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61-F-111

W.P. # 155-61

CHEDOKE

EXPRESSWAY

KING & MAIN

INTERCHANGE

FOUNDATION INVESTIGATION

PILE LOADING TEST

KING & MAIN INTERCHANGE  
CHEDOKE EXPRESSWAY

DISTRICT No. 4

Cont. IB-2-61

W.J. 61-F-111

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W.P. 155-61

REPORT ON PILE LOADING TEST  
at  
King St. and Main St. Interchange  
Chedoke Expressway  
Contract #IB-2-61 -- W.P. 155-61  
District #4.

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(Carried out by Bermingham Construction, Ltd.,  
for C.C. Parker & Parsons, Brinckerhoff, Ltd.)

1. INTRODUCTION:

At the site of the proposed King St. and Main St. Interchange (Chedoke Expressway) at Hamilton, several structures will be constructed. In the general area of these proposed structures, subsoil conditions are such that piled foundations are the most practical. The piles will be end bearing on the shale bedrock which occurs at depths of about 60 ft. to 70 ft. below ground level. Subsoil investigations carried out previously, indicated that the upper 3 or 4 feet of the shale bedrock was badly weathered. In view of this fact, it was decided to carry out pile tests on both 'H' piles and Tube piles to determine the most suitable design load for each, and also to determine whether or not the shatter effect of a group of piles affected the bearing capacity of the bedrock.

2. TEST PROCEDURE:

Two sets of 5 piles were driven. These are referred to as Box #1 for concrete filled pipe piles, and Box #2 for steel 'H' piles. Out of each set of 5 piles, three were subjected to loading: 1 for 200 tons and 2 for 120 tons each. The 'H' piles used were

2. TEST PROCEDURE: (cont'd.) ...

14 BP 73 and the tube piles consisted of two 12-3/4" O.D. with 0.203" walls and three 12-3/4" O.D. with 0.25" walls.

To drive the 'H' piles, a Delmag D-22 hammer was used. To drive the two 12-3/4" O.D. tube piles with 0.203" walls, the same hammer was used, but severe buckling of the piles occurred so it was decided to use 12-3/4" O.D. tube piles with a 0.25" wall and also to reduce the capacity of the hammer. A Delmag D-12 was subsequently used. For the test, the loading was applied by means of a jack reacting against an earth filled box. Recording of deflections was carried out as outlined in the National Building Code of Canada, 1953 edition. The locations of the piles are shown on the accompanying sketch and in the contract drawings for Contract #IB-2-61.

A set of Graphs pertaining to the pile test, accompanies this report. Two graphs are shown for each pile:-

- (1) Time versus Settlement.
- (2) Load versus Settlement.

In each case, rebound (as load was released) is also clearly shown.

3. DISCUSSION AND RECOMMENDATIONS:

According to the National Building Code of Canada, the maximum allowable net deflection of a pile under test is 0.01" per ton. In the case of the 200-ton test, this would be 2", and in the case of the 120-ton test, this would be 1.2". The maximum

cont'd. /3 ...

3. DISCUSSION AND RECOMMENDATIONS: (cont'd.) ...

net deflection which occurred in the present test was 0.1".

In view of these facts, the following conclusions are drawn:-

(1) Any loading up to 100 tons on either 'H' piles (14 BP 73), or tube piles (12-3/4" O.D. 0.25" wall) may be used with a safety factor of at least 2.

(2) Shattering of the bedrock by driving several piles has little or no effect on its bearing capacity.

With regard to the driving of the tube piles, it is pointed out that care must be taken not to overdrive. A hammer of capacity not more than 22,500 ft. lbs. per blow, should be used. If a heavier hammer is used, it is possible that severe buckling of the pipe piles will occur. For the 'H' piles, any hammer may be used.

It is pointed out that where piles are driven adjacent to high fills, as in the abutments, the design should incorporate provision for any lateral thrust due to the weight of the fill.

4. MISCELLANEOUS:

The test was carried out during the period May - June, 1961 by Bermingham Construction, Ltd., under the supervision of C. C. Parker & Associates.

October 1961 REPORT PREPARED BY: ..... *K. G. Selby* .....

K. G. Selby,  
SR. PROJECT FOUNDATION ENGINEER.

REPORT APPROVED BY: ..... *A. G. Stermac* .....

A. G. Stermac,  
PRINCIPAL FOUNDATION ENGINEER

APPENDIX I.

PIER No 4

KING ST.

BOX 1

BOX No 1

2

4

1

3

5

30.75'

BOX 2

BOX No 2

6

8

7

9

10

FOOTINGS



(APPROX  
ONLY)

ORIGINATED K. SELBY

DRAWN H. D. REED

CHECKED

APPROVED

DATE 23 OCT. 1961

DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & RESEARCH SECTION

TEST PILE LOCATIONS

CONTRACT 1B-2-61

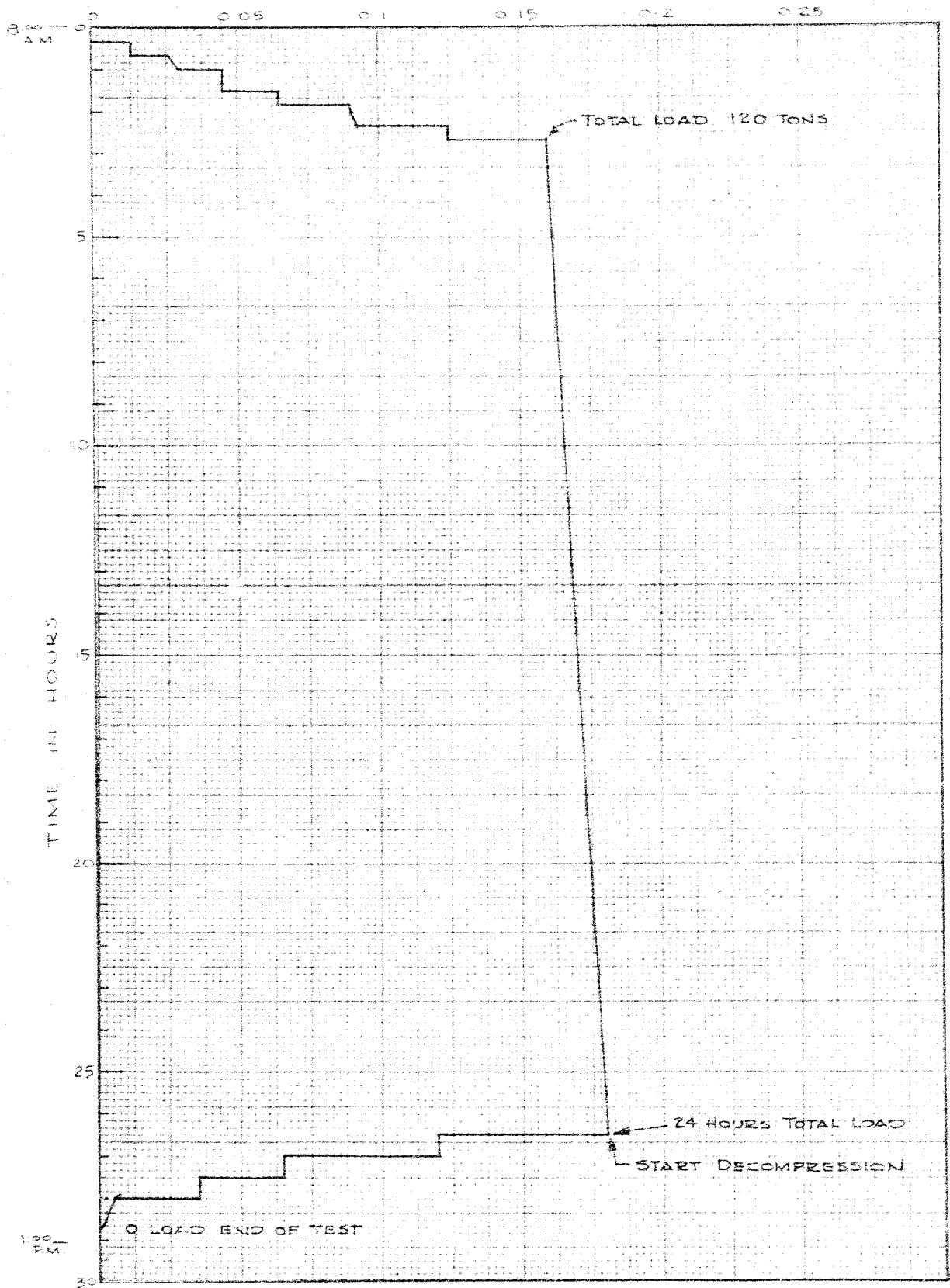
SCALE 1" = 20'

W. P. NO.

JOB NO.

DWG. NO.

## SETTLEMENT IN INCHES



PILE LOADING TEST  
TIME - SETTLEMENT



W P

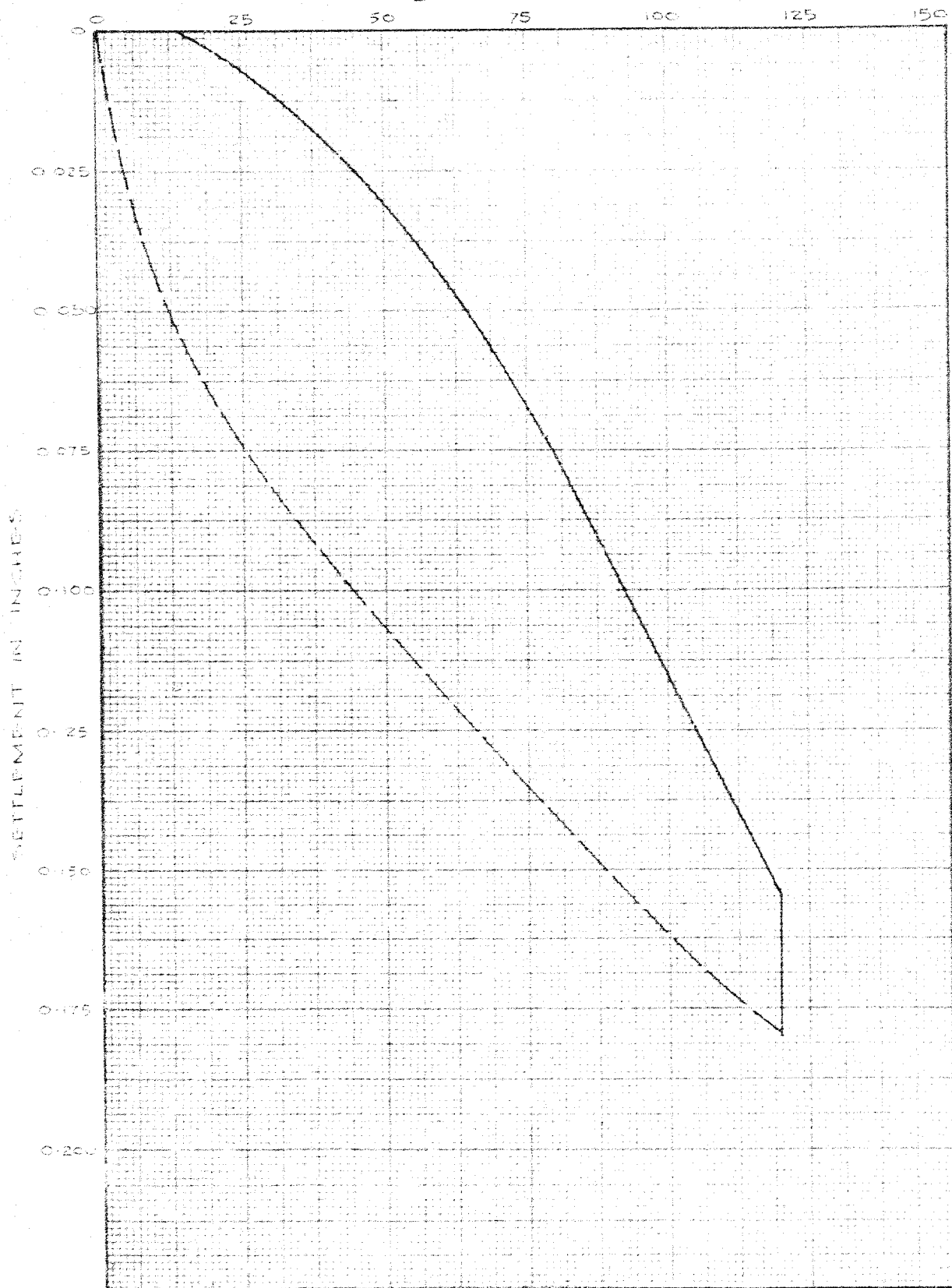
JOB

CONT. 1B-2-61

PILE NO 3

BOX - 1

LOAD IN TONS



PILE LOADING TEST

SETTLEMENT

W.P.

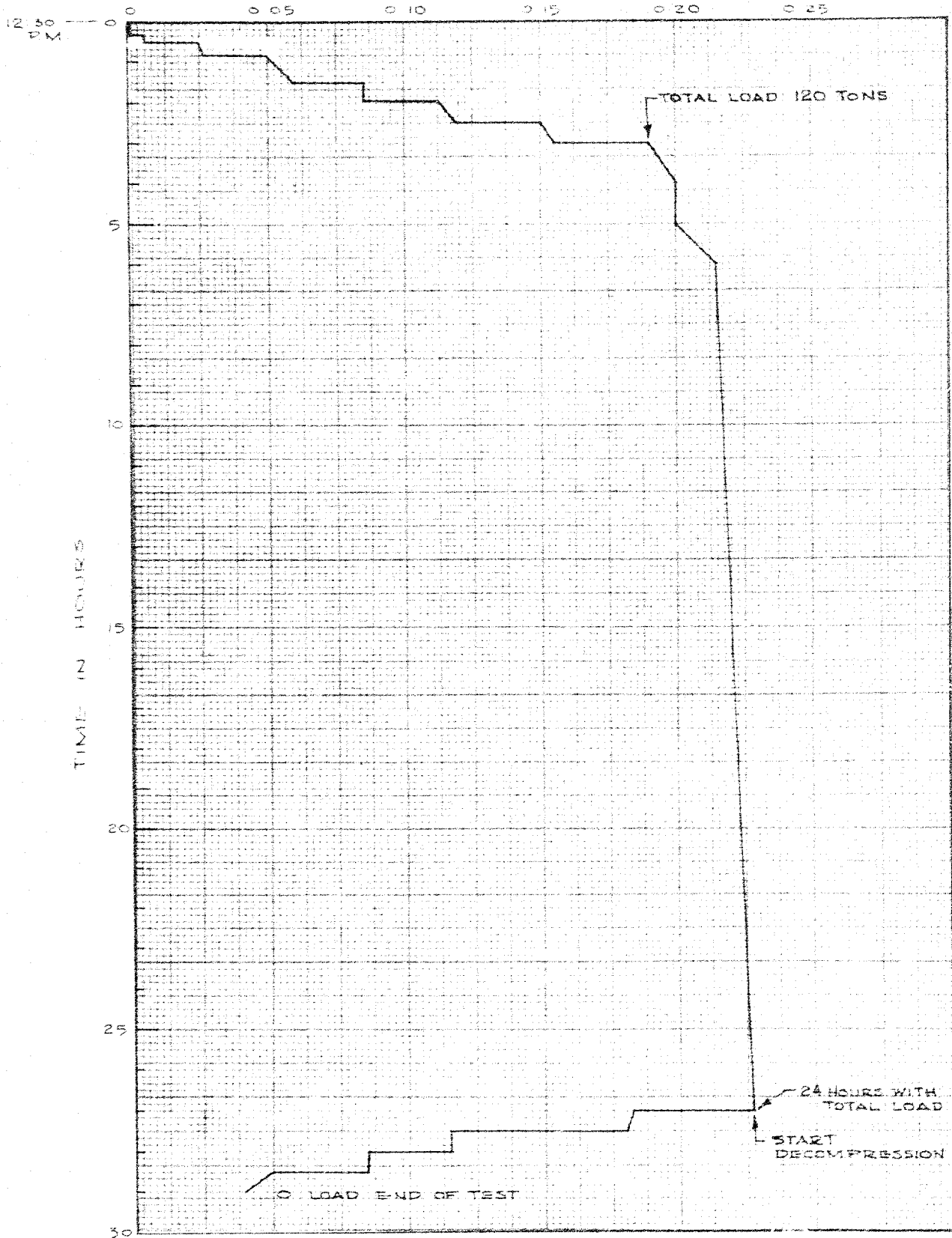
JOB

CONT 1B-2-61

PILE NO 4

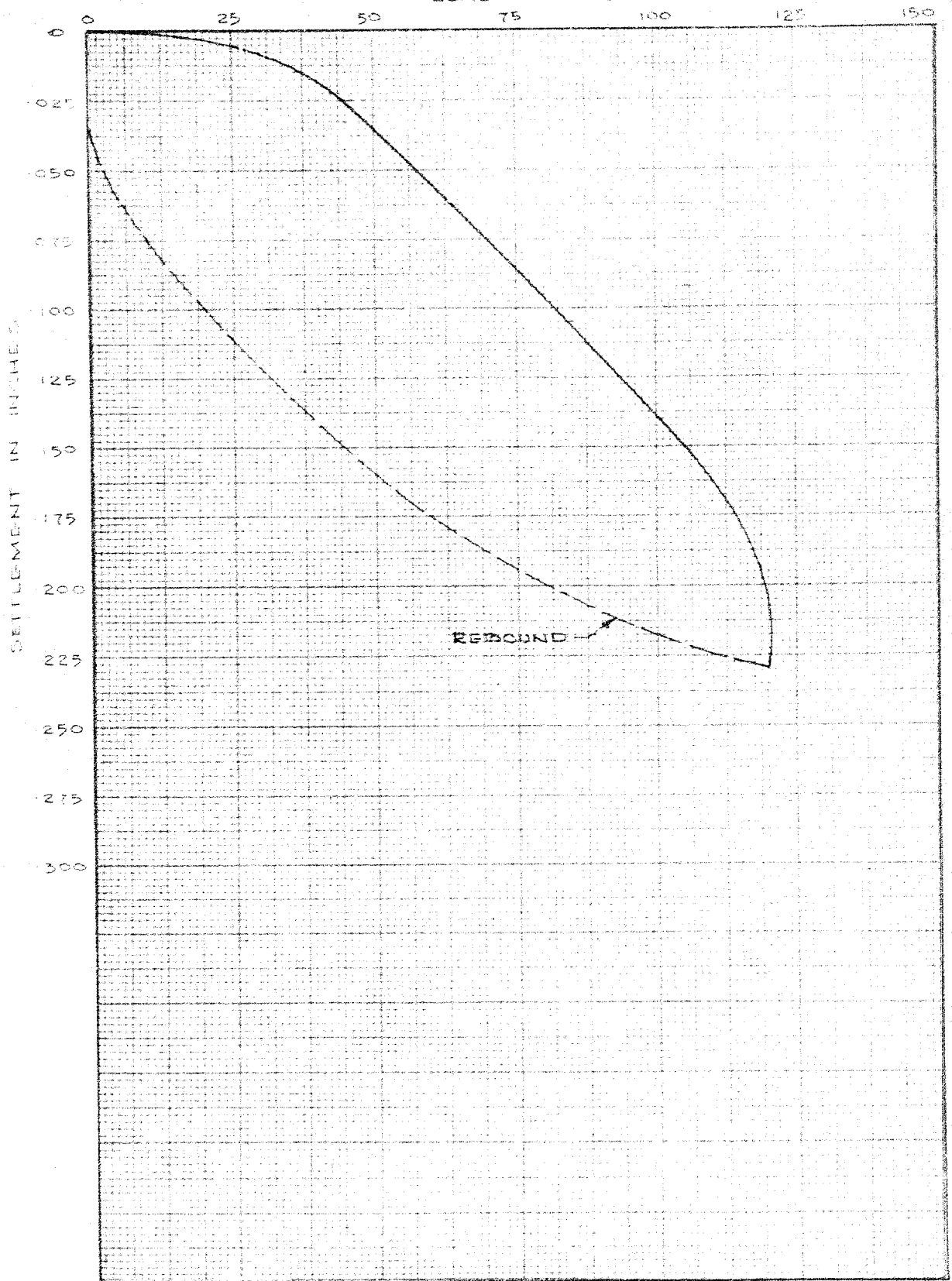
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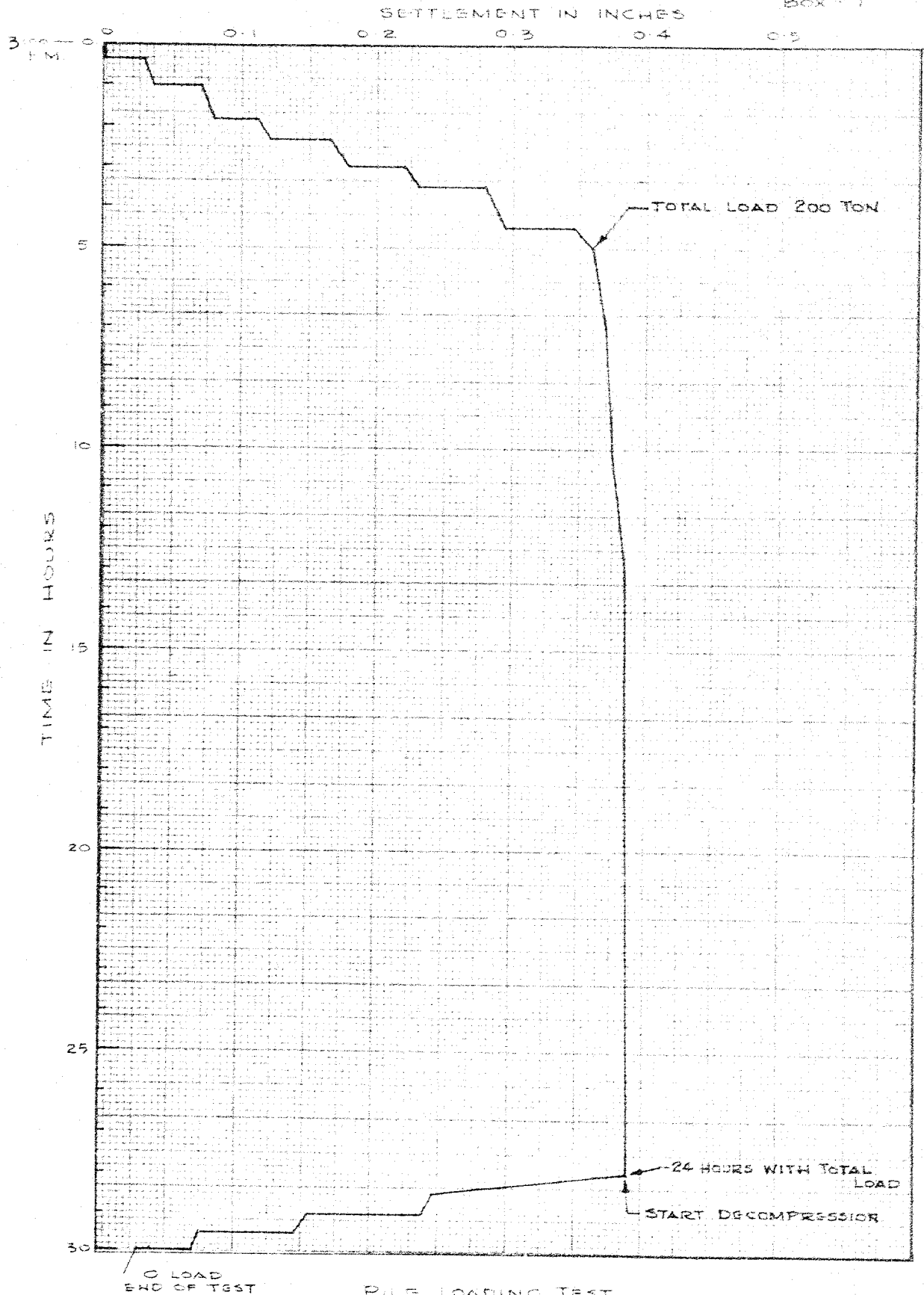
SETTLEMENT IN INCHES



PILE LOADING TEST  
TIME - SETTLEMENT

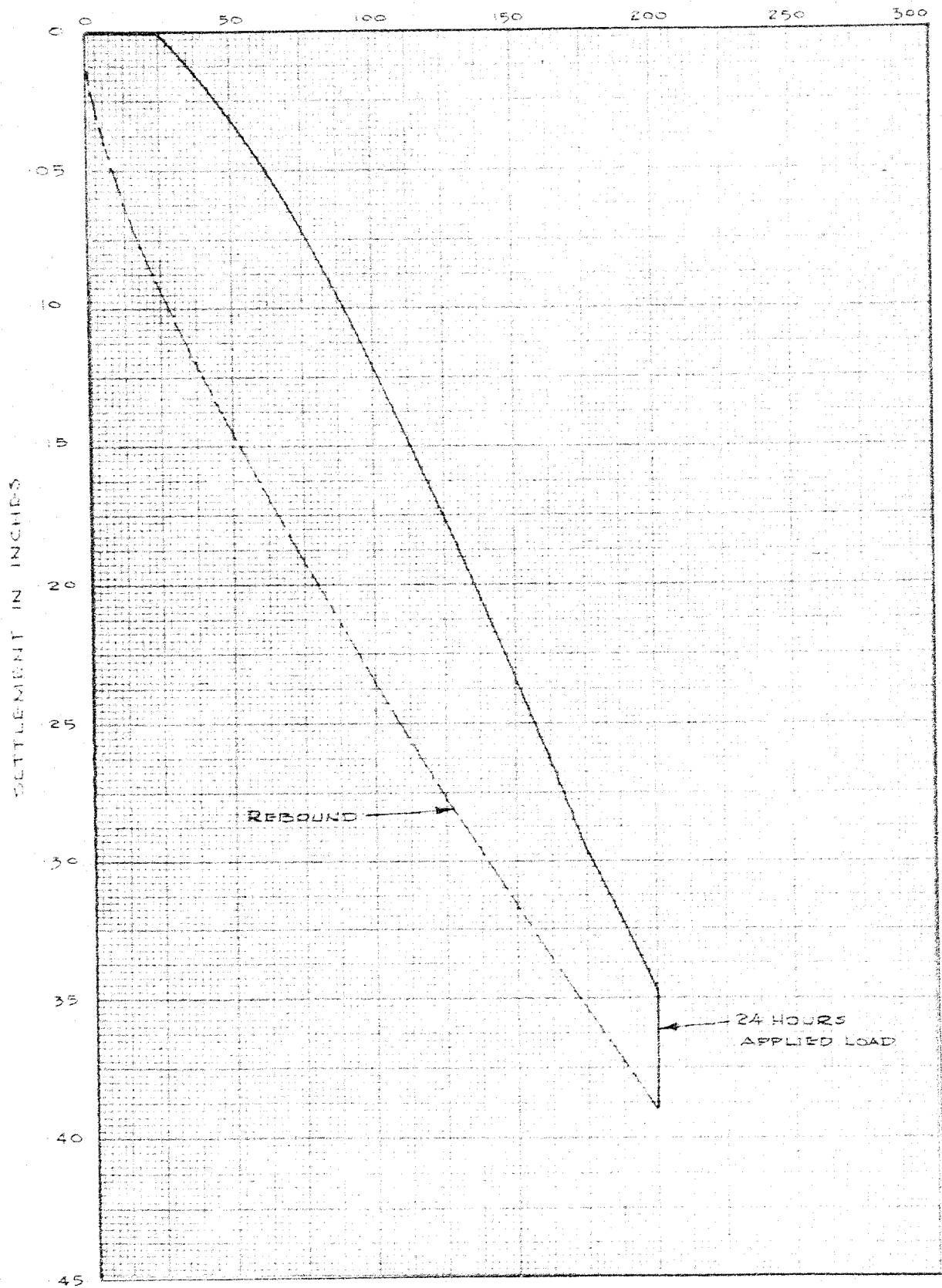
LOAD IN TONS

PILE LOADING TEST  
SETTLEMENT



PILE LOADING TEST  
SETTLEMENT - TIME

LOAD IN TONS

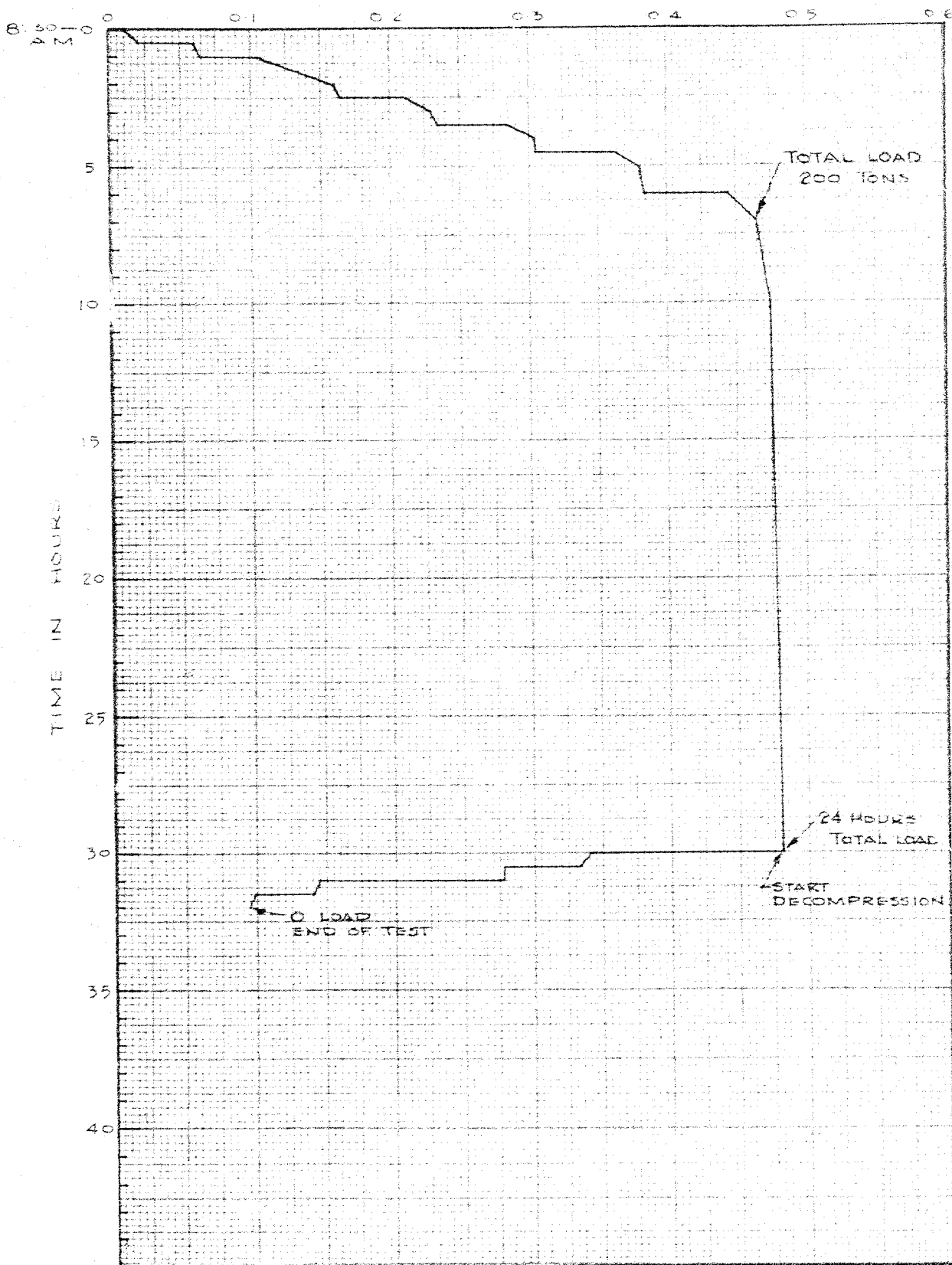


PILE LOADING TEST

SETTLEMENT

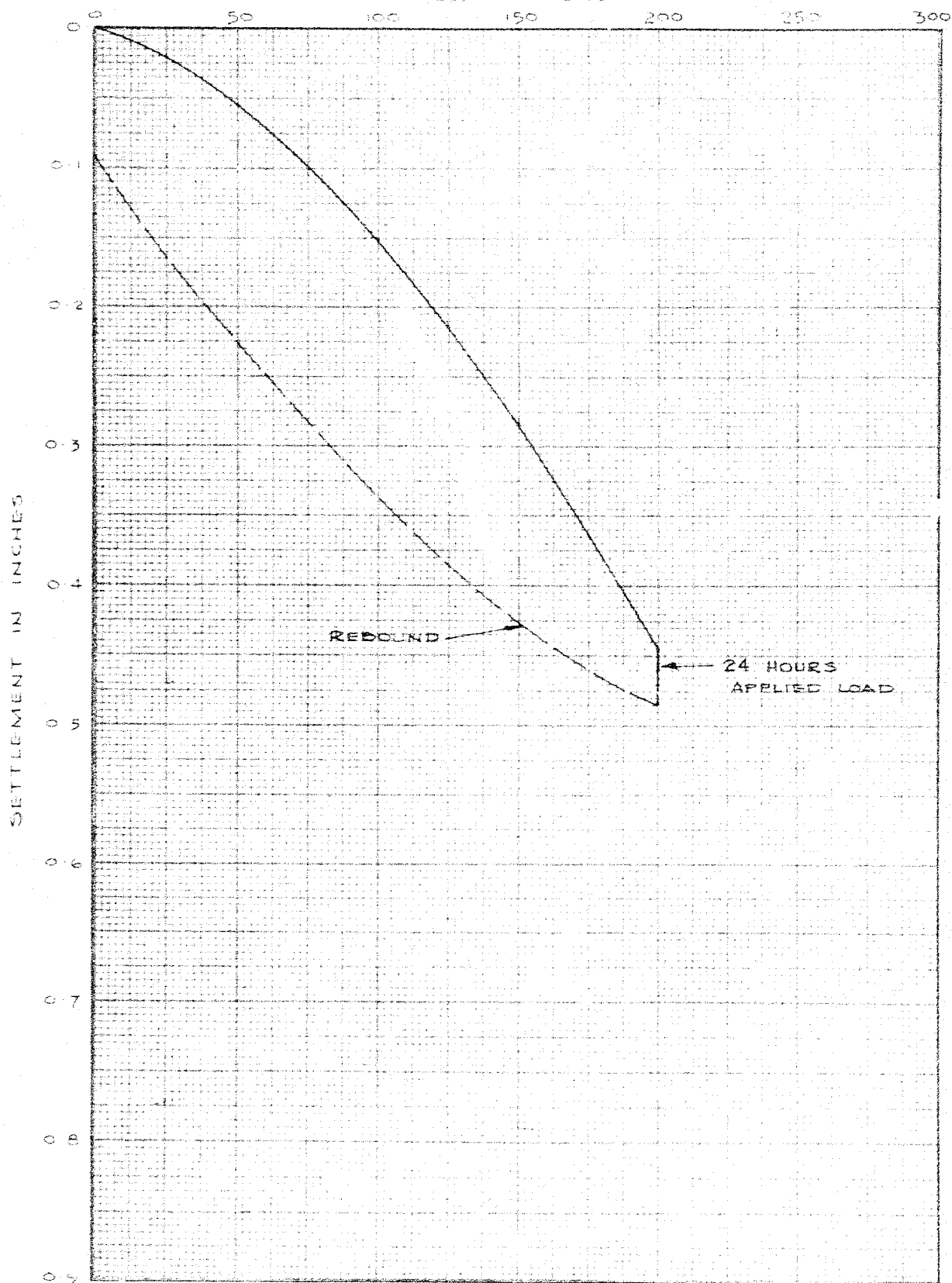
PILE No 6  
BOX - 2

SETTLEMENT IN INCHES



PILE LOADING TEST  
TIME - SETTLEMENT

LOAD IN TONS

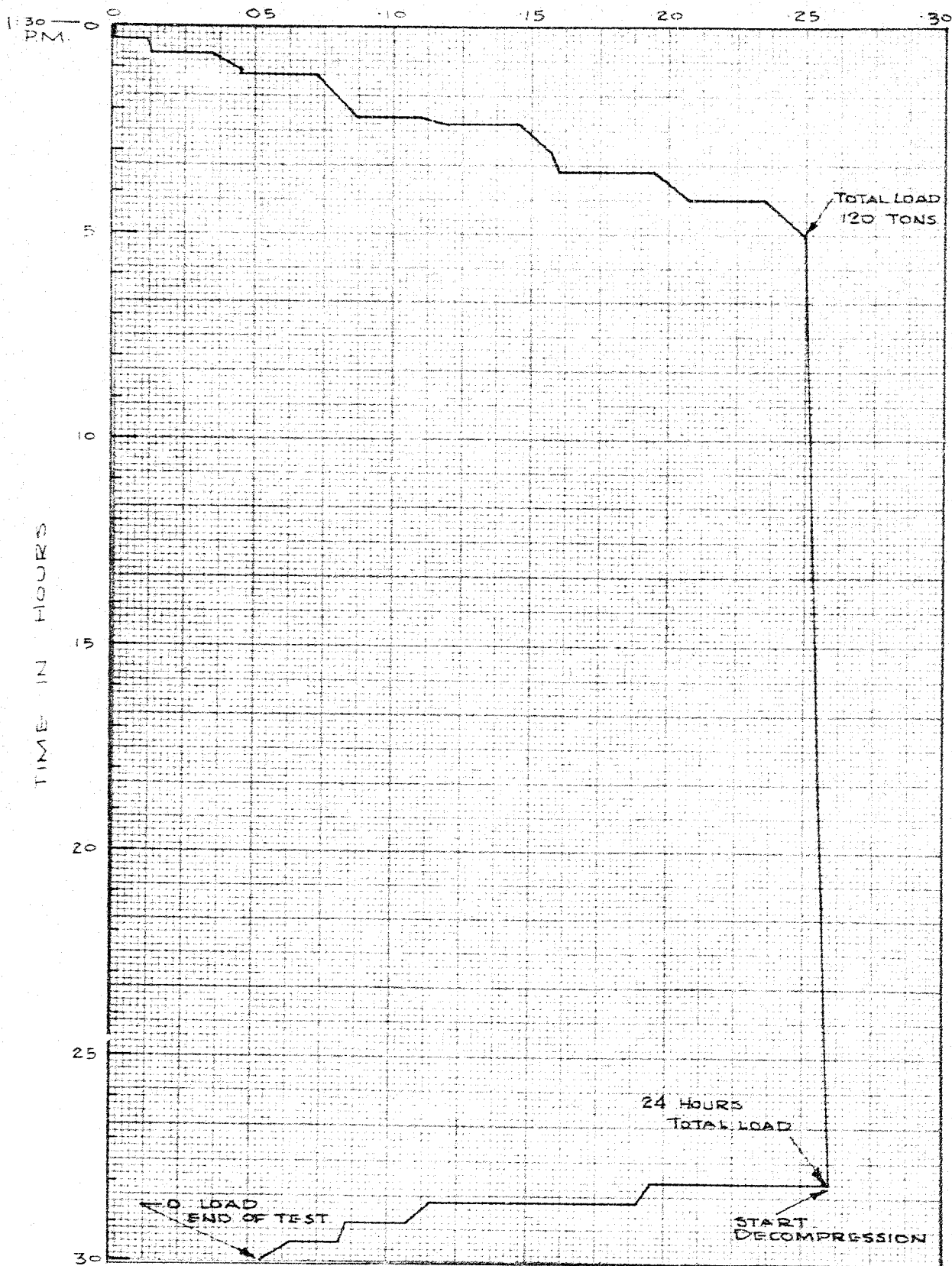


PILE LOADING TEST

SETTLEMENT

PILE No 7  
Box - 2

SETTLEMENT IN INCHES

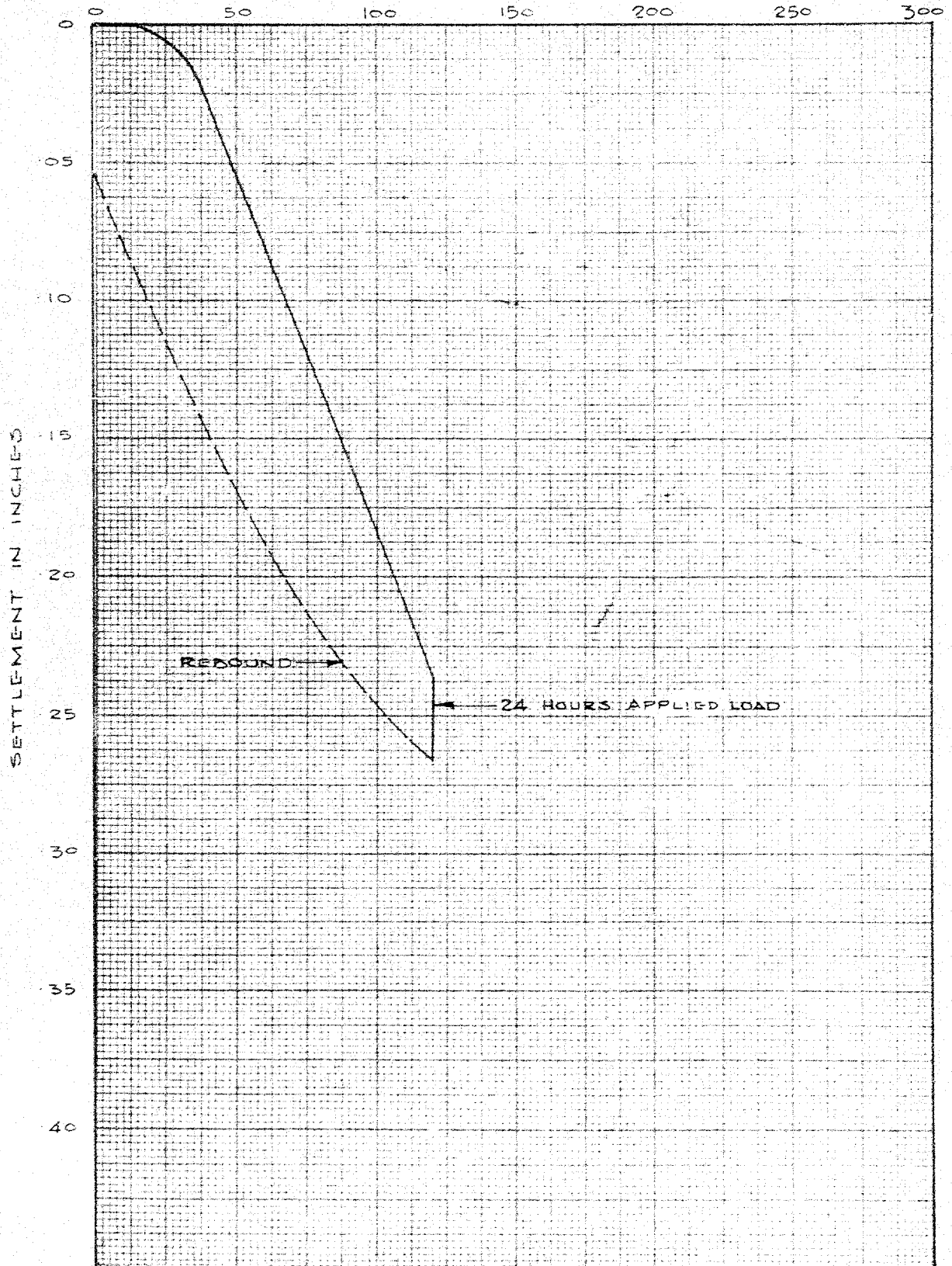
PILE LOADING TEST  
TIME - SETTLEMENT



PILE NO 7

BOX - 2

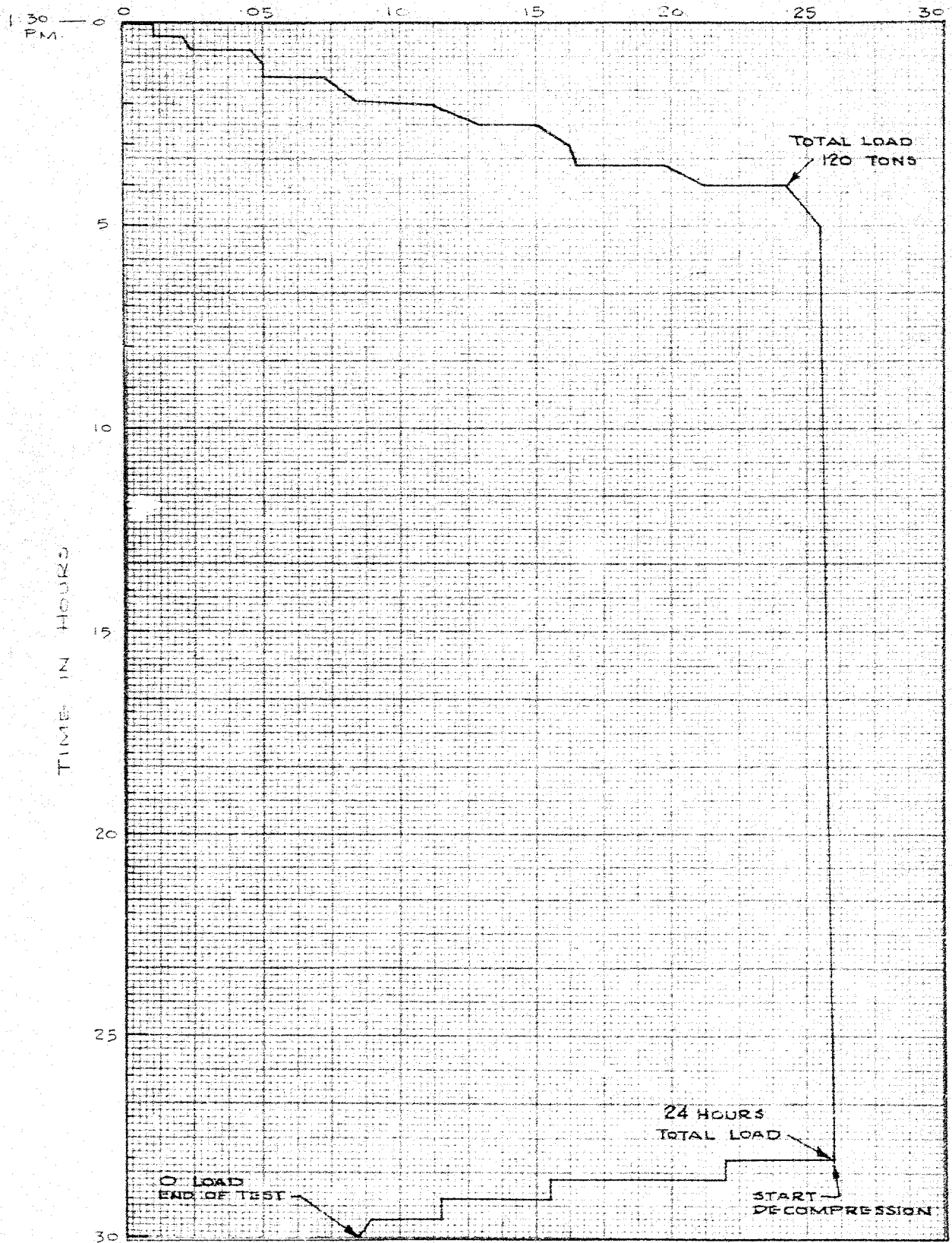
LOAD IN TONS



PILE LOADING TEST  
SETTLEMENT

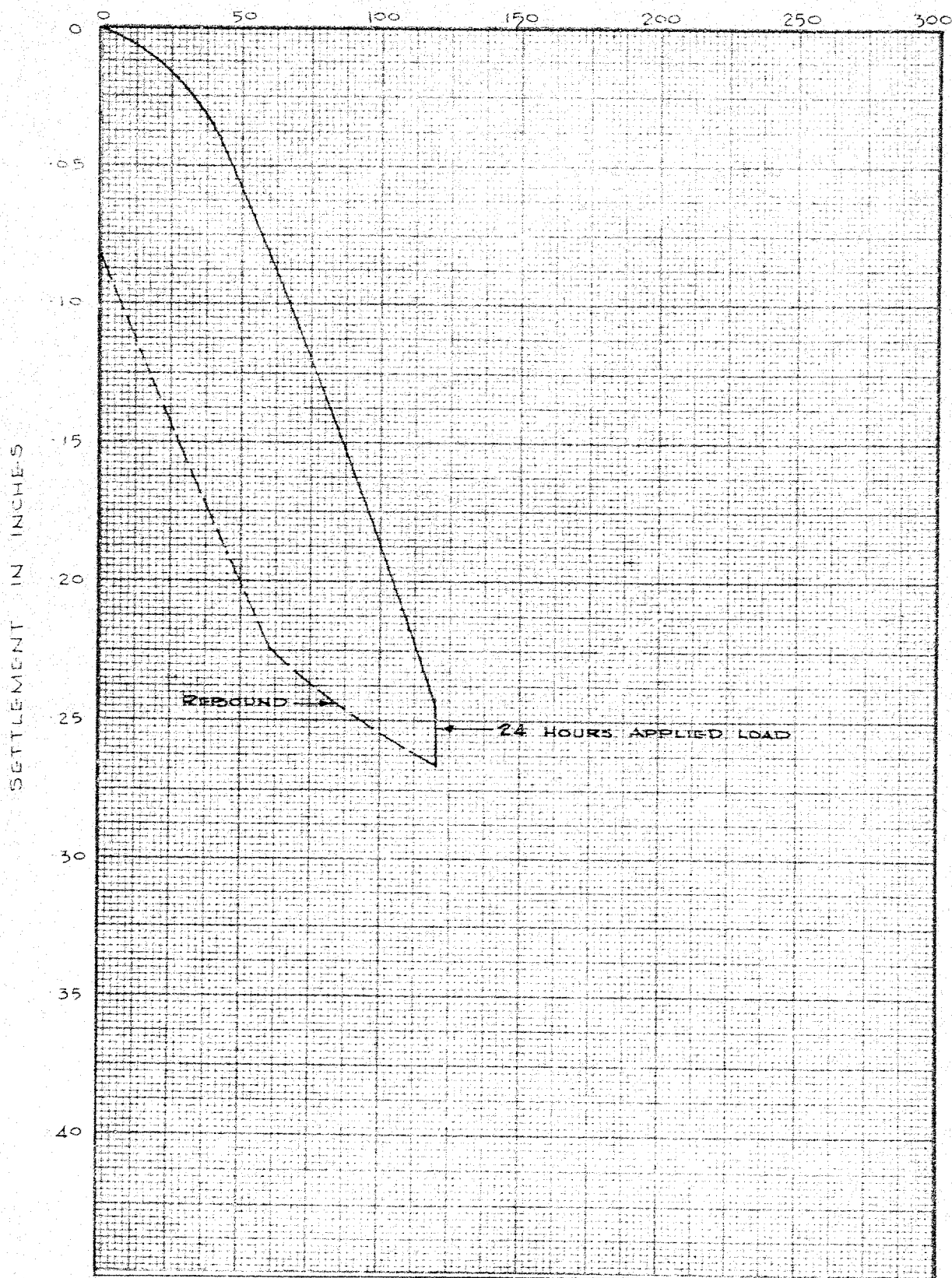
PILE NO 9  
Box - 2

SETTLEMENT IN INCHES

PILE LOADING TEST  
TIME - SETTLEMENT

PILE No 9  
Box - 2

LOAD IN TONS



24 HOURS APPLIED LOAD

REBOUND

PILE LOADING TEST  
SETTLEMENT