TENSION PILE STUDY

PLAN FOR PERFORMING OFFSHORE LARGE-DIAMETER PILE AND SMALL-DIAMETER PILE SEGMENT TESTS

TABLE OF CONTENTS

ILLUSTRATIONS

INTRODUCTION

This report contains a brief description of the activities involving the field installation plan of the large-diameter pile, the "quick" test to be performed on this pile and the additional test on the 7.62-cm (3-in.) pile segment models. These three areas will be further discussed with details to be presented in Appendices A and B.

FIELD INSTALLATION

The 76.2-cm (30-in.) test pile will be assembled from three separate pile segments. These segments are numbered TP1, TP2 and TP3. Their respective lengths are approximately 54.88 m (180 ft) for TP1 and 27.44 m (90 ft) for the two add-on sections, TP2 and TP3. A configuration of the test pile is shown on Plate 1. The instrument locations for the 76.2-cm (30-in.) test pile are presented on Plate 2. This plate also shows the corresponding zones of testing for the 7.62-cm (3.0-in.) small-diameter segments.

As mentioned above, the test pile will be installed in three separate pieces. The 54.88-m (180-ft) instrumented section will be the first to be lowered through the load frame opening. Due to the size of this segment and the restricted work space area on the platform deck (Plate 3), a unique method to upright the instrumented segment had to be developed. This consists of mounting a crawler crane on the deck of the platform with a boom height capable of handling the 54.88-m (180-ft) section along with other associated clearance problems of the load frame. The pile itself will be lifted from a one-point pick-up and rotated about a pivot point at the edge of the platform until the crane can completely upright the pile. At this time, the crane will slowly proceed to lower the instrumented segment through the opening provided in the load frame until it rests on the pivot clamp. The clamp will then be removed, and the pile will then be lowered until the cable spools are at a convenient working height above the deck of the platform. This height was chosed to prevent penetration of the pile tip into the seafloor. At this time, the clamp will be reinstalled so that the cable spools may be removed. The initial location of this pivot clamp and cable

spools along with the installation position is given on Plate 4. The pivot clamp is shown in dotted lines at the elevation required to keep the tip of the pile above the seafloor.

Instrument readings will be taken at this elevation prior to lowering the pile further. Once the instruments have been read, TP1 will be lowered or driven to approximately 5.49 m (18 ft) above the load frame deck. The first add-on section will be attached, and the instrument cables bundled to rods running the length of the segment. This segment will then be driven, with some dynamic measurements during driving. The second add-on will be installed in the same manner as the first and driven to the same level above the deck. Dynamic measurements will also be made during the installation of the second add-on. A complete schematic of the test pile installation plan is given on Plate 5.

With the test pile driven to grade, the eight hydraulic rams will be attached to the load head, and a quick test to failure both in tension and compression will be performed. The elevation of the test pile position for the quick test is shown on Plate 6. After these tests are completed, the pile will be redriven approximately 0.3 m (1.0 ft) to restore the residual compression stresses in the pile. The elevation of the test pile for the future long-term test is presented on Plate 7. An upper work platform will then be attached. This platform is necessary so the extensometers and tell-tales can be lowered into the pile. An overall cross section of both the test platform and load frame is given in Plate 8. A complete step by step plan for the installation of the test pile from mobilization to demobilization of the 150-ton crawler crane is given in Appendix A.

LARGE-DIAMETER LOAD TEST

Two load tests will be performed immediately following the installation of the test pile. The first test will be a tension test to failure. The pile will initially be loaded with an increment of 25 kips. The load will then be increased in 100-kip increments until failure occurs. Incremental displacements will then be applied until a significant amount of movement is recorded. The pile will then

be unloaded in 100-kip increments. A detailed loading procedure for this quick test to failure in tension is given on Plate 9. A typical load diplacement curve is shown on Plate 10. A compression test will follow with a similar loading and unloading pattern. The loading procedure for the compression test to failure is given on Plate 11. Prior to performing any load test, a pretest check will be performed to ensure that all instruments and personnel are ready. This pretest check list is presented on Plate 12.

The measurements will be recorded using both analog and digital data acquisition systems. A schematic of this system for the long-term test is presented on Plate 13. A similar arrangement of recording will be utilized for the quick tests, except that the extensometers and tell-tales will be not be present. A complete list of all the instrument types, channel numbers, and instrument locations is given on Plate 14.

The support staff to perform the load test is given in an organizational chart on Plate 15. The numbers of each position with respect to their location on the platform deck are given on Plate 3.

FREE-FIELD PIEZOMETER MEASUREMENTS

After installation and testing of the 76.2-cm (30-in.) diameter test pile, the next activity will be the implantation of piezometers to obtain in situ pore-water pressure measurements. This work is being coordinated by Conoco and Veritas. At present, the plan is to measure the static free field pore water pressures at 30 m (100 ft), 53 m (175 ft) and 67 m (220 ft) below the seafloor.

The purpose for obtaining the measurements is to better define the pore pressure profile at the test site for future interpretation of pile test results.

The above activity is expected to require approximately three to four days. During this time period, The Earth Technology Corporation's personnel will be recording data from the large test pile since it is very important to obtain

several days of continuous readings immediately following installation. Changes will be occuring very rapidly during this period. Therefore, the schedule proposed will insure the time will be well spent by all field personnel.

SMALL-DIAMETER PILE SEGMENT TESTS

A second series of small-diameter pile segment tests are scheduled to be performed at the West Delta test site following installation of the 76.2-cm (30-in.) diameter pile. These tests will supplement the information gathered during the 1982 small-diameter segment tests. In addition to the 7.62-cm (3.0-in.) diameter tests, testing with the X-probe, a smaller-diameter instrument, is proposed at two elevations in one borehole. This instrument, which is 4.37 cm (1.72 in.) in diameter, will allow an additional diameter comparison to the larger 7.62-cm (3.0-in.) pile segment tools and the 76.2-cm (30-in.) test pile.

Installation of the small diameter pile segments will begin after the installation of the piezometers. Installation procedures will follow those documented in The Earth Technology Corporation's August, 1982, report entitled "Tension Pile Study CNRD 13-2, Volume II, Plan for Performing Offshore Small-Diameter Pile Segment Tests". Briefly, the procedure consists of the following:

1. Drill a boring to a predetermined depth which is slightly above the specified test depth.

2. Attach the pile segment instrument to drill rods, and lower the rods to the bottom of the boring.

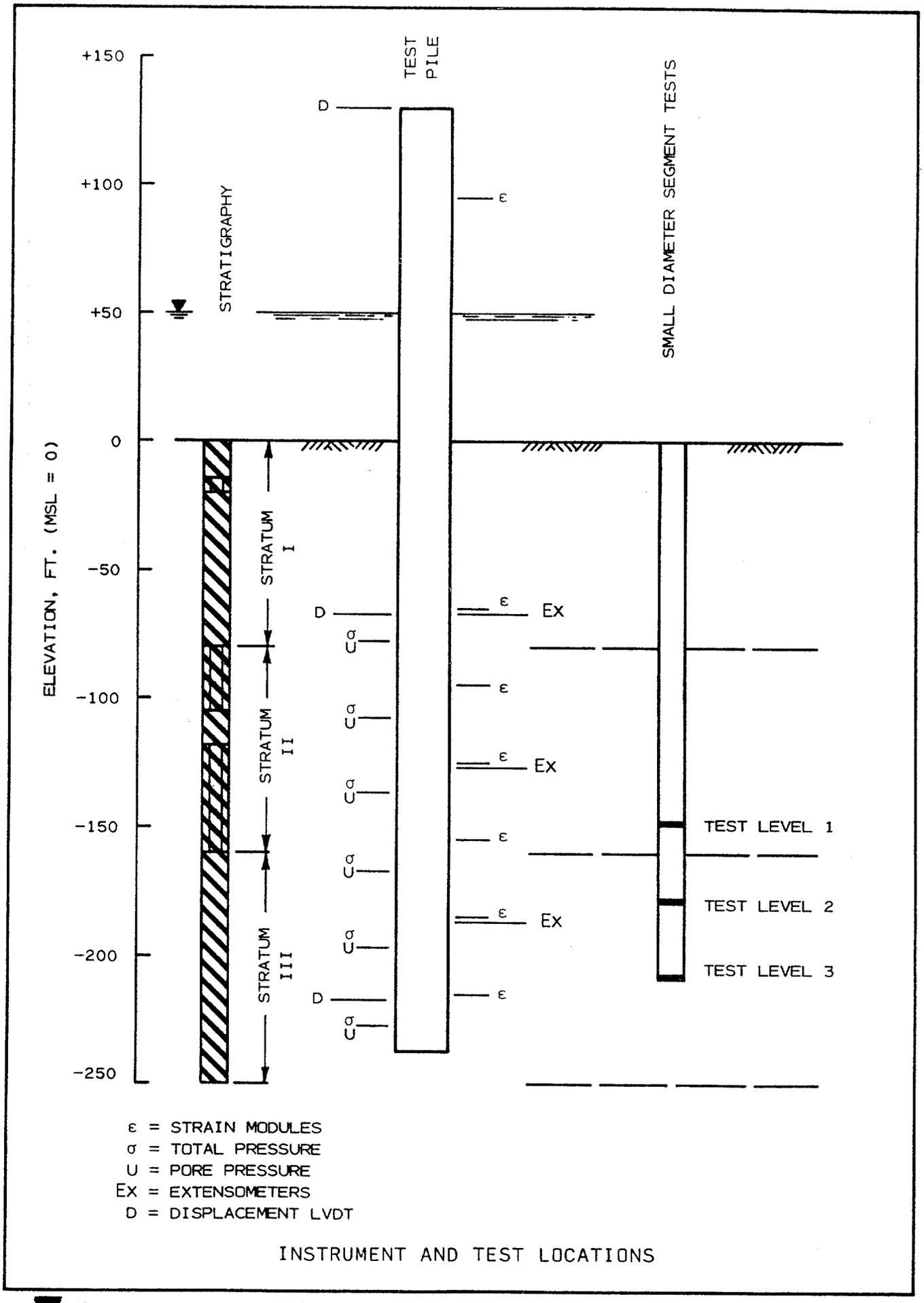
3. Drive the pile segment to the specified test depth.

4. Attach the top rod to the load frame, and perform an immediate test.

5. Allow consolidation to occur for the required time period prior to further testing.

Further details for the test system, test plan, schedule and sequence of the small-diameter test are presented in Appendix B.

ILLUSTRATIONS



INSTRUMENT AND TEST LOCATIONS

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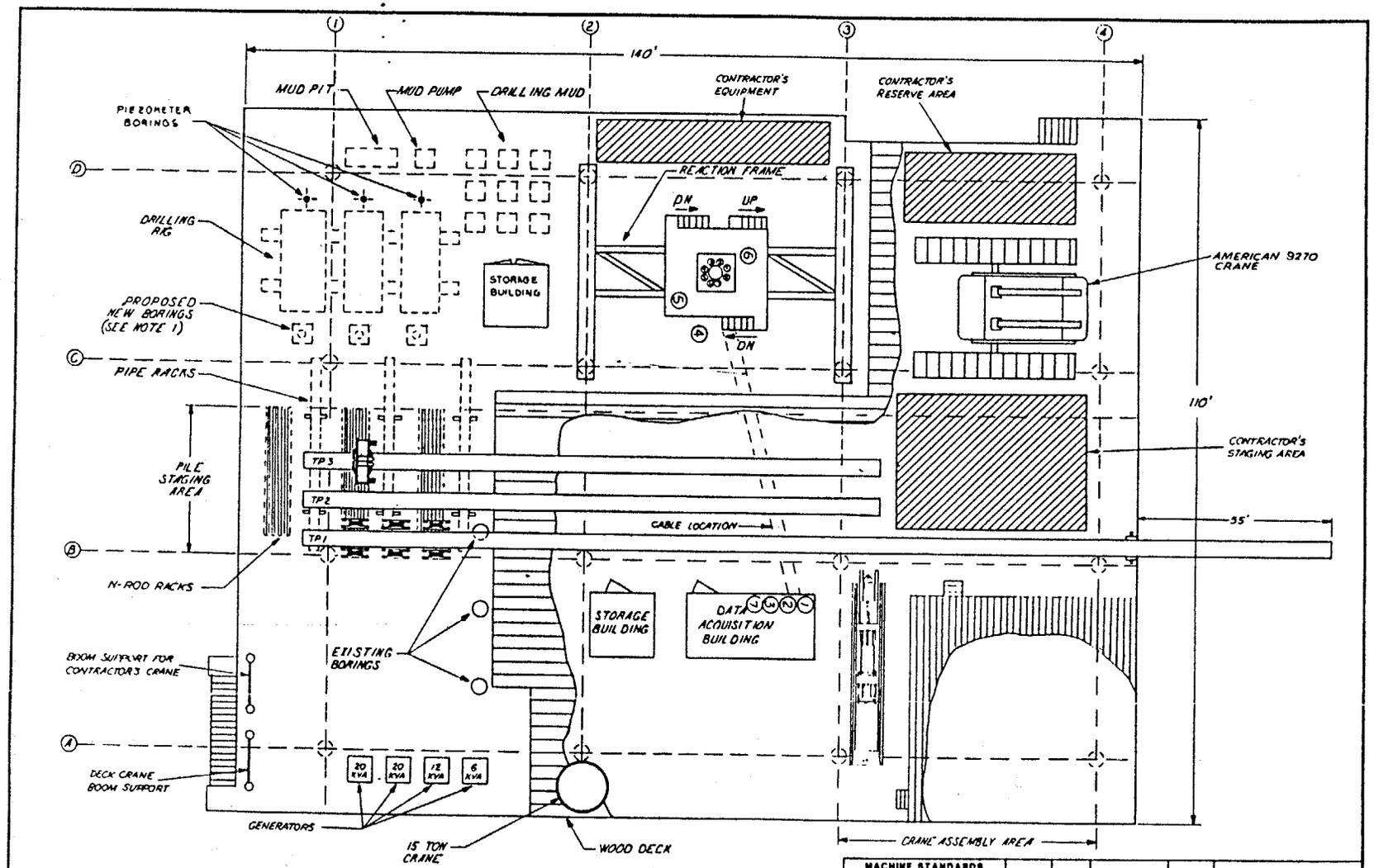
PLATE 2



NOTE:
1) SMALL DIAMETER TESTING IN PROPOSED NEW BORINGS WILL BE CONDUCTED AFTER LARGE DIAMETER PILE IS INSTALLED.

MACHINE STANDARDS	
EXCEPT AS OTHERWISE SHOWN	
MACHINE FINISH TO BE 63 .0005	
DIMENSIONAL TOLERANCE	ANGLE TOLERANCE
0.000 ±.005	XX° ±1°
0.00 ±.01	XX° XX' ±1'
FRACT ±1/64	XX° XX' XX" ±1"
CORNER RADIUS .010 TO .030	
LATHE CUT THREADS CLASS 3	
REMOVE ALL BURRS AND BREAK ALL SHARP CORNERS	
PROJECTION	

Pc MK	QTY	MATERIAL	SPEC	DESCRIPTION
LIST OF MATERIAL				

DECK LAYOUT FOR WEST DELTA PLATFORM

(NUMBERS CORRESPOND TO LOAD TEST ORGANIZATION CHART)

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SCALE: 1" = 10'	DRAWN BY: G.R. COFFEY
APVD BY:	DATE: 3-15-83
DRAWING NUMBER: C-A-100 PLATE 3	REV. NO.

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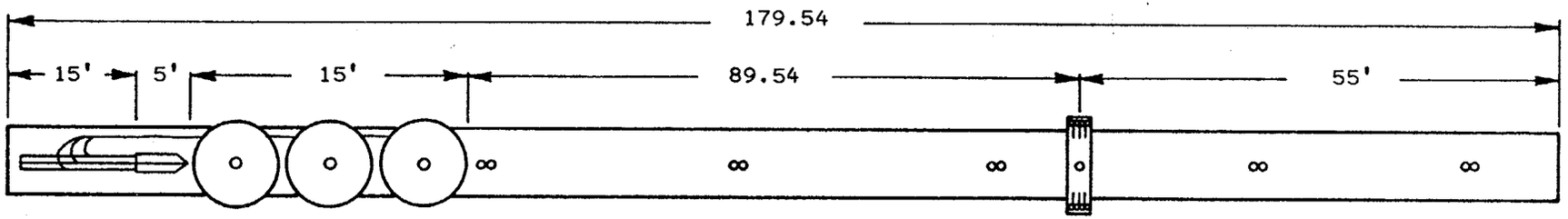
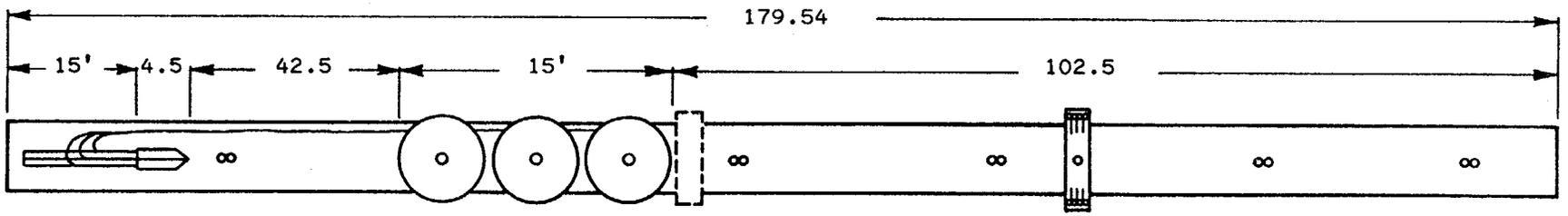


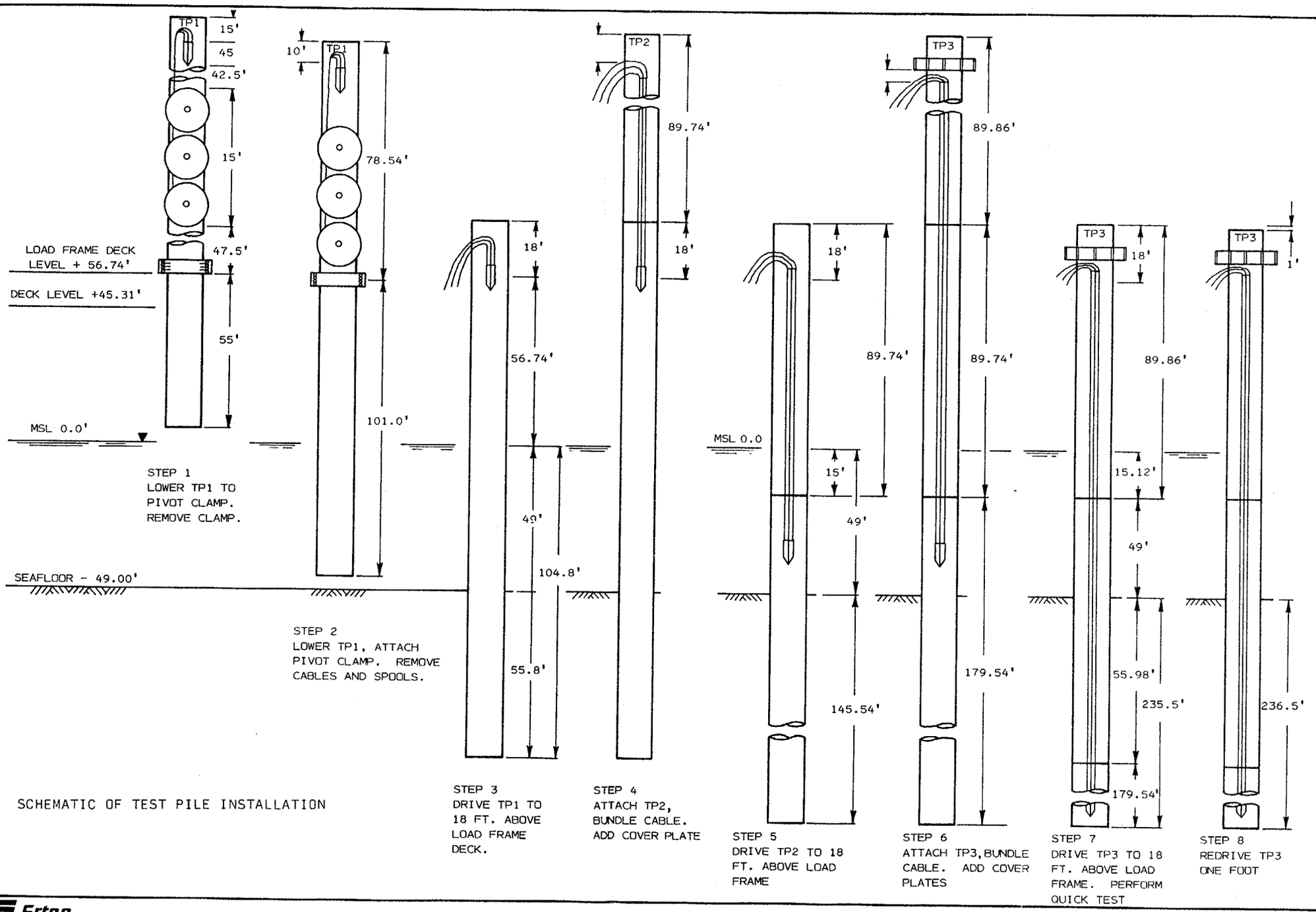
INSTRUMENTED SEGMENT FOR SHIPOUT



INSTRUMENTED SEGMENT PRIOR TO INSTALLATION

LOCATION OF CABLE SPOOLS AND PIVOT CLAMP ON INSTRUMENTED TEST SEGMENT

PLATE 4



SCHEMATIC OF TEST PILE INSTALLATION

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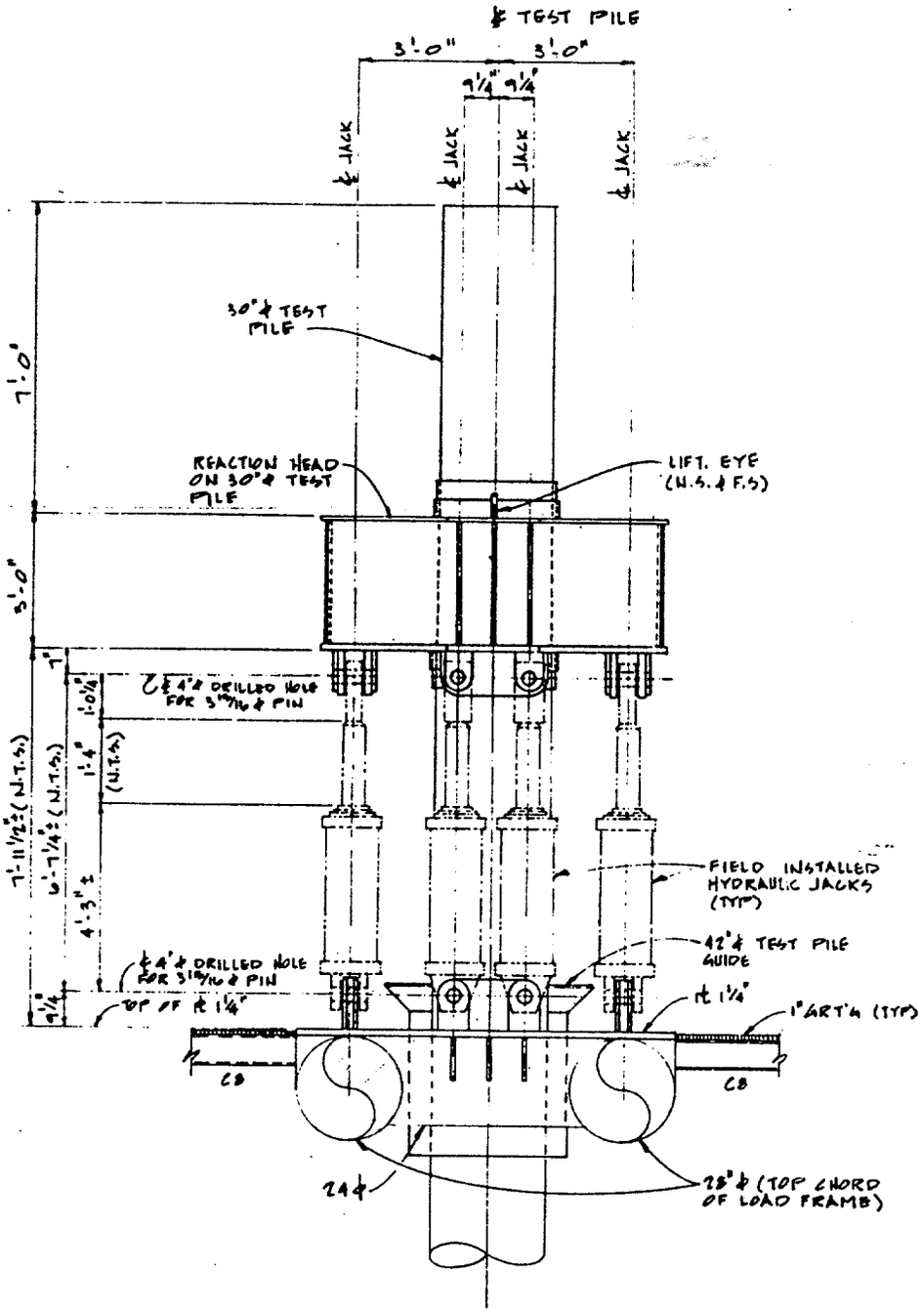

ELEVATION OF TEST PILE POSITION FOR QUICK TEST

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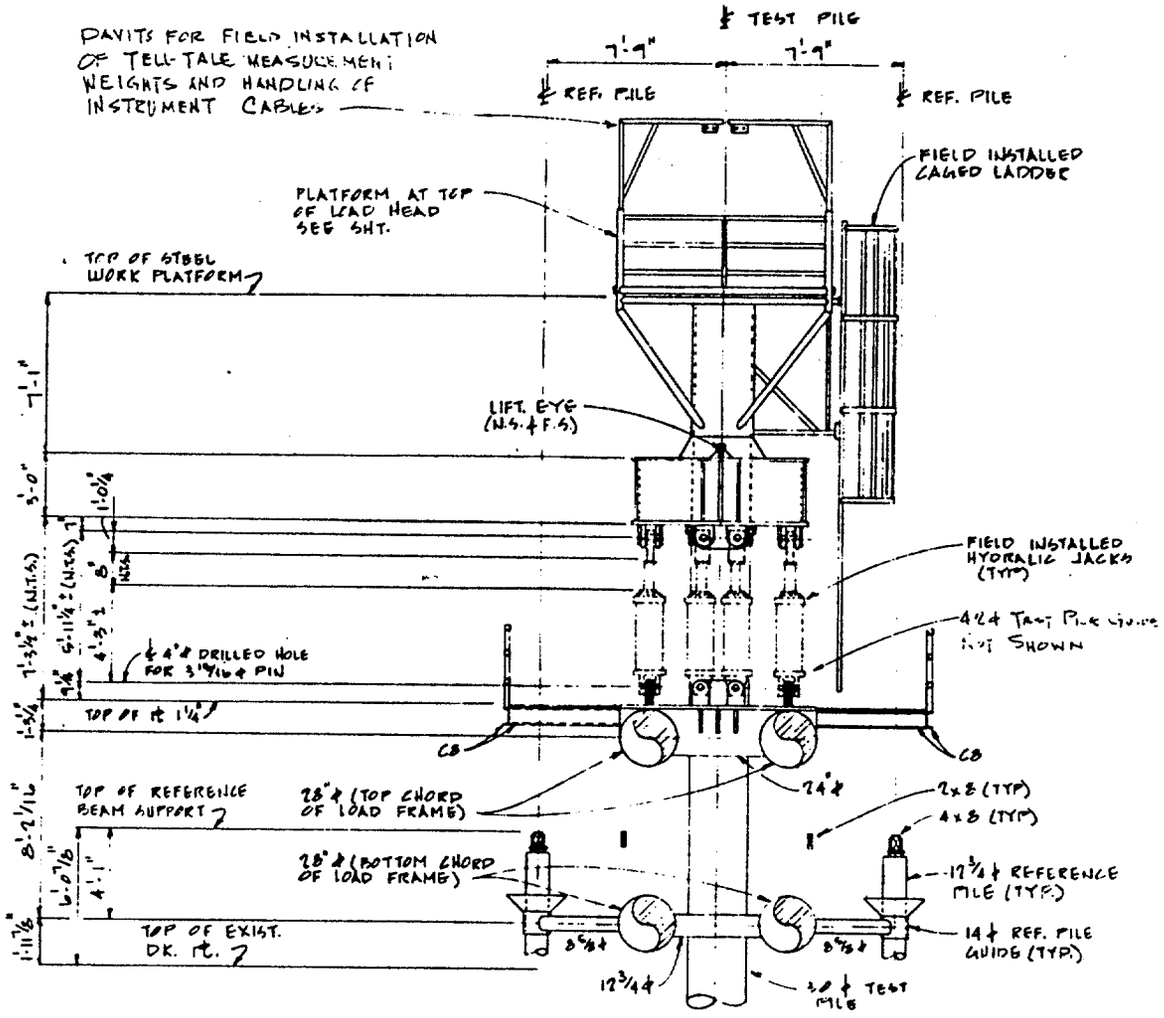
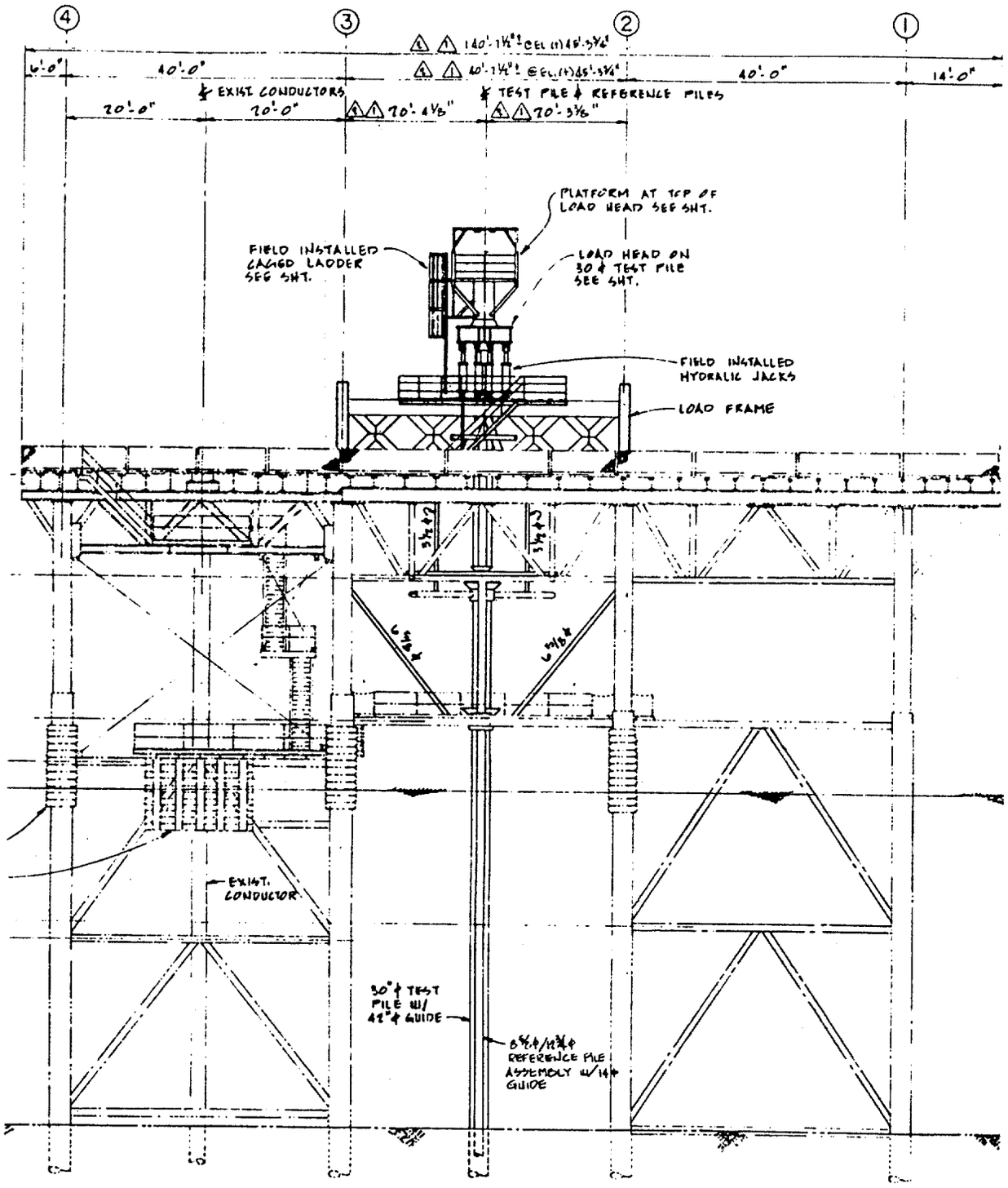
PLATE 6



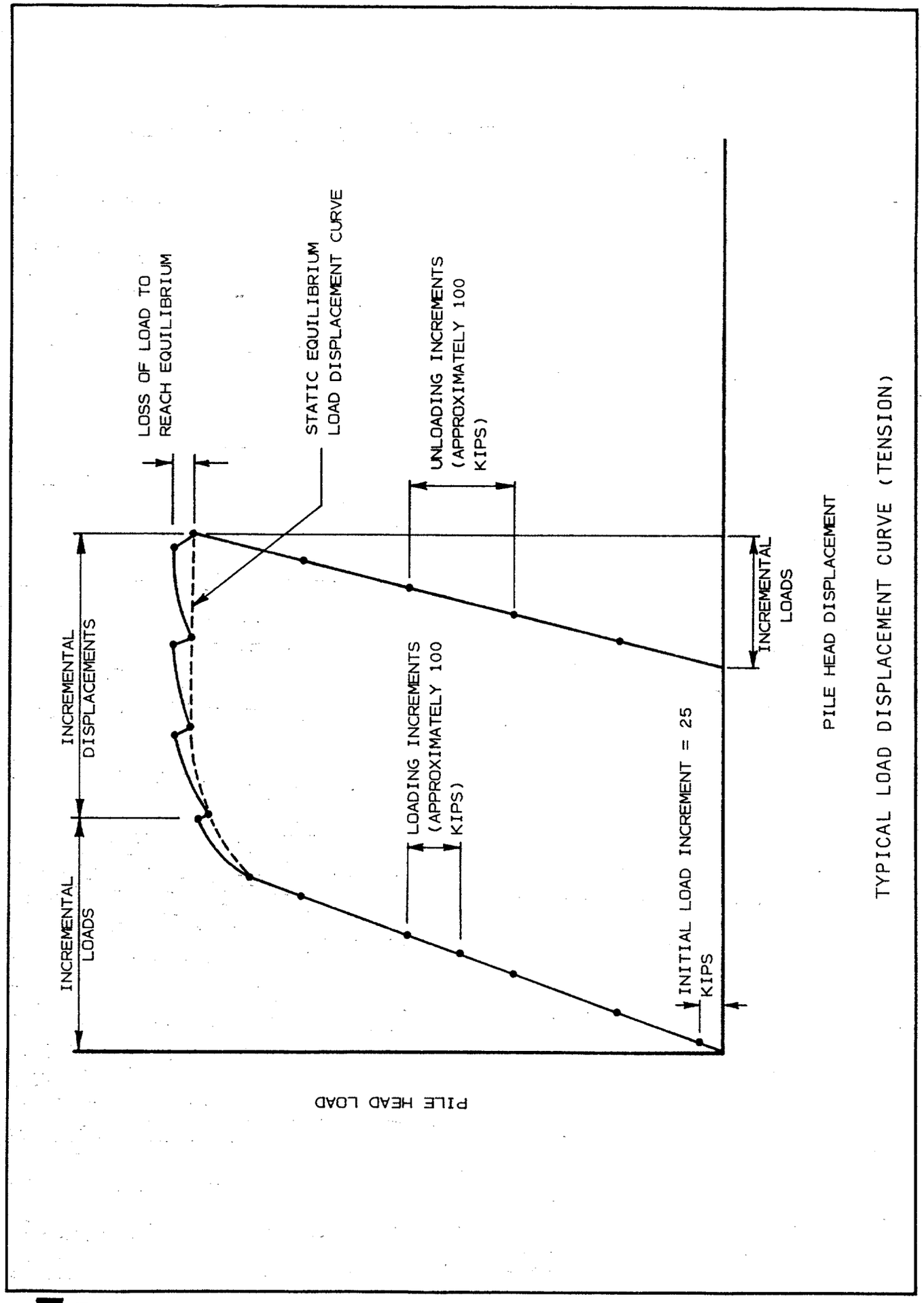
ELEVATION OF TEST PILE POSITION FOR LONG TERM TEST



CROSS SECTION OF TEST PLATFORM AND LOAD FRAME

TEST A - PILE LOADING PROCEDURE
STATIC TEST TO FAILURE IN TENSION

1. ACCOMPLISH "PRE-TEST CHECK".
2. DRIVE TP3 TO 18 FT. ABOVE LOAD FRAME DECK.
3. ATTACH THE 8 HYDRAULIC RAMS TO THE LOAD HEAD.
4. ATTACH PILE-HEAD LVDT AND DIAL INDICATOR.
5. TAKE MANUAL READINGS AT ZERO PILE-HEAD LOAD.
6. APPLY 25 KIP LOAD (TENSION), TAKE MANUAL READINGS.
7. INCREASE LOAD TO 100 KIPS (75 KIP INCREMENT); TAKE MANUAL READINGS.
8. INCREASE LOAD IN 100 KIP INCREMENTS TO FAILURE; TAKE MANUAL READINGS AT EACH LOAD LEVEL.
9. APPLY ≃ 2 INCHES OF PLASTIC SLIP, NO MANUAL RECORDING DURING SLIP.
10. STOP RAMS, RECORD "EQUILIBRIUM" LOADS; TAKE MANUAL READINGS.
11. UNLOAD IN 100 KIP INCREMENTS; READ MANUAL DATA AT EACH STEP.
12. AT ZERO LOAD, LET SYSTEM EQUILIBRIATE AND TAKE FINAL SET OF MANUAL READINGS TO RECORD RESIDUAL PILE STRESSES.



TYPICAL LOAD DISPLACEMENT CURVE (TENSION)

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PLATE 10

TESTS B - PILE LOADING PROCEDURE
STATIC TEST TO FAILURE IN COMPRESSION

1. INITIAL SET OF READINGS CORRESPOND TO FINAL SET OF TENSION DATA.

2. APPLY LOADS IN 100-KIP INCREMENTS TO FAILURE; MANUAL READINGS TAKEN AT EACH LOAD LEVEL.

3. AT FAILURE, RECORD $\approx$ 2 INCHES OF PLASTIC SLIP.

4. STOP RAMS, RECORD LOADS AFTER EQUILIBRATION.

5. UNLOAD IN 100-KIP INCREMENTS; MANUAL RECORDING AT EACH LOAD LEVEL.

6. AT ZERO PILE-HEAD LOAD, RECORD RESIDUAL PILE STRESSES.

7. REMOVE HYDRAULIC RAMS, LVDT, AND DIAL INDICATOR.

8. REDRIVE PILE TO PROPER ELEVATION.

9. RECORD MANUAL DATA AFTER DRIVING, WHEN PILE STRESSES EQUILIBRIATE.

10. DISCONNECT HYDRAULIC POWER-PACK, PREPARE TO DEMOB TO VENICE DOCK.

11. MONITOR CHANGES IN PILE STRESS AND SOIL PRESSURES DURING THE INSTALLATION OF PIEZOMETERS.

PRE-TEST CHECK (ALL TESTS)

1. CHECK HYDRAULIC PUMPS AND RAMS FOR PROPER OPERATION AND CONTROL.

2. TAKE INITIAL ZERO READINGS OF ALL INSTRUMENTS WITH BALANCE BOX.

3. SET LVDT'S FOR PROPER DISPLACEMENT RANGE EXPECTED FROM TEST

4. ZERO DIAL GAGES AFTER SETTING LVDT'S FOR PROPER RANGE.

5. PREPARE X-Y-Y PLOTTERS

   A. ZERO AND SET SCALES
   B. PREMARK ANY GUIDES OR LIMITS
   C. RECHECK INPUTS TO PLOTTER

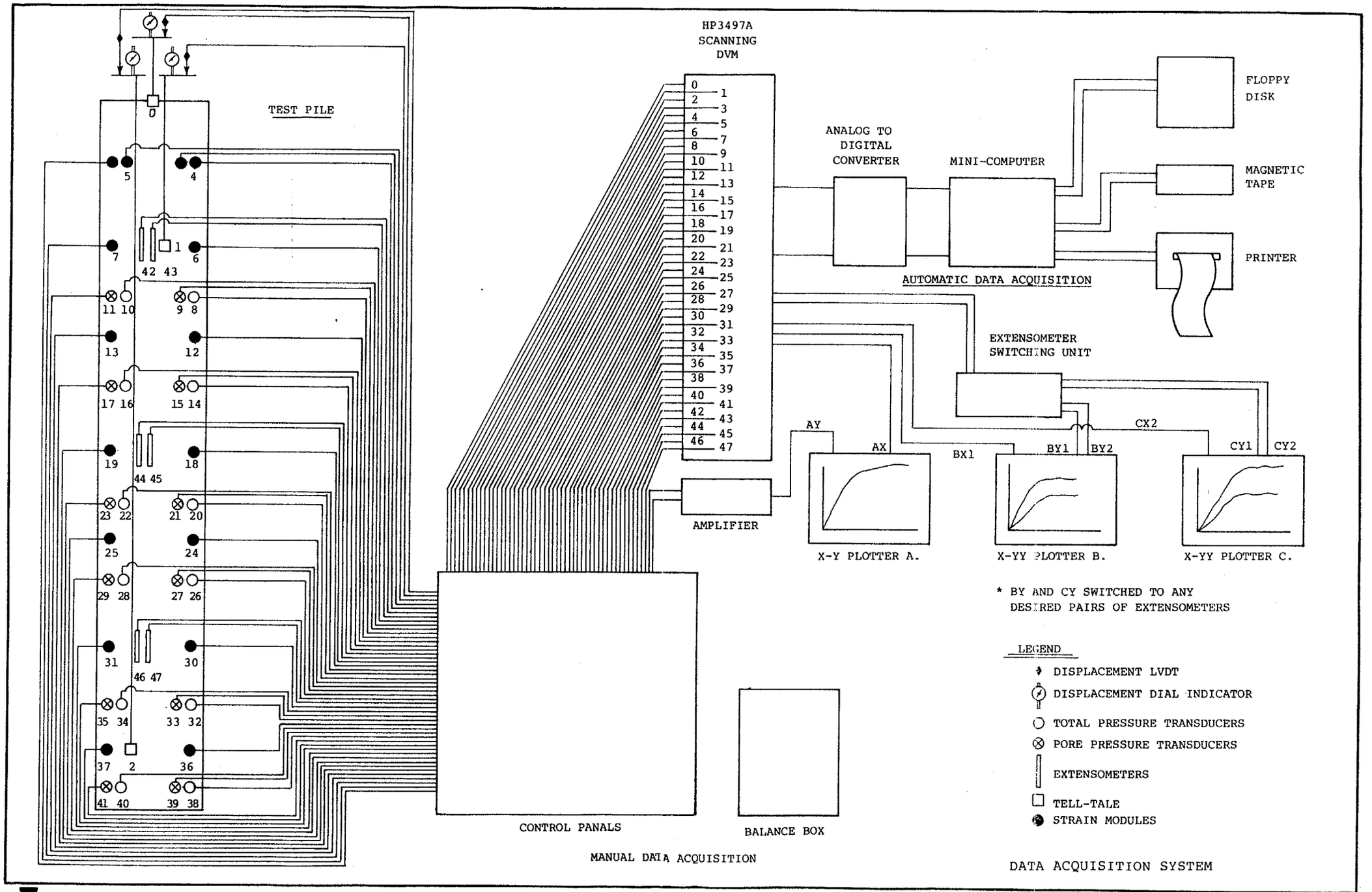
6. SET DATA SAMPLE INTERVAL FOR AUTOMATIC DATA ACQUISITION SYSTEM.

7. INITIALIZE DAS MICRO COMPUTER FOR PROPER LOAD TEST IDENTIFICATION.

8. POSITION PERSONNEL.

9. CALL FOR INITIAL INSTRUMENT READINGS.

10. CHECK COMMUNICATIONS SYSTEMS.



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INSTRUMENT CHANNEL NUMBERING SYSTEM

CHANNEL NUMBER	ELEVATION, FT. (MSL = 0)	INSTRUMENT TYPE
00	+ 122	DISPLACEMENT LVDT
01	- 67	DISPLACEMENT LVDT
02	- 217	DISPLACEMENT LVDT
03	+ 87	STRAIN MODULES A & B (TO ANALOG)
04	+ 87	STRAIN MODULE
05	+ 87	STRAIN MODULE
06	- 65	STRAIN MODULE
07	- 65	STRAIN MODULE
08	- 78	TOTAL PRESSURE
09	- 76	PORE PRESSURE
10	- 76	TOTAL PRESSURE
11	- 78	PORE PRESSURE
12	- 95	STRAIN MODULE
13	- 95	STRAIN MODULE
14	- 108	TOTAL PRESSURE
15	- 106	PORE PRESSURE
16	- 106	TOTAL PRESSURE
17	- 108	PORE PRESSURE
18	- 125	STRAIN MODULE
19	- 125	STRAIN MODULE
20	- 138	TOTAL PRESSURE
21	- 136	PORE PRESSURE
22	- 136	TOTAL PRESSURE
23	- 138	PORE PRESSURE
24	- 155	STRAIN MODULE
25	- 155	STRAIN MODULE
26	- 168	TOTAL PRESSURE
27	- 166	PORE PRESSURE
28	- 166	TOTAL PRESSURE
29	- 168	PORE PRESSURE
30	- 185	STRAIN MODULE
31	- 185	STRAIN MODULE
32	- 198	TOTAL PRESSURE
33	- 196	PORE PRESSURE
34	- 196	TOTAL PRESSURE
35	- 198	PORE PRESSURE
36	- 215	STRAIN MODULE
37	- 215	STRAIN MODULE
38	- 228	TOTAL PRESSURE
39	- 226	PORE PRESSURE
40	- 226	TOTAL PRESSURE
41	- 228	PORE PRESSURE
42	- 67	EXTENSOMETER
43	- 67	EXTENSOMETER
44	- 126	EXTENSOMETER
45	- 126	EXTENSOMETER
46	- 187	EXTENSOMETER
47	- 187	EXTENSOMETER

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LOAD TEST ORGANIZATION

POSITION	LOCATION	FUNCTIONS	NAME
1. TECHNICAL COORDINATOR	DATA ACQUISITION BLDG.	OVERALL DIRECTION	H. MATLOCK
2. TEST MANAGER/ COMPUTER OPERATOR	DATA ACQUISITION BLDG.	CONTROL OF TEST OPERATIONS, OPERATES COMPUTER AND X-Y PLOTTERS	J.D. BOGARD
3. PANEL OPERATOR	DATA ACQUISITION BLDG.	OPERATE CONTROL PANEL AND BALANCE BOX	N.W. DWYER
4. OUTSIDE COORDINATOR	PLATFORM DECK	COORDINATES ALL OUTSIDE ACTIVITIES UNDER INSTRUCTIONS FROM TEST MANAGER	G.L. HOLLOWAY
5. HYDRAULICS OPERATOR	HYDRAULIC PUMPS	OPERATES HYDRAULIC SYSTEM	F. BROWN
6. DIAL GAGE READER	NEAR PILE	READS AND RECORDS PILE DISPLACEMENT DIAL GAGES	W.C. PING
7. LOGS AND RECORDS	DATA ACQUISITION BLDG.	RECORDS TEST NOTES AND OPERATES TAPE RECORDER	J.M.E. AUDIBERT

PLATE 15

APPENDIX A

INSTRUCTIONS FOR INSTALLATION OF THE TEST SYSTEM

INSTRUCTIONS FOR INSTALLATION OF THE TEST SYSTEM

1.0 General

2.0 Preparation of Existing Platform (By COMPANY)
- 2.1 Test Platform
- 2.2 Installation of Load Frame

3.0 Mobilization of Equipment (By CONTRACTOR)
- 3.1 Equipment and Hardware
- 3.2 Test Site

4.0 Installation of the Test Pile (By CONTRACTOR)
- 4.1 Instrument Test Section
- 4.2 1st Add-On Section
- 4.3 2nd Add-On Section

5.0 Installation of the Upper Work Platform and Reference Frame
- 5.1 Upper Work Platform (By CONTRACTOR)
- 5.2 Reference Frame (By COMPANY)

6.0 Demobilization (By CONTRACTOR)
- 6.1 Deck Crane
- 6.2 Test Site

1.0 GENERAL

1.1 These instructions define the requirements for the general sequence of offshore construction activities for the installation of the load frame (by COMPANY) and test pile (by CONTRACTOR). Responsibilities of the CONTRACTOR during the installation of the test pile are defined in Section 3.2 of Bid Tender 4397.2.

1.2 The procedures, instructions and associated drawings are considered to be complementary to Conoco's specifications.

1.3 The organization for the work execution is shown in Plate 1.

1.4 The proposed work schedule is based on the following conditions:

1.4.1 The operations carried out at the offshore test site shall be normally 24 hours a day and 7 days a week.

1.4.2 The overall work schedule is based on normal weather conditions during mobilization and installation of the test pile.

1.4.3 Upon completion of the installation of the test pile and associated hardware, the normal work schedule shall be reduced to 12 hours a day and 7 days a week.

2.0 PREPARATION OF EXISTING TEST PLATFORM (BY COMPANY)

2.1 Test Platform

2.1.1 The existing production facilities remaining on the platform deck shall be cleared or re-positioned so as not to interfere with operations or present safety hazards during the installation or testing phase of the project.

2.1.2 All necessary equipment and facilities (walkways, grating, stairways, boat landings, etc.) shall be upgraded to ensure adequate servicability for the duration of the project.

2.1.3 Where necessary, flanges of the two central floor beams shall be removed over the test bay area to cut a 42" Ø hole through the existing deck plate (see DMS Drawing A-140-D8).

2.1.4 Central portion of the diagonal braces at elevation +10 feet and +31 feet shall be removed and pile guides shall be installed in accordance with the DMS Drawings A-140-D11 and D-12.

2.1.5 Main deck plate adjacent to the jacket legs in each corner of the test bay shall be strengthened for acceptance of the load frame (see DMS Drawings A-140-D9 and D-10).

2.1.6 Generators and a lighting system shall be provided on the platform so that operations may proceed around the clock.

2.1.7 A single side band or marine band communications system shall be available on the platform or construction barge during all construction and testing activities.

2.1.8 Skid beams for the portable drilling rig shall be moved to the new position. Three 12 3/4-in conductor pipes shall be placed at the designated locations and installed to a depth of 30 ft below the seafloor. The loading frame plates shall also be installed at this time. (See Drawing A-100.)

2.1.9 Concentric pipes 12 3/4-in shall be used for supporting the reference beam. These conductors shall be installed to a depth of at least 40-ft below the seafloor (see DMS Drawings A-140-D16).

2.2 Installation of the Load Frame

2.2.1 All preliminary preparations and modifications to the existing test platform shall be performed by COMPANY prior to the installation of the load frame.

2.2.2 The load frame should be complete in one piece upon arrival to the test site.

2.2.3 Installation of the loading frame shall be carried out with the following general procedure:

2.2.3.1 Make edge and surface preparations on the test platform and load frame for welding.

2.2.3.2 Attach lifting lines and hoist the load frame into position with a crane capable of lifting the 75-ton load frame in one piece.

2.2.3.3 Lower the load frame into position and connect the load frame to the test platform. Conduct necessary test to ensure that all welds meet the required welding specifications.

2.2.3.4 Install inner reference piles (8 5/8-in) to a penetration of approximately 40 ft. below the seafloor to serve as the support for the reference beam network. Drawings A-140-D0 and -D5 illustrate the correct location of these members with respect to the load frame and existing platform.

3.0 MOBILIZATION (BY CONTRACTOR)

3.1 Equipment and Hardware

3.1.1 Port of mobilization for the test pile shall be the Fabrication yard at which the pile is assembled and built.

3.1.2 All equipment required for operations shall be mobilized to the test site on either a materials barge or a 70-ton jack-up barge.

3.1.3 The port of mobilization for the second jack-up barge is Venice, Louisiana.

3.1.4 The test pile shall be transported to the test site in 3 pieces. The instrumented segment shall be 180 ft. in length with the 2 add-on sections, each being 90 ft. in length.

3.1.5 In addition to the test pile, COMPANY will supply a portable laboratory, prestrung cable racks, data acquisition building, generators, and other necessary equipment to be mobilized offshore.

3.1.6 Delmag diesel hammers as requested by COMPANY shall be provided by CONTRACTOR.

3.2 Test Site

3.2.1 Upon arrival at the test site, the jack-up barge shall position itself on the west side of the platform and evaluate itself to platform deck.

3.2.2 Preliminary platform modifications (crane boom supports, pile supports, pile rotation support, etc.) shall be completed prior to the test pile or support equipment being unloaded on platform deck.

3.2.3 Crane will be transfered to platform once all connectors from platform to jack-up are completed and mat boards placed.

3.2.4 Boom sections will be lifted by jack-up barge crane to deck of platform for assembly from work boat or materials barge (Plate 2).

3.2.5 Generators and support equipment shall be placed in service while the 150-ton crawler crane and boom sections are being readied for operation.

3.2.6 Once the crane and necessary boom sections have been transferred, the materials barge shall then be stationed on the west side of the platform. This will allow easy access for the 150-ton crawler crane (American 9270) to the support equipment and pile segments. The second jack-up shall also be placed in service at this time.

3.2.7 The instrumented segment and add-on segments of the test pile shall be transferred to the platform pile staging area as soon as possible.

3.2.8 Other equipment shall be transferred to platform and set up while instrumented segment is being readied (Plate 3).

4.0 INSTALLATION OF THE TEST PILE (BY CONTRACTOR)

4.1 Instrumented Test Segment (TP1)

4.1.1 The sequence of field construction activities for the installation of the test pile shall be as follows:

4.1.2 The instrumented pile segment resting in the support stands (by CONTRACTOR) and add-on segments shall be made ready for installation. This will consist of the following events:

4.1.2.1 Lift instrumented and add-on segments of the test pile from the materials barge onto deck of platform into the pile staging area.

4.1.2.2 Remove cable spools from instrumented segment and relocate to approximately 80 ft from top of pile. Prepare pivot clamp on instrumented segment.

4.1.2.3 Ertec personnel will install the saturated porous stones into the pore pressure cells. Cells will be covered with plastic sheets so that they remain saturated during uprighting procedure. Remove spent pad eyes. 11/30

4.1.2.4 Fill the extensometer tubes with oil to obtain the highest level of volume in each tube.

4.1.3 Attach lifting lines and air tugger lines to the instrumented segment and upright the pile.

4.1.4 Position the instrumented pile segment over the load frame and lower pile into the stabbing guide. Lower pile until it rests on pivot clamp stops. (Extreme caution shall be exercised during the uprighting procedure.) Remove pivot clamp with crane holding pile.

4.1.5 Lower the pile segment so that the pile tip is just off the seafloor. (Cable spools should be at load frame deck level.) At elev. +10, remove any plastic sheets covering the pore pressure cells as they are immersed in the seawater.

4.1.6 Re-attach pivot clamp device to serve as a pile stop.

4.1.7 Remove cable and cable spools in an orderly fashion. The cables shall be placed on the deck in groups of six. A Kellems clamp shall be placed over each group of six cables.

4.1.8 The cables shall be connected to the data acquisition system inside the instrument building so that all instruments may be monitored during installation.

4.1.9 A full set of pile instrument readings shall be taken to record the initial zero readings of the instruments while the pile segment is hanging vertically. These readings shall also include the drop-in extensometer units. The extensometers shall be zeroed in the following manner:

4.1.9.1 Hoist the working cage with workers and instruments to the top of the instrumented segment.

4.1.9.2 Fill the extensometer tubes with oil.

4.1.9.3 Lower each instrument into its respective tube and wait for temperature stabilization.

4.1.9.4 Make readings of each instrument and check for repeatability.

4.1.9.5 Retrieve each instrument and repackage extensometer prior to lowering work cage.

4.1.9.6 Lower work cage to platform deck and remove.

4.1.10 Raise the instrumented pile segment off stops upon completion of zero readings on the instruments.

4.1.11 Remove stops and remove all weld metal by grinding.

4.1.12 Lower the instrumented pile segment until the pile supports its own weight. At elev. +10, remove plastic sheets as pore pressure cells pass into the seawater.

4.1.13 Mount the pile hammer and drive the instrumented segment to approximately 18 ft above the load frame deck.

4.1.14 The pile hammer will be removed and the work cage positioned around the pile so that the surface of the instrumented segment may be prepared for welding.

4.2 First Add-On Segment (TP2)

4.2.1 The first 90-ft add-on segment shall be made ready for lifting prior to making the first vertical stab between segments TP1 and TP2.

4.2.2 Attach lifting lines to the add-on segment and lift until pile is vertical. Extreme care shall be taken during the process so as not to damage or drag the pile boot. Tag lines should be employed to control pile movement.

4.2.3 Remove the protective boot and prepare the internal access tube connectors and the surface of the add-on segment for welding.

4.2.4 Lower the add-on segment onto the instrumented segment until the four alignment guides are in contact and the access tubes mate properly.

4.2.5 Pressure test the water tight extensometer connectors prior to welding the two pile segments together. After the connectors have been proven water-tight, the splice joint may be welded. Caution should be exercised to protect the instrument cables from welding (girth weld) and cutting operations (removal of stabbing guides) around the splice joint.

4.2.6 Add additional silicon grease to the extensometer connector block and weld the scew plugs into the pile. Grind any excess material from the vertical splice. Ultrasonic testing of the pile weld is required before additional penetration is permitted.

4.2.7 Attach the cross over bundle rod bars over the splice joint.

4.2.8 Remove any welding protection surrounding the instrument cables and prepare for attachment to the first add-on segment.

4.2.9 Attach the hoisting lines to the work cage. The work cage shall then be hoisted to permit access to the entire length of the add-on segment for the attachment of the instrument cables and protective covers.

4.2.10 Progressively hoist work cage while clamping instruments cables using nylon ty wraps to the bundle rods (Plate 4).

4.2.11 Bundle cables to 12 ft below the top of the first add-on segment and tighten the Kellems clamps to support the cables during pile diving operations. Attach dynamic instrumentation to pre-installed bolts below top of pile.

4.2.12 Lower work cage to the platform deck to install protective insulation around the cable network and to change out workers, if required.

4.2.13 Install angle segments in 10-ft lengths to 15 ft below the top of the add-on around the bundled cable network.

4.2.14 Lower work cage for final welding of angles and prepare pile hammer for driving the first add-on segment.

4.2.15 Mount pile driving hammer on top of first add-on segment and drive to a convenient working height above the load frame. Align pile as it is being driven so that the angle segments correctly match up to the antirotation devices. Interruption during pile driving may be required to make instrument measurements.

4.3 Second Add-On Segment (TP3)

4.3.1 Install dynamic instrumentation below the load head prior to lifting TP3.

4.3.2 Repeat step 4.2.2 through 4.2.10 for the second add-on segment.

4.3.3 Bundle cables to 5 ft below the bottom of the load head. Unspool cables attached below load head and attach the Kellems clamp to support the cables during pile driving. The cables existing below the load head should also be threaded through the Kellems clamp.

4.3.4 Install cable insulation as the work cage is lowered to the load frame deck to change out workers.

4.3.5 Install angle segment in 10 ft length to approximately 5 ft below the load head of the second add-on segment (TP3).

4.3.6 Complete welds on angle segment as the work cage is lowered to deck. Prepare pile hammer for driving the second add-on segment. Remove work cage from load frame deck.

4.3.7 Position the hydraulic rams on the load frame and check out all loading and data acquisition equipment. Once this has been demonstrated to be in good working order, the contractor shall be advised that the pile is ready to be driven.

4.3.8 Monitor dynamic instrumentation while driving the second add-on segment to grade (Plate 5). Pile may be required to be stopped during driving to make instrument measurements.

4.3.9 Attach hydraulic rams to the load head.

4.3.10 Perform immediate load test in tension and compression.

4.3.11 Remove hydraulic rams and redrive the test pile approximately 1.0 ft.

5.0 INSTALLATION OF THE UPPER WORK PLATFORM AND REFERENCE FRAME (BY CONTRACTOR)

5.1 Upper Work Platform

5.1.1 The upper work platform supplied by COMPANY shall be installed upon the completion of the initial tension and compression tests.

5.1.2 The upper work platform shall be complete in one piece upon arrival to the test site (Dwg. No. A-140-D6)

5.1.3 Surface and edge preparations shall be made on the upper work platform and test pile prior to attachment.

5.1.4 Attach lifting lines to the upper work platform and lower over the top of the test pile. Lifting slings shall be sufficient to handle the anticipated ___ tons. These slings shall be attached to the lifting eyes on the work platform as shown in Dwg. No. A-140-D6.

5.1.5 Conduct necessary inspections and tests to ensure that all welds meet the required welding specifications.

5.2 Reference Frame (Installed at Major Test)

5.2.1 The wooden cross members and bracing of the reference frame (supplied by COMPANY) shall be preassembled prior to arrival at the test site.

5.2.2 The two vertical stands that the reference network rest upon shall be installed by COMPANY at the time the platform is modified and the load frame is installed.

5.2.3 The vertical stands consist of a 8 5/8-in. diameter pipe pile inside a larger pipe of 12 3/4-in. diameter with wall thickness of at least 0.25 in. These vertical members shall be placed approximately 15 ft apart and shall be installed to a depth of at least 30 ft below the seafloor. Refer to Dwg. Nos. A-140-D0, -D5, and -D6 for details of the reference network.

5.2.4 Conduct necessary inspections and tests after the test pile is driven to ensure that all reference frame network members are true and level and that they meet the required specifications.

5.2.5 Install the measurement modules and mounting brackets to the cross members of the reference frame.

6.0 DEMOBILIZATION

6.1 Demobilization of the 150-ton Crawler Crane

6.1.1 Demobilization of the crawler crane shall begin immediately upon completion of installing of the upper work platform and removal of the hydraulic rams. It shall follow the same sequence of disassembly as those outline in Section 3.2 for the initial assembly of the crane.

6.1.2 The 100-ton crane located on the jack-up barge shall assist in derigging the deck mounted crawler crane. Upon the crane's disassembly and placement onto the jack-up barge, the offshore CONTRACTOR shall be demobilized.

6.1.3 Upon the disembarkment of the supply barge, the 100-ton jack-up barge used as the living quarters and in the assembly process of the deck mounted crawler crane shall also be demobilized.

6.1.4 The 70-ton jack-up barge shall be replaced with a smaller jack-up barge until the transfer of the crane body is made to the cargo barge and normal time allowed for its return to platform.

6.1.5 This jack-up vessel shall be positioned on the east side of the platform so that the vessel's crane may assist in moving the drilling rig directly onto its working skids.

6.1.6 Other equipment shall be loaded as required.

6.2 Demobilization of the Test Site

6.2.1 The test site shall be completely demobilized upon the final implantation and testing of the small diameter tools.

6.2.2 All of the drilling equipment supplied by the drilling contractor shall first be broken down and placed upon the jack-up barge or supply vessel.

6.2.3 Ertec equipment and that supplied by Conoco shall next be removed from the platform and placed on the jack-up barge.

6.2.4 Final preparations to the platform to secure items that are remaining shall take place prior to the jack-up leaving the test site.

6.2.5 The jack-up will return to the port of mobilization at Venice, Louisiana.

ILLUSTRATIONS

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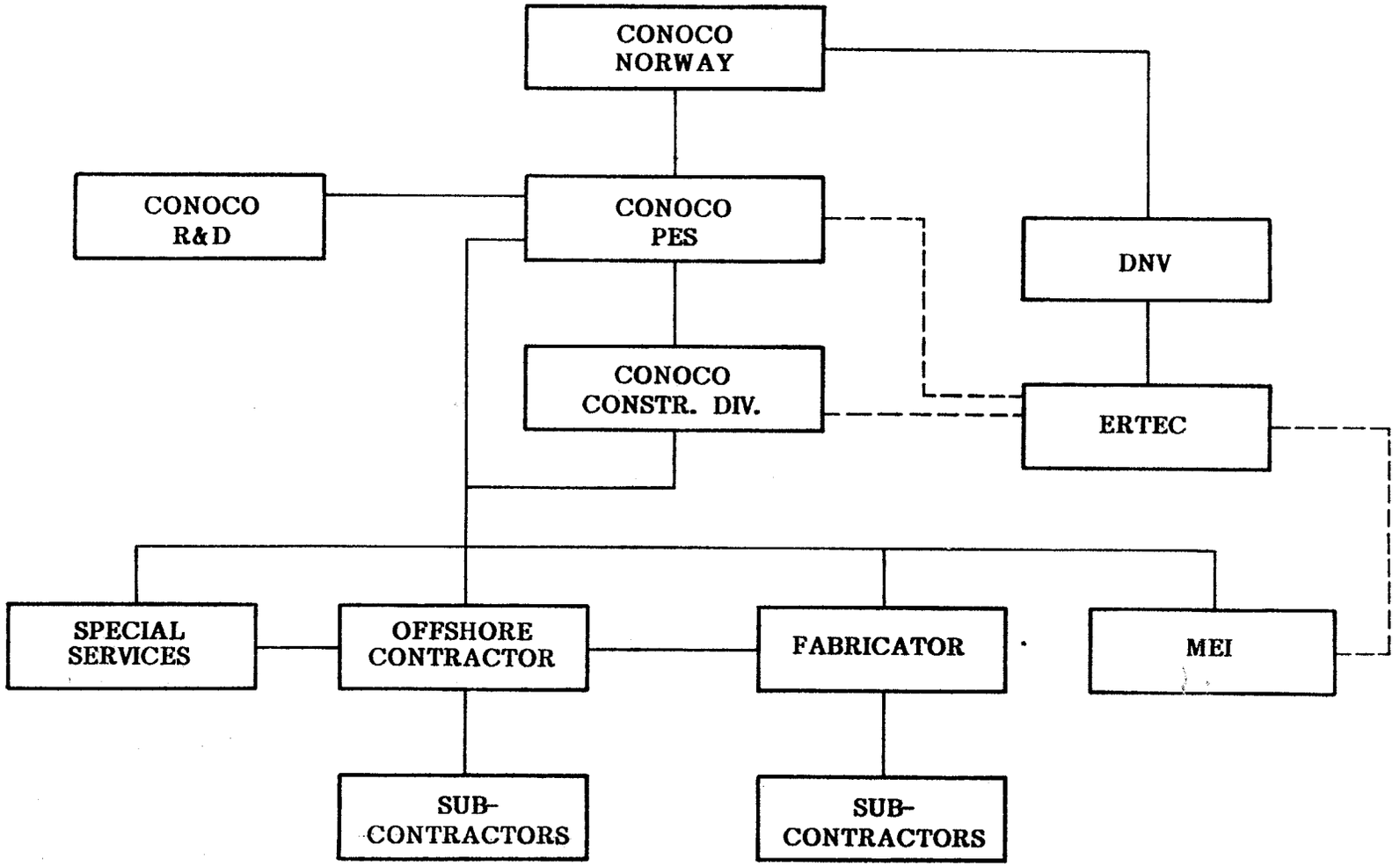

INSTRUMENTED PILE LOAD TEST PROJECT

ORGANIZATION CHART

PLATE 1

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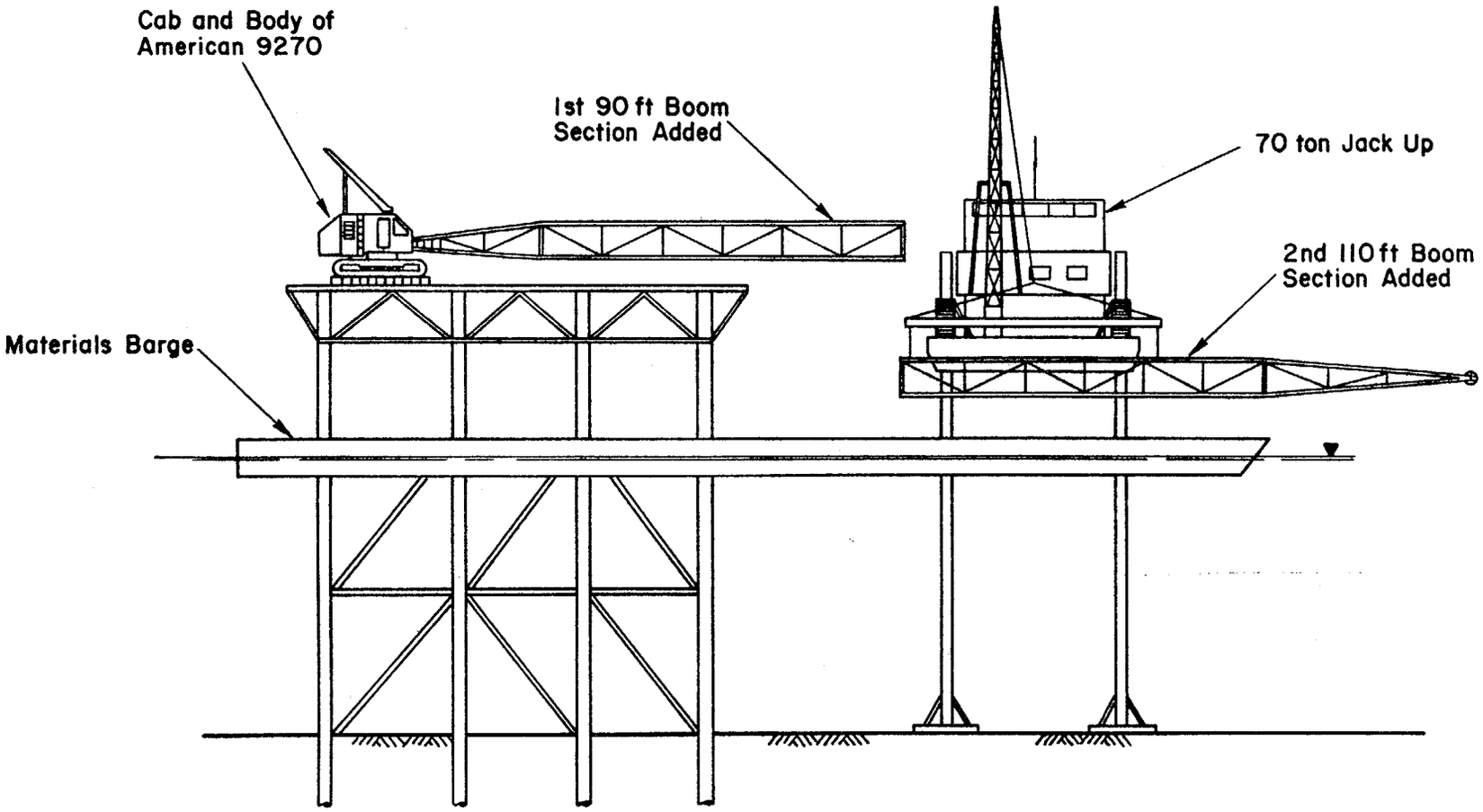
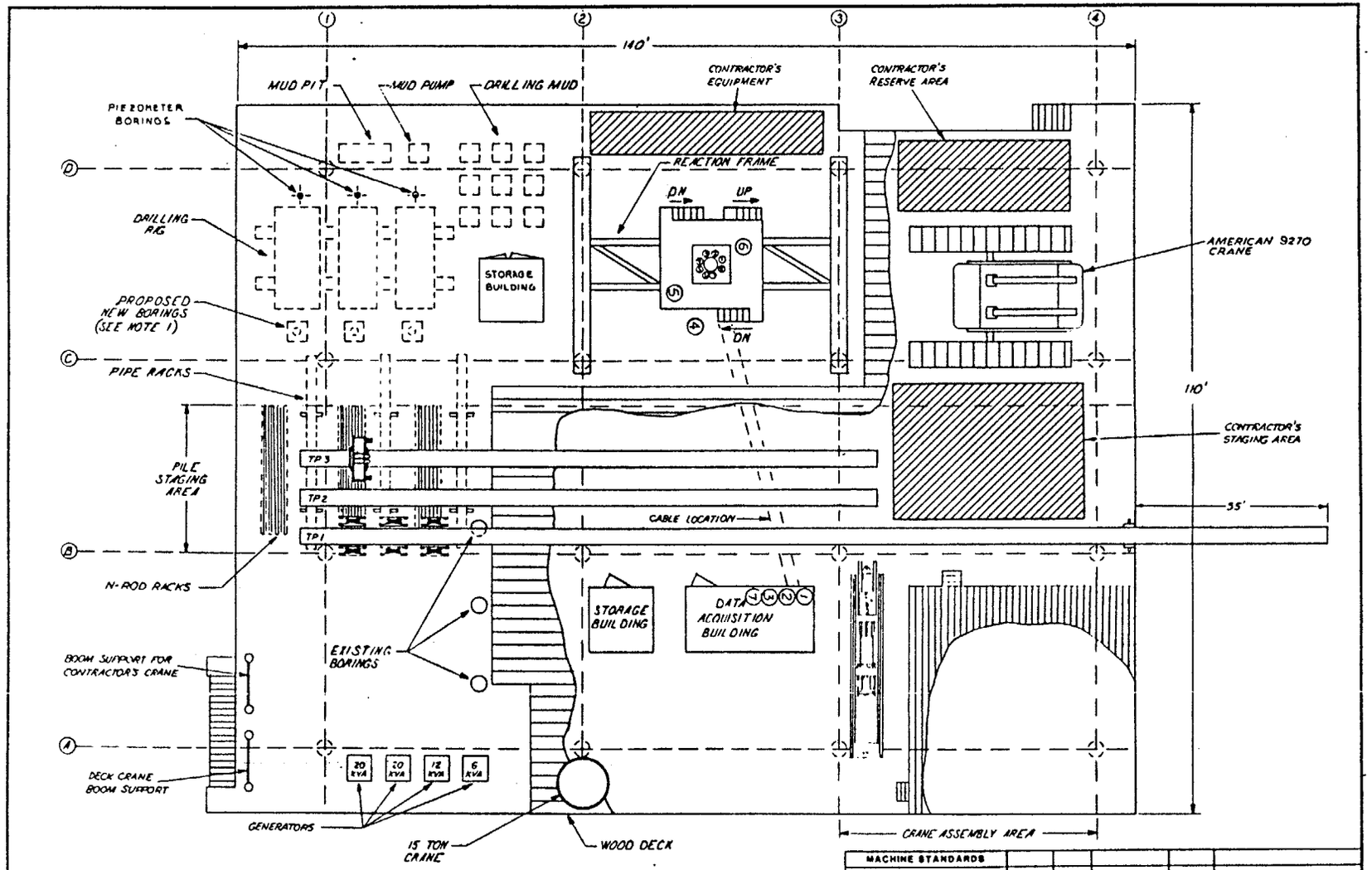


ASSEMBLY OF CRANE BOOM SECTION

PLATE 2



NOTE:
1) SMALL DIAMETER TESTING IN PROPOSED NEW BORINGS WILL BE CONDUCTED AFTER LARGE DIAMETER PILE IS INSTALLED.

MACHINE STANDARDS	
EXCEPT AS OTHERWISE SHOWN	
MACHINE FINISH TO BE 63 .0005	
DIMENSIONAL TOLERANCE	ANGLE TOLERANCE
0.000 ± .005	XX° ±1°
0.00 ± .01	XX° XX' ±1'
FRACT ±1/64	XX° XX' XX" ±1"
CORNER RADIUS .010 TO .030	
LATHE CUT THREADS CLASS 2	
REMOVE ALL BURRS AND BREAK ALL SHARP CORNERS	
PROJECTION	

Pc MK	QTY	MATERIAL	SPEC	DESCRIPTION

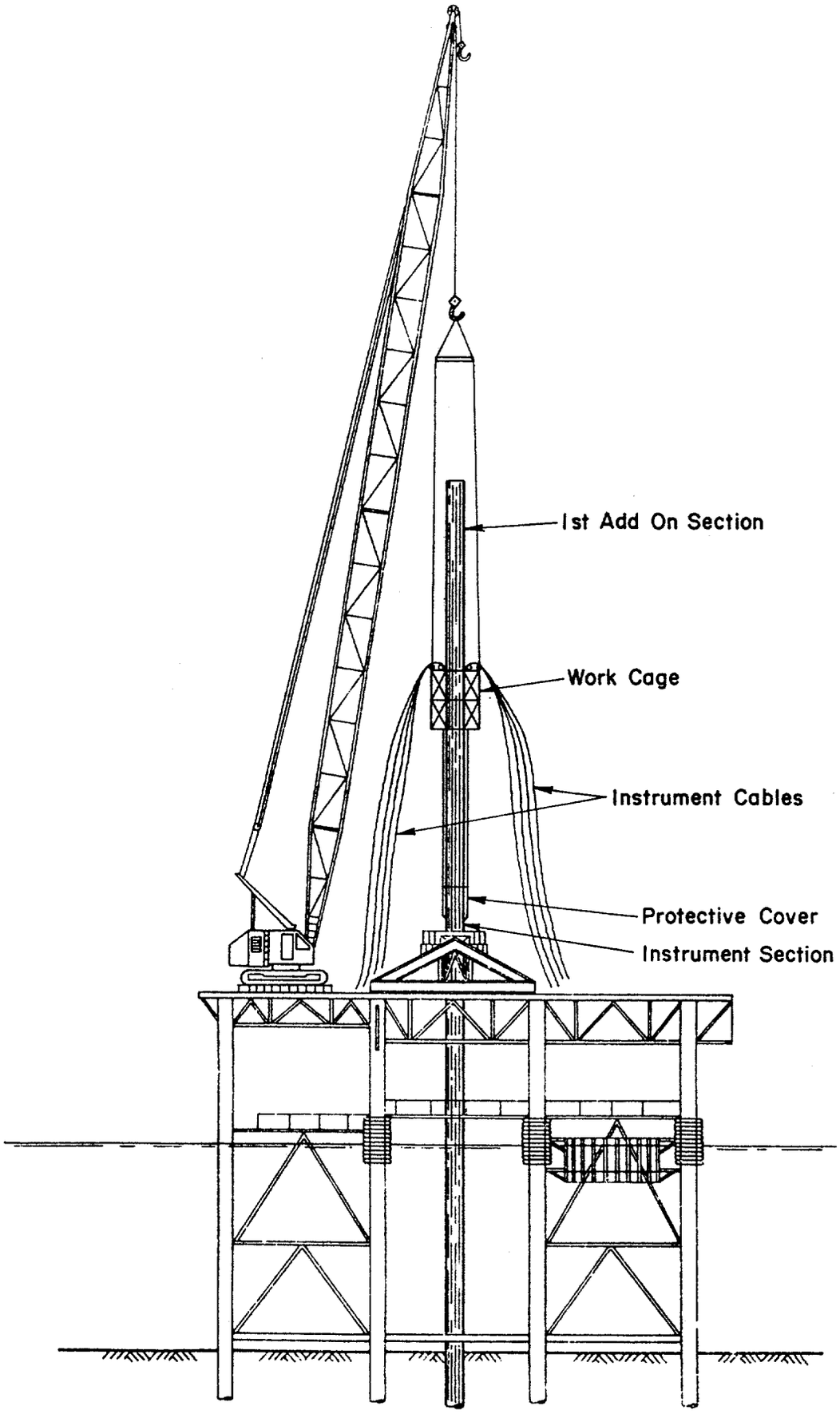
LIST OF MATERIAL

DECK LAYOUT FOR WEST DELTA PLATFORM

(NUMBERS CORRESPOND TO LOAD TEST ORGANIZATION CHART)

Ertec

SCALE: 1" = 10'	DRAWN BY: G.R. COFFEY
APVD BY:	DATE: 3-15-83
DRAWING NUMBER C-A-100 PLATE 3	REV. NO.



CABLE BUNDLING OPERATION

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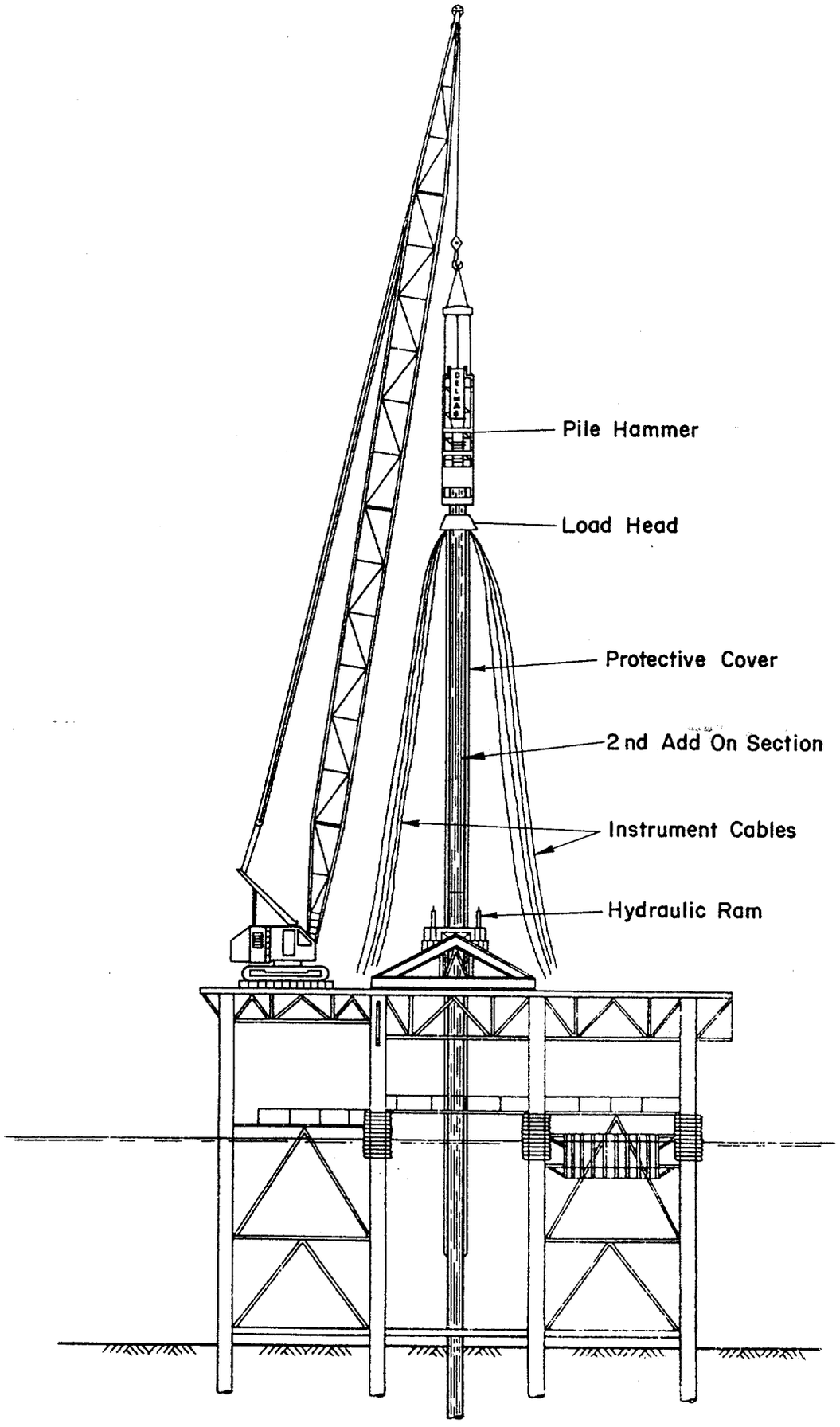
PLATE 4



PILE DRIVING OPERATION

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PLATE 5

APPENDIX B

SMALL-DIAMETER PILE SEGMENT TESTS

TABLE OF CONTENTS

ILLUSTRATIONS

SMALL-DIAMETER PILE SEGMENT TESTS

TEST SYSTEM

The primary instruments to be used are the 7.62-cm (3.0-in.) diameter small-diameter pile segments used for the CNRD 13-2 program. These tools are instrumented to measure shear transfer, displacement, total lateral pressure and pore water pressure. A schematic of the instrument is shown on Plate 1. Four such instruments will be available in the field.

Loading will be accomplished with the specially designed loading system (see Plate 2) which was used in the CNRD 13-2 project.

In addition to the small-diameter pile segment models, tests at two depths in one of the borings are to be made using the X-probe, shown on Plate 3. This instrument is similar to the small-diameter pile segment tool in that the same four parameters are measured. However, the diameter is smaller, 4.37 cm (1.72 in.) versus 7.62 cm (3.0 in.), and the shape resembles a mechanical cone penetrometer. That is, the end of the tool is fitted with a conical shaped tip. Use of the X-probe will allow an additional diameter-effect comparison to the larger pile segment tool and to the test pile.

Data will be recorded using the same basic acquisition system developed for CNRD 13-2. The system, shown schematically on Plate 4, consists of a DEC computer system, an HP-3497A scanner digitizer, a printer and two analog plotters. Digital data will be recorded as raw voltages on disc for later processing and analysis. Real-time analog plots will be made using the two x-y-y plotters. One plotter will display shear transfer versus displacement; the other will show total pressure (y_1) and pore pressure (y_2) versus displacement. The entire system will be housed in a waterproof, air-conditioned portable building.

In some cases "retests" will be performed. Retests are defined as tests performed after a major load test program and an additional consolidation period. Planned retests are also shown on Plate 5.

Of particular interest are the tests at the 63.4-m (208-ft) elevation. An eight-hour and seventy-two hour test will be performed in two of the three borings at this level. The third tool will be left undisturbed for approximately ninety days, or until the time of the major pile test. Following the eight and seventy-two hour tests, those instruments will also be left implanted to allow full consolidation prior to retesting after approximately ninety days.

TEST SCHEDULE AND SEQUENCE

A testing schedule and sequence has been developed to allow maximum utilization of offshore field time. The program developed will require approximately ten days of test time. Plate 7, Test Types and Sequence, shows the plan which begins (Day 1) on the day following completion of the piezometer work. An additional day should be allowed after completion of all tests for demobilization.

Work schedules for the test crew (Plates 8A and 8B) and drilling crew (Plates 9A and 9B) respectively, have been prepared to itemize activities for the ten-day test period. In addition, an elevation schedule for the instruments has been prepared and is shown on Plate 10. Accompanying this elevation schedule is a schematic (Plate 11) for the installation schedule showing the corresponding lettering for the specific test designation.

TEST PLAN

Testing will be performed at three depths in each of three borings. Tests will be performed at approximately the same depths as for the previous program with the only exception being the 17.7-m (58-ft) depth, which has been omitted from the forthcoming series of tests. Soil strength at this shallowest depth is very low, thus making meaningful interpretation of test results difficult. In addition, the test pile will obtain only a very small percentage of its total support from the soft soils in the upper zone.

The three depths which will be extensively tested are 45.1 m (148 ft), 54.3 m (178 ft) and 63.4 m (208 ft) below the seafloor. The soil at 45.1 m (148 ft) is in Zone 2, which primarily consists of low plasticity silty clay (CL). The lower two test elevations are in Zone 3, which is a high plasticity clay (CH). Zone 3 will provide the majority of the soil support for the test pile.

An immediate load test in tension will be performed as soon as possible after intrument installation at each test depth in each boring. The time between completion of installation, and testing is expected to be on the order of five to ten minutes. After the immediate tension test and one compression cycle, the instruments will be left undisturbed for a prescribed consolidation period as outlined on Plates 5 and 6. After the desired consolidation time has been achieved, the major load testing program will be performed.

The major load test plan at each of the depths is as follows:

1. Quasi-static (slow continuous) load test to failure in tension.

2. Two-directional large-displacement cycling to achieve minimum friction.

3. Quasi-static load test to failure in tension.

A short time will be allowed between tests 2 and 3 to allow equilibration of pressures, but not additional consolidation.

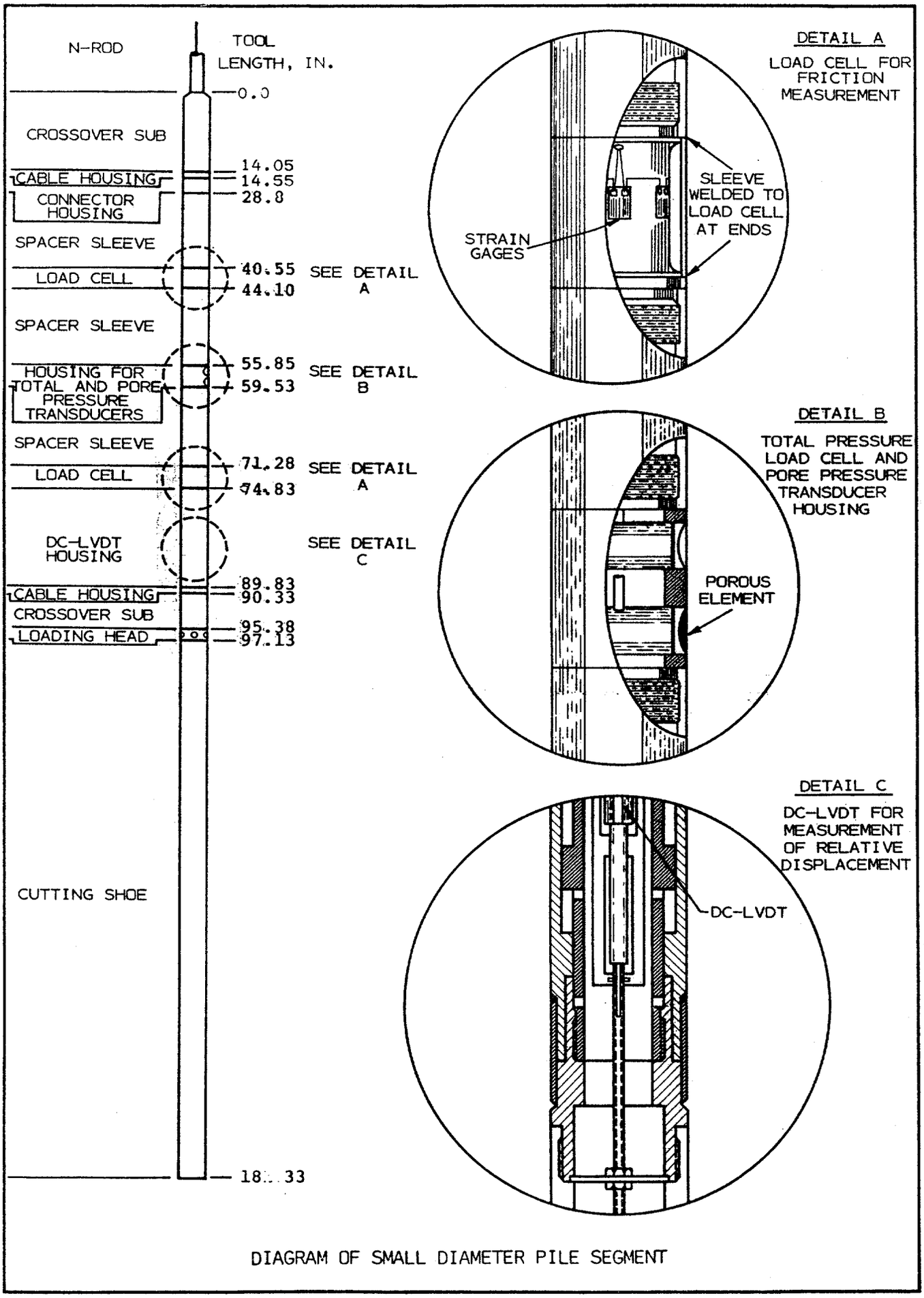

DIAGRAM OF SMALL DIAMETER PILE SEGMENT

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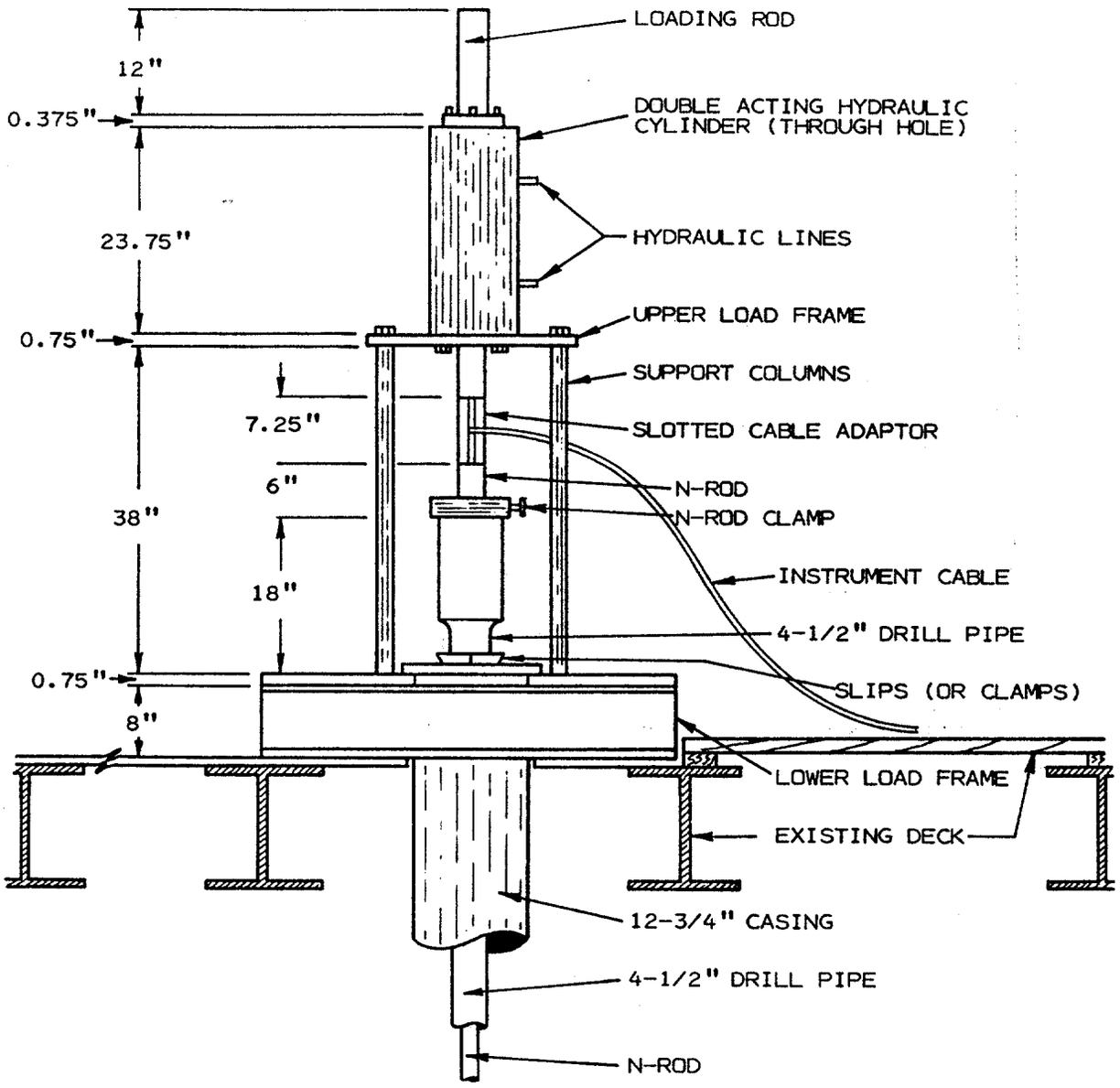
PLATE 1



SCHEMATIC DIAGRAM OF TESTING ARRANGEMENT
FOR 3-INCH DIAMETER PILE SEGMENT TESTS

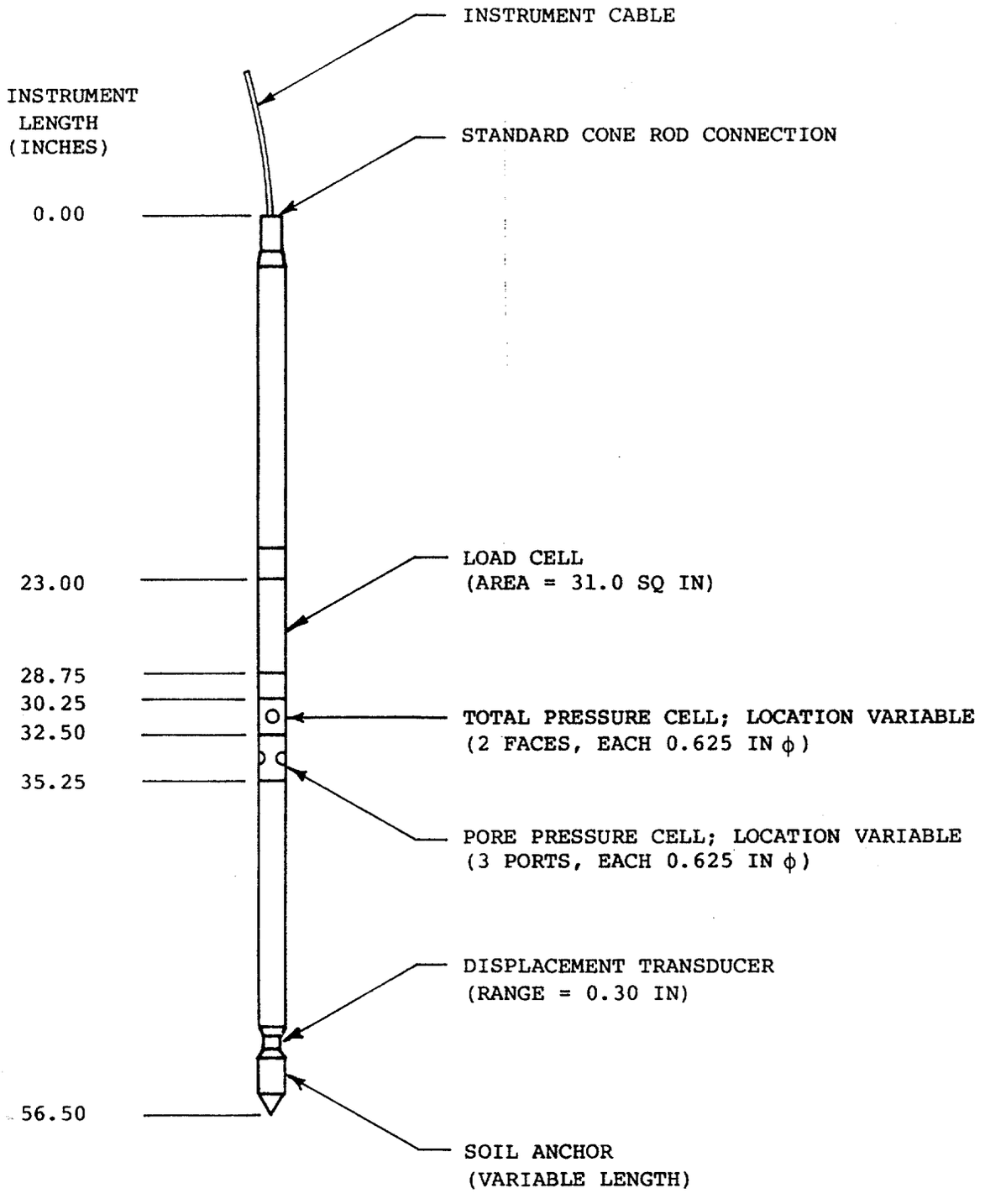


DIAGRAM OF X-PROBE

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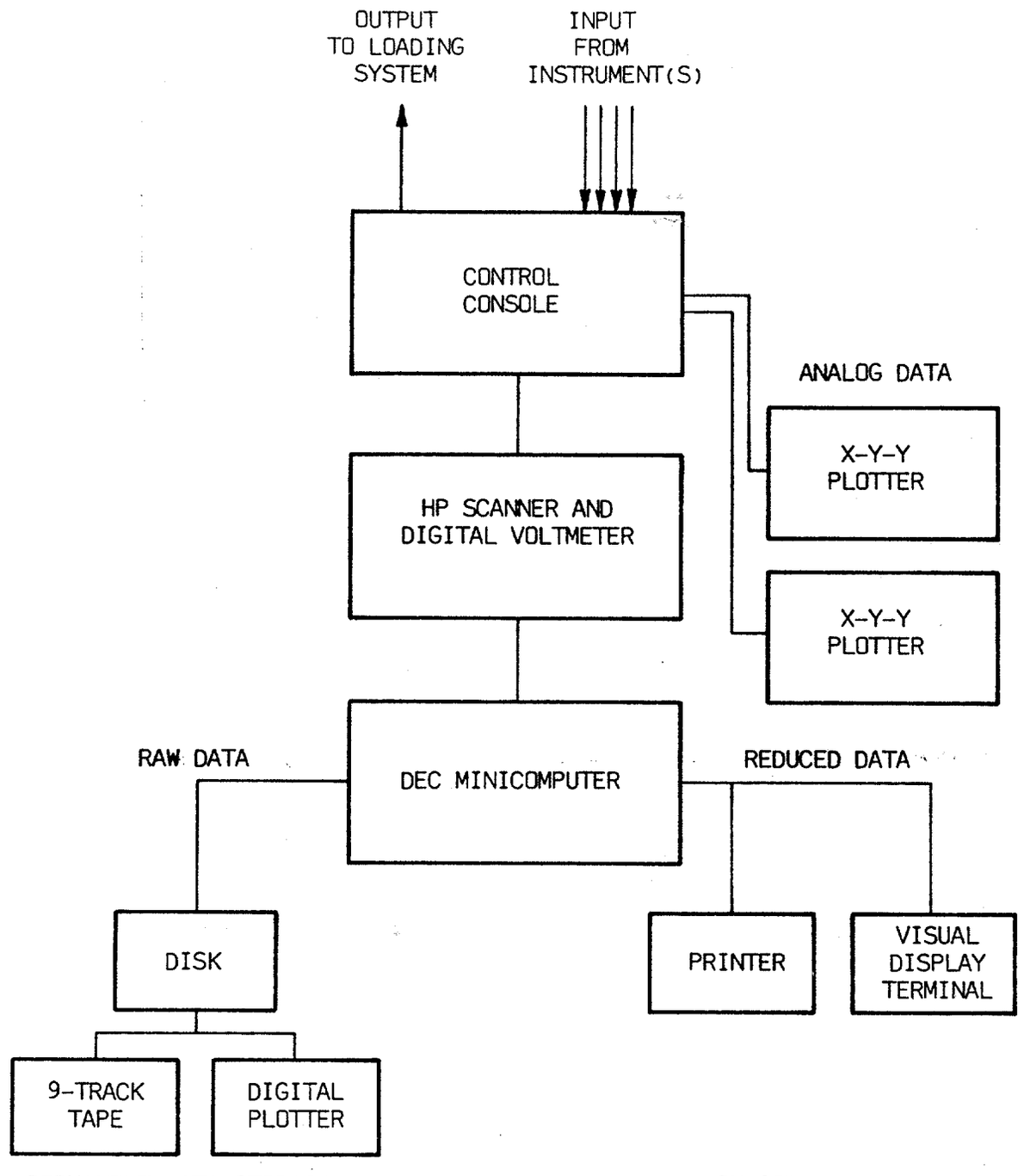
PLATE 3



SCHEMATIC DIAGRAM OF
DATA ACQUISITION SYSTEM

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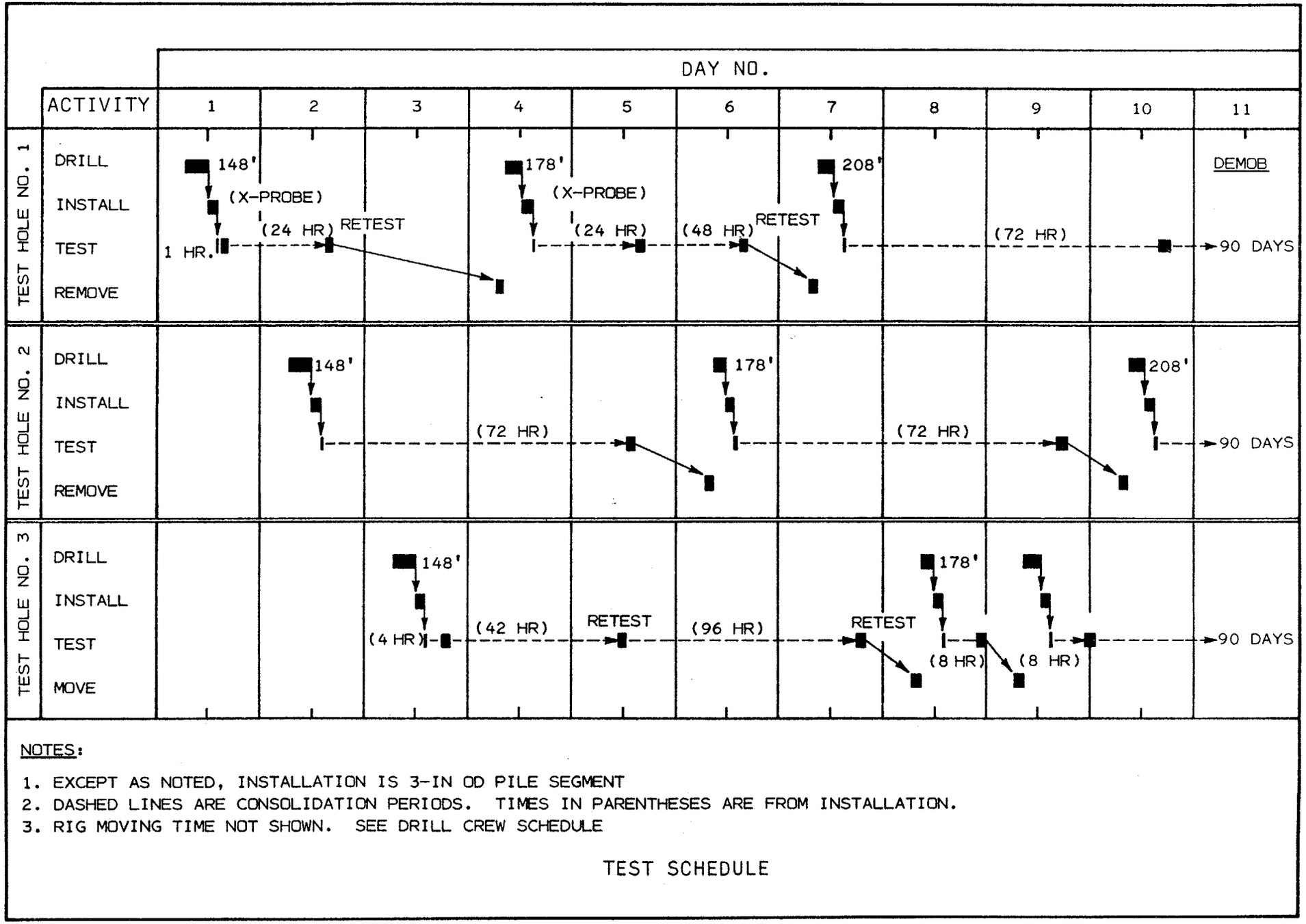
PLATE 4



NOTES:

1. EXCEPT AS NOTED, INSTALLATION IS 3-IN OD PILE SEGMENT
2. DASHED LINES ARE CONSOLIDATION PERIODS. TIMES IN PARENTHESES ARE FROM INSTALLATION.
3. RIG MOVING TIME NOT SHOWN. SEE DRILL CREW SCHEDULE

TEST SCHEDULE

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PLATE 5

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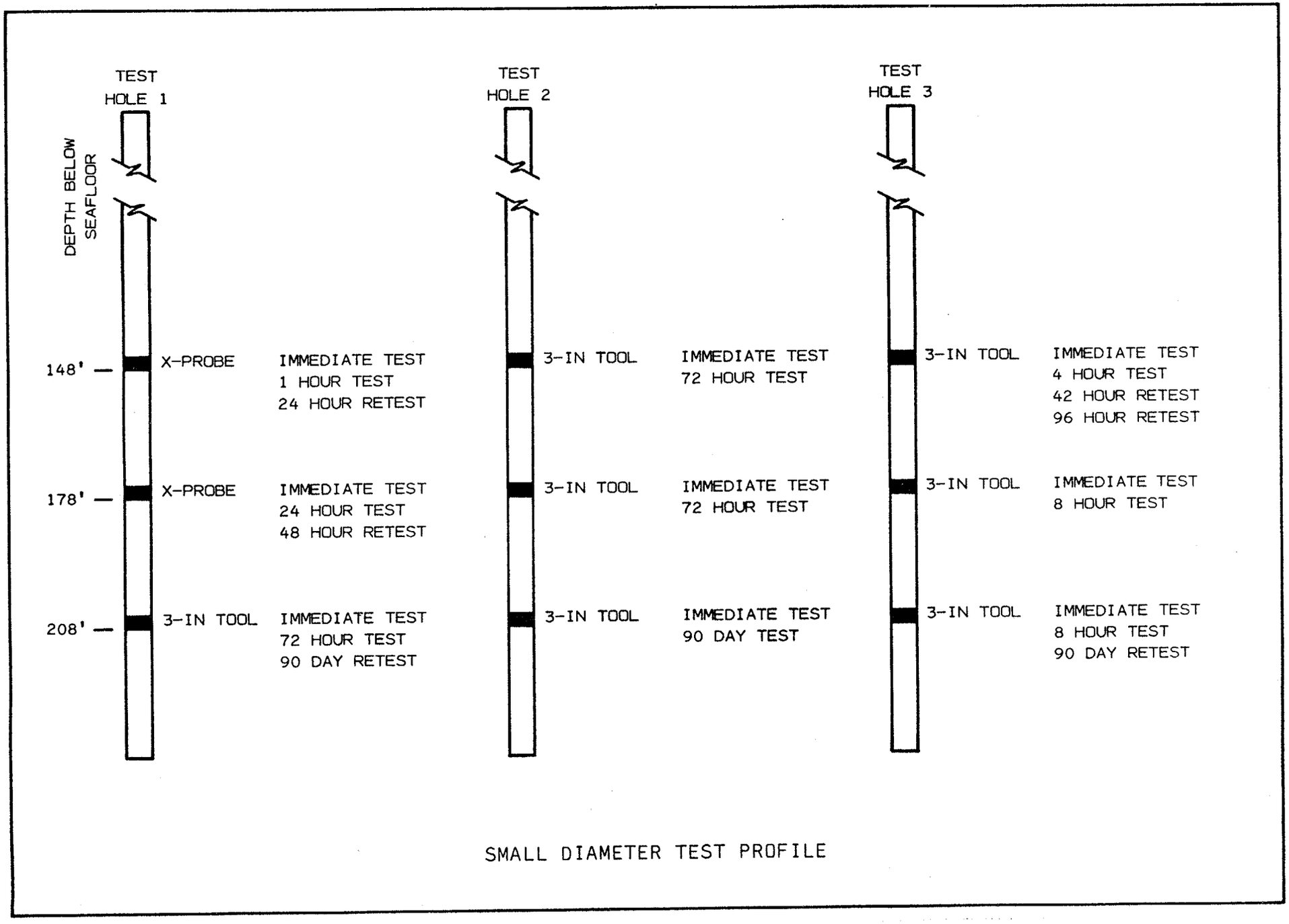


SMALL DIAMETER TEST PROFILE

PLATE 6

HOLE NO.	DEPTH, FT.	TIME, HRS.	U = UNDIST. R = RETEST	TOOL (X OR S)	DAY PERFORMED
1	148	I	U	X	1
1	148	1	U	X	1
2	148	I	U	S	2
1	148	24	R	X	2
3	148	I	U	S	3
3	148	4	U	S	3
1	178	I	U	X	4
3	148	42	R	S	5
2	148	72	U	S	5
1	148	24	U	X	5
2	178	I	U	S	6
1	178	48	R	X	6
1	208	I	U	S	7
3	148	96	R	S	7
3	178	I	U	S	8
3	178	8	U	S	8
3	208	I	U	S	9
2	178	72	U	S	9
3	208	8	U	S	9
2	208	I	U	S	10
1	208	72	U	S	10

TEST TYPES AND SEQUENCE

TEST CREW SCHEDULE

DAY 1
- INSTALL INSTRUMENT IN HOLE 1 AT 148' (X-PROBE)
- IMMEDIATE TEST (X-PROBE; HOLE 1)
- 1-HOUR TEST (X-PROBE; HOLE 1)

DAY 2
- INSTALL INSTRUMENT IN HOLE 2 AT 148' (3-IN. TOOL)
- IMMEDIATE TEST (3-IN. TOOL; HOLE 2)
- 24-HOUR RETEST (X-PROBE; HOLE 1)

DAY 3
- INSTALL INSTRUMENT IN HOLE 3 AT 148' (3-IN. TOOL)
- IMMEDIATE TEST (3-IN. TOOL; HOLE 3)
- 4-HOUR TEST (3-IN. TOOL; HOLE 3)

DAY 4
- RECOVER INSTRUMENT IN HOLE 1 (X-PROBE)
- INSTALL INSTRUMENT IN HOLE 1 AT 178' (X-PROBE)
- IMMEDIATE TEST (X-PROBE; HOLE 1)

DAY 5
- 42-HOUR RETEST (3-IN. TOOL; HOLE 3)
- 72-HOUR TEST (3-IN. TOOL; HOLE 2)
- 24-HOUR TEST (X-PROBE; HOLE 1)

DAY 6
- RECOVER INSTRUMENT IN HOLE 1 (X-PROBE)
- INSTALL INSTRUMENT IN HOLE 2 AT 179' (3-IN. TOOL)
- IMMEDIATE TEST (3-IN TOOL; HOLE 2)
- 48-HOUR RETEST (X-PROBE; HOLE 1)

DAY 7
- RECOVER INSTRUMENT IN HOLE 1 (X-PROBE)
- INSTALL INSTRUMENT IN HOLE 1 AT 208' (3-IN. TOOL)
- IMMEDIATE TEST (3-IN. TOOL; HOLE 1)
- 96-HOUR RETEST (3-IN. TOOL; HOLE 3)

DAY 8
- RECOVER INSTRUMENT IN HOLE 3 (3-IN. TOOL)
- INSTALL INSTRUMENT IN HOLE 3 AT 178' (3-IN. TOOL)
- IMMEDIATE TEST (3-IN. TOOL; HOLE 3)
- 8-HOUR TEST (3-IN. TOOL; HOLE 3)

DAY 9
- RECOVER INSTRUMENT IN HOLE 3 (3-IN. TOOL)
- INSTALL INSTRUMENT IN HOLE 3 AT 208' (3-IN. TOOL)
- IMMEDIATE TEST (3-IN. TOOL; HOLE 3)
- 72-HOUR TEST (3-IN. TOOL; HOLE 2)
- 8-HOUR TEST (3-IN. TOOL; HOLE 3)

TEST CREW SCHEDULE (CONT.)

DAY 10

RECOVER INSTRUMENT IN HOLE 2 (3-IN TOOL)
INSTALL INSTRUMENT IN HOLE 2 AT 208' (3-IN. TOOL)
IMMEDIATE TEST (3-IN. TOOL; HOLE 3)
72-HOUR TEST (3-IN. TOOL; HOLE 1)

DRILL CREW SCHEDULE

DAY 1
DRILL TO 148' IN HOLE 1
INSTALL INSTRUMENT (X-PROBE)
MOVE RIG TO HOLE 2

DAY 2
DRILL TO 148' IN HOLE 2
INSTALL INSTRUMENT (3-IN. TOOL)
MOVE RIG TO HOLE 3

DAY 3
DRILL TO 148' IN HOLE 3
INSTALL INSTRUMENT (3-IN. TOOL)
MOVE RIG TO HOLE 1

DAY 4
REMOVE INSTRUMENT IN HOLE 1 (X-PROBE)
DRILL TO 179' IN HOLE 1
INSTALL INSTRUMENT (X-PROBE)

DAY 5
MOVE RIG TO HOLE 2
ASSIST IN SETTING UP FOR TEST IN HOLES 1, 2 & 3

DAY 6
REMOVE INSTRUMENT IN HOLE 2 (3-IN. TOOL)
DRILL TO 178' IN HOLE 2
INSTALL INSTRUMENT (3-IN. TOOL)
MOVE RIG TO HOLE 1

DAY 7
REMOVE INSTRUMENT IN HOLE 1 (X-PROBE)
DRILL TO 208' IN HOLE 1
INSTALL INSTRUMENT (3-IN. TOOL)
MO-E RIG TO HOLE 3

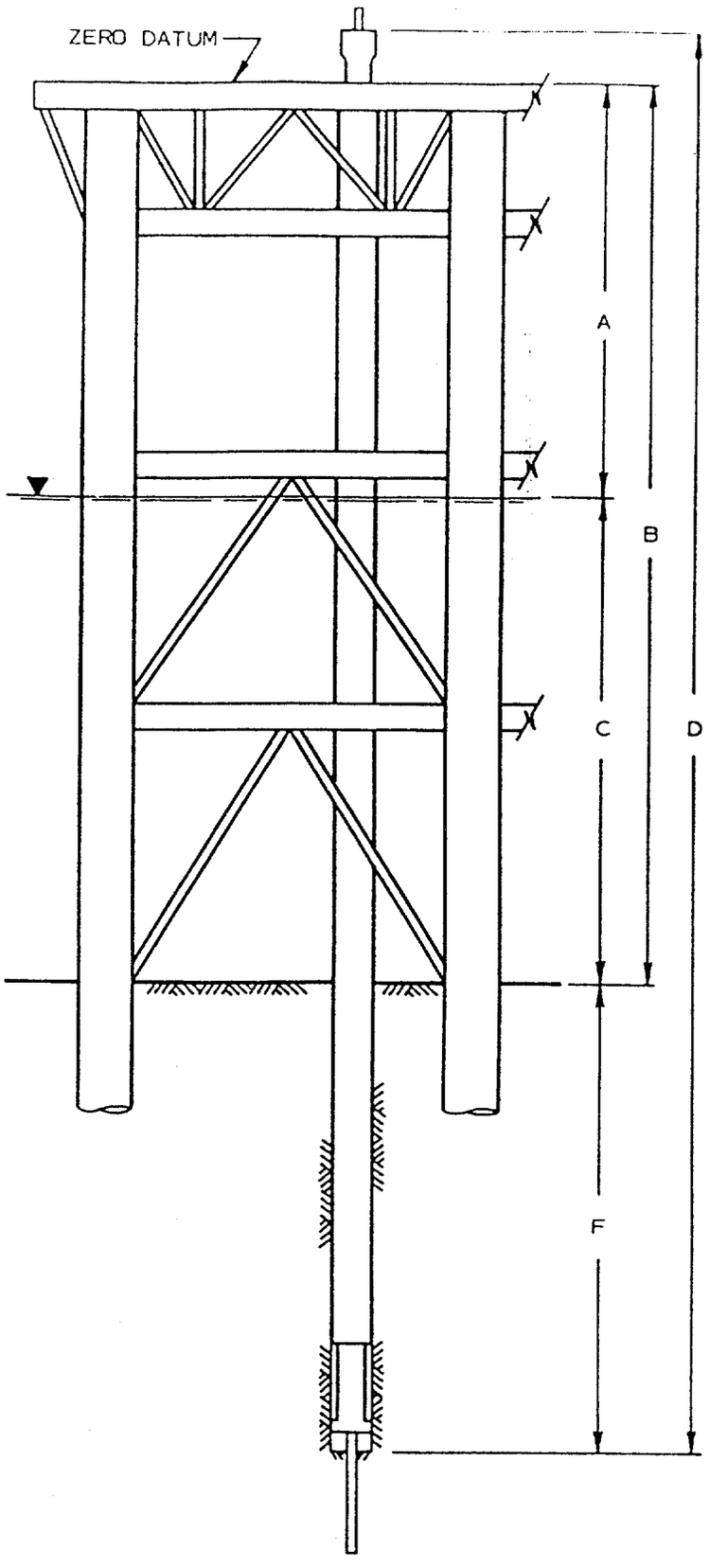
DAY 8
REMOVE INSTRUMENT IN HOLE 3 (3-IN. TOOL)
DRILL TO 178' IN HOLE 3
INSTALL INSTRUMENT (3-IN. TOOL)

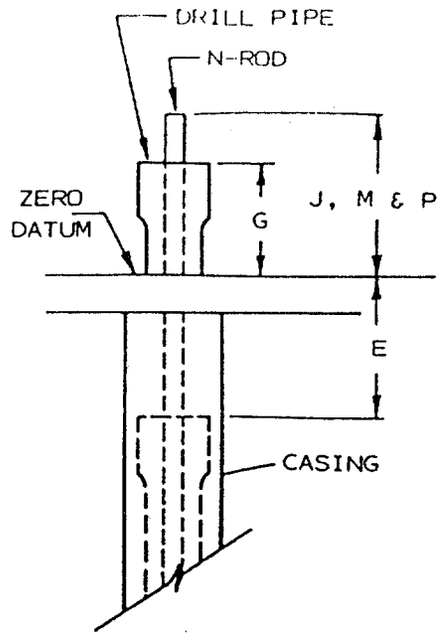
DAY 9
REMOVE INSTRUMENT IN HOLE 3 (3-IN. TOOL)
DRILL TO 208' IN HOLE 3
INSTALL EQUIPMENT (3-IN. TOOL)

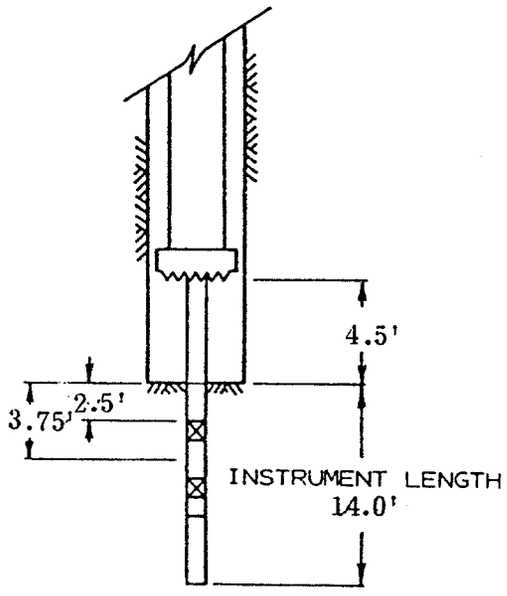
DRILL CREW SCHEDULE (CONT.)

DAY 10

MOVE RIG TO HOLE 2
DRILL TO 208' IN HOLE 2
INSTALL INSTRUMENT (3-IN. TOOL)







NOTE: Not to Scale

SCHEMATIC OF INSTALLATION ELEVATIONS
FOR SMALL DIAMETER PILE SEGMENT TESTS

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PLATE 10

	TEST DESIGNATION	X-PROBE	X-PROBE	3" TOOL	3" TOOL	3" TOOL
A	Platform deck(1) to water surface					
B	Total depth (deck to seafloor)					
C	Water depth (B-A)					
D	Total pipe required (2)	241.0	271.0	241.0	271.0	301.0
E	Drill to 2 ft below deck 3 ft*	243.0	273.0	244.0*	274.0*	304.0*
F	Boring depth below seafloor (E-B)					
G	Pipe stick-up above deck (approximate)	1.5	1.5	1.5	1.5	1.5
H	Total N-rod required (excluding tool)	245.0	275.0	245.0	275.0	305.0
I	Total N-rod lowered into casing excluding driven sections	240.0	270.0	230.0	260.0	290.0
J	N-rod stick-up above deck prior to driving (3)	2.0	2.0	2.0	2.0	2.0
		Add first section to be driven (10 ft)				
K	Total N-rod after first driven section is added	-	-	240.0	270.0	300.0
L	N-rod stick-up above deck prior to driving	-	-	12.0	12.0	12.0
		Drive (or lower) 10 ft				
M	N-rod stick-up above deck (4)	-	-	2.0	2.0	2.0
		Add second section to be driven (5 ft)				
N	Total N-rod after second driven section is added	245.0	275.0	245.0	275.0	305.0
O	N-rod stick-up above deck prior to driving	6.8	6.8	7.0	7.0	7.0
		Drive (or lower) 5 ft				
P	N-rod stick-up above deck	2.0	2.0	2.0	2.0	2.0
Q	Depth of tool TIP (5) Below seafloor (F+14) (6)					
R	Depth below seafloor of first load cell (F+2.5) (7)					
S	Nominal test depth (midpoint of friction sleeve) (F+3.75) (8)					

Notes:

1. Drilling deck elevation shall be taken as zero datum.
2. Total pipe required includes bit length.
3. Initial measurements of tool shall be taken (LVDT open).
4. Measurements of small tool shall be taken (LVDT closed).
5. Small-diameter tool length shall be taken as 15.0 ft.
6. X-probe tip (F+4.8)
7. X-probe load cell (F+2.0)
8. X-probe midpoint of pressure measurements (F+2.7)

INSTRUMENT ELEVATION SCHEDULE