15 detailed engineering calculation for design
16 significance?

17 A (WITNESS KOSTAL) That's correct.

18 Q All right, sir.

19 If, by contrast, the reduction in the area of that
20 weldment were 20 percent, was a 2 square inch reduction
21 as opposed to 1 square inch, it would have an R value of
22 .80, it would fall in the category of a Z and would be
23 required to receive a detailed engineering calculation
24 for design significance?

1 A (WITNESS KOSTAL) Yes, sir.

2 Q Now, if the defect were a size discrepancy for a
3 structural member, in particular a structural member
4 smaller in area than -- smaller in length, let's say,
5 than as specified in the design specifications, would
6 the calculation of R value be similar?

7 Would you make a calculation of as-designed area
8 for that member, the plate, and compare that to the
9 as-built, as-found, area for that plate?

10 A (WITNESS KOSTAL) Yes, sir.

11 Q And you calculate an R value.

12 On the basis of that calculation, you either
13 determine that a further detailed calculation was
14 required for design significance or not depending on the
15 amount of reduction in the capacity?

16 A (WITNESS KOSTAL) Yes, sir.

17 JUDGE GROSSMAN: Excuse me.

18 I take it when Dr. Kaushal told me that all of the
19 defects were evaluated for design significance, what he
20 didn't tell me was that automatically anything in
21 Category Y was considered not design significant; is
22 that so?

23 A (WITNESS KOSTAL) That's correct.

24 Category Y is a category where it has an R value

1 that exceeds .9; and our logic is defined, actually, as
2 to why we don't believe we have to continue the
3 evaluation further -- is defined and clarified, in terms
4 of the philosophy of why we don't believe that, on Page
5 12 of Exhibit 161 under Item 3 starting with the last
6 paragraph, and the philosophy is that these components
7 have design margins in them, they have material -- we
8 use -- for example, we use material strengths as
9 specified in the code where the actual material
10 strengths exceed the code allowables by generally 20
11 percent. We know that our methods of analysis have
12 conservatisms built into them, so taking into account
13 all the various conservatisms that we applied to our
14 design, plus the conservatisms that exist in the
15 selection of materials compared to what the code
16 requires compared to what you actually get, it's our
17 belief that values less than 10 percent can easily be
18 accounted for if you did an exact analysis.

19 JUDGE GROSSMAN: I understood the
20 explanation; but that went a little further than my
21 question.

22 Thank you.

23 A (WITNESS KOSTAL) Oh, I'm sorry.

24 BY MR. GUILD:

1 Q The pertinent language appears at Page 13, in fact, Mr.
2 Kostal, of your procedure, quote, "When the capacity of
3 an item is reduced by less than 10 percent, it becomes
4 apparent that the minor effect to the design margin may
5 easily be offset by applying any of the calculation
6 refinements available. Therefore, engineering judgment
7 that an item remains within design allowables may be
8 applied to any item that retains at least 90 percent of
9 its section."

10 A (WITNESS KOSTAL) That's correct.

11 Q All right, sir.

12 And, in fact, it's not simply a discretionary
13 proposition; engineering judgment, in fact, is and was
14 applied to all such items such that no further
15 calculations were made?

16 A (WITNESS KOSTAL) That's correct.

17 JUDGE GROSSMAN: Excuse me. One further
18 clarification.

19 We were talking about a particular weld.

20 Were they welds that were categorized as Category
21 X, Y or Z or were they entire components which might
22 include a considerable number of welds?

23 A (WITNESS KOSTAL) We do not perform -- unless a weld is
24 by itself, we perform an analysis based on what we would

1 call a stress plane or a transfer plane with loadings
2 from one section to another section.

3 In that analysis, you consider all the welds that
4 are made at that plane, you consider all the
5 discrepancies that are found in all those welds
6 simultaneously and you perform one analysis, including
7 all the discrepancies in that analysis.

8 So to answer your question, multiple discrepancies
9 on multiple welds are accounted for in the analysis.

10 (Indicating.)

11 JUDGE GROSSMAN: Okay. I believe I
12 understand what you are saying now.

13 BY MR. GUILD:

14 Q All right, sir.

15 But that's not the case for welds that don't
16 appear, though defective, at the same transfer plane,
17 although the same item?

18 For those you do independent R value calculations
19 limited only to the defects that happen at a common
20 transfer point?

21 A (WITNESS KOSTAL) No, that's not a correct statement.

22 If we had -- in fact, when we go through
23 Calculation 104, I will show you examples where all the
24 defects are considered on that stress plane.

1 Q That's not the question.

2 I think your testimony is you considered multiple
3 defects on a common stress plane for calculation of an R
4 value?

5 A (WITNESS KOSTAL) That's correct.

6 Q All right, sir.

7 But if the defects on an item occur on different
8 stress planes, those have to be calculated
9 independently, and independent R values are calculated
10 for each stress plane where a defect occurs?

11 A (WITNESS KOSTAL) All right, that's correct.

12 Q All right, sir.

13 That point, in fact, is made at 3.1 of your
14 procedure, which is entitled, "Stress Transfer Plane,"
15 and specified that the stress transfer plane is the unit
16 of evaluation?

17 A (WITNESS KOSTAL) Correct.

18 Q "The stress transfer plane is defined" -- and I'm
19 reading -- "as the load carrying mechanism for all
20 normal and shear stresses occurring at the discrepant
21 location."

22 Again, stress transfer plane is defined with
23 reference to the discrepant location?

24 A (WITNESS KOSTAL) That's correct.

1 We would not --

2 Q The --

3 A (WITNESS KOSTAL) We would not perform an analysis other
4 than at the point where you have a discrepancy.

5 Q All right, sir.

6 Now, if there were multiple discrepancies and they
7 occur at different transfer planes, you have to do
8 multiple analyses --

9 A (WITNESS KOSTAL) That's correct.

10 Q -- independently?

11 A (WITNESS KOSTAL) That's correct.

12 Q Now, let's turn to the last page of your procedure, Mr.
13 Kostal, "Discrepancy Reports."

14 Look at Item 2, please. In particular, the
15 following: "Root cases and programmatic characteristics
16 of an observation shall only," with the emphasis in the
17 original -- "be addressed on Part 4" -- I take it that
18 is Part 4 of the observation form -- "if, 1, the root
19 cause or programmatic characteristics occurred as a
20 result of a deficiency in S&L specifications, drawings,
21 et cetera; and, 2, the observation is design
22 significant. The root cause is the engineer's judgment
23 as to the underlying cause of the discrepancy. Whether
24 this cause appears to be programmatic or not should also

1 be indicated. Additional pages may be attached."

2 Well, I take it you find no cases where you made
3 any analysis of root cause pursuant to that provision of
4 your procedure?

5 A (WITNESS KOSTAL) That's correct.

6 Q All right, sir.

7 Let me ask you this:

8 Did you find any instances where the first
9 condition of that provision was met, and that was, "The
10 root cause or programmatic characteristics occurred as a
11 result of a deficiency in S & L specifications,
12 drawings, et cetera," whether or not they were with
13 reference to a design significant discrepancy?

14 A (WITNESS KOSTAL) Not to my knowledge.

15 Q Well, did you look?

16 A (WITNESS KOSTAL) Sure.

17 Q Did you document an evaluation of observations for that
18 condition?

19 A (WITNESS KOSTAL) It didn't require to document it so
20 because there were none.

21 Q I take it you did not?

22 A (WITNESS KOSTAL) No.

23 Q Mr. Thorsell, do you have anything to add to that
24 answer?

1 A (WITNESS THORSELL) No, sir.

2 Q Well, you are sort of asking Sargent & Lundy to perform
3 a critique of its own work when you are asking for an
4 evaluation by your engineers of the condition of root
5 cause or programmatic characteristics resulting from a
6 Sargent & Lundy deficiency, aren't you?

7 A (WITNESS KOSTAL) That's correct. It's part of our QA
8 program.

9 JUDGE GROSSMAN: Why don't we take a
10 10-minute break.

11 MR. GUILD: Fine, Mr. Chairman.

12 (WHEREUPON, a recess was had, after which
13 the hearing was resumed as follows:)

14 JUDGE GROSSMAN: Continue, Mr. Guild.

15 BY MR. GUILD:

16 Q Mr. Kostal, now, to recap a moment, then, having gone
17 through Intervenors' Exhibit 161 with respect to the
18 calculation of capacity reduction factors, designations
19 of X, Y's and Z's, if I can ask you to help me correlate
20 that categorization to the data that appears on
21 Intervenors' Exhibit 141, and that's your print-out of
22 the CSR data base, the column of notable discrepancies
23 there for R observations evaluated by Sargent & Lundy
24 for which a capacity reduction factor value of less than

1 .90 was derived.

2 A (WITNESS KOSTAL) That's correct.

3 Q The insignificant category represents a count of all
4 other observations comprising observations in the X's
5 and Y categories?

6 A (WITNESS KOSTAL) That's correct.

7 Q Including, among those, observations for which Sargent &
8 Lundy made no calculation, but simply reached an
9 engineering judgment that the observation or discrepant
10 condition was insignificant? That's the X category?

11 A (WITNESS KOSTAL) The X category, yes, sir.

12 Q Now, Mr. Thorsell, Mr. Kostal has been responding to
13 questions, as I understand, in the structural area,
14 relating to welding and structural components.

15 You have responsibility for talking about all other
16 electrical areas.

17 It's true that you didn't compute R values for all
18 other electrical discrepancies that were non-structural?

19 A (WITNESS THORSELL) That's true.

20 Q There were, of course, as there were in the structural
21 welding area, X discrepancies, discrepancies that, on
22 the basis of engineering judgment, you determined to be
23 insignificant without any calculations at all?

24 A (WITNESS THORSELL) For each one of the X-category

1 evaluations, there was a documented evaluation of
2 engineering judgment that was prepared and reviewed.

3 That meets the same requirements as an engineering
4 calculation. It's just that it does not carry with it a
5 calculation number and does not contain numerical values
6 necessarily.

7 Q It's a documented judgment?

8 A (WITNESS THORSELL) Correct.

9 Q Maybe a narrative or a summary of that engineering
10 judgment?

11 A (WITNESS THORSELL) Yes, sir.

12 Q All right, sir.

13 Now, how about for the Y category of discrepancies
14 in the non-structural non-welding area?

15 It's true that, for the non-structural non-welding
16 area, there were Y's that -- there were non-notable
17 categorizations made without calculations?

18 A (WITNESS THORSELL) Again, those were documented
19 engineering judgments that may be of a narrative nature
20 rather than a numerical nature.

21 Q All right, sir.

22 Can you tell me, Mr. Thorsell, in how many
23 instances discrepancies in the non-structural
24 non-welding area were evaluated as insignificant without

1 an engineering calculation?

2 A (WITNESS THORSELL) No, sir, I can't. I would have to
3 go back and check.

4 Q All right, sir.

5 Well, let's look at one.

6 I've handed you a document that you were kind
7 enough to make available to me in preparation, and
8 counsel made copies. I appreciate it. It's an
9 observation for Cable 130 Observation 02.

10 (Indicating.)

11 Now, apparently it's not the complete
12 observation -- oh, maybe it is. Page 3 of 3 is the
13 second page in the package, Page 1 of 3 follows, Page 2
14 of 3 follows that, and then there's a letter attachment.

15 A (WITNESS THORSELL) Yes, sir.

16 Q Now, sir, I want to turn to Dr. Kaushal's Attachment 4.
17 Now, I'm looking there for Cable Observation 130. I'm
18 trying to determine whether or not this was the subject
19 of any revision.

20 Do you know whether this item was revised or not,
21 Mr. Thorsell?

22 A (WITNESS THORSELL) The observation -- whether the
23 observation was revised?

24 Q Whether the data on Dr. Kaushal's Attachment 4 for this

1 particular observation was revised.

2 I've simply mislaid my --

3 A (WITNESS THORSELL) I don't have a copy of Dr. Kaushal's
4 Attachment 4.

5 My understanding of the -- well, I don't know
6 whether this was the subject of a revision or not.

7 MR. GUILD: Counsel informs me that it
8 apparently was not.

9 I certainly would like to be corrected if I'm
10 referring to unrevised data.

11 BY MR. GUILD:

12 Q But let me look at the copy that I have; and this
13 particular observation -- well, the description is, "All
14 three conductors of cable," et cetera, number, "have a
15 trained radius of three inches inside the high voltage
16 terminal box RC/FC fan," a number, "per drawing number."
17 The minimum training radius for that number is 12.9
18 inches or for a numbered cable it is 3.2 inches.

19 Now, these are bend radius violations,
20 discrepancies, are they not?

21 A (WITNESS THORSELL) Yes, sir.

22 Q All right.

23 Now, are those categorized as pull or term
24 attributes in Dr. Kaushal's Attachment 4?

1 A (WITNESS THORSELL) I don't know how he would have
2 categorized that.

3 Q Well --

4 A (WITNESS THORSELL) I suspect --

5 Q Yes, sir.

6 A (WITNESS THORSELL) If the bend radius violation occurs
7 right before the termination of the cable, I suspect
8 that bend radius was considered a pull categorization by
9 Dr. Kaushal, but --

10 Q Well, sir, we have three entries for Cable 130 in Dr.
11 Kaushal's Attachment 4. These are Line Items 268, 269
12 and 270.

13 The first two of them are termination inspections
14 by N. K., and they reflect 18 inspection points in the
15 first case, 3 discrepancy points; 18 inspection points
16 and 0 discrepancy points in the second case; and then a
17 pull inspection with 45 inspection points and 4
18 discrepancy points by J. T. R.

19 Now, do you know which discrepancies reflected on
20 Dr. Kaushal's Attachment 4 are the subject of
21 Observations Cable 130-02?

22 A (WITNESS THORSELL) No, sir, I do not.

23 JUDGE GROSSMAN: Excuse me.

24 Didn't we have testimony that they didn't consider

1 any pull violations discrepancies?

2 MR. GUILD: Mr. Chairman, as I understand it,
3 since pulling radius, bend radius, is not a recreateable
4 attribute, it cannot be inspected in CSR, but if the
5 final training of the cable or cable and conductors
6 violated the minimum training radius, that was an
7 observable condition, and that's what's reflected in
8 this observation.

9 JUDGE GROSSMAN: Well, that's my
10 understanding.

11 So no pull radius violations were determined; isn't
12 that your understanding of what was testified?

13 MR. GUILD: I'm somewhat in the dark about
14 exactly how they would categorize this, Mr. Chairman.

15 That's the point of the question, in part.

16 A (WITNESS THORSELL) I didn't do the categorization, and
17 I'm not aware of which one of these relates.

18 BY MR. GUILD:

19 Q All right, sir, all right, sir.

20 Let's turn, for a moment, to Mr. Kostal's
21 print-out, Intervenors' Exhibit 141, and look, again, at
22 Cable 130.

23 A (WITNESS THORSELL) Yes, sir.

24 Q Okay.

1 For Cable 130, we have 4 insignificant
2 discrepancies in the CF/PL -- that's configuration
3 pull -- so we have 4 pull discrepancy points and 3
4 termination discrepancy points.

5 Do you see that, sir?

6 A (WITNESS THORSELL) Yes, sir.

7 Q All right.

8 For a total of 7 insignificant discrepancies for
9 which an R capacity reduction value of 1.0 is assigned;
10 correct?

11 A (WITNESS THORSELL) Yes, sir.

12 Q And those 7 insignificant pull and term discrepancies
13 are associated with Observations 2, 3 and 4 for this
14 particular CSR item?

15 A (WITNESS THORSELL) Yes, sir.

16 Q And we have Observation 2?

17 A (WITNESS THORSELL) Correct.

18 Q All right, sir.

19 There's a total of 7 discrepancy points notable for
20 that particular CSR item; correct?

21 A (WITNESS THORSELL) Yes, sir.

22 Q All right, sir.

23 Now, you did not, in fact, calculate an R value for
24 this particular -- for these particular discrepancies,

1 did you?

2 A (WITNESS THORSELL) An R value was determined by
3 engineering judgment.

4 Q The number that's shown, the 1.0, seems to suggest that
5 it's a numeric product of some calculation.

6 It is not, is it?

7 A (WITNESS THORSELL) It is not a product of a numeric
8 calculation. The number 1.0 indicates that there was no
9 reduction in capacity.

10 Q All right, sir.

11 And I take it that in the non-welding
12 non-structural area, similarly, there would be other
13 numeric expressions of capacity reduction values in Mr.
14 Kostal's tabulation, Intervenors' Exhibit 144, which are
15 also the product of engineering judgment and not numeric
16 calculations?

17 A (WITNESS THORSELL) Yes, sir, there are other values of
18 1 which appear there.

19 Q All right, sir.

20 And I take it that you simply -- if you didn't do a
21 calculation, you didn't assign any other value but 1?

22 A (WITNESS THORSELL) No, sir, that's not true.

23 If I have no capacity reduction, I assign a value
24 of 1, and there's no need to do a calculation.

1 Q Well, what I mean to say is it also -- the converse of
2 that proposition is also true, and that is, the fact
3 that there are no listings of .98 or .95 or .91 or .90
4 for the non-structural non-welding discrepancies, does
5 not suggest that you -- does not suggest that such
6 capacity reductions wouldn't be found if you had
7 performed calculations?

8 A (WITNESS THORSELL) No, sir.

9 Q You just didn't do the calculations?

10 A (WITNESS THORSELL) If I had a five percent capacity
11 reduction, I would have computed a five percent capacity
12 reduction

13 Q Did you make any calculations, sir?

14 A (WITNESS THORSELL) Of capacity reduction?

15 Q For your non-structural non-welding.

16 A (WITNESS THORSELL) Yes, sir.

17 Q Did you make any in the cable area?

18 A (WITNESS THORSELL) No, sir.

19 Q So if there's 1's in the cable area, the 1 indicates
20 that you have done an engineering assessment and
21 represented that assessment by the numeric value 1,
22 right, but the absence of values between .90 and 1 does
23 not suggest that there aren't values .90 to 1; just the
24 fact that you didn't make the calculations --

1 A (WITNESS THORSELL) No, sir.

2 Q -- you simply reached a judgment?

3 A (WITNESS THORSELL) It suggests there are no values
4 between .9 and .1.

5 Q I beg your pardon?

6 A (WITNESS THORSELL) It states that there are no values
7 between .9 and .1.

8 Q All right, sir.

9 But you didn't make calculations for the assignment
10 of non-welding non-structural insignificant attributes
11 where --

12 A (WITNESS THORSELL) I did not make calculations where
13 there was no capacity reduction.

14 Q Or where that capacity reduction factor was deemed to be
15 insignificant on the basis of engineering judgment?

16 A (WITNESS THORSELL) No; where there was no capacity
17 reduction.

18 Q Well, sir, as I read your procedure, your procedure
19 covers both cases that I have proposed to you, and that
20 is, that the one where you say there is no capacity
21 reduction and also the one where you deem, by
22 engineering judgment, that that reduction is
23 insignificant but don't make a calculation.

24 A (WITNESS THORSELL) Which procedure are you referring

1 to?

2 Q The procedure that's in evidence I just discussed with
3 Mr. Kostal, and that's your --

4 A (WITNESS THORSELL) That is a structural procedure used
5 by Mr. Kostal for preparation of structural
6 calculations.

7 Q I stand corrected. You are absolutely right.

8 Does your procedure, which I don't have a copy of,
9 for non-structural non-welding also allow you to assign
10 items to the insignificant category on the basis not of
11 calculations but engineering judgment?

12 A (WITNESS THORSELL) I don't have a procedure in the
13 electrical area that corresponds to Mr. Kostal's
14 procedure in the structural area.

15 I would have to review the general project
16 instruction to be able to answer that question
17 accurately.

18 Q All right, sir. That's helpful.

19 And I asked you -- again, to give you credit for
20 having been forthright with me when we talked.

21 You said that, when you spoke, you didn't have a
22 procedure analogous to Mr. Kostal's.

23 I asked you for one and you said you didn't have
24 one?

1 A (WITNESS THORSELL) That's true.

2 Q All right, sir.

3 Let's look at this observation, then.

4 MR. GUILD: Mr. Chairman, I'd ask that this
5 this document be marked as Intervenors 162, please.

6 (The document was thereupon marked
7 Intervenor's Exhibit No. 162 for
8 identification as of October 10, 1986.)

9 BY MR. GUILD:

10 Q Now, I'm going to ask for some help in understanding,
11 Mr. Thorsell, what the nature of the as-found condition
12 was here.

13 The reference to conductors is for the, I'll call
14 them, wires, the wires that appear within the cable
15 jacket for a larger cable that is bound together binding
16 three conductors?

17 That's a folk engineering description, I
18 understand.

19 A (WITNESS THORSELL) Would it be easier, Mr. Guild, if I
20 used the exhibit that was previously used and make some
21 sketches --

22 Q It would be very helpful, Mr. Thorsell.

23 A (WITNESS THORSELL) -- and try and characterize the
24 nature of this discrepancy, and then you can ask

1 questions with that background?

2 Q That would be very helpful, Mr. Thorsell. I appreciate
3 it.

4 A (WITNESS THORSELL) What I have attempted to sketch here
5 is the motor termination box that's mounted on the side
6 of the RC/FC fan, and what this is is a -- essentially a
7 sheet metal enclosure, and coming out the back of the
8 sheet metal enclosure from the motor itself are what we
9 refer to as pigtails, which are three single-conductor
10 cables for attaching the power cable that supplies power
11 to the motor.

12 The way this connection is made is by putting a
13 compression lug on each of the three pigtails, putting a
14 compression lug on each of the three conductors of the
15 power cable that feeds it, and then making a connection
16 of one of the conductors in the power cable to one of
17 the pigtails, the second power cable conductor to the
18 second pigtail and the third power cable conductor to
19 the third pigtail.

20 (Indicating.)

21 The power conductor in this particular case is not
22 unlike this cable. It's a three-conductor cable with an
23 overall jacket on it.

24 (Indicating.)

1 Q By "this cable," Mr. Thorsell, just so the record will
2 be clear, you are referring to an earlier demonstrative
3 exhibit, the one that looks like a trident mounted on a
4 board?

5 A (WITNESS THORSELL) Yes, sir.

6 Q That was the -- I believe it's the 5,000-volt cable --

7 A (WITNESS THORSELL) Yes.

8 Q -- power cable?

9 A (WITNESS THORSELL) Correct.

10 Visually this power cable that is the subject of
11 this discrepancy appears very similar to this.

12 The difference is that this is a larger cable.
13 Each of the conductors is larger.

14 Q Which is the larger cable, sir --

15 A (WITNESS THORSELL) The --

16 Q -- the subject of the discrepancy?

17 A (WITNESS THORSELL) The subject of the discrepancy is a
18 larger cable.

19 And this cable is a 600-volt cable rather than a
20 5,000-volt cable. Okay.

21 (Indicating.)

22 Q By "this cable," you mean to say the cable, the subject
23 of the discrepancy, is a 600-volt?

24 A (WITNESS THORSELL) Correct.

1 Now, in the description of the observation, there
2 are two minimum training radiuses referred to.

3 The first training radius, of 12.9 inches, is the
4 minimum training radius of the total cable, which would
5 be the fat part of this exhibit.

6 (Indicating.)

7 Okay. The second training radius that's listed is
8 a training radius for a single conductor cable of the
9 same conductor size as the cable that is the subject of
10 the discrepancy.

11 Q Can you translate the cable size that's the subject of
12 the discrepancy, Mr. Thorsell, into a gauge number?

13 A (WITNESS THORSELL) This is a 500 MCM cable.

14 JUDGE GROSSMAN: You don't use AWG
15 designations for that?

16 A (WITNESS THORSELL) No. It's larger than AWG.

17 5,000-MCM refers to --

18 BY MR. GUILD:

19 Q 500?

20 A (WITNESS THORSELL) Or 500 MCM refers to 500,000
21 circular mill cross section of the conductor.

22 Q What's the diameter expressed in inches of cable itself,
23 the discrepancy cable?

24 A (WITNESS THORSELL) Okay. The cable itself has an

1 outside -- or the individual conductor of the cable that
2 is the subject of this observation has an outside
3 diameter of 1.072 inches.

4 Q You are referring to -- you are deriving that number
5 from the evaluation portion of the document?

6 A (WITNESS THORSELL) Yes, sir.

7 Q Now, that is a measured value or is that a specified
8 value, if you know?

9 A (WITNESS THORSELL) That is data provided by the cable
10 manufacturer.

11 Q All right, sir.

12 Now, what's the outside diameter of the entire
13 cable itself with the jacket, if you know?

14 A (WITNESS THORSELL) I don't have that information.

15 I would expect it to be on the order of 2-1/2 --
16 between 2-1/2 and 3 inches.

17 Q All right, sir.

18 What's the piece of equipment that's the subject of
19 this discrepancy? What is an RC/FC fan?

20 A (WITNESS THORSELL) That is a reactor containment fan
21 cooler.

22 Q What safety-related function does that fan perform?

23 A (WITNESS THORSELL) It's part of the cooling system for
24 the containment structure.

1 Q All right, sir.

2 Now, where were the measurements of the training
3 radius violations made, if you know?

4 A (WITNESS THORSELL) Okay. I've drawn this sketch with
5 the conductors disconnected.

6 The way the connection is made, the conductor of
7 the power cable comes up, the pigtail comes up, and
8 there is a bolting of the lugs in a back-to-back
9 configuration, and the violation of bend radius is the
10 bending of the conductor of the power cable as it's
11 turned up to make this back-to-back bolted connection,
12 and that radius is measured as the -- as the inside
13 radius of this bend.

14 (Indicating.)

15 Q All right, sir.

16 Now, this particular power cable was terminated to
17 the pigtails from the fan motor in the observed
18 condition?

19 A (WITNESS THORSELL) Yes, sir.

20 Q All right.

21 Do the lugs simply -- are they simply supported by
22 the weight of the pigtail and the power cable conductor
23 inside the equipment?

24 A (WITNESS THORSELL) Yes, sir.

1 Q They are not mounted to any sort of structural member or
2 terminal block?

3 A (WITNESS THORSELL) No, sir. This type of connection is
4 used for motors, so that any motor vibration is
5 accounted for, and it provides isolation from any
6 structure so that you don't create any wear as a result
7 of the motor vibration.

8 Q All right, sir.

9 I take it there is some taping or sealing of the
10 lugs after they are bolted together?

11 A (WITNESS THORSELL) Yes, sir.

12 Q And they were found in that condition?

13 A (WITNESS THORSELL) Yes, sir.

14 Q All right, sir.

15 Now, then, the measurement of the training radius
16 made by the CSR inspector and determined to be
17 discrepant was the training radius specified as an
18 inspection attribute in the CSR inspection checklist?

19 A (WITNESS THORSELL) Yes, sir.

20 Q Was the training radius specified by Sargent & Lundy in
21 a component-specific design specification?

22 A (WITNESS THORSELL) The training radiuses are shown on
23 an electrical installation drawing for each cable type.
24 There is a tabulation of the characteristics of that

1 cable, which include minimum pulling radius, minimum
2 training radius, maximum pulling tension, factors that
3 are used in equations that are also provided for
4 calculating maximum pulling tension as well as other
5 cable information.

6 Q All right, sir.

7 Was that training radius acceptance criterion the
8 same as was applicable to the L. K. Comstock pull or
9 termination inspection for that connection, for that
10 cable?

11 A (WITNESS THORSELL) Yes, sir.

12 Q It was. All right, sir.

13 Now, looking again at the --

14 MR. GUILD: Mr. Chairman, perhaps counsel
15 would agree that we should treat this illustration
16 similarly and --

17 MR. STEPTOE: Yes, Bob.

18 Could we have that one marked as Applicant's
19 Exhibit 147 and the previous one as Applicant's Exhibit
20 146, and we'll treat them in the same way as we were
21 doing. That is, we will accept the obligation of
22 providing manageable copies.

23 JUDGE GROSSMAN: That's fine.

24 MR. GUILD: I'm sorry.

1 146 was what?

2 MR. STEPTOE: Mr. Kostal's sketch.

3 MR. GUILD: Of the --

4 JUDGE COLE: That's the weld.

5 MR. GUILD: Of the weld.

6 MR. STEPTOE: Of the weld.

7 JUDGE COLE: The as built and as-designed
8 example.

9 MR. STEPTOE: Bob, before we leave this,
10 there's something I just don't understand about the
11 drawing.

12 What is holding the lugs up in the air there?

13 A (WITNESS THORSELL) Just the cable. The way this --
14 this is --

15 MR. STEPTOE: I don't get the representation.
16 I mean, I would think gravity would make the lugs
17 fall down the way you've got it drawn.

18 JUDGE GROSSMAN: That's hard to do with
19 one-inch conductors.

20 A (WITNESS THORSELL) Yes. If you come and feel the
21 stiffness --

22 MR. STEPTOE: Okay.

23 A (WITNESS THORSELL) -- of the example here, and consider
24 the cable being larger than this example shown on the

1 board, the cable is relatively stiff. It will not fall
2 down.

3 MR. STEPTOE: Thank you.

4 I'm sorry for the interruption.

5 JUDGE GROSSMAN: Those are a little more than
6 one inch thick conductors?

7 A (WITNESS THORSELL) Right.

8 BY MR. GUILD:

9 Q All right, sir.

10 Now, if you would return to the document marked
11 Intervenors' 162, on Page 2 of 3 of the observation
12 record, there appears an evaluation by the Task Force; a
13 determination that this, indeed, was a valid
14 discrepancy; correct?

15 A (WITNESS THORSELL) Yes, sir.

16 Q Now, the statement reads, "Cable 1VP004 violates the
17 minimum training radius at Equipment 1VP0" -- maybe
18 that's 1?

19 A (WITNESS THORSELL) OlCA.

20 Q A, thank you.

21 "This observation is valid. Note that the
22 violation applies to the individual conductors without
23 the overall jacket."

24 Now, I take it that that was -- that's an

1 appropriate interpretation that minimum training radius
2 does apply, indeed, to the conductors as well as to the
3 overall cable?

4 A (WITNESS THORSELL) Almost right.

5 Q Why don't you clarify it.

6 A (WITNESS THORSELL) It does apply to the individual
7 conductors.

8 Violation of minimum training radius to the overall
9 cable isn't applicable in this situation because the
10 overall cable isn't bent.

11 Q Yes.

12 There is no training radius violation for the
13 overall cable here?

14 A (WITNESS THORSELL) Correct.

15 Q But there are training radius requirements that are
16 applicable to the overall cable that aren't called into
17 question by this observation; correct?

18 A (WITNESS THORSELL) Yes, sir.

19 Q And in this case, the training radius specifications are
20 appropriately applied to the individual conductors
21 within the cable?

22 A (WITNESS THORSELL) Yes, sir.

23 Q Understood.

24 Now, I take it that Sargent & Lundy has no quarrel

1 with the validity determination made by the BCAP Task
2 Force for this observation?

3 A (WITNESS THORSELL) No, sir.

4 Q All right.

5 Now, the preceding page, then, Page 2 -- two pages
6 preceding, the second page of the document, Part 4, this
7 is Sargent & Lundy's evaluation of the discrepancy, and
8 you prepared this evaluation?

9 A (WITNESS THORSELL) Yes, sir.

10 Q All right, sir.

11 Does Box 24 indicate your concurrence that this is,
12 indeed, a valid observation?

13 A (WITNESS THORSELL) Box 24 indicates that the
14 evaluation -- that the discrepancy was determined to be
15 valid by BCAP.

16 Q All right, sir.

17 I mean, I take it you checked Box 24?

18 A (WITNESS THORSELL) Right; but Box 24 merely repeats
19 what's in Box 17.

20 Q All right.

21 Does that reflect any further evaluation of the
22 question of validity by Sargent & Lundy?

23 A (WITNESS THORSELL) In this case, no.

24 Q Well, how would we know if it did or not?

1 If you checked Box -- if you check the valid box,
2 does that always indicate that you are simply
3 transferring the data from the BCAP's determination, or
4 in some cases, does that indicate that you made an
5 independent evaluation and concurred in their
6 conclusion?

7 A (WITNESS THORSELL) In the very initial stages of the
8 BCAP program, the checking of valid or invalid in Box 24
9 was a Sargent & Lundy recommendation for validity or
10 invalidity to the BCAP CSR engineers.

11 That process was revised, and the checking of these
12 boxes for validity or invalidity in Section 24 merely
13 represented an indication of what was in Box 17.

14 Q Well --

15 A (WITNESS THORSELL) There was -- there was no -- there
16 was no evaluation of validity or invalidity indicated by
17 the X in this box.

18 Q All right, sir.

19 Well, you completed that Box 24 and signed the
20 preparation Box 27 June 17, 1985.

21 That wasn't the early days of BCAP program, was it?

22 A (WITNESS THORSELL) No, sir.

23 Q It had been going for a year?

24 A (WITNESS THORSELL) But what I said was, in the early

1 days, the checking of valid and invalid represented a
2 recommendation.

3 Sargent & Lundy stopped making that recommendation
4 as a result of a finding that was made by the NRC, and
5 some confusion over who was validating and invalidating
6 observations, and subsequent to that, the checking of
7 the box merely was a repetition of what had been
8 determined by BCAP.

9 Q Well, sir, I'm afraid -- I thought I had this clear, but
10 I'm afraid this raises some further question on this
11 point.

12 I understood that, at the point where this matter
13 was clarified, they simply changed, by revision, the
14 BCAP observation form and deleted the box Sargent &
15 Lundy made any designation whatsoever of validity?

16 A (WITNESS THORSELL) This is an old form.

17 Q I see.

18 So you just happened to use an old revision of the
19 form?

20 A (WITNESS THORSELL) Old form, new process.

21 Q So your check of the box was essentially a
22 meaningless --

23 A (WITNESS THORSELL) Yes.

24 Q -- step?

1 I understand. All right, sir.

2 Now, are those your words that appear in the
3 evaluation portion?

4 A (WITNESS THORSELL) Yes, they are.

5 Q All right, sir.

6 There is no visible wrinkling of the jackets and no
7 apparent physical distortion.

8 Now, I take it that's your conclusion?

9 A (WITNESS THORSELL) Yes, sir.

10 Q Well, I don't see any observation of the condition of
11 the jacket whatsoever made by the CSR inspector in this
12 document.

13 A (WITNESS THORSELL) That's true.

14 Q I take it that you went out and looked at the cable in
15 question?

16 A (WITNESS THORSELL) That's correct.

17 Q You didn't ask the CSR inspector to go out and inspect
18 the condition of the cable and report on whether or not
19 there was visible wrinkling of the jacket or a physical
20 distortion of the conductor?

21 A (WITNESS THORSELL) No, sir.

22 Q The conductor OD is 1.072.

23 Now, I take it that the CSR inspector didn't derive
24 that measurement of the conductor diameter?

1 A (WITNESS THORSELL) As I stated before, that's
2 information that was provided by the manufacturer in the
3 manufacturer's data.

4 Q All right, sir.

5 JUDGE GROSSMAN: That was not the observed
6 condition, I understand, Mr. Guild. That was the
7 specification for the cable -- for the conductor in the
8 cable.

9 MR. GUILD: Understood.

10 BY MR. GUILD:

11 Q Let's look at the observation description, though.

12 There are values that are stated for the training
13 radius, minimum training radius specifications.

14 The first value, I take it, is for the cable as a
15 whole, and that's the 12.9 inches?

16 A (WITNESS THORSELL) That is correct.

17 Q And the 3.2 inches is stated as the specification for
18 minimum training radius with respect to 01506 cable?

19 A (WITNESS THORSELL) Yes, sir.

20 Q What is 01506?

21 A (WITNESS THORSELL) That is a single-conductor 500-MCM
22 cable.

23 Q All right, sir.

24 That is a specific reference to the conductor of

1 the diameter that was the subject of this discrepancy?

2 A (WITNESS THORSELL) No, sir.

3 The construction of a multi-conductor cable
4 consists of insulation and jacket over the copper
5 conductor for each of the conductors, and then on the
6 overall jacket over the entire assembly of conductors
7 for the cable.

8 In the case of a single-conductor cable, the jacket
9 over the insulation is thicker than the jacket over the
10 insulation of the individual conductors of a
11 multi-conductor cable.

12 In other words, if I have a three-conductor cable
13 and I take off the outer jacket, the individual
14 single-conductor cables that are left are smaller in
15 diameter than a single-conductor cable of the same size
16 that was purchased as a single-conductor cable.

17 (Indicating.)

18 The reason for that is that the jacket is there to
19 provide physical protection of the cable. The jacket is
20 a much tougher, more resilient material than the cable
21 insulation.

22 In the case of a multi-conductor cable, the bulk of
23 the protection is being provided by the overall jacket,
24 so the jacket on the individual conductors is made

1 thinner. In the case of a single-conductor cable, that
2 outer jacket is thicker.

3 (Indicating.)

4 Q All right, sir.

5 So you --

6 A (WITNESS THORSELL) So the number of 3.2 inches written
7 up in this observation does not apply to the cable in
8 question.

9 (Indicating.)

10 Q So it's not a valid observation?

11 A (WITNESS THORSELL) No.

12 The observation indicates that the training radius
13 was violated; and what the inspector used for comparison
14 purposes to make that determination was the allowable
15 training radius of a single-conductor cable, which is
16 greater than the allowable training radius of the
17 individual conductors.

18 In other words, if he had passed this test --

19 Q But it was not an appropriate test? It was not a valid
20 observation, Mr. Thorsell; is that your position?

21 A (WITNESS THORSELL) No, sir.

22 Q Well, the inspector used the wrong specification.

23 Isn't that a basis for determining an observation
24 invalid in the first place? The inspector still

1 identified a bending radius violation?

2 A (WITNESS THORSELL) No. It truly was a violation of
3 criteria that he had available to him.

4 Q Yes, but he used the wrong criteria.

5 That's what your testimony is, isn't it?

6 A (WITNESS THORSELL) It's the only criteria he had.

7 JUDGE GROSSMAN: Excuse me, Mr. Thorsell.
8 You lost me somewhere.

9 I don't believe you explained why the cable jacket
10 is thicker on a single-conductor cable than on a
11 multiple-conductor cable.

12 Your explanation amounted to why a cable jacket is
13 thicker than insulation, but not why the cable jacket on
14 a single-conductor cable is thicker than the cable
15 jacket on a multiple-conductor cable.

16 A (WITNESS THORSELL) Okay. I'm sorry if I -- if I wasn't
17 clear on that, Judge Grossman.

18 The thickness of the jacket and the thickness of
19 the insulation are totally independent of one another.

20 The thickness of the insulation is determined by
21 the voltage rating of the cable. In other words, if I
22 have a cable that I need to apply higher voltages to, I
23 will need thicker insulation in order to apply that at a
24 higher voltage.

1 The thickness of the cable jacket is based on
2 primarily the size of the cable and the material that
3 the jacket is made of.

4 In the case of a multi-conductor cable -- first of
5 all, bear in mind that the jacket is there to provide
6 physical protection of the insulation, if you will.

7 In a multi-conductor cable, that physical
8 protection is provided by an overall jacket, and --

9 JUDGE GROSSMAN: Yes, I understand that. You
10 don't have to --

11 A (WITNESS THORSELL) Okay.

12 And in addition to the protection afforded by that
13 overall jacket, there is a jacket on each one of the
14 individual conductors, also.

15 JUDGE GROSSMAN: Okay.

16 A (WITNESS KOSTAL) Okay.

17 If I go to a single-conductor cable, where it's all
18 by itself, it has no extra overall jacket, the jacket on
19 that single-conductor cable is the only protection for
20 the insulation; and that has to be thicker than the
21 jacket that appears on each of the individual conductors
22 in a multi-conductor cable.

23 JUDGE GROSSMAN: Okay. That's fine.

24 A (WITNESS THORSELL) And it's the thickness of the

1 insulation and the jacket that limit the bending radius
2 of the cable.

3 (Indicating.)

4 BY MR. GUILD:

5 Q In this case, the observed condition observed by the CSR
6 inspector was with respect to a conductor?

7 A (WITNESS THORSELL) Right.

8 Q The conductor had no jacket; the conductor had
9 insulation?

10 A (WITNESS THORSELL) No, the conductor had a jacket.

11 Q It didn't have a jacket that was to protect the
12 insulator -- protect the conductor during the course of
13 cable pulling -- it didn't have a jacket as thick as the
14 jacket on the overall cable?

15 A (WITNESS THORSELL) Correct.

16 Q All right, sir.

17 So you took into account the fact that the -- of
18 the actual diameter of the conductor when you made your
19 evaluation of the discrepancy?

20 A (WITNESS THORSELL) Yes, sir.

21 Q When the CSR inspector used a reference diameter for the
22 size of the individual conductor with reference to a
23 single-conductor cable, it would have had a thicker
24 jacket?

1 A (WITNESS THORSELL) Yes, sir.

2 Q Therefore, you took the advantage of a less stringent
3 requirement for minimum bend radius or minimum training
4 radius, since you considered only the actual diameter of
5 the conductor?

6 A (WITNESS THORSELL) I took advantage of knowledge of
7 what the actual diameter of the conductor was.

8 Q Well, who specified the acceptance criteria for the CSR
9 inspector to utilize, apparently in error?

10 That was to presume that the conductor was, in
11 fact, a single-conductor cable where there would have
12 been a greater diameter jacket.

13 A (WITNESS THORSELL) Well, the acceptance criteria was
14 specified by the BCAP engineers.

15 The acceptance criteria appears on the Sargent &
16 Lundy design documents. It's common practice for both
17 the CSR engineers -- or both the CSR inspectors as well
18 as Comstock inspectors, when a multi-conductor cable has
19 the overall jacket stripped away, to utilize the
20 tabulated allowable training radius for a
21 single-conductor cable of the same size.

22 Since that's a conservative approach and since it
23 eliminates the need for putting a lot of extra
24 information on the drawings, that rarely gets used.

1 That's been an accepted practice.

2 Q All right, sir.

3 What was the diameter of the -- for a 01506 cable,
4 presuming it was a single-conductor cable?

5 A (WITNESS THORSELL) I'm sorry. I don't remember that
6 number.

7 Q The reference standard, in effect, that the CSR
8 inspector used to measure -- to determine the training
9 radius acceptance criteria?

10 A (WITNESS THORSELL) I do not know.

11 Q We do know it was greater than the value that you
12 measured -- or that you employed, on the basis of the
13 manufacturer's submission, for the conductor diameter?

14 A (WITNESS THORSELL) Yes, sir.

15 Q All right, sir.

16 Now, your conclusion is -- excuse me. If I can get
17 back to it.

18 JUDGE GROSSMAN: Excuse me.

19 I believe the inspector wrote up the specification
20 here as requiring a 3.2-inch training radius?

21 A (WITNESS THORSELL) Right.

22 JUDGE GROSSMAN: I thought that was the
23 question.

24 A (WITNESS THORSELL) The question was what the diameter

1 of the cable was, the diameter of a single conductor
2 500-MCM 600-volt cable, which is the --

3 BY MR. GUILD:

4 Q The reference diameter?

5 A (WITNESS THORSELL) -- which is the cable that is
6 designated by the type code 01506.

7 MR. GUILD: Mr. Chairman, the reference
8 diameter that the CSR inspector used, that apparently
9 has a fixed relationship on which is derived the minimum
10 training radius of 3.2 inches.

11 JUDGE GROSSMAN: Now, by the way, just to
12 make sure that the record is clear and that my
13 understanding of it is clear, you are saying now that
14 there was no jacket -- there was the insulation jacket,
15 but no other jacket on these three conductors, and that
16 the radius that the CSR inspector referred to was one
17 that was required for a conductor that had not only
18 insulation, but a jacket on it; not an outer jacket, but
19 an inner jacket.

20 Is that correct, now?

21 A (WITNESS THORSELL) Right. That's -- the conductor will
22 always have -- in the case of this type of cable, the
23 conductor will always have a -- an inner jacket, if you
24 want to call it that, or a jacket around each of the

1 individual conductors as well as the insulation.

2 (Indicating.)

3 JUDGE GROSSMAN: Right.

4 But in this case, was the jacket still on?

5 A (WITNESS THORSELL) Oh, sure, ye. The jacket is never
6 taken off.

7 The only -- the only time that the -- that a
8 jacket, cable jacket, is ever removed is when you take
9 off an overall outer jacket at the point that the cable
10 terminates.

11 (Indicating.)

12 Okay. The other minor clarification for that is
13 that -- let me go to the example.

14 This portion -- I'm referring to the penciled
15 portion -- this portion of the jacket is removed at the
16 termination just to make a nice connection.

17 (Indicating.)

18 But this -- this jacket on the individual conductor
19 is never removed from the -- from the --

20 JUDGE COLE: That's what you referred to as
21 the inner jacket?

22 A (WITNESS THORSELL) Yes.

23 JUDGE GROSSMAN: So there is an inner jacket
24 on both a multiple-conductor cable and a

1 single-conductor cable?

2 A (WITNESS THORSELL) For a single-conductor cable,
3 this -- this jacket -- this inner jacket is the only
4 jacket. There's just one jacket.

5 Perhaps -- would you like me to --

6 JUDGE GROSSMAN: There's no other jacket for
7 the cable as a whole?

8 A (WITNESS THORSELL) Correct, there' only one jacket.

9 Would you like me to draw a cross section of the
10 cable?

11 MR. GUILD: Mr. Chairman, I think you'd
12 better, because there's a misstatement in your
13 description of the condition that was found, at least as
14 I heard Mr. Thorsell's first explanation.

15 Perhaps we could ask him to illustrate the two
16 conditions.

17 JUDGE GROSSMAN: Oh, yes, there was a
18 misstatement, because I stated that the inner jacket was
19 not there, and, of course, he's stating that it is
20 there.

21 Is that what you understood to be the misstatement?

22 MR. GUILD: One part, Judge.

23 I'm afraid there's also a different thickness in
24 the jacket if it's a single conductor, as opposed to if

1 it's one conductor of a three-conductor power cable, as
2 I understand Mr. Thorsell's statement.

3 A (WITNESS THORSELL) That's true.

4 Okay. Any conductor, whether it's part of a
5 multi-conductor cable or is just a single-conductor
6 cable of this type, will have a core that is the copper
7 conductor. This is stranded copper.

8 Around that core there will be an insulation. In
9 this case, it's an ethylene-propylene rubber insulation,
10 and around the insulation is a protective jacket.

11 In this case, the jacket is made of Hypalon, which
12 is an industry term that refers to -- I believe it's
13 chlorosulfonated polyethylene.

14 In the case of a multi-conductor cable,
15 single-conductor cables are combined, and there is an
16 overall protective jacket. This overall jacket is made
17 of the same material as this jacket. It's a Hypalon
18 jacket in this case.

19 (Indicating.)

20 BY MR. GUILD:

21 Q Now, you are comparing "this" and "this."

22 Both jackets --

23 A (WITNESS THORSELL) In the case of the cable that is the
24 subject of the discrepancy.

1 Other cables may use different materials for
2 insulation or jacketing.

3 Q To be clear, the first -- this is a depiction of one of
4 those three conductors.

5 It has a Hypalon jacket, as does the cable as a
6 whole?

7 A (WITNESS THORSELL) Yes, sir.

8 Q All right.

9 A (WITNESS THORSELL) Now, the thickness of the jacket on
10 an individual conductor of a multi-conductor cable is
11 not necessarily the same as the thickness of the jacket
12 of a single-conductor cable, even though the cable is
13 the same size, the voltage rating is the same, the
14 materials are the same, the insulation thickness is the
15 same.

16 Thus, the minimum bending radius or training radius
17 for this conductor may not be the same as this
18 individual cable.

19 (Indicating.)

20 It will -- it will never be, or this jacket will
21 not be thinner -- "this jacket," again, refers to the
22 single-conductor cable jacket -- will not be thinner
23 than the jacket on an individual conductor of a
24 multi-conductor cable of the same size.

1 JUDGE GROSSMAN: You are saying it won't be
2 thinner?

3 A (WITNESS THORSELL) Right.

4 JUDGE GROSSMAN: I thought you were also
5 saying it is thicker.

6 A (WITNESS THORSELL) In general, it's thicker.

7 In order to do my evaluation, what I did was get
8 the actual diameter, outside diameter, of this cable and
9 then go to the manufacturer and determine whether --
10 what the allowable bending radius for that cable was.

11 (Indicating.)

12 Okay. This -- the information regarding the
13 bending radius of this individual conductor is not data
14 that I normally acquire from the manufacturer, which is
15 why there's a letter attached to the -- to the
16 evaluation where that data was provided separately from
17 the data that exists in my design documents.

18 JUDGE CALLIHAN: I have a question, please.

19 JUDGE GROSSMAN: Go ahead.

20 JUDGE CALLIHAN: I have a question.

21 Mr. Thorsell, just in passing and --

22 A (WITNESS THORSELL) Yes, sir.

23 JUDGE CALLIHAN: -- probably irrelevant, does
24 the spacing of the three conductors in the cable under

1 discussion demand more insulation in the three-conductor
2 arrangement than the thickness of the insulation in a
3 single-conductor cable?

4 A (WITNESS THORSELL) No, sir.

5 JUDGE CALLIHAN: Thank you.

6 JUDGE GROSSMAN: Oh, yes.

7 MR. GUILD: Mr. Chairman, if I could ask,
8 following the practice to date, that that sketch be
9 reproduced in an exhibit-size document.

10 148 is my next Applicant's number.

11 MR. STEPTOE: That's fine, Judge Grossman.
12 Applicant's 148 will be reproduced.

13 BY MR. GUILD:

14 Q Now, sir, Mr. Thorsell, again, if you turn to your
15 evaluation of this discrepant condition, what is the
16 relationship between cable diameter and minimum training
17 radius that was applied by the CSR inspector in his
18 inspection of this observation?

19 A (WITNESS THORSELL) I can't speak for what the -- what
20 the inspector did, but I believe that he would not have
21 taken into account diameter at all.

22 Q Well, I take it that's a given, since he was given a
23 specified reference cable --

24 A (WITNESS THORSELL) Correct.

1 Q -- diameter, which, by Sargent & Lundy specification,
2 was associated with a specific minimum training --
3 minimum training radius requirement?

4 A (WITNESS THORSELL) He was given a specific minimum
5 training radius for the cable construction that he was
6 looking at.

7 Q All right, sir.

8 And what was the relationship between the cable
9 diameter for that reference cable and the minimum
10 training radius specification that Sargent & Lundy
11 provided?

12 A (WITNESS THORSELL) Oh, I'd have to calculate that out.
13 I don't know.

14 Q Can you do that, sir?

15 A (WITNESS THORSELL) I don't have all the data.

16 Q What data do you require?

17 A (WITNESS THORSELL) I need to know the specified minimum
18 training radius as well as the OD, outside diameter, of
19 the cable.

20 Q All right, sir.

21 Well, we have some of that data. We have the
22 minimum training radius requirement of 3.2 inches that's
23 specified in a description of the observation.

24 A (WITNESS THORSELL) Yes; but I do not have the diameter

1 of the cable that corresponds to the 3.2-inch minimum
2 training radius.

3 Q All right, sir.

4 How can you obtain that data?

5 A (WITNESS THORSELL) I would have to review Drawing
6 20E-0-3000B.

7 MR. GUILD: Mr. Chairman, I would ask that
8 that information be supplied.

9 Obviously, not now; but if that is a piece of data
10 that can be retrieved from that document, I ask that it
11 be supplied by Applicant.

12 JUDGE GROSSMAN: Any objection to that, Mr.
13 Steptoe?

14 MR. STEPTOE: No, Judge Grossman.

15 JUDGE GROSSMAN: While we're on this, why
16 does there appear to be a conflict between the
17 specifications referred to by the CSR inspector and the
18 specifications that the manufacturer apparently had of
19 four?

20 MR. GUILD: The next question, Judge.

21 A (WITNESS THORSELL) Oh, okay.

22 JUDGE GROSSMAN: It seems to me that using
23 the four times outside diameter -- and I assume the
24 outside diameter referred to by the manufacturer is the

1 conductor, including jacket outside diameter -- that the
2 specification ought to be somewhere in the neighborhood
3 of 4-1/4 inches or 4.2 inches rather than 3.2.

4 A (WITNESS THORSELL) I -- I can explain that, if you
5 would like.

6 JUDGE GROSSMAN: Sure.

7 A (WITNESS THORSELL) Okay.

8 Commonly, with cable, the information that is
9 provided by the cable manufacturer is referred to as
10 minimum bending radius, and the minimum bending radius
11 is generally expressed as a multiplier of the outside
12 diameter of the cable, such as four times the outside
13 diameter, five times the outside diameter, six times the
14 outside diameter of the cable.

15 That minimum bending radius is applicable under all
16 conditions to which the cable may be subjected.

17 In other words, if I am pulling a cable through a
18 conduit during installation, I am not allowed to violate
19 that minimum bending radius as I pull it around the bend
20 of a conduit.

21 Now, under those conditions, I am subjecting the
22 insulating material to forces that result from pulling
23 the cable. In other words, in addition to pulling the
24 cable, bending the cable, there is what's referred to as

1 side wall pressure on the insulation.

2 That pinching, if you will, of the insulation can
3 cause a breakdown or deterioration of the dielectric
4 strength of the insulation and thereby affect the
5 performance of the cable.

6 In this letter, where he -- the cable manufacturer
7 is referring to "four times outside diameter," he's
8 referring to a minimum bending radius.

9 Now, when it goes on to say that we give -- we've
10 given some relief on this to three or two-and-a-half
11 times the outside diameter, in general what they are
12 referring to is conditions where you are not subjecting
13 the cable to additional outside forces. It's commonly
14 referred to as a minimum training radius.

15 In other words, if I'm just bending the cable, I
16 can bend it to a smaller radius than if I am bending the
17 cable and applying pressure resulting from pulling the
18 cable through conduit, for example.

19 (Indicating.)

20 So in this particular case, we're referring to a
21 training of the cable at the cable termination, we're
22 not subjecting the cable to other forces of pulling; and
23 the cable manufacturer in that instance allows 2.5 times
24 the outside diameter of the cable, provided that -- and

1 his extra requirement is that that doesn't result in any
2 wrinkling of the jacket or distortion of the shape of
3 the cable that would indicate that there is some extra
4 force being applied to the insulation.

5 (Indicating.)

6 JUDGE GROSSMAN: So the short of your answer
7 is his four times outside diameter recommendation, with
8 regard to the manufacturer's recommendation, was with
9 regard to pull radius and that here it was a training
10 radius?

11 Even though the observer from the company knew that
12 you were discussing training radius, he just didn't
13 mention that here?

14 A (WITNESS THORSELL) Correct.

15 Now, this letter -- this cable was not only
16 observed by me. It was also observed by a
17 representative of the Okonite Company, a representative
18 from their engineering staff.

19 JUDGE GROSSMAN: Right. Mr. Bartolucci?

20 A (WITNESS THORSELL) Correct; and he observed this along
21 with several other cables.

22 In the case of I'll say at least one of the cables
23 that he observed, there was wrinkling of the -- of the
24 outer jacket or distortion of the cable.

1 So in this letter, which is providing a criteria
2 that we can apply for acceptance, he's making the
3 distinction that in those cases where there is no
4 wrinkling, this criteria can be used. If there is
5 wrinkling, you can't -- you can't use this criteria.

6 (Indicating.)

7 MR. GUILD: Mr. Chairman, may I proceed?

8 JUDGE GROSSMAN: Certainly.

9 MR. GUILD: I would request that Applicant
10 provide, first, an identification of the instances in
11 which Mr. Bartolucci or the Okonite representative --
12 strike that -- instances in which wrinkling or
13 distortion of the cable were identified in the CSR
14 sample items, Mr. Chairman.

15 In addition, there appears, for completeness, to be
16 a letter that prompted the Okonite response with
17 attachments.

18 So that we can understand what exactly the Okonite
19 response is referring to, I would also ask that
20 Applicant provide a copy of the letter with attachments
21 that was apparently sent by J. J. Bojan, B-O-J-A-N, May
22 13, '85.

23 JUDGE GROSSMAN: Any problem with that, Mr.
24 Steptoe?

1 MR. STEPTOE: I don't think so, no.

2 No, Judge, no problem.

3 BY MR. GUILD:

4 Q All right, sir.

5 Now, your evaluation of this discrepancy -- your
6 evaluation is that this discrepant condition was not
7 design significant; correct?

8 A (WITNESS THORSELL) Correct.

9 Q And that evaluation is based on the letter from the
10 manufacturer, the Okonite Company; correct?

11 A (WITNESS THORSELL) Yes, sir.

12 Q All right. Let's turn to that letter from the Okonite
13 Company, the last paragraph:

14 "We cannot, in the absence of data or experience,
15 render a judgment as to whether the observations on the
16 bending radii made in the Analysis Program are design
17 significant."

18 A (WITNESS THORSELL) Correct.

19 Q Well, did you provide the Okonite Company with the data
20 on the basis of which they made a subsequent rendition
21 of an opinion as to the design significance of the
22 bending radii discrepancies?

23 A (WITNESS THORSELL) What the Okonite Company --

24 Q If you would just answer that question directly, sir,

1 and then please feel free to explain.

2 A (WITNESS THORSELL) No, sir.

3 Q All right, sir.

4 A (WITNESS THORSELL) The statement in here does not refer
5 to data that we would provide the Okonite Company.

6 It refers to data that the Okonite Company would
7 assemble on their own regarding bending radius less than
8 2.5 times the outside diameter of the cable.

9 Q They don't say that, do they?

10 That's not what the letter says. You have the same
11 letter before you as I do. It simply says that they
12 lack the data or experience to render a judgment about
13 the bending radii observations that were made in BCAP
14 for design significance.

15 It makes no caveat that that is with reference to
16 any particular relationship between the diameter of the
17 cable and the observed condition.

18 A (WITNESS THORSELL) As I stated earlier, there was more
19 than one bending radius problem or violation observed by
20 the Okonite Company.

21 I believe that Mr. Bojan's letter asks for an
22 assessment in general of the sum total of the
23 information that was provided to the Okonite Company of
24 design significance.

1 In general, the Okonite Company declined to make
2 that assessment, based on a lack of testing and
3 performance data available, for violations of bending
4 radius that were less than 2.5 times the outside
5 diameter.

6 Q Excuse me, sir. Just --

7 A The preceding paragraph --

8 Q Excuse me, sir. Let me interrupt for clarity.

9 When you say "less than," do you mean radii less
10 than or less severe violations?

11 A (WITNESS THORSELL) Radii less than 2.5 times the
12 diameter.

13 Q I apologize for interrupting. Please continue with your
14 answer.

15 A (WITNESS THORSELL) The previous paragraph states the
16 conditions which the Okonite Company finds acceptable.

17 All right. Those conditions are the conditions
18 that exist for the cable that's the subject of this
19 observation.

20 My conclusion of no design significance is based on
21 the fact that the cable manufacturer said that this is
22 an acceptable condition.

23 Q I see.

24 JUDGE GROSSMAN: Excuse me, Mr. Thorsell.

1 Are you reading that last paragraph as the
2 manufacturer saying that a bending radius of 2.5 times
3 the outside diameter is acceptable?

4 A (WITNESS THORSELL) No, sir.

5 The way I read this is that the Okonite Company is
6 declining to make an assessment of design significance
7 on violations of bend radius and also stating that if
8 you meet their bend radius recommendations, it will not
9 affect the ability of the cable to perform its function
10 over its expected life.

11 If I go to the preceding paragraph, they say
12 that -- under the conditions where there is no wrinkling
13 or apparent physical distortion in cables that they
14 observed installed in the plant, Mr. Bartolucci says
15 that -- and there's not a violation of 2.5 times the
16 OD -- that that is acceptable.

17 JUDGE GROSSMAN: Mr. Thorsell, let's just
18 stay with that last paragraph first. I believe you left
19 out the word "published" when you restated that.

20 Now, they are standing by their four times OD
21 recommendation in that last paragraph, aren't they, and
22 saying that things that -- radii that meet that four
23 times OD are acceptable; isn't that correct?

24 A (WITNESS THORSELL) Correct.

1 JUDGE GROSSMAN: And now in the penultimate
2 paragraph, the one preceding that, they are commenting
3 on the particular cases that they reviewed, that Mr.
4 Bartolucci reviewed --

5 A (WITNESS THORSELL) Yes, sir.

6 JUDGE GROSSMAN: -- in which the bending
7 radii were 2.5 times OD or larger; isn't that so?

8 A (WITNESS THORSELL) It is a common practice with the
9 Okonite Company that they will not uniformly change
10 their criteria, whether it be a bending radius criteria
11 or a cable pulling tension criteria.

12 However, they --

13 JUDGE GROSSMAN: Mr. Thorsell, before you go
14 further, I take it your answer was yes and you are
15 giving the explanation now?

16 A (WITNESS THORSELL) I believe so, if I had the question
17 right.

18 Would you like to restate the question and then
19 I'll answer it directly --

20 JUDGE GROSSMAN: Yes.

21 A (WITNESS THORSELL) -- and then explain it?

22 JUDGE GROSSMAN: Well, the question was:
23 They were accepting only the specific cases
24 reviewed by Mr. Bartolucci in which the bending radii

1 were 2.5 or greater times the outside diameter; is that
2 so?

3 A Correct, correct, correct.

4 JUDGE GROSSMAN: Okay.

5 A (WITNESS THORSELL) But the general process is that they
6 have published criteria. If you meet the published
7 criteria, it's acceptable.

8 If you do not meet the published criteria, if you
9 have a violation of that published criteria, and go back
10 to the Okonite Company on a case-by-case basis, you find
11 that their actual criteria is substantially lower.

12 There's a substantial margin in their published
13 criteria. However, they will not give leave to utilize
14 that margin by anybody other than themselves,
15 essentially.

16 They require that you go back on a case-by-case
17 basis and, in the particular circumstance where you have
18 violated their criteria, provide them information. If
19 they have enough information based on the
20 correspondence, they may give you approval.

21 In this particular case, they wanted to make sure
22 that they had all of the data they needed, so they sent
23 out their cable engineer to actually assess the cables
24 in the field to provide approval of that.

1 (Indicating.)

2 JUDGE GROSSMAN: Thank you.

3 Mr. Guild.

4 BY MR. GUILD:

5 Q All right, sir.

6 Okonite starts out by saying in the second
7 paragraph, "The Okonite Company has no data, nor are we
8 aware of any data, or service experience where cables
9 have been shown to be unaffected by being installed with
10 bending radii as small as listed in Appendix A of Mr.
11 Bojan's letter."

12 Now, I take it Appendix A of Mr. Bojan's letter
13 listed the observed minimum bending radii discrepancies
14 in the CSR inspections?

15 A (WITNESS THORSELL) Yes, sir.

16 Q All right, sir.

17 Well, I take it, also, you accept that they use the
18 word "unaffected" and that's not an error, is it?

19 "Unaffected" means they simply are -- that's a
20 correct typographical treatment of what the company
21 intended to communicate, as far as you know? That's a
22 negative there, "unaffected"?

23 A (WITNESS THORSELL) Maybe I can make this a little
24 simpler.

1 Q No. How about just answering that question?

2 That was not an error using that word "unaffected,"
3 was it?

4 A (WITNESS THORSELL) No, sir.

5 Q All right.

6 Now, did -- after the time -- did you receive
7 another letter from Okonite that makes a calculation
8 with respect to the observed minimum radii?

9 A (WITNESS THORSELL) No, sir.

10 Q This is it; this letter is it?

11 A (WITNESS THORSELL) This is it.

12 Q All right, sir.

13 Is there any suggestion that Okonite has since
14 performed the calculations or since acquired the data or
15 experience that they didn't have at the time of their
16 June 5, '85, letter?

17 A (WITNESS THORSELL) No, sir.

18 Q I don't see it. Am I missing some pages here?

19 Did you, Mr. Thorsell, or Sargent & Lundy acquire
20 the data, evaluate the experience and make the
21 calculations that the Okonite Company did not make with
22 respect to these cable discrepancies?

23 A (WITNESS THORSELL) No, sir.

24 Could I clarify this for you?

1 The statement in the Okonite letter that refers to
2 no data or service experience to be able to, I'll say,
3 accept bending radii as small as contained in Mr.
4 Bojan's letter refers to bending radii that were less
5 than 2.5 times the outside diameter of the cable.

6 The particular observation that we are dealing with
7 here is one in which the cable manufacturer provided us
8 with a letter establishing a criterion that allowed us
9 to accept this bending radius violation.

10 There were other bending radius violations for
11 which the manufacturer did not provide us acceptance, if
12 you will.

13 In those instances, what was done was the cable was
14 tested and subjected to the same acceptance criteria as
15 a new cable for a 500-volt DC insulation resistance
16 test, and that test was used to determine whether there
17 was any degradation of the cable or whether the cable
18 would still meet its design requirements.

19 In each case, those tests indicated that there was
20 about a 50-percent margin over the manufacturer's
21 requirements for performance of the insulation, and
22 those cables were deemed to be acceptable.

23 Q All right, sir.

24 MR. GUILD: Mr. Chairman, could I ask that

1 Applicant make available whatever data Mr. Thorsell
2 relies upon for that last response, please.

3 MR. STEPTOE: Sure. Of course, we have no
4 problem doing that.

5 BY MR. GUILD:

6 Q Are there any Okonite letters?

7 A (WITNESS THORSELL) No, sir.

8 Q So there's no letter that said, "We won't accept these
9 cases"?

10 There's just the letter that says, "We will accept
11 this case," as you characterize this Okonite letter?

12 A (WITNESS THORSELL) There were a handful -- I don't
13 remember the exact number -- of bending radius
14 violations identified by BCAP inspectors.

15 To assess those bending radius violations, the
16 cable manufacturer was contacted. The cable
17 manufacturer came out and examined those and, based on a
18 visual examination only, was able to accept some and
19 unable to adopt a position on others.

20 The ones for which the cable manufacturer was
21 unable to adopt a position on, those cables were
22 subjected to tests to determine whether the bending
23 radius violation had, indeed, affected the cable.

24 The result of the test indicated that it had not.

1 Q All right, sir.

2 Well, you are telling me a little more than I asked
3 for and less than I asked for.

4 A (WITNESS THORSELL) I'm trying to make it simpler for
5 you --

6 Q I'm sorry.

7 A (WITNESS THORSELL) I'm sorry.

8 Q If you would respond to the question, that would be
9 helpful.

10 What I wanted to know precisely was:

11 Is there a letter from the manufacturer declining
12 to accept any of the cable discrepancies found in BCAP?

13 I still didn't get an answer to that question.

14 A (WITNESS THORSELL) This is the only letter.

15 Q All right, sir.

16 There is no other letter?

17 A There is no other letter.

18 Q Is there any other documentation reflecting the refusal
19 by the manufacturer to vouch for, to pass off on, to buy
20 off, other BCAP discrepancies?

21 A (WITNESS THORSELL) No, sir.

22 Q Did you document it in any way?

23 A (WITNESS THORSELL) Document what?

24 Q The fact that the manufacturer went out and said, "I'm

1 looking at this discrepancy, and I cannot take a
2 position on it. I will not vouch for that. I will not
3 buy off that discrepancy," words to that effect?

4 A (WITNESS THORSELL) No. I believe those words appear in
5 this letter.

6 Q This is it; this is the only documentation?

7 A (WITNESS THORSELL) This is it, this is it.

8 Q If I look at another observation, it will not say the
9 manufacturer's rep looked at this condition in the field
10 and declined to vouch for the lack of design
11 significance of this discrepancy?

12 A (WITNESS THORSELL) No, sir.

13 Q Did you tabulate those instances? Did you write them
14 down anywhere?

15 A (WITNESS THORSELL) No, sir, no, sir.

16 Q How many are there?

17 A (WITNESS THORSELL) A handful.

18 Q Well, I've got five fingers.

19 Are there more than five?

20 A (WITNESS THORSELL) I don't know whether the number is
21 four or five or six.

22 Q Does anybody know, sir?

23 A (WITNESS THORSELL) I'd have to go back to the data.

24 The number is less than 10.

1 Q All right.

2 What is the data source you are going to have to go
3 back to? It's not the observation form?

4 A The observation --

5 Q The observation will show itself whether or not the
6 manufacturer vouched for the significance or lack
7 thereof of the condition?

8 A (WITNESS THORSELL) No, sir.

9 Q So how are you going to find out, sir?

10 A (WITNESS THORSELL) Is your question which ones the
11 manufacturer did not vouch for --

12 Q Yes.

13 A -- or which ones violating the bending radius that I did
14 a test on?

15 Q The question is which BCAP cable discrepancies the
16 manufacturer observed in the field and declined to vouch
17 for.

18 A (WITNESS THORSELL) I believe those would be contained
19 in Attachment B to Mr. Bojan's letter.

20 Q All right, sir. I'll await that with interest.

21 Is it indicated which ones on that attachment were
22 observed and the manufacturer declined to vouch for,
23 sir?

24 A (WITNESS THORSELL) No, sir.

1 Q It's among a class of discrepancies listed on that
2 attachment?

3 A (WITNESS THORSELL) Yes, sir.

4 Q How are we going to identify which ones?

5 A (WITNESS THORSELL) It would be the bending radius
6 violations that are -- or would be the observations for
7 which the bending radius was less than 2.5 times the OD.

8 Q You state that based on your personal knowledge?

9 A (WITNESS THORSELL) Yes, sir.

10 JUDGE GROSSMAN: Excuse me.

11 The implication I get from that is that
12 notwithstanding that Mr. Bartolucci only approved
13 certain instances that he observed, you took that as a
14 blanket authorization to approve every single one of
15 those instances in which the bending radius was 2.5 or
16 greater times the outside diameter?

17 A (WITNESS THORSELL) No, sir.

18 JUDGE GROSSMAN: Well, in which instances did
19 you not approve that?

20 A (WITNESS THORSELL) This letter approving a 2.5 times
21 outside diameter minimum bending radius violation was
22 only used for those cables which had greater than 2.5
23 times the outside diameter bending radius and were
24 observed by Mr. Bartolucci.

1 Indeed, I believe that this is the only observation
2 for which this letter was used.

3 (Indicating.)

4 JUDGE GROSSMAN: Well, now, where is the list
5 of the ones that Mr. Bartolucci did not observe?

6 There is no list of the bending radii violations --
7 that is, less than the manufacturer's recommendation,
8 but 2.5 or greater times the outside diameter -- which
9 Mr. Bartolucci did not observe?

10 A (WITNESS THORSELL) Those violations don't exist. There
11 are no such discrepancies.

12 JUDGE GROSSMAN: He observed all of the
13 instances, you are telling me, in which the bending
14 radii were 2.5 or greater times the outside diameter?

15 Is that what you are saying?

16 A (WITNESS THORSELL) No.

17 He observed those bending radius violations --
18 let's see. I'm trying to phrase this precisely.

19 There may have been bending radius violations which
20 exceeded 2.5 times the outside diameter but also
21 exceeded other bending radius criteria which were
22 available to us to perform an evaluation. Okay.

23 There's only a narrow band of bend radius
24 violations which Mr. Bartolucci observed for which -- I

1 believe this is the only -- this is the only observation
2 for which his observation -- his field trip provided us
3 the acceptance of that particular discrepancy.

4 JUDGE GROSSMAN: Okay.

5 This is the only instance, then, that you relied on
6 Mr. Bartolucci --

7 A (WITNESS THORSELL) Correct.

8 JUDGE GROSSMAN: -- on his observance?

9 A (WITNESS THORSELL) Correct.

10 He also looked at others with smaller bending
11 radiuses, for which he could not provide an opinion
12 without test data.

13 JUDGE GROSSMAN: Okay.

14 A (WITNESS THORSELL) We did the test data --

15 JUDGE GROSSMAN: Okay. Now --

16 A (WITNESS THORSELL) -- and evaluated the test data.

17 JUDGE GROSSMAN: But you also mentioned other
18 bending radii violations in which the radii were 2.5 or
19 greater times the outside diameter and which you
20 approved, apparently.

21 Is that so?

22 A (WITNESS THORSELL) I'm not sure that there were others
23 in that category. I'd have to review the observations
24 to find out.

1 But if there were others that were greater than 2.5
2 and we approved, our approval would have been based on a
3 published acceptance criteria. In other words -- let me
4 give you a hypothetical case.

5 The hypothetical case would be an installation
6 similar to the one documented in this observation, where
7 the inspector had identified a violation of the
8 12.9-inch criteria, and we accepted it based on bending
9 radius criteria for an individual conductor, for
10 example.

11 JUDGE GROSSMAN: Well, that doesn't seem to
12 be related to this kind of violation that we're talking
13 about.

14 A (WITNESS THORSELL) Right.

15 JUDGE GROSSMAN: So you are saying that there
16 just did not exist instances, such as the one that Mr.
17 Bartolucci observed, which had bending radii of 2.5 or
18 greater times the outside diameter, which you approved
19 on the basis of his approving in this particular
20 instance?

21 A (WITNESS THORSELL) Correct.

22 JUDGE GROSSMAN: Okay.

23 And now you are telling us that --

24 A (WITNESS THORSELL) To the best of my knowledge, this

1 is the only case in which Mr. Bartolucci or the Okonite
2 Company's letter was used.

3 (Indicating.)

4 JUDGE GROSSMAN: Okay.

5 And now you are saying that your testing, voltage
6 testing, was, in all cases in which there was a less
7 than 2.5 --

8 A (WITNESS THORSELL) Correct -- or there was wrinkling of
9 the jacket or distortion of the cable.

10 (Indicating.)

11 There's a -- there's a three-part test.

12 JUDGE GROSSMAN: Okay, fine.

13 In some of those cases, the diameter was between
14 2.5 and whatever the publisher's recommendation was --
15 the published recommend was?

16 A (WITNESS THORSELL) Right.

17 MR. GUILD: Mr. Chairman, I'd ask that
18 Intervenors' Exhibit 162 be received in evidence.

19 JUDGE GROSSMAN: Any objection?

20 MR. STEPTOE: No objection, Judge Grossman.

21 JUDGE GROSSMAN: Mr. Berry?

22 MR. BERRY: No objection from the Staff, Mr.
23 Chairman.

24 JUDGE GROSSMAN: Received.

1 (The document was thereupon received into
2 evidence as Intervenors' Exhibit No.
3 162.)

4 JUDGE GROSSMAN: I think it's time to
5 adjourn, Mr. Guild.

6 MR. GUILD: Yes, sir.

7 JUDGE GROSSMAN: So why don't we --

8 MR. STEPTOE: We'll pick up the admission of
9 these exhibits at a subsequent time --

10 JUDGE GROSSMAN: That's fine.

11 MR. STEPTOE: -- after we get them
12 reproduced.

13 JUDGE GROSSMAN: All right.

14 We'll adjourn now until Wednesday of next week at
15 9:00 o'clock.

16 (WHEREUPON, the hearing of the
17 above-entitled matter was continued to
18 October 15, 1986, at the hour of 9:00
19 o'clock A. M.)
20
21
22
23
24

CERTIFICATE OF OFFICIAL REPORTER

This is to certify that the attached proceedings before the UNITED STATES NUCLEAR REGULATORY COMMISSION in the matter of:

NAME OF PROCEEDING: Braidwood Station
Units 1 & 2

DOCKET NO.: 50-456/457-OL

PLACE: Chicago, Illinois

DATE: Friday, October 10, 1986

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission.

(sig) Gary L. Sonntag
(TYPED) Gary L. Sonntag

Official Reporter

Reporter's Affiliation