



**Consumers
Power
Company**

Donald B Miller, Jr
Site Manager
Midland Project

Midland Project: PO Box 1963, Midland, MI 48640 • (517) 631-8650

April 14, 1983

50-329
50-330

Mr. J. J. Harrison
Midland Project Section
U.S. Nuclear Regulatory Commission
Region III
799 Roosevelt Road
Glen Ellyn, IL 60137

ATTENTION: Dr. Ross Landsman

MIDLAND ENERGY CENTER GWO 7020
MEETING NOTES FOR APRIL 7, 1983, AND MARCH 7-8, 1983
DISCUSSIONS BETWEEN CPCO AND NRC
File: 0485.21 UFI: 42*05*22*04 Serial: CSC-6661
50*31*01

For your information and use please find the attached meeting notes April 5 and 7, 1983 and March 7-8, 1983, including the associated document submittals provided to NRC personnel on March 15, 1983.

Based on providing the attached documentation of these meetings and submittals, we understand per discussions with R. Landsman on 4/12/83, that the NRC Region III will provide authorization to excavate portions of Pier 8E/W. If you have any questions please contact this office.

DBM/RMW/klm

Attachments

PRINCIPAL STAFF			
RA		ENF	
D/RA		SCS	✓
A/RA		PAO	
OPRP		SLO	
ORMA		AG	
ORNSP			
DE			
ML			
OL			

orig + 3
cover letter

cover letter
only

attachments sent
to SCS.

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Notes of Telecon with NRC on April 5 & 7, 1983.

Subject: Soils Remedial Work, Auxiliary Building Underpinning Design Documents.

Participants:

J. Kane]	Nuclear Regulatory Commission (NRC)
R. Landsman		
S. Poulous (consultant)		
D. Hood*		
W. Kilker *]	Stone & Webster
K. Razdan]	Consumers Power Co (CPCo)
R. Wheeler		
G. Murray		
N. Ramanujam*		
T. Thiruvengadam*		
J. Darby]	Bechtel
M. Lewis		
S. Afifi*		
J. Anderson*		
B. Dhar*		
S. Hunt*		
V. Verma*		

(*Part time)

Purpose: This telecon was a follow-up to the telecon with NRC, on March 7 and 8, 1983. During the March telecon, NRC commented on Appendix-D to specification C-195, dealing with the load test for Pier W11, and Specification C-200, dealing with the Administrative action and corrective measures for underpinning activities. Subsequent to the March telecon, NRC was supplied with proposed revisions to Appendix-D and Specification C-200, based on agreements reached. The purpose of this telecon was to get additional comments from NRC on these documents. The following is a summary of agreements and discussions:

1.0 General:

- a) D. Hood advised that the notes of the telecon on March 7 and 8 should be submitted along with the package of information given to NRC on March 14, CPCo concurred.
- b) D. Hood asked CPCo whether they were going to submit notes of telecon with NRC of January 25, 1983 regarding the FIVP proof load jacking. CPCo indicated that the agreements of that telecon were already documented in D. Miller's letter dated January 27, 1983, to W. Schaffer of Region III. R. Landsman also indicated that the agreements reached in that telecon were covered in his report. It was agreed that no further documentation was necessary.

2.0 Appendix-D to Spec C-195: Testing Procedure for Axial Compressive Load Test of Pier W11.

- a) The following agreements were made regarding additional revisions to Appendix-D:
- 1) Page D-2 Sec 3.1 - Add a new sentence after the fourth sentence of the second paragraph "Care shall be taken to ensure that the antifriction lining does not taper inwards with depth."
 - 2) Page D-4 Sec 5.4.3 - Last sentence of the new paragraph to be revised as "The RGE will require a higher load, not exceeding 600 kips, if needed, based on his evaluation of Carlson stress meter data to ensure that the tip bearing pressure is at least 28.6 k.s.f."
 - 3) Page D-4 Sec 5.4.3 - Add at the end of the first sentence "but not longer than 2 hours".
 - 4) Page D-4 Sec 5.4.4 - Add the following at the beginning of the last sentence "if the short term undrained soil modulus of elasticity determined by RGE from data at bearing pressure of 6.8 to 8.8 k.s.f. is 3000 k.s.f. or more,".
 - 5) Page D-4 Sec 6.1 - Delete "each 20 minutes until 2 hours from start".
 - 6) Page D-5 Sec 6.2 - Revised section as "Carlson stress meters shall be read and recorded at least three times at times determined by RGE such that: one loading is taken near start of the load increment, one reading is taken near the end of the load increment, and one reading is taken in between. RGE may require additional readings to be taken if in his judgement there is variation in the readings".
 - 7) Page D-3 Sec 5.2 - Add a new paragraph after the first paragraph as follows "The specified load for the load test pier is 356 kips corresponding to a nominal bearing pressure of 22 k.s.f.. The nominal bearing pressure at 130% of specified load is 28.6 k.s.f."
 - 8) Page D-5 Sec 6.6 - Change the number for reading and recording from ".001 inch" to ".0005 inch".
 - 9) Page D-7 Sec 8.1 (t) - Insert the word "top and tip" after the word "versus".
 - 10) Page D-7 Sec 8.1 (u) - Insert the word "tip" after "versus".

11) Page D-7 Sec 8.1 (x) - Replace the word "movement" by "measurement".

b) J. Kane requested that NRC be supplied with a copy of drawing C-1445-1 which gives the specified load for Pier W11. (This is not considered necessary by CPCo since the specified load will now be listed in the proposed revision to Section 5.2 (see item a.7) above).

c) The following is a summary of additional discussions for Appendix-D:

- 1) Page D-4 Sec 5.4.4 - In response to an NRC question, CPCo stated that the calculated bearing pressure of 22 k.s.f., corresponding to the specified load for Pier W11, is at least equal to or greater than the maximum design bearing pressure for any other underpinning pier and the permanent wall.
- 2) Page D-6 Sec 7.2 - NRC concurred with the adequacy of 20 feet. NRC also indicated that the drifts for Piers E/W-8 could be approved. However, NRC indicated that they would like to review the information on the load-settlement data from the initial jacking of Piers E/W-12 and E/W-9 before approving the excavation and remaining work for Piers E/W-8. This information was transmitted to NRC and a copy is attached to these meeting notes.

2.0 Spec C-200: Administrative action and corrective measures for underpinning activities.

a) The following revisions were agreed for Spec C-200, SCN 13001.

- 1) Page 2 of 7, revised Sec 5.2 - First sentence, replace "(strain for SWPS only)" by "(strain not applicable for Aux Building)".
- 2) Page 3 of 7, revised Sec 5.3 - First sentence, replace "(strain for SWPS only)" by "(strain not applicable for Aux Building)".
- 3) Page 3 of 7, revised Sec 5.3 - Add a sentence after the first sentence "The RSE shall identify whether it is a category 1 event" and add at the beginning of the second sentence, "in case it is not a category 1 event,".
- 4) Appendixes B, C & D - Replace "Exhibit E" by "Appendix E" where reference has been made to the former.
- 5) Appendixes B, C & D - Replace the box "Take Emergency Action" by "Take Emergency Action per Appendix E or other appropriate measures".

b) The following is a summary of other discussions about the drawings referenced in Spec. C-200:

- 1) NRC indicated that the Drawing C-2039 (Rev. 0) specified alert and action levels for strain of .001 and .002 respectively instead of the values of .0007 and .0014 specified in the SSER (Supplement No. 2). (Subsequently, CPCo reviewed this item and found that the new Revision 1 of this drawing, dated 3/21/83, had the correct values per the SSER).
- 2) NRC indicated that Δ_1 values for Phase IV, shown in Draw-C-1493, were not consistent with the values given in Table 2-7 of SSER Supplement No. 2. CPCo replied that the alert value for Δ_1 for Phase IV on the drawing C-1493 is 0.25" and is consistent with the value given in the attachment to the meeting notes of the July 27-30, 1982 design audit issued by D. Hood. These were the agreed values during the audit. SSER Supplement 2 gives a value of 0.2". It seems that the SSER should be revised. NRC stated that they will get back to CPCo on this item after their review.

3.0 Attachments:

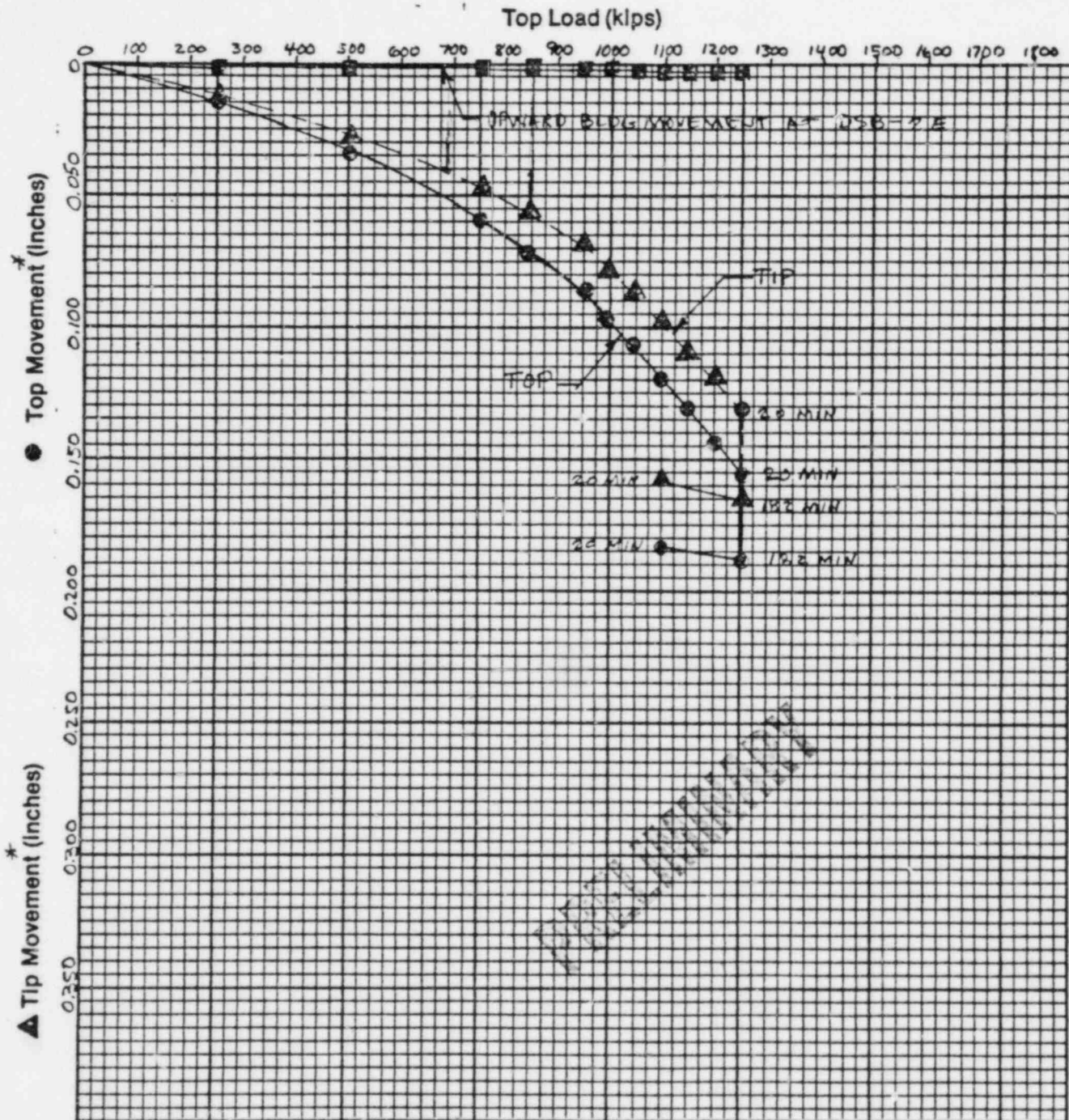
- a) Pier Load Test Data - Top Load versus settlement for Piers E12, W9, E9, W12 (4 sheets).
- b) Plot of bearing pressure vs tip deflection, composite curve for Piers E/W-9 & E/W-12.

K. Razdan
4/13/83

PIER LOAD TEST DATA - TOP LOAD VERSUS SETTLEMENT

Project MIDLAND UNITS 1 AND 2
 Location MIDLAND, MICHIGAN
 Owner CONSUMERS POWER COMPANY
 Engineer BECHTEL - ANN ARBOR, MICHIGAN

Pier No. E 12 **
 Date 3-18-83
 Drawn By SW HUNT
 Job No. 7220



7220-359 3/83

* RELATIVE TO BLDG SLAB

ALL MOVEMENTS BASED ON 10 TO 20 MIN. READINGS EXCEPT AS NOTED

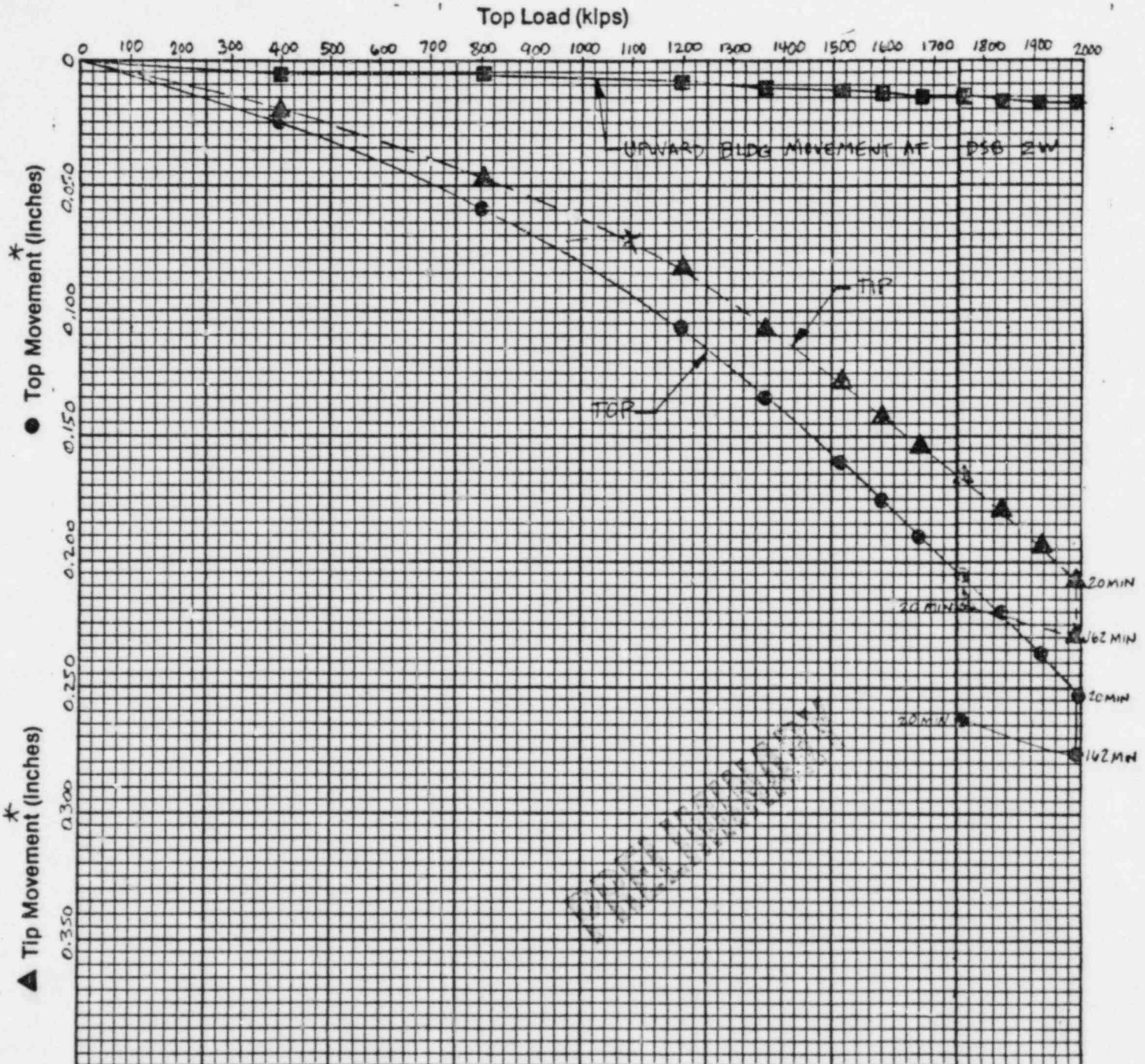
** SHAFT : 3'x6' TOP OF SHAFT (PIER) ELEV: 604.5'
 BASE OF BELL: 8'x12' TOP OF BELL ELEV: 572.8'
 BASE (TIP) OF BELL ELEV: 545.0'

96 x 7
 672
 164.5

PIER LOAD TEST DATA - TOP LOAD VERSUS SETTLEMENT

Project MIDLAND UNITS 1 AND 2
 Location MIDLAND, MICHIGAN
 Owner CONSUMERS POWER COMPANY
 Engineer BECHTEL - ANN ARBOR, MICHIGAN

Pier No. W-9 **
 Date 4-5-83
 Drawn By S.W. HUNT
 Job No. 7220



7220-359 3/83 * RELATIVE TO BLDG SLAB

ALL PLOTTED MOVEMENTS BASED ON 10 TO 20 MIN. READINGS EXCEPT AS NOTED

** SHAFT : 3' X 6'

BASE OF BELL : 10' X 11'

TOP OF SHAFT (PIER) ELEV: 604.5'

TOP OF BELL ELEV: 572.6'

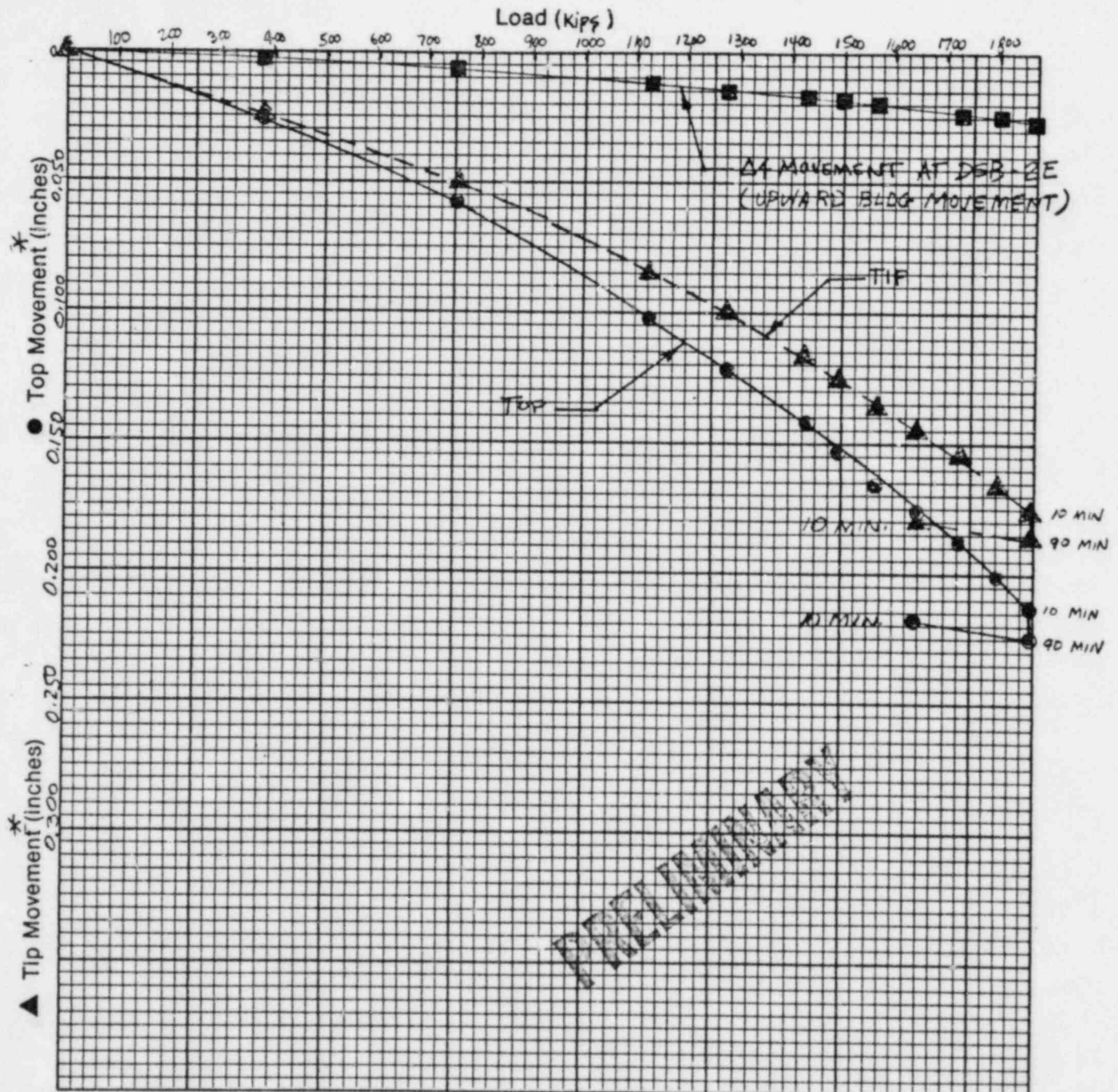
BASE (TIP) OF BELL ELEV: 565.0'

16.9
100

PIER LOAD TEST DATA - LOAD VERSUS SETTLEMENT

Project MIDLAND UNITS 1 AND 2
 Location MIDLAND, MICHIGAN
 Owner CONSUMERS POWER COMPANY
 Engineer BECHTEL - ANN ARBOR, MICHIGAN

Pier No. E-9**
 Date 4-4-83
 Drawn By SW HUNT
 Job No. 7220



7220-359 6/82 * RELATIVE TO BLDG SLAB

ALL PLOTTED MOVEMENTS BASED ON 10 TO 20 MIN. READINGS EXCEPT AS NOTED

** SHAFT: 3' X 6'

BASE OF BELL 10' X 11'

TOP OF SHAFT (PIER) ELEV: 604.5'

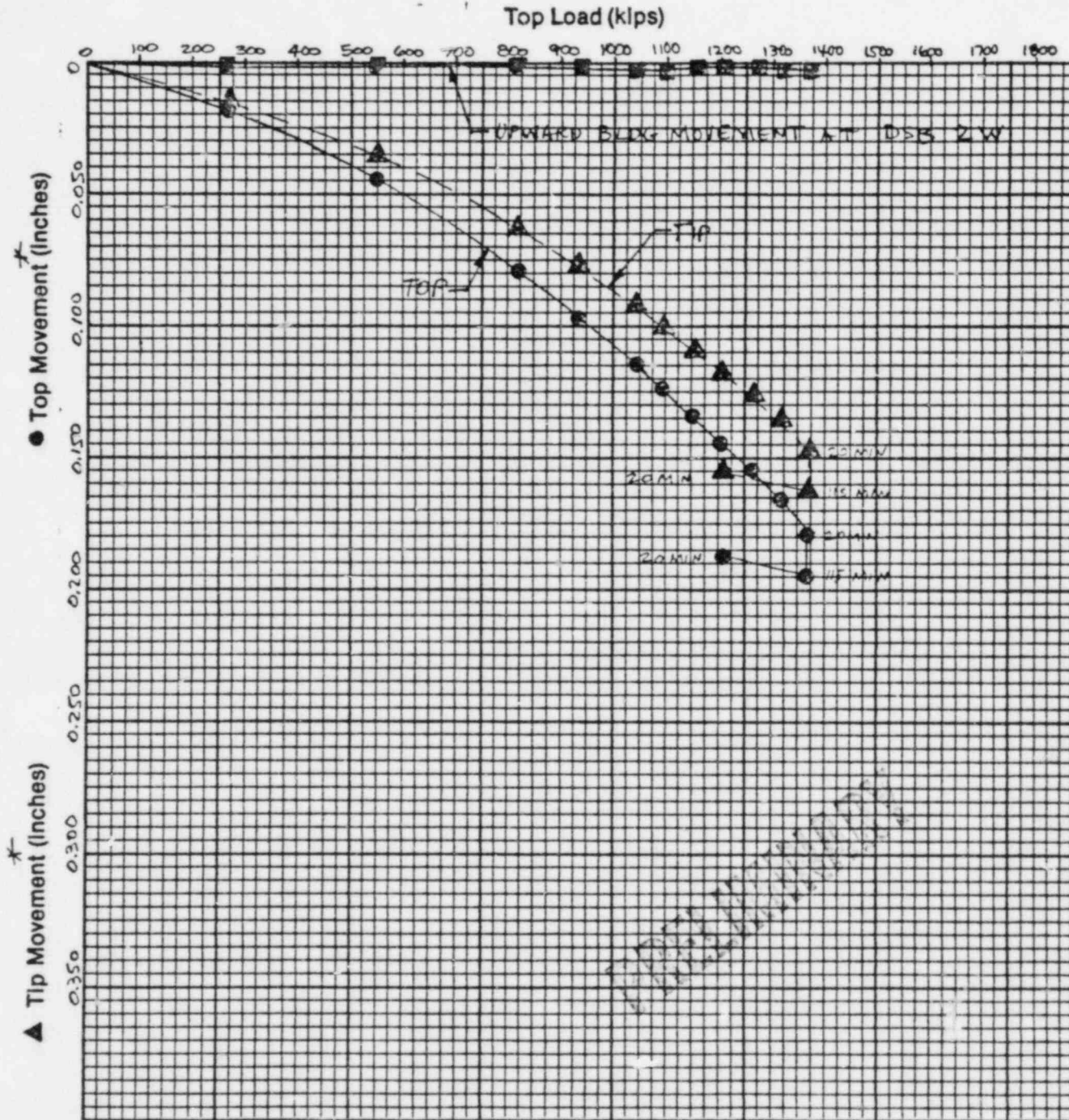
TOP OF BELL ELEV: 572.9'

BASE (TIP) OF BELL ELEV: 565.1'

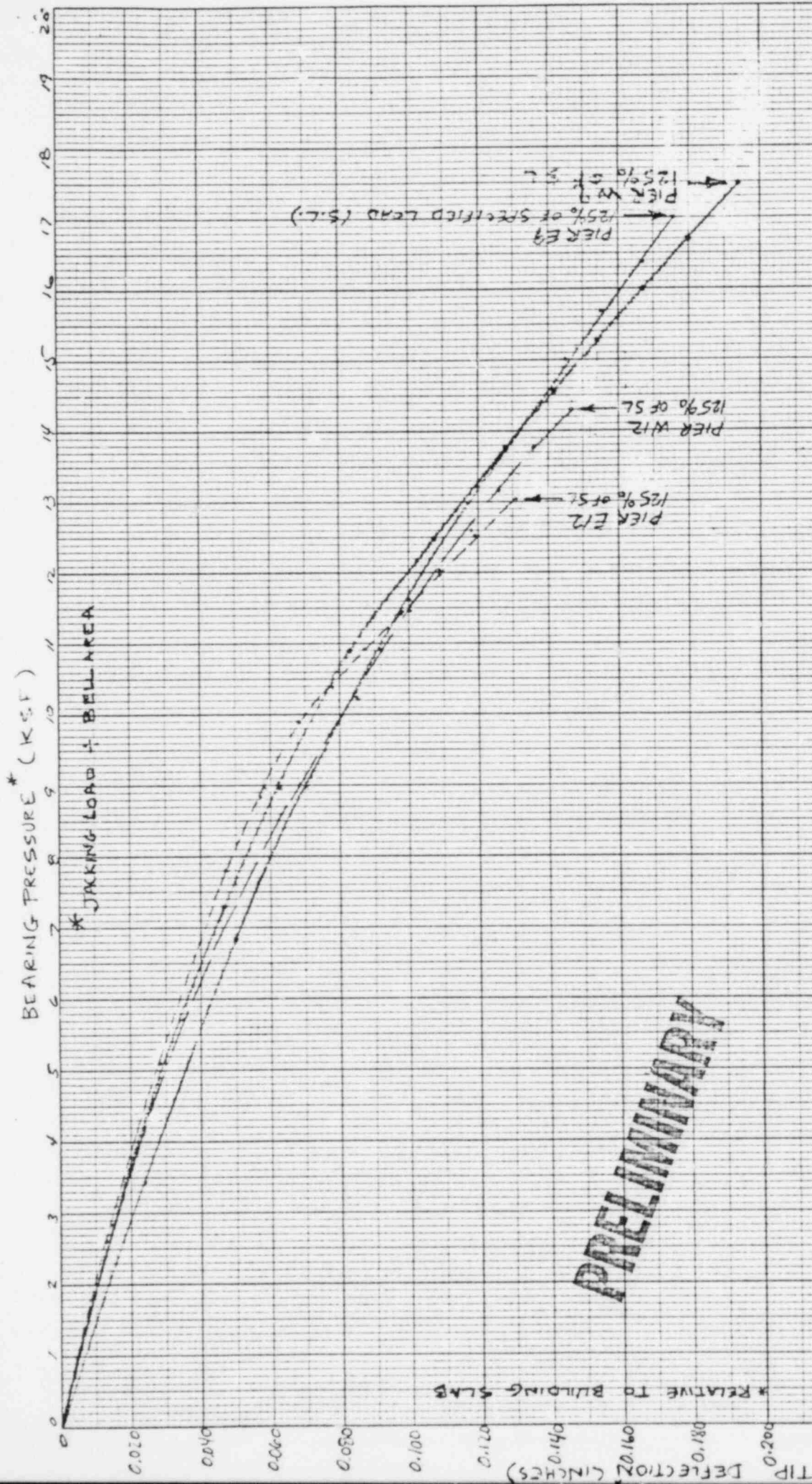
PIER LOAD TEST DATA - TOP LOAD VERSUS SETTLEMENT

Project	MIDLAND UNITS 1 AND 2
Location	MIDLAND, MICHIGAN
Owner	CONSUMERS POWER COMPANY
Engineer	BECHTEL - ANN ARBOR, MICHIGAN

Pier No. W-12 **
Date 3-11-83
Drawn By SW HUNT
Job No. 7220



7220-359 3/83 * RELATIVE TO BLDG SLAB
ALL PLOTTED MOVEMENTS BASED ON 10 TO 20 MIN READINGS
EXCEPT AS NOTED
** SHAFT: 3'X6' TOP OF SHAFT (PIER) ELEV: 604.5'
BASE OF BELL: 8'X12' TOP OF BELL ELEV: 573.1'
BASE (TIP) OF BELL ELEV: 565.1'



PRELIMINARY

NOTES:

PLOTTED DATA BASED ON 10 TO 20
MINUTE READINGS

BELL AREAS:

$$E/W 9 (10' \times 11') = 110 \text{ FT}^2$$

$$E/W 12 (8' \times 12') = 96 \text{ FT}^2$$

MIDLAND UNITS 1 AND 2

CONSUMERS POWER CO.

BECHTEL JOB 7220

PREPARED BY S.W. HUNT 4-6-83

Notes of Telephone Conversation with NRC, on March 7 & 8, 1983.

Subject: Soils Remedial Work

Attendees:

J. Kane]	Nuclear Regulatory Commission (NRC)
R. Landsman		
S. Poulous (consultant)		
D. Hood*		
K. Razdan]	Consumers Power Company (CPCo)
R. Wheeler*		
R. Wieland		
G. Murray*		
D. Sibbald*		
N. Ramanujam*		
S. Hunt]	Bechtel
J. Anderson		
B. Dhar*		
J. DasGupta*		
M. Lewis*		
(*Part time)		

Purpose: The purpose of this telecon was to discuss with NRC, the following:

- 1) Auxiliary Building Pier Load Test Procedure.
- 2) Specification C-200, dealing with Administrative Action and corrective measures for underpinning.
- 3) Construction Dewatering in the Service Water Pump Structure (SWPS) area.
- 4) Deep Probing for Utilities in the SWPS area.
- 5) Procedure for Dutch Cone for observation well number 4.

In addition, R. Landsman wanted to discuss the construction sequence which was presented by CPCo to NRC Region III in a meeting at Midland Plant Site on March 3, 1983. Also J. Kane wanted to discuss the penetrometer readings from Piers 12 East & West.

The following is a summary of the discussions and the agreements:

- 1) Auxiliary Building Pier Load Test:
 - a) NRC provided comments on Appendix-D to Specification C-195, Testing Procedure for Axial Compressive Load Test of Pier W11. These comments were then discussed. It was agreed that CPCo would provide NRC with a marked-up copy of this Appendix with the agreed changes. This would allow NRC to review the proposed revisions. Subsequent to this meeting, NRC was provided with proposed revisions to Appendix-D (attached) on January 15, 1982. It should be noted that the mark-up includes additional minor proposed revisions besides those based on NRC comments.

- b) CPCo agreed that two additional carlson stress meters, one at top and the other at bottom, will be provided for Pier W11. It was also agreed that the lower carlson meters will be located as close to the Pier bottom as practical.
 - c) NRC questioned the basis of the 20 feet exclusion zone in Sec 7.2 of Appendix-D. It was pointed to NRC that no work on drifts or piers would be done in this zone while Pier W11 was being load tested. After discussions, it was agreed that NRC would be provided with a marked-up drawing showing the exclusion zone. Further discussions would then be held between CPCo and NRC as to which other work can be permitted concurrently with the load test. NRC was provided with marked-up prints of drawings C-1417 (plan) and C-1417-1 (elevation), showing the exclusion zone, on January 15, 1982. A copy of these drawings is attached to these meeting notes.
 - d) NRC asked CPCo as to how long it would take them to evaluate the test results after the load test is completed. CPCo indicated that it was planned to have the engineers available at the site for evaluating the load test data. CPCo would be prepared to discuss the load test data and its evaluation with NRC during their site visit at the time of the load test. NRC concurred to review the evaluation at site.
 - e) NRC asked with reference to Sec 5.5 page D-4 of Appendix-D, as to which Deep Seated Bench March (DSB) would be read for the upward movement criteria while Pier W11 is being jacked. It was pointed to them that DSB-2W would be the applicable bench mark.
 - f) NRC asked about the minimum compressive strength required for the pier concrete before it could be jacked. It was pointed that 2000 p.s.i. is required and that the approximate bearing pressure under the bearing plates under the jacks was 275 p.s.i. NRC was satisfied that the concrete strength was adequate.
 - g) NRC requested a copy of Specification C-195 for reference. This was subsequently provided.
- 2) Specification C-200, dealing with Administrative Action and Corrective Measures for Underpinning:

NRC provided comments on Revision 1 of this specification. These comments were discussed and agreements were reached as to their resolution. It was agreed that based on these agreements a Specification Change Notice (SCN) be issued for this specification so that the changes can be implemented at the site, and a copy of the SCN be provided to NRC for their review. If NRC had any further comments they could then be incorporated in another revision to the specification. CPCo provided a copy of SCN 13001 to Specification C-200, dated 3/11/83, to NRC on 3/15/83. A copy of this SCN is also attached to these meeting notes.

3) Construction Dewatering in the SWPS Area:

CPCo asked permission for the drilling of wells numbering approximately 130. NRC indicated that they would give permission to drill 6 preliminary wells of continuous soil sampling to confirm the elevation of the sand layer. After the drilling of these wells, discussions would be held with NRC and they would then give permission to proceed with the remaining wells.

4) Deep Probing for Utilities in the SWPS Area:

CPCo explained the proposed procedure, using jetting, for deep utility probing in the SWPS area. In reply to an NRC question, CPCo stated that there were approximately 16 deep probe holes in the area of soil which was not to be replaced and the remaining probe holes would be in the area where soil is planned to be replaced. NRC indicated that they would give permission for the deep probing inside the area where soil is to be replaced. CPCo would then discuss with NRC the records of the first 5 or 6 probe holes i.e. the rate of penetration, range, material type etc. Based on this record, NRC would make a judgement whether this method of drilling would be allowed for the remaining probe holes in the area where the soil is not to be excavated and replaced.

5) Dutch Cone Penetration Test for Observation Well (OBS) number 4:

NRC provided comments on Specification C-113, static cone penetrometer tests (cone soundings). After discussion of NRC comments it was agreed that the refusal rate, referenced in Sec 7.5 of the specification, would be reduced to a range 40 to 90 kilonewtons and the value would be determined by the Project Geotechnical Engineer (PGE). NRC indicated that with this change they would approve this work. (Subsequently Sec 7.5 of the specification has been revised, with SCN13001, as follows "Refusal shall be defined as a maximum gauge pressure between 200 and 460 Kgf/cm² (thrust of 39kn to 90kn) as determined by PGE).

6) Auxiliary Building Underpinning Construction Sequence:

R. Landsman made comments regarding a 3/3/83 meeting, which he attended at the plant site, between CPCo and NRC Region III, where CPCo explained the construction schedule. The following is a summary of discussions which followed R. Landsman's comments:

- a) R. Landsman pointed out that the schedule showed that Pier W10 would be started before completion of the Pier W11 load test. CPCo indicated that there was a slight error in the information presented to him. In reality, Pier 10 would be restrained by the completion of the load test.
- b) R. Landsman informed NRR that the construction schedule showed that CPCo was planning to use the Utility Access Tunnel (UAT) for approaching the CT Piers. NRR indicated that any significant changes should be discussed with them before proceeding. CPCo pointed that NRC was notified about the proposed change at the site during the March 3 meeting, and CPCo also mentioned at the meeting that they were available for technical discussions with NRC. S. Poulous indicated that this change was an improvement in the design. It was agreed that sketches of the UAT scheme would be supplied to NRC. Subsequently on March 15, prints of drawings SK-C-856, SK-C-857 and SK-C-865 showing the sequence and details for the UAT scheme were provided to NRC. A copy of these drawings is attached to these meeting notes.

- c) NRC asked whether there were any other proposed changes which were significant. CPCo indicated that there was one other change regarding the top level bracing of the temporary underpinning piers (W Piers) adjacent to the electrical penetration area. Previously it was intended to brace the top level against the containment. Because of the interference with the containment structural integrity test, it is now proposed to brace the top portion of these piers against the Turbine Building Mat. This is termed as the Tie Back scheme. CPCo indicated that this change was also reflected in the construction schedule presented to NRC Region III on March 3. NRC asked that they be provided with sketches of this scheme for their review. Subsequently on March 15, CPCo provided NRC with sketches SK-C-839 and SK-C-840. Copies of these sketches are attached to these meeting notes.
- d) NRC emphasized that any significant future changes to underpinning from the SSER supplement 2 should be discussed with them. CPCo indicated that they understand the requirements and intend to do so.

7) Penetrometer Data for Piers E/W-12:

NRC asked about the average values obtained from the cone penetrometer readings for Piers E/W-12. M. Lewis indicated that an average value of 6.5 to 7.0 k.s.f. for the shear strength was obtained. It was agreed that this value seemed reasonable with respect to the design assumptions.

J. Kane was interested in the actual data from the cone penetrometer readings for his information. M. Lewis provided these values over the telephone on 3/9/83. These values are attached.

8) Miscellaneous:

J. Kane asked for copies of the following drawings to enable NRC to prepare for their forthcoming site visit at the time of the load test:

C-1417, C-1492, C-1492-1, C-1490, C-1491, C-1492, C-1493, C-1493-1, C-1495, C-2003, C-2004, C-2039, C-2039-1, C-2039-2, C-2039-3

These drawings were subsequently sent.

9) Attachments:

- a) Proposed Revision to Appendix-D, Spec C-195, Testing Procedure for Axial Compressive load test of Pier W11.
- b) Marked-up prints of drawings C-1417 and C-1417-1, showing 20 feet exclusion zone during the load test.
- c) SCN 13001 to Specification C-200 Revision 1.
- d) Sketches SK-C-856, SK-C-857 and SK-C-865, showing the sequence and details for the UAT scheme.
- e) Sketches SK-C-839 and SK-C-840, showing the proposed Tie Back scheme.
- f) Cone Penetrometer data for Piers E/W-12. (3 sheets)

TESTING PROCEDURE
FOR

Proposed Revision
to Appendix - D

AXIAL COMPRESSIVE LOAD TEST OF PIERS WITH

3/14/83

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EXHIBITS

A-1	Pier Load Test Data Form
A-2	Pier Load Test Data - Carlson Loads Form
B-1	Top Load Versus Settlement Form
B-2	Tip Load Versus Settlement Form
C	Settlement Versus Time Form
D	Pier Load Test Data/Set Up Form
E	Load by Carlson Versus Load by Jacks

APPENDIX D

TESTING PROCEDURE

FOR

AXIAL COMPRESSIVE LOAD TEST OF PIERS W 11

1.0 SCOPE

1.1 GENERAL

This procedure describes the specific requirements for the engineering, materials, and services required for construction of test pier and for performance of incremental axial compressive load test on the designated pier.

This procedure supplements Specification 7220-C-195(Q) by augmenting the unique requirements for construction of the test piers and monitoring of the test load.

- 1.2 The tests will be performed under the direction of the resident geotechnical engineer (RGE) or his designated representative and it will be his responsibility to have all test data properly documented.

In addition to the RGE's documentation of pier test data, Subcontractor shall document the pier proof load test data and pier acceptance records, as in the case of any other pier.

- ~~1.3 For the planned compressive load test at pier W11, the specified load is 400 kips and the proof test load is 520 kips, resulting in a proof test bearing pressure of 31.5 ksf.~~

2.0 EXCAVATION REQUIREMENTS FOR SOIL, SOIL SAMPLING, AND TESTING

- 2.1 Two density tests of the pier subgrade soil shall be performed (by Contractor's testing agency) by either of the following two methods as directed by the RGE:

- 2.1.1 Two volumetric density tests shall be performed at the level of approved

subgrade of the pier in accordance with ASTM D-1556.

- 2.1.2 Between 1 and 1-1/2 feet above the minimum pier tip elevation shown in Design Drawing 7220-C-1417-1(Q), two 10-inch cube samples shall be obtained for density tests in accordance with USBR Earth Manual E-2.
- 2.2 In addition to density ^{bearing} tests, a minimum of six cone penetrometer tests shall be performed by the RGE for the pier, ^{acceptance.} subgrade, ~~soils evaluation.~~

3.0 PIER INSTALLATION REQUIREMENTS

- 3.1 A special antifriction lining shall be constructed inside the pier lagging in accordance with Subcontractor's approved procedures.

The antifriction lining shall be installed from the elevation of the bottom of the shaft to the access drift floor (or approach pit) elevation. The lining construction shall be either of the following two options or as modified in Subcontractor's approved procedure.

Option A - Attach a 1/2-inch thick ^(minimum) plywood lining to the lagging. Coat with grease or tar as required to attach an inner lining of 1/4-inch thick asphaltic fiberboard such as Celotex. The inner lining joints shall be taped to prevent concrete contact with the outer lining.

Option B - Attach a 1/2-inch thick ^(minimum) plywood lining to the lagging. Completely cover with a layer of grease or tar. Attach an inner lining of 1/4-inch thick plywood. The inner lining joints shall be taped to prevent concrete contact with the outer lining.

- 3.2 The lagging and support for the designated test pier shall be constructed to allow for the antifriction lining such that the minimum pier concrete dimensions shown on the design drawings or the concrete dimensions as modified in Subcontractor's approved procedures are met.



4.0 PIER INSTRUMENTATION REQUIREMENTS

- 4.1 Axial deflection measurements will be obtained from the upper and lower telltale dials described in Specification 7220-C-195(Q) and shown in Drawings 7220-C-1492(Q) and C-1492-1(Q).
- 4.2 Lateral deflection measurements will be obtained by marking the initial dial stem locations on the reaction plates and by measuring changes in the dial stem positions. Lateral movements greater than 1/8 inch will be recorded and noted on the data records prior to applying subsequent load increments.

5.0 LOADING REQUIREMENTS

- 5.1 The pier load testing shall not begin until the prerequisites specified in Section 6.3.9 of Specification 7220-C-195(Q) have been ^{Load in} verified and the RGE has approved the test setup. (and if directed by RGE, additional increments not exceeding 5% and decrements not exceeding 10%)
- 5.2 Jack loading of test pier shall be performed at the following incremental sequence unless otherwise directed by the RGE or his designated representative: 5, 25, 50, 40, 30, 20, 10, 20, 30, 40, 50, 65, 80, 90, 100, 105, 110, 115, 120, 125, 130, 120, and 110% of the specified load shown in Drawing 7220-C-~~1419(Q)~~. ^{1445-1(Q).}
- Each increment load shall be maintained for the duration specified in Section 5.4.
- 5.3 Calculated gage pressures for the pier load testing shall be determined by combining the individual jack calibration data; ~~whether or not the jacks have met a 2% calibration check.~~
- 5.4 Load increment ^{and decrement} duration shall be the following ^{unless otherwise} directed by the RGE. ^{and 5.4.4}
- 5.4.1 Load increments, except as specified in Sections 5.4.2, and 5.4.3, shall be held until the rate of pier top settlement is less than 0.005 inch in 30 minutes, but not longer than 2 hours.
- 5.4.2 In the unloading/reloading cycle, the decrements at 40, 30, 20, and 10% and increments at 20, 30, 40, and 50% shall



The proof test load at 130% of specified load or higher load, if directed by the RGE, shall be held until the rate of pier top settlement relative to the supported structure is less than 0.005 inch per 1 hour period. The RGE may require a higher jacking load not exceeding 600 kips, to ensure that a tip bearing pressure is at least 28.6 ksf based on his evaluation of Carlson stress meter data.

at least
be held for 20 minutes. During this loading cycle, it is not required to meet any settlement criterion before proceeding to the next decrement or increment load.

- 5.4.3 The 100 and ~~130%~~ increment load shall be held until the rate of pier top settlement is less than 0.005 in 1 hour.

Wedges shall be handtight ^{higher} for snugfit at 110% of load, and shall not be readjusted with ~~further~~ increments. ~~to 130%~~

NEW PARAGRAPH

- 5.4.4 When the acceptance criterion for pier top settlement at the ~~130%~~ increment, ^{proof test} load is achieved, (less than 0.005 inch in 1 hour) the jacking load shall be reduced to 110% of the specified load.

The 110% load ^{will be} maintained on active jacks with wedges handtightened for a snug fit. The construction activities in the vicinity of test pier shall then resume as directed by the RGE.

- 5.4.5 ^{After} Acceptance of pier at 110% of the specified load, locking off the loads, and maintenance of jacking loads on the pier shall be in accordance with respective sections of Specification 7220-C-195(Q).

- 5.5 If at any time during loading of the test pier there is an upward movement of the existing structure in excess of 0.03 inch at the designated monitoring point, further jacking operation shall follow the procedure specified in Section 6.3.10.f of Specification 7220-C-195(Q).

6.0 LOAD TEST MONITORING REQUIREMENTS

- 6.1 Unless otherwise directed by the RGE, pressure gages and upper and lower tell-tale dial indicators shall be read and recorded ~~until the loading duration requirements~~ ^{and decrement} for each increment ^{are met} at the following minimum times from the start of jacking: 0 (just prior to start of jacking), 5, ~~10~~, 20, 30, 40, 50, 60, ~~70~~, 80, 100, 120 minutes, and each 20 minutes ~~beyond 120 minutes~~.
Until 2 hours from start, each 1 hour until 10 hours from start, and then each 2 hours until the increment duration requirements are met.

The decrements will be held for at least 20 minutes with no additional acceptance criteria.

Until the acceptance criterion specified in Section 6.3.10.d of Spec. C-195(Q) is met. At this time the pier load test shall be considered complete

- 6.2 Carlson stress meters shall be read and recorded ^{and decrement as directed by the RGE.} at least twice per load increment. ~~first reading at approximately 10 minutes after load increment has been applied and second reading within approximately 10 minutes prior to changing the load increment.~~
- 6.3 Building movement Δ 4 and other building instrument data shall be recorded ^{at least} once each increment load, as specified in Drawing 7220-C-1493(Q).
- 6.4 To the extent possible, ^{master pressure gage and telltale dial gage} readings shall be taken simultaneously and recorded along with the clock times on the ^{average} instrumentation data forms. ~~(Wise Janney's)~~. The RGE shall complete the attached sample data form (Exhibit A) to consolidate the instrumentation and pressure data into a common form. Instrumentation data shall be made available to Subcontractor for its records, as specified in Section 6.3.8 of Specification 7220-C-195(Q).
- 6.5 All dial indicators, reference points, and pressure gages shall be clearly identified with a reference number or letter to assist in recording data accurately.
- 6.6 Dial readings shall be ^{the nearest} ~~interpolated~~ ^{read} and recorded to 0.0001 inch and averaged to the nearest 0.001 inch when computing movements. Master pressure gages shall be recorded to the nearest 25 psi. Carlson stress meter readings shall be recorded to the nearest 10 psi.
- 6.7 Notes and observations shall be recorded on the ^{applicable} data forms and shall include, but shall not be limited to, the following: description and explanation of adjustments made to instrumentation or field data or both; notation of any unusual occurrences during testing; detectable lateral movement of the pier and direction; and any other pertinent observations related to the performance of the test. (including weight of pier)
- 6.8 Plots of (a) ^{top} load versus average ^{tip and average} top settlement, (b) ^{tip} load versus average tip settlement, and (c) settlement versus time will be maintained by the RGE to monitor the progress of the test. ^{sample} forms for these plots are attached (Exhibits B_A^C and E_A^F).

indicated

The RGE will plot average top load and average tip load by Carlson Stress meters versus jacking load. These plots and other pier instrument data will be used to evaluate the transfer of load from tip of pier to tip.

and (d) average top load and average tip load indicated by Carlson stress meter versus jacking load

7.0 OTHER UNDERPINNING ACTIVITIES - RESTRICTIONS

- 7.1 Jacking other than to maintain specified loads shall not be allowed at any other piers within 100 feet of the test pier during the test.
- 7.2 Excavating shall not be allowed within 20 feet of the test pier during the test.
- 7.3 Other construction activities which cause vibrations or which may disturb the test pier instrumentation shall not be allowed as determined by the RGE during the test.
- 7.4 All operations in connection with pier load testing shall be carried out in such a manner so as to avoid personnel exposure to hazards.

Only authorized personnel shall be permitted within the immediate test area.

8.0 FIELD LOAD TEST REPORT

- 8.1 A field load test report will be prepared by the RGE. As a minimum, it shall include the following information:
 - a. Project identification
 - b. Project location
 - c. Test pier location and designation
 - d. Name of the RGE or his designated representative(s)
 - e. Log and description of excavation and soil testing
 - f. Cone penetrometer, ~~results and~~ density, and other test results
 - g. Brief description and sketch of Carlson stress meter installation, and ~~tailtale~~ installation
 - h. Description ^{and sketch} of antifriction lining
 - i. As-built pier dimensions ^(as a minimum at top, tip and quarter points) and sketch
 - j. Date ^{pier} concreted and concrete cylinder test results and date mudmat poured and thickness

Specification 7220-C-195(Q), Rev 1
Appendix D

- k. Surveyed pier tip elevation and top elevation
- l. List of related drawings indicating pier rebar, instrumentation details, etc
- m. Date tested
- n. Brief description and sketch of load application apparatus, including jack capacities, jack arrangement, pressure gage arrangement, and arrangement of pump. A sample of the form to be used is attached (Exhibit D).
- o. Identification, location sketch, and description of all gages and reference points
- p. Certification and calibration reports of jacks and gages
- q. Tabulation of all time, load, stress, and movement readings
- r. Notes and observations recorded during testing, including any unusual occurrences and deviations from test procedures
- s. Temperature and environmental conditions during the test
- t. Plot of top load versus movement ✓
- u. Plot of tip load versus settlement
- v. Plots of top and tip settlement versus time
- w. Plot of top and tip load ^{indicated} by Carlson ^{stress meters} versus jacking load
- x. Groundwater levels and basis of ~~movement~~ ^{measurements}
- y. Determination of soil modulus and basis (calculations)

PIER LOAD TEST DATA - MOVEMENTS
(See Sheet No. _____ for Plan)
(See Sheet No. _____ for Notes)

Project MIDLAND UNITS 1 AND 2
Location MIDLAND, MICHIGAN
Owner CONSUMERS POWER COMPANY
Engineer BECHTEL - ANN ARBOR, MICH, JOB NO. 7220

[illegible]

PIER LOAD TEST DATA - CARLSON LOADS

(See Sheet No. _____ for Plan)

(See Sheet No. _____ for Notes)

Project MIDLAND UNITS 1 AND 2

Location MIDLAND, MICHIGAN

Owner CONSUMERS POWER COMPANY

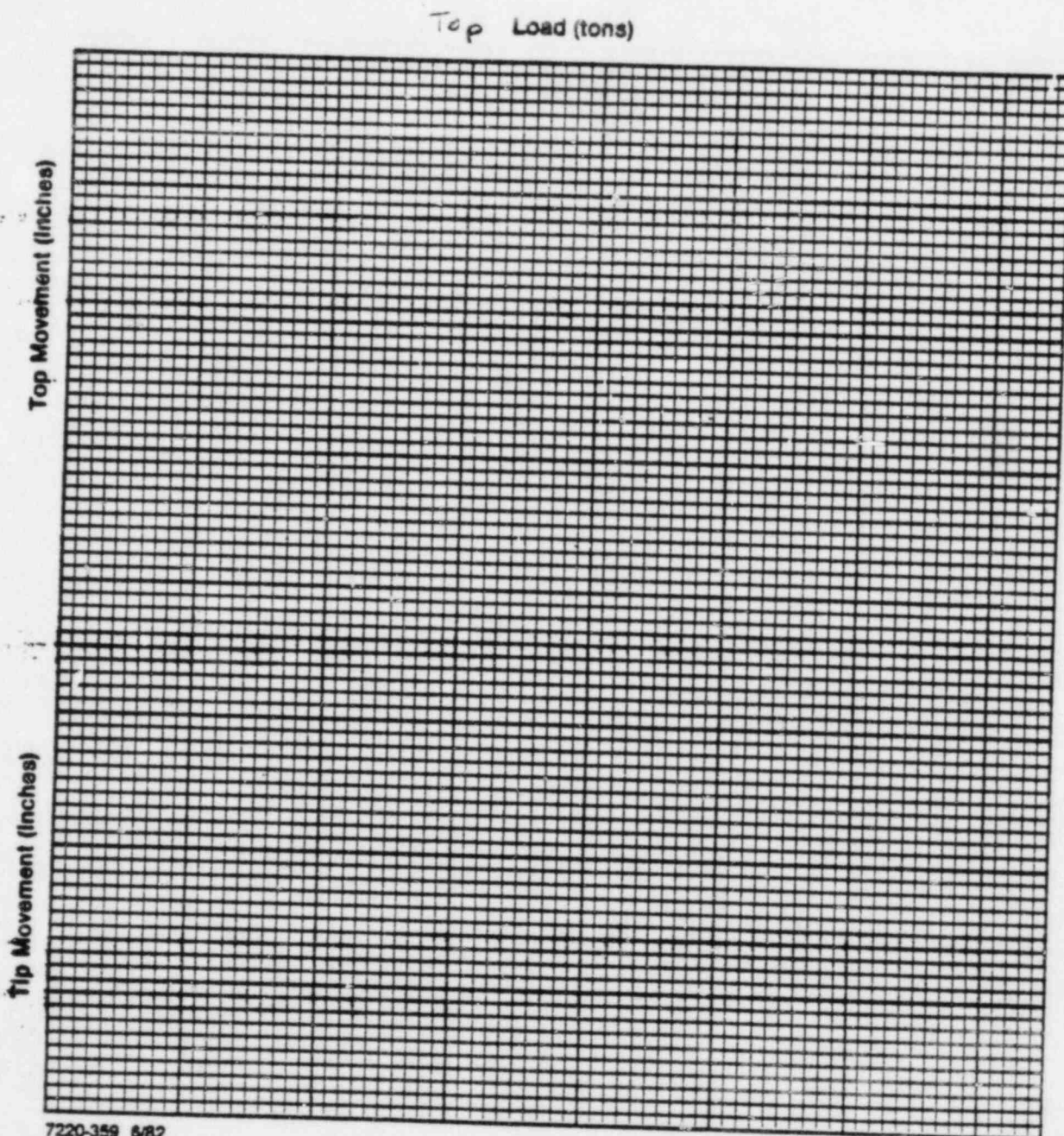
Engineer BECHTEL - ANN ARBOR, MICH. JOB NO. 7220

[illegible]

PIER LOAD TEST DATA ^{TOP} LOAD VERSUS SETTLEMENT

Project MIDLAND UNITS 1 AND 2
Location MIDLAND, MICHIGAN
Owner CONSUMERS POWER COMPANY
Engineer BECHTEL - ANN ARBOR, MICHIGAN

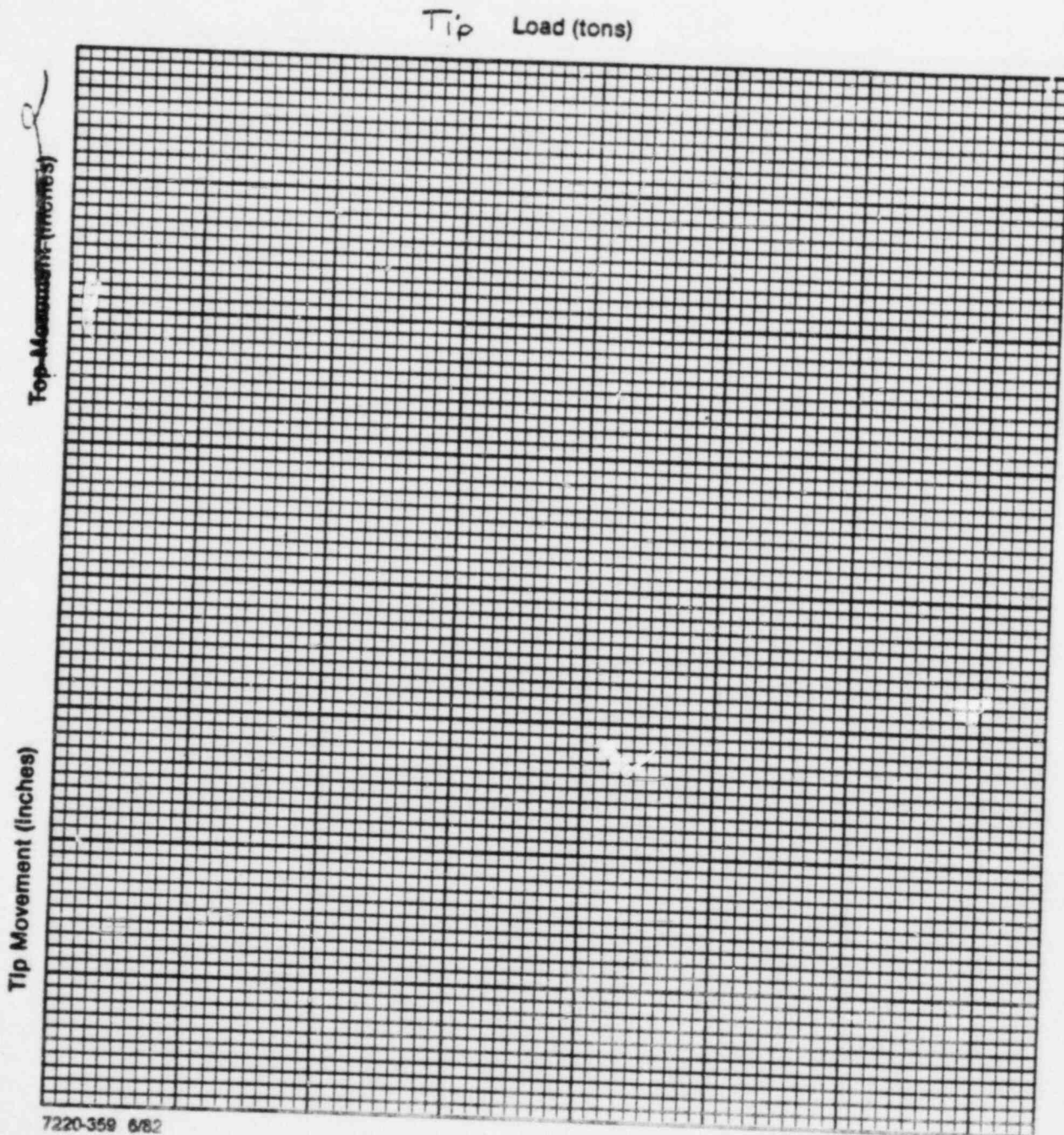
Pier No. _____
Date _____
Drawn By _____
Job No. 7220



PIER LOAD TEST DATA ^{TIP} LOAD VERSUS SETTLEMENT

Project MIDLAND UNITS 1 AND 2
Location MIDLAND, MICHIGAN
Owner CONSUMERS POWER COMPANY
Engineer BECHTEL - ANN ARBOR, MICHIGAN

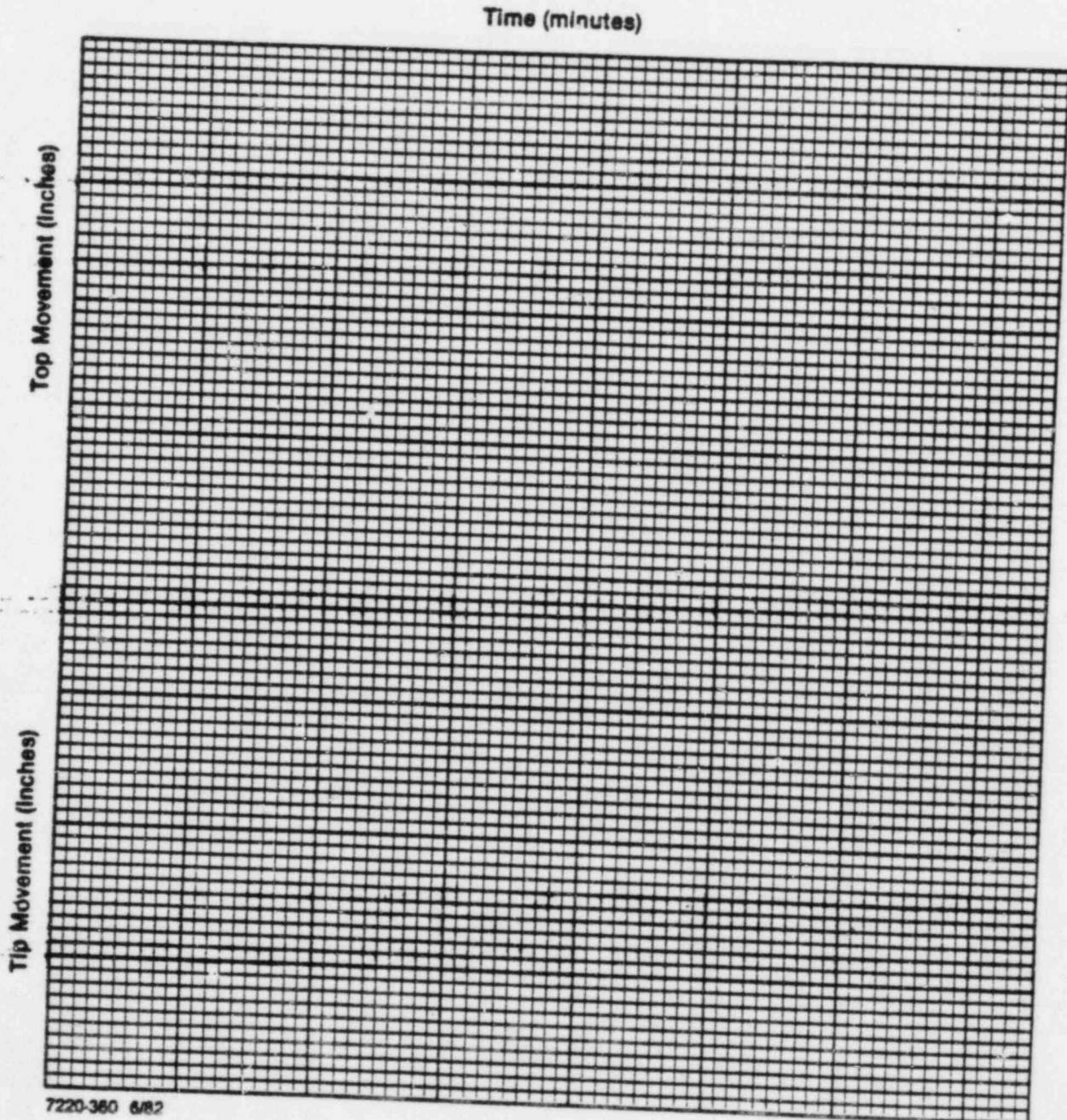
Pier No. _____
Date _____
Drawn By _____
Job No. 7220



PIER LOAD TEST DATA - SETTLEMENT VERSUS TIME

Project MIDLAND UNITS 1 AND 2
Location MIDLAND, MICHIGAN
Owner CONSUMERS POWER COMPANY
Engineer BECHTEL - ANN ARBOR, MICHIGAN

Pier No. _____
Date _____
Drawn By _____
Job No. 7220



PIER LOAD TEST DATA/SETUP

Project	MIDLAND UNITS 1 AND 2
Location	MIDLAND, MICHIGAN
Owner	CONSUMERS POWER COMPANY
Engineer	BECHTEL - ANN ARBOR, MICHIGAN JOB NO. 7220

Sheet	_____ of _____
Date	_____
Pier No.	_____
By	_____
Weather	_____
Temp	_____ °F

Calibration

Hydraulic Jack/Gage Certification - See Sheets:	_____
Jack Serial Numbers:	_____
Gage Serial Numbers:	_____
Spherical Bearing Numbers:	_____
Stress Meter Serial Numbers:	_____
Pier and Boring Locations - See Drawing Numbers:	_____
Soil Data Reference:	_____
Notes:	_____ _____ _____ _____ _____

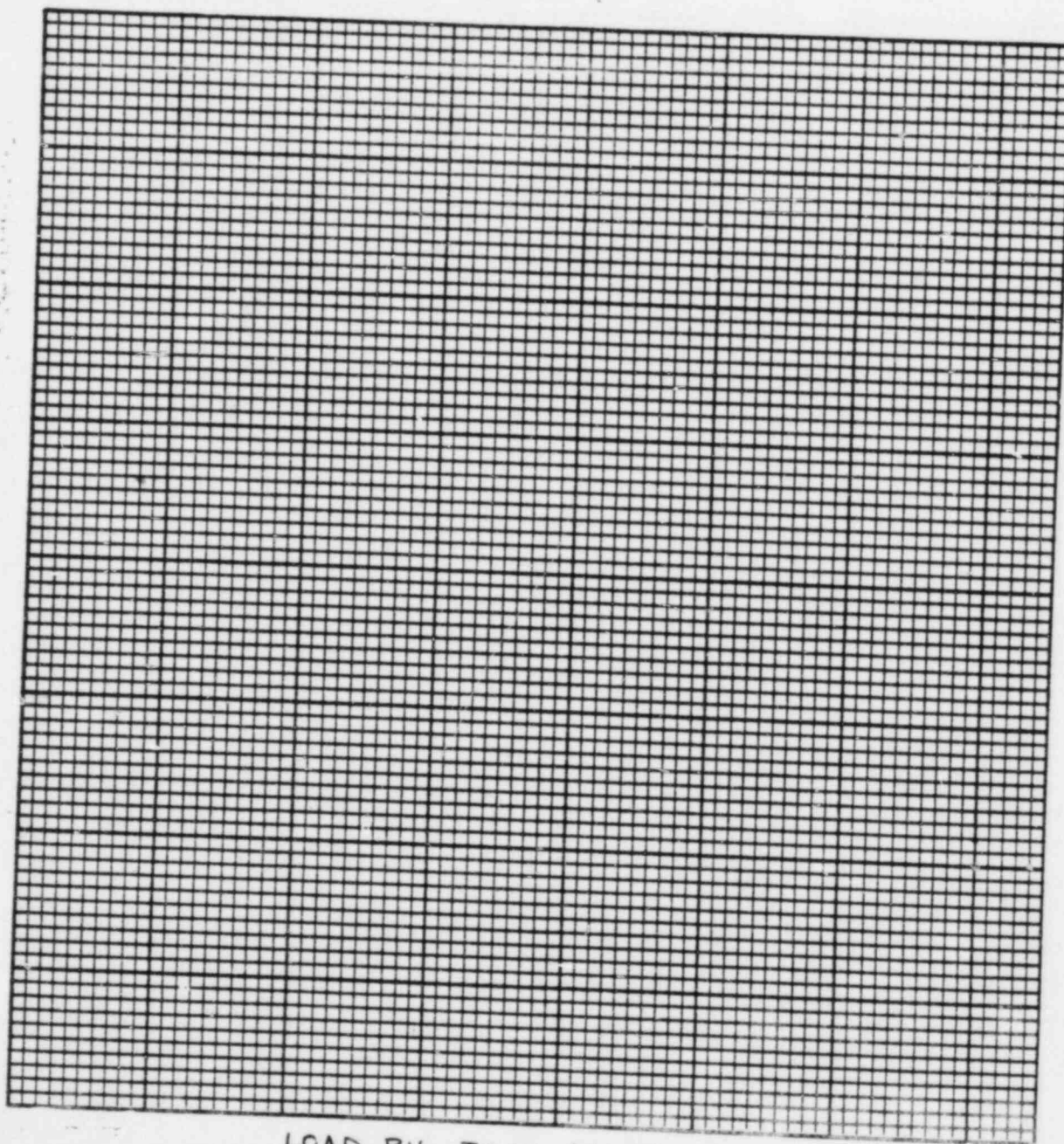
Show Sketches Below for (1) Test Setup, and (2) Plan of Pier Locations

PIER LOAD TEST DATA - LOAD BY CARLSON^{STRESS METERS}_A VERSUS LOAD BY JACKS

Project MIDLAND UNITS 1 AND 2
Location MIDLAND, MICHIGAN
Owner CONSUMERS POWER COMPANY
Engineer BECHTEL - ANN ARBOR, MICHIGAN

Pier No. _____
Date _____
Drawn By _____
Job No. 7220

AVG TP AND AVG TP LOAD BY CARLSON STRESS METERS (KIPS)



LOAD BY JACKS (KIPS)