

NUCLEAR REGULATORY COMMISSION

CF  
ORIGINAL

In the Matter of:

CONSUMERS POWER COMPANY ) DOCKET NOS 50-329 OM  
) 50-330 OM  
(Midland Plant, Units 1 & 2 ) 50-329 OL  
50-330 OL

DEPOSITION OF THIRU R. THIRUVENGADAM

DATE: December 11, 1980 PAGES: 1 thru 61

AT: Chicago, Illinois

ALDERSON  REPORTING

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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 In the matter of: : Docket Numbers:  
 :  
 CONSUMERS POWER COMPANY : 50-329 OM & OL and  
 : 50-330 OM & OL  
 Midland Plant, Units 1 and 2 :  
 :  
 -----x

Chicago, Illinois

Thursday, December 11, 1980

Deposition of THIRU R. THIRUVENGADAM, a witness  
 herein, called for examination by Counsel for the NRC in  
 the above-entitled action, pursuant to notice, the witness  
 being duly sworn by PATSY ANN STROH, a Notary Public in  
 and for the state of Illinois, at the offices of Isham,  
 Lincoln, and Beale, First National Plaza, 42nd Floor,  
 Chicago, Illinois 60603, commencing at 1:15 p.m.,  
 Thursday, December 11, 1980, and the proceedings being  
 taken down in stenotype by PATSY ANN STROH and trans-  
 cribed under her direction.

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1 APPEARANCES:

2 On behalf of the NRC Staff:

3 WILLIAM D. PATON, Esq.  
4 United States Nuclear Regulatory Commission  
Washington, D. C. 20555

5 On behalf of the Applicant:

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10 JOSEPH D. KANE  
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12 HARI N. SINGH  
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Chicago, Illinois

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<u>Deposition of</u>	<u>Examination by Counsel</u>
	<u>For NRC</u> <u>For Applicant</u>
Thiru R. Thiruvengadam	3

EXHIBITS

For Identification

1. Resume of Mr. Thiruvengadam. 3
2. Sketch of cracks in diesel generator 22  
generator building drawn by  
Mr. Thiruvengadam, dated  
12/11/80.

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P R O C E E D I N G S

Whereupon,

THIRU RADHA THIRUVENGADAM

a witness herein, called for examination by Counsel for Nuclear Regulatory Commission, having been first duly sworn by the Notary Public, was examined and testified as follows:

EXAMINATION BY COUNSEL FOR NRC

BY MR. PATON:

Q Would you state your full name for the record, please?

A Thiru Radha Thiruvengadam.

Q And would you state by whom are you employed?

A Consumers Power Company. This resume is about three years old.

Q All right. As a matter of fact let me mark this as Thiru deposition Exhibit 1 and today's date, December 11, 1980.

(The document referred to, resume of Mr. Thiru, was marked as deposition Exhibit No. 1, for identification)

BY MR. PATON: (Resuming)

Q The resume that you just handed me is three pages long, and you have just indicated that it is

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1 approximately three years out of date. Alright, I just want  
2 to go over with you, very brierly, your education.

3 A All right.

4 Q You have a degree of civil engineering from the  
5 University of Madras in 1961, is that correct?

6 A That's right, sir.

7 Q It says passed in first class with honors?

8 A Yes.

9 Q Does that mean you were first in the class?

10 A No, there is a classification of first class,  
11 second class, and third class and honors. I got a very  
12 high grade to be classed in first class and got and even  
13 higher grade to be placed in honors.

14 Q Okay, thank you. That was civil engineering?

15 A That's right.

16 Q Did that involve any structural classes?

17 A Yes.

18 Q How many, do you recall?

19 A No, I don't recall.

20 Q Okay, your next degree you have a M.E. degree in  
21 power engineering, is that Masters?

22 A Masters of Engineering, yes.

23 Q In 1963?

24 A That's right.

25 Q And you received a P.H.D. degree from the

1 University of Illinois in 1969, is that correct?

2 A That's right.

3 Q And that is in civil engineering, but it says,  
4 (structures), does that mean you majored --

5 A Majored in structures, right.

6 Q Are you presently working on the Midland facility?

7 A Yes, that's correct.

8 Q When did -- when were you first assigned to the  
9 Midland facility?

10 MR. FARNELL: During the time he was at Consumers  
11 Power?

12 MR. PATON: Yes.

13 THE WITNESS: I was assigned off and on starting  
14 from the beginning of 1979, to the best of my recollection.

15 BY MR. PATON: (Resuming)

16 Q All right, give me some idea in the year 1979,  
17 what percentage of your time you spent working on the Mid-  
18 land facility?

19 A In the beginning of 1979, just a pure guess  
20 would be approximately 50%, toward the end of 1979, my  
21 guess again, probably 80%.

22 Q All right, do that for 1980.

23 A 1980, 100% of the time.

24 Q Okay, are you familiar with a document that is  
25 entitled -- that is dated December 6, 1979, entitled Order

1 modifying construction permit?

2 A I have heard of the document, yes.

3 Q Have you ever, to your knowledge, seen the  
4 document?

5 A I might have seen the document, yes.

6 Q Do you know if you have ever seen the document?

7 A I have not read the document.

8 Q Okay, and your work on the Midland facility  
9 involved your expertise in structures?

10 A That's right.

11 Q Describe your present responsibilities with  
12 respect to the Midland facility.

13 A At the present time I'm the section head for  
14 civil engineering in the Design Production Department in  
15 the Midland Project Division.

16 Q You said you're the section head. Did you say  
17 of the Design Production Department?

18 A Yes.

19 Q Okay, that is your title or the name of your job  
20 but I'm asking you to describe your present responsibilities.

21 A My responsibilities are to expedite, design,  
22 production and in general to be responsible for all civil  
23 engineering items concerning the Midland project.

24 Q Do you spend most of your time at Jackson,  
25 Michigan?

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1 A That's correct.

2 Q With respect to structural matters, do you  
3 communicate with people at Bechtel?

4 A Yes, I do.

5 Q Who do you communicate with most?

6 A With all the individual structural engineers, the  
7 structural group supervisor, assistant project engineer and  
8 whoever in that particular section.

9 Q With respect to structural work give me the names  
10 of the people that you communicate with at Bechtel, for  
11 example, who do you communicate with most?

12 A Bimal Dhar, Mo Elgaaly, E-l-g-a-a-l-y, and there  
13 could be others. There's a whole group of people.

14 Q Okay, but as far as your -- you said in response  
15 to my question of who do you communicate with most, you  
16 would say Bimal Dhar?

17 A Yes.

18 Q When did you become the section head of the  
19 Design Production Department?

20 A May of '80.

21 Q What was your job before May '80?

22 A I was a staff engineer assigned to Project  
23 Engineering Services Division.

24 Q Staff engineer? Would you say that again?

25 A Staff engineer assigned to the Project Engineering

1 Services Division.

2 Q What were your responsibilities in that position?

3 A To provide technical assistance to the projects  
4 under construction and under modification.

5 Q Did this -- when you were the staff engineer  
6 assigned to Project Engineering Services Division, did you  
7 utilize your structural training?

8 A Yes.

9 Q In other words, was your job -- were you involved  
10 in other disciplines?

11 A I was enrolled mainly as a civil engineer with  
12 special emphasis on structural engineering.

13 Q All right sir, and when did you first become --  
14 when did you first -- when were you first assigned to that  
15 job as staff engineer?

16 A Since the time I joined Consumers Power, November  
17 1978.

18 Q Are you aware that the diesel generator building  
19 walls have shown cracking?

20 A Yes.

21 Q In your opinion what is the cause of this  
22 cracking?

23 A I haven't personally investigated all the data  
24 pertaining to that. I have to rely on the conclusions  
25 drawn from Bechtel engineers -- that most of the cracking

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1 was due to shrinkage, and some of the cracking is due to  
2 the building being held up by duct banks.

3 Q I want to make sure I understand your answer. I  
4 think you indicated that you're relying in stating your  
5 answer on Bechtel engineers. Can you tell me who within  
6 Bechtel gave you that information?

7 A This was presented in many meetings and the  
8 group supervisor in charge of civil structural area is  
9 Bimal Dhar.

10 Q I understand your statement about the building  
11 being supported by duct banks but the other reason you  
12 described as shrinkage.

13 A Shrinkage, right.

14 Q Do you know what caused the shrinkage?

15 A There is a normal process in any concrete walls.  
16 The concrete upon curing tends to shrink.

17 Q Okay, you're not indicating that the cracking is  
18 something that is normally to be expected or are you?

19 A Shrinkage cracks are normally to be expected.

20 Q Okay, what kind of cracks do you have at the  
21 diesel generator building, other than shrinkage cracks?

22 A My recollection is the cracks are due to the  
23 building being held up by duct banks.

24 Q When is the last time you saw those cracks?

25 A I was touring the site along with the NRC

1 personnel. I don't recall the exact time that was. That was  
2 a day before the appeals board meeting.

3 Q Okay, was that in August of 1980? I don't mean  
4 to pin you down to a date. I mean just approximately, what  
5 month was it?

6 A I don't recall.

7 Q You don't recall what time it was? Was it in the  
8 last half of 1980?

9 A It would be a guess.

10 Q Okay, how many times have you visited the site  
11 in the year 1980?

12 A I don't recall that either.

13 Q Do you recall whether it was more than five times?

14 A I would say more than twice.

15 Q Do you have any idea how many times you visited  
16 the site in the year 1979?

17 A I can't recall the number.

18 Q Can you say it was less than five?

19 A Probably.

20 Q Have you read any of the depositions that have  
21 been taken in this proceeding?

22 A Yes.

23 Q Tell me whose deposition you have read?

24 A Sherif Afifi's.

25 Q Is that all?

1 A Yes.

2 Q I want to ask you a question about your relation-  
3 ship with Bimal Dhar. Do you direct his activities?

4 A Not personally. I act on behalf of my boss  
5 who is Design Production Manager and he directs all the  
6 activities of Bechtel.

7 Q Okay, what is your boss's name?

8 A Ronald Bauman, B-a-u-m-a-n.

9 Q And he direct Bechtel's activities?

10 A That's right.

11 Q Does he monitor Bechtel's structural activities?

12 A The question is not clear.

13 Q Okay, does he observe, does he watch Bechtel's  
14 construction activities? Does he stay on top of what  
15 Bechtel is doing in building structures?

16 MR. FARNELL: Stay on top, that's --

17 MR. PATON: Well he asked for clarification. I  
18 think the first question was pretty clear.-- does he observe  
19 Bechtel's structural activities?

20 MR. FARNELL: Do you mean the building, you mean  
21 observe structural activities?

22 MR. PATON: If the witness can not answer that  
23 question I will move on to another question.

24 THE WITNESS: I have difficulty --

25 BY MR. PATON: (Resuming)

1 Q You can not answer that question?

2 A Yes.

3 Q Did you say his name was Bauman, B-a-u-m-a-n?

4 A Yes.

5 Q What are his responsibilities?

6 A He is responsible for design production. That is  
7 a title. To make sure that all the designs are done in  
8 time and meet the schedule.

9 Q You said he is responsible for making sure that  
10 all the designs are done on time and meet the schedule, is  
11 that correct?

12 A That's right.

13 Q Is he also responsible for seeing that all the  
14 designs are done correctly?

15 A I don't know whether that is his specific respons-  
16 ibility or not.

17 Q I don't want to interrupt you as long as you have  
18 got anything.

19 A No, go ahead.

20 Q You said he is responsible for making sure all  
21 the designs are done on time. Now, I'm not sure exactly  
22 what that means. Can you apply that to the diesel generator  
23 building?

24 A No. The diesel generator building and soil  
25 related problems are being handled by the project manager.

1 Q By Consumer's project manager?

2 A Consumer's project manager.

3 Q What's his name?

4 A Gilbert Keeley. K-e-e-l-e-y.

5 Q You mean -- does Mr. Keeley -- are you indicating  
6 that Mr. Keeley is responsible in Consumers for all of the  
7 work to do with the remedial action that has to do with the  
8 soil?

9 A That's right.

10 Q And does Mr. Bauman have any responsibility with  
11 respect to the remedial action with respect to the soil?

12 A To my knowledge, no.

13 Q Okay. I will continue the deposition but it  
14 appears that Mr. Thiru is probably not the right witness  
15 in the structural area. But I will pursue it further.

16 Does Mr. Keeley get any assistance on structural  
17 matters from the Design Production Department?

18 A Yes.

19 Q And who provides him that assistance?

20 A I do.

21 Q Okay, so we're back to you again.

22 (Discussion off the record)

23 THE WITNESS: Just for your clarification I  
24 would also add Mr. Keeley is also the boss of Mr. Bauman.

25 BY MR. PATON: (Resuming)

1 Q Will you describe the cracks -- just a minute.  
2 Is there any cracking in the service water structure?

3 A Yes, there are.

4 Q Are those cracks shrinkage cracks?

5 A Some of them have been determined by Bechtel to  
6 be shrinkage cracks.

7 Q Are there other cracks in the service water  
8 structure, other than shrinkage cracks?

9 A Some of them have been determined by Bechtel to  
10 be other than shrinkage cracks.

11 Q You say determined by Bechtel, has Consumers  
12 determined there are other than shrinkage cracks?

13 A I did not.

14 Q Did anybody in Consumers?

15 A Not to my knowledge.

16 Q Are you relying on Bechtel for that conclusion?

17 A Yes.

18 Q In the service water structure have you done  
19 anything with respect to those cracks by way of remedial  
20 action, or have you taken any action with respect to  
21 those cracks -- other than the shrinkage cracks?

22 A My present recollection is we have not done any  
23 remedial action so far.

24 Q Do you plan any?

25 A There is a remedial program in the works.



1 being contemplated.

2 Q Who is working on that?

3 A Bechtel.

4 Q Who within Bechtel? Bimal Dhan?

5 A Civil group.

6 Q Have you drawn any conclusions -- now I want to  
7 ask you about the cracks in the service water structure  
8 and I don't want to ask you about the other cracks that you  
9 consider to be shrinkage cracks. I want to ask you about  
10 the other cracks.

11 Have you or Bechtel drawn any conclusions as to  
12 whether those cracks are serious -- strike that -- That  
13 they impose any safety problem?

14 MR. FARNELL: I assume that's the operation of  
15 the building?

16 THE WITNESS: With the building as it is now,  
17 without any modification?

18 BY MR. PATON: (Resuming)

19 Q If the cracks were not remedied or fixed, that  
20 they would pose a safety problem at the operating stage?

21 A To my recollection, no.

22 Q You did indicate that someone is working on a  
23 remedy?

24 A That's right.

25 Q Do you know why you would work on a remedy before

1 you determined -- before you determined that it had safety  
2 significance?

3 A A few borings taken in that area indicated low  
4 blow count material, even though the structure has not  
5 significantly suffered. So the decision was taken at that  
6 point in time to provide underpinning support for that  
7 portion of the building.

8 Q Is that the remedial action that you propose to  
9 fix the cracking, is the underpinning support?

10 A No. The underpinning support, that's not to fix  
11 the cracks. The cracks may close or may still remain same.  
12 The cracks -- repairing of cracks is a totally different  
13 area.

14 Underpinning is to take the support away from the  
15 soils that have been found poor and to transfer the load  
16 down to the till.

17 Q Right. I want to ask you about the cracks and  
18 the remedy for the cracks. Do you have any idea what  
19 that remedy is going to be? I think you indicated that  
20 somebody is working on it or something like that.

21 A No, not on the remedy for the cracks.

22 Q All right, lets stay with the remedy for the cracks.  
23 Do you know whether anybody is working on a remedy for the  
24 cracks?

25 A Not to my knowledge.

1 Q Do you know whether anyone conducted any kind  
2 of analysis on the cracks in the service water structure  
3 to determine the degree to which they could effect safety?

4 MR. FARNELL: At the operating stage?

5 Mr. PATON: At the operating stage.

6 THE WITNESS: Yes.

7 BY MR. PATON: (Resuming)

8 Q Who did that?

9 A Bechtel.

10 Q Bimal Dhar?

11 A Civil group.

12 Q You don't know who within Bechtel?

13 A Bimal Dhar is the supervisor of the civil group.  
14 I don't know whether he personally did that.

15 Q To your knowledge, it was done within the section  
16 that Bimal Dhar supervises?

17 A Probably so.

18 Q Do you have any idea what conclusion they made  
19 as a result of that analysis?

20 A All the cracks in the service water building were  
21 addressed in a question to the Commission, and was  
22 presented verbally by Julius Rotz of Bechtel, in a meeting  
23 held on the site approximately February of '80.

24 Q And the NRC was present at that meeting?

25 A They were present, yes.

1 Q What -- Do you know the cause of the cracks, and  
2 again I'm not talking about the shrinkage cracks, at the  
3 service water structure?

4 A I personally have not investigated those cracks,  
5 but from the meetings and the response to NRC questions,  
6 some of the cracks were attributed to settlement.

7 Q When did you first become aware of cracks in the  
8 diesel generator building? I have returned to the diesel  
9 generator building. When did you first become aware of  
10 cracks in that building?

11 A I do not recall exactly the time period but it  
12 was soon after the discovery of the diesel generator  
13 problem.

14 Q What was that approximate date?

15 A I would say November of 1978.

16 Q Okay, do you have any knowledge as to the effect  
17 of the surcharge program at the diesel generator building  
18 on the cracks in the diesel generator building?

19 A No.

20 Q Did you observe the cracks? You have just  
21 stated you observed the cracks before January.

22 A I was aware of the cracks.

23 Q When did you first see the cracks?

24 A I don't recall.

25 Q Do you have any knowledge on whether the cracks

1 are any different now than they were in November 1978,  
2 when you first learned about them?

3 A I am aware of the present situation of the cracks,  
4 to the responses to NRC questions, and to my site visits on  
5 observation, but I'm not fully aware of how different they  
6 are from 1978.

7 Q Sir, you said, "I'm not fully aware."

8 A I'm not --

9 Q You're not aware. Are you aware at all?

10 A I'm not aware, yes.

11 Q Do you know how often Bimal Dhar visits the site?

12 A No.

13 Q Do you know how often anyone in Bimal's -- Bimal's  
14 section visits the site?

15 A No, not a specific number, no.

16 Q Is --does Mr. Keeley have any responsibility to  
17 assure that Bechtel performs its function properly in  
18 making the remedial action proposed, for example, at the  
19 diesel generator building?

20 MR. FARNELL: Could I have that read back please?

21 (Question read)

22 MR. FARNELL: You're talking about the diesel  
23 generator building?

24 MR. PATON: Yes.

25 MR. FARNELL: What do you mean by making remedial

1 actions? To me that's not clear.

2 MR. PATON: You mean you have proposed remedial  
3 actions -- this whole case is about the remedial actions  
4 as a result of soil settlement problem and you don't know  
5 what I mean by the remedial actions?

6 MR. FARNELL: By making -- the way you have used  
7 the term making remedial actions, I don't understand what it  
8 means. Designing them, implementing them, constructing  
9 them, I don't know. There are at least two or three things  
10 it could be.

11 MR. PATON: I will clarify it for you. I don't  
12 know if the witness needs clarification. In carrying out  
13 your proposed remedial action--I'll ask the witness even  
14 another question.

15 BY MR. PATON: (Resuming)

16 Q Do you know what your proposed remedial actions  
17 are at the diesel generating building?

18 A Proposed?

19 Q Yes.

20 A I know the remedial actions that have been  
21 carried out.

22 Q Yes, you know those, okay. Do you remember my  
23 last question or do you want to have it read back again?

24 A No, I do. As regards Mr. Keeley's responsibilities  
25 I am not fully aware of it. Whatever I say would be

1 speculation.

2 Q But I gather from what you told me before, with  
3 respect to your structural responsibilities you report to  
4 Mr. Keeley, with respect to the remedial action at the  
5 Midland site?

6 A That's right.

7 Q And you don't know what his responsibilities are  
8 with respect to remedial actions?

9 MR. FARNELL: I think he said he wasn't fully  
10 aware. That was the terminology he used.

11 BY MR. PATON: (Resuming)

12 Q If you're not fully aware then tell us what you  
13 do know about them?

14 A The responsibility of the remedial action rests  
15 with Bechtel primarily. That is what I'm speculating.  
16 And as to how much Mr. Keeley he's responsible for that.  
17 I don't know. I don't know the responsibility structure,  
18 hierarchy, in those terms of "responsibility."

19 Q When you say Bechtel has responsibility for the  
20 remedial action-- Do you know whether any agreement has  
21 been reached between Bechtel and Consumers Power as to who  
22 is going to pay for the remedial actions?

23 MR. FARNELL: I'm going to object. I just don't  
24 think this is part of this hearing but you can answer  
25 if you like.

1 THE WITNESS: I don't know.

2 BY MR. PATON: (Resuming)

3 Q You don't know. If Bimal Dhar visited the site  
4 would you know about it?

5 A Not necessarily.

6 Q Okay, if he visited the site would Mr. Keeley  
7 know about it?

8 A My impression is, not necessarily.

9 Q Is it within Mr. Keeley's scope of responsibility,  
10 with respect to the remedial actions, to make sure that Mr.  
11 Bimal Dhar visits the site often enough so Mr. Bimal Dhar  
12 performs his function with respect to the remedial actions.

13 MR. FARNELL: Would you read that back, please.

14 (Question read)

15 THE WITNESS: I don't know.

16 BY MR. PATON: (Resuming)

17 Q Did you have any involvement in the design of  
18 the diesel generator building structure?

19 A No.

20 Q Mr. Thiru, I hand you a piece of paper which I  
21 will mark, Thiru deposition Exhibit 2, dated 12-10-80,  
22 and ask you -- can you draw for me -- can you sketch the  
23 cracks that now exist in the diesel generator building.

24 (The document referred to, a  
25 sketch drawn by Mr. Thiru,



1 was marked as Exhibit No. 2

2 for identification.)

3 MR. FARNELL: Any particular side?

4 BY MR. PATON: (Resuming)

5 Q For example, do you remember on which wall these  
6 cracks were?

7 A My recollection of these cracks is very vague,  
8 but I remember two cracks as regards to the location.

9 Q And what wall were they --

10 A That is the third wall from the west.

11 Q Is it a center wall?

12 A There are -- There is one on the center wall.  
13 They are four cubicals..

14 Q Before you draw the sketch cracks, let me ask  
15 you this. Are there any cracks in the north wall?

16 A I do not recall.

17 Q Are there any in the south wall?

18 A Probably there are, I do not recall.

19 Q Are there any in the west wall?

20 A I do not recall.

21 Q Are there any in the east wall?

22 A I do not recall.

23 Q All right, now I want to ask you this question,  
24 Mr. Thiru, who is it in Consumers Power Company, that has  
25 the responsibility to see that any problems which arise

1 from these cracks is remedied.

2 A The ultimate responsibility rests on the project  
3 engineering manager.

4 Q Who has the day to day responsibility?

5 A We don't have a day to day responsibility with  
6 Consumers. Day to day responsibility is on Bechtel.

7 Q What is your responsibility with respect to  
8 these -- remedying these cracks?

9 A I work under the direction of Mr. Keeley, and if  
10 there is a problem or if there is a response to a question,  
11 Mr. Keeley requests me to review them -- and I do the  
12 review and take necessary action.

13 Q I gather from your answer it's a response -- kind  
14 of a responsibility. In other words you do something only  
15 when -- when someone comes to you with a problem?

16 MR. FARNELL: We're talking just about cracks  
17 now?

18 MR. PATON: Cracks in the diesel generator  
19 building.

20 THE WITNESS: That is true.

21 BY MR. PATON: (Resuming)

22 Q Is there any responsibility within Consumers  
23 Power to do something more than merely respond to a  
24 problem but to go out and try to supervise the problem?

25 MR. FARNELL: What do you mean by supervise a

1 problem?

2 BY MR. PATON: (Resuming)

3 Q Alright I will eliminate that from my question  
4 and ask you this.

5 Does anybody in Consumers Power have any respon-  
6 sibility with respect to remedying those cracks other than  
7 to respond to a problem that somebody brings to them?

8 A The cracks may be observed by the Consumers field  
9 engineers. They get together with Bechtel and us and the  
10 Jackson office and we resolve the problem.

11 Q Alright, Mr. Thiru, would you sketch on this  
12 piece of paper which I have marked deposition Exhibit No.  
13 2, your memory of the cracks and let me ask you again, your  
14 recollection is you think this is on one of the center  
15 walls?

16 A Yes, and again I want to emphasize this is my  
17 recollection to date.

18 Q And to your knowledge, is this your recollection  
19 of the cracks as they exist now or as you knew them a year  
20 ago or when?

21 A As I knew them a few months ago.

22 Q Alright, sir.

23 (Pause)

24 Mr. Thiru, you drew two x's on this piece of  
25 paper. What I'm asking you to do is show me where the

1 crack began and where the crack ends. In other words, I  
2 want you to draw the cracks for me.

3 A Okay.

4 (Pause)

5 Q Are the two cracks that you've drawn here, not  
6 shrinkage cracks in your opinion?

7 A It was reported to be -- it was reported not to  
8 be shrinkage cracks.

9 Q Do you have an opinion as to whether they are  
10 shrinkage cracks?

11 A I haven't investigated to determine whether they  
12 are shrinkage or not. And also thoses figures are obvi-  
13 ously not to scale.

14 Q Okay, now I'm --I'm -- Let me ask you this.  
15 You've drawn three blocks on this piece of paper. The top  
16 block has four sections to it. Are we looking at the side  
17 of the building, top of the building or what?

18 A The top sketch is a representation of a plan and  
19 the --

20 Q Mr. Thiru, I'm sorry -- that just doesn't --  
21 and it's my problem -- but that doesn't mean anything to  
22 me -- a plan. Are we looking at the top?

23 A From the top.

24 Q From the top. Okay now, down here, this is wall  
25 A, which is one of the center walls, is that correct?

1 A That's right.

2 Q Can you tell me on the top plat, which you have  
3 marked plan-- and I wrote something on there which I will  
4 eliminate, which is north and south?

5 A This is north and south.

6 Q Okay now -- When you drew this -- which is the --  
7 showing the crack for wall A on the lower right three blocks  
8 on this exhibit, were you facing east or west? May I  
9 draw an E right there, would you agree that's east?

10 A Yes.

11 Q That is west?

12 A Yes, I'm not sure in my present recollection as  
13 to which side of the wall these cracks were. They were on  
14 the walls.

15 Q When the diesel generator building was designed,  
16 do you know the total and differential settlement that was  
17 considered in the design?

18 A No.

19 Q Would you expect, considering Mr. Dhar's respons-  
20 ibility, that he would know that?

21 A Sure.

22 Q Do you know whether that information was presented  
23 in a PSAR?

24 A My recollection is that PSAR does not have a  
25 reference to the diesel generator building.

1 Q Would that information be in the ESAR?

2 A Yes.

3 Q Okay, I said would it be in? Do you know in  
4 fact if it is in there?

5 A There -- yes.

6 Q In your judgment -- just a minute -- do you  
7 know with respect to the surcharge program in the diesel  
8 generator building, was an analysis performed to evaluate  
9 the impact of the expected settlement on the structure?

10 MR. FARNELL: Would you read that back?

11 (Question read)

12 Expected settlement under the surcharge?

13 MR. PATON: Right, right, settlement expected  
14 from the surcharge. What impact would it have on the  
15 structure?

16 THE WITNESS: I don't know.

17 BY MR. PATON: (Resuming)

18 Q In your professional judgment, should that have  
19 been done?

20 A If it is considered important and if it is  
21 considered that it might have measureably greater effect  
22 on the structure, yes.

23 Q Mr. Thiru, you're the expert so I don't know  
24 whether it's important or not. I'm asking you in your  
25 professional judgment, should it have been done in the

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1 Midland case, at Midland?

2 MR. FARNELL: I think he answered that.

3 MR. PATON: He said if it was important he  
4 should do it. I could probably reach that conclusion my-  
5 self.

6 I'm asking in his professional judgment, is it  
7 important?

8 MR. FARNELL: He doesn't have to give you a yes  
9 or no answer.

10 MR. PATON: He doesn't have to -- no that's fine  
11 with me. He can give me all the answers he wants.

12 MR. FARNELL: He did.

13 THE WITNESS: I do not know the initial stresses  
14 in the building, so it is difficult to reach a professional  
15 judgment without knowing the stresses in the building.

16 BY MR. PATON: (Resuming)

17 Q Do you know prior to the imposition of the sur-  
18 charge program, that the diesel generator building had  
19 some differential settlement?

20 A I have been aware of that through the settlement  
21 plots.

22 Q And your -- considering everything you know about  
23 the diesel generator building and the soil under the diesel  
24 generator building, I'm asking you whether in your pro-  
25 fessional judgment, an analysis should have been made to

1 evaluate the impact of settlement to be expected under the  
2 surcharge load?

3 MR. FARNELL: That's the exact same question you  
4 asked before, and he answered it once and he answered it  
5 twice.

6 MR. PATON: No, no, after that we established  
7 his knowledge. For example, he was aware that there was  
8 differential settlement in the diesel generator building.

9 Now I'm asking him to assume everything he knows  
10 about the diesel generator building and in his professional  
11 judgment is that --

12 MR. FARNELL: The question as it was asked the  
13 first time had to assume his knowledge. I don't think you  
14 added anything to it.

15 MR. PATON: Are you directing him not to answer  
16 that? You know he's a structural engineer. He's Consumers  
17 Power's expert.

18 If you instruct him not to answer that question  
19 that's fine, I don't think I'll certify that. If he  
20 doesn't want to answer that question, that's fine with me.

21 Will you answer the question, please?

22 MR. FARNELL: My objection was you already asked  
23 and he answered. Do you have anything to add to your  
24 previous --

25 MR. PATON: No. I want you to answer my question.



1 If he refuses to answer my question that's -- that's fine.

2 THE WITNESS: The settlement blocks do not clearly  
3 show whether the settlement was differential in terms of  
4 global, or differential in terms of structural displacement.

5 BY MR. PATON: (Resuming)

6 Q Are you indicating there was some uncertainty as  
7 to whether there was differential settlement at the diesel  
8 generator building?

9 A No, there is differential settlement but if  
10 there is a total body movement it would not have caused  
11 stresses in the building.

12 Q Is there some uncertainty in your mind now as to  
13 whether, prior to the surcharge, the diesel generator  
14 building was under some kind of stress?

15 A No.

16 Q You know it was under some kind of stress?

17 A I know it is under some kind of a stress.

18 Q What kind of stress was it under?

19 A I do not know the exact amount.

20 Q What other kind of information would you have to  
21 know, that you do not now have, to allow you to make a judg-  
22 ment as to whether an analysis should have been performed  
23 to evaluate the impact of the effect of settlement under  
24 the surcharge program at the diesel generator building?

25 A I would have to know the initial stresses on the

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1 building, I would have to know whether the structure itself  
2 suffered differential settlement and not a rigid body  
3 motion.

4 I would have to know that the surcharge is going  
5 to cause additional structural differential settlement  
6 rather than rigid body movement.

7 With this information I could conclude whether a  
8 total analysis is needed or whether this could be missed  
9 by inspection.

10 Q Okay, am I correct, your testimony is that you  
11 do not know those things?

12 A I do not know those things, yes.

13 Q Is it possible that settlement of the diesel  
14 generator building was rigid body motion and in fact there  
15 was no differential settlement?

16 A It is possible.

17 Q Do you -- are you certain that there was -- that  
18 the diesel generator building experienced differential  
19 settlement prior to the surcharge program?

20 A When you measure the settlement at two corners  
21 of the building and you call that as differential settle-  
22 ment, the blocks show that there has been differential  
23 settlement.

24 Q I'm sorry I don't understand. Did you -- your  
25 answer I don't think was a direct answer and I just don't

1 understand it. My question was are you certain whether  
2 there was differential settlement at the diesel generator  
3 building? I would appreciate a yes or no and then you can  
4 explain it all you want. I just didn't understand your  
5 answer.

6 A Yes.

7 Q You are certain that there was?

8 A Yes, the blocks show it. There was differential  
9 settlement between two corners of the building.

10 Q Do you know how much that settlement was? That  
11 differential settlement was?

12 A I don't recall the precise value.

13 Q So there was more involved than rigid body motion?

14 MR. FARNELL: Prior to the surcharge?

15 MR. PATON: Prior to surcharge.

16 THE WITNESS: I don't understand the question.

17 BY MR. PATON: (Resuming)

18 Q Okay, you answered it.

19 Did the settlement records show rigid body  
20 motion?

21 A Again, I did not investigate the settlement  
22 records. I observed the plots and the presentation made  
23 in meetings which showed a combination of rigid body move-  
24 ment and differential settlement.

25 Q Mr. Thiru, I forgot your answer. When I asked

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1 you -- we had some discussion about whether an analysis  
2 should have been made in your judgment but I think before  
3 that I asked you a question about whether or not, in fact,  
4 such an analysis had been made.

5 The analysis I'm referring to is one that evaluated  
6 the impact of the settlement under the surcharge load.  
7 What was your answer? Has such an analysis been made?

8 A I told you I do not know.

9 Q You do not know. Does Consumers have any problem  
10 measuring actual settlement at the site? What I'm getting  
11 at, is there any difficulty with your survey data or any-  
12 thing you used to measure actual settlement at the site?

13 MR. FARNELL: Are you referring to any specific  
14 building?

15 MR. PATON: No, generally.

16 MR. FARNELL: Could you read the question back?

17 (Question read)

18 MR. FARNELL: I don't understand the question.

19 BY MR. PATON: (Resuming)

20 Q How do you measure actual settlement?

21 A I want to clarify that by a statement that  
22 Bechtel is responsible for evaluating the settlements.

23 Q Okay.

24 A Are you implying to Bechtel or Consumers?

25 Q Yes. In other words I appreciate the fact that

1 Bechtel's responsible. Does Bechtel or Consumers -- is  
2 there any difficulty, to your knowledge, in measuring  
3 actual settlement at the site?

4 A Not to my knowledge.

5 Q For the design of the diesel generator building,  
6 what values of modulus of subgrade reaction were used?

7 A I do not recall.

8 Q Is that -- is that something that would be deter-  
9 minded by Bechtel?

10 A Yes.

11 Q Okay, do you personally have any responsibility  
12 with respect to the structural work done by Bechtel other  
13 than to respond to requests for information or respond to  
14 the problems brought to you?

15 MR. FARNELL: Repeat that, please. Read that  
16 back.

17 (Question read)

18 MR. FARNELL: The question assumes several  
19 factors that I don't think he testified to. I'm going to  
20 object to it.

21 BY MR. PATON: (Resuming)

22 Q Can you answer the question?

23 A The question is not very clear. My responsi-  
24 bilities were stated earlier. I do not have a direct  
25 responsibility to what Bechtel is doing in-house.

1 Q Okay, you have repeated several times that when  
2 I asked you a question you answered that's Bechtel's  
3 responsibility.

4 A That's right.

5 Q I'm trying to find out what your responsibilities  
6 are with respect to Bechtel and I'd rather so far that you  
7 have none other than to respond to requests for infor-  
8 mation.

9 A To review.

10 Q Okay. Now, do you converse with Mr. Keeley?

11 (Short recess taken)

12 BY MR. PATON: (Resuming)

13 Q Mr. Thiru, tell me in very general terms what  
14 Bechtel is responsible for with respect to structural  
15 work, for example, at the service water structure. From  
16 the beginning, from the design of the plant on.

17 I do mean in general terms as opposed to what  
18 Consumers does.

19 A Generally, my understanding is Bechtel would be  
20 responsible for laying out of the structure, planning the  
21 structure.

22 Q Planning?

23 A Designing the structure and construction of the  
24 structure and whatever associated monitoring programs  
25 there may be.

1 Q Okay. Now with respect to those activities, does  
2 Consumers Power review the work Bechtel does?

3 A Consumers Power reviews in general the work done  
4 by Bechtel.

5 Q Okay now. Now I want to get a little more spe-  
6 cific. You say they review in general. Tell me a little  
7 more about that. For example, laying out the structure.  
8 What does Consumers do to review the work that Bechtel does  
9 and at the Midland Plant, I mean, I want to know what in  
10 fact happens.

11 A I can only speak in terms of what happened after my  
12 joining the Consumers Power. By the time the service  
13 water building has been laid out, designed, and constructed.

14 Q And planned?

15 A And planned.

16 Q All right, with respect to the -- there is a pro-  
17 posed remedy at the service water structure, is that correct?

18 A That's right.

19 Q And Bechtel is responsible for that proposed  
20 review?

21 A That's right.

22 Q And how long has Bechtel been working on that?

23 A I would guess about more than a year.

24 Q Okay, now you used the work guess, that was a  
25 figure of speech wasn't it?

1 A I do not know the exact time.

2 Q Would you estimate about a year?

3 A About a year, yes.

4 Q All right, now tell me what has Bechtel done in  
5 that year with respect to the proposed -- for the service  
6 water structure?

7 Q Bechtel has evaluated a proposed fix and is still  
8 doing the evaluation. The final design is not complete  
9 yet.

10 Q All right, they're evaluating -- they have been  
11 evaluating a proposed fix and they're working on a design?

12 A That's right.

13 Q Tell me during the last year what review  
14 Consumers Power had made of that work being done by  
15 Bechtel?

16 A Consumers reviewed the concept of the fix.

17 Q Have you completed your answer?

18 A Yes.

19 Q Tell me what you mean by the concept of fix.  
20 What is -- what is the concept of the fix at the service  
21 water structure?

22 A Bechtel proposed to transfer the load from the  
23 cantilever portion of the service water building by means  
24 of piles to the glacial till level.

25 Q And Consumers reviewed that concept?



1 A That's right.

2 Q And did Consumers approve that concept?

3 A Consumers, based upon the recommendation of  
4 Bechtel and their consultants, agreed with the concept.

5 Q Who in Consumers reviewed that concept?

6 A Myself and Mr. Keeley.

7 Q Tell me all of the specifics that you were  
8 aware of with respect to the concept prior to your approval  
9 of it. I mean what did you know about that concept?

10 MR. FARNELL: I think it might be easier if we  
11 made it a little more specific. Instead of saying give  
12 me everything.

13 BY MR. PATON: (Resuming)

14 Q Well, you told me--you told me the concept  
15 consisted of transferring the load from the cantilever  
16 portion by piles to the glacial till. Is that all you  
17 knew?

18 A No.

19 Q Tell me what else you knew?

20 A I do not recall the specific details at this  
21 moment. What I recall is as follows: Bechtel proposed  
22 sixteen piles and proposed a corbel system to transfer the  
23 load from the pile. They didn't propose to us the details  
24 in terms of pile capacity, diameter of the piles, I do  
25 not recall them now.

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1 Q I'm sorry, you say they did but you just don't  
2 remember the numbers. Okay, you said they told you the  
3 pile capacity and you said something else?

4 A Pile diameter.

5 Q What else did they tell you besides the fact that  
6 they were going to use sixteen piles, they were going to  
7 use a corbel system and they told you the pile capacity  
8 and pile diameter. What else did they tell you?

9 A That's rather a general question.

10 Q No, I think its an extremely specific question.  
11 Did they tell you anything else, the answer is either yes  
12 or no and you can explain your answer.

13 A Yes, but I don't recall specific items.

14 Q Okay, without getting into specifics, do you  
15 remember the general subject matter of what it is they  
16 told you about?

17 A They discussed a transfer of the load from the  
18 corbel to the wall and the method of transferring the load  
19 from the pile to the corbel. And the method of driving  
20 the piles. That's in general.

21 Q Okay, do you remember what they told you about  
22 the method of driving the piles?

23 A They were designed to be pre-drilled piles and  
24 a hole would be drilled with a diameter smaller than the  
25 pile diameter and the pile would be driven from the top

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1 of the building.

2 Q Did you evaluate this concept? I think you did  
3 say you evaluated this concept and approved it.

4 A Reviewed the concept.

5 Q You reviewed it and approved it?

6 A Agreed with it.

7 Q Agreed with it. Did anyone else share -- assist  
8 you in your review of this concept?

9 A Within Consumer Power Company?

10 Q Yes.

11 A I do not know for sure.

12 Q And did you, with respect to your review of this  
13 concept, did you report to Mr. Keeley?

14 A Yes, sir.

15 Q Tell us what you said to him about this concept.

16 A I don't know what I actually said to Mr. Keeley  
17 about this concept. The decision could have been reached  
18 in a meeting in which Mr. Keeley was there.

19 The fact that I did not raise any objection to  
20 the scheme -- or I might have told him that I agreed to  
21 the scheme. I do not know the exact conversation. These  
22 were the possible ways in which it could have happened.

23 Q But you don't really remember?

24 A I do not remember, yes.

25 Q Did Mr. Keeley say anything to you about this

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1 concept?

2 A I do not remember.

3 Q Is Mr. Keeley a structural engineer?

4 A No.

5 Q You report to him in this regard because he is  
6 your supervisor, he's been designated as your supervisor  
7 in this regard?

8 A That's right.

9 Q Mr. Keeley's -- I'm not trying to embarrass you.  
10 Mr. Keeley is not as competent in structural engineering  
11 as you are, is he?

12 MR: FARNELL: You can take the 5th amendment  
13 if you want. Do you understand?

14 THE WITNESS: I do not know that for sure.

15 BY MR. PATON: (Resuming)

16 Q I think I will have to let that go.

17 Has Mr. Keeley, to your knowledge, spent any  
18 substantial periods of time acting in the capacity as a  
19 structural engineer?

20 A I do not know whether he acted in a capacity as  
21 a structural engineer.

22 Q Okay, did you report to anyone else or did Mr.  
23 Keeley report to anyone else with respect to this concept.

24 A I do not know about Mr. Keeley. I had reported  
25 to Mr. Keeley, that's for sure.

1 Prior to joining the Midland -- full time in  
2 Midland in May of '80 I reported to Mr. Jack Hunt. I  
3 might have reported this to him. I'm not sure.

4 Q Do you know whether Bechtel or Consumers consi-  
5 dered any alternative to this concept?

6 A I recall one of the alternatives were to provide  
7 jacked piles or caissons.

8 Q Was it -- was it ever considered to take it out  
9 and start all over again?

10 A Not that I'm aware of.

11 Q In your professional judgment, at the time you  
12 reviewed and approved this concept, did you have adequate  
13 soils information to review and accept this concept?

14 A For soils information, I relied upon Bechtel  
15 and Bechtel consultants.

16 Q Okay, and what did they tell you?

17 A They told me that this scheme is feasible.

18 Q They told you the conclusion that the scheme  
19 was feasible?

20 A Yes, sir.

21 Q What did they tell you about the soils?

22 A I'm referring to the soils.

23 Q You mean that the soils were feasible?

24 A You raised a question whether I was aware --  
25 information on soils?

1 Q Yes.

2 A And my response was I relied, for the information  
3 on the adequacy of the soils from -- on Bechtel and consul-  
4 tants.

5 Q Okay, did they give you any information about  
6 the soil or did they just give you information that their  
7 conclusion -- that there was no problem with the soil?

8 I mean did they give you any soil parameters?  
9 I'll ask the question in another way if it's giving you  
10 any difficulty. I think my question is quite simple.

11 Did you merely rely on their conclusions or did  
12 they, in fact, give you some specific information about  
13 the soil in which you could make your own judgment?

14 A I relied specifically on Bechtel and consultants  
15 on the soils.

16 Q And you had -- Consumers had previously relied  
17 on Bechtel, with respect to the soils in placing the plant  
18 fill, had they not?

19 A This is right.

20 Q And that didn't work out very well, did it?

21 MR. FARNELL: Objection.

22 BY MR. PATON: (Resuming)

23 Q Was there not subsequent to that a rather sig-  
24 nificant problem with the plant fill?

25 A There was a problem.

1 Q I would suggest that the problem was significant,  
2 do you agree with that?

3 A It's a matter of opinion.

4 Q What is your opinion?

5 A Reasonably significant.

6 Q Easily a multimillion dollar problem, is it not?

7 A From an economic point of view, yes.

8 Q Now bearing in mind the fact that you had relied  
9 on Bechtel on one instance, with respect to placement of  
10 fill.

11 Did you consider it appropriate in considering  
12 the concept in this case to again rely on Bechtel with  
13 respect to information about the fill?

14 MR. FARNELL: You're mixing up two things. The  
15 placement of fill and information about the fill.

16 MR. PATON: If the witness tells me there is  
17 absolutely no connection between those two, that's fine,  
18 I will move on to the next question.

19 MR. FARNELL: You're making connections which  
20 I don't think you asked.

21 MR. PATON: If the witness can't make that  
22 connection, that's fine.

23 BY MR. PATON: (Resuming)

24 Q Is your attorney right? You saw no connection  
25 between those two?

1 A Would you repeat that question, please?

2 (Question read)

3 THE WITNESS: You have addressed the issue of the  
4 fill twice.

5 BY MR. PATON: (Resuming)

6 Q In fact right at the end of that last question  
7 I thought I said soil, perhaps I said fill.

8 Do you want me to say it again?

9 A Yes, please.

10 Q You relied upon Bechtel, with respect to plant  
11 fill, and thereafter you developed a problem which may be  
12 a significant problem.

13 In light of -- you later indicated that consid-  
14 ering the concept of the fix of the service water structure,  
15 you did not receive any specific information about the  
16 soils. You relied again on Bechtel, with respect to the  
17 information that they gave you about the soils.

18 MR. FARNELL: I don't think he said he didn't  
19 get any specific information.

20 BY MR. PATON: (Resuming)

21 Q Allright, tell me what you got then.

22 A I could have received -- but I'm not aware --  
23 I'm not aware of the specific information.

24 Q You don't know if you received any specific  
25 information?



1 A That's right.

2 Q I thought you had answered the question telling  
3 me that you had not, that you had relied on Bechtel's  
4 conclusions with respect to the soils?

5 MR. FARNELL: There's nothing inconsistent on  
6 relying on a conclusion and getting specific information.

7 BY MR. PATON: (Resuming)

8 Q I will ask you again. Your statement is you don't  
9 remember whether -- in connection with your consideration  
10 of the concept of the fix at the service water structure,  
11 you received any specific information about the soils?

12 A I could have but I do not recall.

13 Q You do not recall. Do you know whether you were  
14 ever told what the depth of the penetration into the glacial  
15 till was to be?

16 A There was a discussion.

17 Q Do you remember it?

18 A No, I don't.

19 Q How long ago did that take place?

20 A I do not remember that either.

21 Q Do you know now how far the piles are extended  
22 into the glacial till?

23 A No.

24 Q Do you know if Bechtel knows?

25 A I know Bechtel knows.

1 Q Mr. Dhar knows or his section, someone in his section:

2 A Since this is an area of geotechnical engineering  
3 I think probably the geotechnical engineer of Bechtel  
4 would know this information for sure.

5 Q Okay. Let's take five minutes.

6 (Short recess taken)

7 BY MR. PATON: (Resuming)

8 Q What was the purpose of the surcharge at the  
9 diesel generator building?

10 A My understanding is to consolidate the fill.

11 Q Did it accelerate the rate of settlement?

12 A It accelerated the rate of settlement compared  
13 to the settlement measured previous to surcharge.

14 Q Did it in anyway improve the safety of the diesel  
15 generator building?

16 MR. FARNELL: Safety in an operating sense?

17 MR. PATON: I think you can leap all the way to  
18 that operating stage but if you want it clarified, yes.

19 BY MR. PATON: (Resuming)

20 Q The safety at the operating stage.

21 A The surcharge consolidated the fill. Thereby  
22 providing a firm foundation for the building. Thereby  
23 increasing the safety of the building.

24 Q Wouldn't the weight of the completed  
25

1 itself have eventually consolidated the fill under the  
2 diesel generator building?

3 A It would have taken a very long time.

4 Q Right, that's my point. In other words, what it  
5 did was to accelerate the rate of settlement.

6 A I agreed to that.

7 Q Okay. Did it -- the surcharge aggravate the  
8 cracks that were in the diesel generator building? I  
9 guess my recollection isn't -- I don't know the answer to  
10 that but -- anyway I'm sorry.

11 A I do not recall.

12 Q Sorry about that. Did it aggravate differential  
13 settlement?

14 A After the surcharge there was --- I'm sorry, there  
15 were differential settlements. I do not know at this  
16 point whether it aggravated it as compared to before.

17 Q Did the surcharge program in any way reduce the  
18 amount of settlement?

19 MR. FARNELL: Compared to what? Would you  
20 read the question back, please?

21 (Question read)

22 BY MR. PATON: (Resuming)

23 Q Compared to what you would have expected --  
24 would have resulted from just the building being there  
25 itself?

1 A I do not fully understand the question. However  
2 I would like to make a statement that I have only very  
3 limited background in geotechnical engineering to evaluate  
4 settlements.

5 Q Well, but doesn't a structural engineer -- is  
6 very interested in knowing about settlement and differential  
7 settlement?

8 A Yes, yes.

9 Q Do you know whether there are any gaps under-  
10 neath the wall footing of the diesel generator building?

11 A I have been informed that there are gaps.

12 Q Did you ever see the gaps?

13 A No, I have not seen the gaps.

14 Q When did you find out there were gaps under  
15 the wall footings?

16 A I do not know the timing.

17 Q Okay. What is the present status of those gaps?  
18 Are they being fixed?

19 A There was a program to grout under the gaps.  
20 I'm not aware whether that has been carried out or not.

21 Q That would be done by Bechtel?

22 A Yes.

23 Q When Bechtel performs that work, do you in any-  
24 way review what they did?

25 A Review the actual grouting process?

1 Q Review the work that they did in whatever manner  
2 that you do it. Whether you review the actual process --  
3 I mean do you do anything about it? Do you do anything  
4 to verify that what they did was effective?

5 A The work done by Bechtel in the field comes  
6 under the jurisdiction of the field Consumer personnel.

7 Q I gather you have no responsibility to review  
8 that work-- the work that we're talking about here?

9 A Yes, I do not have the responsibility to review  
10 the actual grouting process.

11 Q Okay, fine. Go off the record for just one  
12 second.

13 (Discussion off the record)

14 BY MR. PATTON: (Resuming)

15 Q Do you know the program that is planned to  
16 treat these gaps?

17 A The plan was to grout the gaps.

18 Q Do you know how many gaps there are?

19 A I do not recall.

20 Q And it's correct, you do not know whether these  
21 gaps have been grouted yet or not?

22 A That's correct.

23 Q Are you familiar with the seismic analysis that  
24 was performed on the diesel generator building?

25 MR. FARNELL: What time?

1 BY MR. PATON: (Resuming)

2 Q The original analysis for the application for  
3 the construction program?

4 A I am aware a seismic analysis has been performed  
5 for the diesel building. I'm not familiar with the details.

6 Q That analysis was performed by Bechtel?

7 A Yes.

8 Q You have a -- just a minute. Do you have any  
9 training in seismic design of structures?

10 A Yes.

11 Q Could you describe that please? Describe what  
12 that training consists of.

13 A I have taken courses in my graduate program on  
14 analysis, structural analysis, and I have reviewed some  
15 seismic analysis of structures.

16 I did not participate in -- I did not participate  
17 in a training program for seismic analysis of structures.

18 Q So you have some training and you have some  
19 experience. You have some education and some experience  
20 in this field?

21 A Review experience, yes.

22 Q What soil parameters would you need in order to  
23 perform a seismic analysis, for example, at the diesel  
24 generator building?

25 A You would need the modulus of elasticity,

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the sheer wave velocity, and damping.

Q Is that all?

A At this moment, that's all I can recall.

Q Would you have to know for different soils, and different depths, strain dependent sheer modulus?

MR. FARNELL: Repeat that, please?

BY MR. PATTON: (Resuming)

Q I'll repeat it. Would you have to know for different soils, at different depths strain dependent sheer modulus?

A It is a function of what analysis you do. For the analysis done by Bechtel you could derive the foundation spring constants from the value -- from the parameters I have given there.

Q Would you make a soil stratification profile?

A I don't understand your question.

Q Do you recall that this follows the question of what soil parameters you would need to perform a seismic analysis? To perform a seismic analysis would you need to make a soil stratification profile?

A For the type of analysis I mentioned previously it takes an average of the soils present under the building so you need not make a soil stratification.

Q Have you performed a seismic analysis of the diesel generator building after the surcharge was removed?

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A I did not.

Q Did Bechtel?

A They were in the process of doing it.

Q And do you know whether in that -- in performing that seismic analysis they plan to take an average of the soil as opposed to making a soil stratification profile?

A That is what I recall from the responses to the questions, summary to the Commission.

Q Mr. Thiru, am I correct, that you stated with respect to the soil parameters you would need to perform a seismic analysis? You did not necessarily need to determine strain dependent sheer modulus, is that correct?

A From what I recall in your earlier question you stated for soil strata. Am I right? You have the --

Q I see, I did preface that with for different soils and different depths, is that what you mean?

A That's right.

Q How will Bechtel address variation of sheer modulus with strain?

A Bechtel uses the soil spring constants and soil damping in there analytic model. The equation for those soil spring constants and damping are given in Bechtel's Topical Report 4A, Revision 3, which has been approved by NRC.



1 Q In your-- I'm sorry.--

2 A I would presume that variation in strain levels  
3 would be accounted for in those formulas.

4 Q My original question was, how will Bechtel  
5 address variations of sheer modulus with strain and you  
6 referred to the Topical Report.

7 Do you know how the Topical Report addresses  
8 this subject?

9 A No, I don't.

10 Q Did you expect that the surcharge loading would  
11 require a revision of your seismic analysis after the  
12 removal of the surcharge?

13 MR. FARNELL: Would you repeat that please?

14 (Question read)

15 THE WITNESS: Yes.

16 BY MR. PATON: (Resuming)

17 Q And I believe you answered that as far as you  
18 know Bechtel has that under consideration right now?

19 A That's right.

20 Q And -- does Bechtel plan, to your knowledge, to  
21 obtain new soil parameters for that seismic analysis?

22 A To my knowledge, they are using new soil para-  
23 meters for correctional analysis.

24 Q To your knowledge, they have already obtained  
25 that information, is that correct?

1 A That's correct.

2 Q Did they obtain it after the surcharge was removed?

3 A That's right.

4 Q Do you know how Bechtel obtained -- that --  
5 those new soil parameters?

6 A My understanding is that they performed cross  
7 hole tests to obtain shear wave velocities.

8 Q You said they obtained new soil parameters and  
9 you mentioned shear wave velocities. Did they obtain any  
10 other new soil parameters?

11 A I'm not aware of anything else besides what they  
12 have obtained in this case.

13 Q Okay. Off the record.

14 (Discussion off the record)

15 BY MR. PATON: (Resuming)

16 Q Mr. Thiru, I want to ask you some questions that  
17 relate to pipes and conduits under the ground.

18 Are you aware that there are discontinuities  
19 in the foundation of the diesel generator building con-  
20 sisting of pipes and conduits?

21 A I'm aware there are pipes and conduits under  
22 the building.

23 Q And you're not certain that you would call them  
24 discontinuities, is that correct?

25 A That's right.

1 Q Do you know how many pipes there are under the  
2 diesel generator building?

3 A I don't recall the number but it is submitted  
4 along with the responses to the questions to the Commission.

5 Q Do you know how deep in the soil they are? Any  
6 of them?

7 A My recollection is that the circulating water  
8 pipe is quite deep. I don't know the elevation. The  
9 condensate line is less deep.

10 Q The first one you named was the service water pipe?

11 MR. FARNELL: Why don't we get it read back?

12 (Question not read.)

13 BY MR. PATON: (Resuming)

14 Q I don't -- Do you remember?

15 A No, what I said was circulating water pipe,  
16 circulating is what I said.

17 Q Circulating water pipe.

18 A Now I remember that there could be a service  
19 water pipe also under the building.

20 Q Are any of the three pipes you named, to your  
21 knowledge, category one pipes?

22 A The service water piping would be category one.

23 Q Have you been involved in the analysis of the  
24 stress on those pipes?

25 A No.

1 Q Who is responsible for analyzing any stress  
2 that may be on the pipes under the diesel generator  
3 building?

4 A Bechtel.

5 Q Is that within Mr. Dhar's section?

6 A No, the stresses and piping would be analyzed  
7 within the Bechtel organization by a group called Piping  
8 Stress Group.

9 Q Okay, are those mechanical engineers?

10 A I believe they are.

11 Q Do you know the name of the person who heads up  
12 that section.

13 A Yes, I do. The name is Don Riat.

14 Q Do you know whether there are any deviations in  
15 the depth of the pipes from the original design?

16 A I have seen the response to some of the questions  
17 by the Commission which had figures relating to the survey  
18 profiles taken and these show deviations from the original  
19 designs.

20 Q Do you recall any deviations as much as twenty-  
21 one inches?

22 A I recall a large amount like that. I do not  
23 recall the exact amount.

24 Q Did you ever hear anyone at Consumers Power  
25 state that any of the pipes under the diesel generator

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1 building are already over stressed?

2 MR. FARNELL: Currently?

3 BY MR. PATON: (Resuming)

4 Q Did you ever?

5 A I do not recall anyone within Consumers Power  
6 Company making a statement like that.

7 Q Did you recall anyone within Bechtel making a  
8 statement like that?

9 A I recall that within Bechtel there was a concern  
10 that the pipes could have stresses more than a certain  
11 amount. I do not recall the amount but the discussion  
12 was which code should be applicable under this condition.

13 Q Do you agree that some of the pipes under the  
14 diesel generator building are presently undergoing some  
15 stress?

16 A Since I am not a piping stress engineer I can  
17 not give you a definite answer to the question.

18 Q Do you know whether Bechtel has any plans to  
19 monitor settlement of the diesel generator building?

20 A There is a monitoring program to measure settle-  
21 ment of all the buildings.

22 Q Do you know any -- has that been submitted to  
23 the NRC?

24 A I believe in the presubmittals to last time, it  
25 had been, yes.