

Do you consider the quality of work (and design's contribution) completed for the Midland plant as being of good quality? Details of the work that is of good quality should be noted.

What shortcomings in your association with the plant do you attribute to be the cause of the problems? e.g. Attitudes or actions, not timely concerned with the completion of the project, etc.

Are you a more skilled and/or experienced professional than the person who has responsibility for the design, construction, etc. of the plant? (See page 2)

What do you view as the areas in which you are completely responsible for safe operation of the Midland plant? What are your responsibilities?

If none - ask who is responsible for future settlement of safety related structures and pipes - that they do not exceed tolerable limits during years of plant operation

What are the responsibilities of the other Consultants?

In your opinion why has it been necessary for the owner and designers of Midland to fortify themselves with so many other Consultants?

Possible to use shop drawings, verify past demonstrated deficiencies in construction of plant, supplement Bechtel's technical

The following series of questions are intended to have an understanding of your involvement with the Midland project?

How many hours have you worked on the Midland project?
of this total - what portion has been related to your attendance at meetings?

site visits }

Have you ^{personally} made detailed studies of ^{# all the} lab and field data or have you relied on briefings by design or construction groups at scheduled meetings to inform you of this data?

Do you know if this is true for the other Consultants working on Midland?

If briefings, ask - does this mean that you were not asked or authorized to make detailed studies to arrive at your conclusions or recommendations but rather, rely on the selection of subject matter by someone else?

What do you anticipate will be your future involvement as a Consultant on the Midland project? (Avoid generalities - attempt to understand SPECIFIC ASSIGNMENTS such as provide recommendations for tolerable ~~use~~ total and differential settlement limits of safety related structures and components during plant operation to be included in technical specifications, etc.)

(Return to pg. R-1)

Will you explain for us the meaning of the term "observational method" as used in foundation engineering?

Can you tell us in detail how the observational method was used in surcharging the DGB area?

Is it necessary when using the observational method to devise, IN ADVANCE, a positive means for solving any problem that may develop when using this method?
(Answer - yes)

At Midland - what values of settlement, and dimensions of opening cracks under the surcharge load were established IN ADVANCE as being unacceptable - where positive means would have to be employed?

If none - is this implying the structures had to fall down & pipes break in order to fail the observational method?

Did the surcharging widen the cracks in the DGB? - Exhibit
Do you recall the magnitude of increased widening?

Do you have a concern that if the NRC staff's request for lab consolidation test were performed, that the results would indicate larger settlements in the future than indicated by the surcharge field data? What settlement values do you anticipate from the requested lab testing? Why are you confident that the lab data will not indicate the preconsolidation pressure of the surcharge load for tests on undisturbed samples of clay?

Piezometers (Cont.)

P-4

(Refer to Kane Exhibit No. 12 (Piez 40 graph)
During the months of May, June and July 1977, when full surcharge load was applied, was there a DROP or an INCREASE in the piezometer elevation?
(Answer should be a slight increase)

Did you anticipate this behavior?
Wouldn't you have anticipated further decline in piezometric elevation as pore water would have seeped from the soil voids?

Look at other piezometer graphs in Kane Exhibit & Piez 40 again.
Could you indicate on these graphs where you feel secondary consolidation was reached?

For Piez. No. 40 behavior - ask the following:

- ① What caused the decline in the piezometric level after surcharge removal?
- ② Is the level to which the piezometer rebounds the porewater pressure which is being controlled by the groundwater regime WITHOUT any influence of excess pore pressure due to the surcharge load (Answer should be yes if their position is they were in secondary consolidation at time of surcharge removal)
- ③ What causes the second drop in the piezometric elevation?
Isn't this excess pore pressure as the level drops to the elevation being controlled by seepage from the pond?
- ④ Please explain the slower, more gradual rise in piezometric elevation ^{after this period,} Isn't this continuing development of steady seepage from the pond

J. Kane
Jan. 1981

Bill Paton's Flight on 11

Questions for Dr. Beck

A-1

SETTLEMENT MONITORING

Are you familiar with the various types of settlement markers and monuments that have been installed at the Midland site?

Would you identify these various types of installed markers & monuments? (Answer - building settlement markers (DG series); borros anchors; settlement plates & pedestal markers)

Would you briefly describe & sketch for us the typical installation details of the:

- : Building Settlement Markers (designated DG)
- : Settlement Plates (designated PL)
- : Pedestal Rod (Designated PD)
- : Borros Anchors

Do you know approximately when the major portion of these markers & monuments were installed at Midland? (Answer should be in the fall of 1978)

Why were they installed?

Have the installed monuments & markers (building settlement markers, borros anchors, settlement plates, ^{pedestal rods}) been periodically monitored from their initial installation up to the present time?

If yes - ASK Refer to Figs 27-113, 115, 118, 83
- ASK why the information submitted to the NRC in November 1980 presents records for borros anchors and settlement plates only up to the FALL of 1979?

ASK if he has seen these records up to the present time!

Has he provided these records in his deposition papers?

Has he seen records of pedestal rods? What settlement do they show?

If no - Why are the borros anchors & settlement plates no longer being recorded? Specific reasons

SETTLEMENT MONITORING

Questions for Dr. Peck

A-2

Isn't it still important to know how settlement is occurring within the various depth intervals of the plant fill foundation soils?

If no - why not?

In your review of the settlement records at the Midland project - did you observe larger settlements in one depth interval of the plant fill versus other depth intervals?

If yes - what approximate depth interval showed the greatest amount of settlement (Approx. El. 612 to 627)?

WHY did this zone show more compressibility?

(Answers could be - not properly placed, inadequately compacted, this depth interval was subjected to the greater loading stress, etc.)

~~If no~~ - Ask him to look at the following figures:

~~Figs 27-137, 27-138, 27-139
also Figs 27-93, 27-94, 27-95, 27-92~~

~~Aren't these observations of larger settlements in the more compressible zone between El. 612 to 627 also consistent with the penetrometer results completed by Dr. Wood? (Refer to Tab 48, Vol. 3)~~

Wouldn't continued reading of the boros anchors which have been installed at various depths in the plant fill provide us with the information to determine how settlement is ^{still} occurring with depth?

Kane
Ketch

SETTLEMENT MONITORING

Questions for Dr. Beck

A-3

Why then, does the information which was submitted to the NRC in November 1980 not contain settlement records beyond the fall of 1979 for the borros anchors and settlement plates in the plant fill?

If his answer is we have the building settlement markers to show us how settlement is occurring ask the following:

In the past didn't we have differential settlement under the DGB wall footings where soft foundation spots were being bridged?

Couldn't this still be occurring and not be reflected by the building settlement markers? Wouldn't our chances of detecting this behavior be improved if the borros anchors were being monitored?

Do you know why the settlement curve for DG-2 was not provided to the NRC?

Do you know of any building settlement marker or settlement plate or borros anchor, within the plant fill area which was surcharged, that was directly monitored from the time of its initial installation in 1978 to the present time?

(Answer should consider Borros anchors & settlement plates which are measuring plant fill settlement have records up to the fall of 1979. Building settlement markers were not read directly from 3/22/79 to 9/14/79).

SETTLEMENT MONITORING

Refer to Fig. 27-54 (for marker DG-6)

Would you indicate on Fig. 27-54 the period indicated on the note from 3/22/79 to 9/14/79?
(Should indicate the time of 54 days and 230 days)

The note on Fig. 27-54 indicates temporary markers were used during this period to ESTIMATE settlement?

* Could you explain for us the procedure that was used to estimate the settlement? (Ask for details such as the installation of the temporary markers, how monitored, how settlement curve for DG-6 was developed based on the temporary markers, etc.)

Depends on his explanation

Could the large rebound (> 1 inch) which is indicated on Fig. 27-54 - actually not be a rebound but a result of the procedure which used temporary markers to estimate settlement during this period?

Could this rebound actually result from a decrease in the curvature of the wall footing in response to the removal of the surcharge

Depends on his explanation

Don't you think it is highly unusual that the most IMPORTANT portion of the settlement versus log time curve for ALL the building settlement markers which you have based your position on for being in secondary consolidation - that this portion of the curve is actually based not on directly measured settlements but on temporary markers whose adequacy is questionable?

SETTLEMENT MONITORING (A-5)

Have you reviewed the settlement versus log time plots for the building settlement markers, settlement plates and borros anchors that were submitted to the NRC in November 1980?

Do these plots of settlement ^{for plant fill materials} exhibit a rebound behavior that you anticipated?

If yes - ask his basis for the anticipated behavior? (e.g. Previous experiences? Attempt to obtain details of these experiences or alternatively ask for reports that would provide similar rebound records)

From his ^{past} review of the settlement plots what ^{is} his recollection:

- of the amount of rebound (how many inches)?
- of the time period that rebounding occurred? (Actually rebounding is still shown to be occurring in the latest settlement records as late as 8/80 which is one year after the surcharge was removed. This rebounding can be seen on building settlement markers DG-④, 5, 6, 8, 12, 13, ②⑥, 27. Suggest plots of the circled markers be viewed if this is questioned. (Surcharge removed on 8/15/79 (200 days) & 8/80 is 565 days)

Could you explain the reasons for the rebounding as late as 1 year after surcharge removal?

SETTLEMENT MONITORING A-6

Some unusual rebounding behavior is indicated in the following comparisons:

- | | | | |
|-------|---|----|--------|
| Bay 3 | 0.5" + | to | 0.1" ± |
| | Compare DG-14 (Fig 27-62) rebound with the closest settlement plate PL-13 (Fig. 27-151) | | |
| | | | |
| Bay 4 | 1.0" + | | 0.1" ± |
| | Compare DG-16 (Fig 27-64) rebound with the closest settlement plate PL-51 (Fig 27-173) | | |
| | | | |
| Bay 1 | 0.5" + | | 0.1" ± |
| | Compare DG-6 (Fig 27-54) rebound with the closest settlement plate PL-21 (Fig. 27-158) | | |

Wouldn't it ^{be more} reasonable for the lighter settlement plates to have had the larger rebound than the building settlement markers which are embedded in the heavier concrete structures?

Can you explain this rebound behavior?

Doesn't this unusual behavior of rebound lead you to question the accuracy of the data for the DG series markers, particularly during the period of 3/22/79 to 9/4/79 where the note on each of these plots indicates settlement during this period was estimated?

SETTLEMENT MONITORING

Hold until his previous answer on page A-4 is assessed

Isn't it likely that the method, with its inherent assumptions used to estimate the settlement during this period is inadequate?

Aren't your conclusions on reaching secondary consolidation and ^{your} future predictions of settlement during plant operation BASED on the shape of the settlement curve during this period where you were not directly measuring settlement of these markers but rather estimating settlement by another method whose adequacy is questionable?

Doesn't the request of the COE & the IJRC staff to take undisturbed samples and perform laboratory consolidation tests on plant fill foundation soils offer a reasonable way to resolve these questions?

Refer to Figs. 27-79 & 27-118

Can you explain the reason for the large rebound of BA-46? (Near SE side of ^{Bay 1} pedestal). What caused this rebound? Significant rebound was also recorded at adjacent Borros anchors (BA-47 & 48) Figs. 27-119 & 120.

There is significant difference in the amount of rebound on the East & West sides of the pedestal in Bay 1 (BA-46 rebound 1.6" versus BA-29, 30, 31 negligible rebound)

Does this mean we can expect recompression of the East side of Bay 1 during plant operation? How has this potential recompression concern been addressed at Midland?

SETTLEMENT MONITORING

A-8

Can you explain the behavior of settlement marker DG-28 (Buy 4, NE Corner (Fig. 27-76) between 300 and 400 days? (Location Fig. 27-79)

Would you consider the ^{settlement in this period} behavior to be indicative of secondary consolidation? Do you know why or how DG-28 was destroyed after 2/19/80?

In this same area, Settlement Plate PL-1 (Fig. 27-14n) became inoperable in Mar. 1979 - Was this loss of plate 1 related in any way to the settlement of the large diameter (96" ϕ) circulating water line over which it was located?

During the years of plant operation - what settlement behavior can we expect from those portions of structures where rebounding has been shown to occur?

Have you been aware, in the past, of questionable accuracy of the surveys which were conducted to measure the settlement of structures at the Midland site? (Sals Rock)

What was the problem with survey accuracy?
How was it resolved?

Do you know what monitoring plans have been established during plant operation, for

Cat. I structures?

Cat. I safety related piping & conduits?

How will monitoring plans address the problem of future settlement and possible overstressing of buried pipes & conduits during plant operation when these components will not readily be accessible for profiling?

Effect of Settlement on Safety Related Pipes & Conduits

Do you recall what safety related pipes and conduits are founded in the plant fill near and beneath the Diesel Generator Building? (Attempt to have Dr. ~~Peck~~^{Henderson} identify the types of pipes, diameter and approximate location - NRC attorney can refer to Table 17-1 & Fig. 17-1)

What is the range in elevation that most of the Category I pipe inverts were placed at?

Have the borros anchors shown this range of ^{foundation} elevations to be the most compressible?

Does this give you concern that important safety related pipes were initially installed in a compressible foundation material which condition was aggravated when the surcharge load was imposed? If not - why not?

Were laboratory consolidation test results available to Bechtel and you on plant fill material BEFORE the SURCHARGE was placed? (Answer - yes)

Did you review ^{these} lab. results?

Was a prediction of settlement made before surcharging based on these lab results?

If yes - what was that prediction? Who made it?

If no - Ask why no prediction was made?

Refer to 50.54f responses - Vol. 3, Tab. 12, pg. 3

Effect of Settlement on Pipes

What is the basis for this range of settlement from 6" to 18" that you gave in December 1978?

-Pursue - how did he arrive at these values? It can't be just off the top of his head.

Are you aware that this range of settlement resulted in Bechtel's decision to disconnect the condensate line between the DGB & turbine building?

What maximum settlement actually occurred under the surcharge? (Approx. 3 1/2")

What is his explanation for the large difference between his Dec. 1978 prediction and what actually took place?

In your professional opinion do you consider it good engineering practice to have estimated the amount of settlement which was going to occur along the safety related pipes and conduits before the surcharge load was imposed?

Answer will be No

Why isn't it necessary?

Isn't there a differential settlement limit beyond which structures and components will be overstressed? Answer - Yes
But yet Bechtel elected to go through with the surcharging program without even knowing what limit of differential settlement would not be acceptable. Isn't that correct?

Effect of Settlement on Pipes

Do you know today whether the DGB and safety related piping and conduits have been overstressed because of the settlements which have occurred at the Midland project?

Do you know today of any tolerable limits of total and differential settlements which have been established for the DGB? for safety related piping & conduits?

Do you know of any practical means for measuring future settlement of safety related piping & conduits while the plant is in operation? ~~What are they?~~ Briefly describe ^{for us the settlement monitoring plan during plant operation} When will this information be provided to the NRC?

Refer to Fig 19-1, Vol. 1 50.54(f) responses
What does Fig 19-1 show?

Can you describe for us the procedure and instruments used to establish these profiles?

Recognizing that piping and conduits were founded on backfill placed in the excavations around such structures as the containment - Do you feel that it would be prudent to profile these pipes even though the structure is founded on till
Do you know the level of accuracy which is obtainable with the instruments which are used to profile the buried pipes?

How do you feel the safety of the DGB and safety related pipes & conduits have been improved by employing the surcharge program?

Did surcharging reduce the amount of ^{TOTAL} settlement?

" " " " " DIFFERENTIAL "

Effect of Settlement on Pipes

(B-4)

Didn't surcharging actually increase the amount of total and differential settlement as reflected by your settlement markers and plates?

In your opinion, did surcharging increase or decrease the level of induced structural stresses on the buried conduits & pipes? On the DGB?

Do you have an opinion as to the extent of cracking which could develop in the DGB structure and still permit the DGB to operate safely?
 (Pursue - length of cracks, frequency, width of cracks)
WHAT IS THE BASIS FOR THIS OPINION.

In your professional experiences do you know of any structures that have been subjected to the extent of cracking because of settlement of compacted fill that the DGB has experienced?
 Request involved structures w/ brief details.
 Were the structures abandoned or safely reconstructed?

SETTLEMENT - LOG TIME CURVES

Refer to Fig 27-1, Vol 2

Will you explain the lab test procedure for running a laboratory consolidation test?

What are some of the important conditions which are assumed in Terzaghi's one-dimensional theory of consolidation

- No lateral displacement
- Pore water is expelled both upward & downward (Along vertical lines)
- Coefficient of permeability of the soil material is constant (Darcy law)
- A constant ratio exists between the change in volume per unit of volume and the change in effective pressure
- Soil is 100% saturated.

TYPICAL

Is the lab time-settlement curve presented on Fig 27-1 based on the results ^{and observations} of many one-dimensional lab consolidation tests. (Answer should be yes)

So your statement on pg 3 of the Sept. 14, 1980 report (Kane Exhibit No. 8) which states "Primary settlement occurred rapidly - - - shown on Fig. 3" is really based on ~~the~~ typical shape curves for establishing primary and secondary consolidation that comes from many years of observing lab results and field behavior. Is that not true?

SETTLEMENT - LOG TIME CURVE

D-2

It appears highly contradictory to say on the one hand, that we are in secondary consolidation because of the settlement - log time curves which have been measured in the field - but yet the settlement curve shape and accepted engineering practice for distinguishing primary and secondary consolidation is based predominantly on laboratory consolidation test results which you now have so much trouble accepting for the Midland project. Do you agree?

(If answer indicates the heterogeneous nature of the plant fill is the ^{major} reason for not wanting to run the lab tests ask the following:

1. Why is it that highly variable foundation soils in the field, with their different compressibility characteristics, can be expected to exhibit the ^{overall} typical settlement - log time curve shape which has been based on many lab test results, but yet if we were to take the best undisturbed samples from representative soil zones and run the same type of laboratory consolidation tests that this shape is based on - you would not have confidence in the results?

(Before the surcharge load was applied in January 1979, had the settlement of the plant fill soils reached a very small rate of deformation?

If yes - ask for basis of his answer?

What was the actual ^{range for} rates of settlement that he recalls?
Where in documents submitted to the NRC can this rate be checked?

200-1100-100 11-1000

SETTLEMENT-LOG TIME CURVE (D-3)

If no to previous question ask the following (Omit if his previous answer gives definite values that can be checked)

When running consolidation tests, is it normal practice to wait until the rate of deformation under a given loading increment becomes a very small rate? (Answer should be yes)

Don't we have unusual and difficult conditions at Midland then, for estimating when secondary consolidation is reached under the surcharge load, because we still had settlement remaining in the plant fill due to its own weight?

What would you estimate would happen to the settlement-log time curves that Bechtel has provided if the log of time began with the completion of fill placement?

Wouldn't this alter the settlement-log time curves and likely change the time of primary consolidation?

In your professional experiences - do you know of any cases where a structure founded on soils stopped settling for a long period and then began settling once again with no additional increase in loading?

SETTLEMENT-LOG TIME CURVES

(D-4)

Request specifics of these cases (Project names, reason for resumed settling, etc)

Are you familiar with the settlement problem at the North Anna pump structure?

Had settlement of the pumphouse leveled off?

In your opinion what caused resumption of settlement?

General Questions

What deposition transcripts have you read? What are your comments with regards to these transcripts? Do you disagree with any?

To whom have you had discussions with regarding anyone's (Bechtel's or NRC or CPCo) deposition? With each person, what was discussed?

Have you assisted in the preparation of questions for anyone's deposition? Whose?

Were these questions written by you or recorded in conversations with you? With whom? When?

What meetings or contact have you had with Bechtel since August 1980 regarding the Midland plant?

What is your recollection of the questions which you assisted in preparation? Specific topics & contents?

Have you had discussions with other Consultants working on the Midland project relative to past & future depositions. With whom? What was discussed?

Have you been requested to provide testimony input for the upcoming ASLB hearing on Midland?
(Specifics - contents)

Have you been requested to provide your services as an expert witness for the Midland project for ASLB hearings? for ACRS Hearings? Who requested? When? What was your response to these requests?

General Questions

Based on your professional experiences, do you feel the cost of \$400,000 to complete the work requested by the COE and NRC staff is a REALISTIC cost?

Do you have a real concern that hydraulic fracturing and resulting instability of the cooling pond dike will happen if the borings requested by the NRC are drilled?

Don't you have a great deal of experience where borings were ^{safely} drilled in ~~a~~ completed dams that were retaining reservoirs?

Why is it then that this ~~poor~~ excuse is being given as a reason for not drilling the borings in the cooling pond dike at Midland?

Do you feel the NRC staff, in its responsibility to assure plant safety, should be requiring an extensive level of review because of the

How many hours have you actually spent in the review of data and information for the Midland project (Exclude time for traveling to meetings)

SURCHARGE PROGRAM

G-1

What professional experiences ^{or knowledge} do you personally have with preloading or surcharging? Attempt to establish the following with regards to EACH project:

1. Project name
2. Type of involved structure (e.g. concrete or steel tank, etc)
3. Type & thickness of compressible soil layer being preloaded
4. Height of surcharge imposed
5. Time when surcharge was imposed (Important to distinguish which projects were constructed before surcharge was imposed)
6. Were piezometers installed ^{and recorded} prior, during and after surcharging
7. Were settlement monuments monitored prior, during and after surcharging
8. References (e.g. technical publications ^{or reports}, etc.) where these projects are discussed and piezometric & settlement records are available.

Would you give the technical definition of "preloading",? of "surcharging"?

What is basis for his definitions? (e.g. Technical publication)

^{Depends on his definition}
 Would you agree that the program which was completed at Midland is not accurately defined by "preloading" since the structure was already completed?

Can you provide a reference list to the NRC staff which would give insight into past projects where surcharging of completed structures was performed? ^{Not necessary that it be his personal experience}

SURCHARGE PROGRAM

G-2

Can you specifically identify those structures again, which you have had ^{personal} experience with, that meet the following conditions:

Concrete structures that were essentially completed in construction when the surcharge load was imposed?

Are reports or references available that will tell how these structures performed after surcharging?

Are you familiar with NAVDOCKS DM-7 Design Manual?

If yes

Are you familiar with the design guidance provided in DM-7 with regards to preconsolidation by surcharge?

Does the guidance in DM-7 suggest a method for determining the surcharge load and percent consolidation under surcharge that would be required to eliminate primary consolidation plus a portion of secondary compression that would occur under final load (For NRC benefit - pg. 7-6-17, par. 4. b.)

Was this method in DM-7 used at Midland to determine required surcharge load?

If not, what method was used to establish the required surcharge load before starting surcharging?
Require specifics

Questions for Dr. Peck

6-3

SURCHARGE PROGRAM

Did you compute the loading stresses which are plotted on Fig. 2? (Dr. Peck used Fig. 2 as a Vu Graph at the Aug. 29, 1980 meeting in Midland)

Did you check Bechtel's computations?

Do you know the method which was used to compute the vertical stresses with depth that are reflected on Fig. 2?

~~Please explain how the vertical stresses with depth are computed?~~

On Fig. 2, what is the approximate stress increment due to structural load (dead) at Elev. 628? (Approx. 3.4 Kips per sq. feet)

Was this value of 3.4 KSF your understanding of the structural loading of the DGB at the time surcharging was placed in Jan. 1979?

Can you explain for us why in Feb. 1980 the building pressure was indicated to be only 2.2 Ksf? (Refer to 50.54 f volumes - responses to Q4 (Table 4-1A) ~~Q27 (Pg 212)~~ Vol. 1)

What method was used to compute the average total building pressure of 2.2 Ksf?

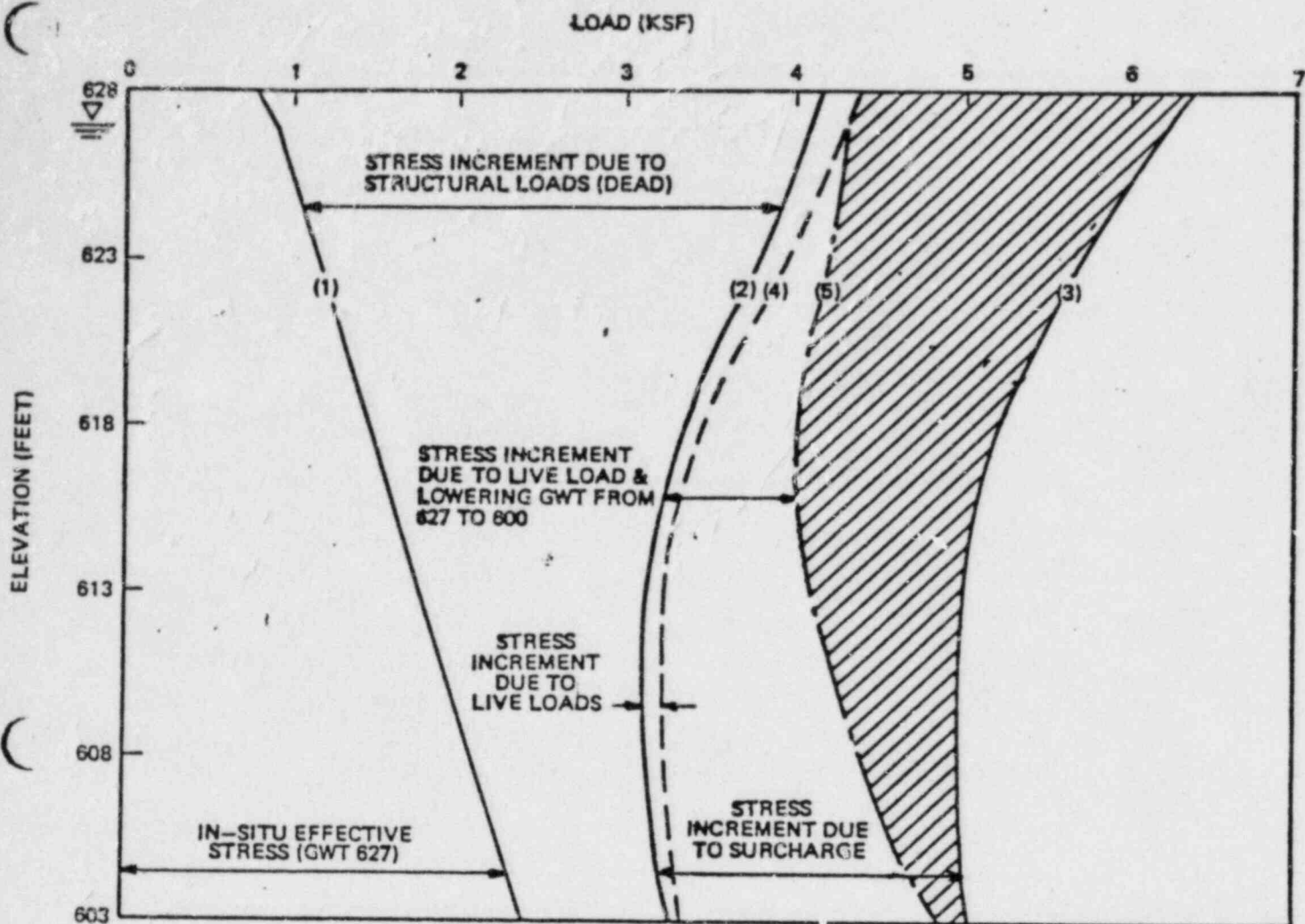
What is the reason for this ^{difference} discrepancy in loading that existed at time of surcharge?

In your opinion which loading ~~is the correct loading?~~ ^{the 2.2 KSF or the 3.4 KSF should be plotted on Fig. 2?} Why?

Does this discrepancy change your opinion on the adequacy of the magnitude of the surcharge load that was imposed

Do you know whether the stress difference between curves (2) & (4) is the FULL live load? (It is not, but actually 25% of the full live load)
Is it customary in computations for bearing capacity and settlement to use the Full live load?

Figure 2
(See Reference 1)



NOTES:

1. (1) In-situ effective overburden pressure GWT at 627.
2. (2) Total effective pressure due to in-situ effective overburden pressure and structural dead loads.
3. (3) Total effective pressure at the end of surcharge due to in-situ effective overburden pressure, structural dead loads, & surcharge loads.
4. (4) Total effective pressure due to in-situ effective overburden pressure, structural dead loads, & live loads.
5. (5) Total effective pressure during the life of plant operation due to in-situ effective overburden pressure, structural dead loads, dewatering loads, & live loads.

COMPARISON OF EFFECTIVE STRESS AT
1) END OF SURCHARGE AND 2) DURING
LIFE OF PLANT OPERATION

SOUTHWEST CORNER OF DIESEL GENERATOR BUILDING

SURCHARGE PROGRAM (G-4)

Would you say it is normal engineering practice in surcharging operations to make an estimate of the amount of settlement and the rate of settlement BEFORE during the work in the field?

Before starting the surcharge program at Midland were estimates made of the following:

1. Amount of settlement which could be expected
2. The rate for settlement to occur
3. Response of piezometers during & after surcharging
(How high did he expect excess pore pressures to reach)

If yes

Request results of estimates, ^{for each of the above} made by whom, when

If no

Why not? (Answer will probably be tied to the heterogenous nature of the plant fill. If it is, ask the following:

- In your professional experience - haven't you been faced with other projects where foundation conditions were just as heterogeneous?
- Didn't you have to make estimates of settlement in spite of these difficult foundation conditions by using engineering judgment and weighted soil properties
- Why is it so difficult at Midland to establish a range of foundation conditions where reasonable estimates of future settlement can be predicted?
- In seismic analysis of structures on plant fill at Midland don't you have to model the difficult soil stratification

SURCHARGE PROGRAM

- and assign representative soil parameters such as shear modulus, elastic modulus & damping ratio?
- Why then can't this same modeling with representative compressibility characteristics also be performed?

At previous meetings with the NRC staff it is our understanding that you indicated there was considerable pressure to remove the surcharge as quickly as possible - is that understanding correct?

If yes

How was that pressure manifested? By whom? When?

In Tab 70, Vol. 3, 50.54 (f) responses, ^{pages 3 & 4} the Consultants discuss the practical considerations of removing the surcharge.

What are the practical considerations to which this letter refers to?

This letter is dated 2 July 1979. Approximately a month and a half before the surcharge was actually removed:

From 2 July 1979 to 15 August (start of surcharge removal) - was there any significant change in the piezometer levels? (Answer should be no)

Was there any significant change in the settlement readings during this same period? (Answer should be no)

Did you, before deciding to remove the surcharge, have the opportunity to review all of the settlement and piezometer records?
If no - what data did you review

... for DIRECT

SURCHARGE PROGRAM

G-6

If no significant change - why was the decision made to remove the surcharge?

"On the same Tab 70, pg. 4 it is indicated that if a suitable means is developed for making reliable temperature corrections to the readings of the precise settlement gages, we believe that removal could, if necessary, begin in August."

Were those reliable temperature corrections made to your satisfaction BEFORE removing the surcharge?

If no - why was the surcharge allowed to be removed?

If yes

Will you explain the procedure used to make the temperature corrections?

Are you aware that John Dunninghoff had expressed concerns on temperature corrections as late as Feb. 8, 1980?

Can you describe for us your understanding of the various problems that have been experienced at the Midland site relative to survey accuracy of the various settlement monuments & markers?

Had you questioned the reliability of the settlement and piezometer data at any time during the surcharge operation?

What was your concern?

How were these concerns resolved?

Piezometers

Were piezometers installed in the DGB area prior to the surcharge operation in January 1979?

What was their purpose?

Were the piezometers sealed in individual ~~soil~~^{single} layers in the plant fill soils?

Is the basis for your answer the information provided in Table 27-1?

Do you know whether the borings which were drilled to install the piezometers included sampling and description of soil types encountered in those borings? (they did not)

How then was the column on Table 27-1 entitled "Soil Type Near Tip of Piezometer" established? (From extrapolating information from nearest boring to piezometer)

Have you checked the logs of adjacent borings and results of lab classification soil tests to reach an agreement with the identified soil types on Table 27-1? (I think answer will be no)

Would it surprise you that a check on that information would indicate layers and lenses of sand within the depth interval of most piezometer porous tubes?

Piezometers

Let us assume that a piezometer porous tube approx. 2' long is placed in a 5' thick zone of pervious sand which is founded in an impervious clay layer that has several thin (72") pervious sand layers within that 5' interval. What is the likelihood that the pore pressures measured in that piezometer installation would accurately reflect the pore pressures in the impervious clay layer? ~~What value would the piezometer level recorded be if this condition existed?~~

Is it possible that the major reason that piezometers never reflected anticipated levels under the surcharge load at the Midland site is because this condition of having pervious sand layers predominantly existed?

If answer is yes - ask for his comments on the reliability of using piezometric data for input into the decision for removing the surcharge load?
Can this data even be meaningful?

IMPT. If answer is no - ask what level of piezometric pressure did he anticipate under the surcharge load? What is his basis for this level? (How established - computed by experience - what project w/ similar conditions?)

What information is available to you that demonstrates that the plant fill was saturated when the surcharge load was applied in January 1979?
(If response is the piezometer data, ask the following - Wouldn't the piezometer pressure also reflect the influence of the surcharge load - How can you be assured the level to which it rises is due only to saturation and not be reflecting the surcharge load?)

Piezometers

P-3

What piezometric ^{and settlement} behavior would you have anticipated if the plant fill were only PARTIALLY saturated?

Answer might be:

Applying surcharge to partially saturated plant fill would cause IMMEDIATE settlement (which happened @ Midland) and a RAPID solution of the gas in the soil voids.

Some gas would likely remain as the soil system came to an equilibrium condition under the new pore water pressure state.

As consolidation would take place, pore water pressure would decrease and thereby permit gas to come out of solution. This expanding gas pressure would cause the RATE of SETTLEMENT to be less.

Could this have happened at Midland when there was essentially no change in the piezometric level from April to August 1979?

ASK Dr. Peck to sketch the behavior of a piezometer founded in the DGB foundation soils on the assumption that excess pore pressures still existed ^{in the piezometer} at time of surcharge removal (Plot of piezometric elevation versus time from Jan. 1979 to Nov. 1979)

On the sketched plot, ask if the influence of the pond seepage can be separated from the piezometer readings which are being recorded? (W. Ferris indicated in his deposition that this was done by Bechtel)
If it is possible in his estimation, ask him to separate the effect of the pond for piezometer no. .

Deposition of Dr. Peck - Hilton Inn - Albuquerque, N.M.
Approx 200 to 300 hrs since Sept. 1978
Visited site for meetings & inspections - 3 to 4 times

Responsibilities - Advise Bechtel of his thinking on remedial measures particularly DGB (Involved to some extent of the details for DGB fix)

Details - Manner of placing surcharge & dimensions
(DGB) Type of instrumentation
8c to 10% Advice on time surcharge might be ~~removed~~ removed

Dr. Peck had very little input into SW Structure, Aux. Bldg., Berated Water Tank
Dr. Peck recommended the pocket penetrometer tests in test pits (Suggested in Oct. 1978) to give indication in variation in strength of fill material actually placed (Variation 1/2 ton to 4 1/2 tons uncovered)

Had 3 or 4 meetings w/ Bechtel since Aug. 1980
meeting: Oct. 2, 1980 w/ attorneys } To provide info the attorneys requested
Nov. 25, 1980
Jan. 12, 1981

Dr. Peck has read Kane, Heller & Afifi's deposition
No specific disagreement w/ Dr. Afifi's transcripts
AS Yet - not requested to provide - expect to provide hearing testimony

Dr. Peck reviewed in some detail - field observations of settlement & pore pressure
" " " " less detail - subsurface information w/ regards to the DGB
Dr. Peck has not reviewed IN DETAIL (but ^{only} generally) the information on other faces
Dr. Peck is GENERALLY satisfied w/ accuracy of data he has reviewed.

Not familiar w/ DM No. 7 on Surcharging on preconsolidation by preloading

At Midland - surcharge load determination did not follow any method per se

- method actually used @ Midland included 3 principal steps

Step 1 - Max height of fill which could be placed ^{by the bldg} before bldg

A factor used to increase surcharge load

Step 2 - Stresses @ all depths beneath that fill would not be exceeded by future design load

Step 3 Odds good that consolidation would proceed rapidly

Fig. 2 (Stress vs. depth graph)

* Dr. Peck advised Bechtel what constituted live load ^{what was appropriate} in making up this graph before it was completed ^{live load includes} (Equipment, transient such as eqpt & people)

Dr. Peck in Jan. 1979

Problems w/ survey accuracy @ Midland

Problem w/ transferring reference elevations from bench marks

Record of each deep boros anchors

Settlement rod - has outer rod, settlement rods extended to surface

Method used to Estimate Settlement During 3/22/79 to 9/14/79

Around Mar. 22, 1979 - bldg markers covered by fill. Used higher markers & correlated

Dr. Peck believes for DG-16 - majority of rebound is EFFECT of method used to measure settlement temporarily

11/3/89

2 of 4

Brine removal - Resolved by looking @ DOW bench marks where there was no long term subsidence
Dewatering - Bechtel staff & Dick Loughney

Unreliable prediction of settlement @ Midland because

1. Is a fill (non-homogeneous m)
2. Have representative samples (impractical if not impossible)

Preloading experiences of Dr. Peck

1. 1942 Iron Ore Storage yard in Cleveland (Ore stored & was the surcharge)
Settlement monuments - did not work. Involved ret. walls (one 20' high) & their connections
Pore pressure devices did work for 10 yrs
2. 1954 Relocation of RR tracks around Ottawa field - No structures involved
Peat bog - several thousand feet long - had sand drains
3. Ill. Div. of Highways
La Salle, Barrington, Ill. . Most highway fills, some bridge approach & culverts

Concerned w/ preloading (surcharging) over his career of 30 to 40 projects

Defining preloading ^{synonymous w/ surcharging} - placing a load on a subgrade to improve soil properties either before some other construction, during or after

Projects where surcharge was placed after the structure was completed

Geotechnical Abstracts - 1970 - 1980...

His knowledge of surcharged structures after construct. completed

American Storage Warehouse in N.J.
(Believed)

Anticipated a fraction of an inch rebound
This is Based on experience w/ past preloading
Most rebounding occurred during removal & within 1 to 2 weeks after surcharge removal

Settlement plates would not be expected to rebound more than the diesel generator building

- Limitations of full scale field test (surcharge)
- Field observations should be reliable to necessary extent to make reliable forecast
- Loading conditions in field are properly related to future design load

Experiences where settlement resumed after leveling off

Auditorium Bldg in Chicago
Stopped settling after decades & then started resettling
- Due to all time low in Lake Michigan which caused resettling

Stockholm - many structures

Also cases affected by construction activities

Second Day - Deposition of Dr. Peck

"Agreement for Consulting Services" - Excerpts
Scope of Services - site visits, reviews, evaluations & prof. advice on soil mechanics for various projects - beginning w/ Midland

Temp. dewatering - amount of settlement because of temp. dewatering

Amending yesterday's testimony - regards to Dr. Peck's input into 50.54 f responses (Applicability of comp. ^{reqs} requirements concerning fill around DGB - no longer applicable
(Response to question 4) Dr. Peck did give minor input

* Piezometer -
Information prepared by Mr. Dunn cliff (Check his report for the zones where p_1)

Dr. Peck Expected piez. to rise 5' to 15'
Max. height - expected $\frac{1}{2}$ to $\frac{1}{3}$ that height

30
36,
47
Project Dr. Peck's experiences w/ piezometers after removal
Ore dock in Cleveland (Published - Terzaghi wrote in 1948
← Published in Terzaghi Anniversary Vol. From theory to Practice

Another paper - Pore pressure & suction in soils - Conference
Senior author was Gibson in 1960s - Dealt w/ loading & unloading of tanks

Another - Marsland - author Proceedings of European Conf. on Soil Mech. & Fdn. Engr. - West Germany 1960s

1/14/91 =
2 of 3

Settlement Estimate BEFORE surcharging (6" to 18")
Made on Knowledge of total $\frac{1}{2}$ differential settlement before
surcharging

Had been $2\frac{1}{2}$ " (avg.) caused by settlement of fill under own weight
(Perhaps 20' of fill was participating in this settlement)

Taking of 20' surcharge over entire area

Fill under its own weight would be about $\frac{1}{4}$

$$4 \times 2\frac{1}{2} = 10$$

Settlement hadn't stopped - so avg may be 10
therefore allowed for variation of the 10

Dr. Peck's experiences w/ cracked structure

Second Day of Dr. Peck's Deposition

- Minimum requirements for Geotechnical Specialist
- Basic knowledge of soil mechanics (fills, compaction processes)
 - Field experience on fill placement jobs
 - Served under more experienced for a period of time

For pile driving inspection - minimum requirements

- More experienced than above

Difficult to address - must weigh good field experience

- not critical to have had advanced academic training

12/30/80

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of
CONSUMERS POWER COMPANY
(Midland Plant, Units 1 and 2)

}
Docket Nos. 50-329 OM & OL
50-330 OM & OL
}

NOTICE OF DEPOSITION

Please take notice that, in accordance with 10 C.F.R. § 2.740a of the Commission's Rules of Practice, the NRC Staff shall take the deposition on oral examination of the following persons at the times, dates and places indicated.

C. Gould	9:30 a.m. Thursday January 8, 1981	Flemington New Jersey 08822
Ralph B. Peck	9:30 a.m. Tues. & Wed. January 13 and 14, 1981	Albuquerque Hilton 1901 University N.E. Albuquerque, N.M. 87102
M. T. Davisson	9:30 a.m. Wed. & Thurs. January 14 and 15, 1981	14 Lake Park Road Champaign, Illinois

The subject matter of the depositions shall be all matters relating to the issues set forth in the Licensing Board's Order of December 6, 1979 (Order Modifying Construction Permits), and the contentions of Intervenors Stamiris and Warren.

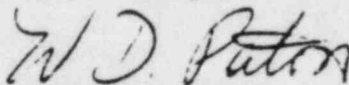
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Each deponent should bring with him to the deposition copies of all documents^{*} within his possession or control which relate to the subject matter of the deposition except documents which have already been furnished the NRC.

Respectfully submitted,



William D. Paton
Counsel for NRC Staff

Dated at Bethesda, Maryland
this 30th day of December, 1980.

^{*}/ As used herein, "documents" includes, but is not limited to, subsurface investigation and foundation reports, geotechnical engineering calculations, geotechnical evaluations and special study reports, construction plans and specifications, papers, photographs, criteria, standards of review, recordings, memoranda, books, records, writings, letters, telegrams, mailgrams, correspondence, notes and minutes of meetings or of conversations or of phone calls, interoffice, intra-agency or interagency memoranda or written communications of any nature, recordings of conversations either in writing or upon any mechanical or electronic or electrical recording devices, notes, exhibits, appraisals, work papers, reports, studies, opinions, surveys, evaluations, projections, hypotheses, formulas, designs, drawings, manuals, notebooks, worksheets, contracts, agreements, letter agreements, diaries, desk calendars, charts, schedules, appointment books, punchcards and computer printout sheets, computer data, telecopier transmissions, directives, proposals, and all drafts, revisions, and differing versions (whether formal or informal) of any of the foregoing, and also all copies of any of the foregoing which differ in any way (including handwritten notations or other written or printed matter of any nature) from the original.