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MARINE SEISMIC SYSTEM
AT-SEA-TEST DEPLOYMENT OPERATION

ROBERT L. WALLERSTEDT
GLOBAL MARINE DEVELOPMENT INC
2302 Martin Street
Irvine, California 92715

9 OCT 1981

FINAL REPORT FOR PERIOD MARCH 1981

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FINAL REPORT
FOR
MARINE SEISMIC SYSTEM AT-SEA-TEST DEPLOYMENT OPERATION

JULY 1, 1981

PREPARED FOR
NAVAL OCEAN RESEARCH AND DEVELOPMENT ACTIVITY
NSTL STATION, MISSISSIPPI 39529

PREPARED BY
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This report summarizes the MSS At-Sea-Test Deployment Operations conducted from the DSDP Glomar Challenger during late March 1981. The BIP seismic package was successfully emplaced into and recovered from a 15,000 foot water depth borehole located in the Mid-Atlantic. Good reentry and downhole seismic data was obtained.

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APPENDICE

SECTION 1.0 - SUMMARY

In March of 1981, GMDI successfully deployed a large Borehole Instrumentation Package (BIP). This was accomplished under ONR Contract N00014-80-C-0821, issued as part of the Defense Advanced Research Projects Agency (DARPA) sponsored Marine Seismic System (MSS) Program. The Naval Ocean Research and Development Activity (NORDA) directed the program. Testing was conducted in cooperation with the National Science Foundation (NSF) Deep Sea Drilling Project (DSDP) who provided the drillship Glomar Challenger and her crew. The BIP was, in fact, lowered into an existing borehole (DSDP Site No. 395A) previously drilled by the Glomar Challenger.

This report summarizes the part of the overall MSS Program associated with the design, fabrication, mobilization, logistic support, modification, planning of the deployment hardware and the actual conduct of the BIP operational deployment At-Sea. After only 9 months of effort commencing in June of 1980, the actual 14,712 foot (4,484 meters) sea depth deployment and recovery operations from the 1,667 foot (508 meters) borehole took less than 4 days to complete. The deployment went very smoothly with no serious problems encountered.

The following list depicts some of the major accomplishments and highlights of the deployment operation. Each item is discussed in further detail throughout the body of the report.

- Operations successfully demonstrated the feasibility of emplacing large instrumentation packages into holes pre-drilled in the ocean floor.
- Handling, deployment, release and retrieval of the BIP, EM Cable and drill string were successful.
- Deployment equipment designs were proven.
- Deployment procedures were verified.
- High quality seismic data was obtained.
- Impact forces were within design criteria.
- Cable entanglement was apparently not a problem.

The MSS equipment was mobilized in San Juan, Puerto Rico and was installed on the Glomar Challenger. It departed for the test site on March 27, 1981. Once onsite and with the ship dynamically holding position, the BIP, suspended from the drill string, was lowered to the ocean floor. An existing acoustic reentry cone placed over the borehole was used to guide the BIP into the hole where it was lowered an additional 1,998 feet (609 meters) into the basalt layer. Over the next two days a series of tests were performed using explosive charges dropped from the USNS Lynch. The BIP was subsequently retrieved from the borehole. There was only minimal damage to the BIP, EM Cable or deployment hardware. The entire onsite operation was completed in 73 hours.

The successful test demonstrations testified to the cooperative planning efforts of NORDA, Geotech, DSDP and GMDI personnel. The experience of the Glomar Challenger marine and drilling crews was invaluable. The overall operation went very smoothly considering the number of new equipment items required, their complexity and the untried procedures involved. Deployment, reentry and recovery of the BIP were all achieved without any significant difficulties. Based upon this actual experience, with only minor modifications, the existing procedures can be used with confidence for future deployments.

High quality seismic data was recorded by both the BIP and Ocean Bottom Seismographs (OBS)[2]. The propagation source was an explosive device dropped from the support vessel USNS Lynch at various distances from the Glomar Challenger. A total of 113 explosive charges, ranging in size from 0.5 to 120 kg, were dropped by the USNS Lynch. The distance from the BIP installation site was approximately 10 to 65 km. The seismic refraction records obtained from the downhole BIP exhibited good first and secondary arrival. There was little of the complexity and long reverberation due to converted phases, surface waves and/or channeled waves that normally contaminate OBS explosion records. The data quality was excellent and should

(2) The data measurement aspect of the program are the subject of a separate report (TR 81-6) by Teledyne-Geotech.

provide some new and very detailed information on velocity structure of the oceanic crust. The background noise level recorded by the downhole seismometer appeared to be very low.

This report covers the design of the deployment equipment, the At-Sea operational procedures utilized, deployment test data and evaluation, mobilization/demobilization considerations, plus the At-Sea-Test Plan, Interface Specification, and drawings of deployment equipment.

SECTION 2.0 - INTRODUCTION AND BACKGROUND

The Marine Seismic System (MSS) Program is sponsored by the Defense Advanced Research Projects Agency (DARPA). The program is for development, installation, and operation of a broadband, triaxial, ocean bottom borehole seismometer station similar in capabilities to landbased Seismic Research Observatories (SRO). The Naval Ocean Research and Development Activity (NORDA), a field activity of the Chief of Naval Research, is directing the task under Contract N000104-80-C-0821. Global Marine Development Inc (GMDI) is the integration and deployment engineering contractor. Deployment was carried out in conjunction with the NSF Deep Sea Drilling Project using the D/V Glomar Challenger. The downhole BIP instruments are designed and built by Teledyne-Geotech, Inc.

Present schedules provide for the installation of a prototype operational station in the North Pacific during the Summer of 1982. This MSS installation will permit the seismic observatory to be established within regional distances of the Northwest Pacific subduction zone (Japan-Kuril-Kamchatka Trench).

A semi-permanent observatory on the leading edge of a convergent margin will provide seismologically unique data. A wideband, wide dynamic range SRO in a low ambient noise marine environment will provide information capable of contributing to the following scientific objectives:

- Obtain data from a wide range of earthquake magnitudes, first motions and focal depths. This will help to clarify processes associated with subduction such as defining possible areas of tensional, compressional and strike-slip faulting.

- Determine the magnitude of changes of seismic properties of the ocean crust with increasing age by establishing more precise epicentral locations and by recording signals from events whose propagation paths are undistorted by seamount chains or island roots.

- Measure signal absorption and propagation characteristics of both long-period and short-period body and surface waves. This data would determine plate structure and evaluate source mechanisms within regional distances of an actively subducting plate boundary.

- Measure anisotrophy of the crust and upper mantle and anisotrophic variations within crustal layers.

- Determine the relationship of seismic background noise beneath the seafloor as a function of such environmental parameters as bottom currents, tidal cycles, convective heat flow and sediment thickness and lithification.

- Measure elastic and rheological properties of converging plates.

- Obtain long-term borehole temperature measurements which will permit determination of steady state heat flow rates.

Uncertainties associated with deep ocean reentry impact, controlled lowering of BIP within a borehole, and the potential for cable entanglement made it desirable to perform an early deep water At-Sea demonstration. Accordingly, DARPA requested NSF to provide 10 days for special mobilization plus test time of the Glomar Challenger during the Spring period of 1981. Specific objectives of this At-Sea-Test were:

- Demonstrate capability of deep ocean large package emplacement using drill string technique.

- Define reentry and handling shock levels imposed on BIP.

- Determine the effects of surface and bottom currents on cable/drill pipe entanglement.

- Establish whether the sensor state-of-health monitoring function can perform within design limits in a borehole environment.

- Compare borehole seismometer signal and noise levels with similar signals recorded on conventional OBS records.

DSDP reentry site 395A, a borehole originally drilled over 5 years ago, was utilized for the At-Sea-Test demonstration. The site had previously been selected for special scientific downhole instrumentation investigations. The At-Sea-Test Plan plus the Associated Interface and Requirements Specification are included as Appendix A and B respectively.

SECTION 3.0 - TEST EVALUATION AND RECOMMENDATIONS

The overall BIP deployment and recovery operations went very smoothly, with no major problems encountered. No cable entanglement difficulties requiring the use of the emergency backup equipment occurred. A potential problem encountered was the partial closing of reentry stinger cable release slot due to bending of the stinger. The slotted reentry stinger is required for deployment when using existing DSDP reentry cones. Recovery of the reentry sonar tool and emplacement of the Otis/Baker tool, between reentry and release of the BIP, requires approximately 5 hours. The long time period makes this system marginal for rough weather reentries. In this installation, the stinger tube bent approximately 5 degrees and the slot permanently closed down 0.375 inches at the stinger flange. Fortunately, there was adequate clearance remaining for cable exit. For future operations, the reentry sub should be seated more firmly into the cone, have continuous support around the periphery, and if possible provide for reduced time in the cone. The stinger slot should be deleted, if possible.

With the present load cell instrumentation, determination of accurate static and dynamic loading was difficult since the cable tension was not directly monitored. The load cell records sheave loading which is affected by both heave compensator position and sheave cable angles. A direct readout of cable tension which defines an accurate measure of static loading plus dynamic oscillatory loads is desirable.

The present communications system was very noisy due primarily to the unmuffled winch diesel engine. For extended periods of operation, and in the event of an emergency, an improved system is necessary and reduced engine noise is desirable. In all other areas, the winch operated satisfactorily.

The Otis/Baker "fishing" tool did not operate correctly. The Baker plug stuck in the control carriage sub causing the Otis release pin to inadvertently shear. Neither could be retrieved. This resulted in time lost in an unsuccessful fishing operation and a bothersome and slow "wet" drill string recovery.

Relatively high shock loads (but below criteria) were experienced during shipboard handling and release of the carriage. In particular, the shipboard handling environment will be considerably more severe in the North Pacific. The BIP should be handled always within a shock mounted cannister.

In order to reduce future operational time, limit handling shocks, and improve overall deployment reliability the following recommendations should be considered:

- Incorporate a design which leaves stinger in the borehole and does not require a cable release slot. This will decrease deployment time, and strengthen the stinger assembly.

- Provide full peripheral seating of reentry sub into reentry cone.

- Adapt dynaline type in-line cable tension/cable counter equipment instead of present load cell. Provide damped gauge readout plus a two track analog recorder for cable tension.

- Design a new BIP carriage with built-in shock isolation unit that can be used as a BIP shipping container and then later fitted into the reentry carriage on the rig floor.

- Reduce lateral shock to BIP caused by modifying offset shear pin release technique.

- Reduce operational time by adding an azimuth capability to the sonar reentry tool.

SECTION 4.0 - DOWNHOLE INSTRUMENT SYSTEM

4.1 SYSTEM DESCRIPTION*

The MSS instrumentation consisted of two functional subsystems. These were the Borehole Instrumentation Package (BIP) and the Shipboard Test Console (STC). The STC system supplied power to the BIP, performed data recording and monitoring, and displayed selected data plus state of health information in real time. The BIP and STC were connected by an electro-mechanical (EM) cable and slip rig assembly on an EM Cable winch. DC power is applied to the BIP and digital data is transmitted to the STC via this cable. The EM Cable armor provides the necessary mechanical strength to assist in the borehole installation and retrieval of the BIP.

4.2 FUNCTIONAL DESCRIPTION OF BIP

The BIP, Teledyne Goetech Model 53100, is an assemblage of acceleration, seismic, temperature, pressure and state of health sensor along with associated signal conditioning and control electronics.

The BIP was 28 feet 6 inches in total length with an OD of 8 inches. It basically consisted of a pressure vessel enclosed instrumentation section plus a ballast weight section. Total weight was approximately 3,500 pounds (2,700 pounds wet). Figure 4-1 shows the BIP during installation. Figure 4-2 is a functional block diagram of the BIP. The mechanical configuration outline is shown in Figure 4-3.

The acceleration sensors consist of two sets of three component orthogonal sensors, each component output being preconditioned by a charge amplifier and an antibiasing filter. The acceleration ranges are 50 g peak for all channels except for the 2-Z axis channel which has a range of 100 g peak. The seismic sensor system consists of two Teledyne Geotech S-700 short period piezoelectric type seismometers, and associated frequency filters which provide the desired response

*More details can be found in Teledyne-Geotech Report 81-6.

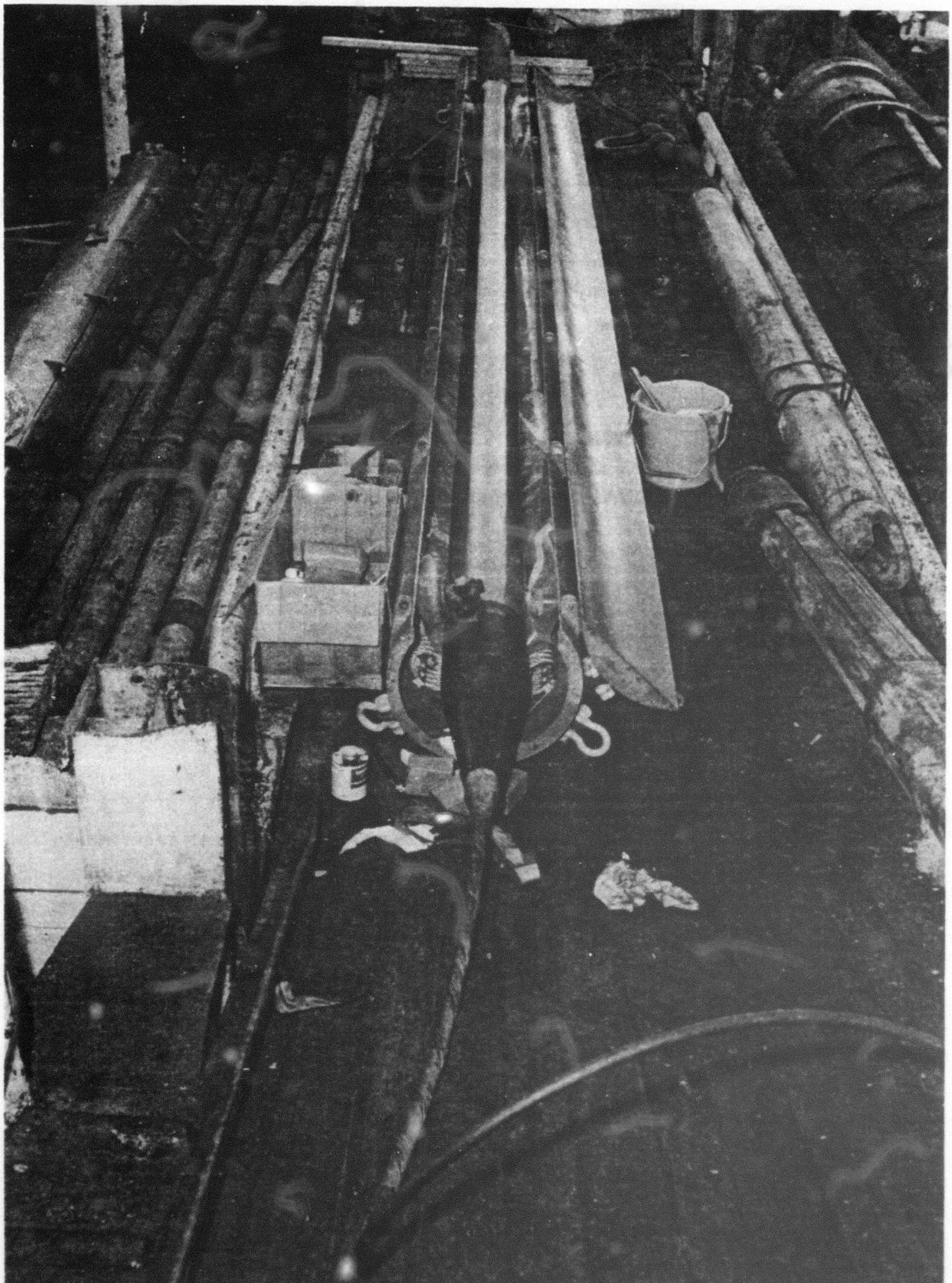

FIGURE 4-1 BIP ON CASING RACK

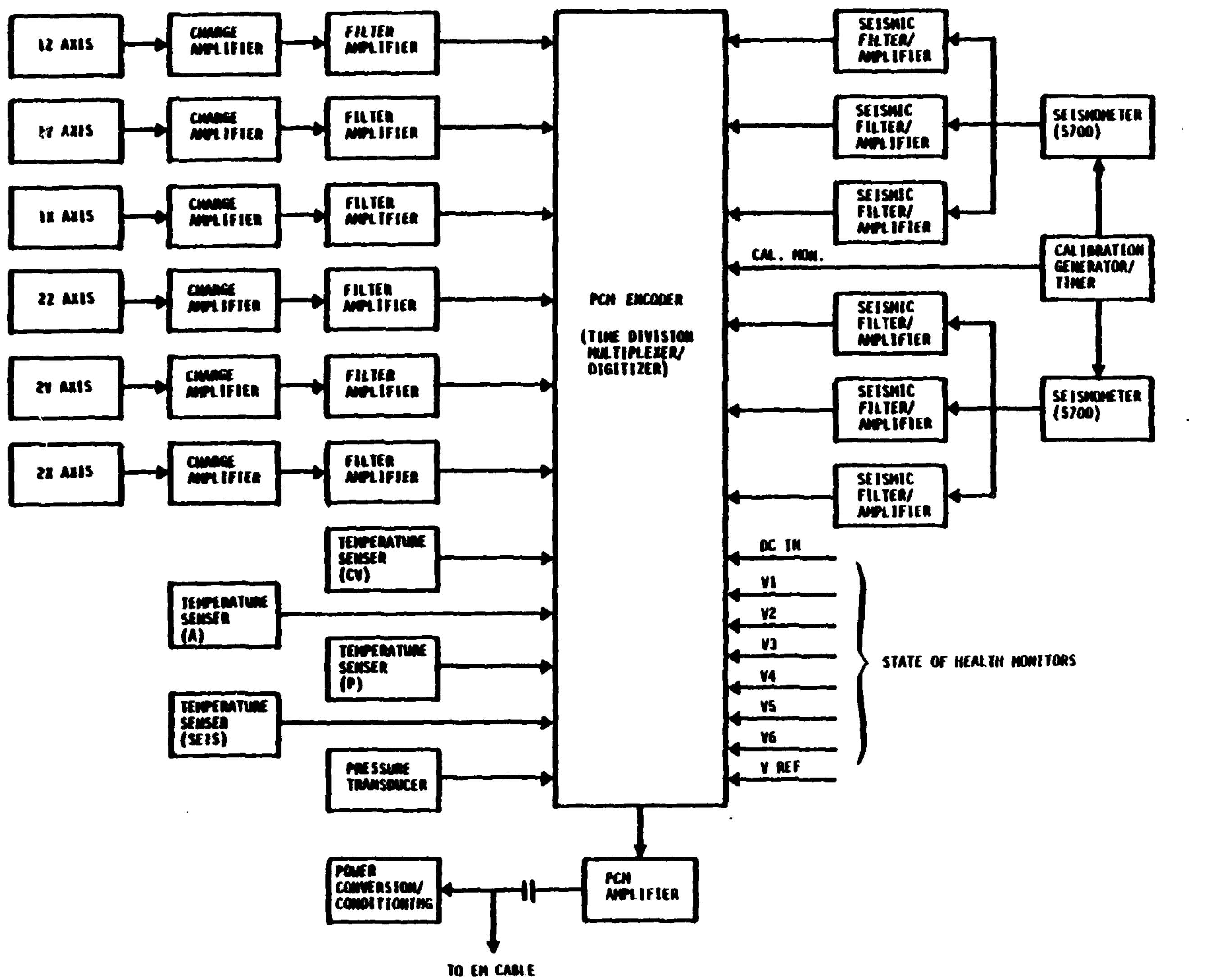

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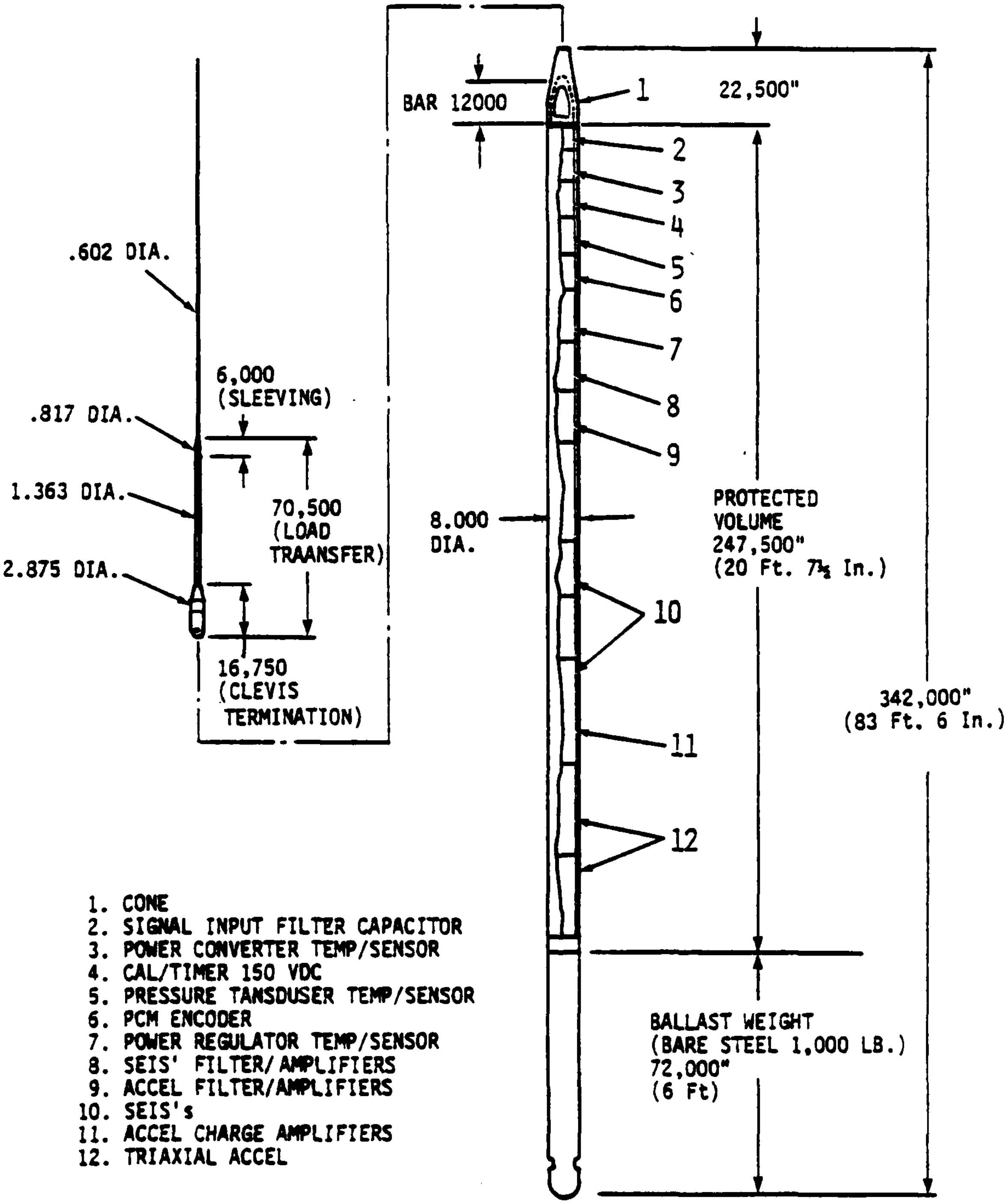
FIGURE 4-2 AT-SEA-TEST BIP FUNCTIONAL BLOCK DIAGRAM



1. CONE
2. SIGNAL INPUT FILTER CAPACITOR
3. POWER CONVERTER TEMP/SENSOR
4. CAL/TIMER 150 VDC
5. PRESSURE TANSDUSER TEMP/SENSOR
6. PCM ENCODER
7. POWER REGULATOR TEMP/SENSOR
8. SEIS' FILTER/AMPLIFIERS
9. ACCEL FILTER/AMPLIFIERS
10. SEIS's
11. ACCEL CHARGE AMPLIFIERS
12. TRIAXIAL ACCEL

FIGURE 4-3 AT-SEA-TEST BIP MECHANICAL OUTLINE

0006-040

shaping as well as antibiasing. Each seismometer drives three frequency filters. The voltage gains are staggered such that a total dynamic range of approximately 144 db is achieved, with an overlap of approximately 12 db between adjacent channels. On Leg 78B only vertical axis seismic data was provided.

Four temperature sensors are provided, each having a range of 0 to 100°C. The sensors are as follows:

CVTEMP	Attached to the BIP DC to DC converter;
PTEMP	BIP internal ambient temperature monitor located near the mid-portion of the electronics stack;
ATEMP	BIP internal ambient temperature monitor located near the bottom of the electronics stack;
SEISTEMP	BIP pressure vessel temperature monitor located near the bottom of the seismometer package.

A pressure sensor is located in the electronics stack to provide internal pressure of BIP, and provides an output range of 9 to 40 PSIA. The BIP is evacuated and backfilled with helium to a nominal 16 PSIA during final assembly.

BIP State of Health (SOH) monitors are provided to monitor its condition, and to assist in any system fault analysis.

The State of Health monitors include:

V1 Voltage monitor for the bipolar (± 12V) supply for the 1X, 1Z and 2Z accelerometer filters;

V2 Voltage monitor for the bipolar (± 12V) supply for the 1Y, 2Y and 2X accelerometer filters;

V3 Voltage monitor for the bipolar (± 12V) supply for the U1, U2 and U3 seismometer filters;

V4 Voltage monitor for the bipolar (± 12V) supplies for the L1, L2 and L3 seismometer filters;

V5 Voltage monitor for two bipolar (± 12V) supplies for the accelerometer charge amplifiers;

V6 Voltage monitor for two bipolar (± 12V) supplies for the two S-700 seismometers;

VREF Voltage monitor for the BIP temperature sensor bridge reference voltage;

DCIN Voltage monitor for the BIP 150 Vdc input voltage level;

CAL A negative (when active) monitor of the seismic channel calibration circuit output.

The data output from all sensor and state of health channels are input as analog signals to a pulse code modulated (PCM) encoder which time division multiplexes and digitizes the data, then formats and outputs the data as a 54 KHz PCM digital data stream, with appended synchronization data. Three levels of subcommutation are used to permit the desired sampling rates for the various data types. Figure 4-4 illustrates the PCM data format.

The output of the PCM encoder is preconditioned by a PCM amplifier for transmission via the EM Cable. This circuit also separates the high voltage DC component on the cable providing BIP power (150 Vdc). This input DC is converted to the various voltages required by the subassemblies by a DC to DC converter module. The outputs of this device are further conditioned via outboard current limited series regulators, which isolate the converter from external subassembly failures, thereby minimizing the risk of catastrophic system failures caused by minor module failures.

WORD																	
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
FRAME SYNC	FRAME SYNC	SUB-FRAME I.D.	ACCEL. #1Z ±50g	ACCEL. #1Y ±50g	ACCEL #1X ±50g	ACCEL. #2Z ±100g	ACCEL #2Y ±50g	ACCEL. #2X ±50g	S.O.H. *	UPPER SEIS. *	LOWER SEIS. *	ACCEL. #1Z	ACCEL. #1Y	ACCEL. #1X	ACCEL. #2Z	ACCEL. #1Y	ACCEL. #1X

*SUBFRAME WORD

FRAME	9	10	11
0	CV TEMP 0-100°C	μ1	L1
1	P TEMP 0-100°C	μ2	L2
2	A TEMP 0-100°C	μ3	L3
3	SEIS TEMP 0-100°C	SPARE	SPARE
4	PRESS 0-40 PSI	μ1	L1
5	CAL.	μ2	L2
6	VREF +2Vdc	μ3	L3
7	DC IN +150 Vdc	SPARE	SPARE
8	V1	μ1	L1
9	V2	μ2	L2
10	V3	μ3	L3
11	V4	SPARE	SPARE
12	V5	μ1	L1
13	V6	μ2	L2
14	SPARE	μ3	L3
15	SPARE	SPARE	SPARE

DATA RATES:

18 WORDS/FRAME
10 BITS/WORD
300 FRAMES/SECOND
5,400 BITS/SECOND

SAMPLE RATES:

ACCELERATION = 600 SAMPLES/SEC.
SEISMIC = 75 SAMPLES/SEC.
S.O.H. = 18.75 SAMPLES/SEC.

SENSITIVITIES:

TEMPS = 0.1° C/BH
PRESS. = 0.08 PSI/BH
VREF & V1-VC = 0.01 V/BH
DC IN = 1.0 V/BH
μ1 = 0.11 mμ/BH
L1 = 1.63 mμ/BH
μ2 = 3.48 mμ/BH
L2 = 51.5 mμ/BH
μ3 = 110.1 mμ/BH
L3 = 1629 mμ/BH
1Z,1Y,1X,2Y & 2X = 0.1g/BH
2Z = 0.2g/BH

FIGURE 4-4 AT-SEA-TEST BIP PCM DATA FORMAT

4.3 FUNCTIONAL DESCRIPTION OF STC

The STC is an assemblage of primarily off-the-shelf commercial data decoders, timers and recorders mounted in standard relay racks in an approximate 8 feet x 12 feet (2.5 meters x 3.5 meters) environmentally controlled equipment van. Figure 4-5 shows the STC as installed on the CHALLENGER. Major functional items of the STC are:

- o Line receiver (special)
- o Tape recorders (2 each), Ampex, Model PR-2230
- o Decommutator, Aydin Vector, Model PLD-400
- o Time Code Generator/Translator, Datum, Model 9300-100
- o Strip Chart Recorder (3 each), Hewlett Packard, Model 7404, 4 channel
- o Teletypewriter, Texas Instruments, Model KSR 743
- o Patch Panel (Special)
- o Power Supply, (4 each), Kepco, Model OPS 100-1m
- o Uninterruptable Power System (UpS), (2 each), Topaz, Model 82102-12 with battery modules, Model 2566-2

PCM data is received from the BIP via the receiver, preconditioned, then applied in parallel to each of the two magnetic tape machines (analog 14 track) and to each of the two data decommutators. The raw PCM data and an IRIG B time signal generated by the time code generator/translator are recorded on the selected magnetic tape (or both) on the even and odd channels respectively. Figure 4-6 shows partially the instrumentation recorders.

Through the use of a "stitch back" mode and a modification allowing the activation or deactivation of selected record heads (tracks), data is recorded in 7 passes as follows:

PASS 1	TRACKS 1 & 2
PASS 2	TRACKS 3 & 4

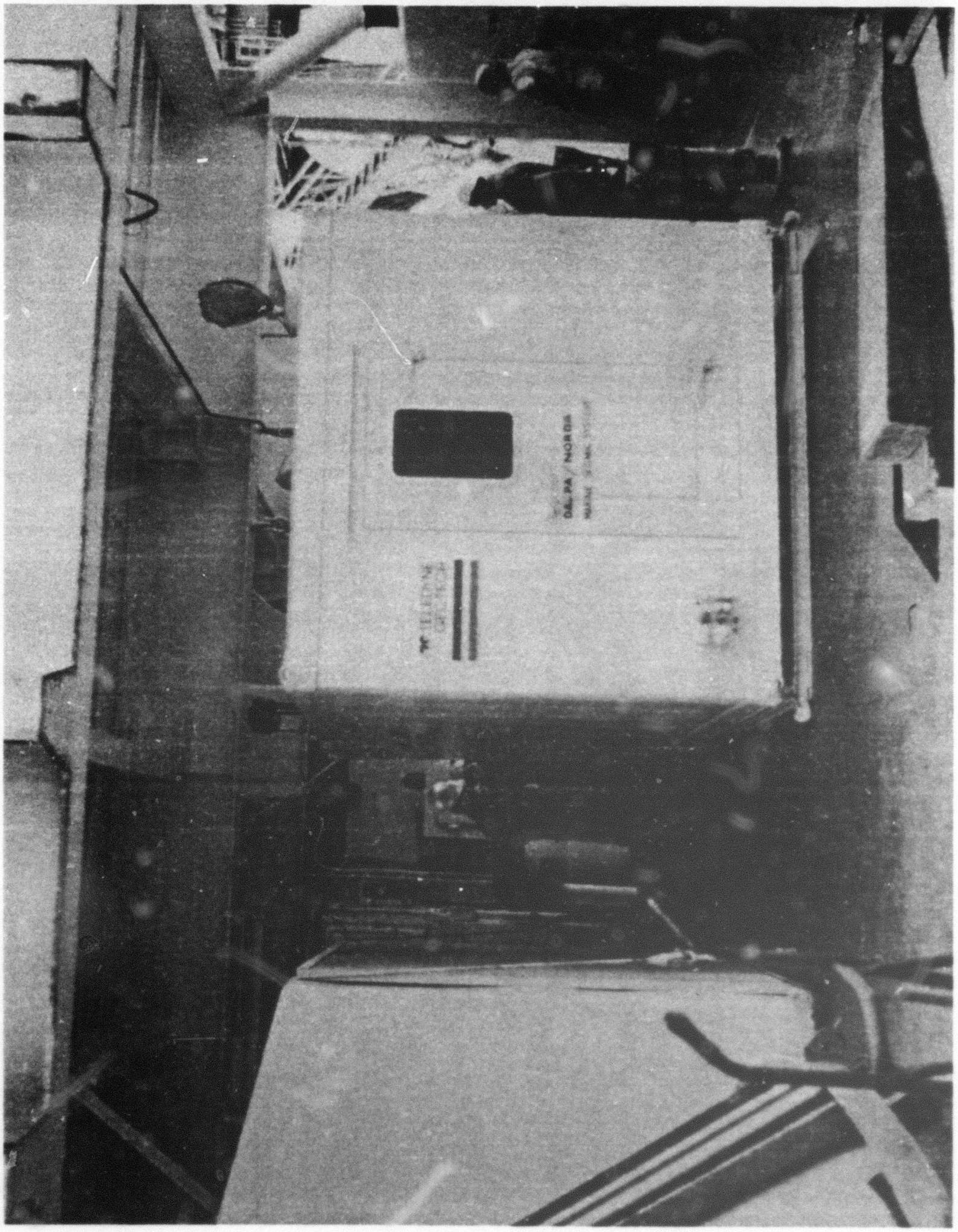


FIGURE 4-5 STC INSTALLATION

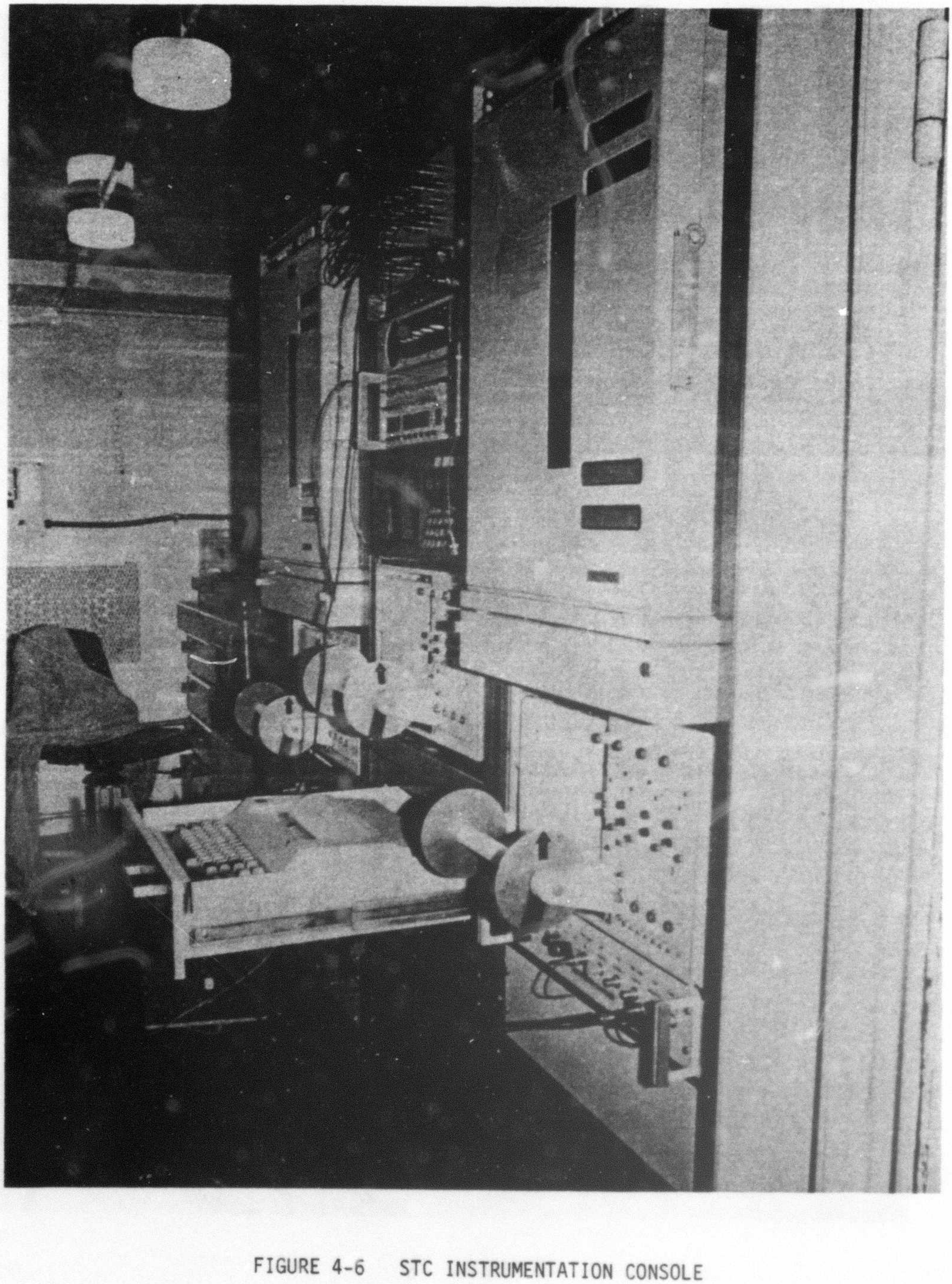


FIGURE 4-6   STC INSTRUMENTATION CONSOLE

PASS 3	TRACKS 5 & 6
PASS 4	TRACKS 7 & 8
PASS 5	TRACKS 9 & 10
PASS 6	TRACKS 11 & 12
PASS 7	TRACKS 13 & 14

Each pass, at 3-3/4 IPS, will accommodate approximately 3-1/2 hours of 50 KHz digital data.

The two PCM data decommutators allow real time monitoring of data and the state of health of the BIP. The Conic D-Pad III uses a CRT display and 12 user, programmable digital to analog output ports to display and make available to external recorders this data and SOH information. Hard copy outputs of any CRT display are available upon operator request via the teleprinter. All D/A output ports are hardwired to the patch panel where they can be patched to any of 12 strip chart channels. The Aydin Vector PLD-400 device is limited to 12 firmware programmed D/A ports and one front panel D/A port whose input is operator selectable via front panel switches.

Three analog strip charge recorders, Hewlett Packard Model 7404, are provided for recording up to a total of 12 channels of real time or playback analog data. Each recorder has an additional edge marker pen for use as a time or event marker. A time code will normally be applied to the input of this channel.

The time code generator/translator, Datum Model 9300-100 outputs an IRIG B time code (Julian day of year, hours, minutes and seconds) in the generator mode for recording on magnetic tape. Additionally, a SLO CODE output is available for inputting to the marker pens of the strip chart recorders. In the translate mode, the timer serves as a time code reader for off-line tape playback. The time code generator will be synchronized to WWV for accurate time measurements.

The BIP power supply system consists of redundant sets of series-connected DC power supplies providing 150 vdc @ 300 mA maximum. A front panel switch is provided to select the back-up power supply set in the event of a failure.

The STC technical system power is supplied by two Topaz uninterruptable power systems to isolate the technical load from ship's power surges and provides up to 19 minutes of technical power in the event of a total loss of ship's AC power.

<u>SECTION 5.0 - REENTRY SITE</u>

DSDP site 395A is located at about 81 nautical miles (150 km) west of the mid-Atlantic Ridge at latitude 22° 45.34' N, longitude 46° 04.90' W as shown by Figure 5-1. This borehole was drilled in December of 1975 by the D/V <u>Glomar Challenger</u>. The water depth is 14,712 feet (4,489 meters). Figure 5-2 depicts the general bathymetry of the site.

A hole was cored and cased through the sediment and drilled out through the basalt to a depth of 2,178 feet (664 meters). The sediment was of calcareous brown clay nature. The basement was predominately asphyric and basalt units. The hole was encased with 16 inch and 11-3/4 inch casing as shown by Figure 5-3. Also shown is the basic geometry of the reentry cone. The cone was fitted with three steel passive reflectors. In addition, between the steel reflectors, spherical, hollow glass balls were fitted on 15 foot tethers in case the cone should settle.

Five joints of 16 inch casing were run and hung off in or on reentry cone below the moonpool and then lowered to the bottom. The casing was then jetted into the sediment and the 14-7/8 inch hole was washed down to accommodate the casing. Three hundred thirty two feet of 11-3/4 inch casing was then made up, reentered into the site and attached by hangers. Successive reruns (six) were then made to drill the basalt down to approximately a total depth of 16,890 feet (5,148 meters). The bottom portion of the borehole was unstable in places. The bottom of the hole was partially cemented. During these activities, a hydrophone was inadvertantly dropped in the hole.

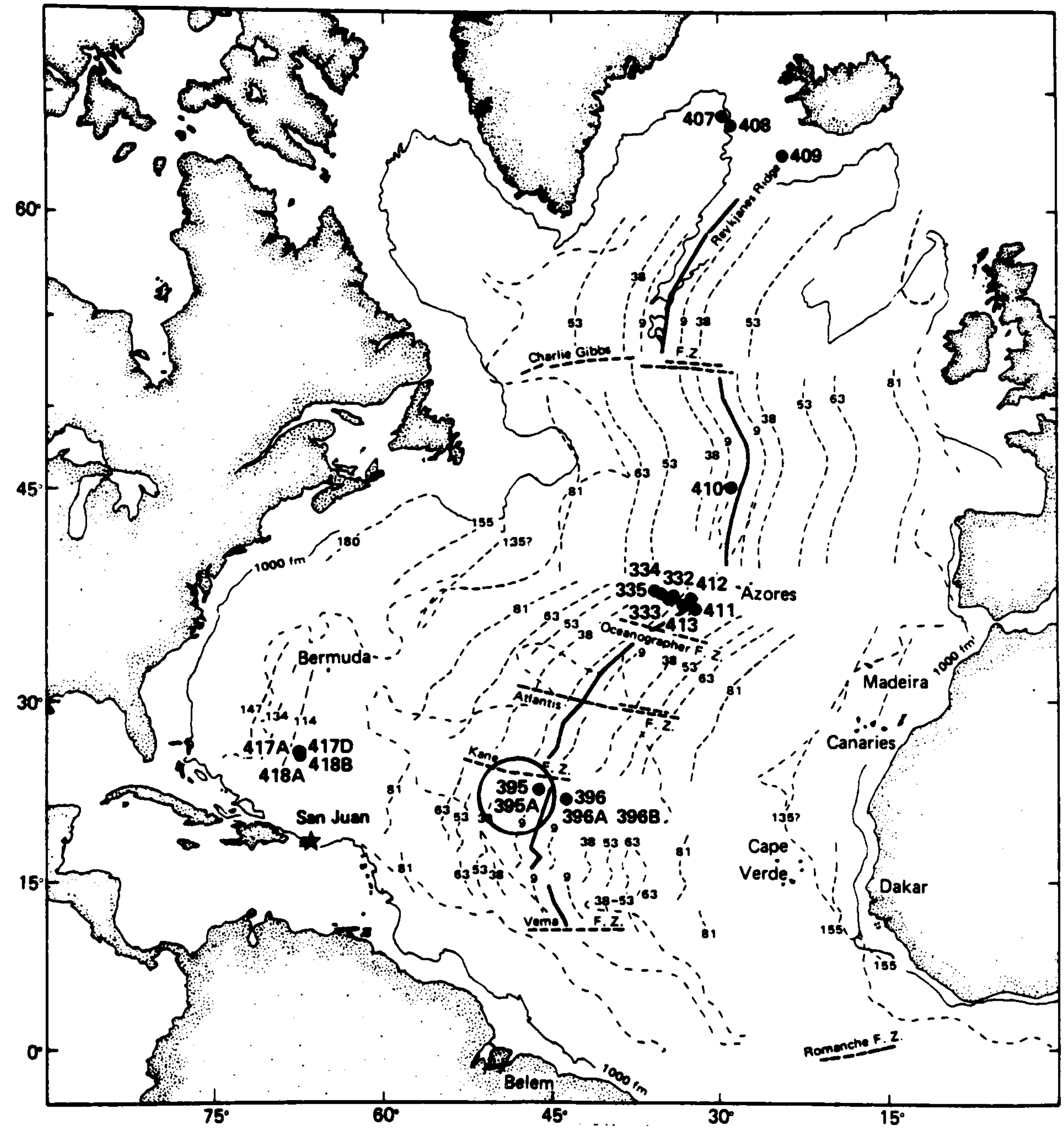


FIGURE 5-1 MSS AT-SEA-TEST DSDP SITE 395A

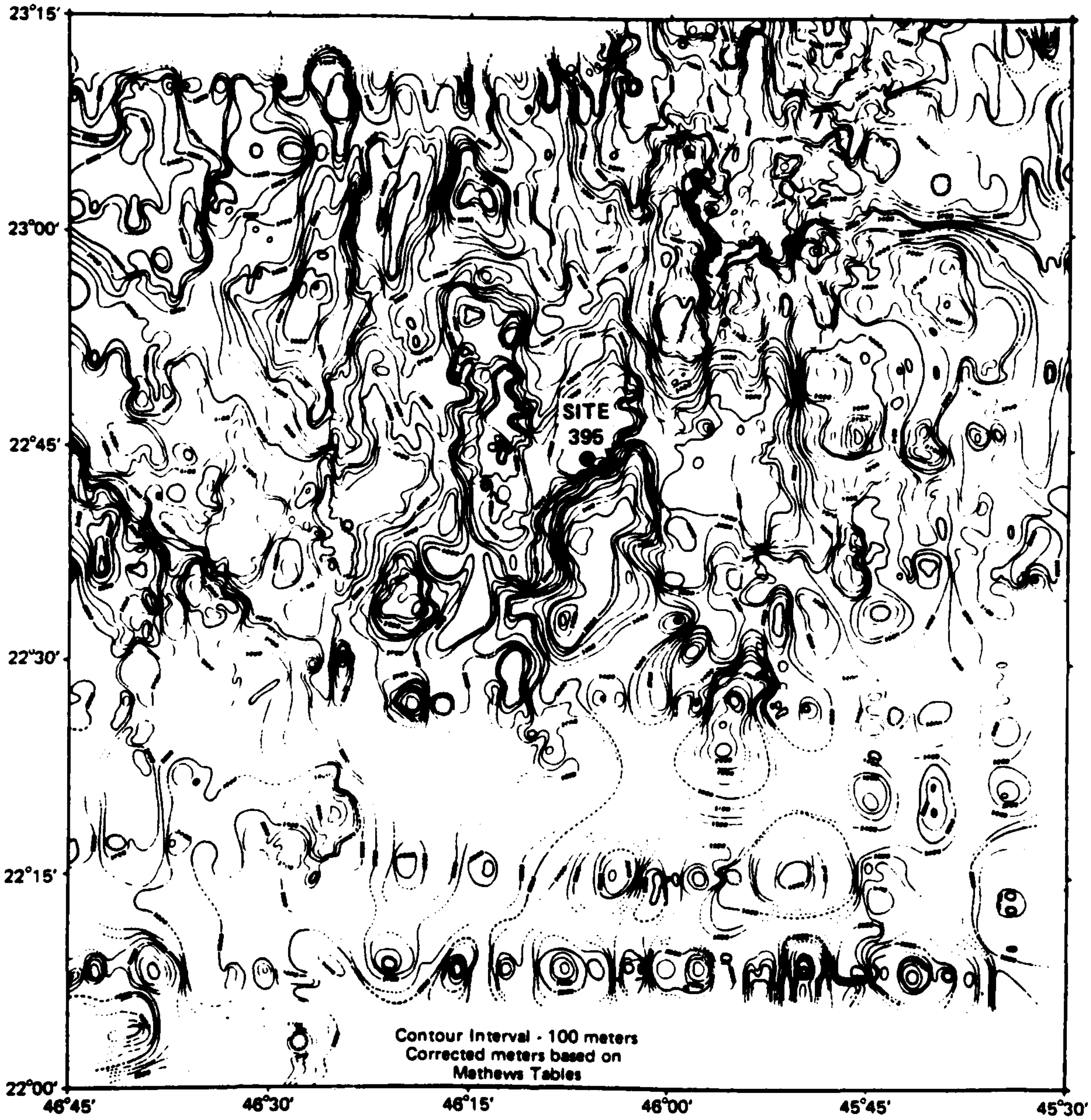


FIGURE 5-2 BATHYMETRIC CHART SITE 395

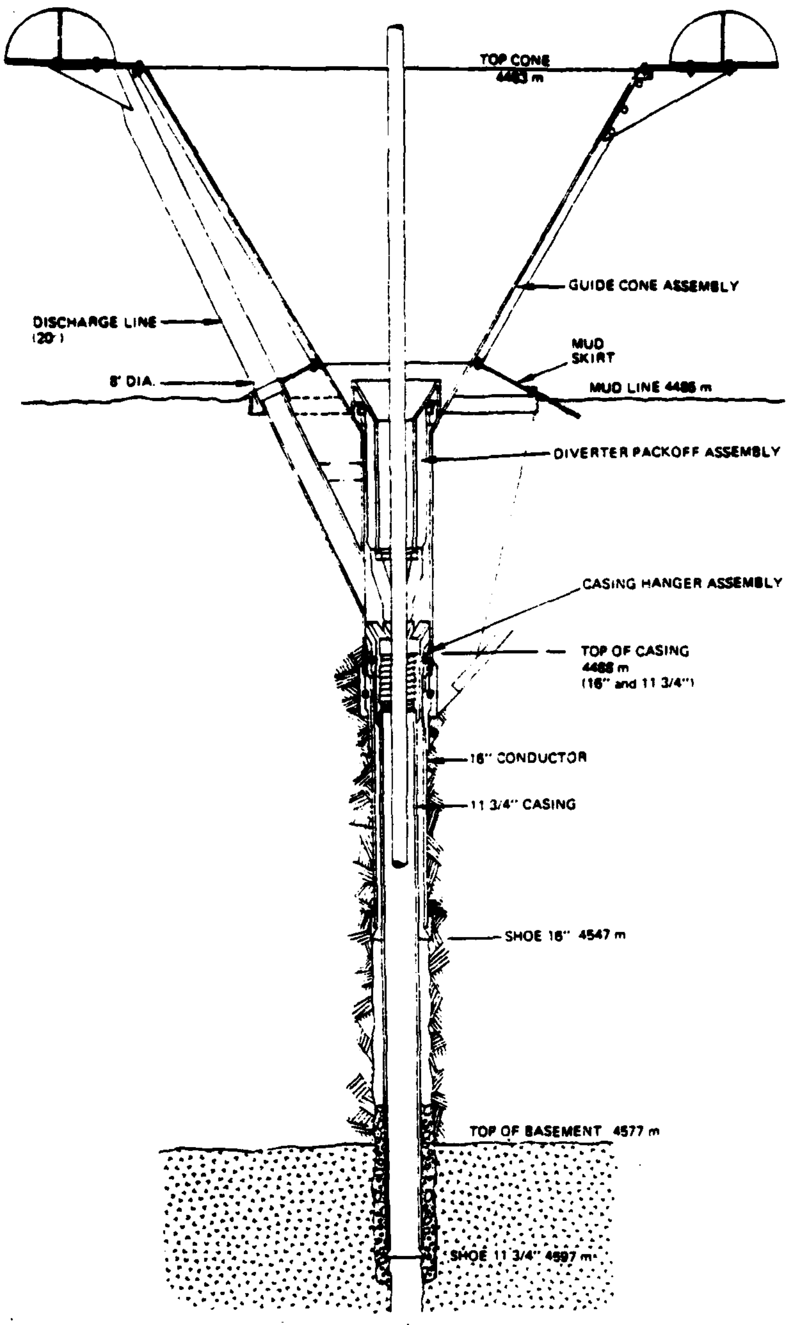


FIGURE 5-3 SCHEMATIC OF RE-ENTRY CONE & CASING AT MUD-LINE HOLE 395A

SECTION 6.0 - GLOMAR CHALLENGER

The D/V Glomar Challenger, utilized for the MSS At-Sea-Test, is a specially constructed, dynamically-positioned drillship operated by Global Marine Drilling Co. under direction of Scripps Institution of Oceanography, University of California, San Diego. Scripps operates the Deep Sea Drilling Project (DSDP) on behalf of the Joint Oceanographic Institution for Earth Sampling (JOIDES).

The Glomar Challenger, Figure 6-1, was placed in service in 1967. It has a length of 400 feet, beam of 65 feet, draft of 20 feet and displaces 10,500 long tons. It is powered by twin screws, each driven by 3 - 750 hp electric motors. Maximum speed is 12.5 knots. Four tunnel thrusters are provided for lateral positioning. A total of 13 AC and DC diesel generators provide basic power.

The drilling equipment is characterized by the 142 foot, 1 million pound derrick. Approximately 38,000 feet of special S-135, 5 inch drill pipe is carried plus associated drill collars, bumper subs, swivels, etc. A passive action heave compensator can be utilized in the drill string with some difficulty. Two large 5,000 psi mud pumps are available. A 50 ton plus a 15 ton crane can handle deck loads.

An early version Delco type ASK (Automatic Stationkeeping) system is used to maintain position over a deployed short baseline beacon. Automatically, the ship's propulsion screws and/or thrusters are directed to maintain desired position. For deep water depths, stationkeeping positions of $\pm$ 10 feet can be normally achieved within an offset distance of approximately 3,000 feet of the beacon.

A total crew of 74 marine, drilling and scientific personnel can be accommodated. Typical legs last about 2 months at which time a complete crew changeover is accomplished.

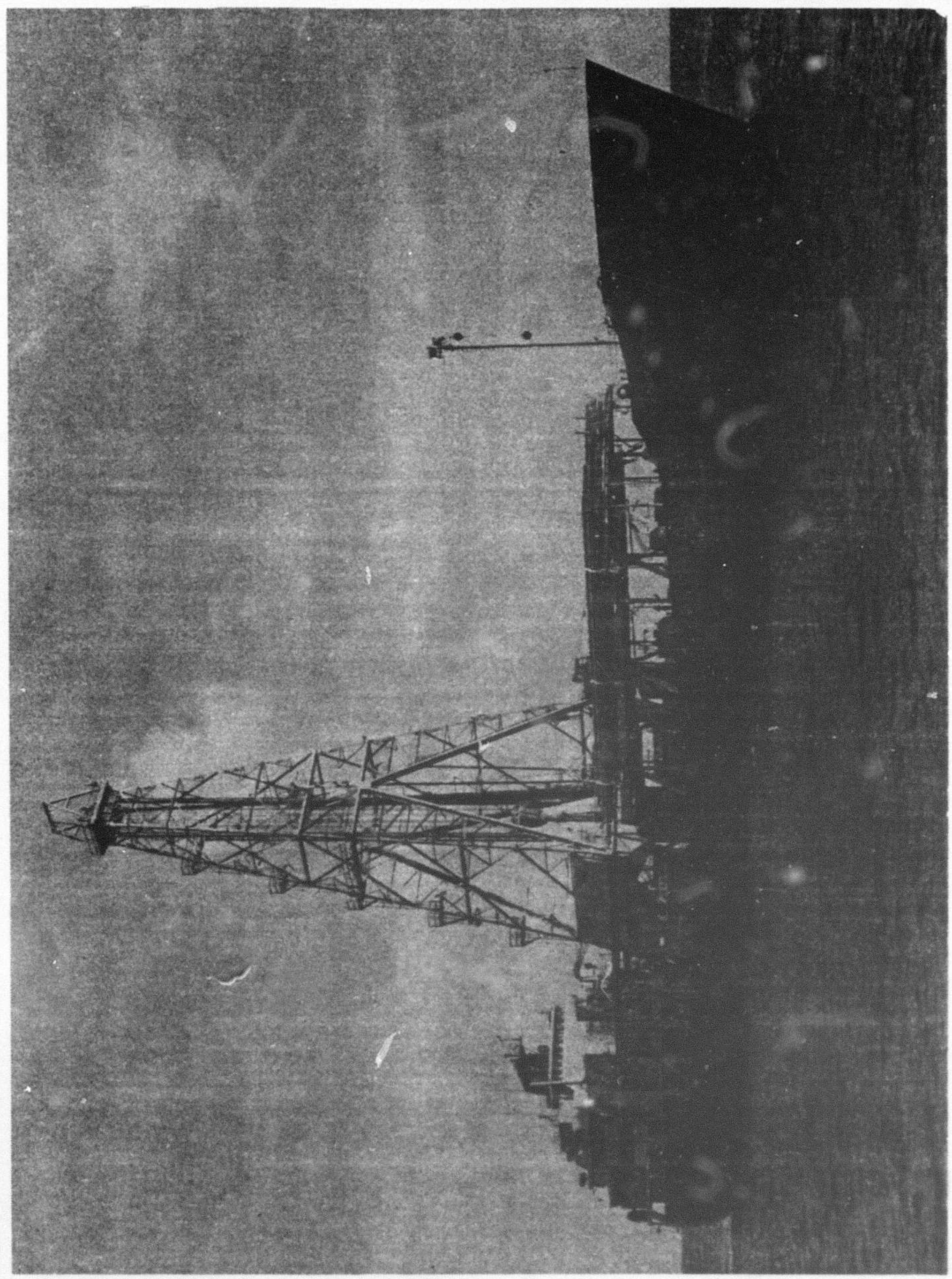


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FIGURE 6-1 GLOMAR CHALLENGER

SECTION 7.0 DEPLOYMENT EQUIPMENT

7.1 GENERAL DESCRIPTION

The MSS At-Sea-Test deployment equipment can be broken down into two basic categories, shipboard and subsea. The shipboard equipment consisted of a dual "bull" drum EM Cable winch supplied by the U.S. Navy, a specially constructed overside A-Frame, a single cylinder heave compensator adapted from a guideline tensioner, and a large swiveled sheave block. This equipment was mounted on the portside main deck area located between the derrick subbase and the casing support rack structure.

Figure 7-1 is a perspective layout of the shipboard installation. The subsea equipment basically consisted of a reentry sub which was attached to the lower end of the drill string and a specially designed coaxial EM Cable provided by the U.S. Navy. The reentry subassembly was made up of a carriage, carriage housing, stinger and control sub. The reentry subassembly accommodated a shock mounting for the BIP for impact reentry into the borehole. Refer to Appendix J for drawings of the At-Sea-Test deployment equipment.

7.2 SHIPBOARD EQUIPMENT

The EM Winch was originally to be a new single "bull" wheel manufactured by the Pengo Co. of Ft. Worth, Texas. Unfortunately, this specific winch could not provide the required traction on the EM Cable, a problem later attributed to the EM Cable coating "slipperiness". Fortunately, an existing Pengo dual "bull" wheel winch of the same general size and capability was available at the Roosevelt Roads, U.S. Navy Base, in Puerto Rico. Both winches were tested against each other in the San Juan shipyard with the dual "bull" wheel winch proving superior. Accordingly, this latter winch was refurbished and installed as shown by Figure 7-2. The winch is mounted to a specially welded deck foundation.

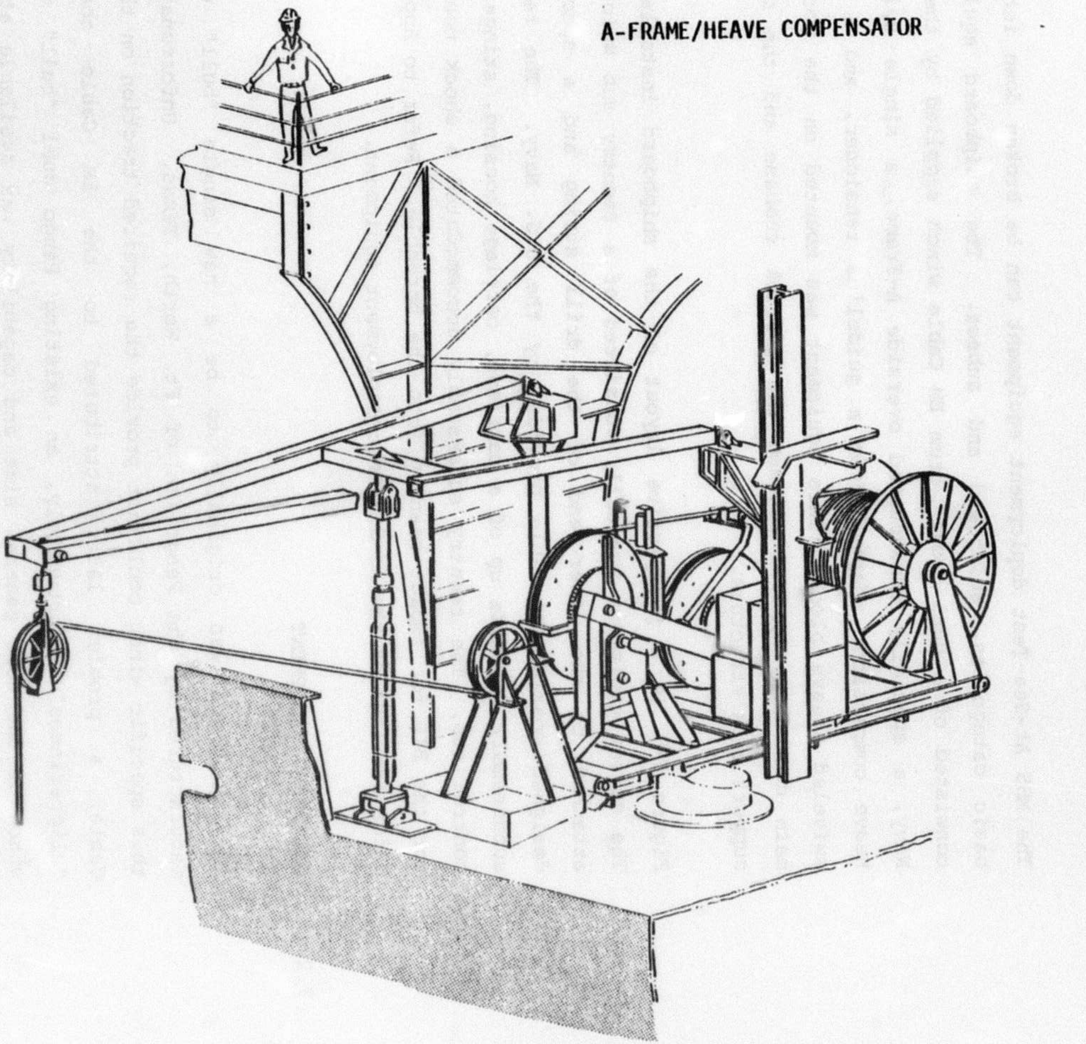

FIGURE 7-1 EM WINCH/A-FRAME/HEAVE COMPENSATOR INSTALLATION

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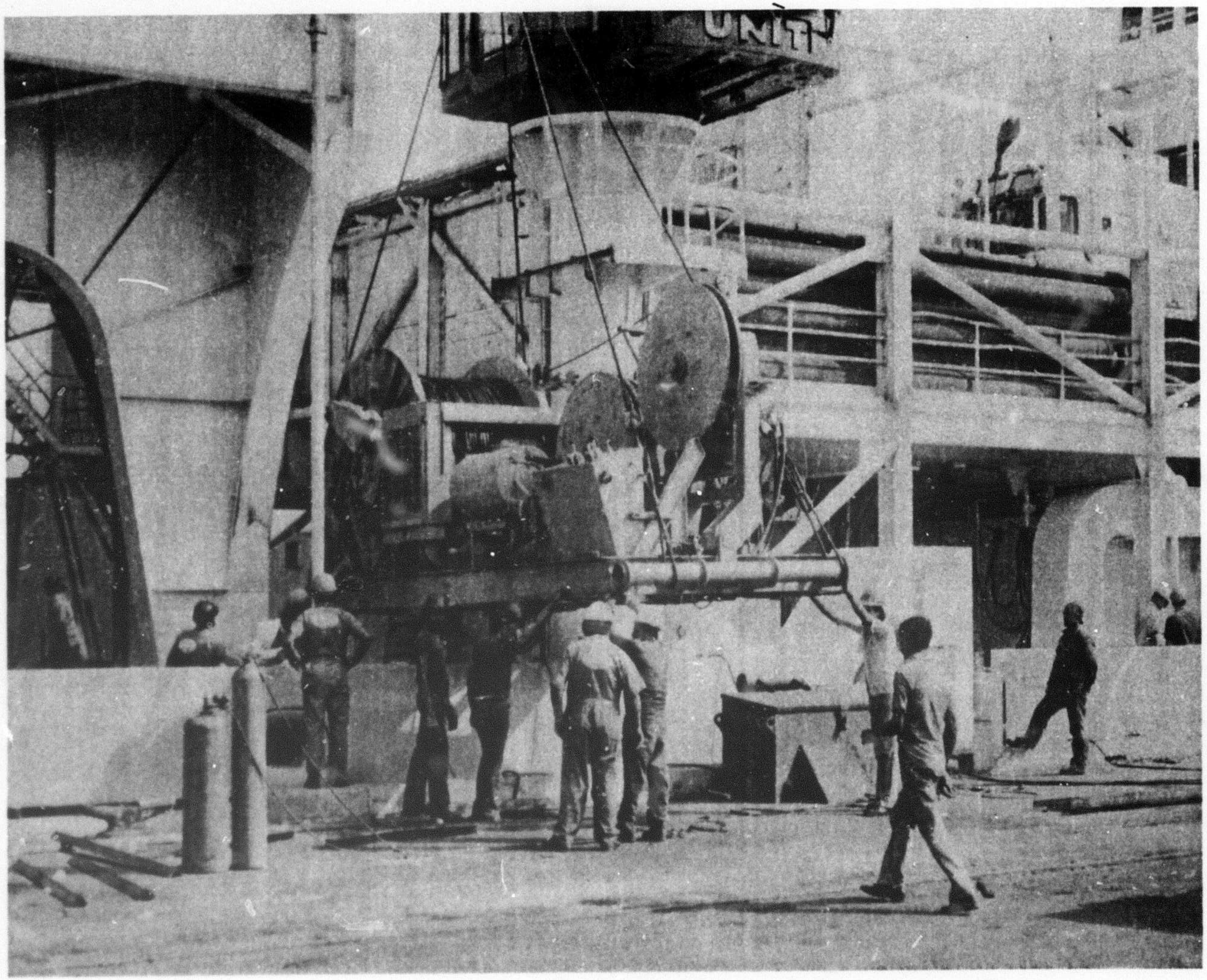


FIGURE 7-2 LOADING EM WINCH

The A-Frame structure was of simple design, mounted on two pinned inboard pedestals and attached to a central heave compensator cylinder. The A-Frame projected out above the deck about 8 feet high and overhung the side approximately 15 feet. The A-Frame was rated at and tested to 28,000 pounds. The A-Frame and support structure was fabricated at Puerto Rico Drydock and Marine Terminals shipyard. The heave compensator was operated off a single accumulator bottle interconnected to 4 standard pressurized nitrogen bottles. The stroke of the heave compensator was approximately 7.5 feet. The system was rated at 2,500 psi. The effective load area was approximately 28 square inches. The system was controlled manually at the manifold console.

The 48 inch sheave block was adapted from an existing NCEL block by regrooving. The snatch block was supported at the outboard end of the A-Frame by a tension type Martin Decker load cell transducer. Figure 7-3 shows the A-Frame, HC cylinder and sheave block installed for the At-Sea-Test.

The load cell could be read out at either a large gage dial or a digital recorder both mounted at the heave compensator console. In addition, an analog chart recorder was provided in the STC that operated for a portion of the test. The load cell indicated an effective loading of approximately 1.7 times the actual cable tension.

Other MSS deployment equipment onboard but not utilized consisted of:

- A subsea TV camera designed for mounting through the moonpool to view the upper drill string area in the advent of cable entanglement.

- A Helle acoustic release system, plus a special sheave were onboard to provide a "dual" ship capability also in the advent of cable entanglement.

- Eastman stoking tools for alignment of the individual drill string sections during deployment.

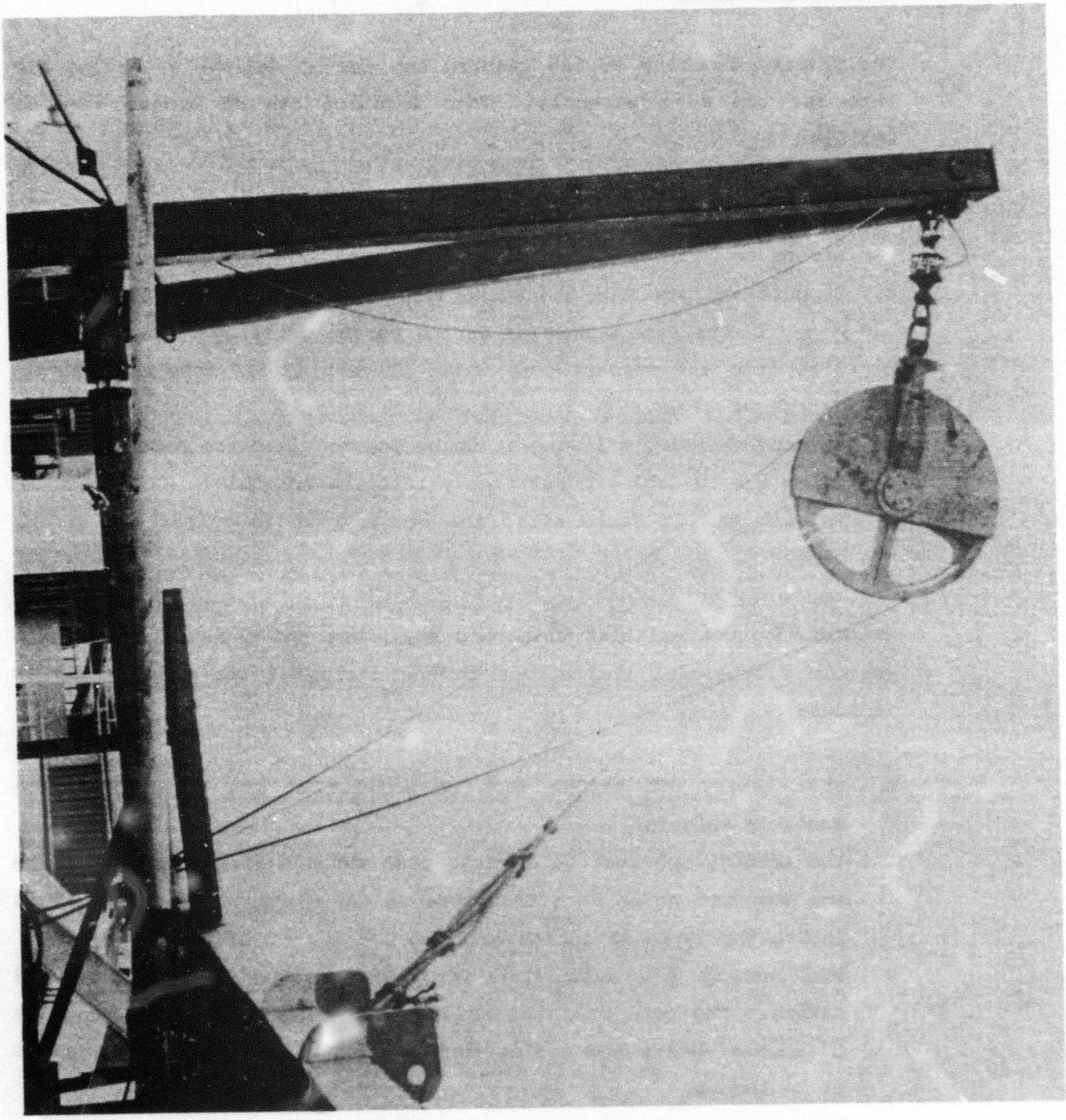


FIGURE 7-3 A-FRAME & SHEAVE BLOCK AS INSTALLED

7.3 SUBSEA EQUIPMENT

7.3.1 Reentry Sub Design

The primary function of the reentry sub was to deliver a working BIP into the top of a borehole. This function can be broken down as follows:

- o Carry the BIP during drill string deployment in a protective enclosure.
- o Support and position the sonar reentry tool to locate the reentry cone, in the same manner as during normal drilling operations.
- o Stab into the reentry cone while preventing BIP accelerations in excess of 10 Gs.
- o Release the BIP, allowing it to be lowered into the borehole.
- o Allow the EM Cable to run freely into the borehole.
- o Release the EM Cable after the reentry sub is pulled out of the cone.

In order to use existing shipboard equipment and methods, there were certain dimensional limitations on the design of the reentry sub as follows:

- o The reentry sub weight must be similar to the normal downhole assembly weights.
- o The reentry sub must be able to pass through the rotary table and the moonpool guide horn structure on the Glomar Challenger. This limits the OD to 31 inches maximum.
- o The reentry sub must stab into an existing reentry cone and casing. The cone base has an ID of 24 inches down to a depth of 57 inches, where the casing hanger begins. The casing has an ID of 11 inches.
- o The reentry sub stinger must be able to support th[illegible] sonar reentry tool which has an OD of 3.75 inches. This conflicts with the BIP diameter, so a removable support is needed.

In addition, there was the uncertainty associated with the exact configuration of the reentry cone emplaced 5 years ago.

The materials used in the reentry sub needed to be readily available so as to not delay fabrication in an already tight schedule. The steels were of varying strength levels in order to accomplish the specific purposes of each component of the reentry sub. In addition, the steels could not be of a type which would become brittle at the seafloor temperature. The other materials used (rubber) should not exhibit markedly altered characteristics, due to temperature or pressure.

The design concept used met the requirements under the sea conditions encountered. To understand the functional methods and sequence of the concept, the reader is referred to the MSS OPERATIONAL PROCEDURES (Appendix C). The requirements of Section 7.3.1 above, were met as follows:

- The BIP was deployed inside a carriage, with rubber shock rings, for protective enclosure.
- The Hydraulic Plug/Sonar Adaptor (HP/SA) was positioned initially in the tip of the stinger to locate and support the sonar reentry tool, subsequently it was raised to the control sub, where it acted as a hydraulic packer.
- The stinger, with HP/SA inside its tip, stabbed into the cone. Under the conditions encountered, the stinger attenuated part of the shock, and the rubber isolation rings attenuated part of the shock. The peak accelerations seen were 4 to 5 Gs. It would appear that more isolation capacity will be needed for rougher sea conditions.
- The BIP was released by shifting the carriage to center over the stinger and borehole, after the HP/SA had been raised clear and locked into the control sub for hydraulic pressurization. The BIP was then lowered on the EM Cable.
- The carriage, carriage housing and stinger were slotted (1½ inch) to allow the EM Cable to run freely downhole even when the reentry sub was being raised.

- The EM Cable release cylinder, at the lower end of the carriage, retained the cable inside the stinger until the stinger was well clear of the cone, to prevent possible crushing of the cable within the borehole between the outside of the stinger and the casing. During drill string recovery, when the stinger was sufficiently clear of the cone, the hydraulic pressure in the system was increased to release the cable.

Figure 7-4 shows a sketch of the reentry sub before and after release. A photo of the complete reentry sub is shown in Figure 7-5 during field test.

The reentry sub weight was about 16,600 pounds, the BIP weighed 3,300 pounds and there were four bumper subs with a small drill collar on top. This gave a reentry assembly weight similar to the weight of the downhole assembly normally used.

The maximum OD of the reentry sub was 30½ inches in areas of the carriage housing. However, these areas were not faired in, and there were several points which could (and did) hang up on the lip of the moonpool guide horn. This can be alleviated in the future by providing a long lead-in ramp to any projections.

The stinger OD was 10.5 inches at the tip for about 4 feet, and 10 inches for the remaining 20 feet. The 16 inch diameter flanges joined the section of the existing site 395A cone base. To meet the last two dimensional constraints, the stinger ID was 9 inches for the top 22 feet, with an ID of 8.5 inches in the bottom 2 feet of the tip. This provided a support ledge for the HP/SA. The inside profile of the HP/SA was the support for the sonar reentry tool. When the cone has been reentered and the sonar tool has been retrieved, the HP/SA was shifted upward to the control sub leaving the stinger bore clear for the BIP.

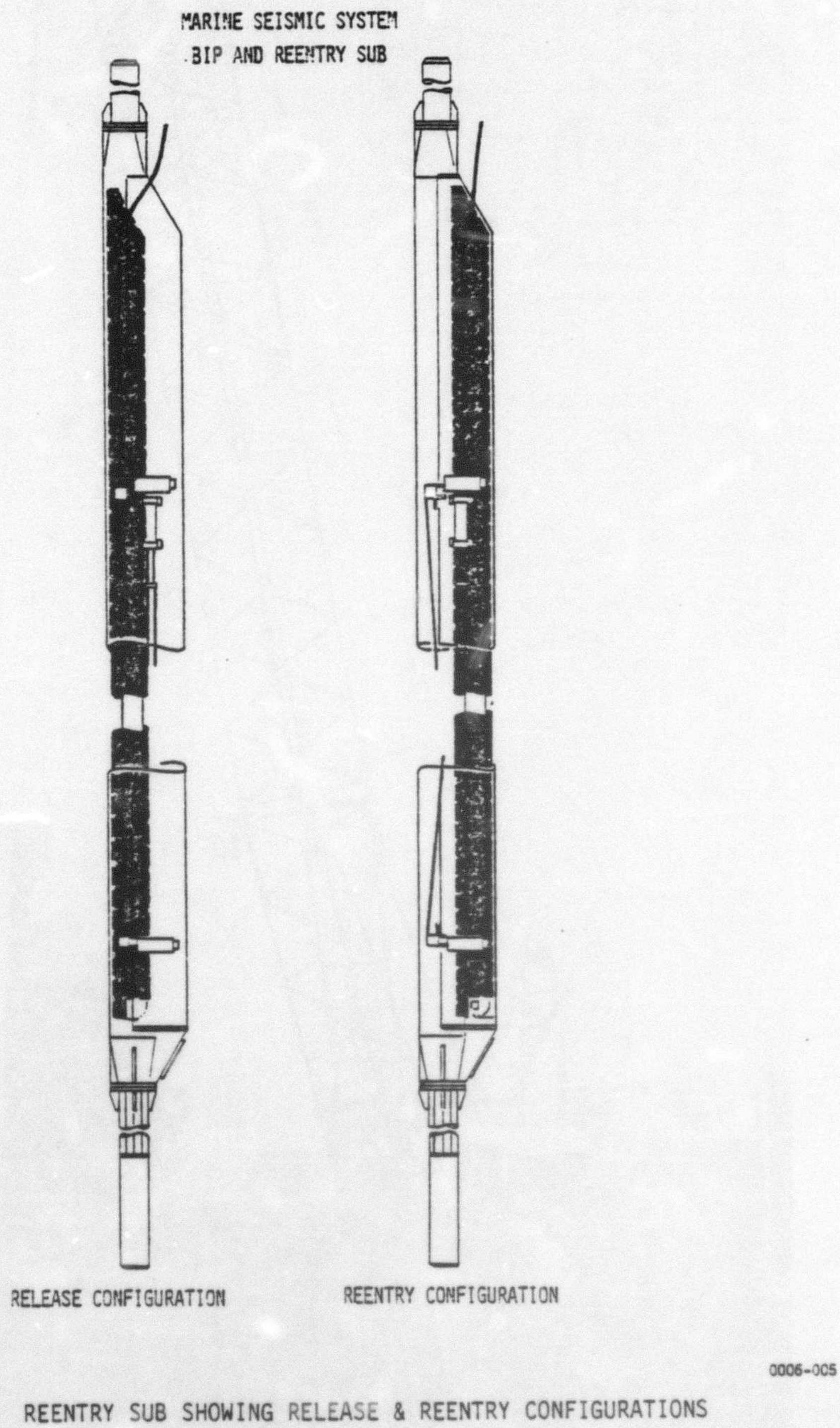


FIGURE 7-4 REENTRY SUB SHOWING RELEASE & REENTRY CONFIGURATIONS

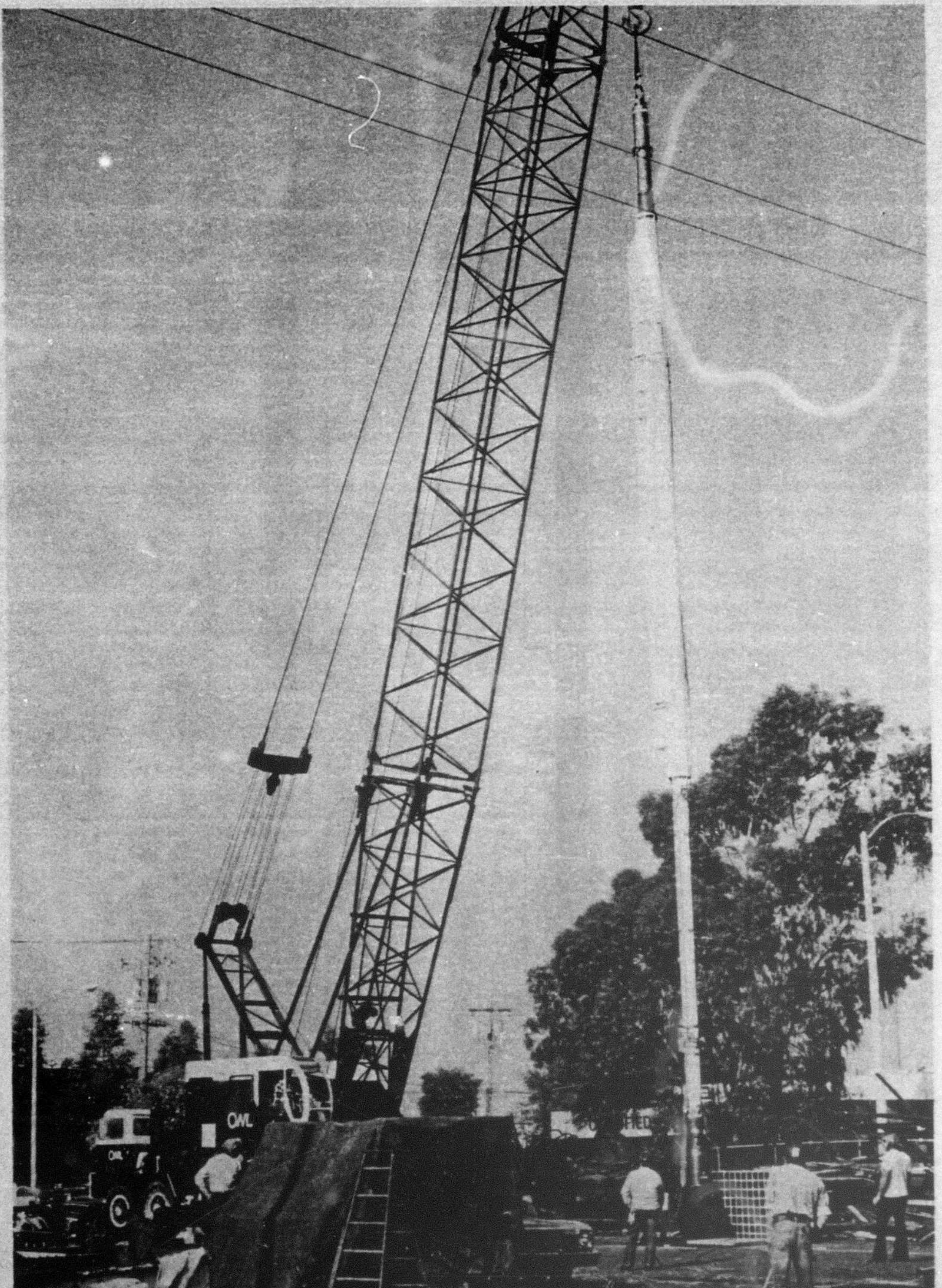


FIGURE 7-5 FIELD TEST OF REENTRY SUB

In order to satisfy the material requirements and to provide the various strength levels needed, several different alloys were used:

- o The stinger tip required 80,000 psi yield strength at the point of impact. ASTM A-543 CL1 (HY85) forging steel was used, with an 85,000 psi yield strength. This provided the necessary resistance to impact crushing.
- o The stinger tube was made from AlSl 1020 WDOM tubing with a 60,000 psi yield. This strength level was required to survive the bending moment induced by impact. However, it is apparent from the At-Sea-Test that more strength is needed just below the flange, since there was a permanent bend in this area after retrieval. The cause of this bend is thought to be ship-offset induced moments. More stiffness will be needed in this area.
- o The carriage tube was 14 inch Sch 40 pipe of ASTM A-53, Grade B. This material was chosen primarily for availability and cost. Bulk and stiffness were more important than yield strength for this piece.
- o The carriage housing was 16 inch sch 40 pipe of API-5LX, Grade X-52, split lengthwise, with ½ inch x 11¼ inch plate inserted, made of ASTM A-131, (ABS AH-36) with a yield strength of 51,000 psi. The section and steel were for stiffness and strength to resist bending moments.
- o The control sub was made of AlSl 4140 with a yield strength of 100,000 psi. The section and strength of this component were needed for high dimensional stability to provide a positive seal for the hydraulic system, and to provide sufficient strength for the lock ring groove shoulder. Also, this material was selected for compatability with the drill pipe material for corrosion and gall resistance at the threaded joint.
- o The Hydraulic Plug/Sonar Adaptor was made of AlSl 4140 with a yield strength of 100,000 psi for the same reasons as the control sub. The lock ring was also AlSl 4140, but was heat treated to a BHN 235 for high shear strength.

- Buna-N and natural rubber were the preferred shock ring elastomers because they were relatively stable down to the seafloor temperatures, and would not compress to any appreciable degree under the deep ocean ambient pressures encountered.

7.3.2 Reentry Sub Fabrication

The reentry sub consisted mainly of weldments, made up from steel plate, pipe and shapes. For specific steels used, and the weld procedure and heat treatment, please refer to the drawings of the various components. Some of the problems involved in the fabrication were as follows:

- Stinger tube, carriage tube and carriage housing were made from pipe or tubing, and each had a slot (1½ inch wide) longitudinally. When the cuts were made for these slots, each piece tended to warp or twist, relieving residual stresses of manufacture. Fortunately, in no case was this warping beyond repair. Each piece was pressed into the proper straightness and concenticity.
- The carriage housing, in addition to the slot, had to be cut in half and have 11½ inch wide plates inserted to produce the desired oval shape. The welds required were very long, (32 feet - 9 inches) continuous pass welds, which could 'draw' the assembly out of the desired shape. With great care and luck, this problem was kept to a minimum, and the carriage housings were acceptably straight.
- Maintaining concentricity of welded sections relative to each other was a problem, particularly between the stinger tube and the stinger tip piece. It was found that some grinding was required at this point, when the hydraulic plug/sonar adaptor failed to traverse this area at first. The problem was overcome fairly easily, but could have been major due to the tight tolerances of the adaptor and stinger tip.
- The shear pin installation was changed during fabrication due to a material problem. The steel pins originally designated failed to shear at the required point and did not exhibit any

consistency of shear point. It was decided to go to 6061 T-6 aluminum due to the more predictable properties. This required some changes in the mount design for the pins as well, but the change was successfully accomplished.

There were three components which required machining to achieve the desired tolerances: the control sub, the hydraulic plug/sonar adaptor and the stinger tip. The HP/SAs and the stinger tips did not present any major problems, but the control subs delayed completion somewhat. The problem areas were as follows:

- The size of the piece presented a problem in finding a machine shop with the ability to handle it, and the open time on the machine to do the job in time. When a shop was found, and the control subs were machined, severe quality control problems developed, and completion was delayed.
- The large bore (the lower end) of the control sub was trepanned to 8 inches ID, then a boring bar was used to turn the diameter out to 8.6 inches. The final step was to hone the bore to finished size. The honing was done at a different shop, so when the quality problem with the boring was discovered, the piece had to be transported again. The problem was due to the long reach into the bore (3 feet - 11 inches) allowing the boring bar to deflect from the desired position. This long reach also presented a problem in measurement, but a special tool was located and utilized.
- The lock ring groove also presented a problem in the machine work. The location made it difficult to cut the proper contour with the boring bar, but it was finally accomplished. Because of its location so deep in the bore, and the narrowness of the groove, it was also difficult to measure directly. A clay impression had to be made, and then the clay was measured.

7.3.3 Inspection and Testing

Dimensional inspection and testing for function was done in accordance with Appendix F. Items 3, 5 and 8 have a dimension in parentheses. These indicate dimensions used in place of those originally called for, reflecting changes made late in the fabrication.

When a problem developed with the original shear pin installation, several samples were sent out to a testing lab. The shear pin configuration had to be redesigned to aluminum.

The reentry sub was instrumented and impact tested per the attached report in Appendix E from Datacraft, Inc.

To satisfy the operating personnel, and give them a practice run opportunity, the reentry sub was assembled and functionally tested while in transit to the site. The tests consisted of the fit, running and function tests indicated in the tables above, and were successful. The practice was very valuable to the operating personnel, and resulted in some minor changes in procedure for easier, faster operation.

Basically, the testing confirmed the design and its associated analysis. Slow motion video tapes are available to provide a detailed analysis of the impact motions if so desired. In addition, accelerometer traces are available to provide corresponding transient force characteristics.

SECTION 8.0 - OPERATIONS SUMMARY

At 0200, Friday, March 27, 1981, the initial deep ocean seafloor deployment test of the MSS began. The sea state and vessel movement (refer to weather summary in Appendix G) were favorable for passing the equipment through the rotary table and moonpool structures. The original sequence of procedures (refer to Appendix C) used to assemble the carriage and to insert the BIP were partially modified to permit better control of the instrument impacts during the insertion into the carriage. The modified operational sequences were performed as follows:

The EM Cable was initially keelhauled and tied off at the moonpool work platform. The carriage control sub was first made up to the reentry housing carriage and the attachment nuts welded while on the casing rack. The reentry assembly was picked up on the traveling blocks, lowered and aligned to the stinger flange, bolted and all of the nuts welded. The total assembly was then deployed to the rotary table and hung off on drill collar slips and safety clamp. Four 8¼ inch OD Baash Ross Bumper Subs, weight of 1,800 pounds each with 5 feet of stroke, were made up to the carriage control sub tool joint and torqued to API specs. Next, the total reentry assembly was suspended on traveling blocks and the drill collar slips removed (tugger and cat lines were used to snub assembly to forward side of rotary table), while the EM Cable was passed through and rigged into a sheave hanging from the derrick on a tugger line. The carriage assembly was lifted until the top of the carriage was approximately 3 feet above the rotary table. Figure 8-1 shows the reentry assembly while being raised in the derrick.

The BIP was then placed on the catwalk, the EM Cable connected and systems checks were made. The BIP was picked up with crane and tugger until load could be taken vertically on EM Cable then carefully lowered into the carriage. Figure 8-2 is a photo of the BIP just before being lowered into the reentry sub carriage. The carriage shear pins and hydraulic connection lines were installed at moonpool work platform. The total assembly was lowered approximately 20 feet and snubbed off with tugger and cat line, while hand feeding the EM Cable through the rotary table.

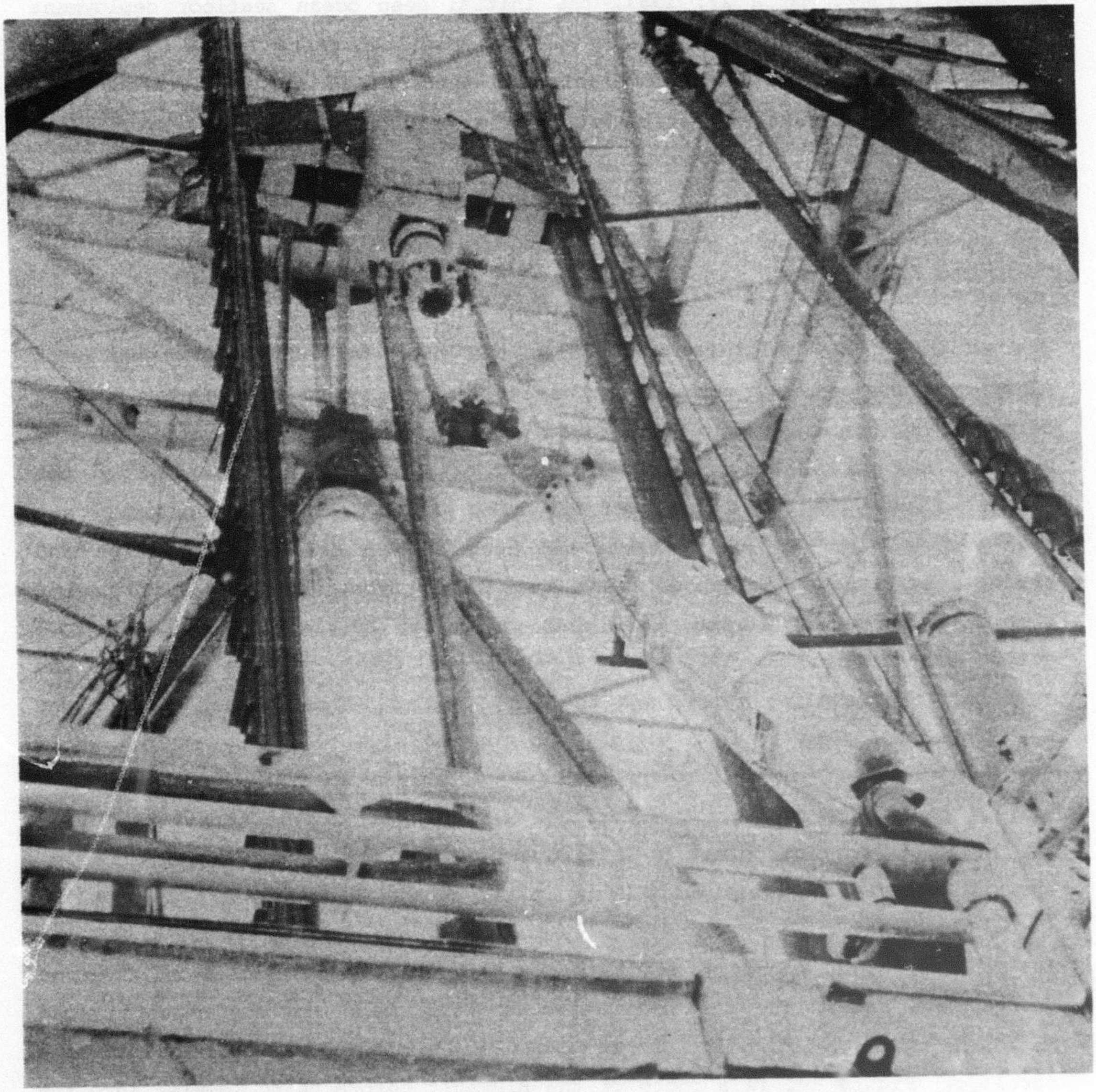


FIGURE 8-1 SHIPBOARD HANDLING OF REENTRY SUB

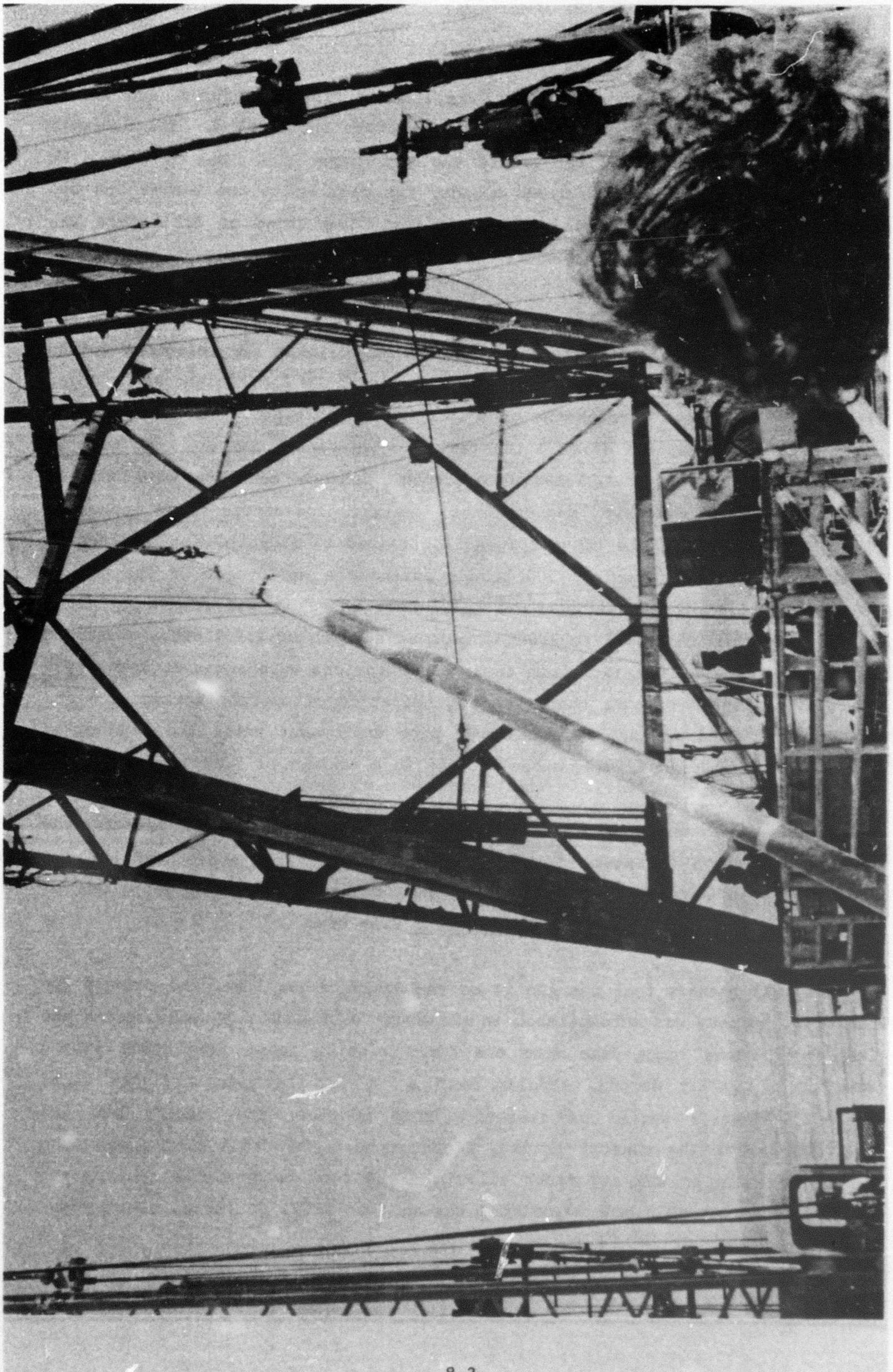


FIGURE 8-2 BIP IN DERRICK

The bight of EM Cable on rig floor was removed from the sheave and passed through the rotary down to the lower work platform and secured. The assembly was then lowered and slips set around the top bumper sub. One 30 foot - 7¼ inch OD drill collar, weight 3,000 pounds, was made up to the bumper sub and the assembly was lowered and landed on slips. One stand of drill pipe was then made up above the drill collar.

The slot in BIP carriage assembly was oriented facing the A-Frame sheave and orientation marks scribed on rotary table and tool joint for reference during deployment. The pipe was lowered 30 feet where the EM Cable bight was removed from guard and passed through the piccolo base and released. The EM Cable was not tensioned during the first 1,180 feet of deployment, but was kept taut to prevent entanglement. At 1,180 foot depth, footage counters were set to correspond with assembly measurements, weight indicators were checked, recorders started and the heave compensator raised to mid-stroke. The tension on EM Cable was increased to 500 pounds during the deployment of the next 9 stands of drill pipe to a depth of 2,017 feet where it was raised to 2,000 pounds, and then increased to 3,000 pounds at a depth of 2,947 feet. Refer to Appendix H for specific data from test. The tensions were somewhat lower than previously planned because there was no indication of current acting upon the EM Cable or drill string. We continued pipe deployment until the sea bottom was reached, while increasing cable tension to a maximum of 7,200 pounds.

The three major concerns at the start were (1) coordination between the driller and winch operator, (2) keeping the BIP carriage orientated and (3) avoiding cable entanglement. The first two concerns soon disappeared due to the skill and dedication of the <u>Challenger's</u> fine crew.

At 1900, the reentry tool was run in on the Schlumberger line, and scanned for reentry. Reentry was accomplished in the usual DSDP manner by maneuvering the <u>Challenger</u> using range data from the sonar reentry tool. The drill string acts as a heavily damped pendulum tending to oscillate in a figure eight motion. After a series of iterative ship motions, the reentry sub was positioned over the conical shaped reentry cone. The drill string was then lowered rapidly at the rig floor allowing a 60 foot drop of the reentry sub into the reentry cone and associated casing. At 1257, 30 March, reentry was smoothly accomplished. We recovered the sonar tool, rigged down the Schlumberger equipment and reset footage counters to correspond with measurements of drill pipe and assembly deployed. This took about 5 hours to accomplish.

The major remaining concern at that time and one which had been with us from the beginning, "cable entanglement" would soon be resolved. The tension on EM Cable was slacked to 7,000 pounds in order to leave approximately half the weight of the BIP setting down on the carriage, thus allowing the BIP to fall a short distance when the pins were sheared. Using the cement pump, pressure was brought up slowly to approximately 2,200 psi with no indication of shear observed on pressure gauge or weight indicator. However, the BIP data indicated shear had been accomplished. The anxious moment had arrived, would the BIP payout freely or were we entangled? The winch began slowly paying out cable with all eyes glued to weight indicators and recorders. The weight began to decrease indicating the BIP was initially not falling. Then, the weight indicators stabilized and the winch smoothly began paying out. No entanglement and the BIP was on it's way to bottom. The BIP was run to the bottom (16,738 feet) and held for data, pulled back 1,000 feet and lowered again to take further lowering data characteristics.

The ship was moved 200 feet upstream to the current and then the reentry assembly was pulled out of the reentry cone approximately 90 feet above cone. The hydraulic system was repressured to 3,400 psi releasing the EM Cable gate. The BIP was returned to the bottom of the borehole. The running string was pulled out, and the reentry assembly was retrieved, disassembled, and returned to the storage rack. The ship was then moved 2,990 feet downstream to current while paying out EM Cable on seafloor with approximately 2,000 feet additional cable laid out.

At 2300 on 28 March seismic experiments were begun, with all systems working well. At 0800, the next morning, an additional 2,400 feet of cable was payed out to help isolate the cable noise at the BIP. The seismic survey was completed at 0300, Sunday, 29 March and preparations made for recovering the BIP.

The slack cable was taken up from seafloor, with approximately 3,000 pounds tension on cable, as the ship moved back over the entry cone. An attempt to pick the BIP off the bottom, with approximately 4,000 pounds over-pull, was not successful. However, the seismic instruments indicated some vibrations were getting to BIP. The conclusion was that the EM Cable was probably fouled or caught under a sonar reflector. With this in mind, the ship was moved 200 feet East, cable slacked approximately 30 feet and then immediately pulled back in tension. The cable came free and the BIP was pulled from the bottom freely. The cable was reeled in and the BIP recovered onboard ship. The frontispiece depicts the final successful recovery of the BIP while alongside the ship preparatory for bringing aboard. The DARPA program was completed at 0445, Monday, 30 March, approximately 72 hours and 45 minutes from start to successful conclusion.

SECTION 9.0 - TEST DATA EVALUATION

9.1 IMPACT FORCES

The long period seismometers scheduled for inclusion in subsequent borehole instrument packages can be subjected to a maximum of 10 Gs dynamic impact loading. In order to determine the actual magnitude of impact loading that these instruments are likely to register during a normal reentry and borehole deployment, this test BIP was equipped with triaxial accelerometers which were continuously recorded during deployment. They are installed on 6 inch diameter bolted tube segments approximately 10 inches and 20 inches long respectively above the pressure vessel base. The bolted tube segments are fixed at the base and are laterally spring-stabilized approximately 60 inches above the base. The mountings thus are much more rigid in the longitudinal direction than along the lateral Y and X axes.

During the deployment of the BIP into the borehole, a variety of shipboard handling, lowering, and reentry shock impacts were recorded. In general, they were of the same general 2 to 6 G (at the BIP) level of magnitude. The most severe forces occurred during initial reentry; however, these impacts were concentrated at the bottom of stinger approximately 30 feet below the carriage housing which supported the BIP. These forces were somewhat attenuated by the cantilevered stinger structure. The other shock loading occurred on the BIP directly on, or in the general area of the carriage housing.

The original analysis of reentry impact was reported in Reference 4. A summary of the predicted characteristics is as follows:

	Rigid Joint
Impact Velocity	10 ft/sec
Impact Impulse	1,158 lbs-sec
Duration of Impact	.011 sec
Max. Impact Force	164,000 lbs
Angular Velocity of RS	0.2 rad/sec
BIP Loading	6 - 8 G

The shock analysis for a complex structure such as a reentry sub attached to a long drill string is a difficult problem. Due to the short impulse time, the effective length of the body reacting to the impulse is difficult to determine. In particular, the joint stiffness above the reentry sub is critical. In general, the test data confirms the original analysis. This analysis can be extrapolated to the more severe 1982 conditions.

The following is a brief description and evaluation of the accelerations recorded for each phase:

- Shipboard Handling - This step included removing the BIP from its shipping container, standing upright, and inserting it into the carriage housing on the rig floor.

- Lowering the reentry assembly to the seafloor - Accelerations were recorded while drill pipe was added and lowered. Cable was payed out at a rate which maintained a relatively constant tension at the BIP.

- Reentry into the cone and cased borehole - Accelerations were recorded while the stinger was stabbed into the cone from about a 6 foot height. It was lowered quickly for about 20 feet; then lowered more slowly for an additional 40 feet to ensure that the stinger was fully in the borehole casing.

- Reentry assembly standing in cone - Drill string motions were imparted to the reentry assemble during the 6-hour period required to retrieve the sonar tool and run in and latch the Baker plug.

- BIP carriage shift and release - Accelerations registered when the BIP carriage was shifted horizontally 12 inches in order to align the BIP over the borehole.

- Lowering the BIP in the borehole - Irregularities in the borehole induced shocks to the instrument housing.

- Landing the BIP at the bottom of the borehole - When the BIP contacted the bottom of the borehole large, vertical accelerations were expected.

- Lifting the BIP - Recovery of the BIP caused shocks because of forces required to free the instrument plus random irregularities in the borehole walls.

The accelerometer output, as recorded in real time on a strip chart, are analyzed and briefly described below for each of the above phases of deployment.

<u>Loading</u>: Random impacts occurred throughout the duration of the approximately 15 minute loading phase. Initial lift by the crane occurred at 10:03:26 and registered a maximum 3.5 G shock. The natural transverse frequency of the BIP is approximately 12.5 Hz. Handling impacts were also noted when the BIP struck the rig floor. Typical X-axis impacts of 3.2 Gs, obtained when the BIP was lowered into the carriage, are shown by Figure 9-1. The plots are Z, Y and X respectively from the top. The bottom trace is a GMT time signal. The apparent lateral fundamental frequency is about 40-50 Hz, but this ringing exhibited in the lateral accelerometer traces may be due to resonant vibration of the accelerometer mounts.

<u>Lowering of the Reentry Sub</u>: Vertical accelerations were recorded each time pipe was added to the drill string. With 4,000 feet deployed, the apparent pipe string fundamental frequency was noted at slightly less than 2 cps. As the drill string length was extended, the recorded shocks were increasingly attentuated.

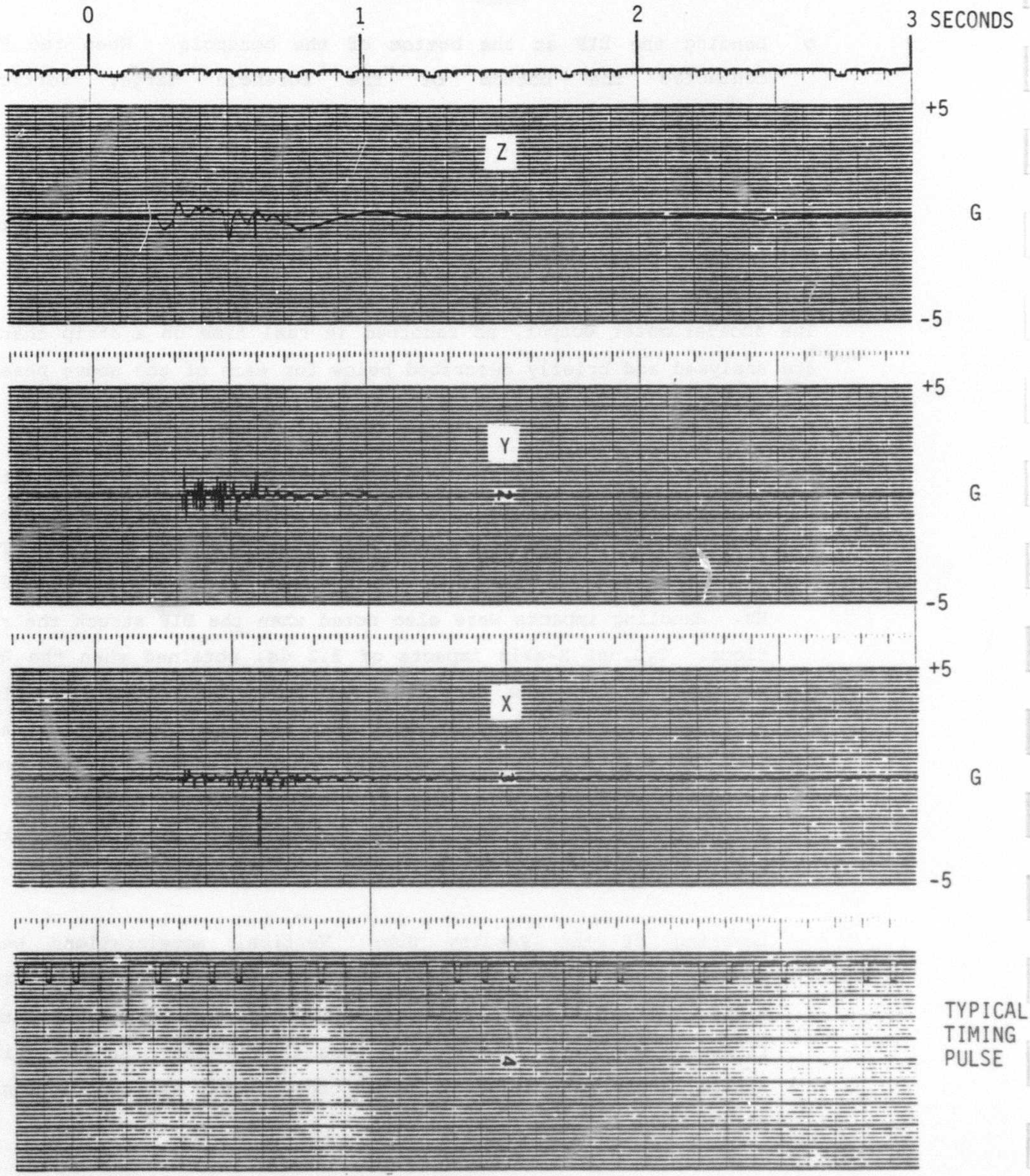


FIGURE 9-1 SHIPBOARD HANDLING (PRIOR TO DEPLOYMENT)

Reentry: Figure 9-2 is the reentry accelerometer record. First contact with the cone occurred at 02:57:26 GMT (1157 local time) with the major impact of about 6 Gs at 02:57:32.7. By 02:57:50 (Figure 9-3) motions had decreased indicating that the bumper subs had set. The predominant X-axis frequency was about 40-50 Hz while the Y-axis frequency was in the 80-90 Hz range. The major vertical shock impulse lasted approximately 15 msec. The initial 40 feet of stab was estimated at about 6 ft/sec with the latter portion estimated at 1-2 ft/sec. The sharp horizontal shock, followed immediately by a sharp vertical shock was the impact of major concern during system design. It may have occurred as the carriage seated in the bottom of the cone. For rougher weather, more shock absorption is undoubtedly required.

Standby in Cone: Figure 9-4 is a representative record of accelerations which occurred while the assembly was standing in the cone. These small events appear to occur with 4-1/2 to 6-1/2 second periods or roughly concurrent with ship and drill string motion. Figure 9-4 shows the record of one event and indicates a small vertical acceleration followed by a larger horizontal acceleration. These motions are probably due to the shock of fully closing or fully opening of one of the bumper subs just above the reentry assembly, although ship heave was slight at this time.

BIP Release: Figure 9-5 is the record of accelerations occurring when the BIP carriage was shifted laterally to the release position. This motion induced large accelerations of about 5 plus Gs for about 0.8 sec on the horizontal axis and smaller accelerations for 0.25 sec on the vertical axis. The accelerometers continued to show motion for several seconds on the horizontal axis, indicating resonance within the BIP case or the reentry assembly or both. The predominant lateral frequency appears to be in the 50-60 Hz range with the X-axis indicating slightly lower frequencies but higher amplitudes than the Y-axis.

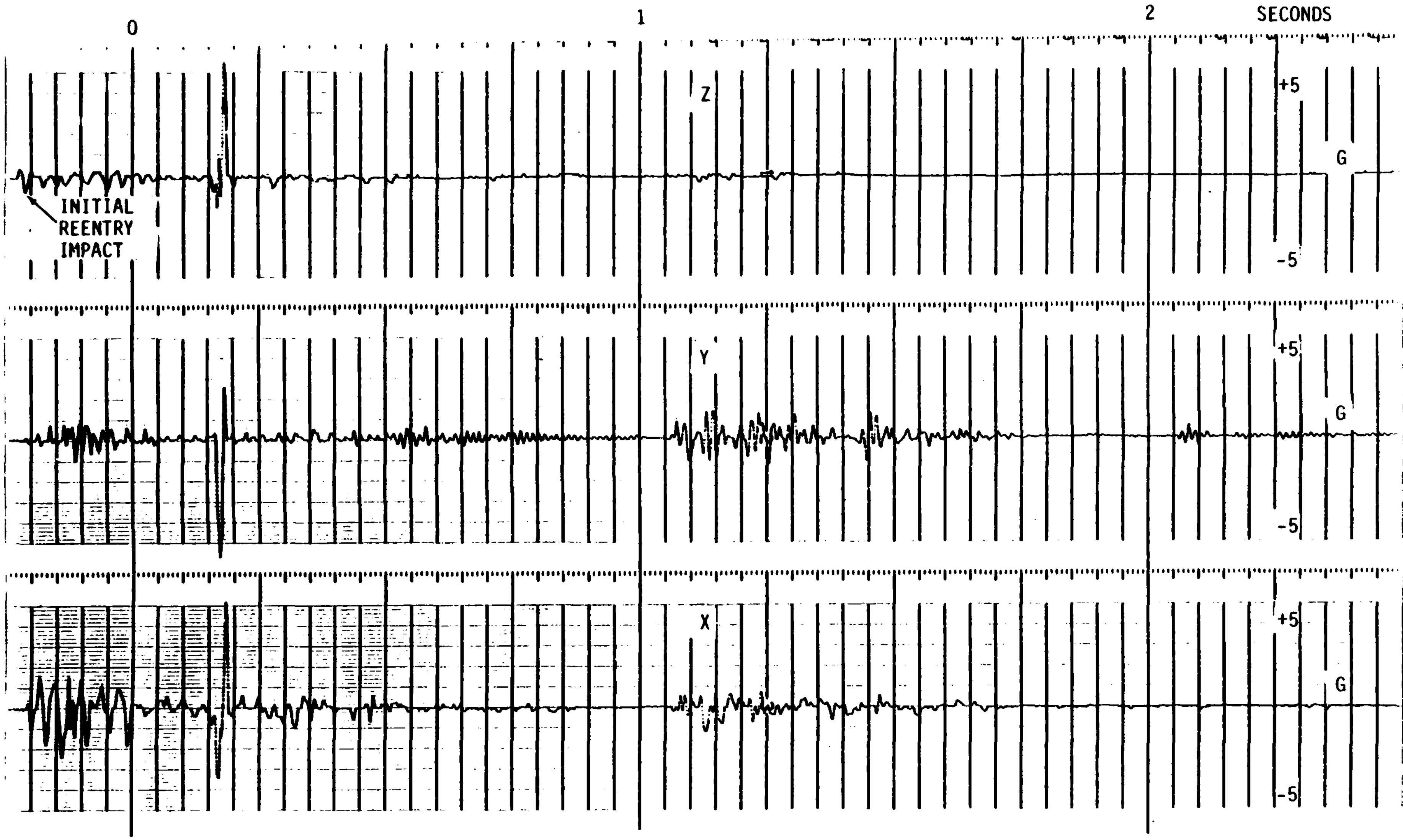


FIGURE 9-2 REENTRY

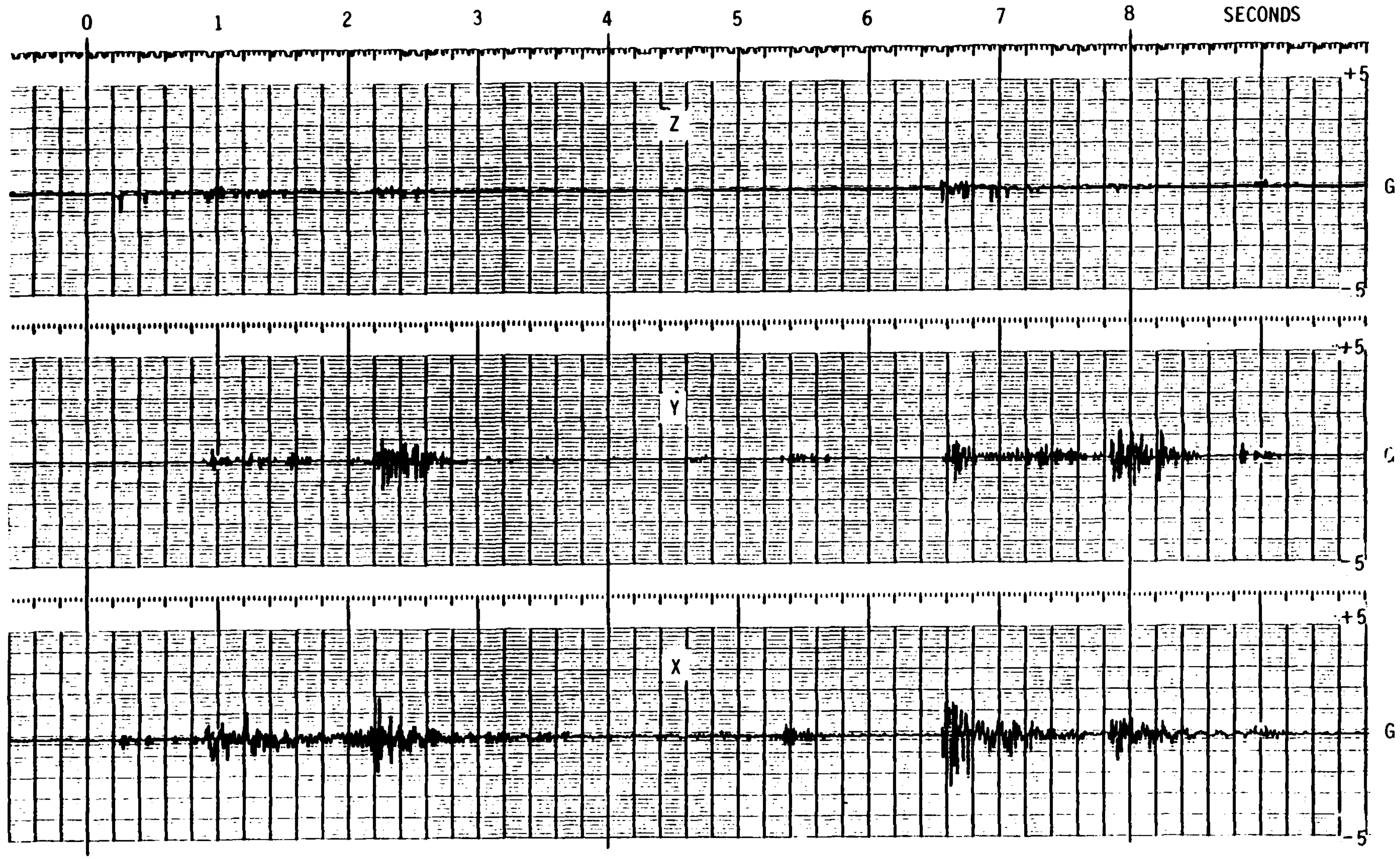


FIGURE 9-3 POST REENTRY

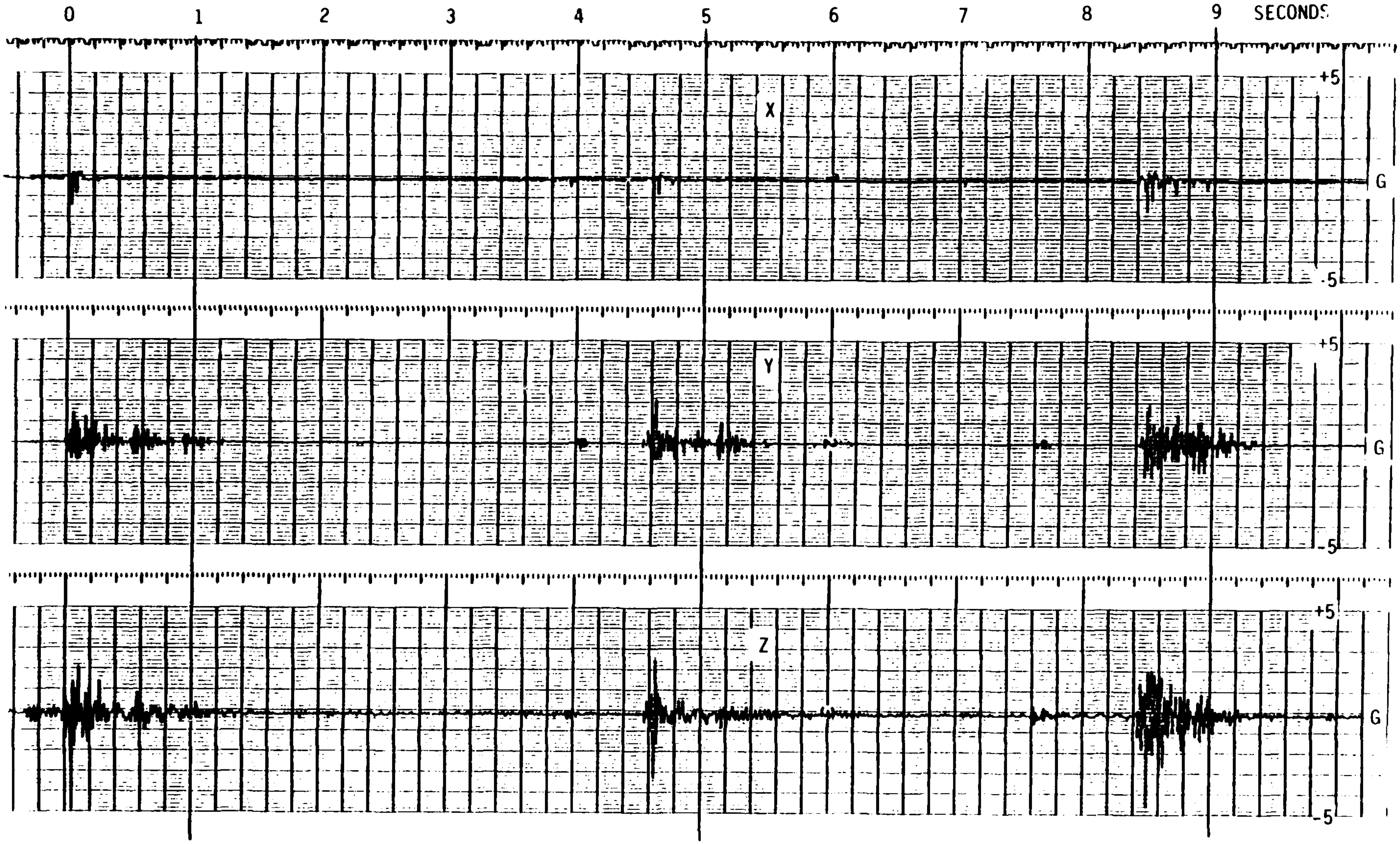


FIGURE 9-4 STANDBY IN CONE

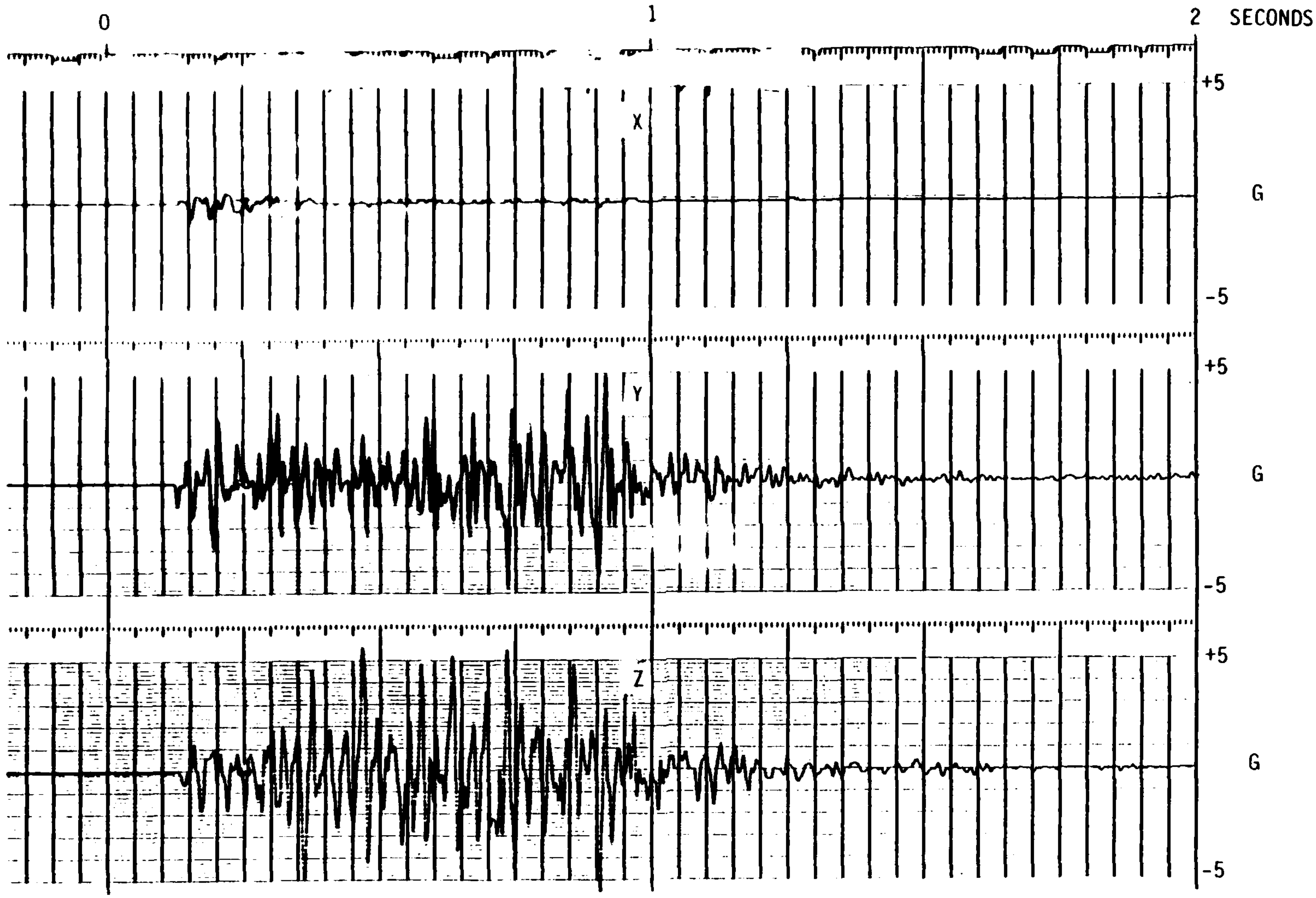


FIGURE 9-5 BIP SHEAR RELEASE

Lowering the BIP Down Hole: Figure 9-6 is a representative record of the accelerations occurring during the lowering of the BIP in the borehole. These shocks of 1 to 4 Gs were probably caused by the BIP striking rock ledges and rebounding. They are not considered a serious threat to the safety of the instrument.

Landing the BIP: The accelerometer record of the BIP making contact with the bottom of the borehole is shown in Figure 9-7. The peak acceleration was 4 Gs. Because bits, tools, and other items remained at the bottom of the hole from previous work, a purely vertical shock was not necessarily expected. Horizontal accelerations, however, were higher than expected indicating that the BIP made a sharp horizontal motion just as it was reaching the bottom. The horizontal accelerations may have been caused by the BIP tilting over and striking the side of the borehole.

In summary, the reentry accelerations were slightly less than expected, but other deployment accelerations were higher than the expected but within the allowable range. The horizontal or lateral axes (X-axis in particular) may have been recording slightly magnified accelerations due to mounting characteristics. Improved shock isolation is desirable for the expected more severe weather conditions of the 1982 deployment.

A detailed analysis of the various shock characteristics has not been performed pending better definition of the future deployment requirements. The data is available for future evaluation when deemed necessary.

9.2 CABLE DYNAMICS

9.2.1 Analysis

Since the inception of the MSS program, the potential problem of cable entanglement has been a major controversy. Proper cable tension was considered necessary to avoid cable/drill string

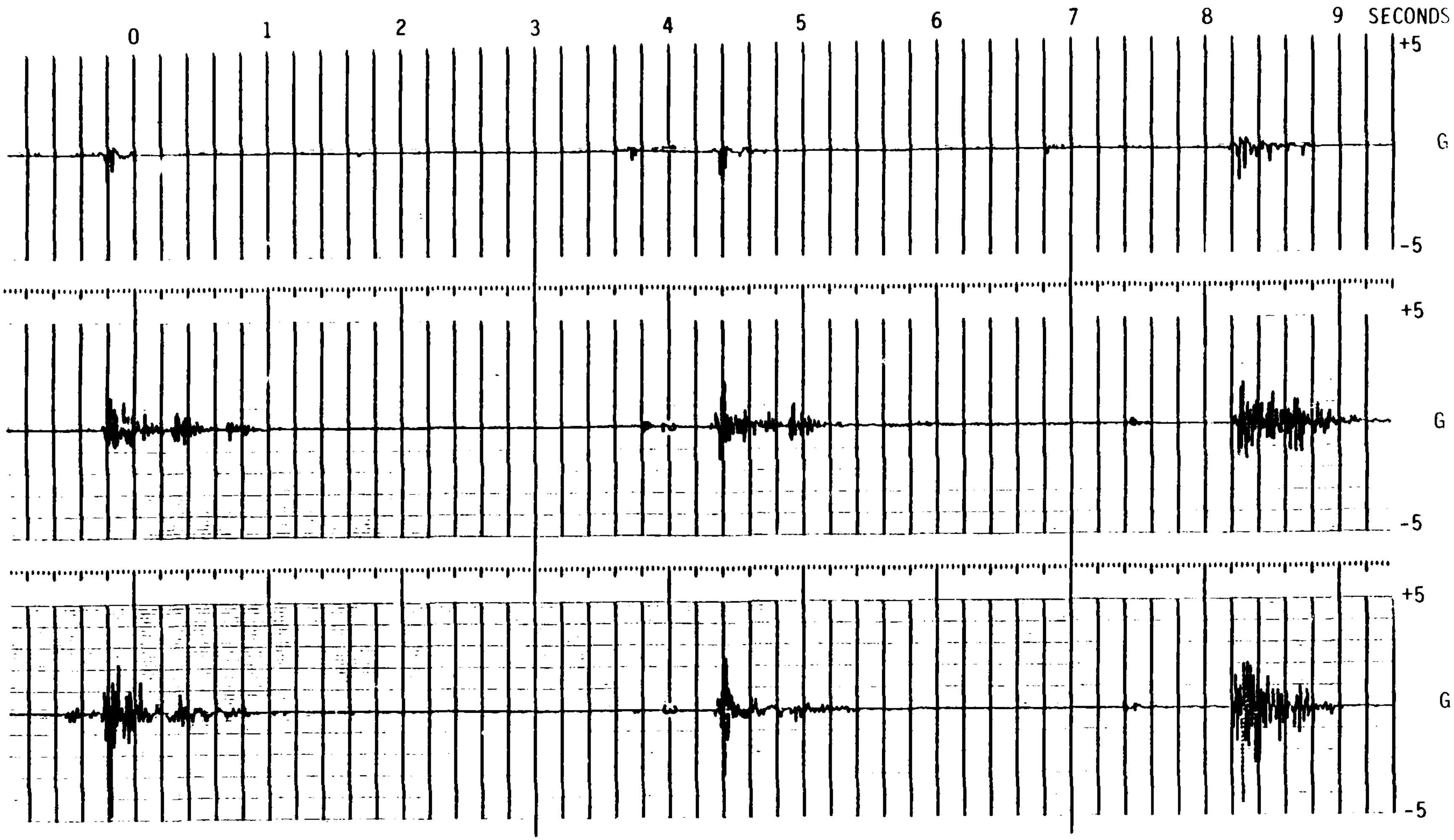


FIGURE 9-6 LOWERING BIP IN BOREHOLE

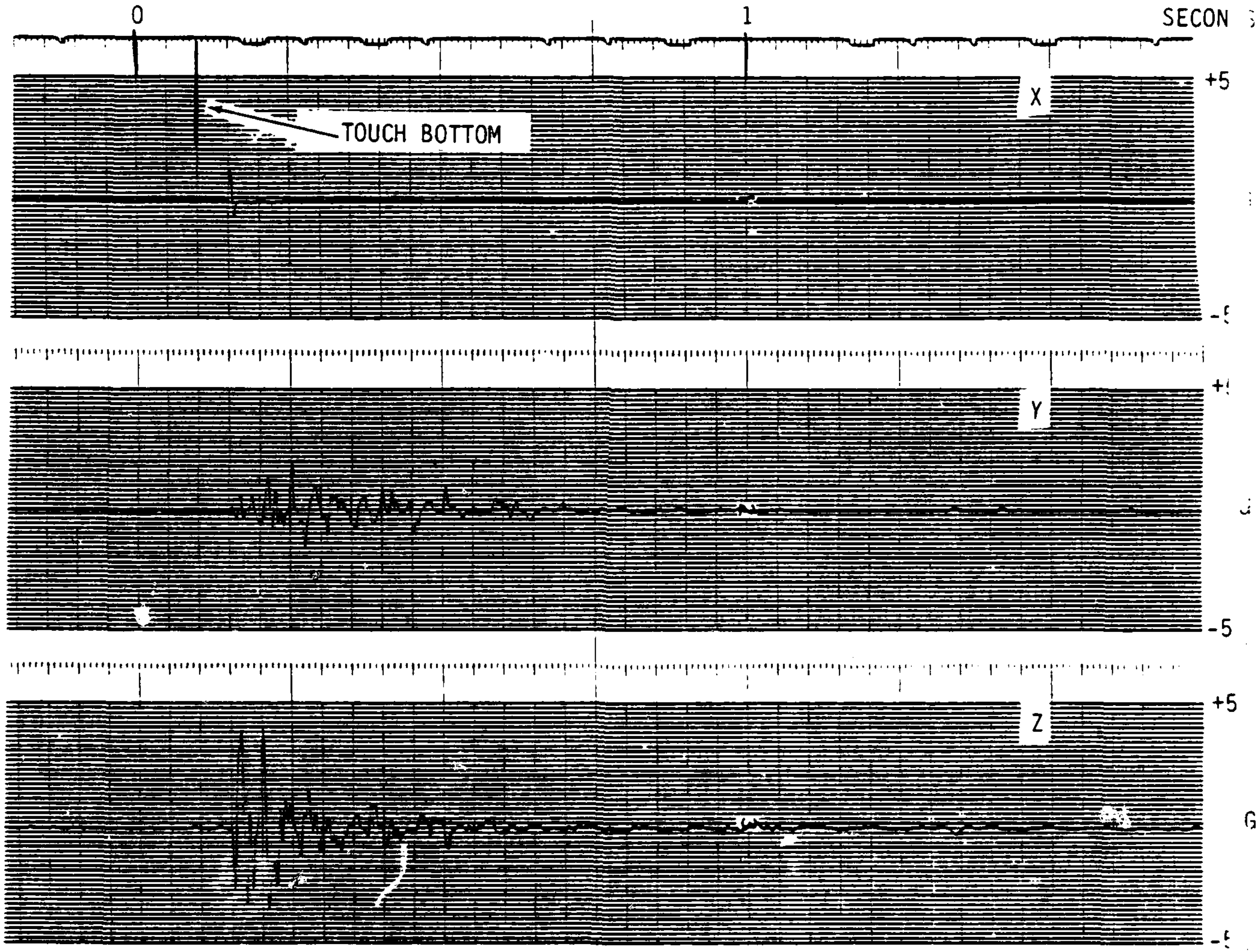


FIGURE 9-7 BIP BOTTOM OF BOREHOLE

entanglement during deployment. An extensive study (Ref. 5) conducted by E. Gershunov of Global Marine Development Inc, investigated the static and dynamic stresses induced in an electro-mechanical cable by horizontal currents and by ship motions responding to various sea surface conditions. In our application at Site 395A, the lower end of the cable was initially secured to the lower end of the drill pipe and the upper portion of the cable was controlled by a ship mounted constant tension winch. The weights, lengths, and tensions discussed are all applicable to the entry of an existing borehole with a seismometer package having an external cable and carried on a reentry sub. The cable was subjected to all the motions induced in the pipe by ship roll, pitch, heave, and yaw plus additional stresses induced independently on the cross-sectional profile of the cable by currents in the water column.

The EM Cable is hytrel jacketed, spaced armored and torque balanced with coaxial conductors. It has an outside diameter of 0.692 inches, breaking strength of about 21,000 pounds, and longitudinal stiffness (product of modulus of elasticity and cross-sectional area) of 2×10^6 pounds. Dry and wet weights are approximately 0.5 and 0.3 lbs/ft respectively.

While it was not possible to describe all wave, sea, and current conditions likely to be imposed on the cable and pipe during deployment; average and limiting conditions serve as useful guides. Surface conditions assumed for Site 395A included an average wave height of 4 feet and an average wave period of 5 seconds. Seas in excess of 5 feet occurred less than 20% of the time. Typical surface currents were 0.34 - 0.66 knots while mid-water currents were not expected to exceed 0.19 - 0.29 knots. There was no evidence for a significant frequency of strong bottom currents. Appendix I contains a short plot of actual ship motion data taken just prior to reentry.

These studies were initiated to determine the maximum tensioning characteristics of the cable and to examine the probability of entanglement between the drill pipe and the cable. Thus, they estimate the tension in the cable, the deflected shape of the cable due to currents and ship motions, and specify requirements for a tensioning system. Understanding and controlling these factors were expected to aid in reducing the dynamic oscillations experienced during deployment and in reducing the probability of cable/drill pipe entanglement. The current is considered as static and planar for these analyses, but in reality are slowly time dependent in direction and magnitude.

The following paragraphs summarize the results of the dynamic and static cable analyses:

- Tension in the cable is controlled primarily by its own weight, current, ship roll, pitch and heave motion and reentry sub release. Surge, sway and yaw generated tensions are small and may be neglected.
- Cable weight and current generate static tension; ship motion and reentry sub release cause dynamic tension in the cable.
- Maximum static tension is dependent on cable length and current and occurs at the upper end of the cable. For linear current with 2 knots at the surface and 0 at the bottom, the maximum tension is about 7,500 pounds. The main contributor to static tension is the weight of the cable. Total cable drag ranges on the order of 500 to 1,500 pounds. Additional tension due to current is thus in the range of 10-20% of the tension caused by cable weight. Minimum static tension occurs at the lower end of the cable where the tension is limited to above 500 pounds to avoid entanglement. Figure 9-8 shows the deflected shape of the cable for various deployed depths.
- Generally, dynamic tension applied to the upper end of the cable causes changes in the deflected shape in addition to the elongation of the cable. Conservative evaluation of the upper limit of the dynamic tension is based on the assumptions: (1) dynamic tension transforms completely into strain energy of the cable or causes elongation only, and (2) the lower end of the cable is attached to the reentry sub/drill pipe and is immovable for each cable length. Figure 9-9 shows the effect of tension on cable configuration.
- Dynamic tension depends on the wave frequency, cable length and velocity of the strain propagation in the cable. Strain propagation is evaluated to be 11240 ft/sec. Maximum dynamic tension occurs at the lower end of the cable.

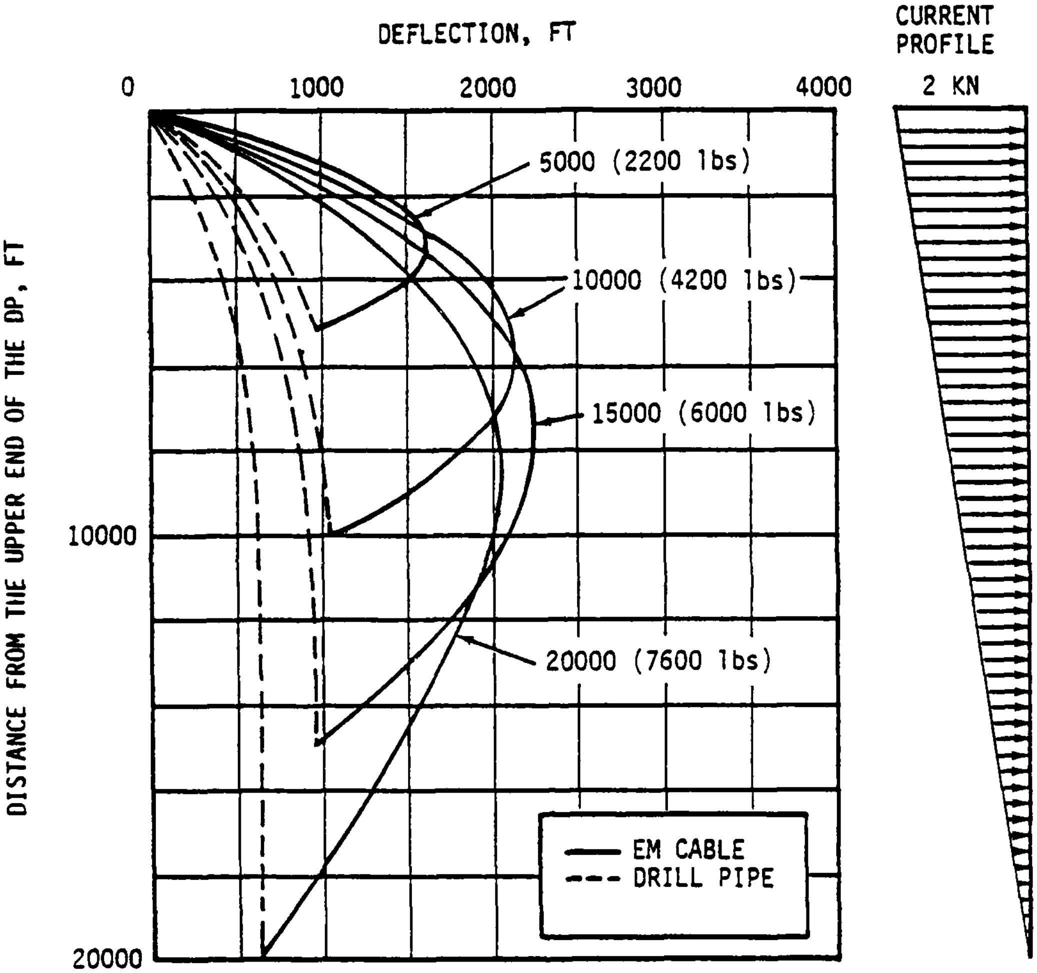


FIGURE 9-8 DEFLECTED SHAPE OF THE EM CABLE DUE TO CURRENT FOR 5000, 10000, 15000 AND 20000 FT OF WATER DEPTH

0006-046

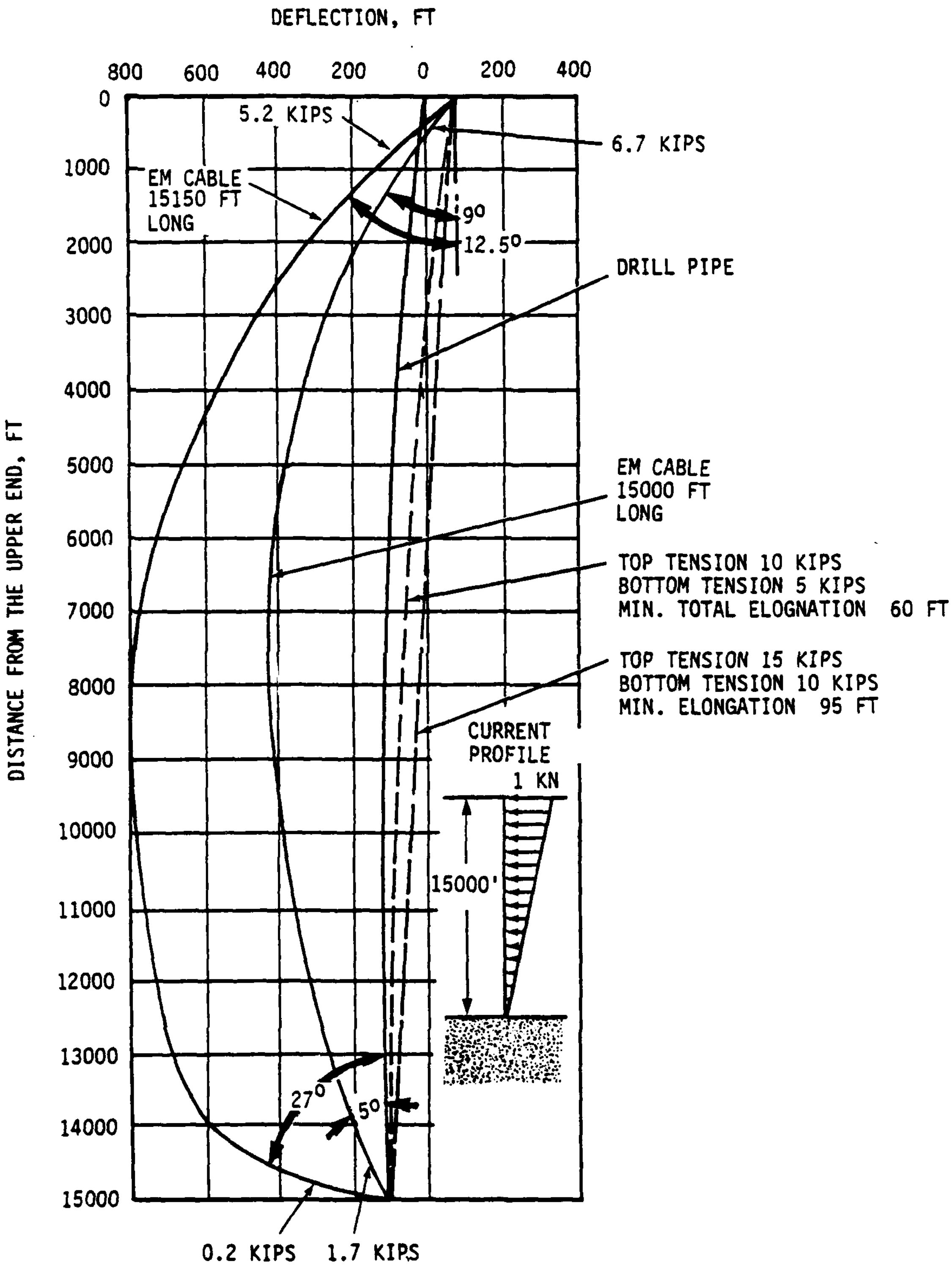


FIGURE 9-9 EM CABLE AND DRILL PIPE DEFLECTED SHAPES

0006-047

- The first natural frequency of the cable in longitudinal oscillation is determined to be in the range of 0.88 - 3.53 radians/sec. which corresponds to a natural period of 1.8 - 7.1 secs, depending on length of the cable. Frequency and period of the second mode are in the range of 2 - 11 radian/sec and 0.6 - 2.4 secs, respectively. The highest modes have the periods in the range of less than 2 seconds corresponding to very low energy of the sea energy spectrum (Table 9.1).
- The upper limit of dynamic tension as caused by ship motions is a function of deployed depth as indicated by Table 9.2.
- For 15,000 foot water depth and the ship location of 3,000 feet downstream of the borehole, the slacked length of the cable is about 1,000 feet and tension at the borehole is estimated in the range of 800 to 900 pounds for sea state 5 condition and linear current profile. For the planned total cable payout of 20,000 feet, approximately 1,600 feet will be laid on the ocean floor to aid in sensor decoupling.
- After BIP release and lowering, the cable remains captured by the reentry sub after the two cases were investigated:

  (1) Cable is locked in the reentry sub
  (2) Cable is pulled through the reentry sub

  If the cable is locked at the reentry sub, tension, as registered by the shipboard dynamometer, will have a tendency to decrease as the pipe is withdrawn. If the cable is pulled through the reentry sub, the observer will note an increase in tension.

- Possible interference between the drill pipe and the cable after BIP release may occur only in cases of no ship offset. If the reentry sub is raised 60 feet, the ship is moved 500 feet up current in the presence of a 1 knots current, the pipe and cable will be offset by about 380 feet. Other offset and current conditions do not indicate real tendency for interference between the drill pipe and the cable after the BIP release.
- In the case of ship maneuver upstream at a speed of 0.25 knots, deflected shape of the drill pipe and the cable suggest enough separation to avoid any interference between the two deflected shapes.

TABLE 9.1

EM CABLE NATURAL PERIOD OF LONGITUDINAL OSCILLATION

N NODE	Cable Length FT	5,000	10,000	15,000	20,000
0	Frequency RAD/SEC	3.53	1.77	1.17	0.88
	Period SEC	1.8	3.5	5.4	7.1
1	Frequency RAD/SEC	10.6	5.3	3.5	2.6
	Period SEC	0.6	1.2	1.8	2.4

TABLE 9.2
UPPER LIMIT OF MAXIMUM CABLE DYNAMIC TENSION

SIGNIFICANT WAVE HEIGHT FT	SHIP MOTION	TENSION IN LBS FOR LENGTH OF THE CABLE			
		20,000 FT	15,000 FT	10,000 FT	5,000 FT
4	ROLL	97	129	193	387
	PITCH	152	203	305	610
	HEAVE	305	407	610	1,220
6	ROLL	145	196	290	580
	PITCH	227	305	458	915
	HEAVE	458	610	915	1,830
8	ROLL	193	257	387	770
	PITCH	305	407	610	1,220
	HEAVE	610	813	1,220	2,440

- If the demonstrated length of the cable is equal to the water depth, the ocean currents may cause additional substantial tension in the cable and result in elongation. This additional tension is distributed along the cable length.
- To avoid kink formation in the cable and snap loading, the maximum tension controlled at the upper end is recommended to be maintained at approximately 10% more than the weight of the deployed length of the cable.
- No snap loads or 0 tension characteristics appeared in the cable for any of the conditions tested and described based upon a special time domain cable program run.

On board the Challenger, a special static cable deflection computer program was established utilizing a HP-41 CV calculator. Cable tension adjustments were derived from a 15 node representation which allows for variable current forces with depth, end tensions, end positions and cable wet weight input. This program provided a quick reference for on-the-spot checks of real data.

Table 9.3 indicates the effect of current (assumed decreasing proportionally with depth) on control parameters. Table 9.4 was tabulated as a guide to cable payout and tensioning limits for the expected 1 or 0.5 knot current conditions. The indicated cable tension needed to be corrected by an approximate 1.7 load cell correlation factor to take into account cable angle over the sheave which varies with both load and heave compensator position.

9.2.2 Cable Load Evaluations

In general, the dynamic cable tensioning characteristics followed the estimates. Experimental data were derived from the hydraulic load cell gauge, a digital readout and from analog recorder records.

Relatively high oscillatory loads induced by ship motion occurred when there was only a short cable/drill string deployed out.

TABLE 9.3
CABLE TENSION EFFECT WITH CURRENT
(15,000 FT)

CURRENT	TENSION (TOP)	LAT. DISP. (max)	STRETCHED LENGTH	CABLE ELONG.	CORR. LENGTH	TENSION (BOTT.)
Knots	lbs	ft	ft	ft	ft	lbs
0.1	4,426	93	15,020	20	15,000	3
0.5	4,984	331	15,021	21	15,000	555
1.0	8,000	509	15,043	43	15,000	3,518
1.5	12,000	650	15,074	74	15,000	7,822
2.0	17,100	796	15,109	109	15,000	12,490

TABLE 9.4
LEG 78B, HOLE 395A
CABLE TENSIONING CHARACTERISTICS

15,000 FT

TOP CABLE TENSION	LAT DISP.	1 knot (surface) CABLE LENGTH	ELONG	CORRECTED LENGTH	TENS. (BUTT)	½ knot (surface) LAT. DISP.	CABLE LGTH.	ELONG	CORRECTED LENGTH	TENSION BUTT
LBS	FT	FT	FT	FT	LBS	FT	FT	FT	FT	LBS
5,000	1,201	15,316	20	15,296	371	308	15,016	21	14,995	570
6,000	782	15,111	28	15,083	1,510	228	15,008	28	14,978	1,572
7,000	614	15,065	36	15,029	2,611	178	15,004	36	14,968	2,573
8,000	509	15,043	43	15,000	3,518	159	15,003	43	14,960	3,573
9,000	436	15,031	51	14,980	4,536	144	15,002	51	14,951	4,573
10,000	384	15,023	58	14,965	5,543	132	15,001	58	14,943	5,573

As depth increased the cable stiffness decreased, resulting in less amplitude tensions at the surface for the same approximate ship motions. At reentry depth, the natural cable frequency approached 0.16 Hz (6 second period) which is similar to ship motion periods. At 14,600 feet, cable dynamic tension amplitude (significant) appeared to be about ± 250 pounds with a fixed end. With the drill string constrained in the reentry cone, the significant amplitude appeared to increase to about 350 pounds. For the deployment phase, sea conditions remained approximately constant. More detailed cable characteristics could be correlated to ship motion data taken concurrently by DSDP (Appendix I).

Figures 9-10 and 9-11 illustrate the typical deep deployment characteristics of the cable when the BIP is restrained to the drill pipe and free, respectively. Reentry is shown on Figure 9-12. An initial reduction in tension occurs as approximately 33 feet of cable was payed out in preparation for the approximate 60 foot stab. The HC/A-frame system fluctuates widely during the actual reentry stab.

The nitrogen gas pressurized passive heave compensator (HC) had a spring constant in the range of 50 to 170 lbs/ft using the fixed accumulator. The gas HC cylinder retains a partial hardened spring action even when locked out. Typically, during the shallow to middle deployment depths, locking out the HC cylinder slightly increased the oscillations at the deepest depths, and decreased oscillation with HC locked indicated that the HC/cable system was near resonance. A preliminary calculation for the HC/cable system indicates a natural frequency of about 0.12 Hz (8.3 second period). Figure 9-13 illustrates the effect of partially locking out the HC by closing the valve to the accumulator.

The initial lowering of the BIP approximately 10 minutes after reentry sub carriage release is shown in Figure 9-14. The BIP was apparently momentarily not released, as indicated by the reduction in load cell reading during initial cable payout, which was followed by an increase in load and free ended vertical oscillation during subsequent lowering.

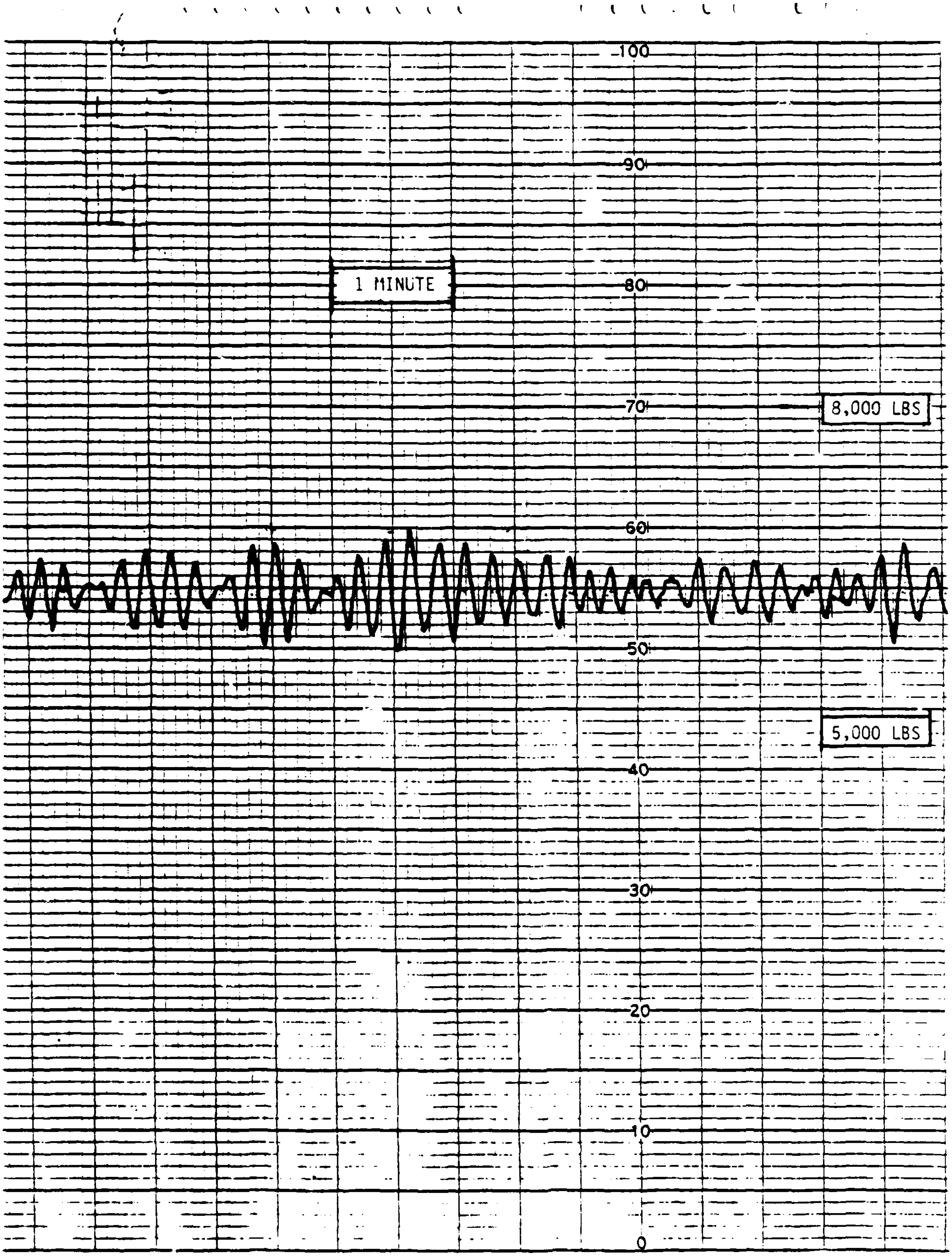


FIGURE 9-10 EM CABLE DYNAMICS FULLY DEPLOYED PIPE STRING (~15,000 FT)

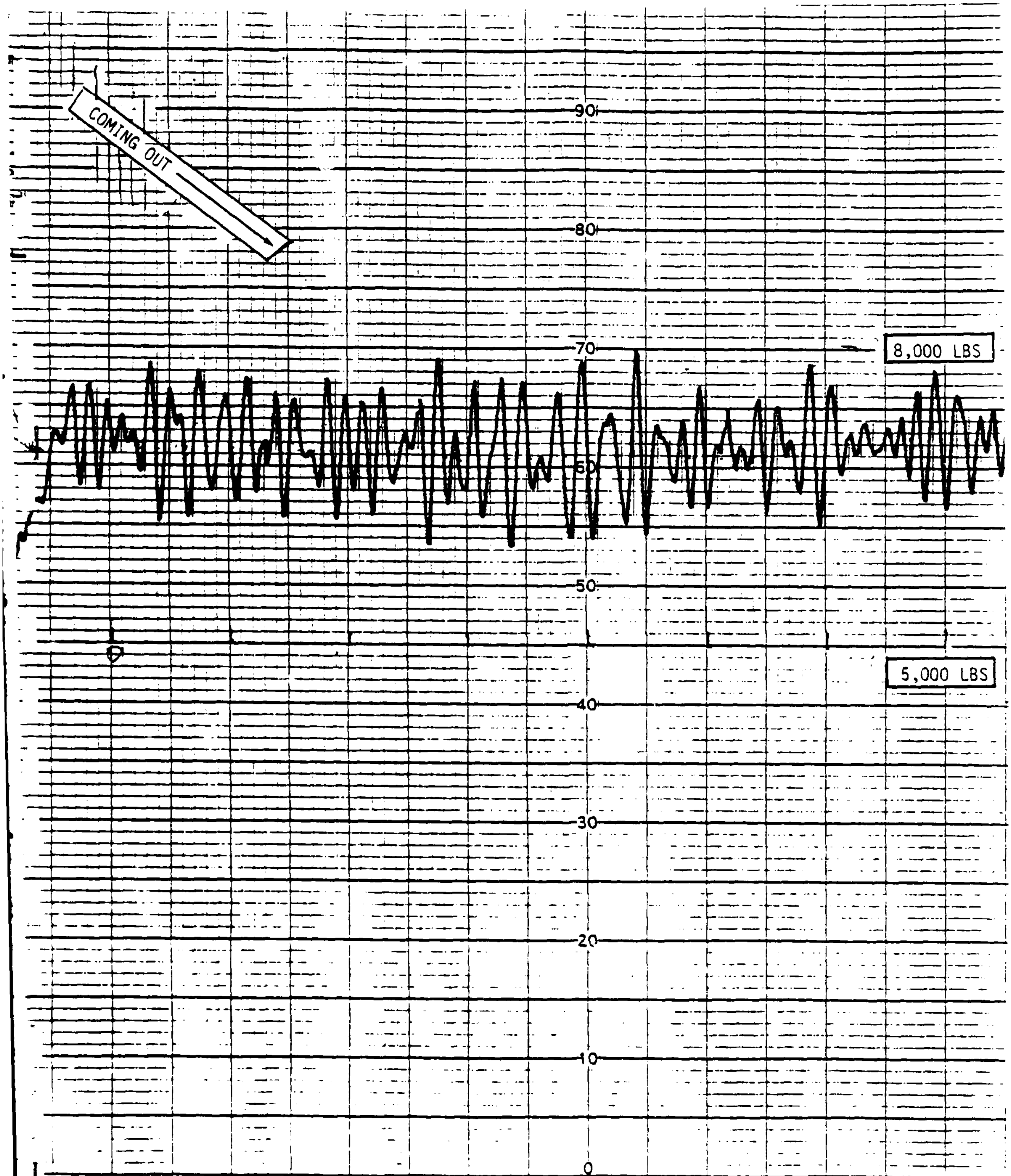


FIGURE 9-11 CABLE DYNAMICS RECOVERY OF BIP (~16,000 FT)

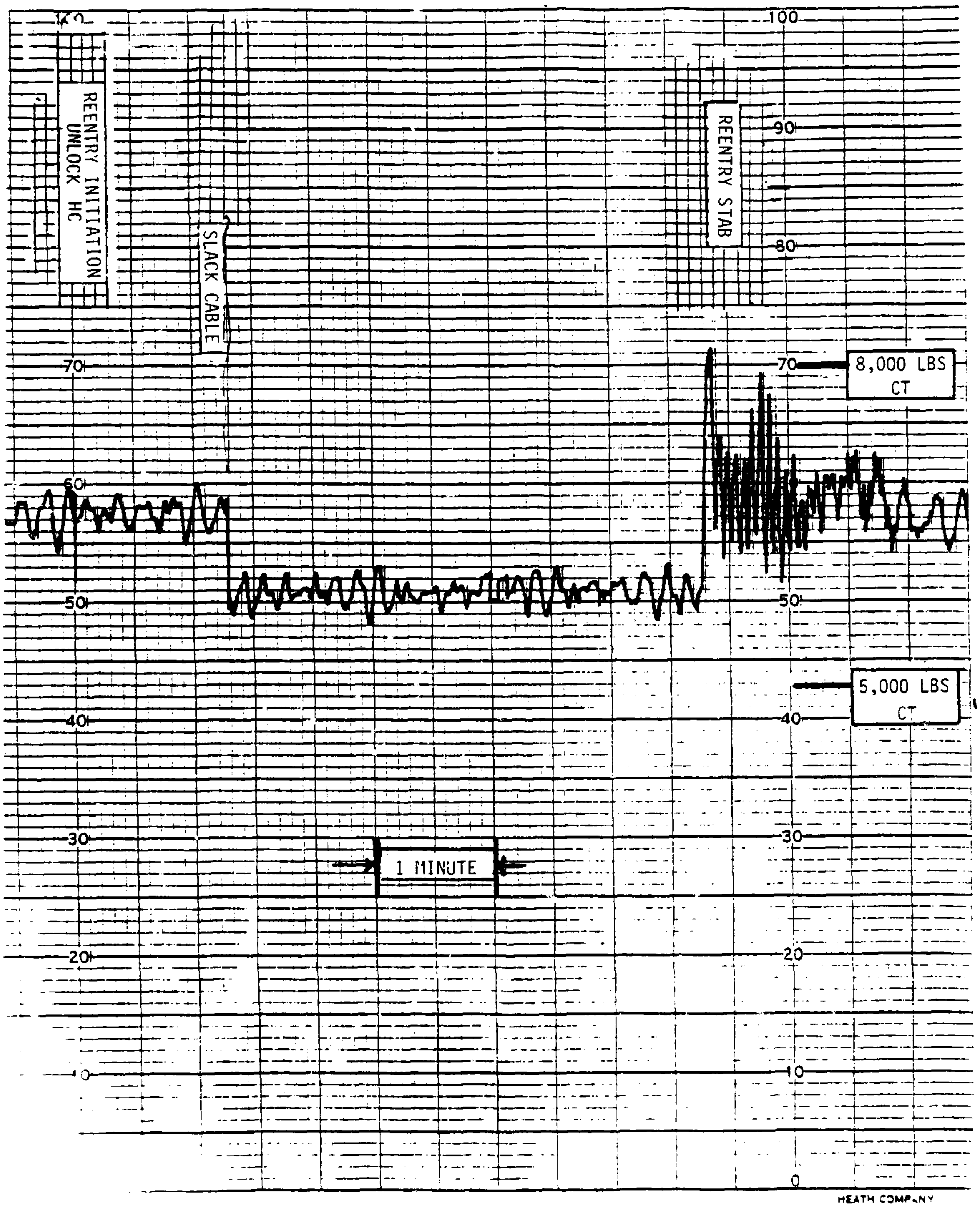


FIGURE 9-12 CABLE DYNAMICS REENTRY

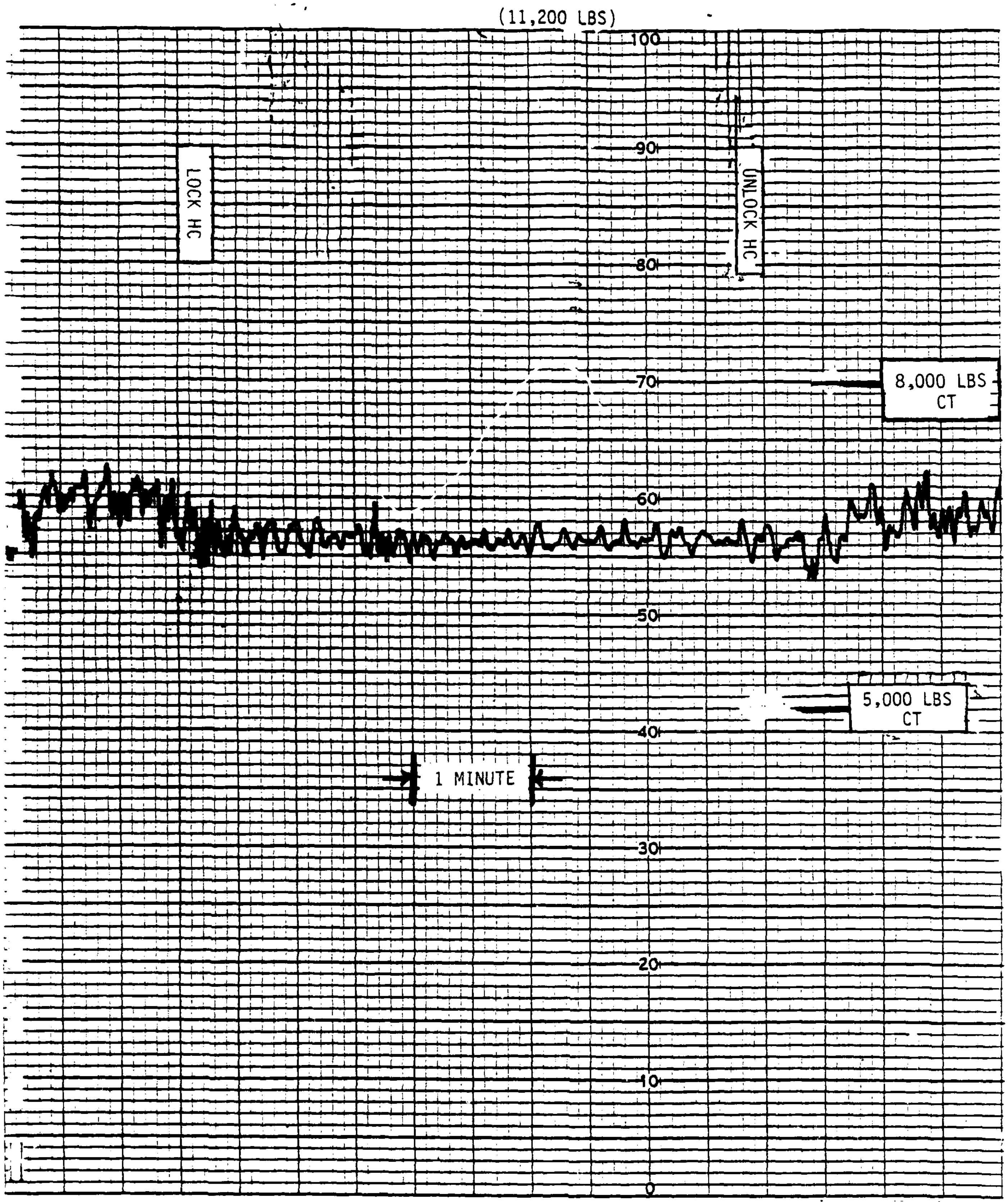


FIGURE 9-13 CABLE DYNAMICS EFFECT OF HC (~14,000 FT)

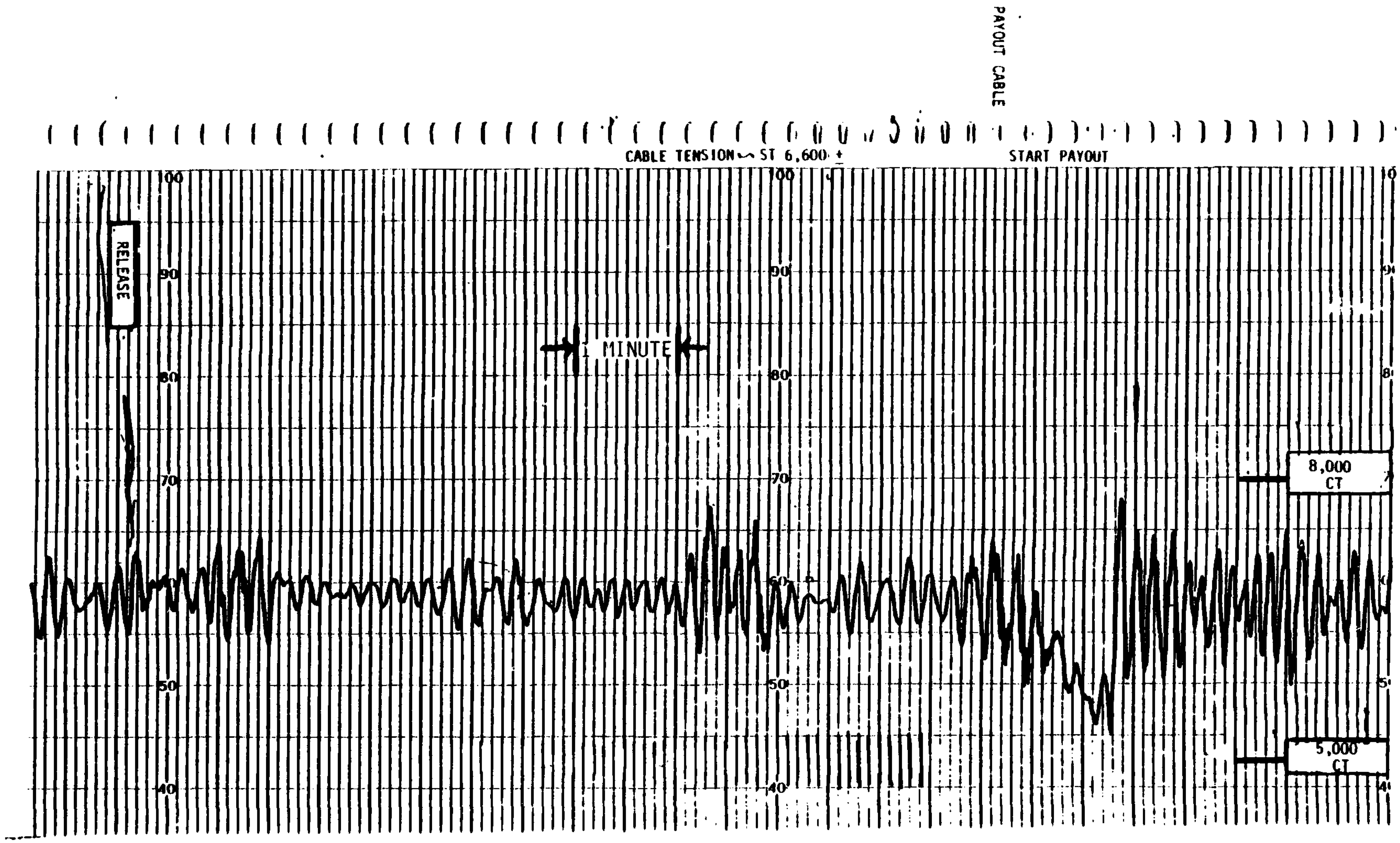


FIGURE 9-14 CABLE DYNAMICS RELEASE OF BIP

During the BIP lowering within the borehole, cable dynamic amplitude appeared to be about ± 900 pounds (significant) at an average frequency of 0.15 Hz. With the BIP at the bottom of the borehole and the cable tensioned, the significant dynamic amplitude ranged from ± 350 pounds to ± 600 pounds and the average frequency ranged from 0.13 to 0.19 Hz. For the BIP at the bottom of the borehole and the cable slacked, the dynamic amplitude was ± 350 pounds at an average frequency of 0.16 Hz. During BIP retrieval, the dynamic amplitude was initially 800 pounds, with an average frequency of 0.11 Hz when 15,000 feet of cable was deployed. At the 4,000 foot cable length, the dynamic amplitude averaged ± 350 pounds with an average frequency of 0.16 Hz. A majority of data were taken with the HC system operating, except when momentarily locked out to record specific data. Figure 9-15 shows the typical oscillatory characteristics during final recovery.

The indicated cable loads, static and dynamic, were well within the ranges predicted by the analysis. No unusual reactions were noted. The noted increase in dynamic load amplitude at the deeper depths during initial deployment of the drill string correlated with a probable HC resonance regime. Limited data is now available which is representatiave of both locked and free ended cable configurations down to approximately 17,000 feet.

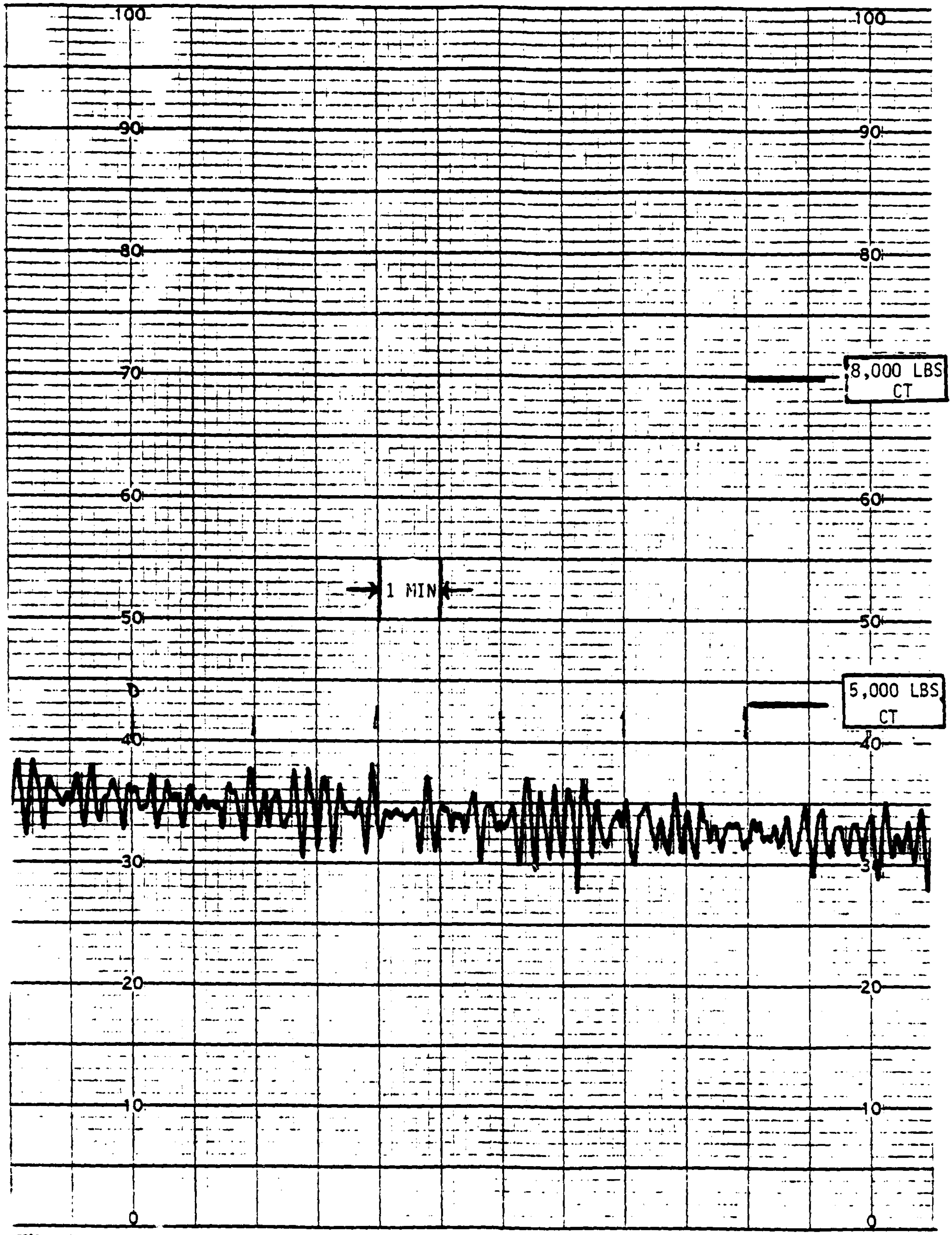


FIGURE 9-15 EM CABLE DYNAMICS RECOVERY OF BIP (~8,000 FT)

SECTION 10.0 - MOBILIZATION/DEMOBILIZATION

The Mobilization/Demobilization effort for the MSS At-Sea-Test was a major complex operation due to the specific foreign field site locations and the amount of shipment required. In addition, the varying equipment availability and DSDP Challenger schedules required continuous replanning of the mobilization tasks. Figure 10-1 outlines the overall schedule of major activities.

Mobilization was accomplished at San Juan, Puerto Rico starting in late December 1980 and lasting through early March 1981. The mobilization was accomplished at the Puerto Rico Marine Terminal and Drydock shipyard. Almost all MSS equipment was shipped to San Juan by truck and trailer barge although some structural units were fabricated at the shipyard. Initial installation of MSS equipment foundations plus the A-Frame were accomplished during the regular DSDP February 1981 four day Challenger port call. The final loading and checkout test of the MSS equipment was successfully accomplished in the special March 1981 MSS two day Challenger San Juan port call. Appendix D provides a listing of major equipment items onboard. In general, we were quite pleased with the support by the Puerto Rico Marine Rico Terminal and Drydock Organization.

There was a continuing problem with clearance of the MSS equipment through Puerto Rico customs. Through prior correspondence with the Excise Tax Board, no Puerto Rican taxes were charged. However, it was quite time-consuming to deal with the Tax Board for each bill of lading.

A major problem was due to the temporary "loss" of BIP #2 Ryder by the trucking firm. It had to be specially reshipped using air freight. Some major damage to the BIP occurred during this reshipment.

The removal of MSS equipment was accomplished very expeditiously in the shipyard in Las Palmas, Canary Islands. The shipment back to the U.S. was very slow (taking approximately two months) and expensive to accomplish. The Geotech equipment was returned to Dallas, Texas; while the remainder was shipped to NOSC San Diego, California for interim storage.

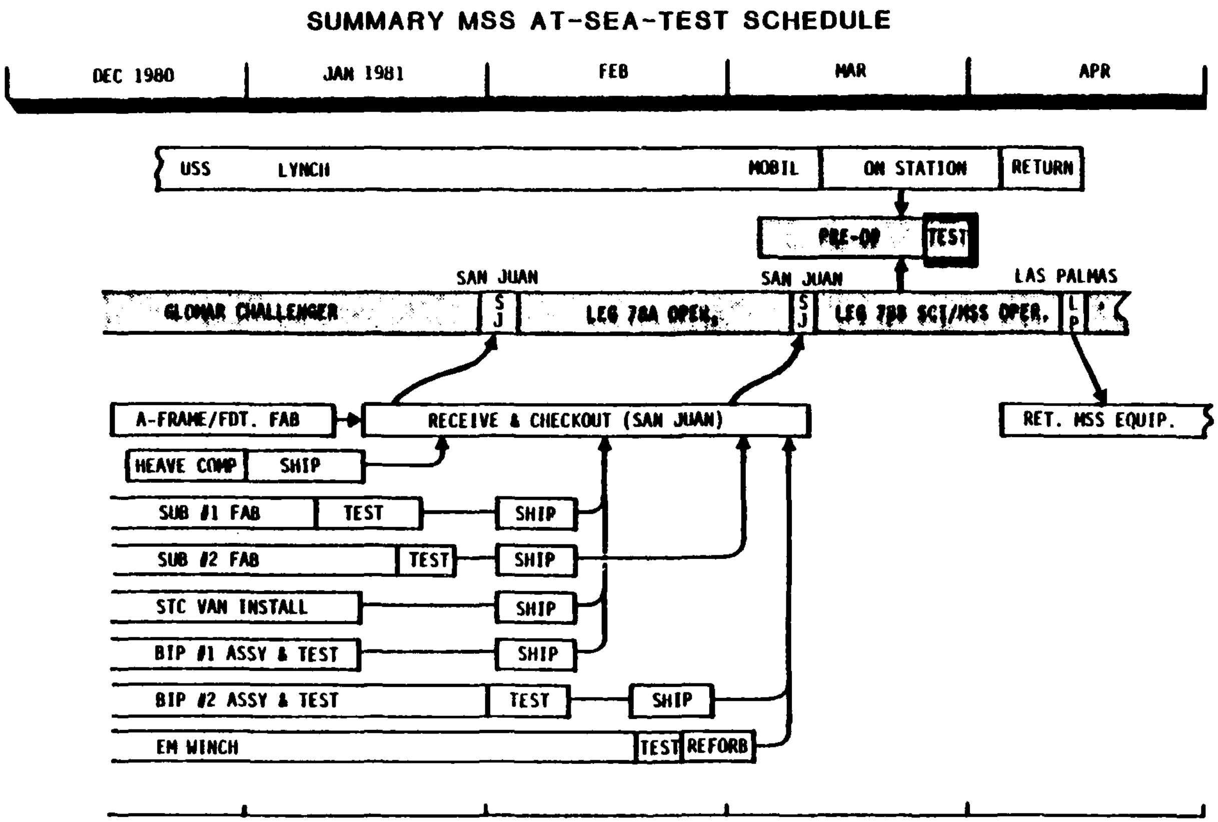


FIGURE 10-1 SCHEDULE

0006-044

REFERENCES

1. MSS Deployment Program Phase II Report
   GMDI Report-001-005 dated 15 January 1981.

2. Summary of Scientific Results of Leg 78B
   DSDP Report dated 16 March 1981.

3. Geotech Report - At-Sea-Test - TR81-6

4. MSS Reentry Impact
   GMDI Report 001-001 dated 25 September 1980.

5. MSS EM Cable Static and Dynamic Response due to Current and Glomar Challenger motion.
   GMDI Report 006-002 dated 2 February 1981.

GLOSSARY

BASELINE CONCEPT	Reentry Concept Based Upon Lowering BIP at End of Drill String into Borehole
BIP	Borehole Instrumentation Package - Seismic Downhole Instrument
CONFIG. I	Prototype Short Period MSS Configuration
CONFIG. II	Long Period MSS Configuration With 5 Year Capability
DARPA	Defense Advanced Research Projects Agency
DSDP	Deep Sea Drilling Program Project Office Scripps Institute of Oceanography
EM CABLE	Electromechanical Cables - Used with BIP and Reentry Tool
FLY-IN CONCEPT	Reentry Concept that flies in BIP on End of Cable into Borehole
GEOTECH	Geotech Teledyne, Dallas, Texas
GMDI	Global Marine Development Inc, Newport Beach, California
GMDC	Global Marine Drilling Company, Houston, Texas - Operator of GLOMAR CHALLENGER
GOULD	Gould Chesapeake Instrument Division, Glen Burnie, Maryland
JOIDES	Joint Oceanographic Institution for Deep Earth Sampling
MSS	Marine Seismic System
NSF	National Science Foundation
NORDA	Naval Ocean Research & Development Agency, Bay, St. Louis, Mississippi
REENTRY CONE	Special Cone Developed by DSDP for Borehole Reentry
REENTRY SUB	Special Lower End Fixture which Supports the BIP
REENTRY TOOL	SONAR/Reentry Control Sensor

APPENDIX A

MSS SEISMIC SYSTEM PROGRAM AT-SEA-TEST PLAN SYNOPSIS

DEPARTMENT OF THE NAVY
NAVAL OCEAN RESEARCH AND DEVELOPMENT ACTIVITY
NSTL STATION, MISSISSIPPI 39529

IN REPLY REFER TO

Revised 12 December 1980

MARINE SEISMIC SYSTEM PROGRAM

AT-SEA-TEST PLAN SYNOPSIS

APPROVED BY: J. A. Ballard
NORDA

PREPARED BY

GLOBAL MARINE DEVELOPMENT INC.
2302 MARTIN STREET
IRVINE, CALIFORNIA 92715

MSS DEPLOYMENT

AT-SEA-TEST PLAN SYNOPSIS

I. OBJECTIVES

The primary objective is to provide a proof of principal demonstration for the deepwater borehole BIP concepts, specific goals are:

1) Demonstrate deepwater instrumented package deployment

2) Collect data for BIP final design

3) Demonstrate sub-seabed instrumentation effectiveness

Deepwater BIP reentry into a borehole will be demonstrated utilizing the baseline concept which lowers the BIP at the end of a drill string. Reentry impact shock levels are to be measured. Cable entanglement data will also be measured as applicable. Short period seismic data from within the existing borehole is also to be provided over a 24 hour period to confirm sub-seabed installation effectiveness. Subbottom vertical reflection survey, air gun seismic echo recording and slant range explosive testing is to be accomplished using the USS Bartlett (AGOR). Recovery of the test BIP is to be attempted.

*II. ORGANIZATION RESPONSIBILITIES

The following responsibilities are :

Program Management	NORDA
Test System Integration and Technical Coordination	GMDI

* Denotes revised areas

Support Ship	NORDA/GMDI
CHALLENGER Operations	DSDP/NSF/GMDC
Reentry Test Equipment	GMDI
BIP Test Package	GEOTECH
Reentry Data MonitoringEquipment	GMDI
EM Cable and Winch	GEOTECH
Seismic and Acceleration Data Monitoring Equipment	GEOTECH
CHALLENGER Modifications	GMDC/GMDC
Test Procedures	GMDI
Test Logistic Support in San Juan	GMDI
Current Meter Equipment	NORDA
Demobilization in Las Palmas	GMDI
MSS OBS Calibration Experiment	NORDA
USS Bartlett Operations	NORDA

III. LOCATION

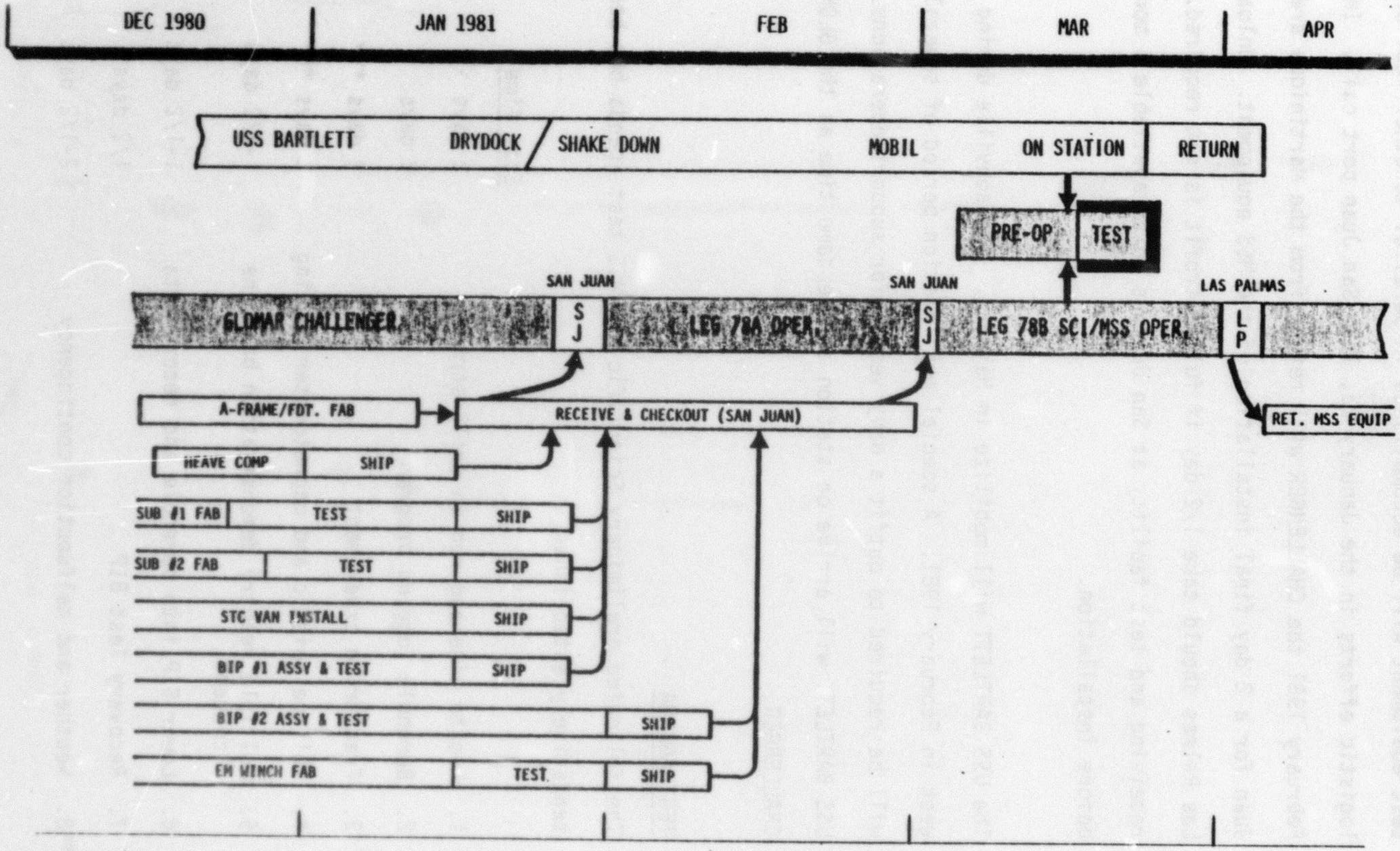
The proposed tests will tentatively be accomplished in the mid-Atlantic area utilizing an existing hole/reentry cone installed earlier by the CHALLENGER DSDP. Site 395A will be the primary hole with Site 396B as alternate. These sites are located along the 23 degree North parallel at the 46 degree West and 43-1/2 degree West Mefidians respectively.

*IV. SCHEDULE

The proposed test will tentatively take place in the early part of March 1981 during the CHALLENGER transit leg 78B to Las Palmas. Total estimated site time of CHALLENGER at-sea involvement is 6 days for the MSS Test. Fig. IV-1 depicts the current overall schedule. There is also an integrated test schedule updated bimonthly.

12 DEC 1980

SUMMARY MSS AT-SEA-TEST SCHEDULE



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Ship modifications plus installation of the foundation and cabling for test equipment will be accomplished in parallel to other regular DSDP logistic efforts in the January 23, 1981 San Juan port call. In late February 1981 the CHALLENGER will return from the Martinique area to San Juan for a 2 day final installation of the MSS equipment. Unloading in Las Palmas should take 1/2 day if full retrofit is not required. A receiving and test facility at San Juan is to be available 1 month before installation.

The USS BARTLETT will mobilize in Mayport. Jacksonville during the last week in February 1981. A special mobilization period of several days will be required to outfit a Navy vessel for support operations. The USS BARTLETT will arrive on station at the same time as the GLOMAR CHALLENGER.

*V. TEST AGENDA

The following preliminary Scientific and MSS test agenda has been tentatively established.

		Est. Time	
1.	Locate site and run in drill string	2 days	
2.	Borehole logging program	2 days	Scientific Testing
3.	Fracturing experiment	2 days ***	Scientific Testing
4.	Oblique seismic and magnetometer testing	2 days ***	Scientific Testing
5.	Multiple reentry demonstration baseline concept	1-1/2 days	
6.	Lower BIP into borehole and record data	1-1/2 days	MSS Testing
7.	Recovery Test BIP	1/2 days	MSS Testing
**8.	Weather and malfunction contingency	2-1/2 days	MSS Testing

Some of the listed scientific tests denoted by triple astericks may not be performed.

** Installation of cement plug and subsequent drill out has been deleted.

*VI. EQUIPMENT REQUIREMENTS

The following At-Sea-Test equipment has been defined for the baseline system.

1) BIP Lowered at End of Pipe (Baseline)	Responsibility	Remarks
BIP reentry test package	GEOTECH	
EM Cable	GEOTECH	NORDA supplied
Reentry tool (sonar) and readout console	-	Onboard
Reentry sub (15,000 ft. depth) includes impact stinger, release mechanism, reentry tool support and control manifold	GMDI	
BIP recording console van (STC)	GEOTECH	
Reentry tool winch and cable	_	Onboard Schlumberger Winch/Cable
BIP EM Cable Winch	GEOTECH	Navy spec.
A-Frame including foundations	GMDI	
Cable tension and measurement equipment	GMDI	
Reentry Cone	-	Use existing cone
Miscellaneous handling equipment	GMDI	
Deployable current meter (3000 ft)	NORDA	
Bottom current meter (reliable)	NORDA	
OBS Seismic Packages (4)	NORDA	
ASK Beacons	DSDP	
A-Frame Heave Compensator	GMDI	
Sub surface TV system	GMDI	

VII. TEST DATA OBJECTIVES

1) Reentry Demonstration

   Reentry sub velocity (lateral)

   Reentry sub position relative to ship and reentry cone

   Ship stationkeeping characteristics

   Shock impact

   Current profile with depth

   Cable tension

   Reentry stabbing velocity

2) Lowering Demonstration

   BIP lowering velocity

   Surface cable payout

   Lowering cable tension

3) Seismic in Hole Demonstration (24 Hours Real Time)

   Short period seismic data 3 vertical channels/sensor - 2 sensors

   OBS comparative data

   Noise of ship affect

   BIP State of Health Instrumentation - 4 temperature

   1 pressure

   2 short circuits

   6 voltage

*VIII. SPECIAL CONSIDERATIONS

1) The use of the high strength drill string is an expensive and long lead procurement item. Present responsibility for the drill string lies with DSDP

2) Both 395A and 396B boreholes are filled with mud which must be flushed out and replaced with light gel.

3) Cementing the BIP into the borehole is not included.

4) A spare test BIP and reentry sub will be provided.

5) Special training for operation of the EM cable winch must be provided for 2 GMDC personnel.

6) The shipping facilities to San Juan are limited.

*IX TEST PERSONNEL

Accommodations for At-Sea-Test personnel will be as follows:

NORDA	1
GMDI	3
GEOTECH	3
DARPA	1
	8

APPENDIX B

MSS PROGRAM AT-SEA-TEST BASELINE DEPLOYMENT SYSTEM

INTERFACE AND REQUIREMENT SPECIFICATIONS

SPC-001-001

MARINE SEISMIC SYSTEM PROGRAM

AT-SEA-TEST

BASELINE DEPLOYMENT SYSTEM INTERFACE & REQUIREMENTS SPECIFICATION

(JOB 00006-325000)

REVISION 4

12 DEC 1980

Approved ____________________
GMDI

PREPARED BY

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DOCUMENT NO. SPC-001-001

GLOBAL MARINE DEVELOPMENT INC.

Newport Beach, Calif.

REVISION RECORD

REV	DATE	AUTHORIZATION	CHANGE DESCRIPTION	PAGES AFFECTED
A	16 Aug 80	R. Wallerstedt	Preliminary Release for NORDA Review	ALL
1	05 Sep 80	R. Wallerstedt		
			2.0 Revised References	1
			4.2 Added Note About Filled in Borehole	2
			4.7 Added New Operational Criteria	3
			5.2 Deleted 10 days of Remotely Recorded Seismic Data	5
			6.1 Revised BIP Configuration Dimensions	5
			6.2 Revised Weight of BIP	5
			6.5 Deleted Magnetic Azimuth	7
			6.6 Deleted Magnetic Azimuth	7
			6.8 Reduced Mag. Tape Capability to 5 days	8
			6.9 Added EM Cable Design Data	8
			7.1.5 Deleted Optional Mechanical Actuation	10
			7.1.6 Reduced Lowering Speed to 20 ft./min.	10
			7.4 Deleted Lowering Cable Requirement	12
			8.2 Deleted Reentry Tool Console	12
			8.5 Deleted Lowering Cable Winch	12
			8.7 Added Rack for 2 BIPS	13
			8.8 Added Rack for 2 Reentry Subs	13

DOCUMENT NO. ____________

GLOBAL MARINE DEVELOPMENT INC.

Newport Beach, Calif.

REVISION RECORD

REV	DATE	AUTHORIZATION	CHANGE DESCRIPTION	PAGES AFFECTED
2	22 SEP 80	R. Wallerstedt	2.0 Revised references	1
			4.2 Added note about mud and equip. in borehole revised dimensions	2
			4.3 Deleted note on mud and equip. in borehole	3
			4.5 Correct comment to "a maximum lowering speed with hydromatic brake"	3
			6.1 Corrected dimensions add Geotech Ref. dwg.	5
			6.2 Revised weight to 3350 lbs.	5
			6.3 Changed "Release" to "Handling"	5
			6.6 Changed 3 shock accelerometers to 5	7
			6.7 Added van dimensions and weight	7
			6.9 Minor revisions	8
			7.1.1 Revised dimensions, added ref dwg.	8
			7.1.2 Revised weight from 15,000 to 20,000 lbs.	10
			7.1.3 Added "the existing Glomar Challenger onboard"	10
			7.1.8 Reduced shock loads to 24G's	10
			7.1.9 Added "impact"	11
			7.6 Added "Dynamic Tensioning Equipment"	12
			8.3 Corrected location and cable length	12
			8.6 Added ships electrical power and communication requirements	13
			APPENDIX	
			Revised Sect. 2 and 4 per Geotech recommendations.	-

DOCUMENT NO. ____________

GLOBAL MARINE DEVELOPMENT INC.

Newport Beach, Calif.

REVISION RECORD

REV	DATE	AUTHORIZATION	CHANGE DESCRIPTION	PAGES AFFECTED
3	12 NOV 80	R. Wallerstedt	2.0 Added Revised Reference Dwgs	1
			4.8 New Added Site Weather and Sea Conditions	4-11
			5.2 Changed Test Time to 4 days. Selected Cement Plug pending borehole logging	12
			6.3 Added Screwed in plugs	12
			6.4 Added Improved Description of Termination	14
			6.6 Revised Completely Data Monitoring	14
			7.1.5 Added Improved description of Release Actuation	17
			7.3.5 New Structure Description	18
			7.3.6 New Size and Weight Definition	18
			7.7 New STC Description	19
			10.0 New Support Ship	21
4	12 DEC 80	R. Wallerstedt	Reference Added New	1
			6.2 Chgd weight to 3500 lbs	12
			6.3 Added power requirements	12
			Fig. 6.1 Revised BIP configuration	13
			6.4 Removed reference to shrinkable coating	14
			6.5 Added Tx rate of 54 K bps	14
			7.5 Add description of A-Frame	19
			7.6 Add description of heave compensator	19
			7.7 Chgd STV van dim. to 8 ft by 8 ft by 14 ft	19
			7.7.5 Change STV power to 12 KW	20

MSS DEPLOYMENT PROGRAM

AT-SEA-TEST BASELINE INTERFACE SPECIFICATION

1.0 OBJECTIVES

The objective of this interface specification is to define the performance and interface requirements for the BIP test package, reentry equipment, CHALLENGER equipment and data recording instrumentation for the baseline system demonstration. The test is to performed at an existing DSDP reentry cone site utilizing the GLOMAR CHALLENGER.

*2.0 REFERENCE

1) MSS At-Sea-Test Plan Synopsis dated revised 12 December 1980
2) Reentry Cone Assembly
3) GLOMAR CHALLENGER Plans (D-377-A002, -A003 and -A004)
4) Reentry Assembly Control Dwg. E-001-A002
5) BIP/Reentry Sub with Stinger Control Dwg. A-001-A001
6) CHALLENGER MSS At-Sea-Test Interface Drawing - E-001-A012
7) BIP Control Drawings 990-53100
8) BIP Assembly Drawing 990-53100-0101
9) At-Sea-Test Mobilization Plan GMDI RPT-001-004
10) MSS (BIP) Test Plan Phase I Geotech date 2 Dec 1980
11) MSS At-Sea-Test Operational Procedures GMDI RPT 006-003
12) EM Cable Winch Geotech Dwg. 990-53554-0101

3.0 TEST OBJECTIVES

The test objectives are to:

1) Demonstrate the baseline BIP reentry technique
2) Determine impact shock levels
3) Provide cable entanglement data for evaluation
4) Measure seismic data within a deep sea borehole
5) Recover BIP and examine

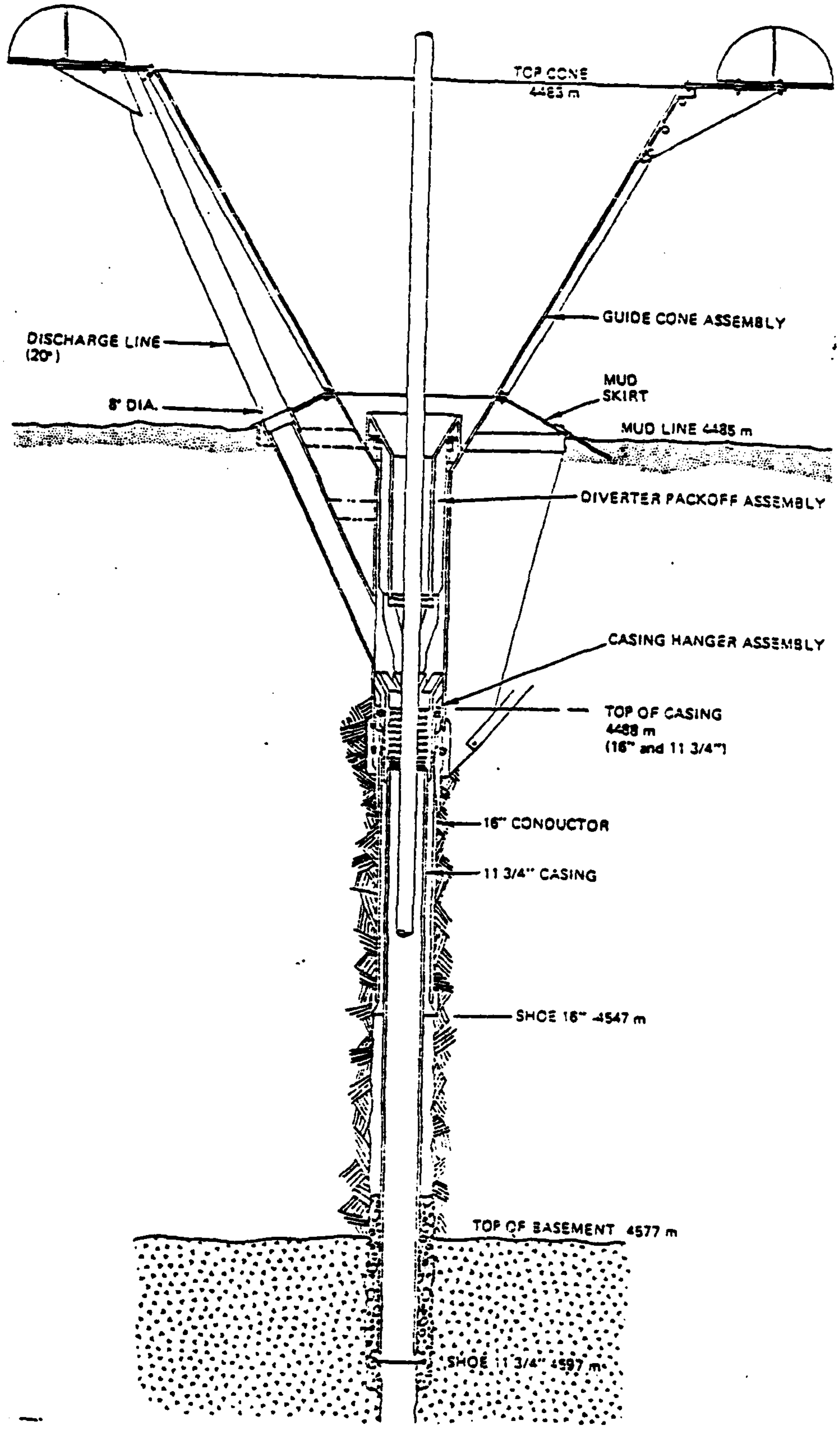
4.0 GENERAL REQUIREMENTS

4.1 Site

Reentry cone site #395A (DSDP leg 45) to be utilized is located at latitude 22°45.35'N, at longitude 46°04.90'W. Site water depth is approximately 4484 meters deep. The alternate site will be #396B located at 22°55.81'N, 43°30.95'W at a water depth of 4450 meters.

4.2 Borehole Characteristics

The existing site #395A borehole has a drilled out diameter of 10 inches to approximately 2178 feet below the seabed. There is a 16 inch diameter by 200 feet conductor casing in the upper unconsolidated sediment area. The central portion of the borehole has been cased down to 360 feet with 11-3/4 inch casing. Refer to Fig. 4.1 for general configuration. The borehole may be caved in and/or filled upto the encased area. There is probably some broken equipment items at the bottom of the borehole.



Schematic of re-entry cone and casing at mud-line Hole 395A.

Fig. 4.1

4.3 Reentry Cone

A standard DSDP reentry cone (Ref. 2) was emplaced and is expected to be in good condition.

4.4 Drilling String

A standard DSDP 5 inch diameter S-135 drilling string is to be utilized. Maximum allowable load (static plus dynamic) is 600,000 lbs.

4.5 Reentry Velocity

The design maximum reentry velocity will be 10 ft/sec. based upon a maximum lowering speed with the Hydromatic brake.

4.6 Pressure

Subsea equipment is to be designed to 10,000 psi pressure capability.

4.7 Operational Criteria

Objective weather and operational criteria are tabulated on Table 4.1.

4.8 Site Weather and Sea Conditions (From Norda Tech. Report 74)

4.8.1 Atmospheric Pressure

Average atmospheric pressure corrected to sea level is 1020-1021 mb. The site lies on the edge of a broad 1020-1022 mb

TABLE 4.1

GLOMAR CHALLENGER

TENTATIVE MSS DEPLOYMENT LIMITS

	SEA STATE	SIGN. WAVE (FT)	WIND SPEED (KNOTS)
HANDLING MODE	5	12	24
DRILLING MODE	6	22	30
REENTRY MODE	4	17	19
POSITIONING	7	?	40
KEELHAULING	3	4	19

ULTIMATE PITCH/ROLL ANGLE ± 9°

SAFETY PITCH/ROLL ANGLE ± 7° (NEW DSDP CRITERIA)

DRILL STRING TENSILE LOAD 600,000 LBS (22,500 FT PIPE STRING - CALM)

MAXIMUM BENDING STRESS (25,000 PSI)

MAXIMUM DYNAMIC AXIAL STRESS (17,000 PSI) high centered at 28°N, 35°W. On the average, two highs per month pass over the site, and are centered over the site 10% of the time. These highs follow a west-to-east course, no low pressure centers pass within 15° of the site from December to May. No storm tracks or hurricane tracks pass in the vicinity of the site. Storm frequency is well under 5%.

4.8.2 Winds

The site lies 3° north of the average limit of the NE trades. Prevailing winds are NE, Force 4, with 26-50% constancy. Average wind speed is 6 m/sec (11.7 kn). The percentage frequency of winds of Beaufort Force 3 or less is 55%; Beaufort Force 4 or greater is 55%; winds of Beaufort Force 8 or more have a percentage frequency well under 5%.

Average winds are tabulated below:

Direction	% Frequency	Mean Beaufort Force
N	7	3
NE	33	4
E	26	4
SE	9	3
S	7	3
SW	8	3
W	5	Data not given
NW	5	Data not given
Calm	4	----

4.8.3 Air Temperature

The mean sea surface air temperature is between 21.1° - 23.3°C (70°-74°F). Average maximum temperature is 28° (82°F); average minimum temperature is 12°C (54°F). Maximum and minimum air temperatures of record are given as 78°F (25.6°C) and 63°F (17.2°C), respectively. Frequency of temperatures under 0°C (32°F) is under 5%, presumably 0%.

4.8.4 Water Temperature

The mean surface water temperature is 22.2 - 23.6°C (72 - 74.5°F)

4.8.5 Relative Humidity

Relative humidity at the sea surface in March is expected to be 75%.

4.8.6 Precipitation

Frequency of observations reporting precipitation ranges from 5-9%, whereas precipitation frequency has been estimated at less than 1%. In any case, precipitation is infrequent, and presumably occurs as local showers. Of observed precipitation, about 80% is weak and 20% is intense. No solid precipitation has been observed.

4.8.7 Cloudiness

Precentage frequency of total cloud amounts of 2/10 or less is 28%; 2/8 or less, 35%; 5/8 or more, 30%. Percentage frequency of low cloud amounts of 7/8 or less is 98%; 4/8 or less, 80%, 6/10 or more, 20%. Values of 30% for clouded sky frequency and 33% for clear sky for February have also been reported. Frequency of total cloud cover is 4.5%.

Cloudiness is associated with winds from the NE quadrant. The area is generally partly cloudy.

4.8.8 Visibility

The frequency of visibility over 5 nm (9.26 km) is well over 95%. The frequency of visibility under 2 nm (4.63 km) is less than 0.5%. Fog frequency (visibility under 1 km (0.54 nm)) is estimated from well under 5% to less than 1%.

4.8.9 Tides

The tidal range at the site is about 0.4 m.

4.8.10 Waves

Average wave height is 1.1 m (3.6 ft) and average wave period is 5 sec. Maximum height of waves (highest 1%) is 8 m (26 ft) and maximum average wave period is 12 sec. Detailed wave data for the 5° square are shown in Predominant wave direction is from the ENE with wave periods of 6-9 sec predominating. Interpolated wave heights are:

Wave Height Equal or Exceeding	Percentage of All Waves
4 ft	48%
8 ft	11%
12 ft	2%

4.8.11 Sea State

Predominant sea direction is from the NE, with a constancy of 40-60%. Frequency of seas by height is:

Sea Equal or Exceeding	Percente Frequency
5 ft	20 %
8 ft	5%
12 ft	2%
20 ft	1%

Highest seas come from the northeast and east.

4.8.12 Swell

Predominant swell direction is from the NE with less than 40% constancy. Percent frequency of swell greater than 12 ft is 5%. There is a substantial component of swell from the NW.

4.8.13 Currents

Except for surface drift, data on currents at the site are scarce and current conditions must be largely inferred. The following water masses are found at the site:

0-500 m	Surface water (North Atlantic Central Water)
500-1500 m	Atlantic Intermediate Water and northern most portion of Antarctic Intermediate Water
1500-4500 m	North Atlantic Deep and Bottom Water
<4500 m	Antarctic Bottom Water

Depth within a range of 0.25° of the site are about 2900-4500 m. Antarctic Bottom Water would therefore not normally be found at the site. The rugged relief, however, may cause some local fluctuation in the water masses. Currents below 500 m are nonseasonal and the information presented applies to the entire year.

4.8.14 Surface Currents

The site lies within the North Equatorial Current. Current direction is W to WNW; current speeds are 0.25-0.5 kn 13-26 cm/sec), with a constancy of 33-66%. The predominant current to be westward, but significant NW and SW components are present. Resultant currents near the site have been reported as high as 15-16 nm/day (28-30 km/day). These drift speeds suggest that 1-2 kn (100-200 cm/sec) currents may be expected occasionally, but that currents is excess of 2 kn (200 cm/sec) would be rare and would occur only in association with extreme winds.

4.8.15 Intermediate Currents

Since the site does not lie within a strong oceanic current system, currents are generally sluggish, but subject to short-term fluctuations. Between 100 and 500 m average annual current speeds are less than 10 cm/sec (0.2 kn) to the SW and WSW. Based on transport calculations, long-term average current flow is 1-3 cm/sec northward on the upper west flank of the Mid-Atlantic Ridge at 13° N, 10° S of the site.

Short term fluctuations in current speed may be expected, however. These are caused by passing eddies and by tidal forcing due to the topographic expression of the Mid-Atlantic Ridge. Root-mean-square speeds of 10-15 cm/sec (0.19-0.29 kn) and occasional maximum speeds of 30-40 cm/sec (0.58-0.78 kn) may be expected at the site. Typically, maximum speeds may have durations of several hours and occupy only a portion of the water column.

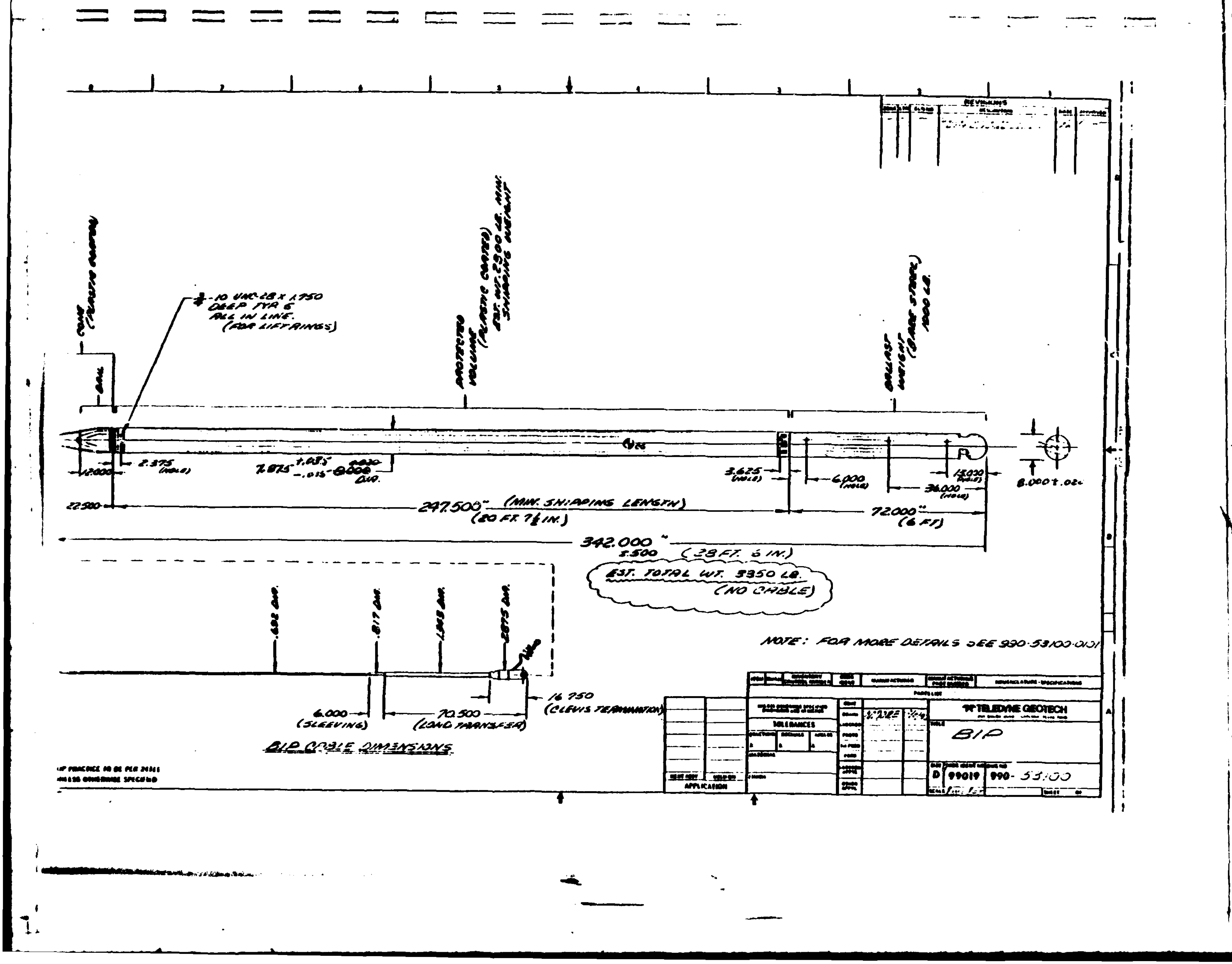
4.8.16 Bottom Currents

No specific data exist on bottom currents near the site, but some general information can be gained by examining the character of the bottom. Several bottom-photograph stations on the west flank of the Mid-Atlantic Ridge show no evidence of sediment ripples or scour, suggesting that bottom currents over 20 cm/sec (0.39 kn) are uncommon. Seismic profiles in the area show horizontally stratified sediment ponds filling lows, and a thin sediment cover on highs [6], [8]. Similarly, these profiles show no evidence of sediment scour on drifts; thus indicating an absence of strong and continuous bottom currents. The presence of horizontal stratification in the ponds, however, indicates that sediments have slumped or were transported from the highs to the ponds by turbidity currents. Turbidity currents in the sediment ponds would be relatively small but could produce current pulses in excess of 200 cm/sec (4 kn). However, annual turbidity current frequency for a pond is probably around 10^{-3} and thus should not be a problem.

5.0 SCHEDULE REQUIREMENTS

5.1 Test Period

The test period will be early March 1981.


CONE (PLASTIC PARTED)
BAIL
1/2-10 UNC-2B X 1.750 DEEP TYP 6 ALL IN LINE. (FOR LIFT RINGS)
PROTECTED VOLUME (PLASTIC COATED) EST. WT. 2300 LB. MIN. SHIPPING WEIGHT
BALLAST WEIGHT (BARE STEEL) 1000 LB.
2.375 (HOLE)
12.000
7.875 +.035 -.015 DIA.
3.625 (HOLE)
6.000 (HOLE)
36.000 (HOLE)
12.000 (HOLE)
8.000 ±.02
22.500
247.500" (MIN. SHIPPING LENGTH) (20 FT. 7 1/2 IN.)
72.000" (6 FT)
342.000" ±.500 (28 FT. 6 IN.)
EST. TOTAL WT. 5350 LB. (NO CABLE)
.632 DIA.
.817 DIA.
1.393 DIA.
2.875 DIA.
6.000 (SLEEVING)
70.500 (LOAD TRANSFER)
16.750 (CLEVIS TERMINATION)
BIP CABLE DIMENSIONS
NOTE: FOR MORE DETAILS SEE 990-53100-0101
REVISIONS
TOLERANCES
APPLICATION
TELEDYNE GEOTECH
BIP
D 99019 990-53100

*5.2 Test Time

The available time for actual baseline testing is 6 days. The tentative test scenario is now 4 days which does not allow for weather delays or major malfunctions. 24 hours of inhole continuously sampled and recorded seismic data will be obtained. Installation and drill out of a cement plug (estimate at 52 hours) has been deleted pending logging of borehole.

6.0 BIP TEST PACKAGE

*6.1 Configuration

The BIP test package will be 8 inches diameter maximum by 28 feet 6 inches long. The package will have a spherical shaped bottom nose. Geotech drawing 990-53100 - Fig. 6.1 defines the general outline of the BIP test package. Two screwed in attachment plugs are available for shipboard handling.

6.2 Weight

The maximum weight of the test package will be 3500 lbs. This weight includes fairings, pressure vessels and all instrumentation and ballast.

*6.3 Power

Input power requirements will be 25 W at 150 VDC.

*6.4 EM Cable Termination

A water tight termination compatible with an armored coax conductor cable will utilized. The mechanical connector will be a pinned connection. The electrical technical is a water-tight connection. A sealant will be provided in the termination area.

6.5 The following instruments will be provided in the BIP. (See Appendix A)

1) 3 axis shock accelerometer
2) 2 short period - vertical seismometers
3) State of Health Instrumentation
4) Multiplexer
   Data Tx Rate will be 54 K bps.

*6.6 Data Monitoring

The following BIP data will be real time and mag tape monitored and recorded on the CHALLENGER during deployment.

Parameter	Deployment	Operational
5 channel acceleration	Waveform	-
2 channel SP seismic	-	Waveform
2 pressure	Alphanumeric	Alphanumeric
2 temperature	Alphanumeric	Alphanumeric
2 moisture	Alphanumeric	Alphanumeric
5 power	Alphanumeric	Alphanumeric
Other SOH	Alphanumeric	Alphanumeric

*6.7 EM Cable

The BIP EM Cable will be specially constructed 0.692 inch diameter armored coax conductor cable. 34,000 feet are to be provided. This allows for current, station keeping allowance, plus slacking off during data recording. Refer to Table 6.1 for design data.

6.8 Shock Capability

The BIP will be capable of surviving 10 G's of shock input along any axis.

7.0 DEPLOYMENT EQUIPMENT

7.1 BIP Reentry Sub

7.1.1 Configuration

The reentry sub will be an approximate 16 x 27 inch by 68 feet long subassembly. Dwg. E-001-A009 defines the reentry sub.

7.1.2 Weight

The BIP reentry sub plus BIP package and reentry plug will weigh a maximum of 20,000 pounds.

7.1.3 Reentry Tool

The reentry tool will be the existing GLOMAR CHALLENGER on-board sonar reentry tool.

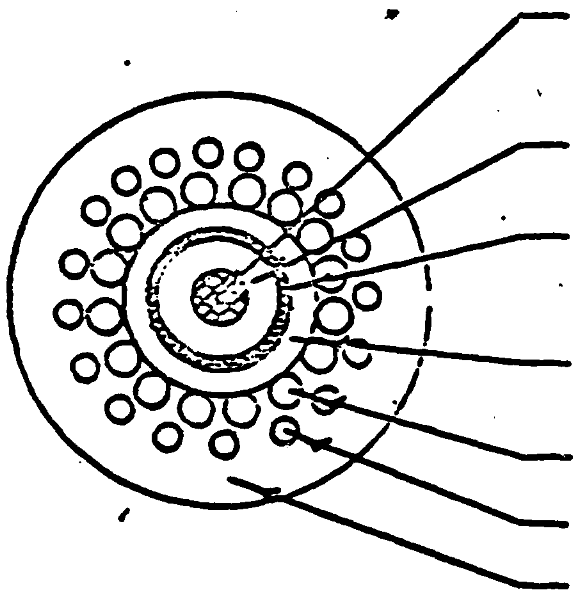
The following measurements are provided:

1) Search sonar - max. 500 ft. range - 360° Azimuth
2) Azimuth sector
3) Short range scanning

TABLE 6.1

A30084. REV. B

Description:
A SUBMARINE TOW CABLE CONSISTING OF (1) #10 AWG COAX WITH AN OVERALL DOUBLE-CAGED ARMOR AND HYTREL JACKET.



Specifications:

ELECTRICAL:	NOM CONDUCTOR DC RESISTANCE @20°C: #10 AWG:	1.08 OHMS/KFT
	COAX RETURN BRAID:	1.40 OHMS/KFT
	VOLTAGE RATING:	2,500 VOLTS RMS
	CHARACTERISTIC IMPEDANCE:	40 OHMS (REF)
	ATTENUATION AT 500 KC:	1.4 DB/KFT
MECHANICAL:	FILLED SHIELD:	TEMPLUBE BLKNG COMPOUND.
	BREAK STRENGTH:	21,000#
	WEIGHT IN AIR:	462 #/KFT
	WEIGHT IN WATER (SG = 1.027)	295 #/KFT
	TORQUE BALANCED DESIGN	

6/23/79 EF/PV

7.1.4 BIP

The BIP will be securely attached by a BIP carriage inside the reentry sub.

7.1.5 BIP Release Mechanism

A BIP release mechanism will be provided as part of the reentry sub. The BIP will be released by salt water hydraulic actuation of 2 cylinders. Four shear pins are simultaneously released causing use carriage to move to the reentry sub center release position.

7.1.6 BIP Lowering

The BIP will be guided into the center of reentry sub and lowered into the borehole at a controlled rate not to exceed 20 ft/min. The lowered position is to be monitored.

7.1.7 Drill Pipe Attachment

The reentry sub will attach through a standard tool joint to the 5 inch drill string.

7.1.8 Shock Capability

The reentry sub will designed to withstand the shock loads during reentry for maximum of 24 G's. In addition, shock isolation for the BIP will be provided to limit shock loading to 10G's.

7.1.9 Data Monitoring

The reentry tool impact data will be monitored and recorded as real time during the reentry.

7.1.10 Cable Interference

The reentry sub will be designed to prevent wear on the EM Cable during lowering and avoid contact during withdrawal.

*7.2 Sonar Reentry Tool EM Cable (Internal)

7.2.1 Size and Configuration

The sonar reentry tool EM Cable will be a standard Schlumberger 5/8 inch diameter by 7 conductor cable.

7.2.2 Strength

Max cable tensile strength is 21,000 pounds.

*7.3 BIP EM Cable Winch

7.3.1 Capability

An EM Cable Winch with slip rings will be provided to accommodate 34,000 feet of 0.692 inch coax cable.

7.3.2 Tensioning Capability

A variable constant EM Cable tensioning capability of up to 15,000 pounds is to be provided.

7.3.3 Payout Capability

A variable speed payout capability up to 20 feet per second is to be provided.

7.3.4 Monitoring

Cable tension, payout speed and length is to be recorded.

7.3.5 Structure Mounting

The winch 8 x 6 steel tubing frame will be welded directly to the special ship mounted foundation piece.

7.3.6 Size and Weight

The EM Cable Winch will be approximately 110 inches high, 91 inches wide with an overall length of 232 inches. A clearance of 30 inches on the right hand side is required for slip rings and hydraulic motor. It will weigh an approximate 38,000 lbs loaded with wire.

7.4 Lowering Cable (External)

Deleted

7.5 Overside A Frame Structure

7.5.1 Size and Configuration

A removable 28 foot long cantilevered A Frame extends approximately 18 foot over the Port side. The A-Frame is rated for 20,000 pound load. The A-Frame is supported off the casing rack and subbase structure and by a center mounted heave compensator.

7.5.2 Deployment

The A-Frame is to be deployed overside during the test.

7.6 Dynamic Tensioning Equipment

7.6.1 Description

A static heave compensation system will be attached to the cantilevered A-Frame to reduce the dynamic EM cable loading.

7.6.2 Equipment

A refurbished air/oil guideline tensioner will be utilized to provide a variable stroke support to the A-Frame. The 5 inch dia by 6 foot stroke tensioner is rated at 64,000 lbs. A 60 cubic foot accumulator will be utilized. Four nitrogen bottles will be provided. A manifold console will be provided.

7.6.3 Operation

An approximate mid position will be established by the normal static loading condition and gas presurization levels. Increased/decreased dynamic loadings will lower/raise the A-Frame end position thereby momentarily effectively paying out or pulling in more cable.

7.7 Shipboard Test Console (STC)

*7.7.1 Size and Weight

The STC will be 8 feet by 8 feet by 14 feet. It will weigh an estimated 9000 lbs loaded.

7.7.2 Shipboard Mounting

The STC shall be capable of being either bolted or welded to the deck foundation frame.

7.7.3 Construction

The STC shall be constructed so as to be completely water tight. All inside and outside wall, ceiling and floor spares shall be metal or high strength glass. Interior walls and/or components shall be constructed of fire proof material.

*7.7.4 Electrical Interface

The STC to ship electrical interface shall include the following interface signals.

a) STC Input Power

b) Voice Communications

c) Universal Standard Time (WWV) Signal

*7.7.5 STC Input Power

The input power capability will be 60 cycle 12 KW 208 VAC, 3 Phase, 4 wire WYE connected with safety ground.

8.0 CHALLENGER MODIFICATION

8.1 General Requirements

The below defined equipments installation are to be quickly accomplished in Port and must be capable of being retrofitted to original condition.

8.2 Reentry Tool Console

Deleted

8.3 EM Cable Winch (External)

Install on main deck area a new 34,000 feet diesel powered EM cable winch assembly.

8.4 A Frame

Install an approximate 10 ton overside A-Frame deployable structure amidships on the Port side.

8.5 Lowering Cable Winch

Deleted

*8.6 BIP Data Console Van

Install a real time data log and recorder van. Provide 12 KVA, 220/440V 3 phase, 60 Hz ships power to van. Also connect to ship's communication network.

8.7 BIP

A horizontal rack for 2 BIP units will be provided in the casing rack area.

8.8 Reentry Sub

A rack for 2 reentry subs will be provided.

9.0 AUXILIARY MEASUREMENT

9.1 Current Meter Array

A 1000 meter depth capability current meter, will be deployed from the support ship during the reentry tests. Current data will be provided, to GLOMAR CHALLENGER via radiotelephone from the support ship.

9.2 OBS

Two OBS (Ocean Bottom Seismic) package will be launched during the test and recovery by the support ship.

10.0 SUPPORT SHIP

10.1 Name and Type

The USS Bartlett, an AGOR type research vessel has been committed as the support ship.

APPENDIX C

MSS AT-SEA-TEST OPERATIONAL PROCEDURES

RPT-006-003
REV-2
FEB. 80

MARINE SEISMIC SYSTEM

AT-SEA-TEST

OPERATIONAL PROCEDURES

DOCUMENT NO. RPT-006-003

GLOBAL MARINE DEVELOPMENT INC.
Newport Beach, Calif.

REVISION RECORD

REV	DATE	AUTHORIZATION	CHANGE DESCRIPTION	PAGES AFFECTED
2	2 FEB 81	R. Wallerstedt AP 9 RW	UPDATE ALL PAGES 3-6-81	ALL

TABLE OF CONTENTS

1.0 PRE-OPERATIONAL CHECKS

1.1 EM WINCH PRE-CHECKOUT (DOCKSIDE)

.1 Steps

- Rig up EM Cable through A-Frame over A-Frame block.
- Hookup weight 4,000 lbs to EM Cable.
- Set HC at midposition (refer to Section 10).
- Lift weight approximately 5 ft and hold 5 minutes.
- Calibrate load sensors and cable payout counter.
- Repeat above with 7,000 and 10,000 lb weights.
- Hookup 15,000 weight and lift slightly and set tension relief setting.

.2 Responsibility - GMDI

- EM Winch Operator
- Rig Crew
- Shipyard Crane Operator

.3 Operational Restrictions

.4 Precautions/Hazards

- Maintain EM Cable loading to below 12,000 lbs except during final relief setting.

.5 Special Equipment

- 4,000, 7,000, 10,000 (approx.) and 15,000 lb weights
- Weight terminal connection to EM Cable (Geotech)

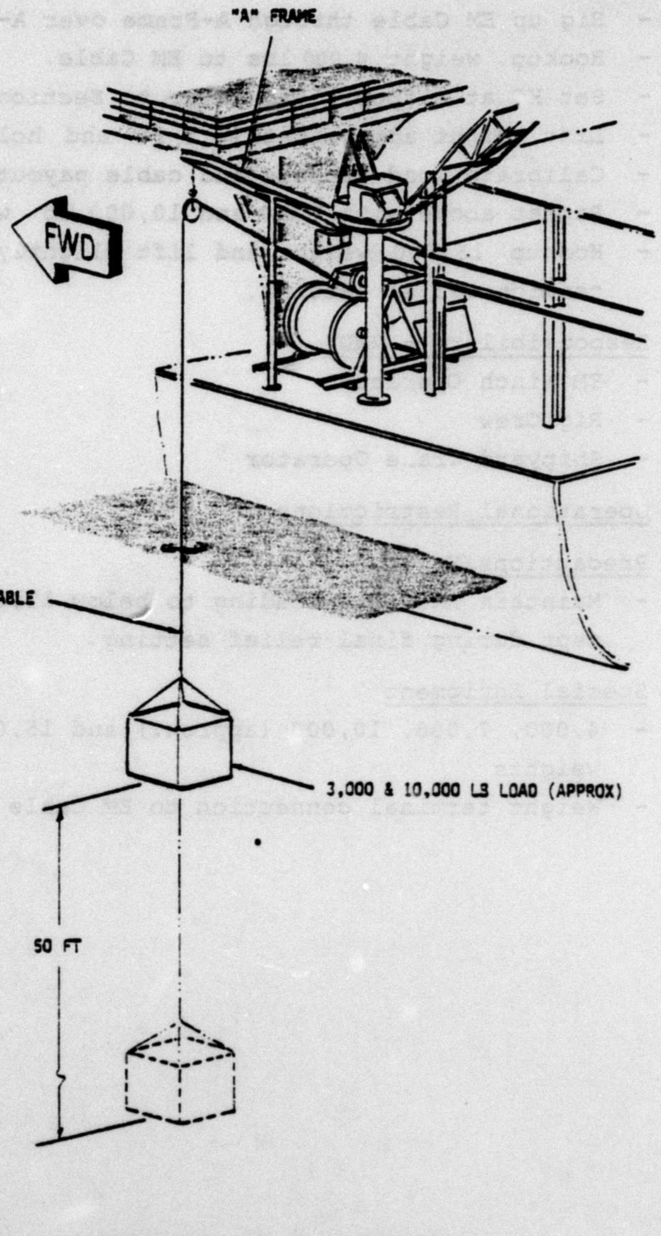


FIGURE 1-2. EM WINCH PRE-CHECKOUT

1.2 EM WINCH PRE-CHECKOUT

.1 Steps

- Rig up EM Cable through A-Frame over A-Frame block.
- Hookup known weight to EM Cable termination.
- Set HC at midposition.
- Payout and take in at minimum and maximum speeds.
- Check calibration of load sensors and cable payout counter.

.2 Responsibility - GMDI

- EM Winch Operator
- Rig Crew
- Crane Operator

.3 Operational Restrictions

.4 Precautions/Hazards

- Maintain EM Cable loading to below 12,000 lbs.

.5 Special Equipment

- Known shipboard weight
- Weight terminal connection to EM Cable (Geotech)

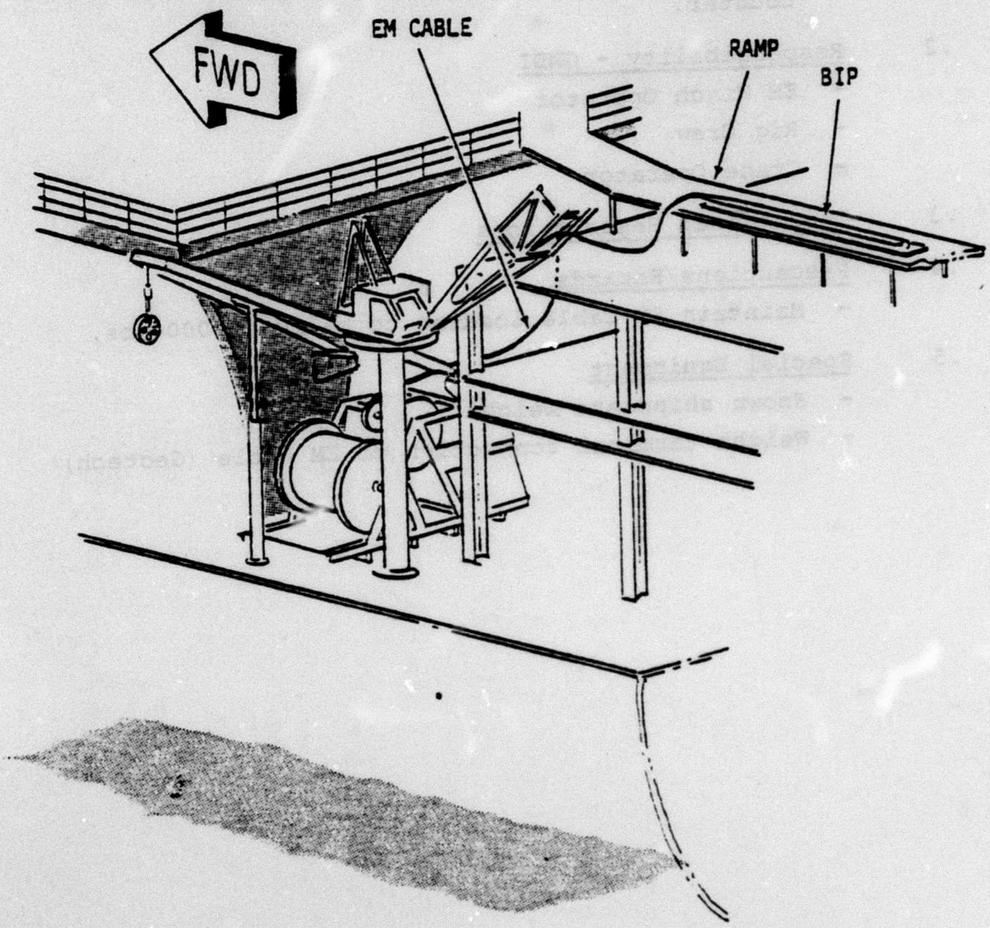


FIGURE 1-3. EM CABLE CIRCUITRY PRE-CHECK

1.3 EM CABLE CIRCUITRY PRE-CHECKOUT

.1 Steps

- Rig EM Cable through A-Frame and pull cable to reach BIP where stored.
- Connect EM Cable to BIP.
- Install interconnecting Cable between EM Winch slip rings and STC Van.
- Check all signals per Teledyne Geotech Test Plan.

.2 Responsibility - Geotech

- STC Van Operator
- Rig Crew
- EM Winch Operator

.3 Operational Restrictions

.4 Precautions/Hazards

.5 Special Equipment

- EM Interconnecting Cable
- EM Cable Winch
- STC Van
- BIP

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1.4 REENTRY SUB RELEASE DEMONSTRATION

.1 Steps

- Install hydraulic plug adaptor and Baker tool in control sub.
- Install special hydraulic sub/handling fixture on reentry control sub.
- Set reentry sub (without stinger) vertically on main deck and support off adjacent structure.
- Connect up EM Cable to BIP and check circuitry.
- Raise BIP using crane and guide into reentry sub.
- Set release pins.
- Set carpenter's clamp on EM Cable to restrict vertical fall.
- Attach Koomey pump.
- Pressurize SW hydraulics to 2200 psi and actuate release.
- Pressurize SW hydraulics to 2800 psi and actuate gate release.
- Lower reentry sub, disassemble, and remove BIP.

.2 Responsibility - GMDI

- Rig Crew
- Van Operator

.3 Operational Restrictions

.4 Precautions/Hazards

- Pressurized system of 2800 psi
- Safe handling of BIP

.5 Special Equipment

- Hydraulic Sub/Handling Fixture
- Koomey Pump

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2.0 SCIENTIFIC TESTING

2.1 PROCEDURES

- No specific MSS procedures involved.

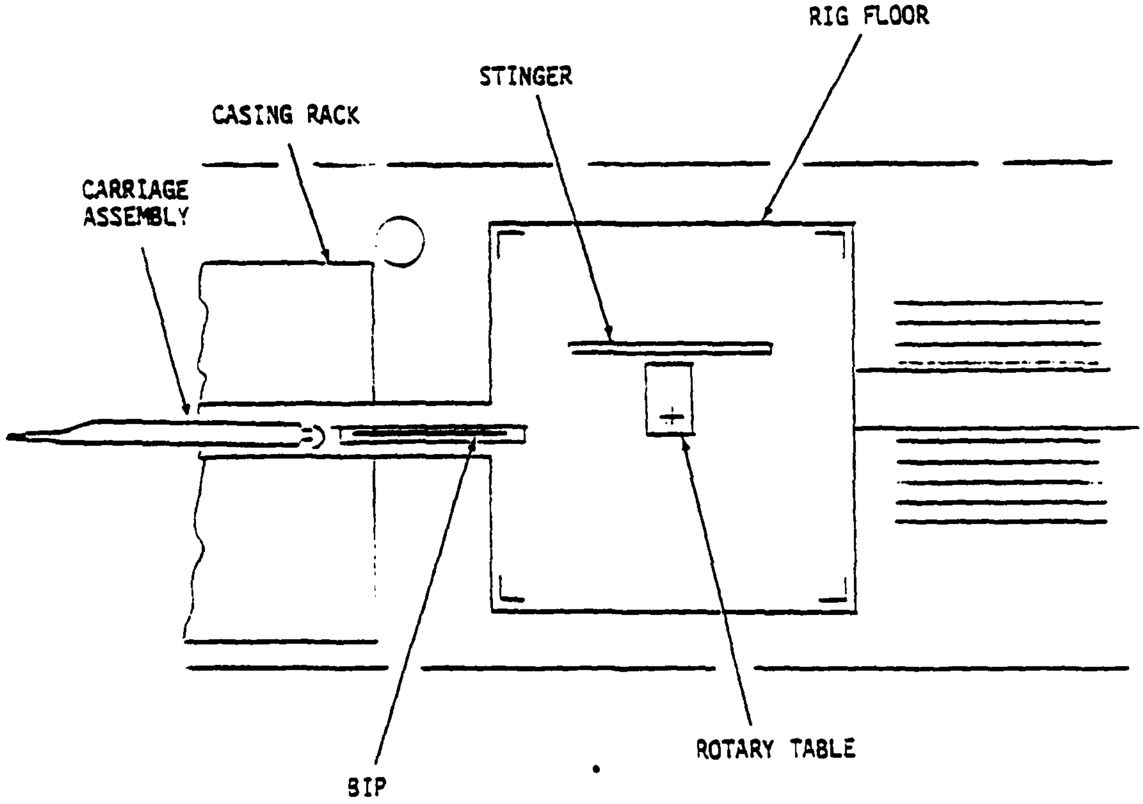

FIGURE 3-1 PREPARING RIG FLOOR

move Check plug stinger Control Sub

3.0 DEPLOYMENT PROCEDURE

3.1 PREPARING RIG FLOOR

.1 Steps

- Move reentry tool stinger, BIP carriage housing, control sub and hydraulic plug to rig floor.
- Move BIP with cradle to ramp area.
- Assemble hydraulic plug in stinger.
- Assemble control sub and carriage housing with drill collar handling sub.
- Tack weld bolts.

.2 Responsibility - GMDI

- Crane Operator
- Rig Crew

.3 Operational Restrictions

- Sea State 4

.4 Precautions/Hazard

- Avoid slamming items into structure.

.5 Special Equipment

- Slings
- Reentry Subassembly, GMDI E-001-A001, E-001-A009
- BIP
- Tag Lines
- Drill Collar Handling Sub

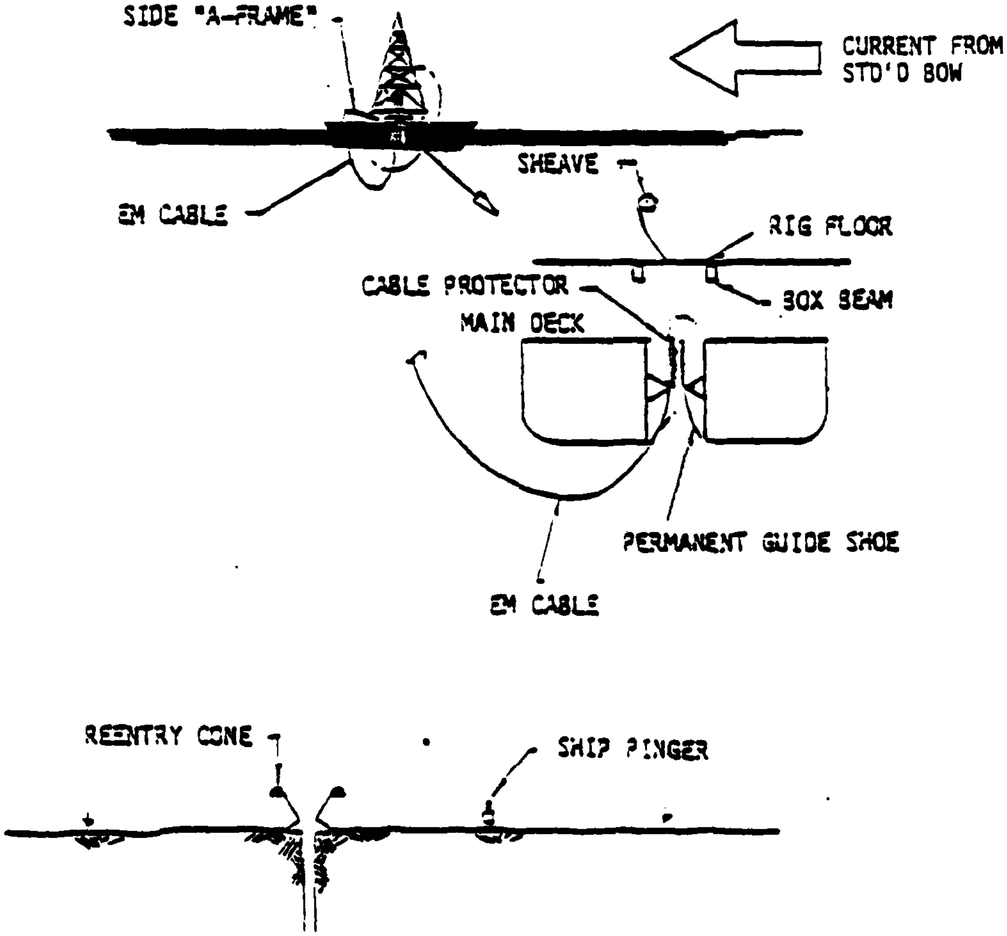

FIGURE 3-2 KEELHAUL EM CABLE

0006-011

3.2 KEELHAUL EM CABLE

.1 Steps

- Attach tag line to EM Cable watertight connector.
- Payout EM Cable 200 ft.
- Pull EM Cable through horn.
- Place cable protector within horn.
- Lead EM Cable through derrick mounted sheave.

.2 Responsibility

- EM Winch Operator
- Rig Crew

.3 Operational Restrictions

- Sea State 4

.4 Precautions/Hazards

- Keep terminal connector dry.
- Keep cable in protector.
- Keep enough tension to maintain cable away from thrusters and propellors.
- Try to minimize cable rubbing on bilge keel and guide hornlip.

.5 Special Equipment

- Tag Line
- EM Cable Winch
- A-Frame
- Derrick Sheave
- Cable Protector, GMDI E-001-A013, E-001-A014
- Cable Pull Assembly, Geotech 990-53574-0101

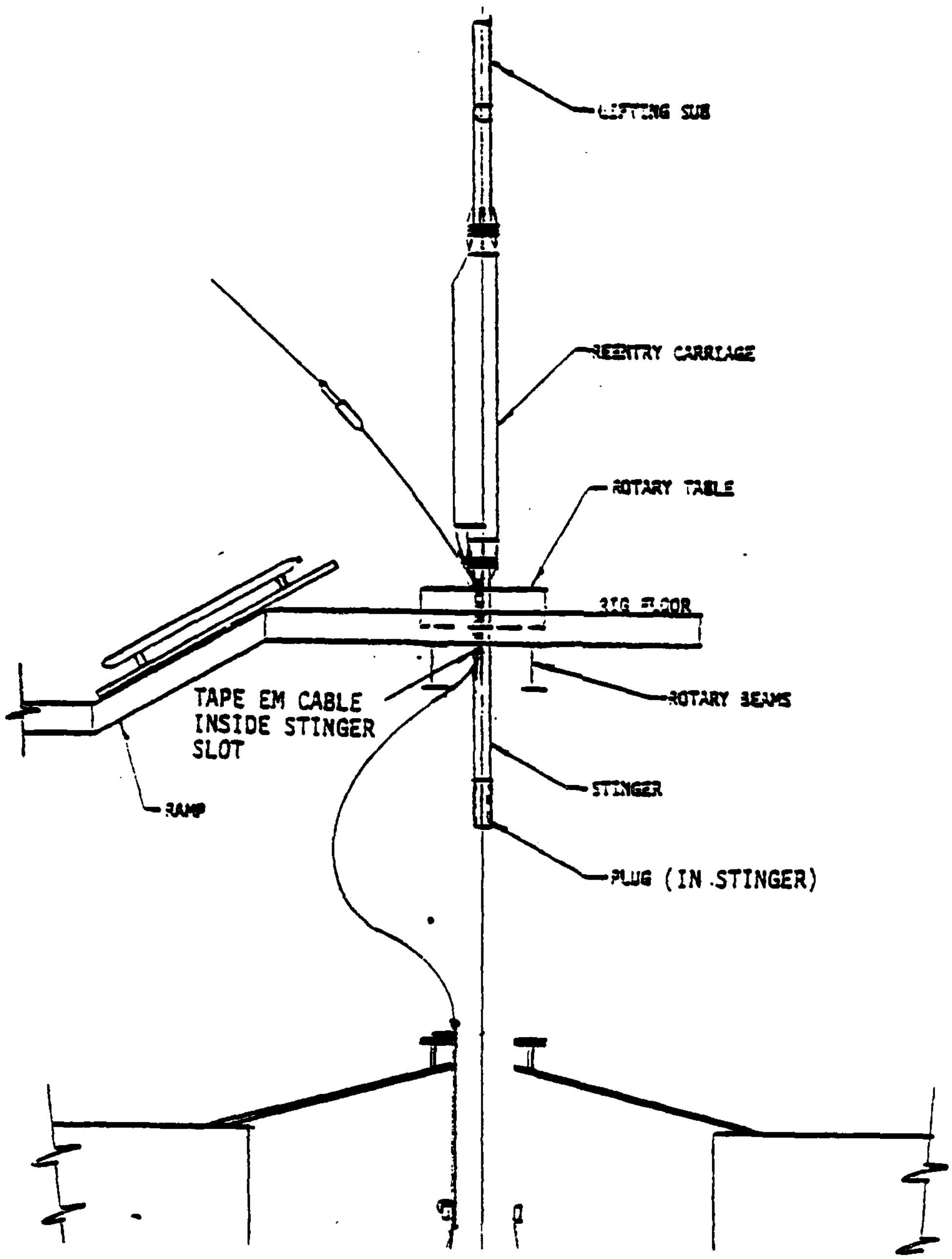

FIGURE 3-3 SET REENTRY SUB ON RIG FLOOR

3.3 SET REENTRY SUB ON RIG FLOOR

.1 <u>Steps</u>

- Install stinger in slips on rotary table.
- Insure EM Cable is protected in stinger slot, use tape to secure.
- Install handling sub on carriage control sub.
- Move carriage to rig floor and vertically erect on stinger and bolt up.
- Tack weld bolts.

.2 <u>Responsibility - GMDC/GMDI</u>

- Crane Operator
- Rig Crew

.3 <u>Operational Restrictions</u>

- Sea State 4

.4 <u>Precautions/Hazards</u>

- Avoid slamming reentry sub into steel structure.

.5 <u>Special Equipment</u>

- Reentry Sub Handling Sling, GMDI D-001-A031
- Carriage Control Sub, GMDI E-001-A008
- SW Hydraulic Test Pump
- Tag Lines
- Drill Collar Handling Sub
- 12" Casing Slips
- Stinger/Slips Adaptor, GMDI D-001-A033

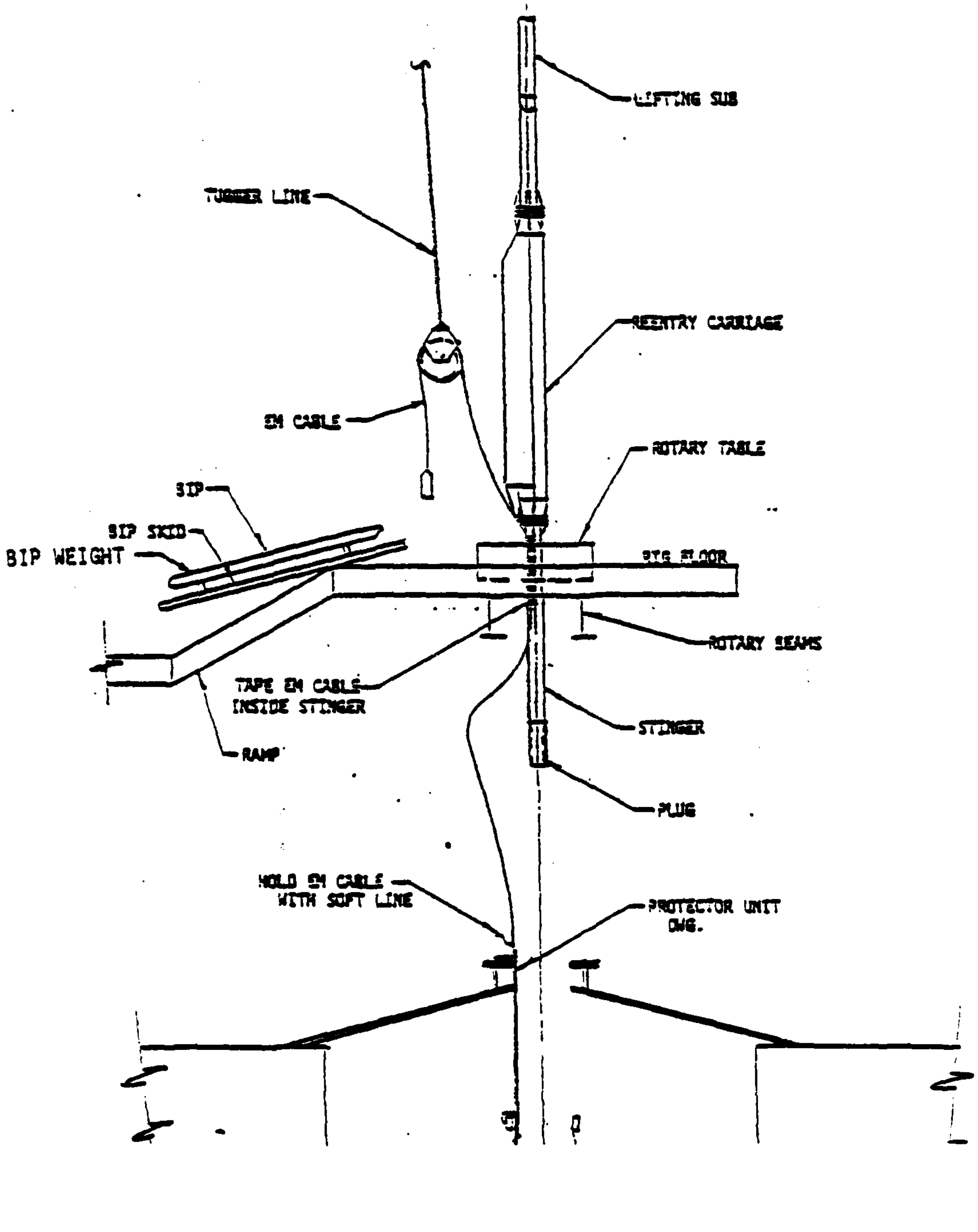

FIGURE 3-4 MOVE BIP TO RIG FLOOR

3.4 MOVE BIP TO RIG FLOOR

.1 <u>Steps</u>

- BIP is in shipping fixture and on pipe ramp.
- Remove covers and install lifting lug.
- Make up mechanical EM Cable attachment.
- Install EM Cable grip near sheave.
- Attach BIP ballast weight.

.2 <u>Responsibility - GMDC/Geotech</u>

- EM Winch Operator
- Crane Operator
- Rig Crew

.3 <u>Operational Restrictions</u>

- Sea State 4

.4 <u>Precautions/Hazards</u>

- Prevent BIP from slamming into steel structure.

.5 <u>Special Equipment</u>

- BIP Shipping Fixture
- BIP Weight
- EM Cable Grip
- Lifting Sub
- BIP Handling T-bar, GMDI D-001-A032

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3.5 ATTACH EM CABLE TO BIP

.1 <u>Steps</u>

- Make up electrical EM Cable connection.
- Apply sealant.
- Test BIP through STC Van.
- Attach BIP handling strap.

.2 <u>Responsibility - Geotech</u>

- Rig Crew
- STC Van Operator

.3 <u>Operational Restrictions</u>

- Sea State 4

.4 <u>Precautions/Hazards</u>

- No hard handling of BIP.

.5 <u>Special Equipment</u>

- Sealant (Geotech)
- BIP Handling Strap

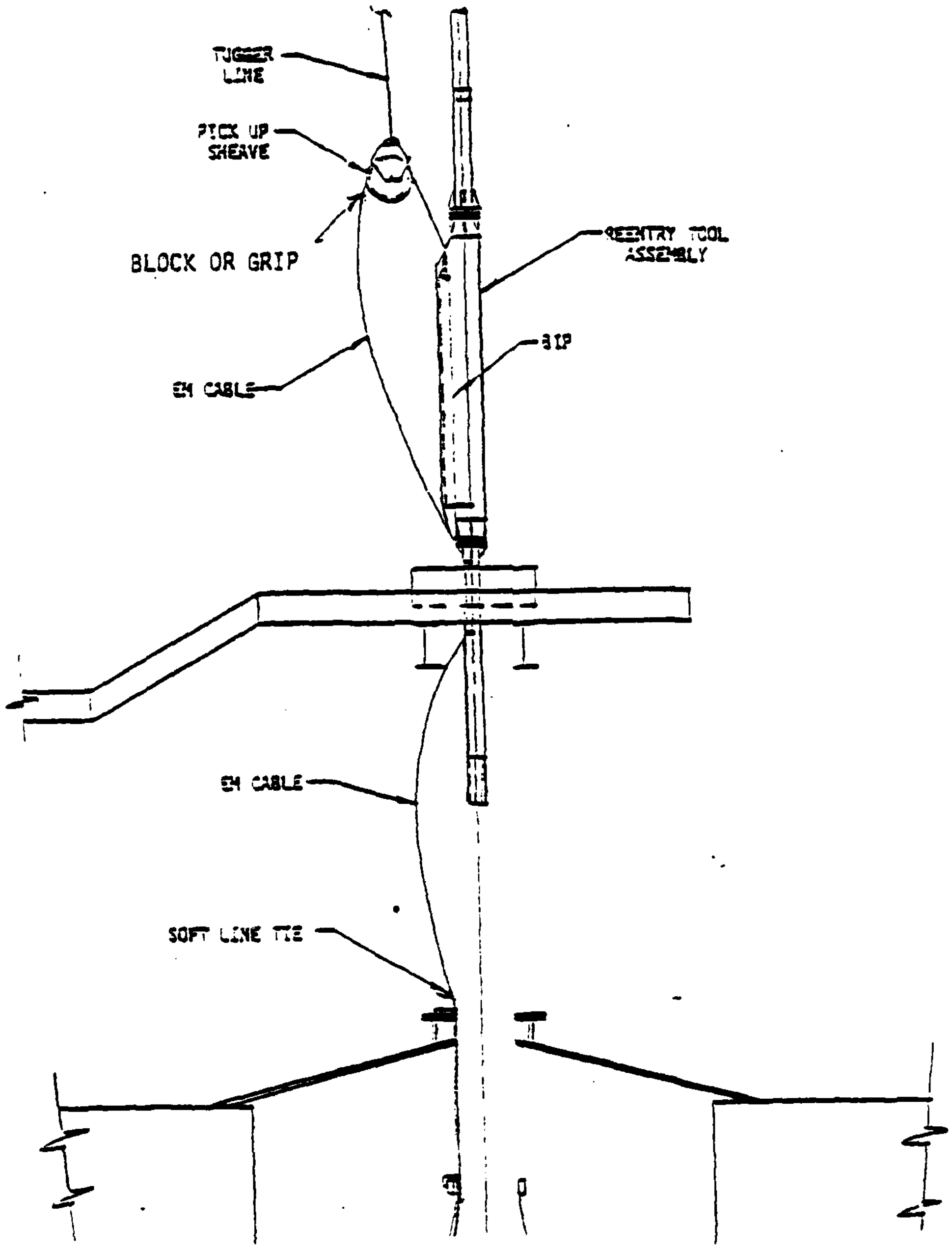


FIGURE 3-6 ERECT AND INSTALL BIP

3.6 ERECT & INSTALL BIP

.1 Steps

- Remove steel transit pins from shear pin holes.
- Lift BIP from horizontal position & erect vertically using crane and tuggers.
- Transfer BIP load to EM Cable support sheave.
- Using tugger, raise BIP 50 ft and guide into reentry sub (refer to sequence diagram).
- Position reentry sub carriage slide and install shear pins.
- Tighten reentry sub release cable tension.
- Test BIP through STC Van.

.2 Responsiblity - GMDC/GEOTECH/GMDI

- Crane Operator
- Rig Crew
- STC Van Operator

.3 Operational Restrictions

- Sea State 4

.4 Precaution/Hazards

- Prevent BIP from slamming into steel structure.
- Do not damage EM Cable with high side loads.

.5 Special Equipment

- Shear Pins, Aluminum with Milled Flats
- Carriage Cable Adjustment Tool
- BIP T-bar, GMDI D-001-A032

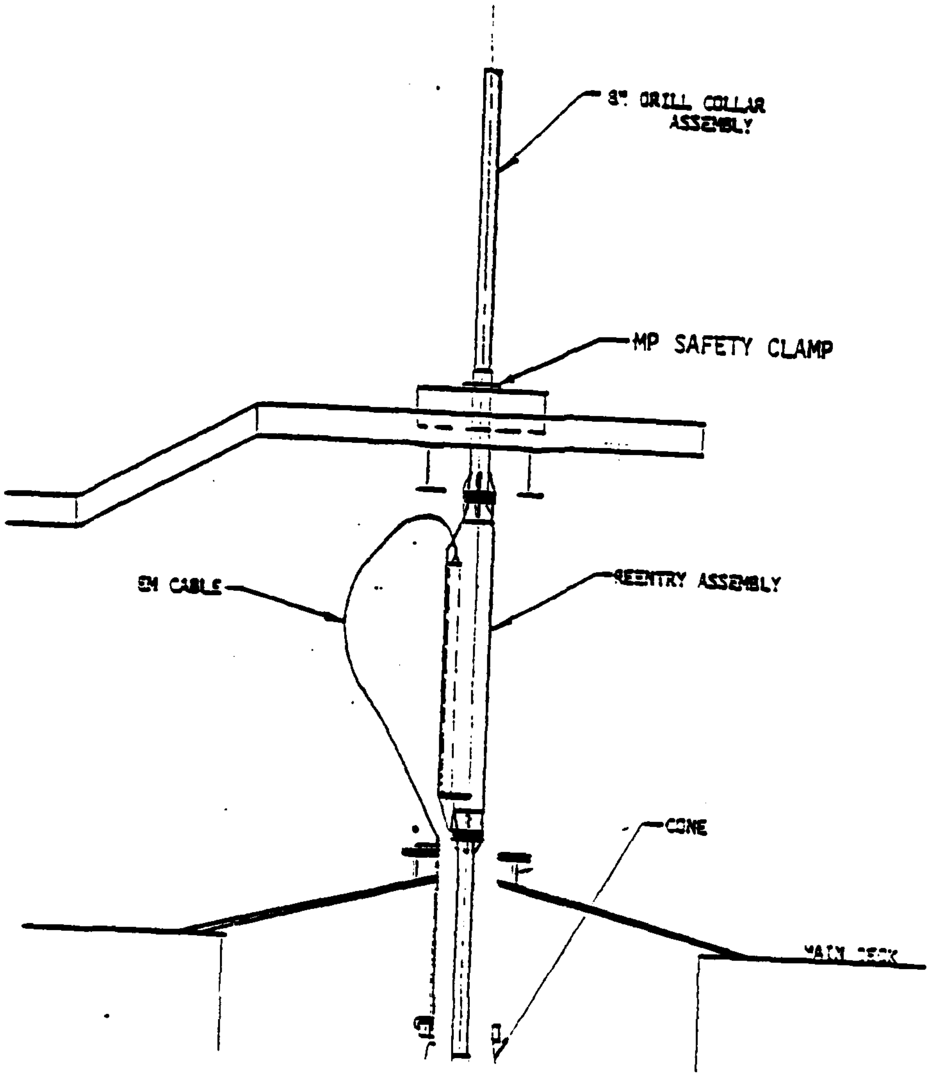


FIGURE 3-7 MAKE-UP LOWER REENTRY ASSEMBLY

0006-016

3.7 MAKE UP LOWER REENTRY ASSEMBLY

.1 Steps

- Lower Carriage Control Sub top to rig floor level.
- Remove EM Cable from sheave.
- Work EM Cable down through rotary table.
- Set slips and safety clamp.
- Make up lower downhole assembly to reentry sub.
- Lower reentry sub to main deck area.
- Install upper section of hydraulic tubing.
- Orient drill string.

.2 Responsibility - GMDC

- Normal Rig Crew
- EM Cable Winch Operator
- STC Van Operator

.3 Operational Restrictions

- Sea State 3

.4 Precautions/Hazards

.5 Special Equipment

- 12" Casing Slips (for Control Sub)
- Safety Clamp
- Lowering Line

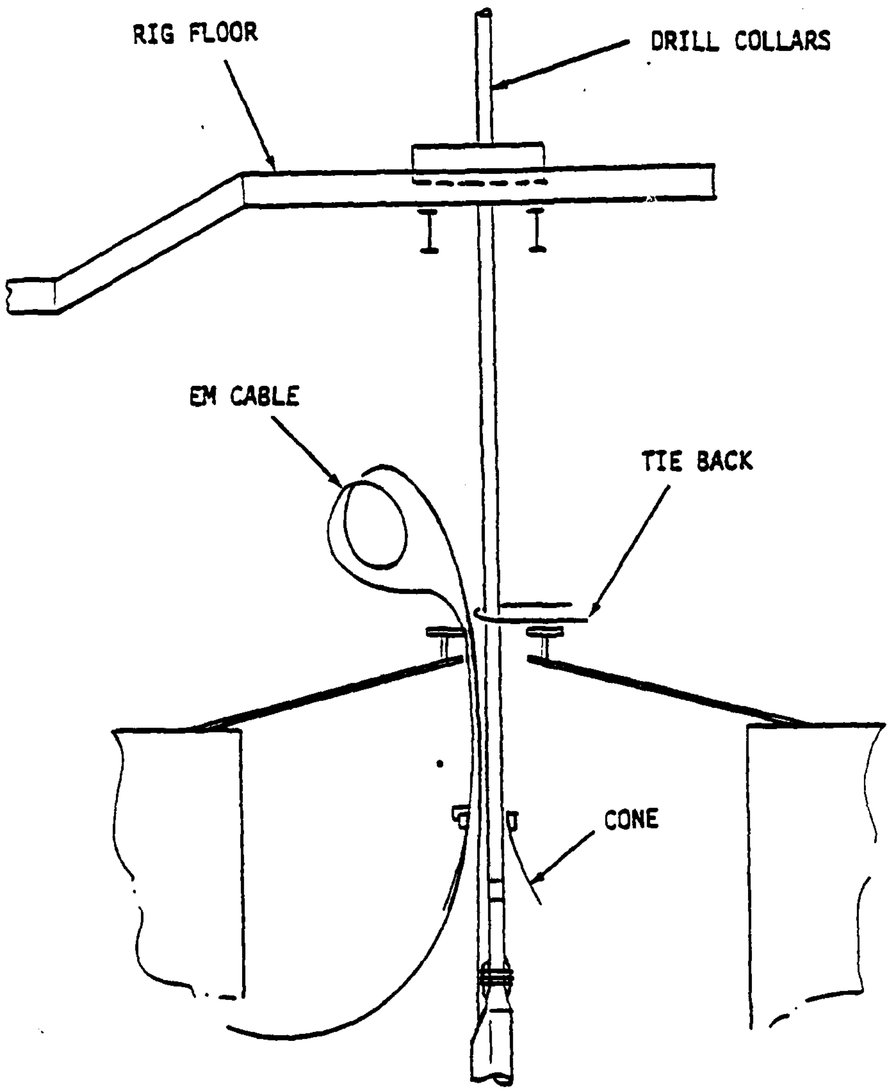


FIGURE 3-8 MAKE-UP UPPER REENTRY ASSEMBLY

3.8 MAKE UP UPPER REENTRY ASSEMBLY

.1 Steps

- Add Drill Collars and Bumper subs (see Ref. Dwg. E-001-A002).
- Lower reentry sub below horn.
- Secure drill collar to one side of horn.
- Remove EM Cable protector.
- Lower downhole assembly approx. 300 ft.
- Work EM Cable loop down through horn using soft line.
- Establish   lbs tension loading on EM Cable winch (refer to separate EM Cable/HC Instructions).
- Check BIP signals.
- Set orientation for reentry sub.

.2 Responsibility - GMDC

- Rig Crew
- EM Cable Winch Operator
- STC Van Operator

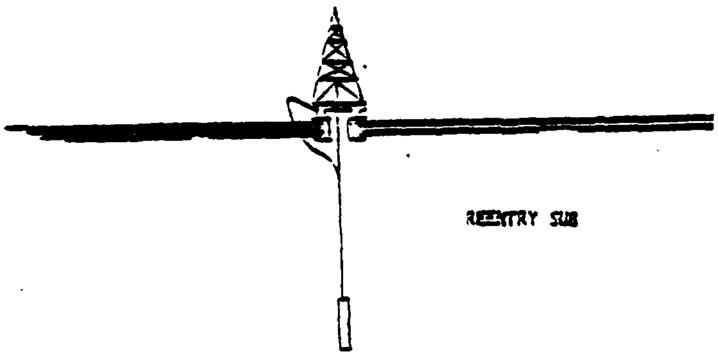
.3 Operational Restrictions

- Sea State 3

.4 Precautions/Hazards

- Keep cable away from thruster and screws.
- Limit side loading on EM Cable termination.

.5 Special Equipment



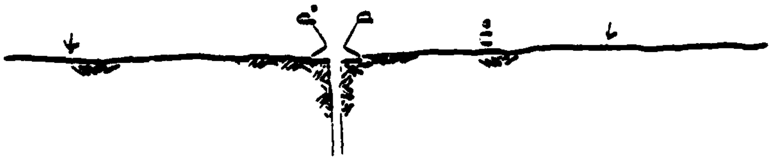


FIGURE 3-9 DEPLOY DRILL STRING

0006-013

3.9 DEPLOY DRILL STRING TO NEAR BOTTOM

.1 Steps

- Set A-Frame HC at midposition.
- Make up and lower standard drill string sections.
- Orient pipe string at each stand using stoking tool.
- Deploy 14,650 ft of 5" drill string, including 340 ft (Bumper subs are open when lowering) of downhole assembly.
- Reentry assembly using normal procedures, and maintaining string orientation.
- Install upper horn sections (if required).
- Maintain cable tension at BIP equivalent to 1,000 lbs (see EM Winch/HC Instructions).

.2 Responsibility - GMDI

- Normal Rig Crew
- EM Winch Operator
- STC Van Operator

.3 Operational Restrictions

- Sea State 5

.4 Precautions/Hazards

- Maintain alignment of drill string.
- Do not allow cable tension to exceed 3,000 lbs at BIP.

.5 Special Equipment

- Stoking Tool

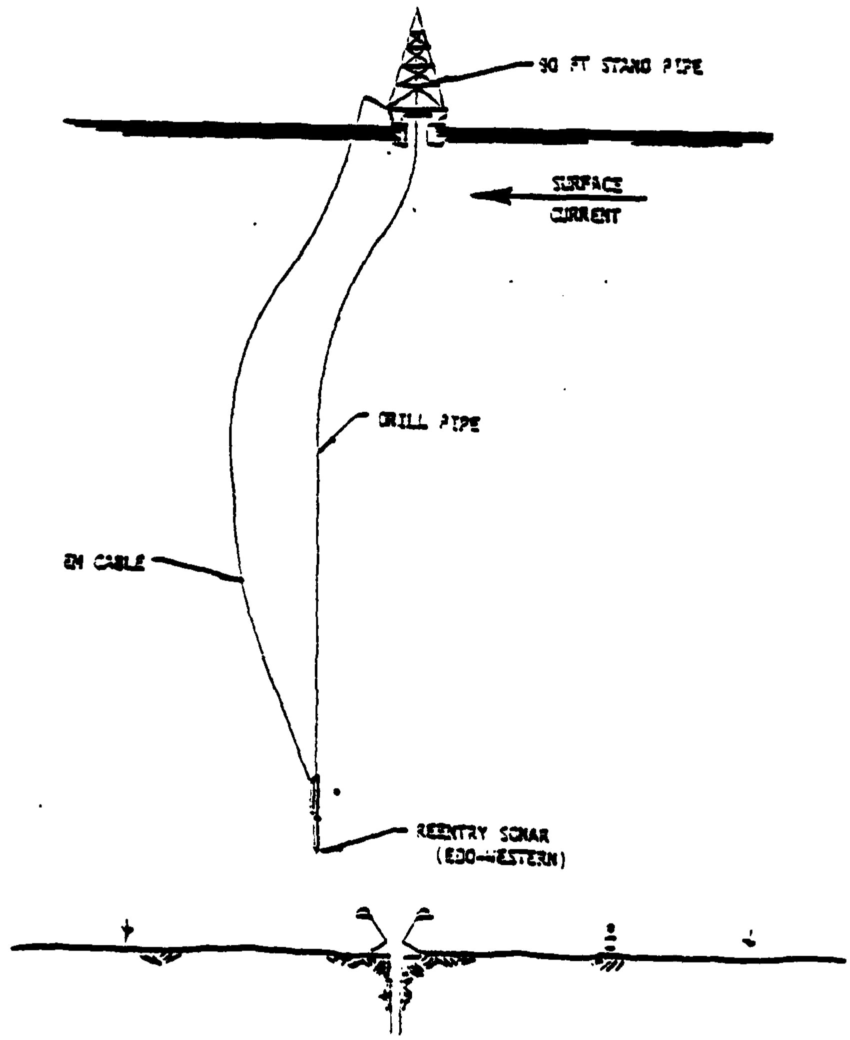


FIGURE 3-10 POSITION DRILL STRING ABOVE REENTRY CONE

3.10 POSITION DRILL STRING ABOVE REENTRY CONE

.1 <u>Steps</u>

- Establish stinger altitude above cone at objective 15 ft above cone.
- Add drill string heave compensator (tentative).
- Prepare upper drill string for sonar reentry.
- Lower sonar reentry tool down to stinger position over reentry cone in accordance with standard procedures.
- Prepare to stab 60 ft.
- Maintain cable tension at BIP equivalent to 1,000 lbs.

.2 <u>Responsibility - GMDC</u>

- Normal Rig Crew
- EM Cable Winch Operator
- STC Van Operator

.3 <u>Operational Restrictions</u>

- Sea State 5

.4 <u>Precautions/Hazards</u>

.5 <u>Special Equipment</u>

- Sonar Reentry Tool

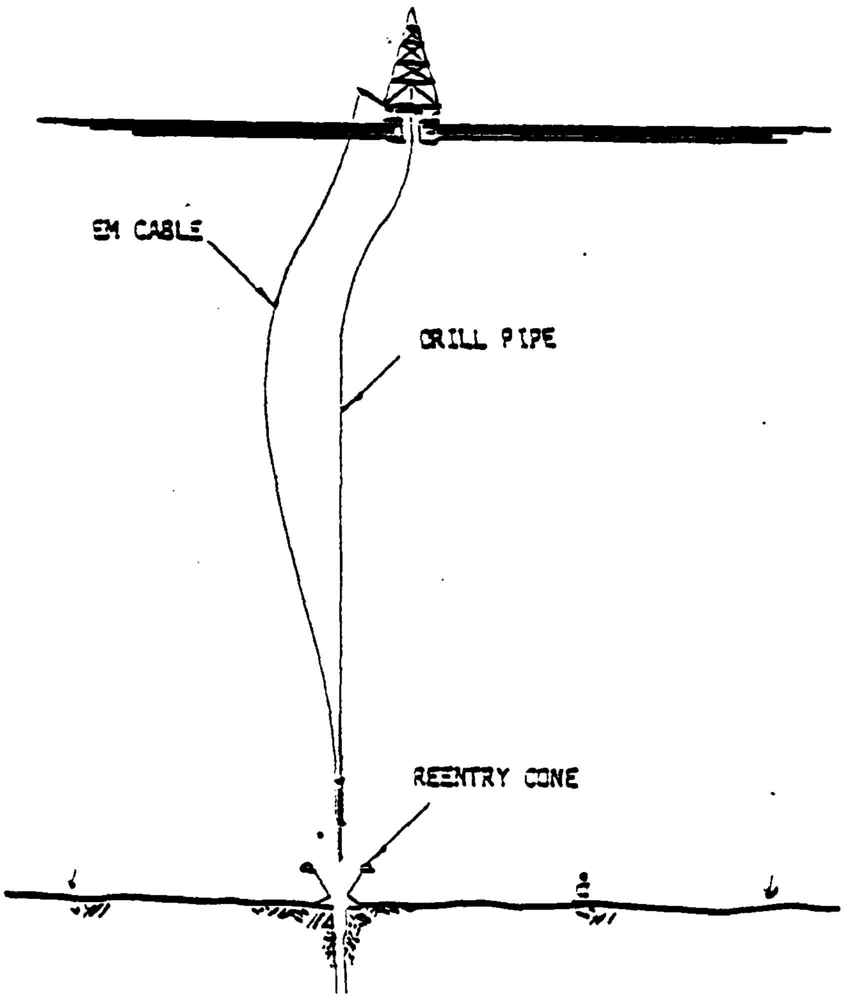


FIGURE 4-1 INITIAL REENTRY STABBING

4.0 REENTRY PROCEDURE

4.1 PERFORM INITIAL REENTRY STABBING

.1 Steps

- Reduce EM Cable tension applicable to 500 lbs at BIP.
- Lower DP 60 ft and stab into reentry cone (quickly accelerate to 6 ft per second and then slowly decelerate).
- During reentry, observe payout of EM Cable.
- Record impact forces.
- Maintain hook load 30,000 lbs* lighter after reentry than before reentry.
- Raise and lower 10 ft to verify partial transfer of load to reentry cone.
- Increase EM Cable tension to 1,500 lbs at BIP.

.2 Responsibility - GMDC

- Rig Crew
- EM Winch Operator
- STC Van Operator
- Reentry Technician

.3 Operational Restrictions

- Sea State 3
- Max stabbing velocity of 10 FPS.
- Max unloading of drill string 50,000 lbs.

.4 Precautions/Hazards

- Maintain minimum tension on EM Cable as defined by operating instructions.
- Initial altitude above seafloor should be 40 ft.
- Minimum hook load of   lbs. should be maintained.

.5 Special Equipment

*This may be modified dependent on weather and specific configuration.

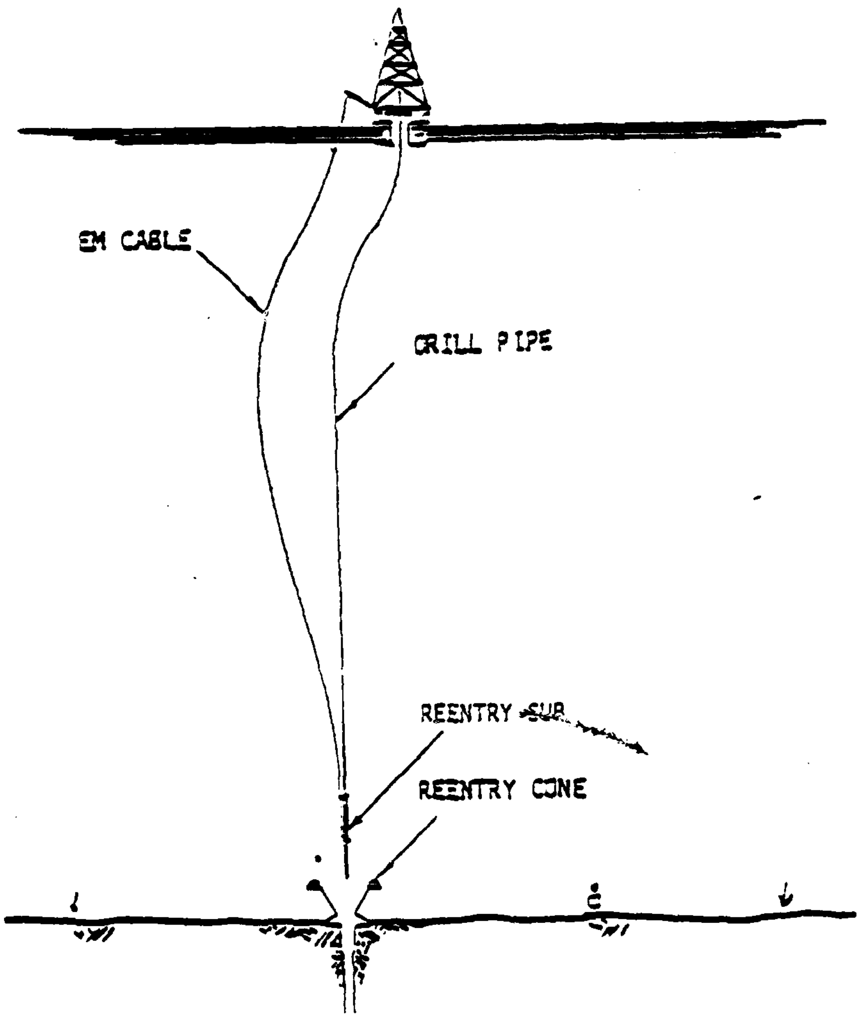


FIGURE 4-2 MULTIPLE REENTRY STABBING

4.2 PERFORM MULTIPLE REENTRY STABBINGS

.1 <u>Steps</u>

- Raise drill string 60 ft.
- Perform stabbing operations (4.1) in accordance with the noted criteria.
- Test 2: *Repeat initial reentry stab-in with CHALLENGER maintaining position over cone.
- Test 3: *Repeat Test 2 but from objective 10 ft above cone.
- Test 4: *Repeat reentry from 20 ft above cone.
- Test 5: Repeat reentry as directed.

.2 <u>Responsibility - GMDC</u>

- Rig Crew
- EM Cable Winch Operator
- STC Van Operator
- Reentry Technician

.3 <u>Operational Restrictions</u>

- Sea State 5

.4 <u>Precautions/Hazards</u>

.5 <u>Special Equipment</u>

- EM Cable Winch

*Tests objectives may be changed as a result of impact data.

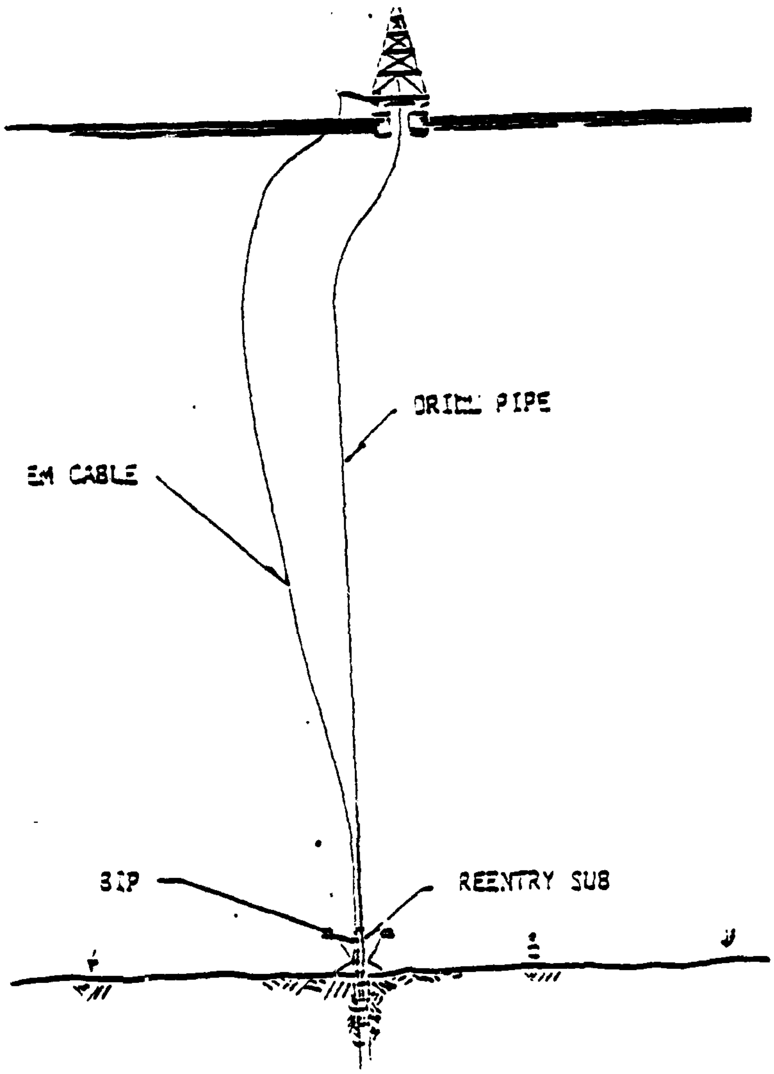


FIGURE 5-1 RELEASE BIP

5.0 BIP RELEASE PROCEDURE

5.1 PERFORMING BIP RELEASE

.1 Steps

- Remove reentry sonar tool.
- Lower Baker Lock subassembly with Otis GS running tool.
- Jar in and lock Baker tool to adaptor plug.
- Raise hydraulic plug to carriage control sub.
- Verify that lock ring has engaged.
- Release Otis tool by jarring down hard and retrieve.
- Attach cement unit to DP tee crossover.
- Set EM Cable winch tension to 3,000 lbs. tension at BIP.
- Pressurize drill pipe to 2300 psi to actuate release hydraulic cylinders.

.2 Responsibility - GMDC

- EM Winch Operator
- STC Van Operator
- Rig Crew

.3 Operational Restrictions

- Sea State 3

.4 Precautions/Hazards

.5 Special Equipment

- Baker "K" Lock Subassembly
- Baker Special Probe
- Otis "4" pulling tool
- Otis Wire Line Stuffing Box with Tee Crossover to DP
- Koomey Test Unit (backup)
- Jarring Tool

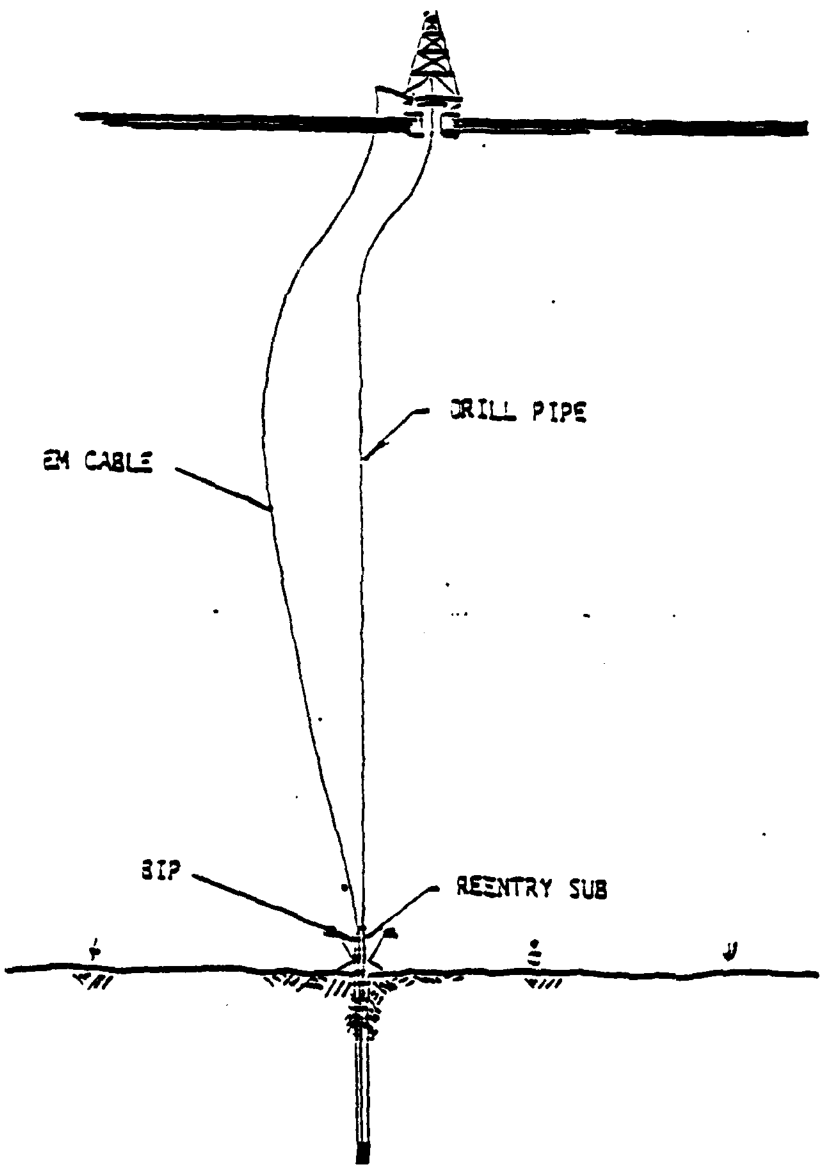


FIGURE 5-2 LOWER BIP INTO BOREHOLE

5.2 LOWER BIP INTO BOREHOLE

.1 Steps

- EM Cable should slowly payout.
- Reduce tension to minimum 500 lbs.at BIP in 250 lb stages.
- When cable starts to payout, set tension to neutralize payout.
- Reduce tension by 500 lbs and lower BIP to borehole bottom (2,200 ft) and record time.
- Increase tension to start raising BIP and bring up 100 ft.
- Reduce tension by 1,000 lbs and lower to bottom and record time.
- Increase tension and raise BIP to 100 ft.
- Reduce tension by 2,000 lbs and lower to bottom and record time.

.2 Responsibility - GMDC

- EM Winch Operator
- STC Van Operator

.3 Operational Restrictions

- Sea State 5

.4 Precautions/Hazards

- Cable entanglement
- BIP binding in stinger

.5 Special Equipment

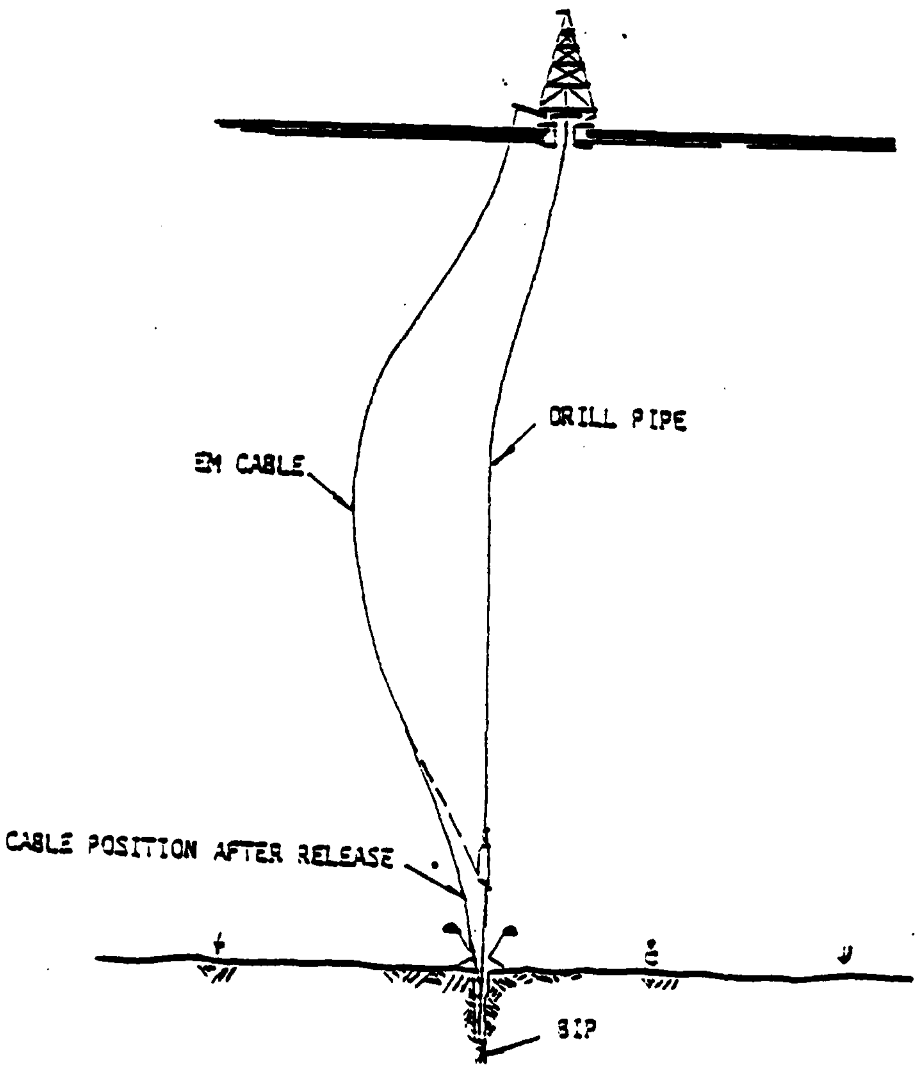


FIGURE 5-3 DISENGAGE EM CABLE

5.3 DISENGAGE EM CABLE

.1 <u>Steps</u>

- Set EM Cable winch tension to 500 lbs at BIP.
- Observe any change in EM Cable tension or payout/takein during operation.
- Establish ship position over borehole.
- Rotate ship/drill string to orient reentry sub groove downstream (if necessary).
- Raise drill string quickly 90 ft.
- Raise hydraulic pressure to 3000 psi to release hydraulic gate.
- Rotate pipe string 180° in both directions.
- Position vessel 500 ft upstream of borehole.
- Repeat above rotation 360° in both directions, if tension increases or payout was indicated.
- Watch fleet angle of EM Cable.

.2 <u>Responsibility - GMDC</u>

- Rig Crew
- Ship's Crew
- EM Winch Operator
- STC Van Operator

.3 <u>Operational Restrictions</u>

- Sea State 4

.4 <u>Precautions/Hazards</u>

- Limit EM Cable tension load to 15,000 lbs.
- Maintain EM Cable away from thrusters and screws.

.5 <u>Special Equipment</u>

- EM Cable Winch

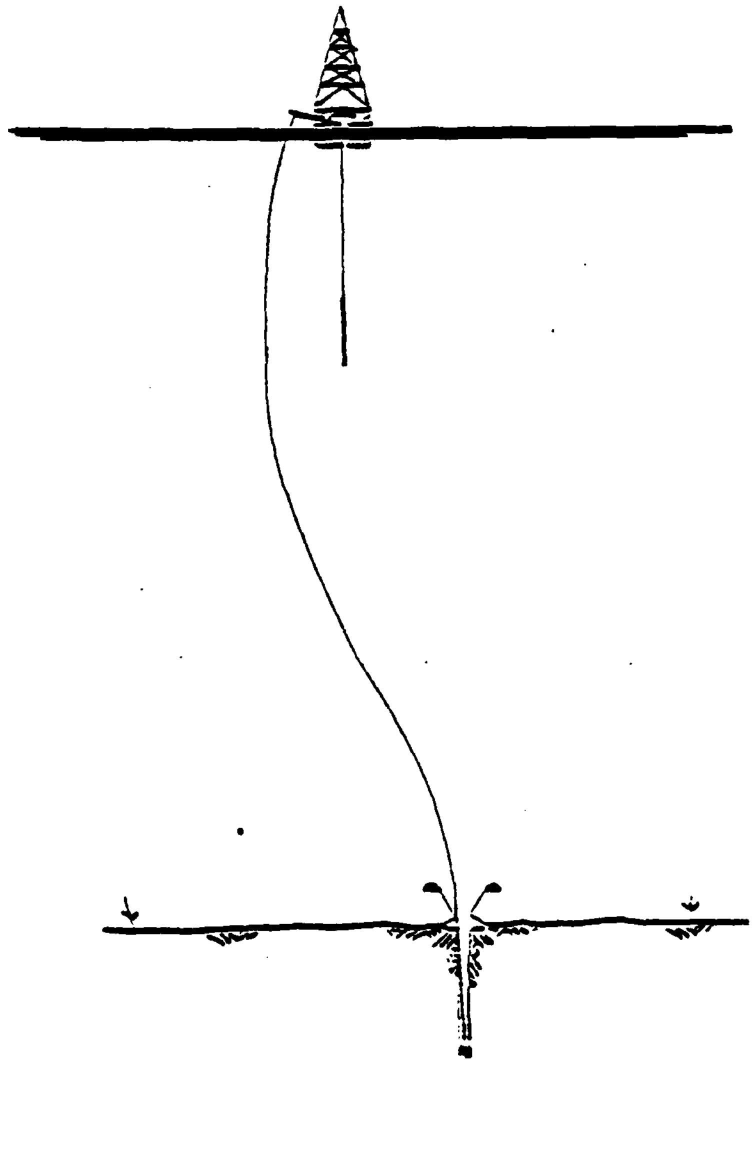


FIGURE 5-4 RECOVER DRILL STRING AND REENTRY SUB

5.4 RECOVER DRILL STRING & REENTRY SUB

.1 Steps

- Maintain CHALLENGER 500 ft upstream of borehole.
- Maintain EM Cable winch tension applicable to water depth.
- Recover pipe string under normal procedures.
- Raise reentry sub to drill rig floor.
- Attach handling sling to reentry sub.
- Remove stinger and move to casing rack.
- Move reentry sub to casing rack.

.2 Responsibility - GMDC

- Rig Crew
- Ship's Crew
- EM Winch Operator
- STC Van Operator

.3 Operational Restrictions

- Sea State 4

.4 Precautions/Hazards

- Limit EM Cable load to water depth weight of cable.

.5 Special Equipment

- Reentry Sub Handling Equipment

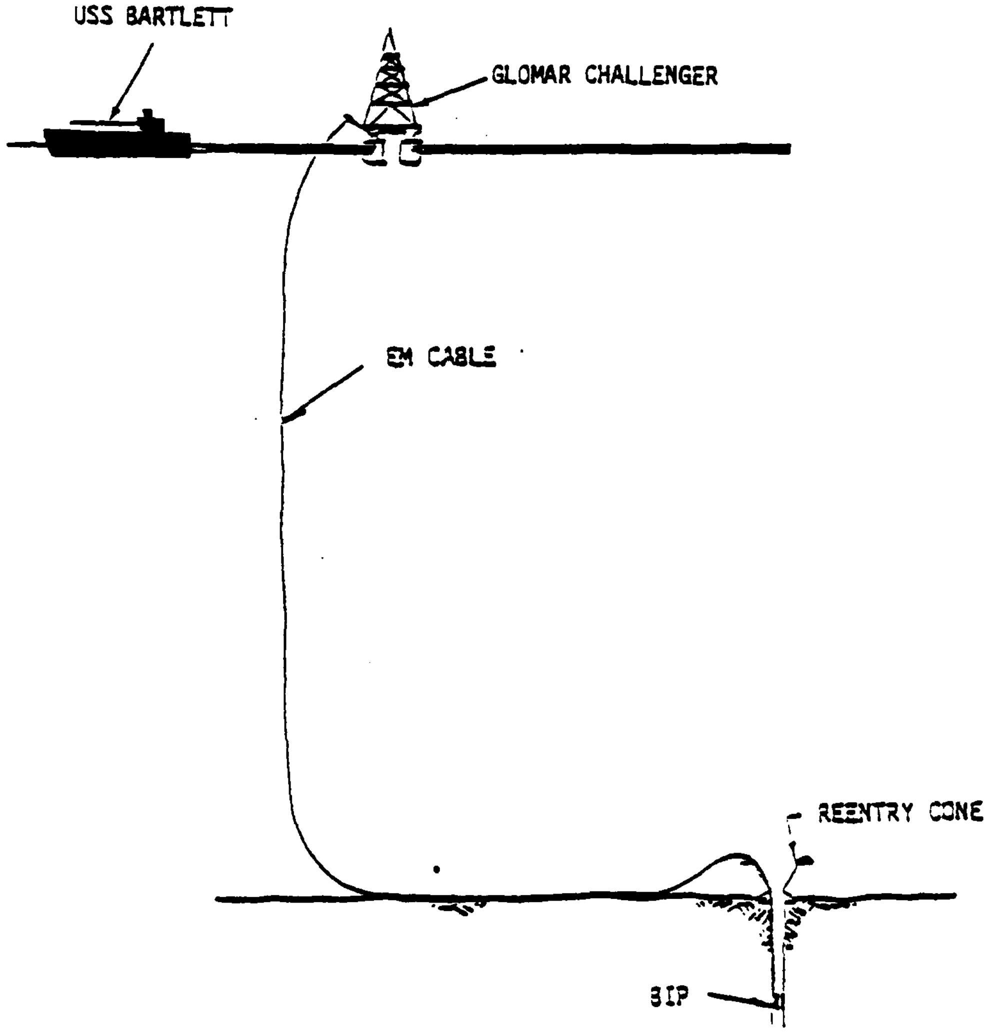


FIGURE 6-1 VESSEL MOVING TO TEST STATION

6.0 **SEISMIC TEST PROCEDURES**

6.1 VESSEL MOVING TO TEST STATION

.1 Steps

- Move CHALLENGER downstream 3,000 ft from borehole maintaining general orientation into wind & weather.
- Maintain EM Cable tension applicable to 0 lbs at ocean floor (refer to EM Cable/HC detail instructions).

.2 Responsibility - GMDC

- Ship's Crew
- EM Winch Operator
- STC Van Operator

.3 Operational Restrictions

- Sea State 6

.4 Precautions/Hazards

- Maintain cable away from thruster and screws.

.5 Special Equipment

- Drop a new ASK Beacon (if necessary).

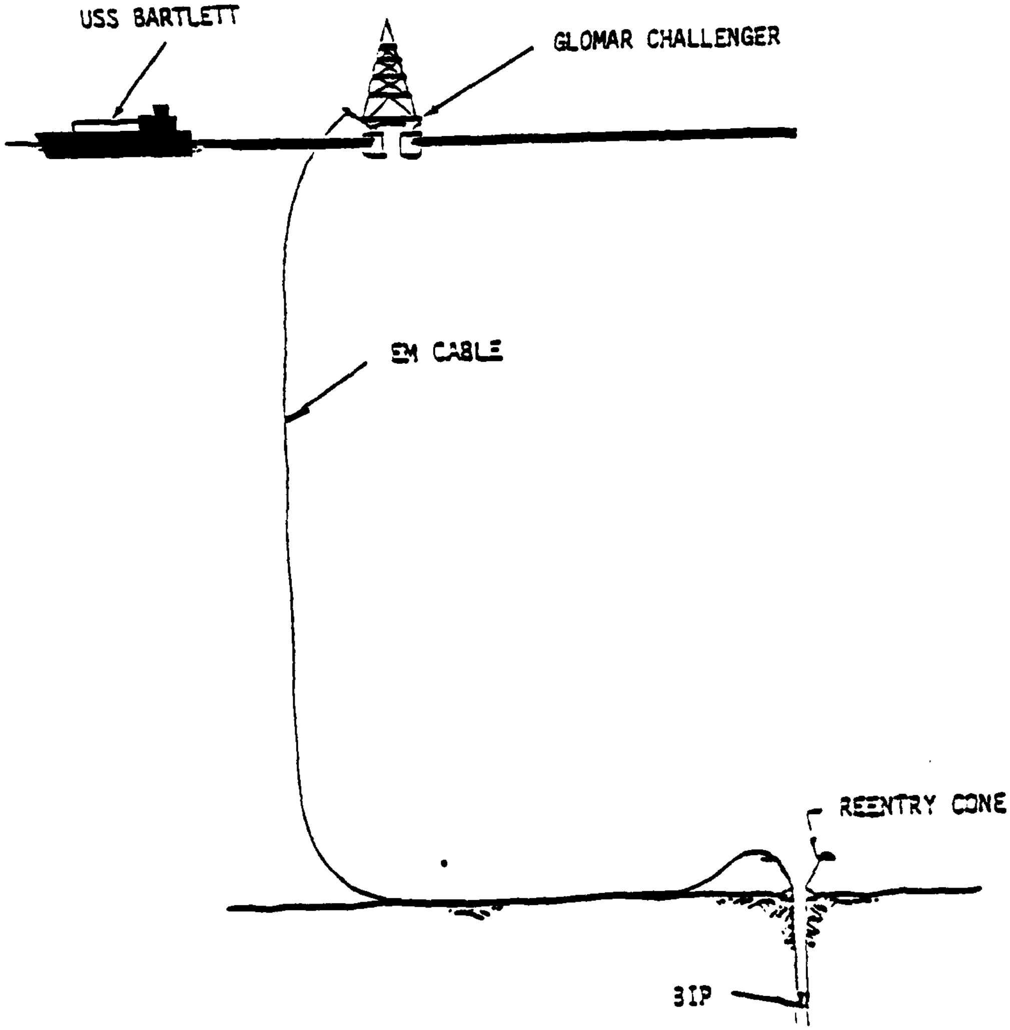


FIGURE 6-2 PERFORM SEISMIC TESTS

0006-027

6.2 PERFORM SEISMIC TESTS

.1 Steps

- Release 2 OBS units 250 & 500 meters away from borehole.
- Record background noise for 4 hours.
- *Perform air gun tests for 4 hours using USS BARTLETT.
- Perform slant range detonation tests for 5 hours using USS BARTLETT.
- Run silent ship operation (turn off thrusters & screws) for 15 minutes.
- Record background noise for 8 hours.

.2 Responsibility - GMDC/NORDA

- Ship's Crew
- EM Winch Operator
- STC Van Operator
- Navy AGOR Vessel

.3 Operational Restrictions

- Sea State 6
- Maintain minimum 2,000 ft between ships.

.4 Precautions/Hazards

- Use of high explosive detonations

.5 Special Equipment

- USS BARTLETT (AGOR) Support Ship

*Specific test sequence may change.

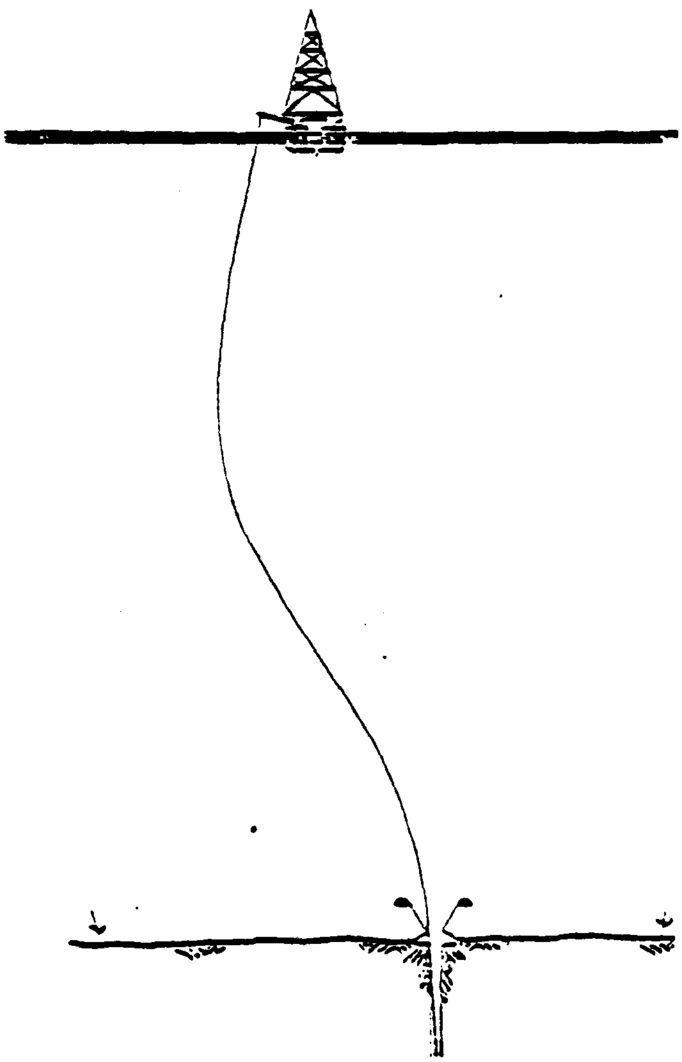


FIGURE 7-1 REMOVE BIP FROM BOREHOLE

7.0 RECOVER BIP FORM BOREHOLE

7.1 REPOSITION VESSEL & RETRIEVE CABLE

.1 Steps

- Position CHALLENGER over borehole.
- Slowly increase EM Winch tensioning loading until equivalent BIP tension of 2,500 lbs is established.
- Slowly increase the EM Winch tensioning loading until an equivalent BIP tension of 3,000 lbs is established. Constant cable take-up speed should be observed.
- Slowly take up approx. 2,500 ft of cable.
- Set take-up speed at 200 FPM.
- With every 1,000 ft. of cable take-up, the EM Winch tensioning load should be decreased to maintain an equivalent BIP tension of 3,500-4,000 lbs.
- As BIP reaches surface, EM Winch tensioning load should be reduced to 3,500 lbs.

.2 Responsibility - GMDC

- EM Winch Operator
- Crane Operator
- STC Van Operator

.3 Operational Restrictions

- Sea State 6

.4 Precautions/Hazards

- Limit take-up speed to 200 FPM.

.5 Special Equipment

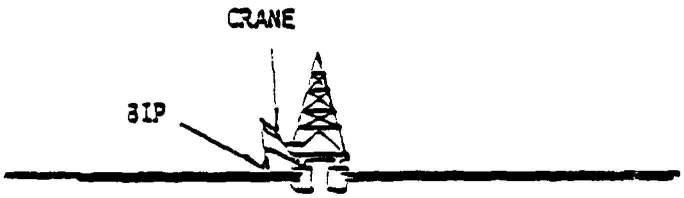


FIGURE 7-2 RETRIEVE BIP ONBOARD

7.2 RETRIEVE BIP ONBOARD

.1 Steps

- Attach tag line and bring BIP close alongside.
- Attach sling to BIP.
- Lift BIP with crane and place in shipping fixture located on casing rack.
- Release EM Cable mechanical and electrical connections.
- Pull in EM Cable to winch.
- Dismantle A-Frame.

.2 Responsibility - GMDC

- EM Winch Operator
- Crane Operator
- Rig Crew

.3 Operational Restrictions

- Sea State 5

.4 Precautions/Hazards

- Maintain cable away from thrusters and screws.
- Limit take-up speed to 200 FPM.

.5 Special Equipment

- BIP Handling Sling
- Crane

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8.0 CABLE DISENTANGLEMENT PROCEDURE

.1 Cable Entanglement can be potentially indicated by:

- Negative fleet angle of EM Cable toward ship
- High relative dynamic cable loads
- Failure of BIP to lower into borehole

.2 If the cable is entangled around the drill string it probably is either:

- A single wrap caught up on an obstruction.
- Wrapped two or three revolutions near the top and the bottom with a large "D" loop streaming in between.
- A few wraps near the center with reverse belly of "D" adjacent to pipe.

.3 First, bring cable tension to normal and compare cable counter and load cell readings. Mark Cable.

.4 Tighten cable tension in 500 lbs increments upto 12,000 lbs (if not released) or 8500 lbs (after release) and record static plus dynamic loads and compre with earlier data. If entangled there will be only a minimal cable take in. Watch for sudden load reduction and/or BIP motion denoting cable disentanglement. Return to normal loading.

.5 Raise drill string slightly to lift reentry off of landing position.

.6 Marking initial position, rotate drill string slowly clockwise 1 revolution then counter clockwise 2 revolutions and then clockwise 1 revolution back to initial position.

.7 A slow rotation of the Ship could also be considered at this point.

.8 Decision point as to whether to retrieve pipe string and disentangle while raising or to proceed positioned in borehole.

.9 Mark initial position, rotate slowly drill string for upto 3 complete revolutions in expected directional rotation of entanglement. Upper cable tension should slowly increase with subsequent slow payout. This step unwrap the bottom wraps only to enable the BIP to be partially lowered.

.10 Proceed with normal cable release procedure but maintaining ship above reentry cone.

.11 Rotate drill string in opposite direction to the initial position plus up to 3 revolutions which should unwrap the upper wraps and result in a completed lowering of BIP.

.12. At this time raise pipe string noting whether cable payout remains constant or reduced. indicating entanglement.

.13 If entangled raise pipe string until problem can be observed by special MSS subsurface TV system.

9.0 MARINE SEISMIC SYSTEM DEPLOYMENT PROCEDURE FOR RUNNING FAIRLEADER ON EM CABLE

These procedures are to be employed when it appears that there is the potential for a cable entanglement problem with the drill string, or in case of suspected entanglement, to assist in disentangling the EM cable from the drill string. These conditions are apt to appear when the EM cable is being deployed up current from the drill string. These procedures assume that the current is more or less uni-directional and varies approximately linearly from surface current velocity to zero at the bottom (15,000 ft deep).

Two procedures are provided. The first, Procedure A, is to be used for the case where the drill string, BIP and EM cable are already at or near the 15,000 ft depth. The second, Procedure B, is to be used when the drill string and BIP deployment are being initiated and at a shallow depth (less than 1,000 ft from the surface).

CONCEPT OF ELIMINATING CABLE ENTANGLEMENT PROBLEM

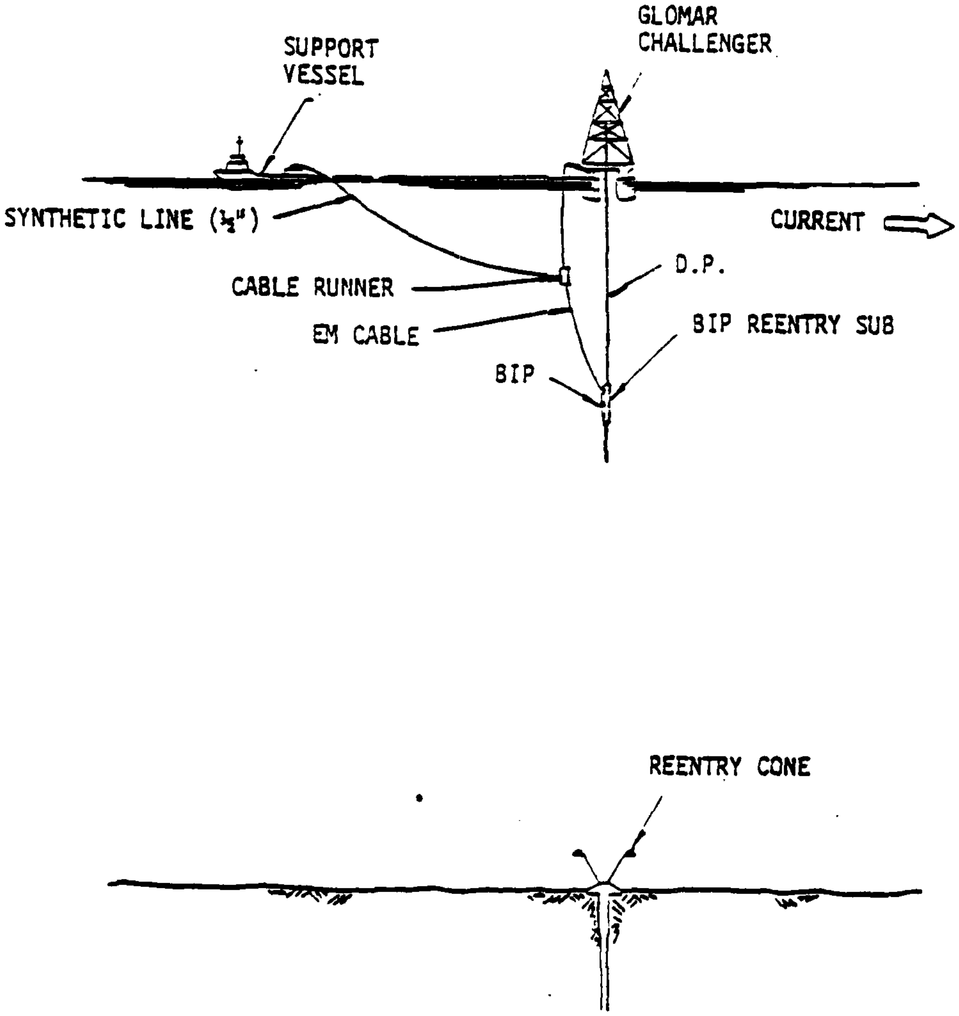

FIGURE 9-1

9.1 DEPLOYMENT PROCEDURE A - DRILL STRING & EM CABLE FULLY DEPLOYED

.1 CHALLENGER rigs fairleader on EM Cable and supports fairleader on tag line over the A-Frame.

.2 CHALLENGER rigs acoustic release to fairleader and attaches 50 ft and 300 ft nylon pendants end to end to acoustic release. Nylon pendants stored on deck with free end available.

.3 USS BARTLETT prepares ballast weight assembly with 1/2 inch diameter wire over stern A-Frame.

.4 BARTLETT sends messenger line to CHALLENGER.

.5 BARTLETT takes position 350 ft up current from CHALLENGER A-Frame.

.6 BARTLETT recovers messenger and 350 ft nylon pendants and couples to 50 ft nylon pendant from ballast weight.

.7 BARTLETT lowers ballast weight 50 ft keeping slight tension in nylon pendant.

.8 CHALLENGER lowers fairleader to the water surface and then releases it. Fairleader sinks slowly, being slightly negatively buoyant.

.9 BARTLETT moves up current until wire tension increases by approximately 150 lbs (valid for 1 ft surface current). The objective is to maintain the ballast weight wire tension fleet angle between 10° and 30°.

.10 CHALLENGER checks EM Cable tension and vertical flute angle. Tension should not go up and angle should be nearly vertical.

.11 BARTLETT moves in 50 ft increments until CHALLENGER observes the EM Cable fleet angle to be 0° to 10° away from side with respect to vertical.

.12 BARTLETT pays out 950 ft of wire and moves up current 300 ft concurrently.

.13 Repeat steps 10 and 11 as required.

.14 BARTLETT pays out 1,100 ft of wire and moves up current 400 ft concurrently. Total 2,100 ft wire payed out. Repeat steps 10 and 11 as required.

.15 Repeat step 14 for total of 3,200 ft wire payed out.

.16 Further direction at this step may be given by CHALLENGER.

.17 BARTLETT maintains final position $\pm$100 ft from CHALLENGER A-Frame.

.18 CHALLENGER maintains watch on cable tension and vertical flute angle and notifies BARTLETT of any changes. Repeat steps 11 and 18 as required.

.19 CHALLENGER actuates release on:

- Emergency order of Captain of CHALLENGER or USS BARTLETT.
- Conclusion of test.
- Preparatory to stab and lowering of BIP into hole.
- Change in current direction negating need for assist.

9.2 DEPLOYMENT PROCEDURE B - DRILL STRING & EM CABLE PARTIALLY DEPLOYED AT SHALLOW DEPTH

.1 Drill string and EM Cable deployed at approximately 1,000 ft.

.2 CHALLENGER rigs fairleader on EM Cable and supports fairleader on tag line over the A-Frame.

.3 CHALLENGER rigs acoustic release to fairleader and attaches 50' and 300' nylon pendants end to end to acoustic release. Nylon pendants stored on deck with free end available.

.4 U.S.S. BARTLETT prepares ballast weight assembly with 1/2" diameter wire over stern A-Frame.

.5 BARTLETT sends messenger line to CHALLENGER.

.6 BARTLETT takes position 350' up current from CHALLENGER A-Frame.

.7 BARTLETT recovers messenger and 350' nylon pendants and couples to 50' nylon pendant from ballast weight.

.8 BARTLETT lowers ballast weight 50', keeping slight tension in nylon pendant.

.9 CHALLENGER lowers fairleader to the water surface and then releases it. Fairleader sinks slowly, being slightly negatively buoyant.

.10 BARTLETT moves up current until a slight wire tension increased is noted 150 lbs (valid for 1 kt surface current). The objective is to maintain ballast weight wire cable fleet angle between 10° and 30°.

.11 CHALLENGER checks EM Cable tension and vertical fleet angle. Tension should not go up and angle should be nearly vertical.

.12 BARTLETT moves in 50 ft increments until CHALLENGER observes the EM Cable fleet angle to be 0° to 10° with respect to vertical.

.13 BARTLETT pays out 450 ft of wire to total 500 ft and moves up current 150 ft concurrently.

.14 Repeat steps 11 and 12.

.15 CHALLENGER runs 1,000 ft of drill string and EM Cable to give total of 2,000 ft.

.16 BARTLETT pay out 500 ft of wire to total 1,000 ft and moves up to current 150 ft.

.17 Repeat steps 11 and 12.

.18 Repeat step 15 to total 3,000 ft.

.19 Repeat step 16 to total 1,500 ft.

.20 Repeat steps 11 and 12.

.21 CHALLENGER runs 2,000 ft of drill string and EM Cable to give total of 5,000 ft.

.22 Repeat step 16 to give total 2,000 ft.

.23 Repeat steps 11 and 12.

.24 CHALLENGER runs 5,000 ft of drill string and EM Cable to give total of 10,000 ft.

.25 BARTLETT pays out 1,200 ft of wire to give 3,200 ft total.

.26 Repeat steps 11 and 12.

.27 Further direction may be given at this step from CHALLENGER.

.28 BARTLETT maintains final position $\pm$100 ft from CHALLENGER A-Frame.

.29 CHALLENGER maintains watch on cable tension and vertical fleet angle and notifies Bartlett of any changes. Repeat steps 12 and 29 as required.

.30 CHALLENGER actuates release on:

- Emergency order of Captain of CHALLENGER or USS BARTLETT.
- Conclusion of test.
- Preparatory to stab and lowering of BIP into hole.
- Change in current direction negating need for assist.

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10.0 OPERATING INSTRUCTIONS FOR THE A-FRAME HEAVE COMPENSATOR

SECTION 1 - SAFETY PRECAUTIONS

Because of high pressures involved in the MSS Heave Compensator system, the following safety precautions should be observed.

- All personnel associated with the operation and maintenance of the equipment must be familiar with the safe operation of the system, and all safety devices must be maintained in proper working order.

Because the following safety precautions apply only to normal operating conditions, supervisors or others in authority may find it necessary to issue supplementary or special precautions to cover local conditions and unusual circumstances. Furthermore, conditions not covered by these safety precautions may arise, which in the opinion of the supervisor may render further operation of the equipment unsafe. Under these conditions, none of the following safety precautions are to be construed as an authorization for such further operation.

The operator shall be familiar with all personnel and equipment safety precautions before attempting to operate the equipment. Authorized personnel only shall be permitted to operate the control panel.

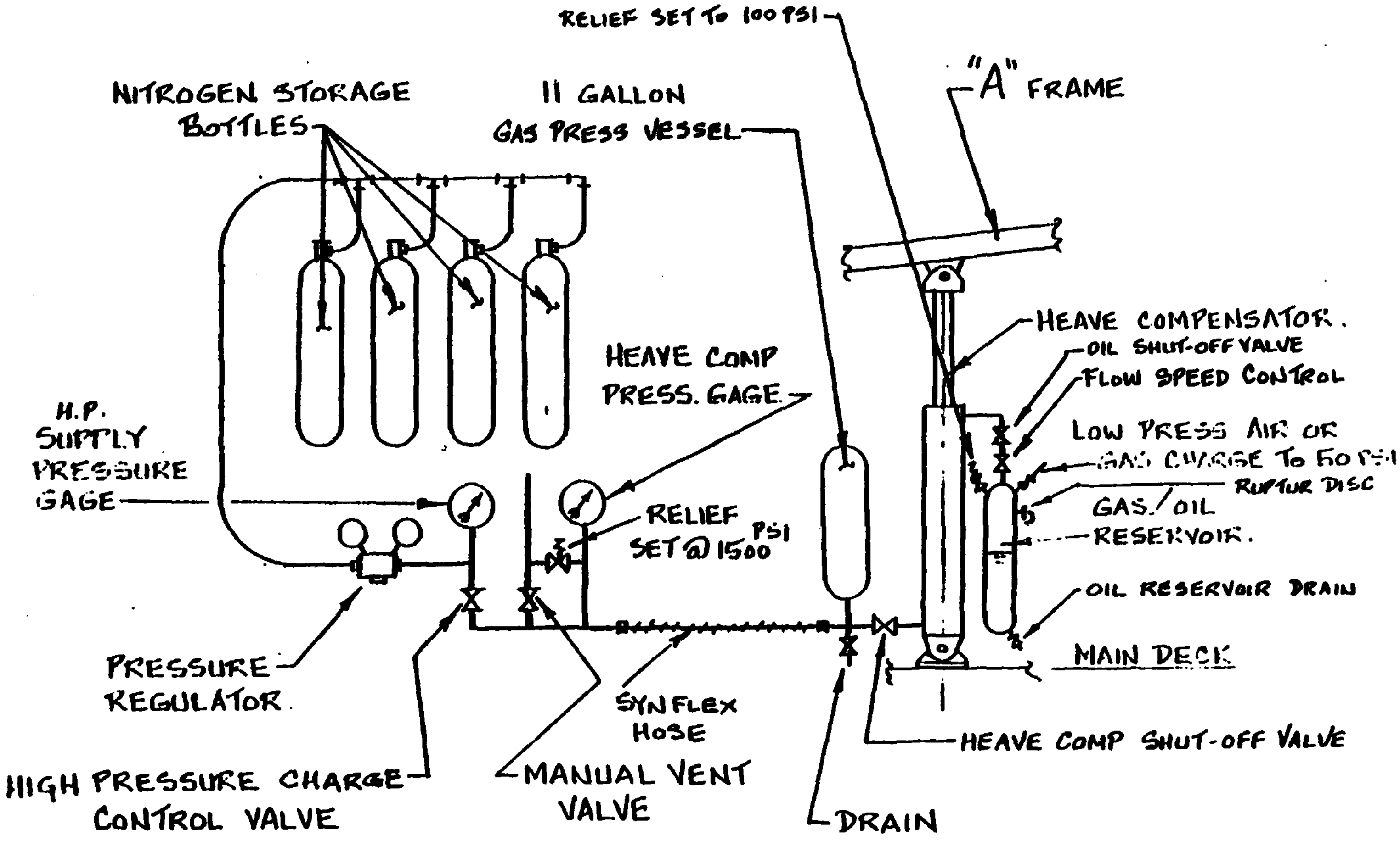
HYDRAULIC SAFETY PRECAUTIONS:

- Always verify that line pressure is zero before disconnecting hydraulic lines.
- Never torque leaking connections or fittings while lines are pressurized. Application of torque to fitting or connections while lines are pressurized may rupture lines and result in injury to personnel.
- Mop up spilled hydraulic fluid immediately. Investigate and correct the cause of any leakage of hydraulic fluid.
- If clothing becomes drenched with hydraulic fluid, change immediately to dry clothing, prolonged contact with hydraulic fluid is injurious to health.

2 KNOT CURRENT DOUBLE BULLWHEEL WINCH

DEPLOYED DRILL STRING LENGTH(FT)	*HEAVE COMPENSATOR GAS PRESSURE(PSI)	AVERAGE LOAD CELL GAGE READING(LBS)
2000	350	2700
4000	500	4400
6000	640	6000
8000	790	8000
10000	930	9600
12000	1080	11400
14000	1220	13000
16000	1360	14800
18000	1500	16400
20000	1640	18000

*THE FORCE EXERTED BY THE HEAVE COMPENSATOR = THE GAS PRESSURE X THE PISTON AREA ($\pi/4 \times 6^2$).
THESE VALUES ARE FOR ASSUMING THAT THE CABLE LENGTH IS EQUAL TO 110% OF THE LENGTH OF DRILL PIPE DEPLOYED.



DIAGRAMMATIC OF MSS HEAVE
COMPENSATOR SYSTEM

SK: M. P. 1-14-91

PNEUMATIC SAFETY PRECAUTIONS:

- Always verify that line pressure is zero before disconnecting pneumatic lines.
- Never torque leaking connections or fittings while lines are pressurized. Application of torque to fittings or connections while lines are pressurized may rupture lines and result in injury to personnel.
- WARNING - DIRECT DISCHARGE OF HIGH PRESSURE AIR OR GAS CAN SERIOUSLY INJURE NOT ONLY SENSITIVE AREAS SUCH AS EYES AND EAR DRUMS BUT ALSO THROW AN ARM AND HAND WITH GREAT FORCE AGAINST A WALL OR MACHINERY. OPEN DISCHARGE VALVES CAUTIOUSLY AFTER STANDING CLEAR AND WARNING OTHERS AWAY. MAKE CERTAIN DUST AND DEBRIS WHICH COULD BE BLOWN TOWARD PERSONNEL ARE SWEPT CLEAR OF DISCHARGE AREA.

SECTION 2 - SYSTEM DESCRIPTION (See Dia. MSS Heave Comp. Sys. Page 2)

This section contains a functional description of the MSS Heave Compensator system and its subsystem components. Its purpose is to describe their general operation and relationship within the system.

The MSS Heave Compensator maintains constant tension on the EM Cable by taking up or paying out cable through the rise and fall of the A-Frame in accordance with movements on the vessel due to sea action. Tension is maintained on the line through the A-Frame movement which is generated by nitrogen gas pressure in the compensator cylinder, this tends to extend the cylinder thus reducing the free length of the cable being controlled.

When upward movement of the ship causes an increase in tension, the cylinder retracts (thus increasing the free length of the cable) and maintains the selected line tension. The reverse movement, tending to decrease line tension, allows the cylinder to extend (thus shortening the free length of the cable) to maintain the tension. Fast, accurate response in paying out or taking up cable with minimum tension variations is due to the use of moment arm of the A-Frame which has a movement that is a fraction of the wire cable movement. The pressure in the tensioner cylinder determines the tension that is achieved. To limit the range of pressure variation in the cylinder as the cylinder position changes, the heave compensator is interconnected with a Power Gas Pressure Vessel. The volume of this pressure vessel determines the variation in tension with the movement of the cylinder.

An gas-oil reservoir is mounted on the tensioner and is connected to the cylinder. Oil fills the rod end of the cylinder and partially fills the reservoir, which has a low pressure air charge. This feature provides continuous lubrication, system damping, and safety control by means of a restrictor in the line. In the event of a cable failure, the cylinder extends to its full stroke, but at a controlled velocity, thus preventing any damage to the tensioner or adjacent equipment.

Complete control of heave compensator system is accomplished at the centralized control panel. This panel enables a single operator to start-up, set controls, monitor and shut-down the entire system.

SECTION 2.1 - OPERATING CONTROLS (See Dia. MSS Heave Comp. Sys. Page 2)

A number of controls beyond those on the control panel are necessary. The following describes each operating control on the heave compensator assembly.

1. Heave Compensator Shut-Off Valve
   A valve enabling the operator to isolate heave compensator high pressure gas line. During all normal operations it remains in an OPEN position.

   CAUTION - DO NOT CLOSE THIS VALVE WHILE THE WIRE LINE LOAD IS ACTIVE -

2. Vent Valve
   A valve enabling the operator to vent gas pressure from the heave compensator. Its position during normal operation is CLOSED.

3. Oil Shut-Off Valve
   This valve on the gas-oil reservoir can shut-off the oil flow from the cylinder to the gas-oil reservoir. It may be used to lock the compensator in a retracted position. By the proper application of gas pressure through the HP shut-off valve and closing of the oil shut-off valve, the cylinder may be locked in any position between retracted and fully extended. The normal operating position is fully OPEN.

   CAUTION - DO NOT LOCK THE COMPENSATOR WHEN THE WIRE LINE LOAD IS ACTIVE -

4. Flow Speed Control Valve
   This valve on the gas-oil reservoir limits the extension speed of the cylinder.

5. Gas Shut-Off - Gas-Oil Reservoir
   This valve on the gas-oil reservoir is a local control for the precharge gas into the gas-oil reservoir. Its normal operating position is CLOSED.

6. Oil Reservoir Drain
   This valve drains oil from the gas-oil reservoir. Its normal position is CLOSED.

7. Gas-Oil Reservoir Relief Valve
   This relief valve prevents the gas pressure in the gas-oil reservoir from exceeding a preset safe value. Always maintain its original setting (normally 95 to 120 psi).

8. Rupture Disc
   This safety rupture disc is installed to insure against exceeding the safe operating pressure of the gas-oil reservoir. The rupture disc should be intact during operation. Infrequent replacement does not indicate a system problem.

9. Oil Level Sight Gauge

This gauge indicates the oil level in the gas-oil reservoir. The gauge at the reservoir's bottom is the correct oil level when the cylinder is fully retracted.

Oil Types: Pydraul-150 (Monsanto), Fyrquel-150 or petroleum based.

\- DO NOT OVER-FILL OR OPERATE BELOW PROPER LEVEL -

10. Gas Pressure Vessel

This unit is connected to the compensator during operation and normally operates up to 1500 psi. This pressure determines the tension level of the heave compensator. During normal operation the gas pressure vessel and compensator are always interconnected.

2. 2 - OPERATING CONTROLS

There are three controls listed below which are mounted directly on or at the the heave compensator. All other controls are a part of the control panel.

1) Drain Valve

The gas pressure vessel is provided with a drain valve. The valve should be opened periodically to drain-off any condensate water. Durning normal operation it remains CLOSED.

2) Heave-Compensator Shut-Off Valve

This valve isolates the heave compensator in a set position should the gas supply line burst. But should be left OPEN during normal operation.

3) Low Pressure Gas Charge Valve

This is for pre-charging the oil-gas reservoir. It is normally set at 40-50 psi when the heave compensator is fully retracted.

2.3 - CONTROL PANEL

The best understanding of each control on the panel can be derived from the schematic. The main control functions are briefly described below:

1. High Pressure Charge Valve
   This valve controls supply from the high pressure source to bleed into the gas pressure vessel. Before opening this valve, be sure that the gas source is active as indicated by the supply pressure gauge. During normal operation this valve is CLOSED, but is opened to increase cylinder pressure when the heave compensator load requirements increase during deployment.

2. Vent Valve
   This valve vents the unit to reduce cylinder pressure when the heave compensator load requirements decrease during recovery operations. During normal operation this valve is CLOSED.

3. Pressure Gages
   a) There is a HP supply gauge which indicates the pressure level of the high pressure source.

   b) There is a have compensator pressure gauge. This gauge reads directly the heave compensator charge pressure.

2.4 - GAS-OIL RESERVOIR

The reservoir, partially filled with oil, has a 40-50 psi gas charge piped to the rod end cavity of the cylinder. This arrangement provides system damping, continuous lubrication and safety controlled stroke velocity in the event of cable failure. Incorporated in the reservoir is a disc designed to rupture at 150 psi.

SECTION 3 - PREOPERATIONAL CHECK LIST

PRELIMINARY TASKS

These tasks should be performed before putting the heave compentator into operation:

1. Inspect all piping to insure a proper hookup.
2. Check oil level in gas-oil reservoir on heave compensator. Correct if necessary. (Pydraul-150, Fyrquel-150 or petroleum based).
3. Pressurize the gas-oil reservoir to 40-50 psi. Cylinder should be fully retracted.
4. Open oil shut-off valve.
5. Open air-vent valve on cylinder.
6. Open heave compensator shut-off valve on cylinder.
7. Open all valves on control panel.
8. Open nitrogen storage valves. Set pressure regulator and allow gas pressure to build-up in the system until a pressure of 150-200 psi is registered and the vent valve is OPEN. A few seconds will suffice to insure clean and clear lines. Nitrogen supply is limited, don't vent unnecessarily.
9. Direct gas to heave compensator so that it vents through the heave compensator local vent valve.
10. Close gas input to the heave compensator at the control panel and close the heave compensator local vent valve.
11. Charge the system to the desired pressure for the length of cable deployed (see Page 9).
12. Check that all rotating points are well lubricated.
13. Open heave compensator shut-off valve and establish cylinder stroking about cylinder mid-point.The compensator is now fully operating.

SECTION 4 - OPERATING INSTRUCTIONS (See Dia. of Gage Board Pg 11 & MSS A-Frame Reeving Plan Pg 12)

Before leaving the shipyard, the EM Cable should be reeved under the 36" lead block mounted on the top of the Pengo winch. To do this the wheel will have to be removed. Then the cable should be reeved through the snatch block at the end of the A-frame.

This should be done at the Jetty with the heave compensator retracted.

The heave compensator should be brought into operation after the EM cable has been keelhauled; the necessary connections have been made to the BIP; the stinger and the EM cable have passed down through the 30" restricted area of the moonpool horn and about 1000 ft of cable has been paid-out. The gas pressure in the heave compensator should be about 250 psi at this stage and should be increased with the increase of cable deployed in accordance with the valves shown on Page 9 and graph on Page 9A.

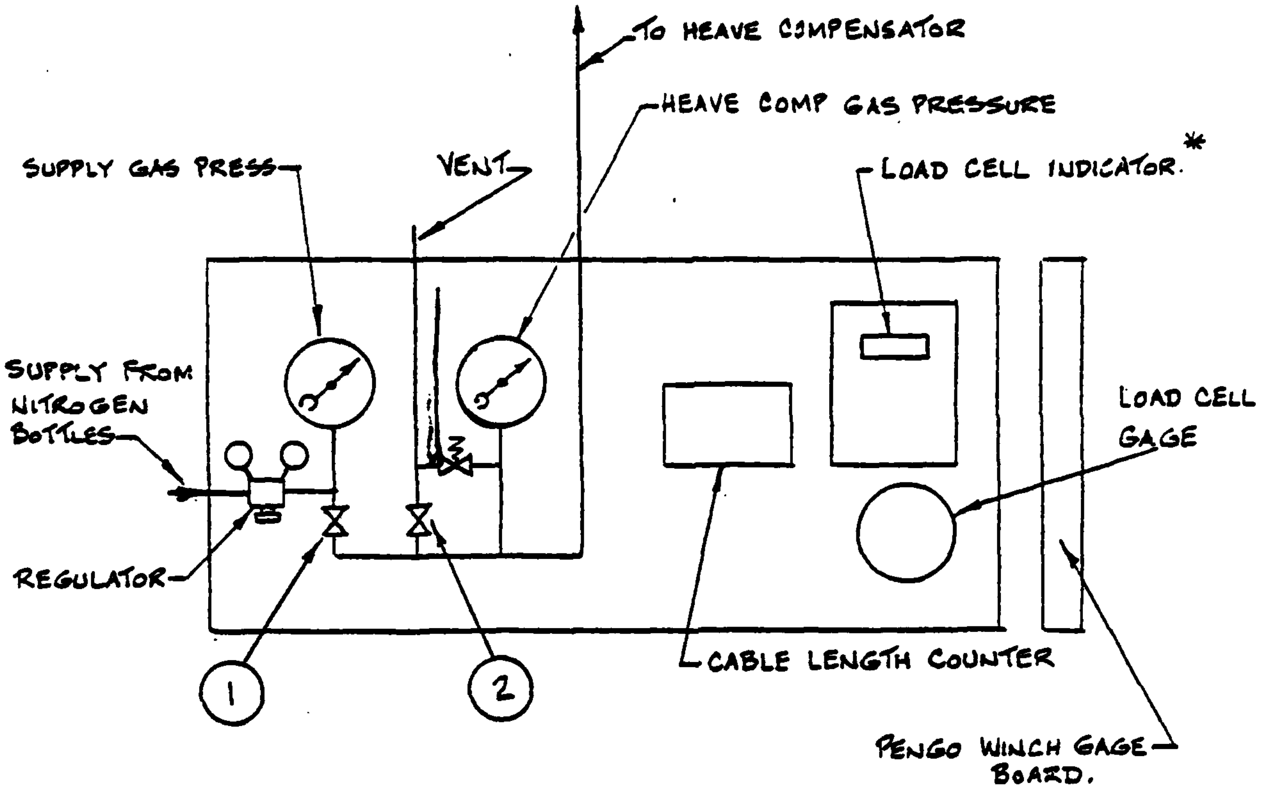
The maximum tension spin-off control on the Pengo winch should be set to pay-out at load cell tensions corresponding to the drill pipe deployed, see Page 9 & 9A, so that the EM cable will not exceed this recommended maximum loading while the EM cable is being payed out. Pressure in the heave compensator is increased by opening valve (1) slowly and observing the pressure increase on the heave compensator gas pressure gage (see Page 11).

When recovering the cable, the heave compensator gas pressure is lowered by venting to atmosphere by opening valve (2) (see Page 11).

W. BUCHANAN

JOB 00006 TASK 323000

16 JAN 1981 MSS HEAVE COMP INSTRUCTIONS.



* THE INDICATOR IS CALIBRATED TAKING INTO CONSIDERATION THE OPERATING ANGLE OF THE "A" FRAME.

DIAGRAM OF GAGE BOARD.

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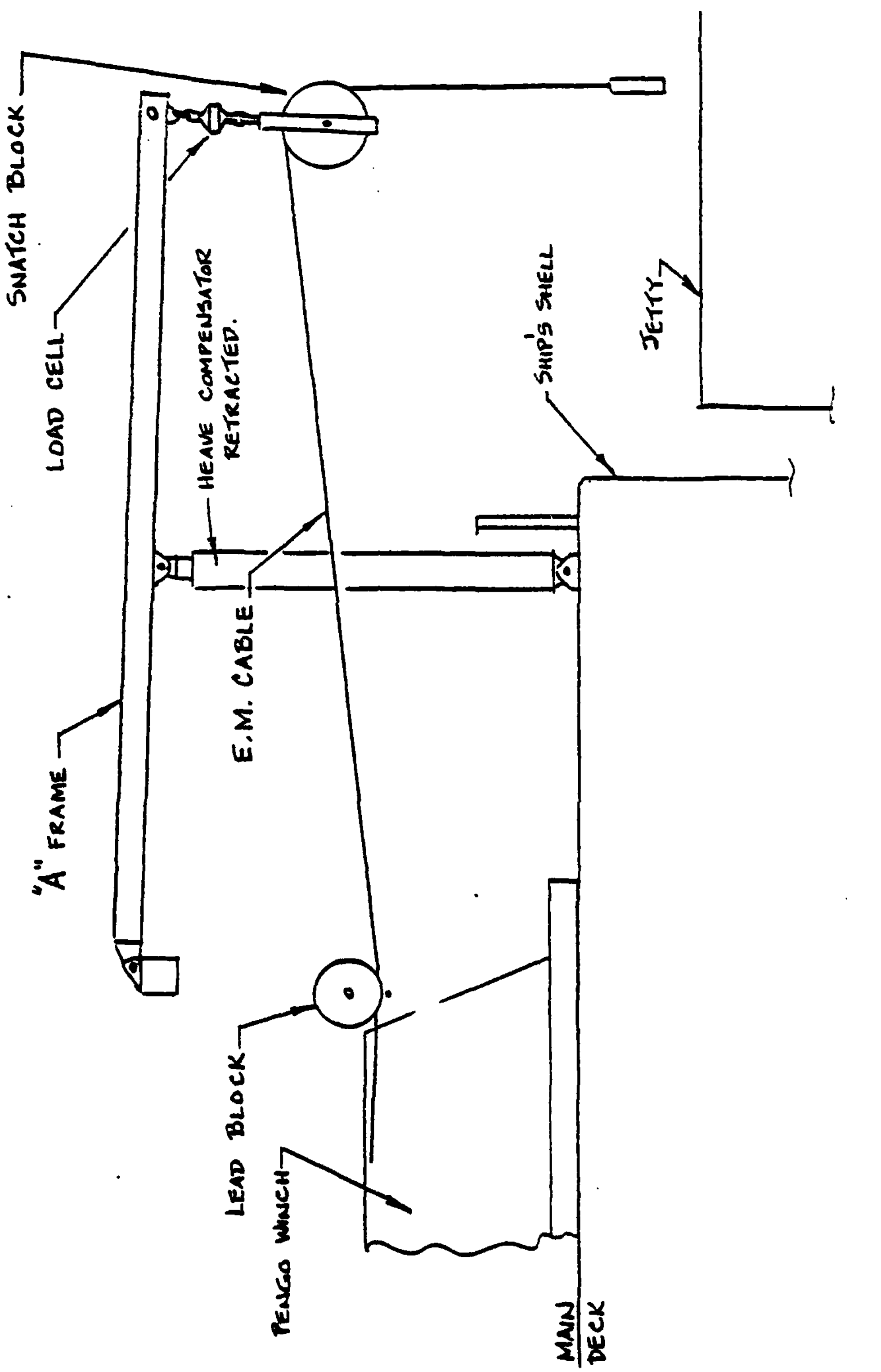

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MSS "A" FRAME REEVING PLAN.

MSS HEAVE COMP INSTRUCTIONS
JOB 00006 TASK 323000

W. BUCHANAN
16 JAN 81

SECTION 5 - DE-COMMISSIONING

On recovery of the BIP the heave compensator should be de-commissioned in the following manner:

- Close all the nitrogen bottles shut-off valves.
- Check that the high pressure charge valve is closed. This is valve (1) on Sketch, Page 11.
- Open the gage board vent valve and vent system. This is valve (2) on Sketch, Page 11. This will cause the heave compensator to retract.
- When the heave compensator pressure gage indicates that the system is at atmospheric pressure, close the heave compensator shut-off valve.
- Open the drain on the 11 gallon gas pressure vessel.
- If desired, the Synflex hose connecting the gage board to the 11 gallon gas pressure vessel can now be removed.
- The A-Frame and the EM Cable can be secured in this position until the vessel reaches port.

SECTION 6 - REFERENCES

The information in these instructions was derived from the following sources.

1) Rucker-Shaffer Technical Manual TM42023

2) Instrumentation & Controls Installation
GMDI Dwg. E-001-A020.

3) Heave Compensator Piping Diagram
GMDI Dwg. E-001-P001

4) MSS Glomar Challanger Equipment Installation Arrangement
GMDI Dwg. E-001-A028 Two Sheets.

APPENDIX D

EQUIPMENT LIST

APPENDIX D
MSS AT-SEA-TEST EQUIPMENT LIST

NUMBER	DESCRIPTION	REMARKS
1	INSTRUMENTATION VAN (STC)	TELEDYNE GEOTECH
2	PENGO BULL WHEEL WINCH	TELEDYNE GEOTECH
3	2 - BIP & CONTAINERS	TELEDYNE GEOTECH
4	2 - BALLAST WEIGHT (WD CRATE)	TELEDYNE GEOTECH
5	POWER CABLE & SNATCH BLOCK	TELEDYNE GEOTECH
6	PORTABLE A-FRAME ASS'Y	TELEDYNE GEOTECH
7	WINCH PARTS	TELEDYNE GEOTECH
8	MISC. TOOLS	TELEDYNE GEOTECH
9	A-FRAME	TELEDYNE GEOTECH
10	3 SNATCH BLOCKS	NAVOCEANO
11	UNDERWATER TELEVISION	
12	UNDERWATER T.V. REEL	
13	MISC. TOOLS AND FITTINGS	
14	SHEAVE & DECK SUPPORT STAND	
15	UNDERWATER T.V. GUIDE FRAME	
16	HEAVE COMPENSATOR CONTROL BOARD	
17	WEIGHT INDICATOR	
18	NYLON SHEAVE	
19	KOOMEY UNIT	
20	48" A-FRAME SHEAVE	NCEL
21	ACCUMULATOR BOTTLE	
22	GUIDELINE TENSIONER	
23	2 BIP CARRIAGE ASSY'S	
24	2 HYD. CONTROL SUB ASSY'S	
25	2 REENTRY STINGERS	
26	CABLE - PROTECTOR 3" SPLIT PIPE	
27	TENSION LOAD CELL	
28	4 - NITROGEN BOTTLES	
29	DIGITAL LOAD READOUT	
30	ANALOG LOAD RECORDER	
31	SUBSEA ACOUSTIC RELEASE EQUIP.	

APPENDIX E

FIELD IMPACT TEST

United Fabricators
Marine Sesmic Systems Test
January 22, 1981

PURPOSE

This report describes the instrumentation and video motion analysis uses for testing of a marine sesmic system. The tests were performed on January 22, 1981, at United Fabricators facility in Santa Fe Springs, CA. All instrumentation including strain gages and accelerometers were provided by Datacraft. Datacraft personnel operated the recording equipment and video system. United Fabricators operated the test specimen, crane, forklift etc., required to provide the necessary impact conditions.

INSTRUMENTATION SYSTEM

The instrumentation system used by Datacraft for recording data is shown in the attached block diagram. Statham strain gage type accelerometers were mounted at appropriate locations on the test specimen as well as single active arm strain gages and dual strain gages for the measurement of bending. The output signals of these transducing elements were fed to a amplifying system. The signal conditioning system provides the appropriate excitation voltages, balancing and calibration. The output of the signal conditioners were fed to Bell & Howell light beam oscillographs. The records produced by these oscillographs are on a light sensitive paper. The paper is exposed by an ultraviolet light source in the recording unit and latensified under florescent lights. The resulting record should never be exposed

Marine Sesmic Systems Test (Continued)

to sunlight or incandescent lights. To do so, would bleach out the record. The recording oscillographs incorporated galvanometers which limited the frequency response of the data to 300 Hz. This was done to eliminate spurious signals from local resonances and other sources and to make the desired data more clearly visible.

VIDEO SYSTEM

The purpose of this system is to provide stop action high resolution video images for determination of time and position data. This data can be recorded for later use on a magnetic tape recorder Panasonic model NV8410 or the data can be analyzed on the spot by using the Sony model SVM1010 motion analyzer.

SYSTEMS FEATURES

Rotary Shutter Camera

This camera is equipped with a shutter which rotates at high speeds synchronized to the video signal. This shutter cuts off excess light input producing a shot the same as would be obtained using a shutter speed of 1/500 of a second.

Video Motion Analyzer SVM1010

The most outstanding feature of this analyzer is its capability to display information for any length of time without damage to the disc or deterioration of the information. The SVM1010 has the capability of playing back in real time 1/7 or 1/15 slow motion playback. It also, has the capability of displaying still frame for any length of time.

Marine Sesmic Systems Test (Continued)

VIDEO DATA FORMAT

The impact data was recorded with a black and white video camera with a shutter speed of 1/500 of a second at 60 frames per second. The camera was placed 50 feet from the specimen. In the background there is a backboard with a syncronous motor attached to a clock face. This motor rotates at 600 rpm. The backboard also has lines, horizontally and vertically, that are six inches apart. When provided, a wide angle color shot of the impact data will precede the black and white impact data. Each impact is numbered with a piece of paper taped to the target itself. The above data was placed on a video cassette recorder VHS type.

TEST DATA

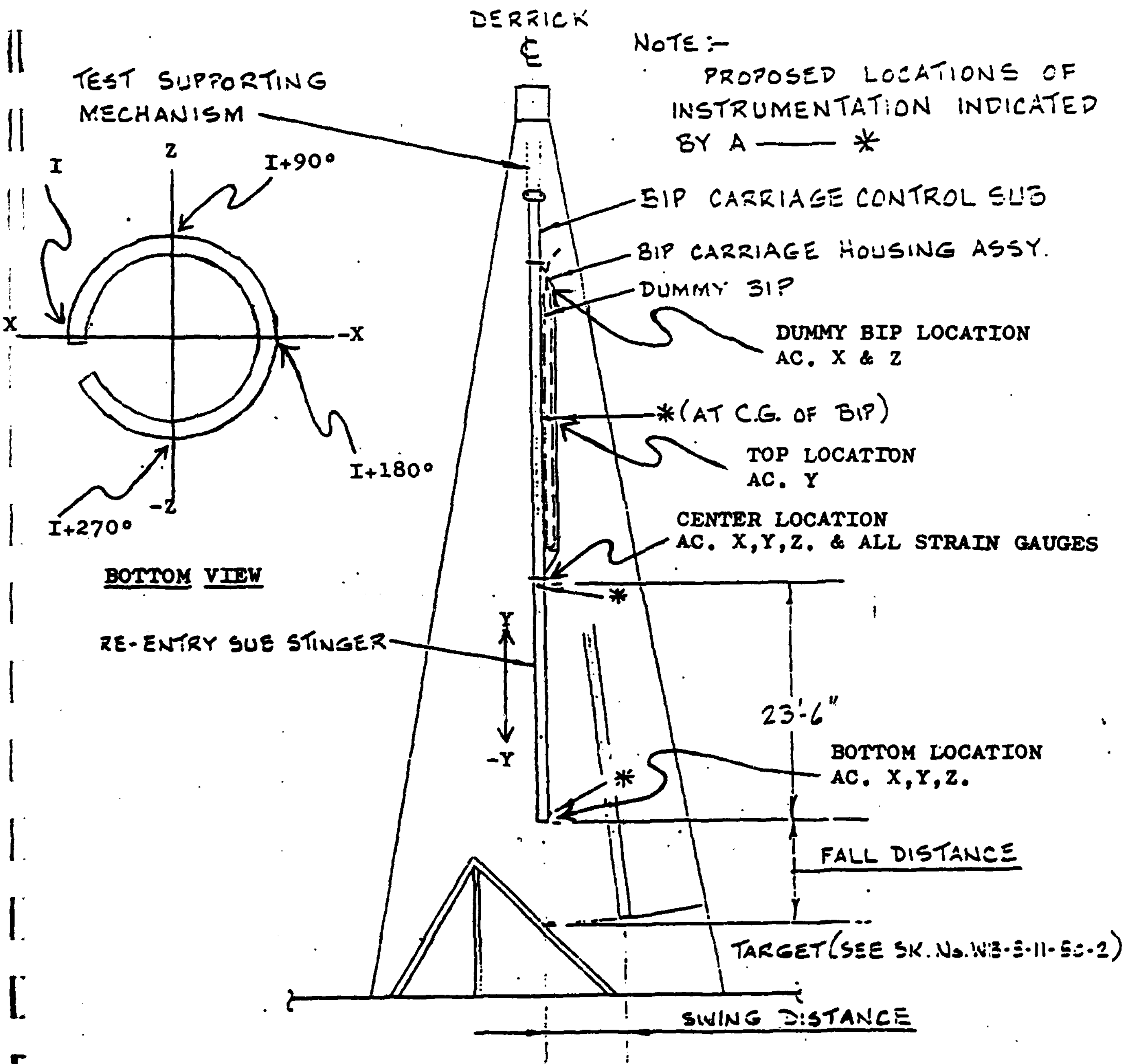
The data supplied with this report includes the records from the recording oscillograph, a video tape and a reduced data sheet for strain and acceleration measurements, a reduced data sheet for swing impact velocity obtained from the video tape. The reduced data sheets contain a single reading from each of the data channels. The maximum of each channel is shown as well as the time from impact to the maximum. A sketch is included showing the various transducer locations and axis.

UNITED FABRICATORS

VIDEO TAPE REDUCED DATA

Event No.	VELOCITY AT IMPACT (FPS)	DROP HEIGHT (Inches)
1	Indeterminate	1
2	Indeterminate	3
3	Indeterminate	7
4	5	12
5	6	19

Event No.	(FPS)	HORIZONTAL DISTANCE FROM TARGET (FT)
6	.53	12
7	1.15	28
8	1.50	40
9	1.76	52
10	2.72	64



MARINE SEISMIC SYSTEM (MSS)

TEST SET-UP.

UNITED FABRICATORS
JANUARY 22, 1981

Meas#	EVENT #1		EVENT #2		EVENT #3		EVENT #4		EVENT #5		EVENT #6		EVENT #7		EVENT #8		EVENT #9		EVENT
	Gs	T	G		G	T	G	T	G	T	G	T	G	T	G	T	G	T	G
AC.DZ	1.7	.43	2.8	5.1	-3.7	1.2	-2.5	1.1	5.0	.47	0	0	0	0	1.7	.32	1.7	.31	3
AC.TY	2.0	.08	2.8	.19	3.3	.36	2.8	.26	3.3	.18	0	0	0	0	0	0	0	0	0
AC.DX	-1.0	.07	-1.7	.52	8.3	1.2	0.5	1.1	5.8	1.0	0	0	0.8	.09	1.7	.09	1.7	.09	4.8
AC.CZ	0	0	0	0	-1.7	.81	1.0	.08	-1.2	.1	0	0	0	0	-0.8	4.0	-1.0	.01	1.7
AC.CY	-2.0	.08	-2.5	.19	-3.0	.35	-2.5	.25	-3.3	.18	0	0	0	0	0	0	0	0	.83
AC.CX	0	0	0	0	-3.3	.81	1.7	.05	3.0	.12	0	0	0	0	-1.3	.02	-1.7	.01	2.2
AC.BZ	0	0	0	0	1.7	.81	1.7	.2	-2.5	.06	0	0	0	0	1.3	.6	1.7	.01	2.3
AC.BY	1.7	.14	3.3	.20	3.3	.38	2.5	.25	5.0	.19	0	0	0	0	1.3	.04	-15.	.04	1.7
AC.BX	4.2	.02	6.7	.02	6.3	.02	3.3	.05	10.	.02	1.5	.02	3.3	.03	4.6	.02	6.5	.01	8.3
	S	T	S	T	S	T	S	T	S	T	S	T	S	T	S	T	S	T	S
SG.BEN	-.50	.11	-.67	.10	-.90	.12	-1.0	.12	-1.3	.11	0	0	-.33	.11	-.33	.11	-.70	.12	-.87
SG.I	-.23	.11	-.33	.10	-.50	.1	-.40	.11	-.67	.11	0	0	.17	.11	1.7	.11	-.33	.11	-.37
SG.I+90°	0	0	0	0	0	0	.23	.10	.23	.10	0	0	0	0	0	0	0	0	.17
SG.I+180°	.50	.10	.67	.10	.83	.12	1.0	.12	1.0	.12	0	0	.33	.12	.33	.11	.67	.11	.67
SG.I+270°	0	0	0	0	-.50	.12	-.33	.10	.50	.10	0	0	0	0	0	0	-.30	.08	.33

T = Seconds (FOR PEAK CHARACTERISTICS) G = 1 Gravity S = In/In X 1000

AC = Accelerometer
B = Bottom Location
Ben = Bending
C = Center Location
D = Dummy Bip

I = Impact or +x Axis
SG = Strain Gage
T = Top Location
X,Y,Z = Axis

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323-9120

UNITED FABRICATORS SET-UP SHEET
January 22, 1981

Meas.	Location	Range F.S.	Sig. Con.	Tape Recorder R	Tape Recorder Ch	Xducer S/N	Cal. = 1.5 inch
AC.DZ		25 G	1	1	1	624	19.8K = 25 G
AC.TY		25 G	2	1	2	12102	19.0K = 25 G
AC.DX		25 G	3	1	3	627	19.8K = 25 G
AC.CZ		25 G	4	1	4	7536	19.5 = 25 G
AC.CY		25 G	5	1	5	7537	19.9 = 25 G
AC.CX		25 G	6	1	6	1560	19.9 = 25 G
AC.BZ		25 G	7	1	7	7614	19.9 = 25 G
AC.BY		25 G	8	2	1	7538	19.3 = 25 G
AC.BX		25 G	9	2	2	7535	19.7 = 25 G
SG.Ben		5000 Min/in	10	2	3		34.6 = 5000 Min/in
SGI		5000 Min/in	11	2	4		34.6 = 5000 Min/in
SGI+90		5000 Min/in	12	2	5		34.6 = 5000 Min/in
SGI+180		5000 Min/in	13	2	6		34.6 = 5000 Min/in
SGI+270		5000 Min/in	14	2	7		34.6 = 5000 Min/in

Blank trace on Recorder 2

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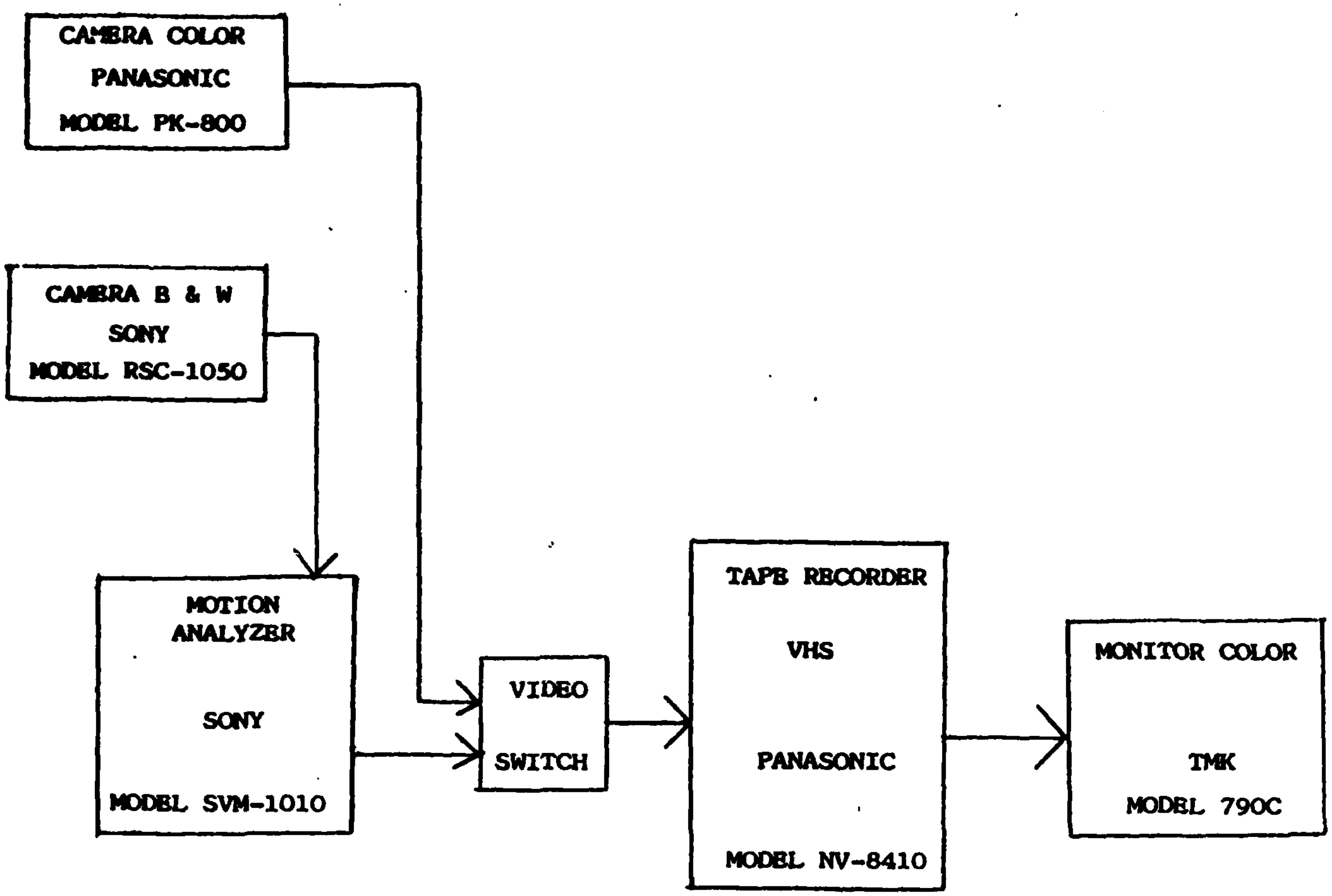
321-2320

MOTION ANALYZER SYSTEM



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321-2320

APPENDIX F

REENTRY SUB INSPECTION AND TEST

MSS REENTRY ASSEMBLY - FIT, RUNNING & FUNCTION TESTS

A) FIT TESTS - COMPONENT TO COMPONENT FIT-UP CHECKS:

ITEMS TO BE FIT	FIT UNIT#1	FIT UNIT#2	UNIT #1 vs UNIT #2	UNIT #2 vs UNIT #1
1) Baker Plugs vs Otis Tools	✓	✓	✓	✓
2) Baker Plugs vs Hyd Plug/Sonar Adap	✓	✓	✓	✓
3) Dummy Sonar Tool vs Hyd Plug/Sonar Adap	✓	✓	N/A	N/A
4) Hyd Plug/Sonar Adap vs Stingers	✓	✓	✓	✓
5) Hyd Plug/Sonar Adap vs Control Subs	✓	✓	HP/SA 1 NOT CHECKED W/CS2	✓

B) RUNNING TESTS - RAISE & LOWER COMPONENTS INSIDE ASSEMBLY:

ITEMS TO BE RUN IN ASSEMBLY	CLEAR UNIT#1	CLEAR UNIT#2	UNIT #1 vs UNIT #2	UNIT #2 vs UNIT #1
6) Sonar Tool Down then Up	✓	✓	N/A	N/A
7) Baker Plug & Otis Tool Down	✓	✓	✓	✓
8) Baker Plug & Otis Tool W/HP/SA Up	✓	✓	✓	✓

C) FUNCTION TESTS

TEST TO BE RUN	UNIT #1	UNIT #2
9) Pressure Test; HP/SA in Control Sub 3500 to 4000 psi	✓	✓
10) Hydraulic System Test	✓	✓
Shear - Uniform, Clean	✓	✓
Traverse - Smoothly, Evenly	✓	✓
Drop Gate - Correct Pressure	✓	✓

MSS REENTRY ASSEMBLY - CRITICAL DIMENSIONS

INSPECTED ITEM	DESIGN	UNIT #1	UNIT #2
E-001-A003: CARRIAGE CONTROL SUB			
1) LOWER BORE	8.877" / 8.880"	8.878"	8.879"
2) UPPER BORE	4.12 ±.03"	4.125"	4.125"
3) LOCK RING GROOVE DIA. (DEPTH)	9.258 ±.005" (0.190 ±.003")	(0.193)	(0.193)
4) BOX THREADS GO/NO-GO GAGE	6-5/8 FH	GAGED	GAGED
5) LONGITUDINAL CLEARANCE ABOVE LOCKING GROOVE - MINIMUM	6-3/4 (5-7/8)	6-1/16	6
D-001-A004: BIP CARRIAGE			
6) LONGITUDINAL EAR TO EAR	22'1"	22'1"	22'1"
E-001-A005: BIP CARRIAGE HOUSING			
7) LONGITUDINAL EAR SLOT TO EAR SLOT	22'1"	22'1-1/16"	22'1"
8) TOP & BOTTOM CONE OPENINGS	8.96 / 9.04 (9.00 / 9.10)	9.1"	9.1"
C-001-A006: LATERAL SHOCK RING			
9) RING ID	8-1/8"	8-1/8"	8-1/8"
10) RING OD	13-1/8"	13-1/8"	13-1/8"
D-001-A007: REENTRY TOOL STINGER			
11) LOWER BORE	8.53 / 8.50	8.52"	8.52"
12) CONCENTRICITY OF SECTIONS	TO CLEAR	✓	✓
E-001-A008: BIP CARRIAGE HOUSING ASSEM.			
13) CLEARANCE BEHIND CARRIAGE FOR HP/SA	TO CLEAR	✓	✓
D-001-A010: HYDRAULIC PLUG/SONAR ADAPTOR			
14) SNAP RING OD	9.25"	9.25"	9.25"
15) SNAP RING HEIGHT	0.75"	0.75"	0.75"
16) INSIDE PROFILE	TO FIT SONAR TOOL & BAKER	✓	✓
17) OUTSIDE PROFILE	TO FIT STINGER & CONTROL SUB	✓	✓

APPENDIX G

WEATHER SUMMARY

MSS-AT-SEA-TEST

WEATHER SUMMARY

DATE	TIME	HEADING	WIND		SEA		SWELL		ROLL	PITCH
			DIR.	MPH	FT.	SEC	FT.	SEC		
3/27	1200	135	airs		rippled		3	10	1	1
	1800	135	WNN	10	1	4	3	10	1	1
	2400	135	ENE	10	1	4	3	10	2	1
3/28	0600	090	ENE	20	3	4	3	10	3	2
	1200	125	E	18	3	4	3	10	4	2
	1800	110	E	20	3	4	3	10	2	2
	2400	100	ENE	18	3	4	3	10	4	2
3/29	0600	140	SSE	18	3	4	4	10	5	2
	0200	140	SSE	20	3	4	4	10	3	2
	1800	175	W	8	1	4	6	11	3	2
	2400	160	airs		---	---	6	11	2	1
3/30	0200	130	NE	13	2	4	6	11	4	2
	0600	155	N	10	1	4	5	11	2	2

APPENDIX H

AT-SEA-TEST CHRONOLOGY

STEP	DRILL STRING LENGTH	CABLE LENGTH (NOM.)	CABLE TENSION OBJ.	WINCH HYD PRESS	HC PRESS PSI	LOAD CELL LBS	DRILL PIPE TRIPLES	TIME	REMARKS
								3/27/81 0200	START
3.2	-0-	200 +	slack		220 / 0	-0-	---	0400	Did not raise HC
3.3	-0-	200 +	slack		-0-	-0-	---	0800	
3.4	-0-	200 +	slack		-0-	-0-	---		
3.5	-0-	200 +	slack		-0-	-0-	---		
3.6	-0-	200 +	slack		-0-	-0-	---	0930	
3.7	68	200 +	slack		-0-	-0-	---		
3.8	165 / 158	~100	taut		220	-0-	---	1000	
3.9	165 / 158	~100	taut		220	~200 / 210	---	1130	2 ft HC ext.
	535	440	500		450	800	4		

STEP	DRILL STRING LENGTH	CABLE LENGTH (NOM.)	CABLE TENSION OBJ.	WINCH - HYD PRESS	HC PRESS PSI	LOAD CELL LBS	DRILL PIPE TRIPLES	TIME	REMARKS
	995	887/911			300	450	9		
3.9 (Cont'd)	1001	920	2000		450	3300	9		
	995	1944/2000			410	3000	9	1200	
	2015	1935	3000		570	5100	20		
	3033	2953	3000		570	5100	31		
	3041	2570/2650			570	5400	31	0300	
	3958 3971	3878 3727/3836	4000		670 540	7000 200	41 41	1320	± 500 lbs load cell
	4975 4994	4895 4699/4837	4000		670 610	7000 6500	52 52	1345	
	5993 6017	5913 5683/5854	4000		670 650	7000 6800	63 63	1410	
	7010 7040	6930 6657/6858	5000		780 690	8700 7300	74 74	1435	± 400 lbs load cell
	8028 8063	7948 7633/7864	5000		780 620	8700 7000	85 85	1500	
	9045 9086	8965 8613/8823	5000		780 620	8700 7300	96 96	1523	

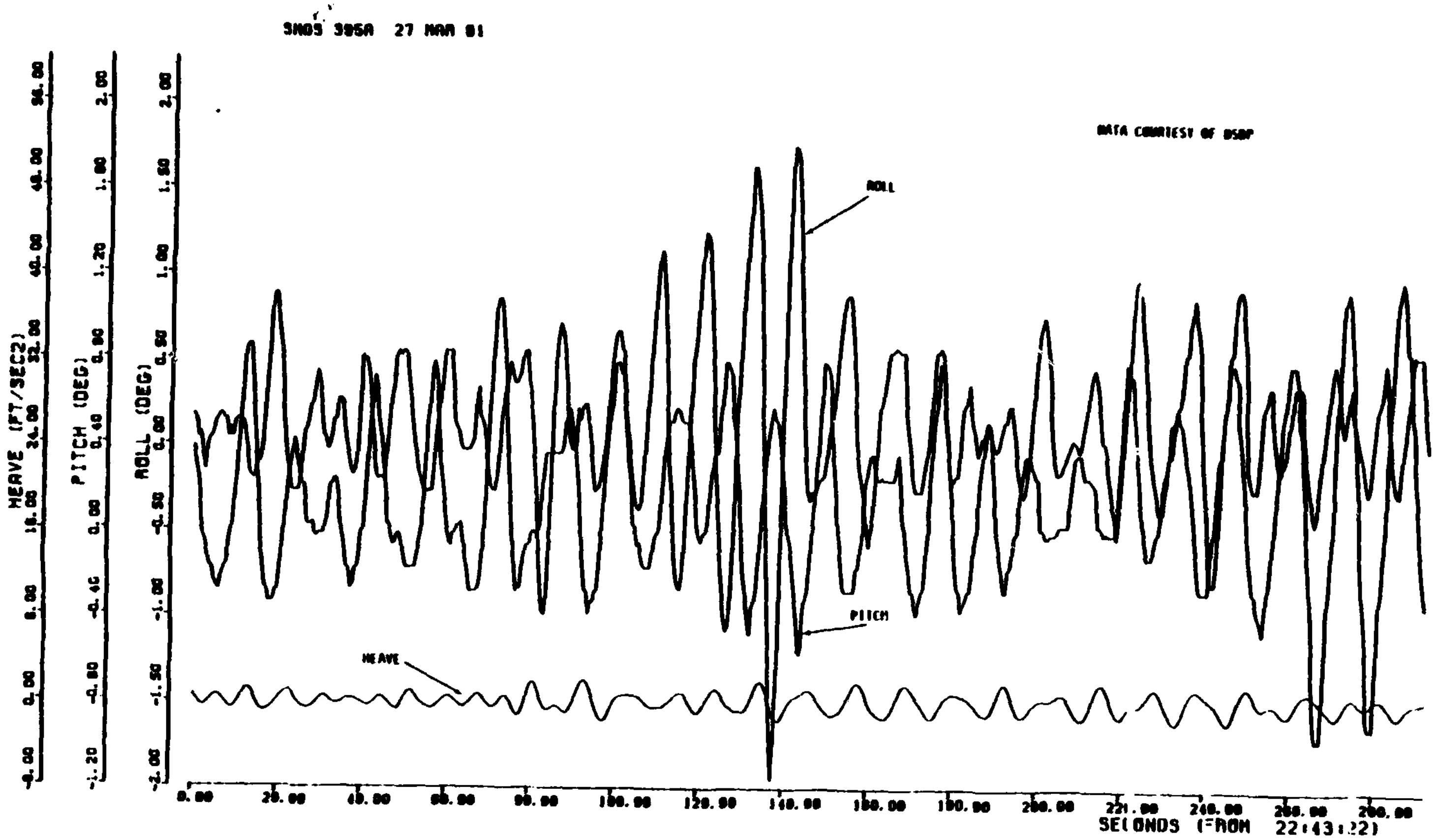
STEP	DRILL STRING LENGTH	CABLE LENGTH (NOM.)	CABLE TENSION OBJ.	WINCH HYD PRESS	HC PRESS PSI	LOAD CELL LBS	DRILL PIPE TRIPLES	TIME	REMARKS
	10016	9501/9790			610	6300	106	1537	slight recal of digit:
3.9	9970	9890	6000		900	10600	106		HC calib.
(Cont'd)	10016	9690/9990			750	8900	106	1550	
	10988	10908	6000		900	10600	117		
	11039	10506/10869			800	10000	117	1620	
	12005	11925	6000		900	10600	128		
	12062	11346/11845			845	10200	128	1646	
	12248	11608/11963			890	10400	130	1656	
	13023	12943	7000		1020	12400	141		
	13271	12594/12981			875	11000	141	1812	
	14040	13960	7000		1020	12400	150		
	14139	14148/14813					150+1/3	1830	calib. HC-Reset count
		14601/14603						1835	Reset sea Mac
	14668	14588	8000		1110	14200	157*		
	14640	14598/14599				12400	156+1/3	1959	56 ft above rig floor
	14640	14603/14604			865	11400	156+1/3	2072	
4.1	14728	14643	7000		1020	12400	158*		60 foot stab
	14696	14657/14660			750	10000	156+1/3		payout 54/56 feet
	14696	14699/14700			845	11500	156+1/3	2357	STAB - 56 feet
5.1	14728	14643	8000		1110	14200	158*	3/28/81	Entanglement test
	14696	14686/14691			865	12000	156+1/3		
	14696	14686/14691			870	11800		0520	
	14728	14643	6000		900	10600	158*		release carriage
	14696	14686/14691					156 1/3	0620	

STEP	DRILL STRING LENGTH	CABLE LENGTH (NOM.)	CABLE TENSION OBJ.	WINCH HYD PRESS	HC PRESS PSI	LOAD CELL LBS	DRILL PIPE TRIPLES	TIME	REMARKS
5.2	14728	16643	7500		1050	13300	158*		lower 2000 ft slowly
	14696	16577/16640			860	11800	156 1/3	0624	
	14728	~16000	6500		950	11500	158*		lowering test at
									~1000 lbs
	14696	15774/15611			930		156 1/3	0630	~184 ft/sec
		16070/16125							
5.3	14638	16143	7800		1100	12400	157*		Raise BIP 500 feet,
	14603	16070/16125			925	12300	155 1/3	1910	raise drill string
	14603				940	12300	155 1/3	1930	90 ft, release gate
	14668	18000	6000		900	10600	157*		lower BIP to bottom
	14603	16576/16651			835	11400	155 1/3	2023	recover drill string
		16596/16672			750	9000		2028	900 ft of hole
		16596/16672			0	7700			remove HC
6.0		16596/16672				7700		2151	
		16894/18847				6500		2230	moved vessel to 3000
									ft off hole
								3/29/81	
		18694/18847				7160		0817	
		21015/21250				7000		0830	payout 2321 feet
7.0								3/30/81	
		21015/21250			670	7800		0000	± 1500 lbs
		16530/16600			---	12000		0215	BIP raising
		00762/10227			---	4250		0332	
									BIP alongside

DRILL STRING LENGTH - BASED ON 90 FOOT STANDS DEPLOYED
CABLE LENGTH - READ OFF TWO FOOTAGE LINE COUNTERS
CABLE TENSION - TEST CRITERIA
HC PRESSURE - INLET PRESSURE TO ACCUMULATOR
LOAD CELL - READS SHEAVE LOADING WHICH MUST BE CORRECTED TO CABLE LOADS

APPENDIX I

TYPICAL CHALLENGER SHIP MOTIONS



APPENDIX I TYPICAL GLOMAR CHALLENGER WAVE RESPONSE

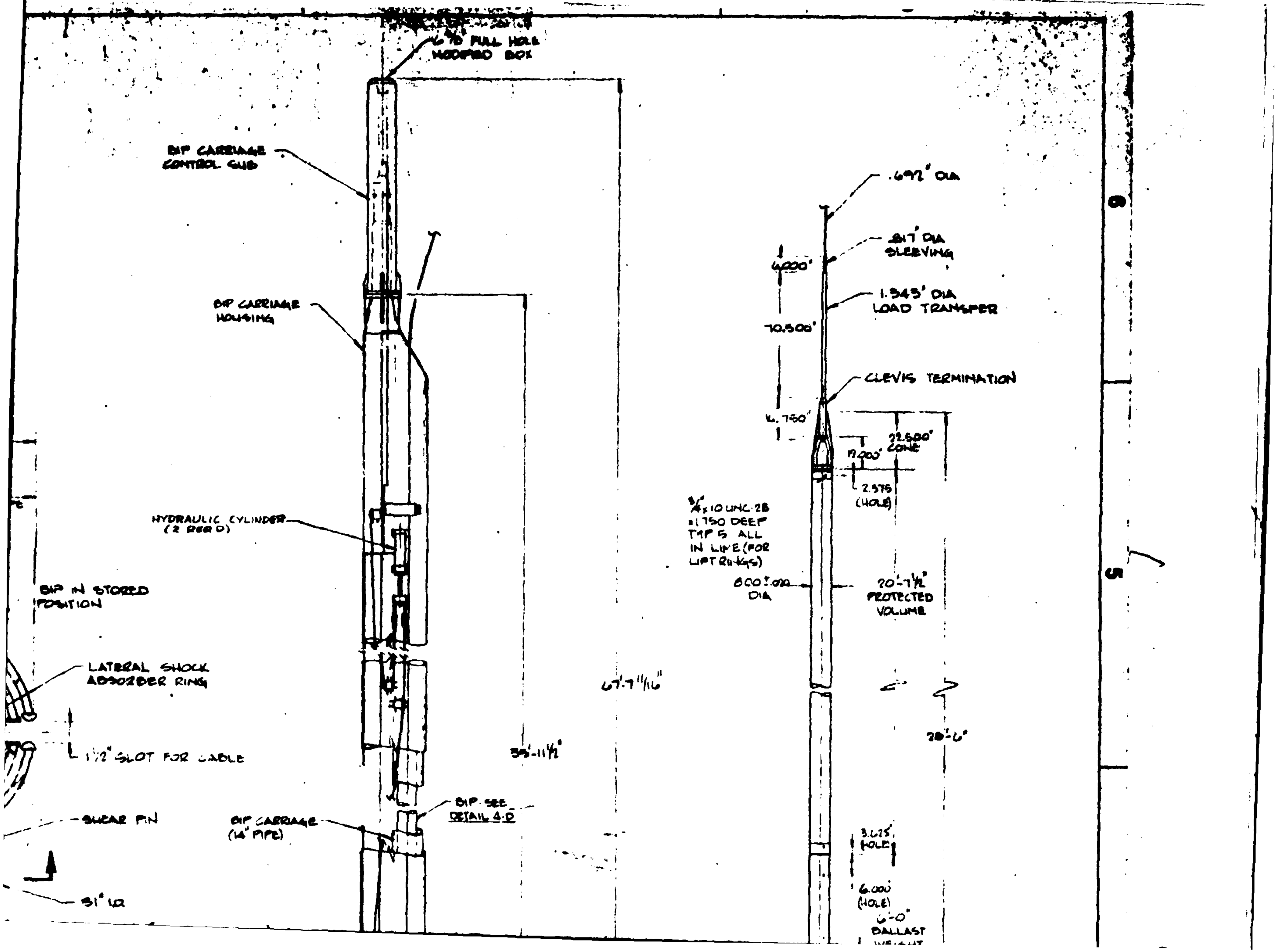
APPENDIX J

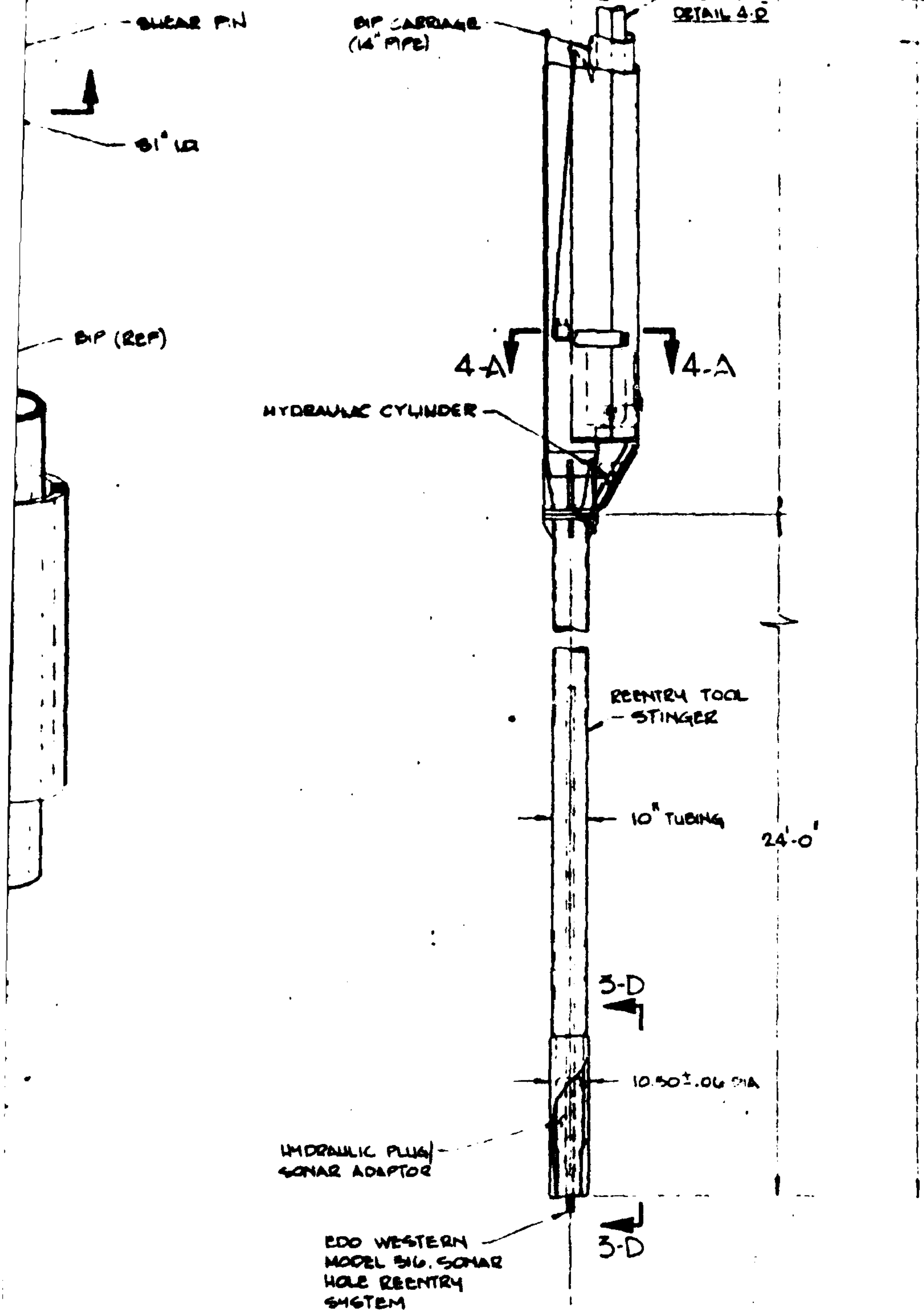
AT-SEA-TEST DRAWINGS

APPENDIX J

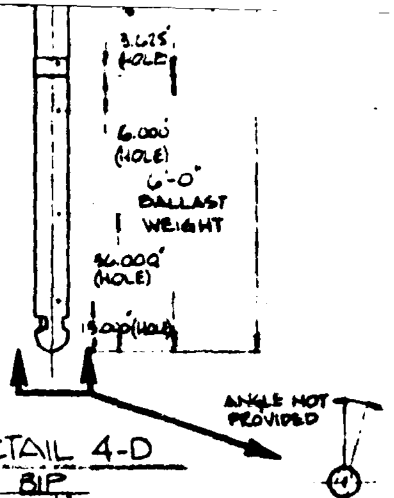
DRAWING LIST

E-001-A001	BIP Reentry Sub W/Stinger Control Dwg. Alt 2
E-001-A002	Reentry Assy Control Dwg. Alt 3
E-001-A003	BIP Carriage Control Sub Details & Assy Alt 1
D-001-A004	BIP Carriage Assy & Details Alt 1
E-001-A005	BIP Carriage Housing Assy & Details Alt 2
C-001-A006	Lateral Shock Absorber Ring Detail Alt 2
D-001-A007	Reentry Tool Stinger Assy Details Alt 2
E-001-A008	BIP Carriage Housing Main Assy Alt 2
E-001-A009	BIP Reentry Tool Assy Alt 1
D-001-A010	Hydraulic Plug/Sonar Adaptor Details Alt 2
E-001-A013	Marine Seismic System EM Cable Protector Details & Assy Alt 1
E-001-A014	MSS EM Cable Protector Installation Arrangement Alt 1
E-001-A018	MSS Heave Compensator Control Board, Details & Assy Alt 1
E-001-A020	MSS Instrumentation & Controls Installation Alt 2
E-001-P001	MSS Heave Compensator Piping Diagram Alt 0
E-001-A022	MSS A-Frame Details & Assy Alt 1
E-001-A023	MSS A-Frame Support to Sub Base Details & Assy Alt 1
E-001-A024	MSS A-Frame Support to Casing Rack Details Alt 1
E-001-A025	MSS Winch Foundation Details & Arrangement Alt 0
E-001-A028	MSS GLOMAR CHALLENGER Equip. Install. Arrangement Alt 0
E-001-A030	MSS Accumulator Supports Details & Assy. Alt 0
E-001-E001	MSS GLOMAR CHALLENGER Electrical Installation Alt 2
D-001-A031	MSS BIP Handling T-Bar Details Alt 0
E-001-A034	MSS TV Guide Frame Assy and Details Alt 0
D-001-A033	Slip Adaptor for Stinger Details Alt 0
D-001-A032	MSS Handling Tool for Stinger & Carriage Housing Details Alt 0
E-001-A026	Marine Seismic Sys Idler Sheave Support Details & Assy Alt 0
E-001-A027	Marine Seismic Sys Sheave Beam to Winch Assy & Install Alt 0
E-001-A029	Marine Seismic Sys Heave Compensator Bracket Mod. & Details Alt 0
D-001-A035	Marine Seismic Sys Running Fairleader Details Alt 1
D-001-A037	Marine Seismic Sys Dual Ship Entanglement Sys Assy Alt 0


6
5
6 5/8 FULL HOLE MODIFIED BOX
BIP CARRIAGE CONTROL SUB
BIP CARRIAGE HOUSING
HYDRAULIC CYLINDER (2 REQ'D)
BIP IN STORED POSITION
LATERAL SHOCK ABSORBER RING
1 1/2" SLOT FOR CABLE
SHEAR PIN
BIP CARRIAGE (14" PIPE)
BIP SEE DETAIL 4-D
31" ID
67'-7 11/16"
35'-11 1/2"
.692" DIA
.817" DIA SLEEVING
1.345" DIA LOAD TRANSFER
CLEVIS TERMINATION
4.000"
70.500"
6.750"
22.500" CONE
17.000"
2.375 (HOLE)
3/4 x 10 UNC-2B x1.750 DEEP TYP 5 ALL IN LINE (FOR LIFT RINGS)
8.000 ±.002 DIA
20'-7 1/2" PROTECTED VOLUME
28'-6"
3.625 HOLE
6.000 (HOLE)
6'-0" BALLAST



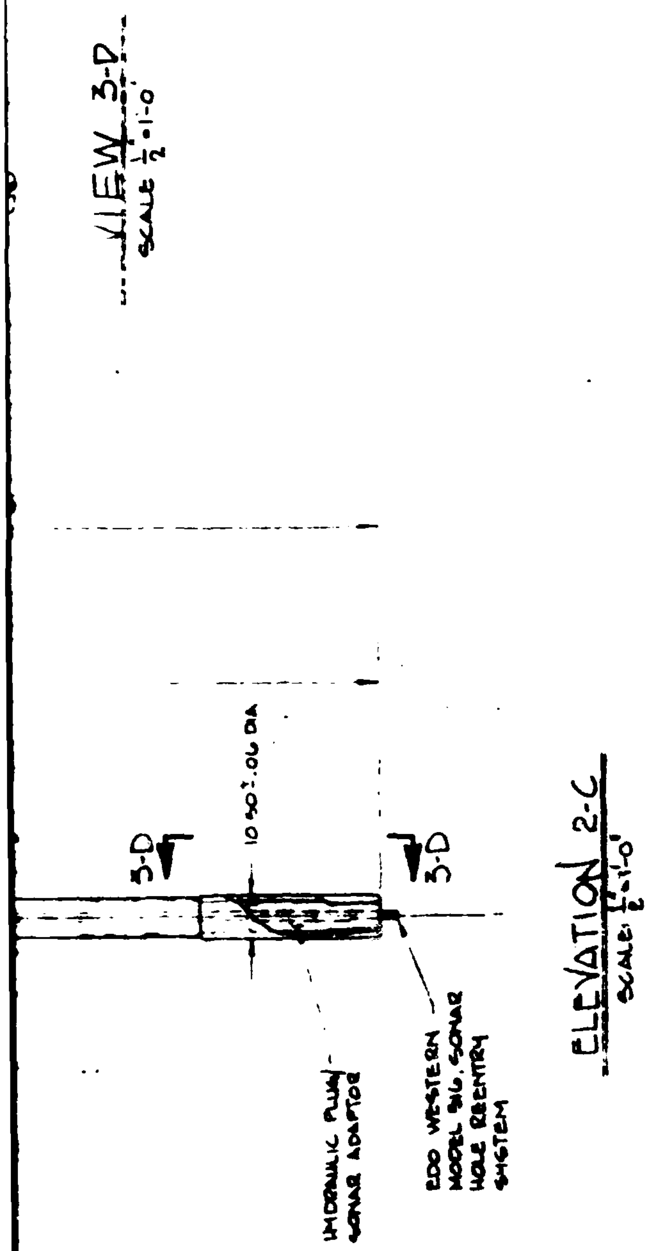
ELEVATION 2-C
SCALE: 1/2"=1'-0"



DETAIL 4-D
BIP
SCALE: 1/2"=1'-0"

VIEW 3-D
SCALE 1/2"=1'-0"

LIST OF MATERIALS

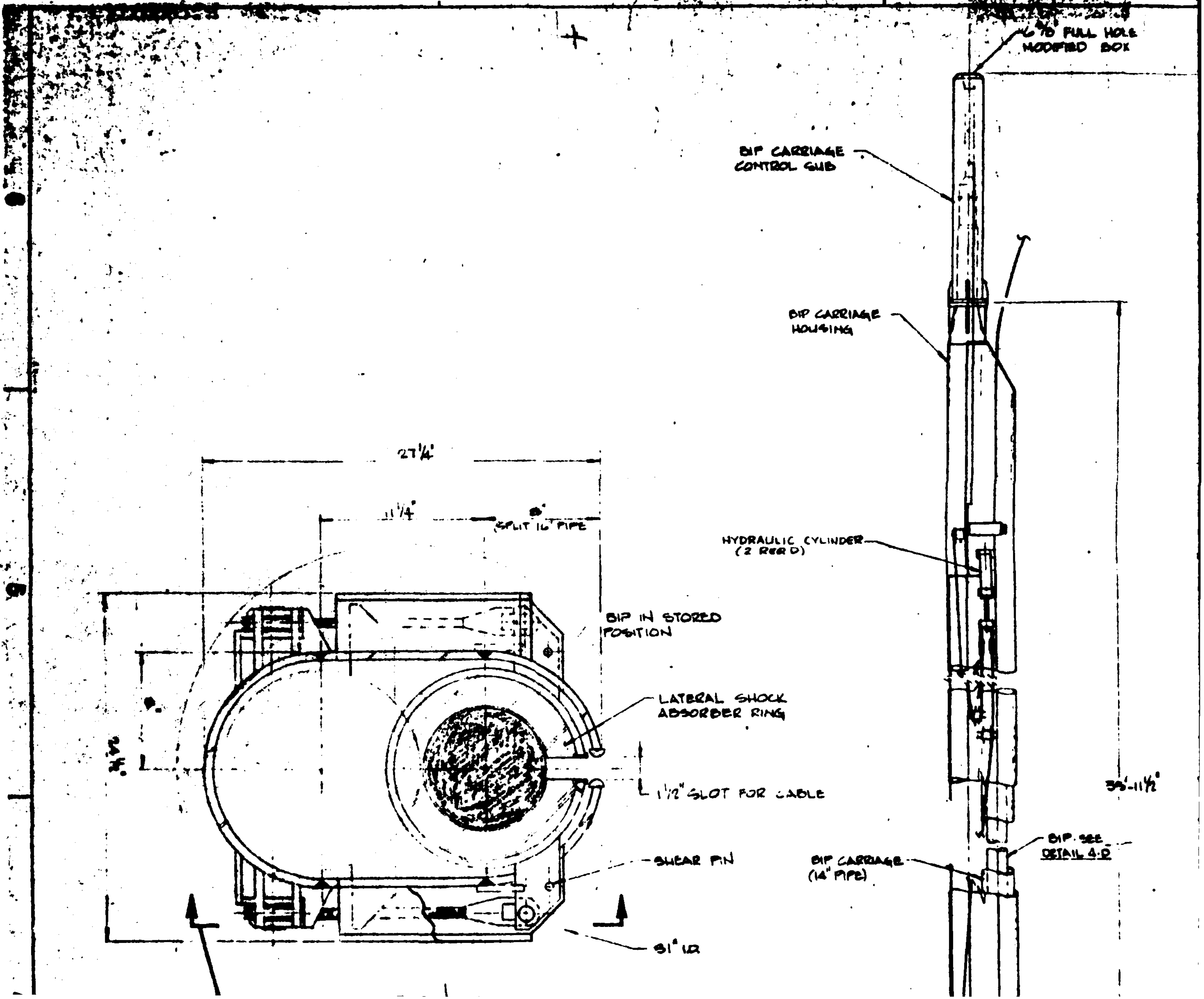


REFERENCE DRAWINGS:

1. E-001-A009 MARINE SEISMIC SYSTEM/[illegible]
BIP RE-ENTRY TOOL [illegible]

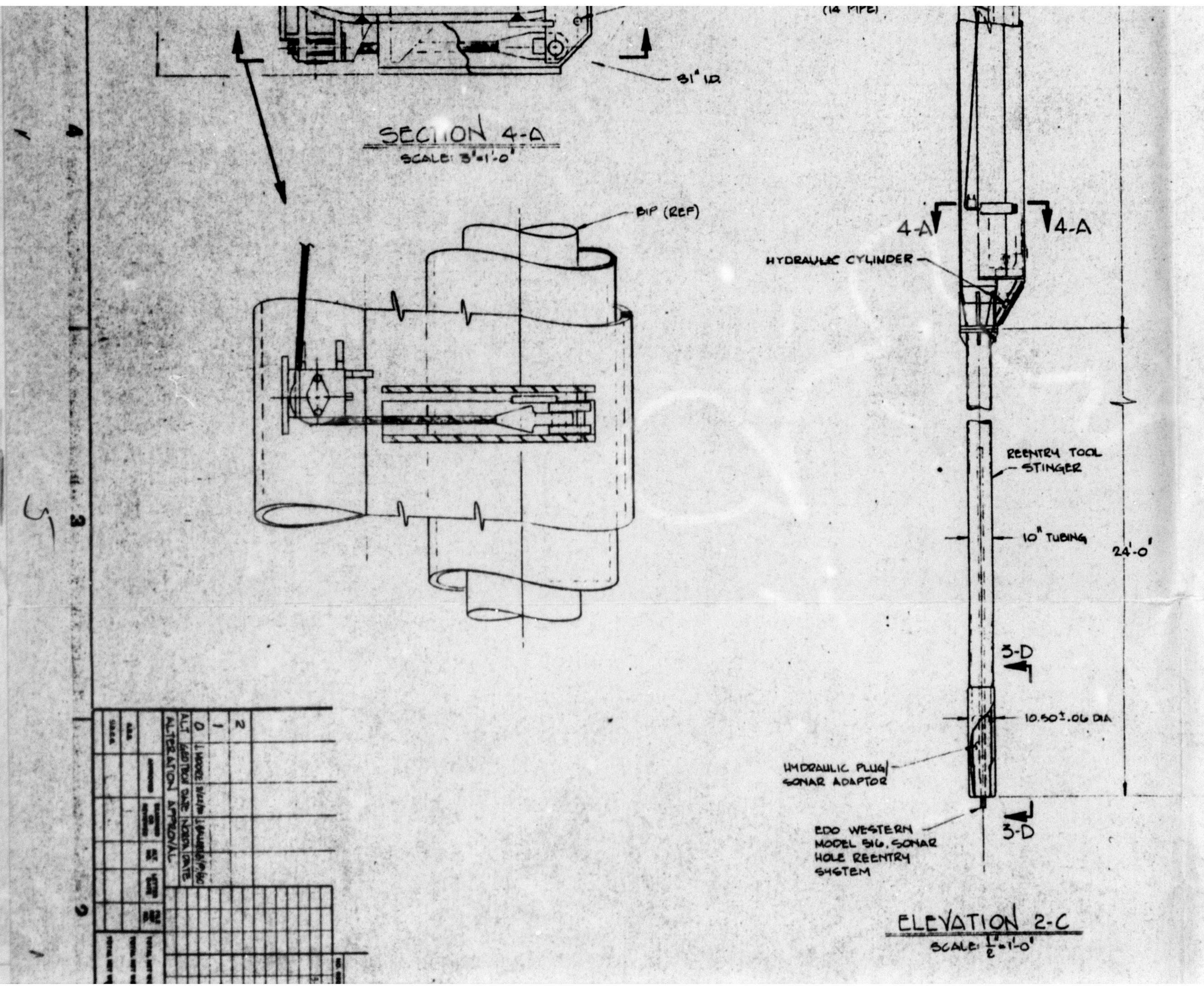
TELEDYNE GEOTECH DRAWINGS

2. 990-55100 BIP
3. 990-55100-0101 BIP LAYOUT

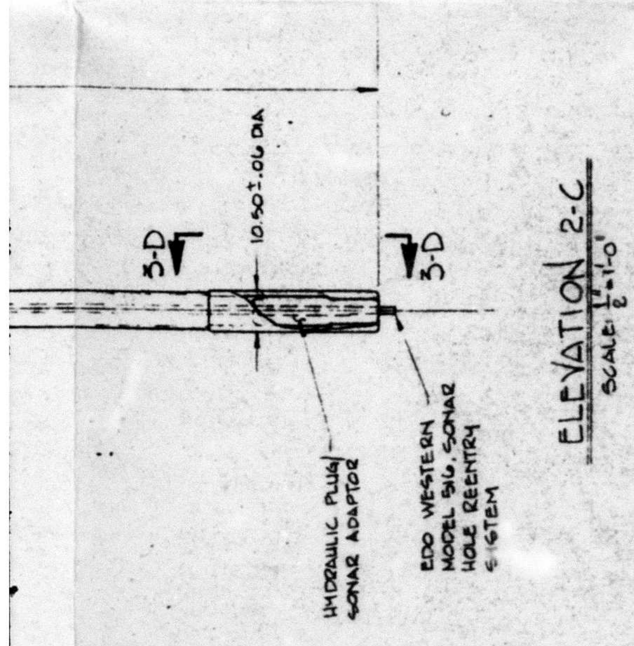


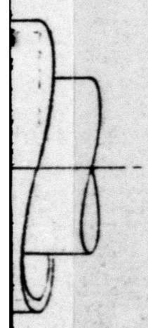
6 5/8 FULL HOLE MODIFIED BOX
BIP CARRIAGE CONTROL SUB
BIP CARRIAGE HOUSING
HYDRAULIC CYLINDER (2 REQ'D)
BIP SEE DETAIL 4-D
BIP CARRIAGE (14" PIPE)
35'-11 1/2"
27 1/4"
11 1/4"
8"
SPLIT 16" PIPE
BIP IN STORED POSITION
LATERAL SHOCK ABSORBER RING
1 1/2" SLOT FOR CABLE
SHEAR PIN
31" ID
24 1/2"

4



31" I.D.
SECTION 4-A
SCALE: 3"=1'-0"
BIP (REF)
4-A
HYDRAULIC CYLINDER
REENTRY TOOL STINGER
10" TUBING
24'-0"
3-D
10.50±.06 DIA
HYDRAULIC PLUG/ SONAR ADAPTOR
EDO WESTERN MODEL 516, SONAR HOLE REENTRY SYSTEM
ELEVATION 2-C
SCALE: 1/2"=1'-0"
ALTERATION APPROVAL
ALT
0
1
2
J. MOORE





REFERENCE DRAWINGS:

1. E-001-A009 MARINE SEISMIC SYSTEM (MSS) BIP RE-ENTRY TOOL ASSEMBLY

TELEDYNE GEOTECH DRAWINGS

2. 990-53100 BIP
3. 990-53100-0101 BIP LAYOUT

NO.	DATE	BY	DESCRIPTION	JOB AUTH.	APPR.
2	10-3-80		CHG. HYD. CYL. PLACEMENT, MOD. CABLE RUN & ADDED BIP PICK UP POINTS	006-285000	
1	9/17/80	NW	REVISED PER BID PACKAGE	001-210500	
0	8/6/80	NW	INITIAL RELEASE	001-210500	
B	7/29/80	NW	REDESIGNED & REDRAWN	00001-210500	
A	7/21/80	NW	PRELIMINARY RELEASE	00001-210500	

ALTERATIONS

NO. REQ'D.	NEXT ASSEMBLY
2	ALTERATION
3-5-81	DATE
	PURCHASING
	CONSTRUCTION
	ENGINEERING
	USGS
	ABS
10	CUSTOMER
1	WALLERSTEDT
1	DYE
1	BUCHANAN
1	MITCHELL
1	FRANHAM
2	LIBRARY

ALT	GEOTECH	DATE	NORDA	DATE
2				
1				
0	J. MOORE	11/6/80	J. BALLARD	10/7/80

ALTERATION APPROVAL

	APPROVED	EXAMINED OR REVIEWED	ALT. NO.	LETTER DATE	FILE REF NO.
A.B.S.					
U.S.G.S.					

TOTAL NET WGT. MAT'L. ______

TOTAL NET WGT. EQUIP. ______

TOTAL NET WEIGHT ______

GLOBAL MARINE DEVELOPMENT Inc.
Newport Beach, Calif.

MARINE SEISMIC SYSTEM (MSS)
BIP RE-ENTRY SUB WITH STINGER - CONTROL DRAWING

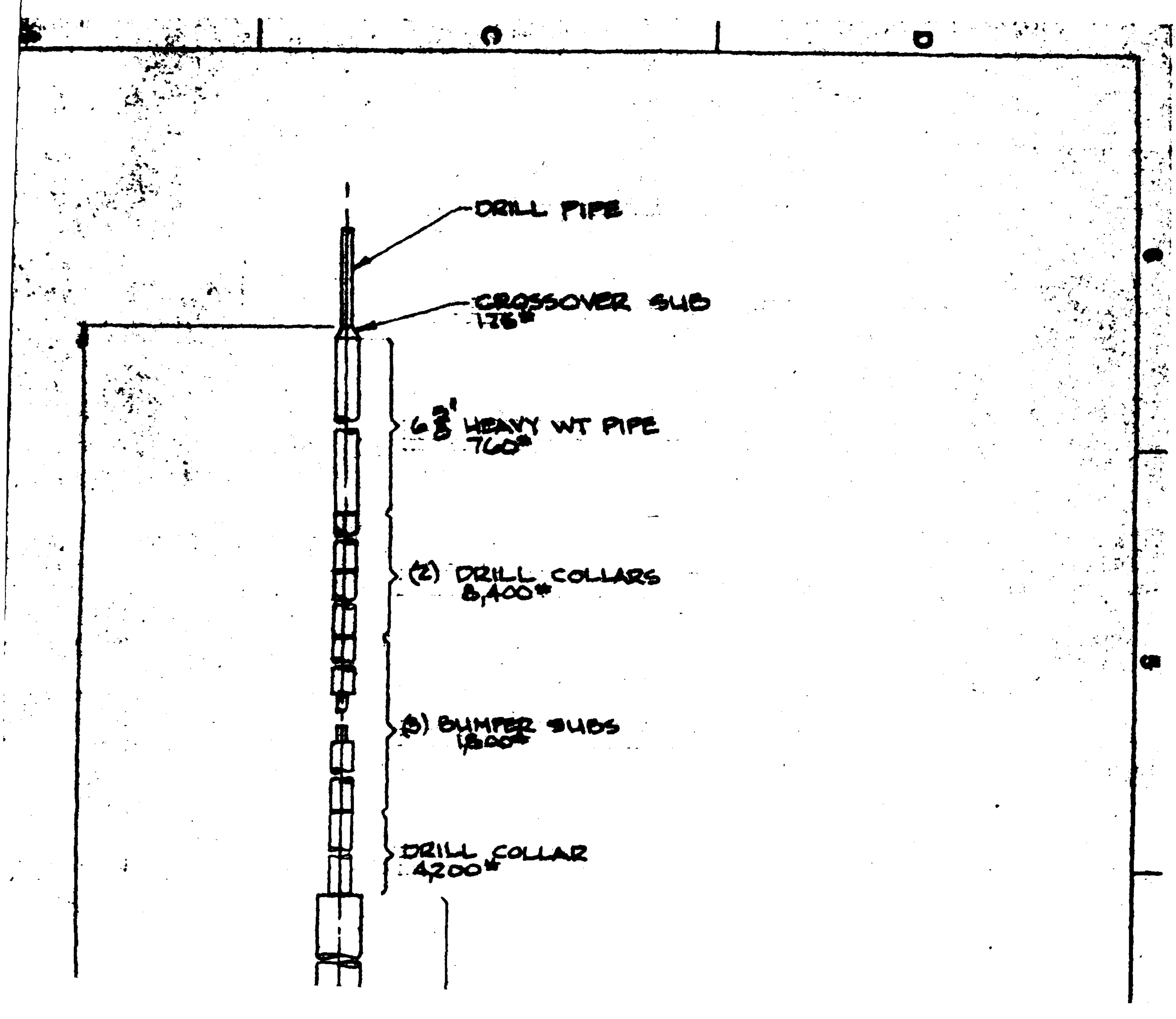
DFT. N.G. WAGNER	7/29/80	SCALE AS NOTED
CHK. [illegible]		JOB AUTH. 00001-210500
APPR. [illegible]		

DWG. NO. E • 001•A001 SHT. 1/1 ALT. 2

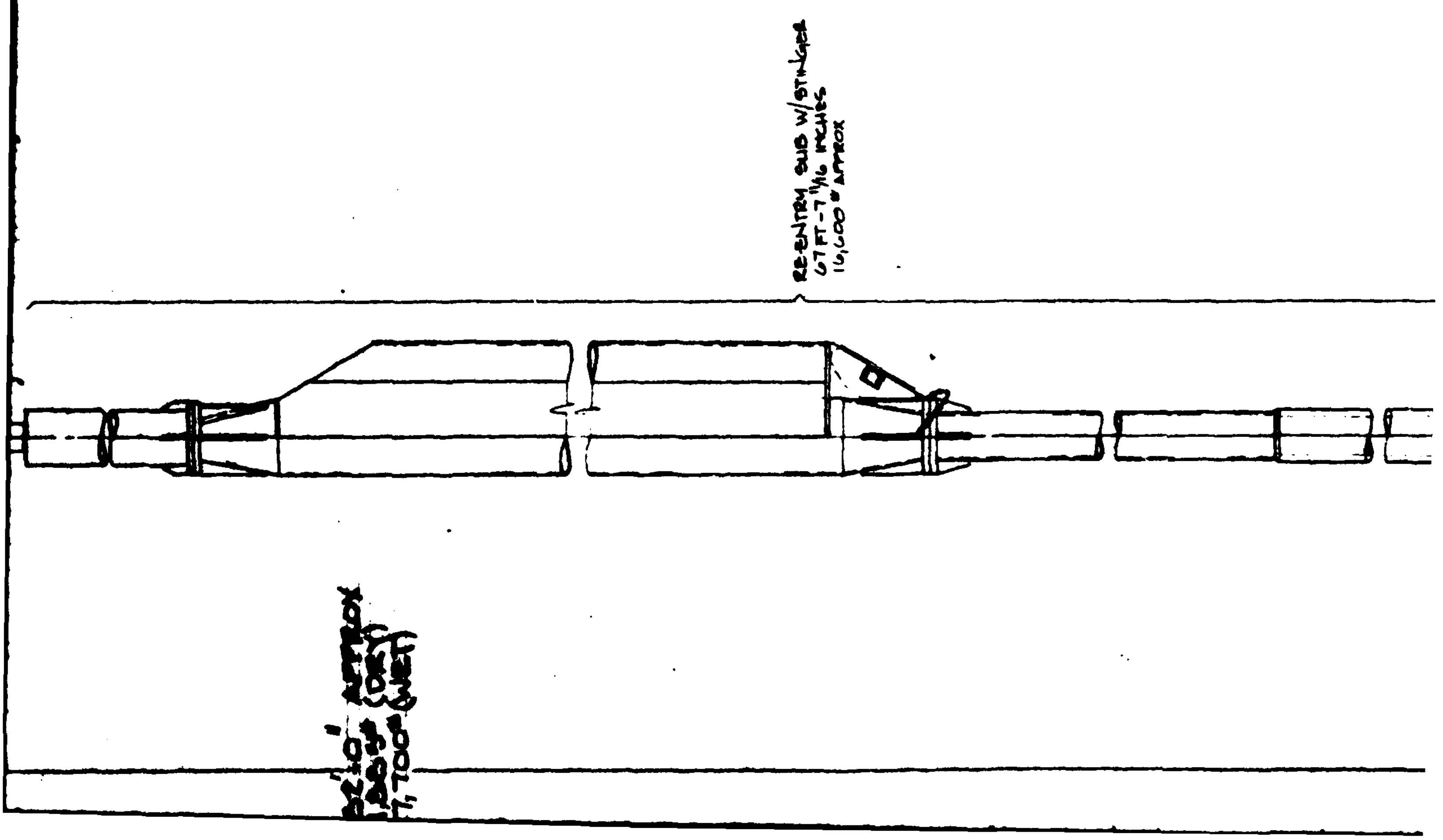
C B A

2 1

6


DRILL PIPE
CROSSOVER SUB
175#
6 5/8" HEAVY WT PIPE
760#
(2) DRILL COLLARS
8,400#
BUMPER SUBS
1,800#
DRILL COLLAR
4,200#

4 | 3 | 2


RE-ENTRY SUB W/STINGER
6 FT-7 11/16 INCHES
16,600 # APPROX
APPROX
(DRY)
(WET)

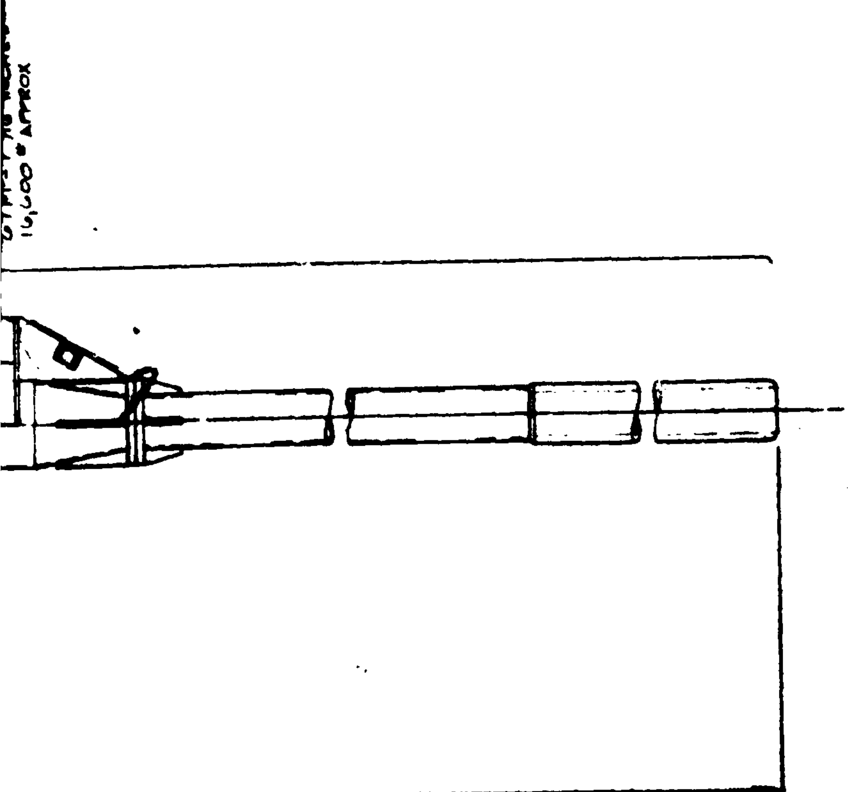
2 1 3b

2 1

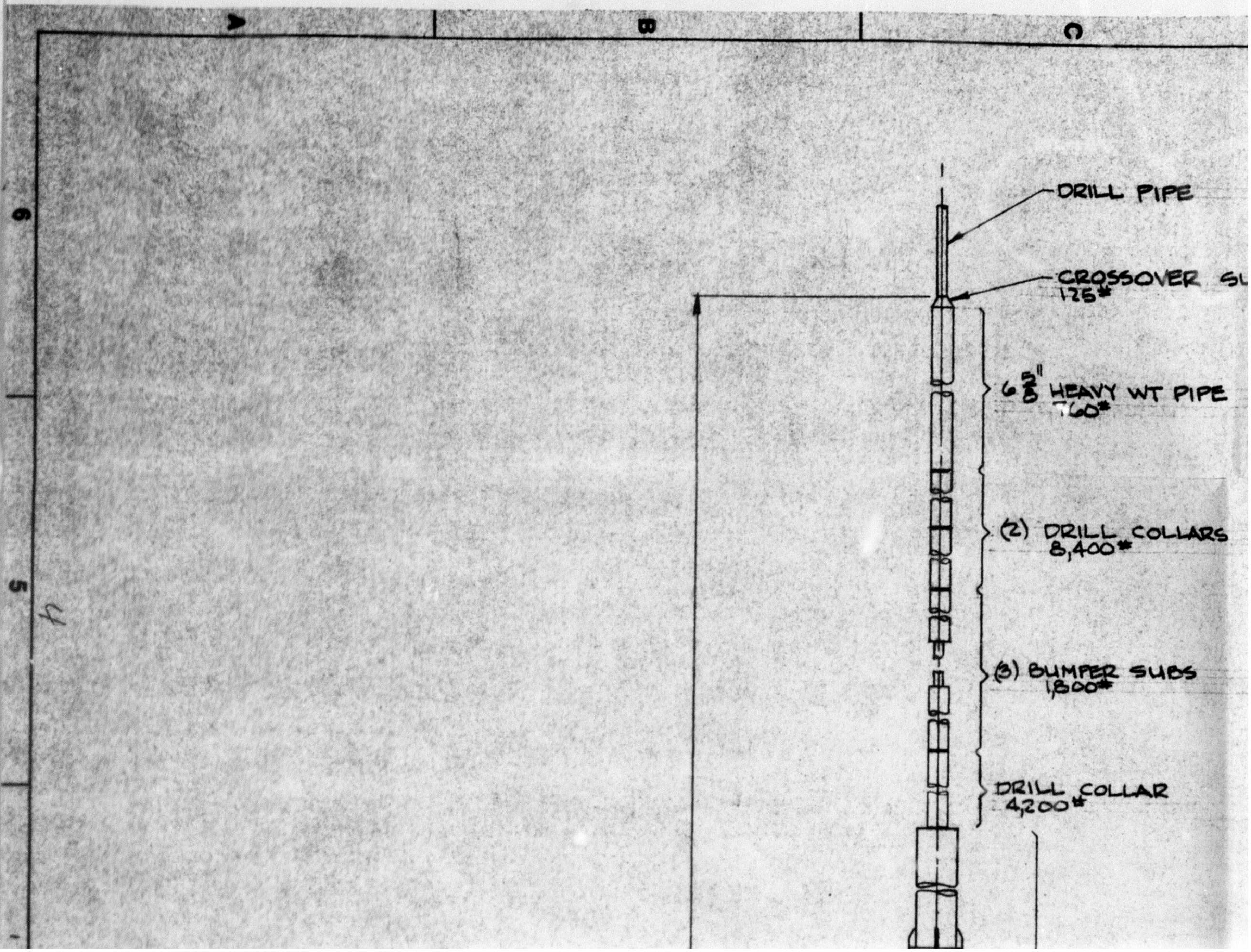
LIST OF MATERIALS

D

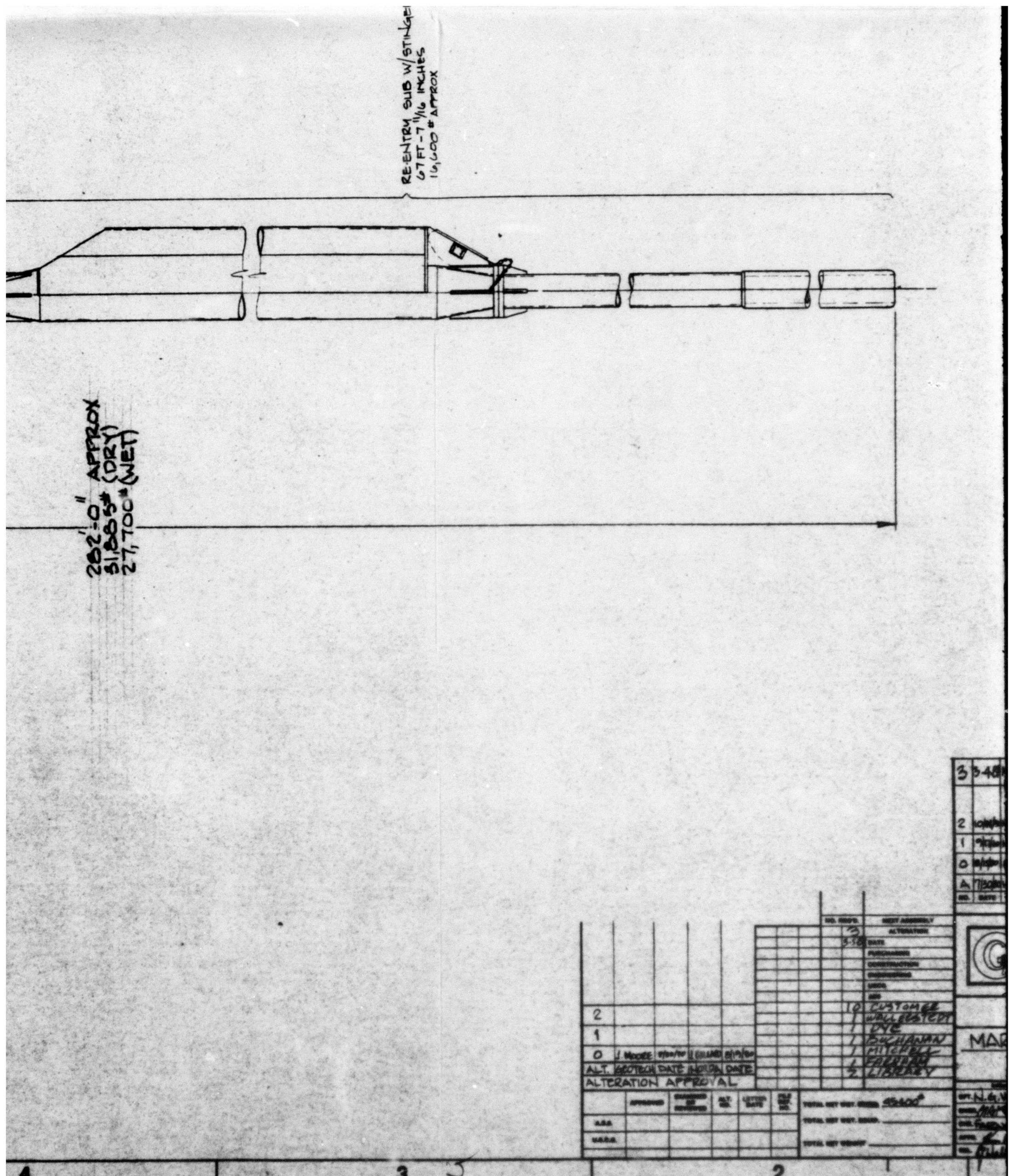
C

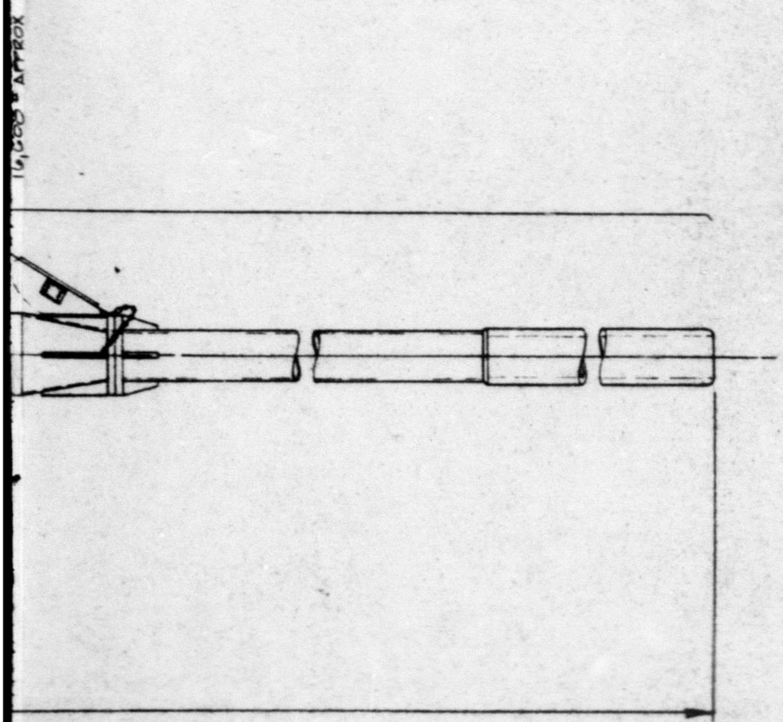


B



DRILL PIPE
CROSSOVER SU
125#
6 5/8" HEAVY WT PIPE
760#
(2) DRILL COLLARS
8,400#
(3) BUMPER SUBS
1,800#
DRILL COLLAR
4,200#
A
B
C
6
5
4


RE-ENTRY SUB W/STINGER
67 FT-7 11/16 INCHES
16,600 # APPROX
282'-0" APPROX
31,885# (DRY)
27,700# (WET)
ALTERATION APPROVAL
ALT. GEOTECH DATE HORDA DATE
CUSTOMER
WALLERSTEDT
DYE
BUCHANAN
MITCHELL
FARNHAM
LIBRARY
MAR
4
3
2



NO.	DATE	BY	DESCRIPTION	JOB AUTH.	APPD.
3	3-48	NW	REVISED BOTTOM HOLE ASSY	006-323000	
2	[illegible]	NW	DELETED HEAVY WT. D.P., ADDED LIGHT WT. D.C., CHG. BUMPER SUBS WAS 1 & CHG TOTAL WT.	006-325000	[illegible]
1	[illegible]	NW	REVISED PER BID PACKAGE	001-210500	RW
0	[illegible]	NW	INITIAL RELEASE	001-210500	[illegible]
A	7/30/80	NW	PRELIMINARY RELEASE	001-210500	

ALTERATIONS

GLOBAL MARINE DEVELOPMENT Inc.
Newport Beach, Calif.

MARINE SEISMIC SYSTEM (MSS)
RE-ENTRY ASSEMBLY
CONTROL DRAWING

NO. REQ'D.	NEXT ASSEMBLY
3	ALTERATION
3-48	DATE
	PURCHASING
	CONSTRUCTION
	ENGINEERING
	USCG
	ABS
10	CUSTOMER
1	WALLERSTEDT
1	DYE
1	BUCHANAN
1	MITCHELL
1	FARNHAM
2	LIBRARY

ALT.	GEOTECH	DATE	HORDN	DATE
2				
1				
0	J. MOORE	7/30/80	[illegible]	8/19/80

ALTERATION APPROVAL

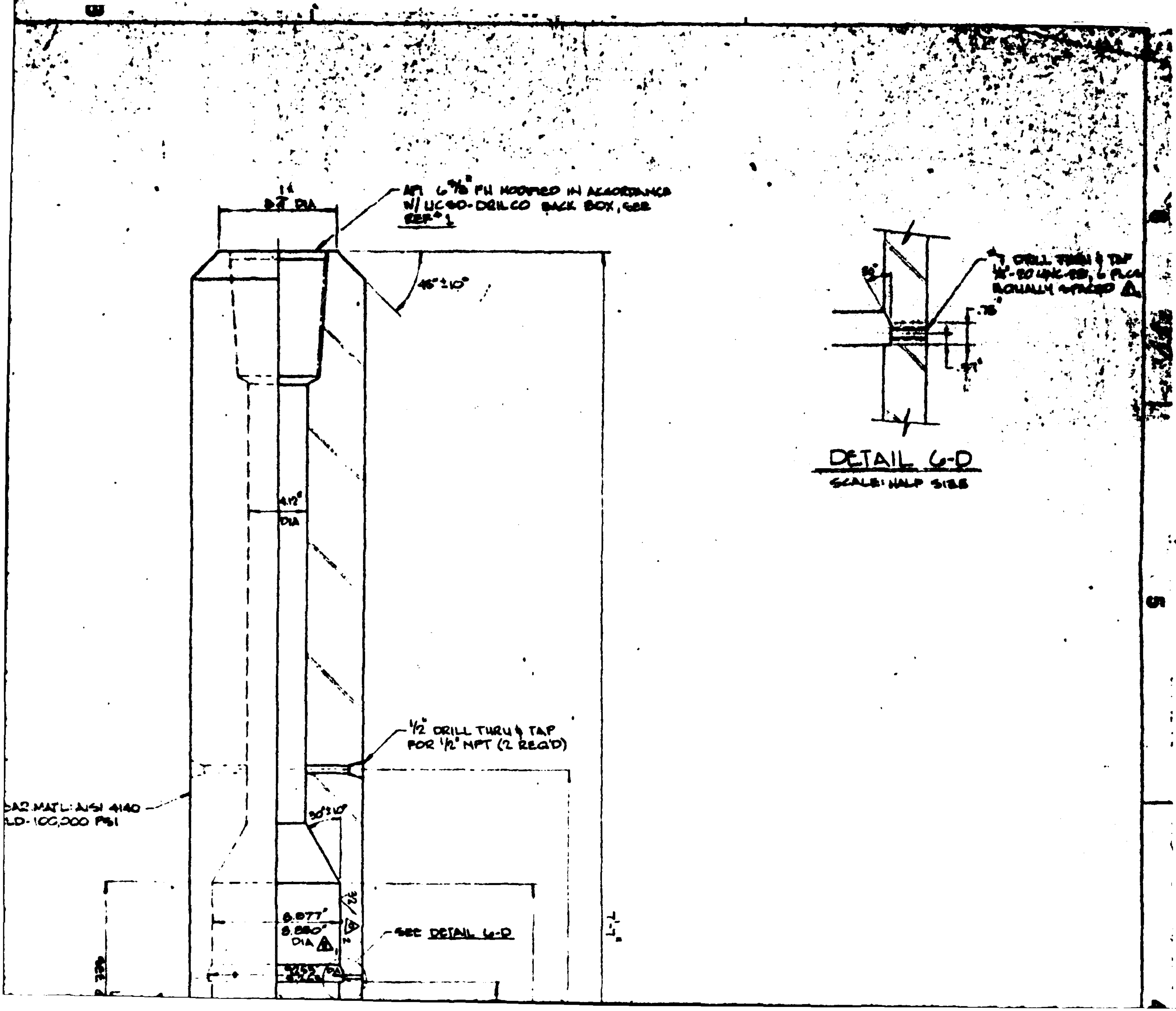
	APPROVED	SUBMITTED OR REVIEWED	ALT. NO.	LETTER DATE	FILE REF. NO.
A.B.S.					
U.S.C.G.					

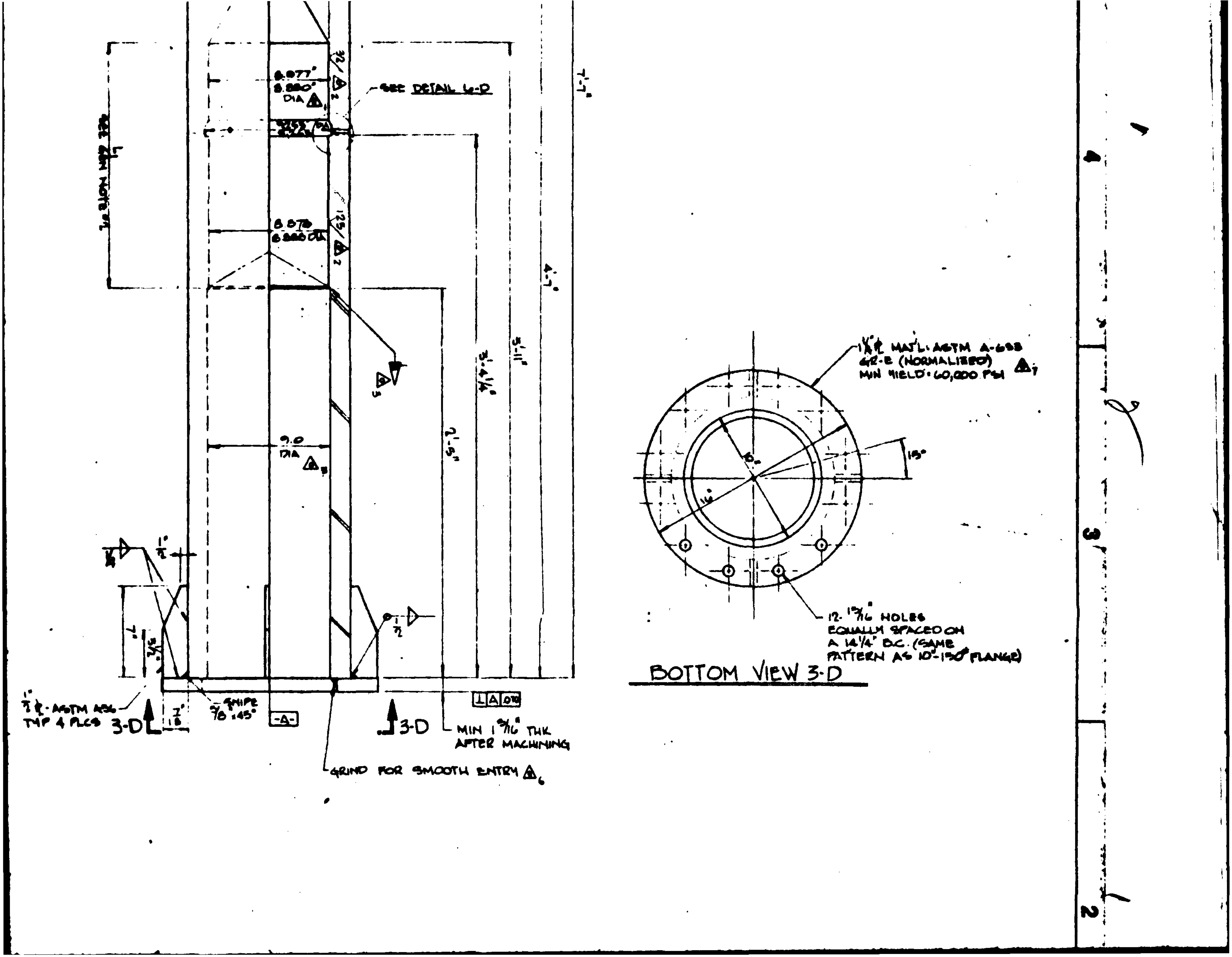
TOTAL NET WGT. REQD. 55,400#
TOTAL NET WGT. ROUND. ______
TOTAL NET WEIGHT ______

		DATE
DFT.	N. G. WAGNER	7/30/80
CHKD.	[illegible]	8/15/80
ENG.	FARNHAM	[illegible]
APPD.	[illegible]	[illegible]
	[illegible]	[illegible]

SCALE: NONE
JOB AUTH. 001-210500
DWG. NO. E 001 A002
SHT. 1 OF 1
ALT. 3

2 1

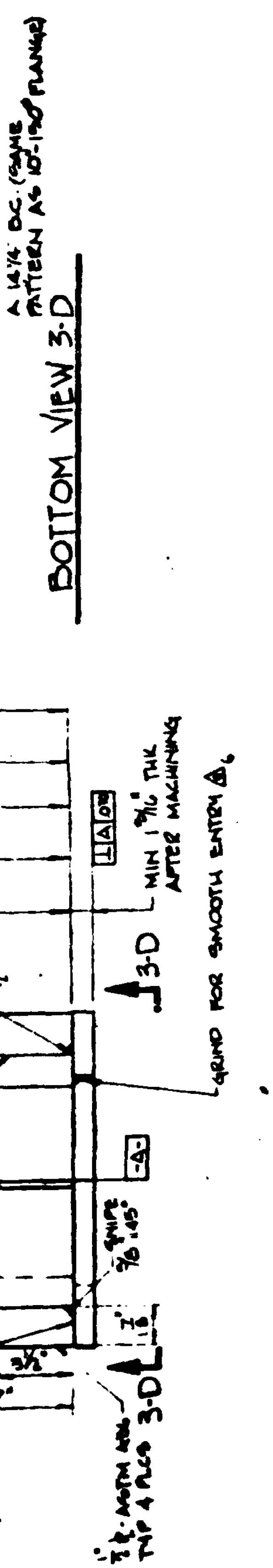

API 6 5/8" FH MODIFIED IN ACCORDANCE W/ UC80-DRILCO BACK BOX, SEE REF #1
45°±10°
4.12" DIA
1/2" DRILL THRU & TAP FOR 1/2" NPT (2 REQ'D)
30°±10°
8.877" 8.880" DIA
SEE DETAIL 6-D
7'-7"
BAR MAT'L: AISI 4140
YLD- 100,000 PSI
DETAIL 6-D
SCALE: HALF SIZE
30°
.75"



SEE DETAIL 6-D
SEE GEN NOTE #1
7'-7"
4'-7"
3'-11"
3'-4 1/4"
2'-5"
8.877" 8.880" DIA
8.878 8.880 DIA
9.0 DIA
1 1/2" ℞ MAT'L: ASTM A-633 GR-E (NORMALIZED) MIN YIELD: 60,000 PSI
12 - 1 3/16" HOLES EQUALLY SPACED ON A 14 1/4" B.C. (SAME PATTERN AS 10"-150# FLANGE)
15°
BOTTOM VIEW 3-D
1" ℞ - ASTM A36 TYP 4 PLCS
3-D
CHAMFER 5/8 x 45°
-A-
MIN 1 5/16" THK AFTER MACHINING
GRIND FOR SMOOTH ENTRY
7"
3 1/2"
4
3
2

2	1

LIST OF MATERIALS



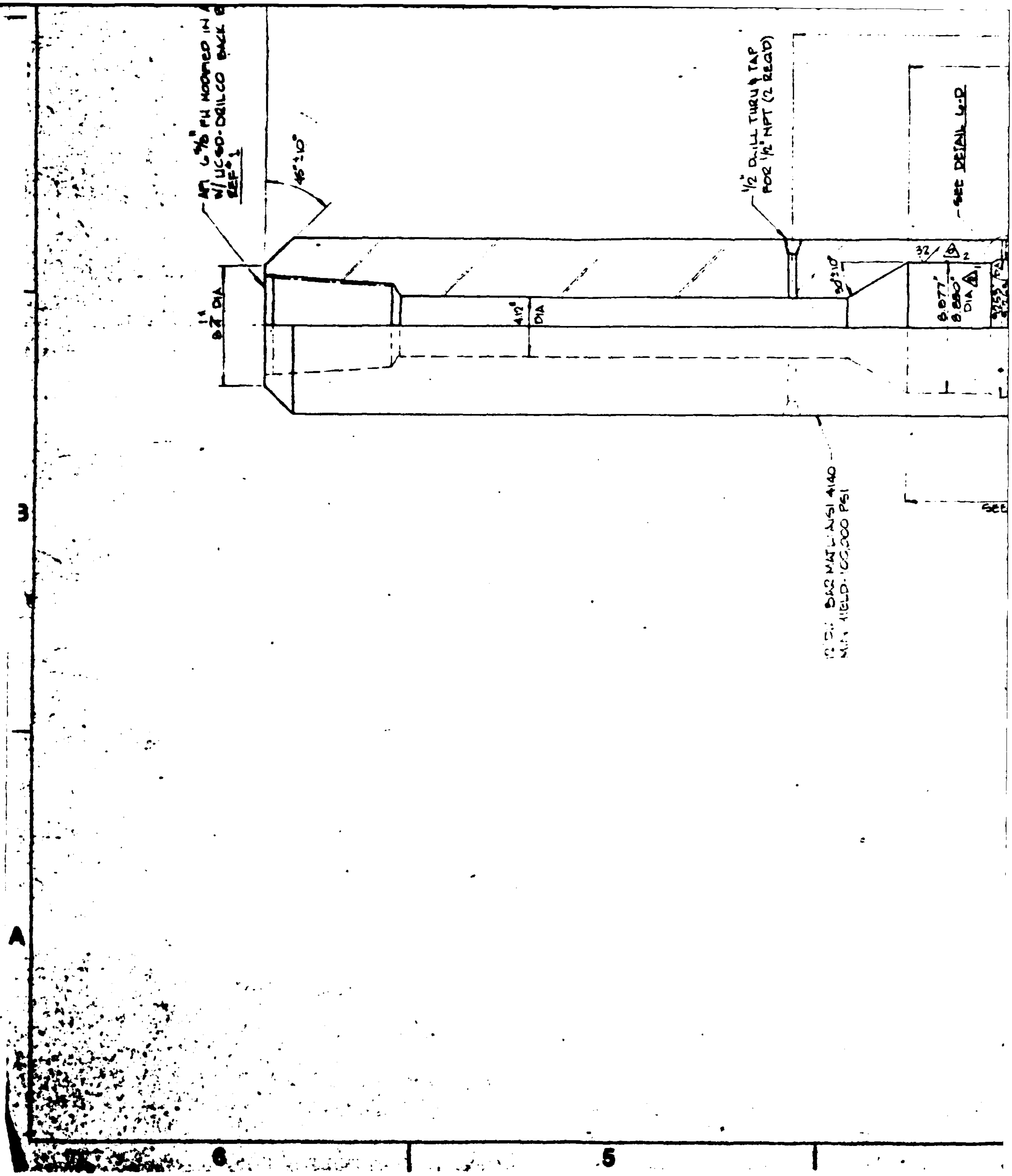
GENERAL NOTES: (UNLESS OTHERWISE NOTED)

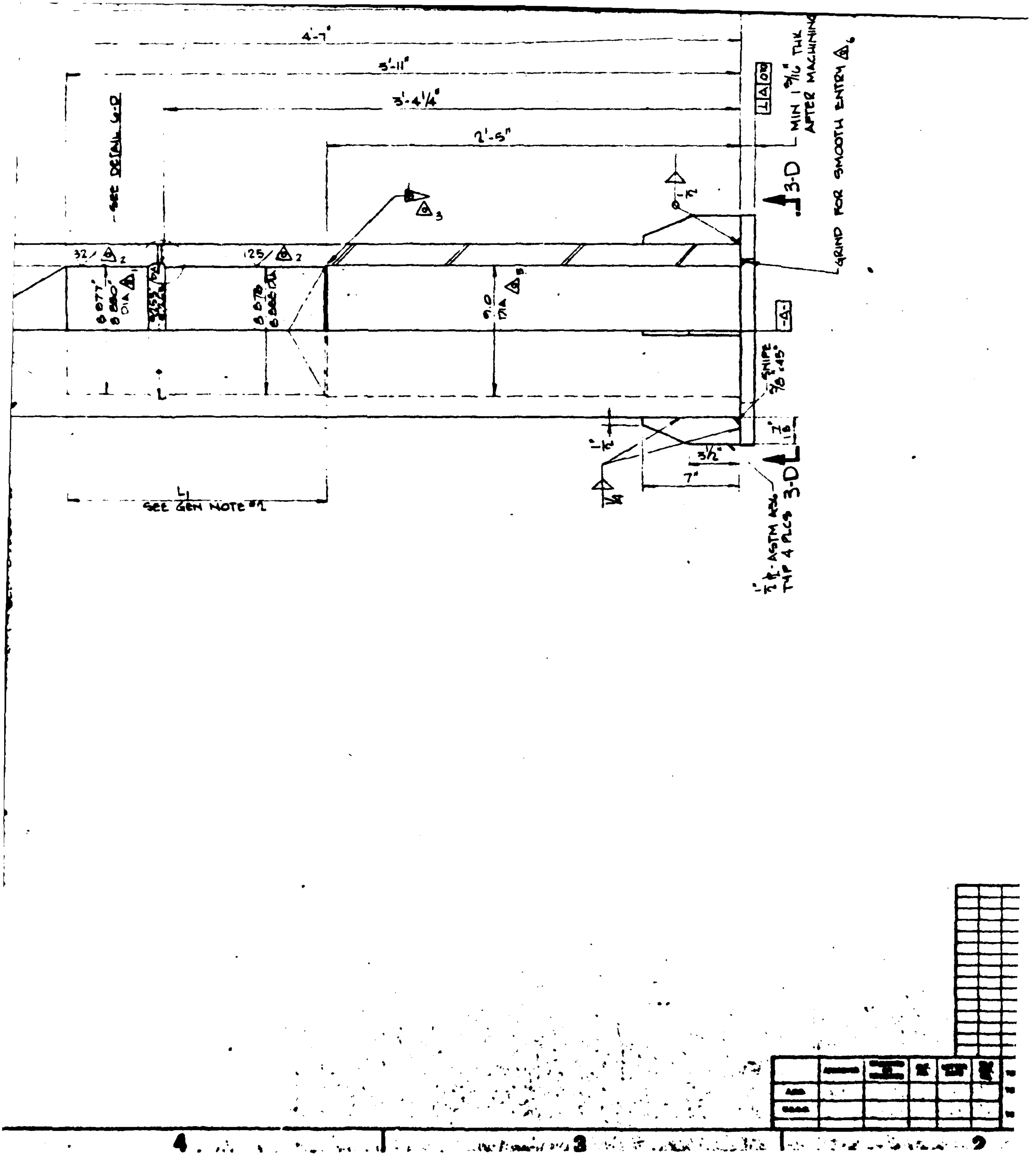
1. ALL MACHINE SURFACES TO BE 250
2. ALL INTERNAL DIAMETERS TO BE CONCENTRIC TO TIR .030, ONLY BORE LENGTH L_1
3. BREAK ALL MACHINE CORNERS AND RADII TO 0.01" MIN
4. MACHINE TOLERANCES TO BE .X ±.1, .XX ±.03, .XXX ±.010
5. TRANSITION STEP IS TO BE SMOOTH TO AVOID ROLLING OUT O-RING IN HYDRAULIC PLUG/SONAR ADAPTOR (REF DWG #2)
6. ALL WELDS TO BE IN ACCORDANCE WITH AWS D1.1 STRUCTURAL WELD CODE - STEEL

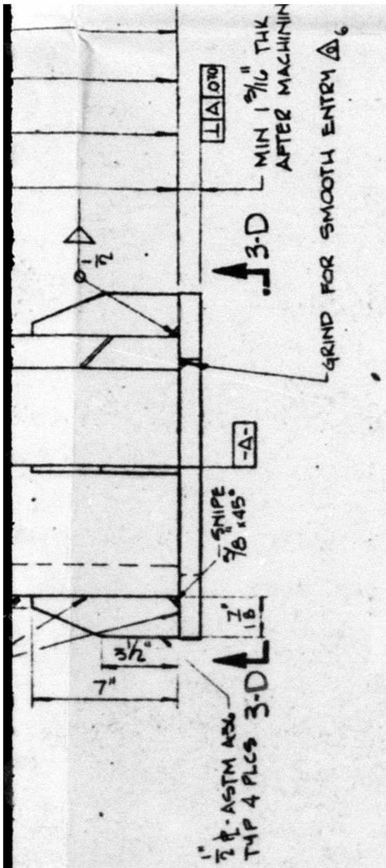
REFERENCE DRAWINGS:

1.	C-0633	UNIV. OF CALIF. DEEP SEA DRILLING PROJECT 6 5/8 FULL HOLE MODIFIED BOX (DRILCO BORE-BACK BOX RELIEF)
2.	D-001-A010	MARINE SEISMIC SYSTEM (MSS) HYDRAULIC PLUG/SONAR ADAPTOR DETAILS

1		CHANGED AMOUNT OF HOLES


45°±10'
1/2" DRILL THRU & TAP FOR 1/2" NPT (2 REQ'D)
SEE DETAIL
4.12" DIA
8.077"
8.880" DIA
32
B
A
6
5


4'-7"
3'-11"
3'-4 1/4"
2'-5"
SEE DETAIL
MIN 1 9/16" THK AFTER MACHINING
GRIND FOR SMOOTH ENTRY
3-D
9.0 DIA
SNIPE 7/8 x 45°
7"
3 1/2"
L
L1
SEE GEN NOTE #2
TYP 4 PLCS
4
3
2



GENERAL NOTES: (UNLESS OTHERWISE NOTED)

1. ALL MACHINE SURFACES TO BE 250 ✓
2. ALL INTERNAL DIAMETERS TO BE CONCENTRIC TO TIR .030, ONLY BORE LENGTH L_1
3. BREAK ALL MACHINE CORNERS AND RADII TO 0.01" MIN
4. MACHINE TOLERANCES TO BE .X ± .1, .XX ± .03, .XXX ± .010
5. TRANSITION STEP IS TO BE SMOOTH TO AVOID ROLLING OUT O-RING IN HYDRAULIC PLUG/SONAR ADAPTOR (REF DWG #2)
6. ALL WELDS TO BE IN ACCORDANCE WITH AWS D1.1 STRUCTURAL WELD CODE - STEEL

REFERENCE DRAWINGS:

1. C-0633 — UNIV. OF CALIF. DEEP SEA DRILLING PROJECT 6 5/8" FULL HOLE MODIFIED BOX (DRILCO BORE-BACK BOX RELIEF)
2. D-001-A010 — MARINE SEISMIC SYSTEM (MSS) HYDRAULIC PLUG/SONAR ADAPTOR DETAILS

NO.	DATE	BY	DESCRIPTION	JOB AUTH.	APPD.
1	11/6/81	NW	1. CHANGED AMOUNT OF HOLES FROM 3 TO 6 IN DET. 6-D	006-325000	
0	10/7/80	NW	7. CHANGED FLANGE MAT'L VIEW 3-D 6. ADDED GRIND CALLOUT @ ENTRY 5. CHANGED DIM. WAS DIA 4. CHANGED SURFACE REQUIREMENT IN GEN. NOTE #1 WAS 125 ✓ 3. ADDED NOTE 5, NOTE 6 & REF #2 2. ADDED SURFACE REQUIREMENT 1. ADDED DIM.	001-210300	RW
B	9/30/80	NW	CLARIFY L/M - OPEN UP TOL.	001-210300	
A	9/11/80	NW	RELEASE FOR BID	001-210300	

ALTERATIONS

NO. REQ'D.	NEXT ASSEMBLY
	E-001-A009
	ALTERATION
3-5-8	DATE
	PURCHASING
	CONSTRUCTION
	ENGINEERING
	USCG
	ABS
10	CUSTOMER
1	WALLERSTEDT
1	DYE
1	BUCHANAN
1	MITCHELL
1	FARMER
2	LIBRARY

	APPROVED	ISSUED OR REVISED	ALT. NO.	LETTER DATE	FILE REF. NO.
A.B.S.					
U.S.C.G.					

TOTAL NET WGT. MAT'L. ______
TOTAL NET WGT. COMP. ______
TOTAL NET WEIGHT ______

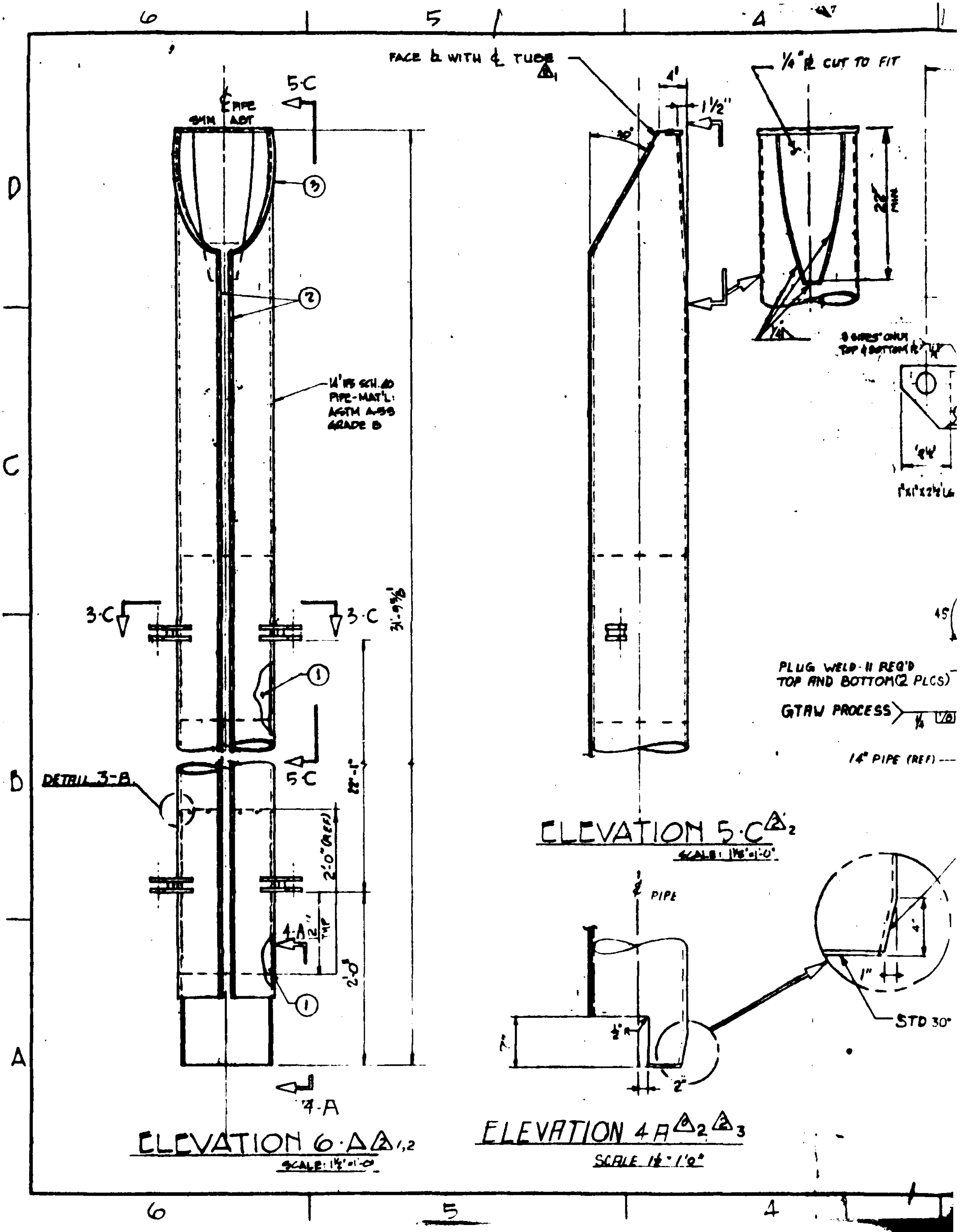
GLOBAL MARINE DEVELOPMENT Inc.
Newport Beach, Calif.

MARINE SEISMIC SYSTEM (MSS)
BIF CARRIAGE CONTROL SUB DETAILS AND ASSEMBLY

	NAME	DATE
DFT.	WAGNER	9/11/80
CHKD.	PRR	9/12/80
ENG.		
APPD.		
APPD.		

SCALE: 3" = 1'-0" AS NOTED
JOB AUTH.: 001-210300
DWG. NO.: E-001-A009
SHT. 1 OF 1
ALT. 1

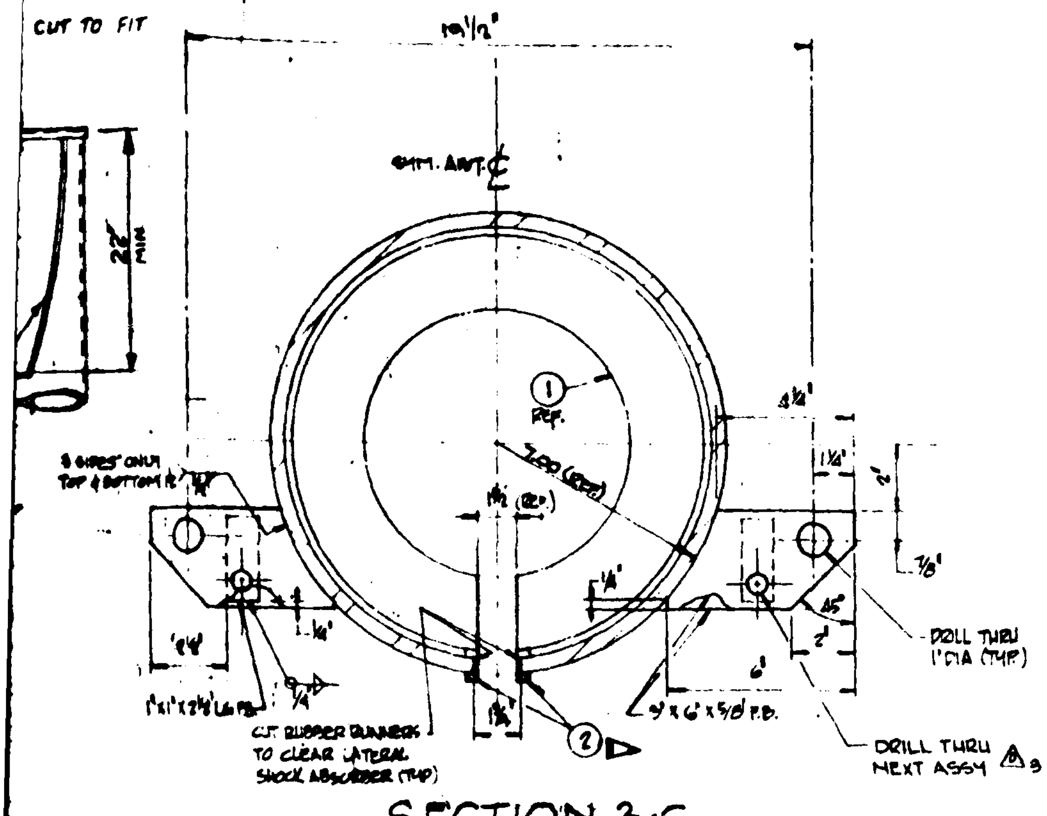
6



6
5
4
D
C
B
A
5·C
℄ PIPE
6MM ABT
3
2
14" ⌀ SCH. 40 PIPE-MAT'L: ASTM A-53 GRADE B
3·C
3·C
1
5·C
DETAIL 3-B
2'-0" (REF)
4-A
2'-0"
31'-9 3/8"
4-A
ELEVATION 6·A
SCALE: 1½"=1'-0"
FACE ℄ WITH ℄ TUBE
4"
1½"
¼" ℄ CUT TO FIT
22" MIN
PLUG WELD-11 REQ'D
TOP AND BOTTOM (2 PLCS)
GTAW PROCESS
14" PIPE (REF)
ELEVATION 5·C
SCALE: 1½"=1'-0"
℄ PIPE
½" R
2"
4"
1"
STD 30°
ELEVATION 4 A
SCALE 1½"=1'-0"
45

LIST OF MATERIALS

OWNER FURN	ITEM	QTY	DESCRIPTION	MATERIAL OR PART NO.
	1	2	LATERAL SHOCK ABSORBER	REF 1
	2	2	'RUBBER CRAFT' CAT # 1410 70 DUROMETER	NATURAL [illegible] NEOPRENE [illegible]
	3	1	'RUBBER CRAFT' CAT # 1410 70 DUROMETER	↓



SECTION 3-C

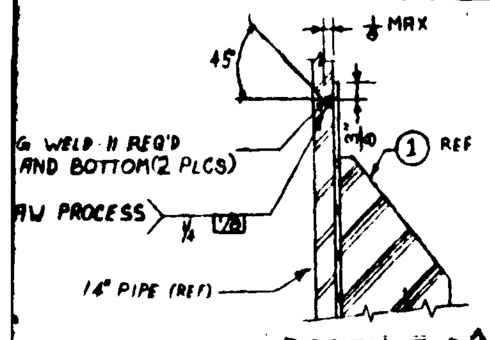
SCALE: [illegible]

GENERAL NOTES: (UNLESS OTHERWISE N[OTED])

1. TO BOND: USE WATER RESISTANT ADHESIVE PER MANUFACTURERS RECOMMENDATION.
2. PAINT EXTERIOR IN ACCORDANCE WITH GMDI SPEC. 001-002.
3. ALL PLATES & SHAPES TO BE ASTM A36.
4. BREAK ALL SHARP EDGES & REMOVE ALL BURRS

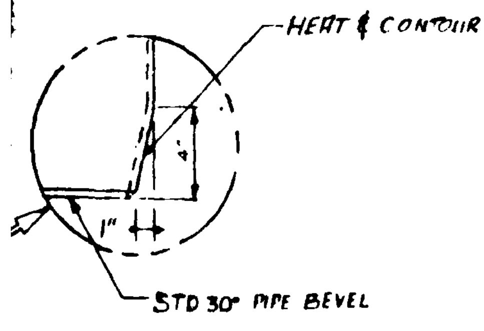
REFERENCES

1. C-001-A006 MARINE SEISMIC SYSTEM (MSS) LATERAL SHOCK ABSORBER ENG DETAIL



DETAIL 3-B

SCALE: HALF SIZE



NO.	DATE	BY	DESCRIPTION	JOB AUTH
2		B.F.	3. ROTATED 180°, CHANGE BEVEL & ADDED CONTOUR IN ELEV 4-A 2. ADDED TAPER AT TOP 14" PIPE IN ELEV 5-C & ELEV 6-A 1. INCORPARATED CHANGES IN ITEM ① IN ELEV 6-A, ADDED DET 3-B	006-323000
1	11-4-80	NW	CHANGED MATERIAL CALLOUT FOR ITEMS 2 & 3 IN L/M WAS NATURAL RUB	006-323000
0		NW	5. ADDED NOTE # 4 4. CHANGE NOTE # 2 TO EXTERIOR ONLY 3. ADDED SHEAR HOLE IN SEC. 3-C 2. BEVELED BOTTOM OF TUBE ELEV 4-A 1. ADDED CALLOUT TO MAKE ℄ W/ ℄ TUBE IN ELEV. 5-C	001-210300
B		NW	CLARIFY L/M - OPEN UP TOL.	001-210300
A		MM	RELEASE FOR BID	001-210300

ALTERATIONS

NO REQ'D	NEXT ASSEMBLY
2	E-001-A008

ALTERATION, DATE, LOS ANGELES, NEWPORT BEACH, HOUSTON, PURCHASING, CONSTRUCTION, ENGINEERING, USCG, CUSTOMER, WILLERSTEDT, PK, FILE, RITCHIE, [illegible], LIBRARY

ABS / USCG — APPROVED, EXAMINED OR REVIEWED, ALT NO, LETTER DATE, FILE REF NO

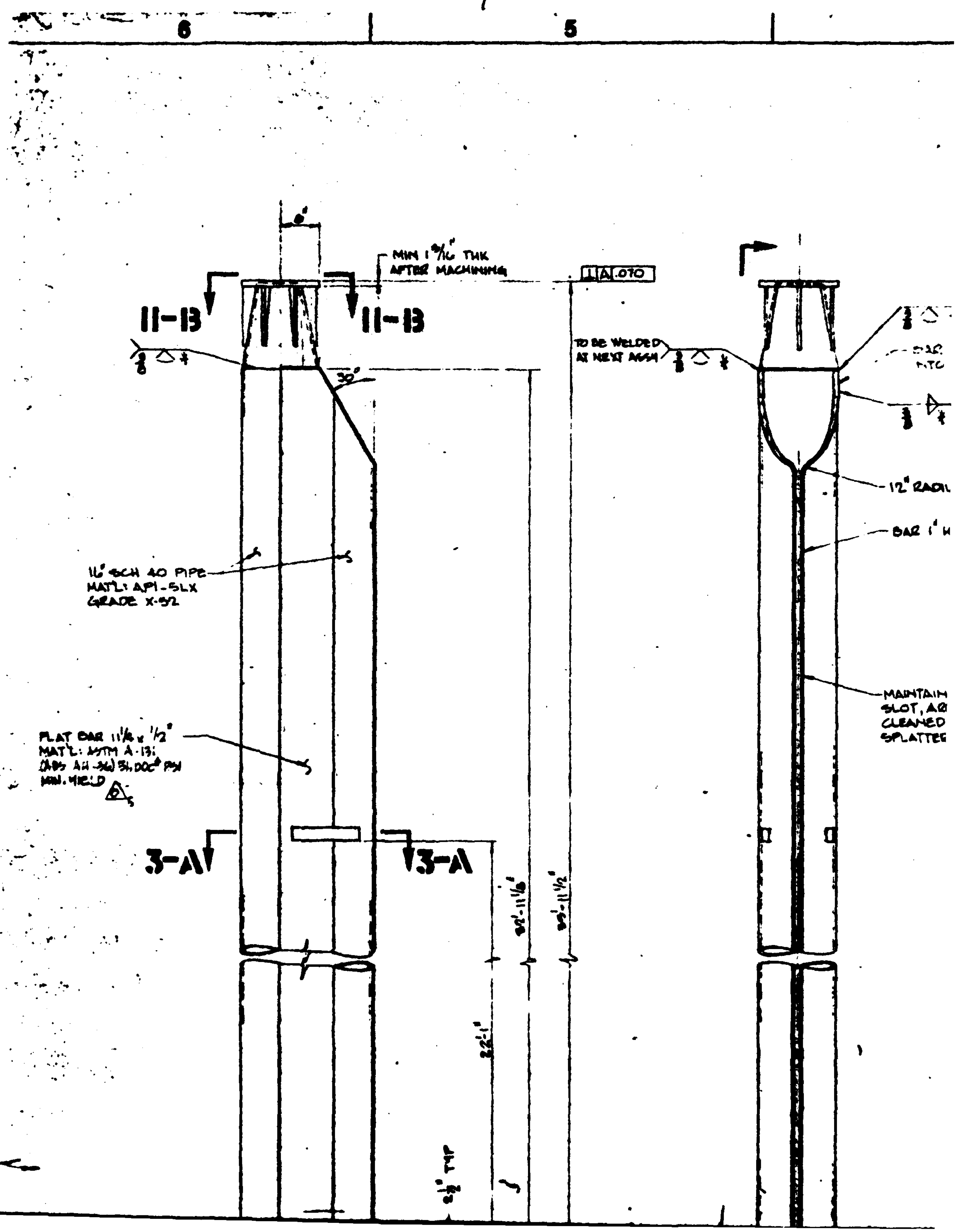
TOTAL NET WGT MAT'L
TOTAL NET WGT EQUIP.
TOTAL NET WEIGHT

GLOBAL MARINE DEVELOPMENT Inc.
Newport Beach, Calif

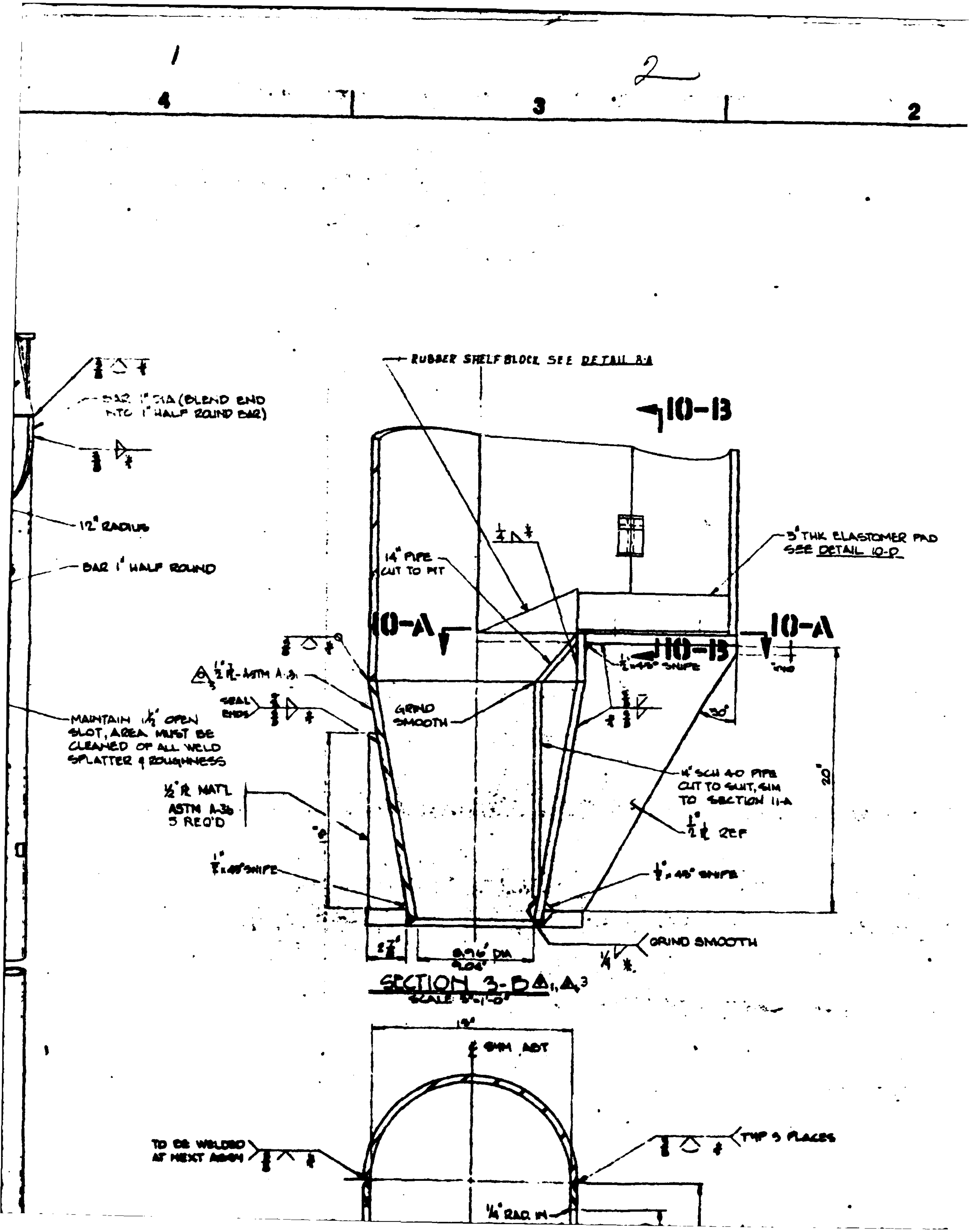
MARINE SEISMIC SYSTEM (MSS)

BIP CARRIAGE ASSEMBLY AND DETAILS

DFT	DATE	SCALE	TOLERANCE UNLESS OTHERWISE NOTED
[illegible]	9-9-80	AS NOTED	FRACTION ± 1/16" ANGULAR ± ½° MILLIMETER ± 1 MM
CHKR		JOB AUTH 001 210300	DWG NO. D 001 A004



6
5
MIN 1 9/16" THK
AFTER MACHINING
11-B
11-B
TO BE WELDED
AT NEXT ASSY
30°
16" SCH 40 PIPE
MAT'L: API-5LX
GRADE X-52
FLAT BAR 11/16 x 1/2"
MAT'L: ASTM A-131
(ABS AH-36) 51,000 PSI
MIN. YIELD
3-A
3-A
12" RADI
BAR 1" H
MAINTAIN
SLOT, AR
CLEANED
SPLATTER



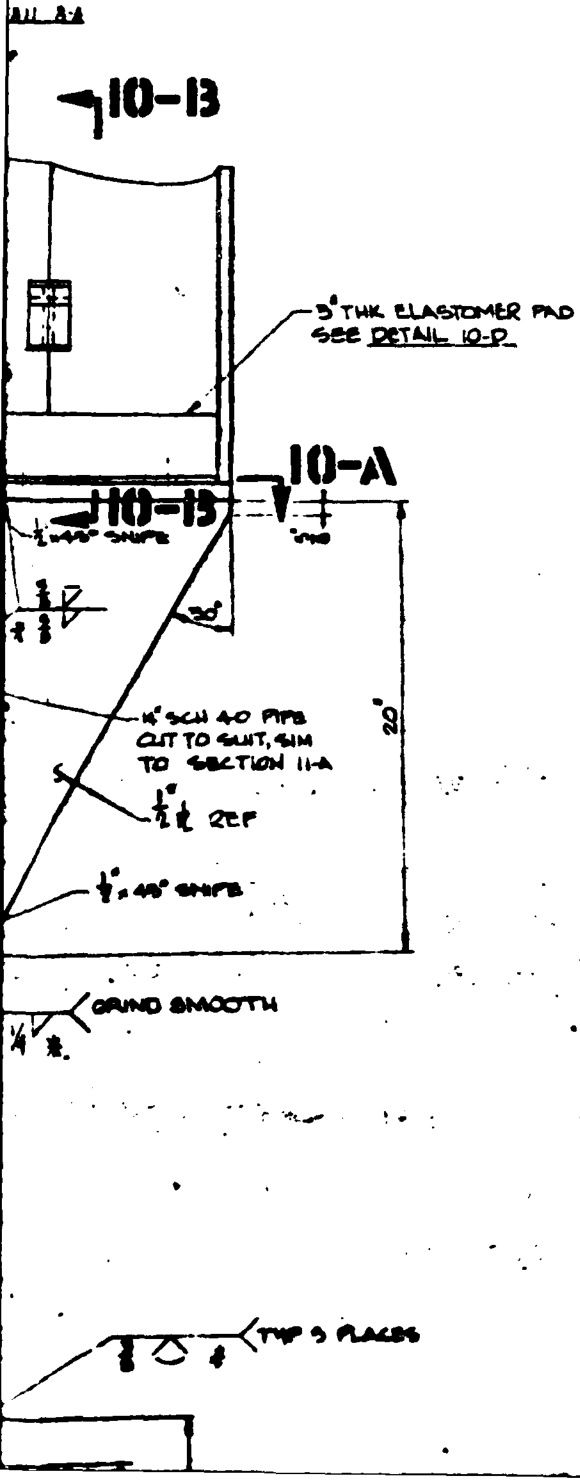
4
3
2
RUBBER SHELF BLOCK SEE DETAIL 8-A
10-B
BAR 1" DIA (BLEND END INTO 1" HALF ROUND BAR)
12" RADIUS
BAR 1" HALF ROUND
3" THK ELASTOMER PAD SEE DETAIL 10-D
14" PIPE CUT TO FIT
10-A
10-A
10-B
GRIND SMOOTH
SEAL ENDS
MAINTAIN 1½" OPEN SLOT, AREA MUST BE CLEANED OF ALL WELD SPLATTER & ROUGHNESS
½" R MAT'L ASTM A-36 5 REQ'D
4" SCH 40 PIPE CUT TO SUIT, SIM TO SECTION 11-A
½" R REF
1" x 45° SNIPE
20"
30°
GRIND SMOOTH
SECTION 3-B
TO BE WELDED AT NEXT ASSEM
TYP 3 PLACES
¼" RAD IN

2 4 3

2	1

LIST OF MATERIALS

ITEM	[illegible]	QTY.	DESCRIPTION	[illegible]



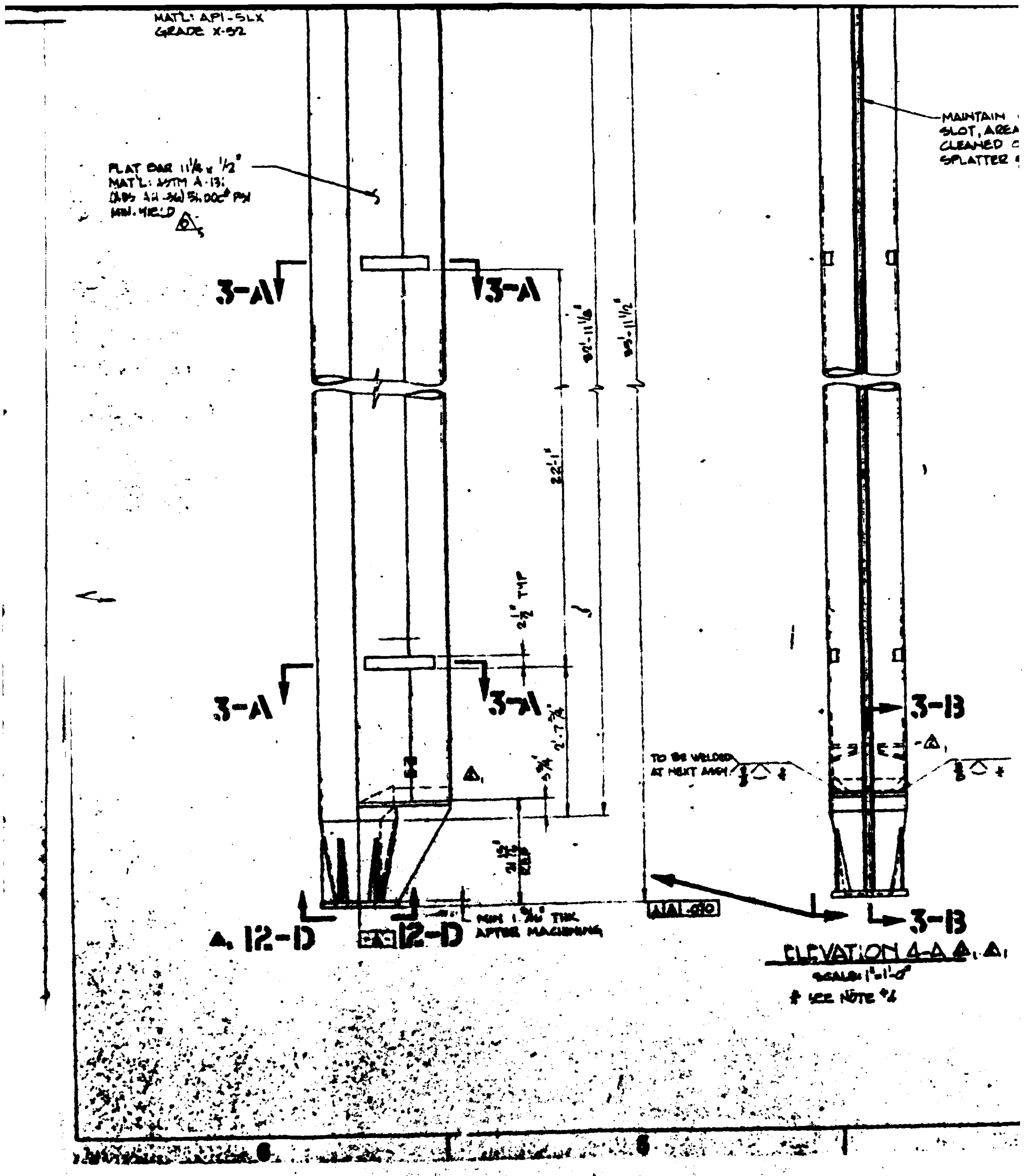
GENERAL NOTES: (UNLESS OTHERWISE NOTED)

1. ALL WELDING TO BE IN ACCORDANCE WITH AWS D1.1 STRUCTURAL WELDING CODE – STEEL.
2. BREAK ALL SHARP EDGES AND REMOVE ALL BURRS.
3. ALL MACHINE SURFACES TO BE 125✓.
4. ALL WELDS, THIS ASSEMBLY, TO USE E 7018 ELECTRODE EXCEPT AT END FLANGES (A-035) ARE TO BE WELDED WITH E 8018 ELECTRODE AND PRE HEAT @ 175°F.

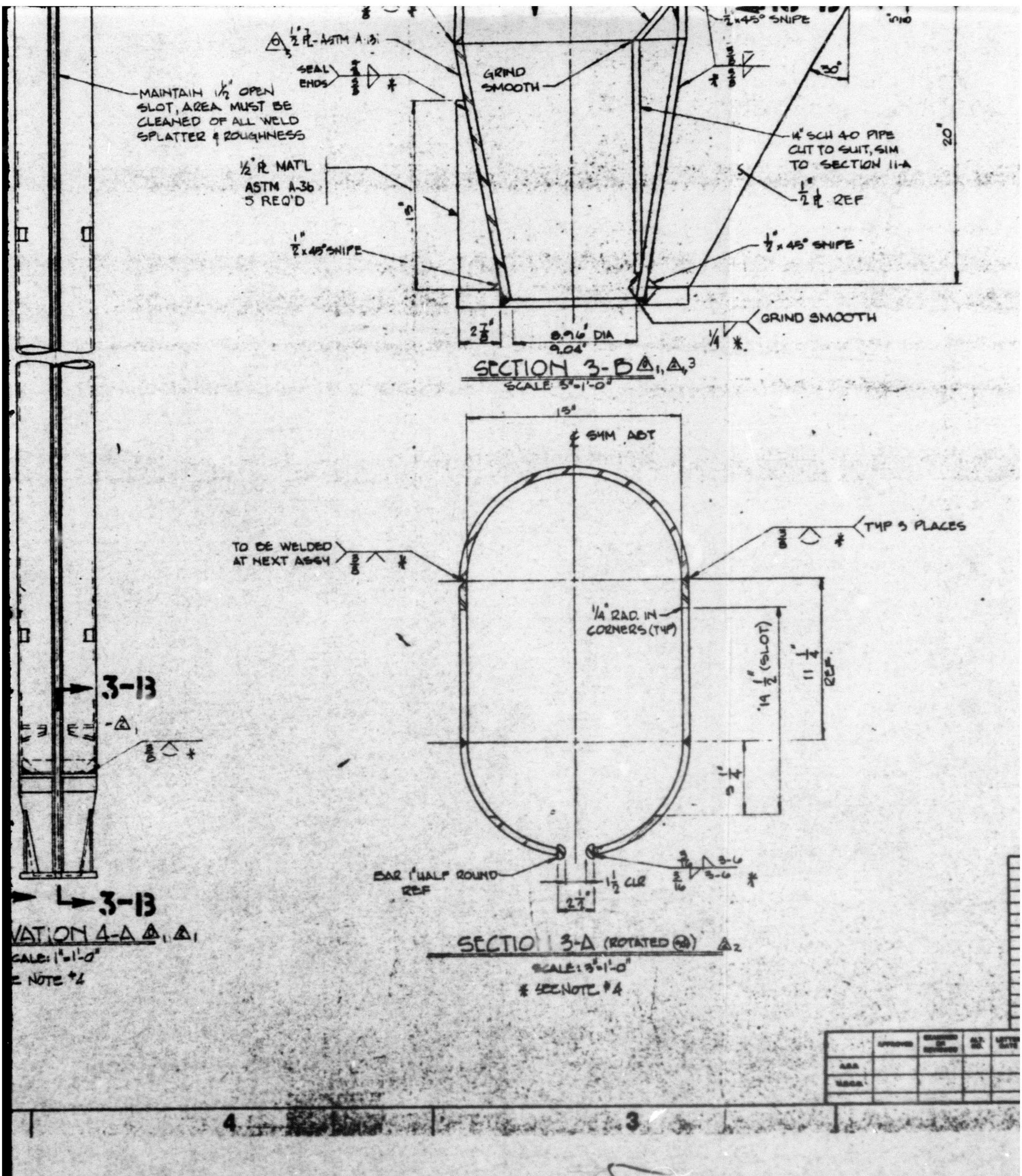
REFERENCE DRAWINGS:

1. E001-A003 MARINE SEISMIC SYSTEM (MSS) BIP CARRIAGE CONTROL SUB DETAILS & ASSEMBLY
2. D001-A007 MARINE SEISMIC SYSTEM (MSS) REENTRY TOOL STINGER ASSEMBLY & DETAILS

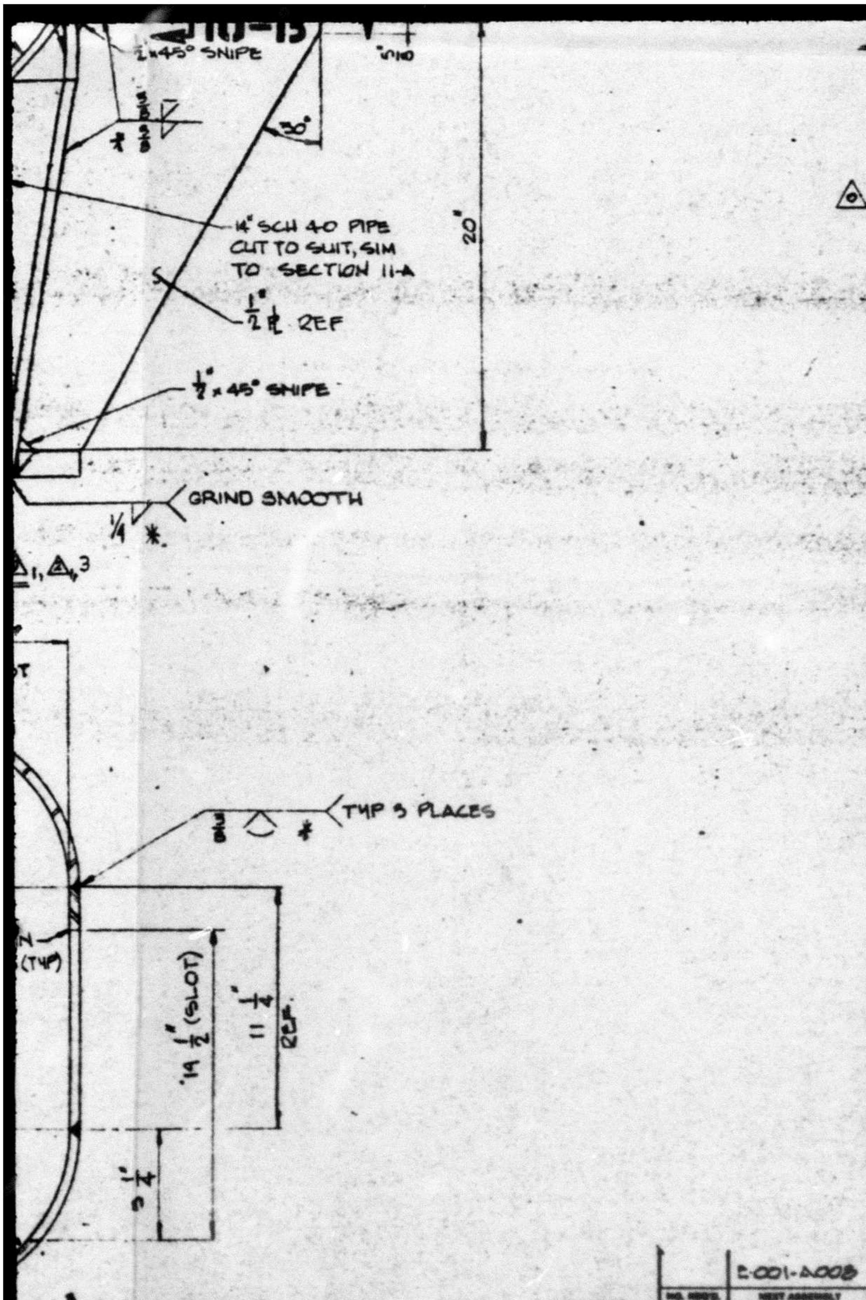
			7 ADDED DETAIL 8-A
2	[illegible]		6 CHANGED DIM IN DETAIL 10-D WAS 5/8" & 6 7/8"
			5 ADDED BOTTOM VIEW 12-D
			4 ADDED (1) GUSSET ℄ – SECT 11-A, & TOP VIEW 11-B
			3 CHANGED 3" ELASTOMER PAD ATTACHMENT SECT 3-B, SECT 10-B DET 10-D & SECT 10-A
			2 CHANGED SLOT LENGTH WAS 13 1/2 – SECT. 3A
			1 CHANGED LOCKING EAR DIM


MAT'L: API-5LX
GRADE X-52
FLAT BAR 1 1/4 x 1/2"
MAT'L: ASTM A-131
3-A
3-A
3-A
3-A
2'-7 3/4
MIN 1 3/16 THK
AFTER MACHINING
12-D
12-D
MAINTAIN
SLOT, AREA
CLEANED
SPLATTER
TO BE WELDED
AT NEXT ASSY.
3-B
3-B
ELEVATION 4-A
* SEE NOTE #6

4



MAINTAIN 1½" OPEN SLOT, AREA MUST BE CLEANED OF ALL WELD SPLATTER & ROUGHNESS
½" PL-ASTM A-36
SEAL ENDS
GRIND SMOOTH
½" x 45° SNIPE
½" PL MAT'L ASTM A-36 5 REQ'D
14" SCH 40 PIPE CUT TO SUIT, SIM TO SECTION 11-A
½" PL REF
30°
20"
GRIND SMOOTH
8.96" DIA 9.04"
SECTION 3-B
SCALE: 3"=1'-0"
15"
℄ SYM ABT
TYP 3 PLACES
TO BE WELDED AT NEXT ASSY
1/4" RAD. IN CORNERS (TYP)
14 ½" (SLOT)
11 ¼" REF
5 ¼"
3-B
3-B
BAR 1" HALF ROUND REF
1½ CLR
2 ¼"
3-6
VATION 4-A
CALE: 1"=1'-0"
E NOTE #4
SECTIO 3-A (ROTATED)
SCALE: 3"=1'-0"
* SEE NOTE #4
APPROVED
4
3



GENERAL NOTES: (UNLESS OTHERWISE NOTED)

1. ALL WELDING TO BE IN ACCORDANCE WITH AWS D1.1 STRUCTURAL WELDING CODE - STEEL
2. BREAK ALL SHARP EDGES AND REMOVE ALL BURRS
3. ALL MACHINE SURFACES TO BE 125.
4. ALL WELDS, THIS ASSEMBLY, TO USE E 7018 ELECTRODE EXCEPT AT END FLANGES (A-633) ARE TO BE WELDED WITH E 8018 ELECTRODE AND PRE HEAT @ 175°F.

REFERENCE DRAWINGS:

1. E001-A003 MARINE SEISMIC SYSTEM (MSS) BIP CARRIAGE CONTROL SUB DETAILS & ASSEMBLY
2. D001-A007 MARINE SEISMIC SYSTEM (MSS) REENTRY TOOL STINGER ASSEMBLY & DETAILS

NO.	DATE	BY	DESCRIPTION	JOB AUTH.	APPR.
2	2-24-81	CR	7. ADDED DETAIL 8-A 6. CHANGED DIM. IN DETAIL 10-D WAS 5/8" & 6 15/16" 5. ADDED BOTTOM VIEW 12-D. 4. ADDED (1) GUSSET ℄ - SECT 11-A, & TOP VIEW 11-B 3. CHANGED 3" ELASTOMER PAD ATTACHMENT SECT. 3-B, SECT 10-B DET 10-D & SECT 10-A 2. CHANGED SLOT LENGTH WAS 13 1/2 - SECT. 3-A 1. CHANGED LOCKING EAR DIM WAS 9" - ELEV 4 A, SECT 3B, SECT. 10B		
1	11-4-80	NW	CHANGED RUBBER CALLOUT IN DETAIL 10-D WAS NATURAL	001-210300	
0	10/14/80	NW	5. REVISED MATL CALLOUT & ADDED NOTE #5 4. CHANGED DIM. 17 1/4" TO 17 13/16" SEC 11-A 3. ADDED BEVEL EDGE TO 14" PIPE IN SEC. 11-A 2. ADDED 14" PIPE IN SEC. 10-A 1. CHANGED DET. 3-B TO SEC. 3-B	001 210300	
B	9/30/80	NW	CLARIFY L/M - OPEN UP TOL.	001-210300	
A	9/25	NW	RELEASE FOR BID	001-210300	

ALTERATIONS

NO. REQ'D.	NEXT ASSEMBLY
	E-001-A008
2	ALTERATION
1	DATE
	PURCHASING
	CONSTRUCTION
	ENGINEERING
	USCG
	ABS
10	CUSTOMER
1	W. ALLERSTEDT
1	BYE
1	BUCHANAN
1	MITCHELL
1	
2	LIBRARY

	APPROVED	STAMPED OR REVIEWED	ALT. NO.	LETTER DATE	FILE REF. NO.
A.B.S.					
U.S.C.G.					

TOTAL NET WGT. MAT'L. ______
TOTAL NET WGT. EQUIP. ______
TOTAL NET WEIGHT ______

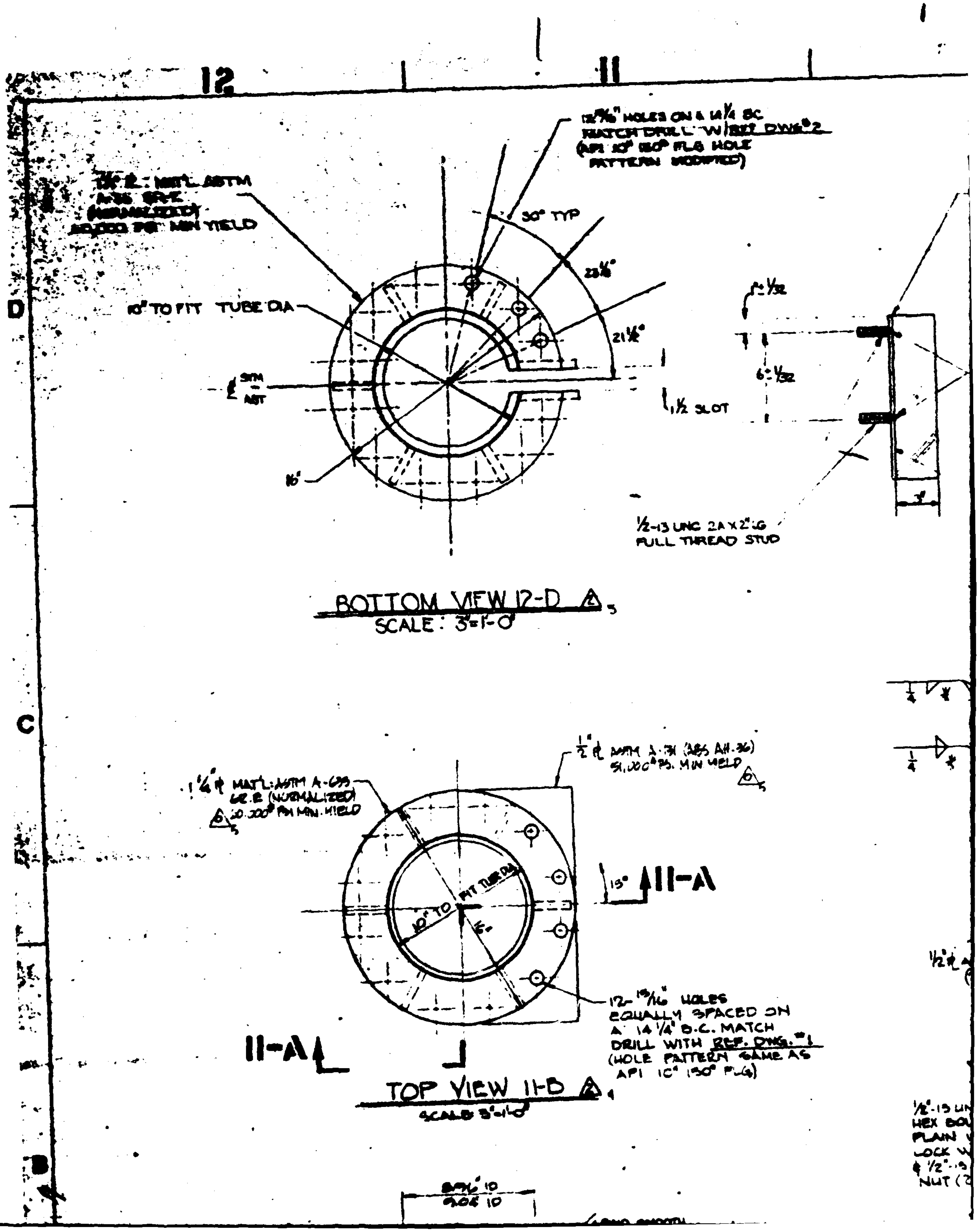
GLOBAL MARINE DEVELOPMENT Inc.
Newport Beach, Calif.

MARINE SEISMIC SYSTEM (MSS)
BIP CARRIAGE HOUSING ASSEMBLY AND DETAILS

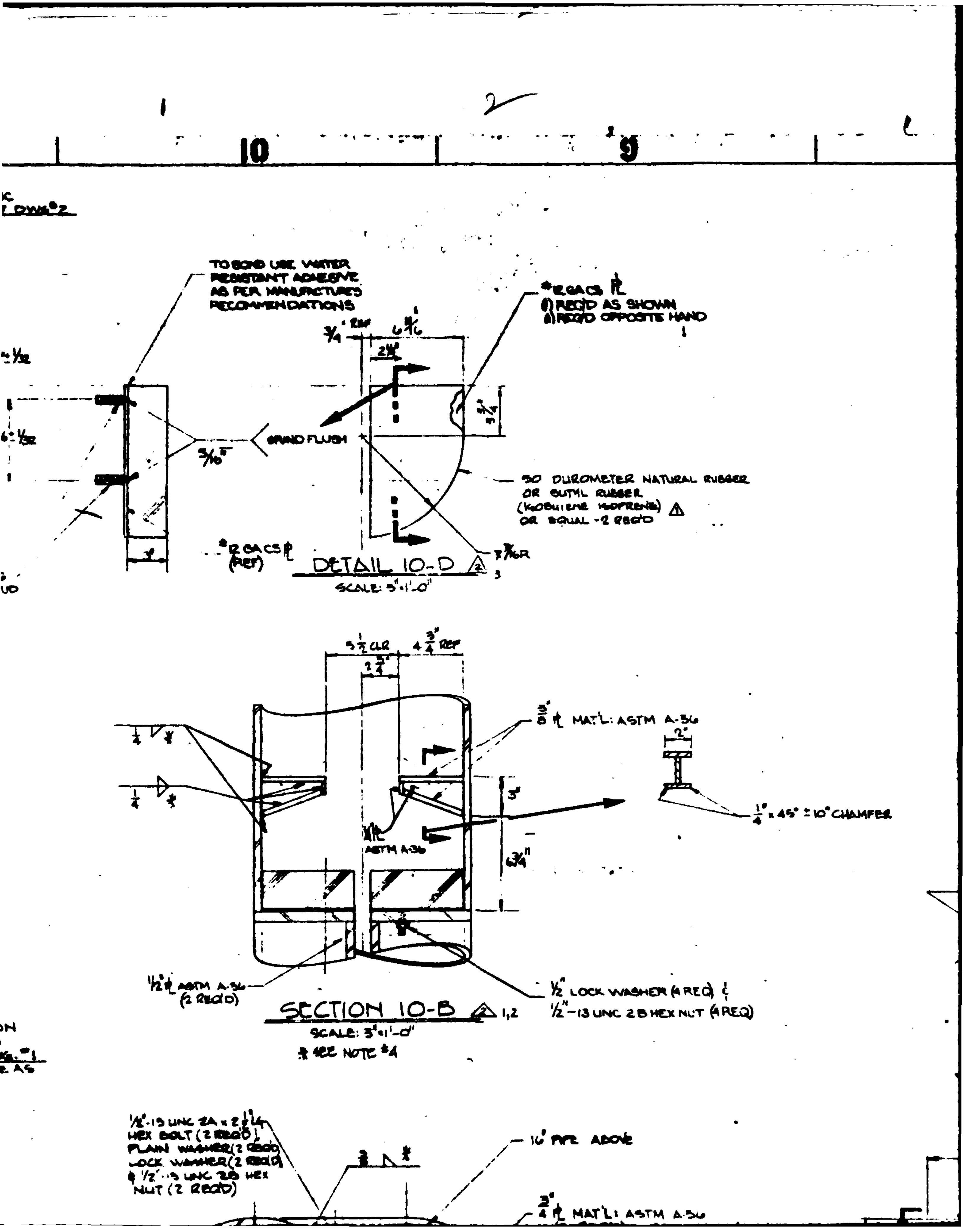
	NAME	DATE	SCALE	
DFT.	N. WAGNER	9-2-80	AS NOTED	
CHKD.				
			JOB AUTH. 001-210300	DWG. NO. E-001-A005, SHT. 1/1, ALT. 2

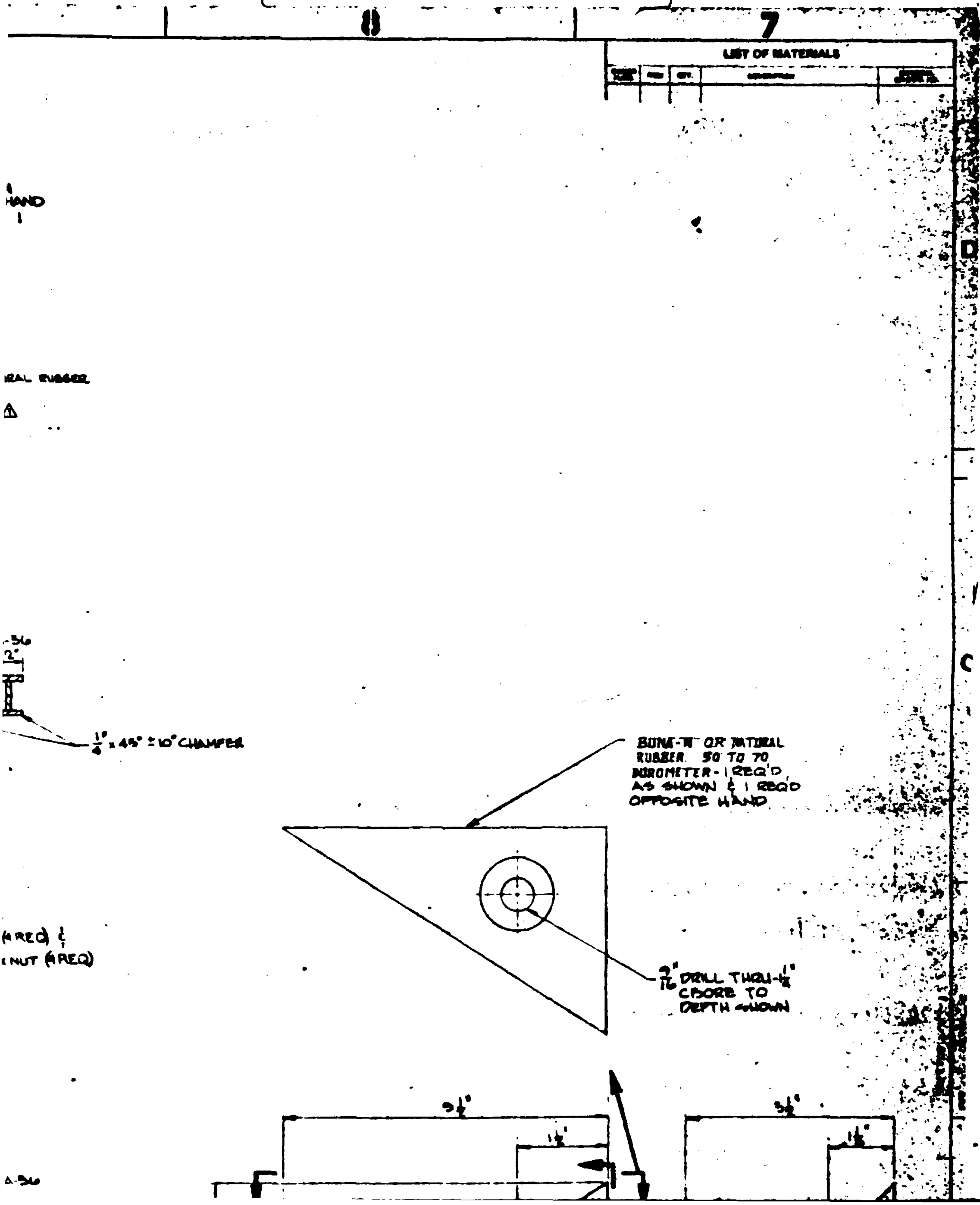
2 1

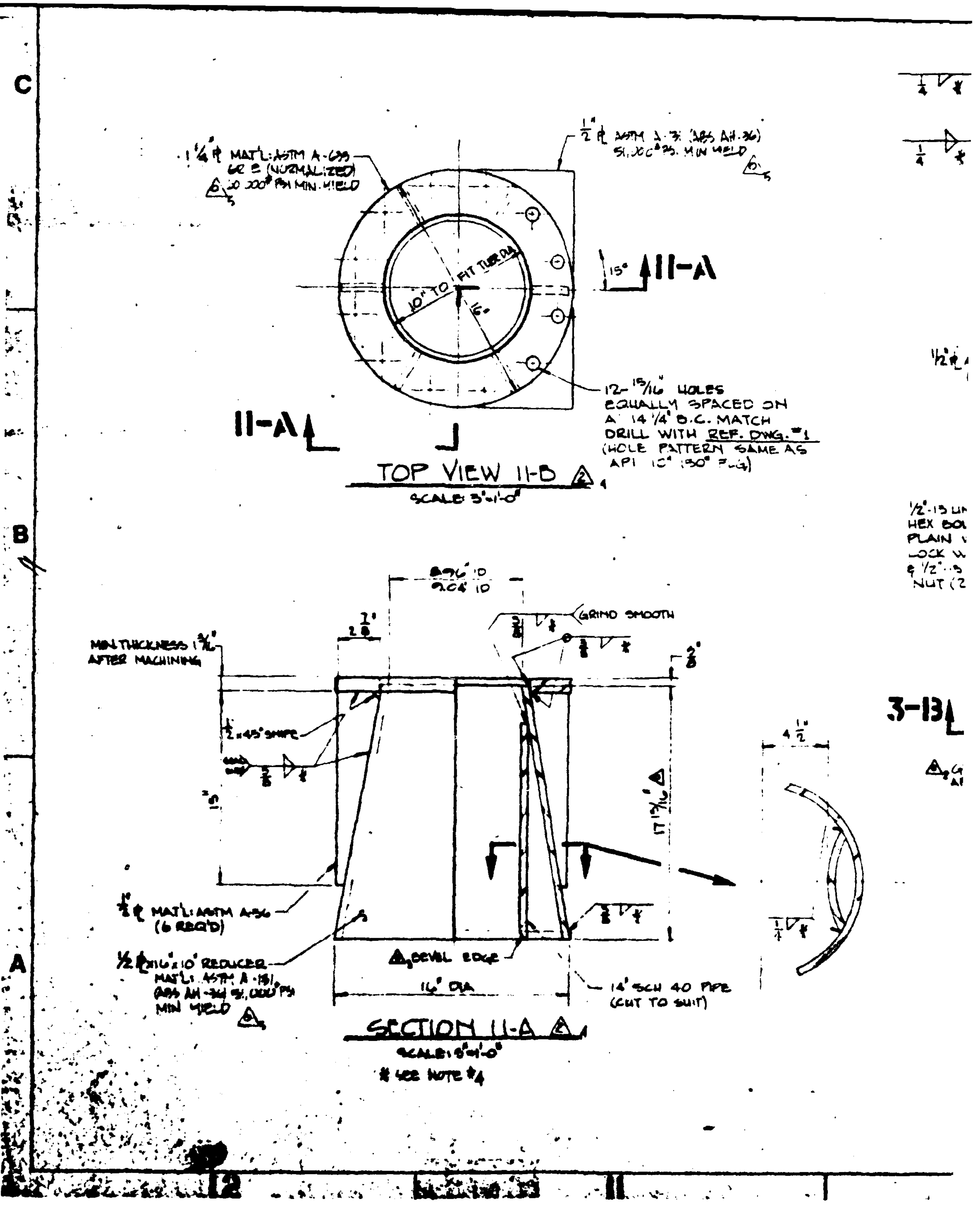
6

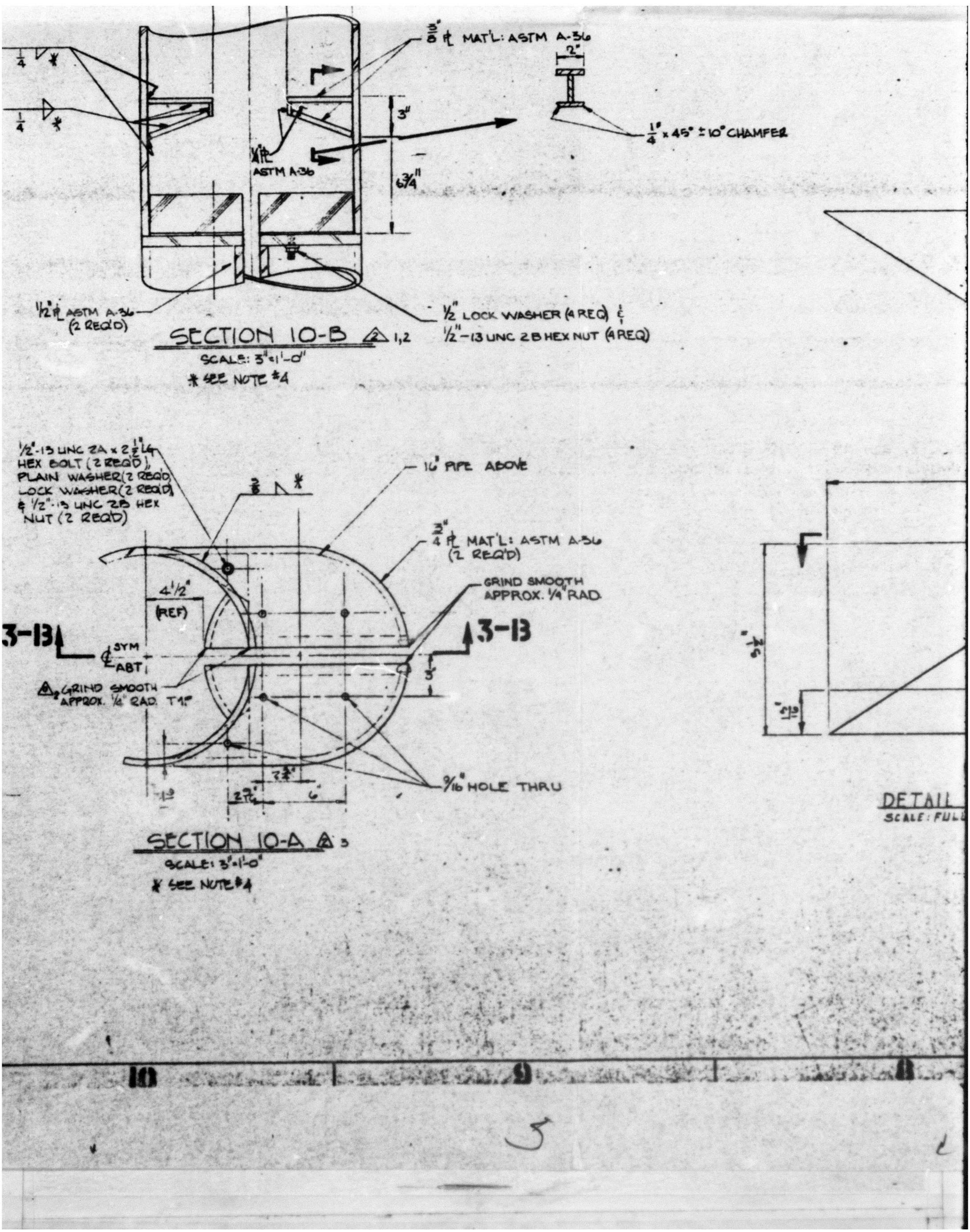


12
11
D
C
B
12-15/16" HOLES ON A 14 1/4 BC MATCH DRILL W/REF DWG #2 (API 10" 150# FLG HOLE PATTERN MODIFIED)
30° TYP
23 1/4°
21 1/2°
10" TO FIT TUBE DIA
1 1/2 SLOT
16"
6-1/32
1/2-13 UNC 2A X 2" LG FULL THREAD STUD
BOTTOM VIEW 12-D
SCALE: 3"=1'-0"
1/2" ℞ ASTM A-131 (ABS AH-36) 51,000# PSI MIN YIELD
1 1/4" ℞ MAT'L: ASTM A-633 GR.E (NORMALIZED) 50,000# PSI MIN YIELD
10" TO FIT TUBE DIA
15°
11-A
12-15/16" HOLES EQUALLY SPACED ON A 14 1/4" B.C. MATCH DRILL WITH REF. DWG. #1 (HOLE PATTERN SAME AS API 10" 150# FLG)
TOP VIEW 11-B
SCALE 3"=1'-0"

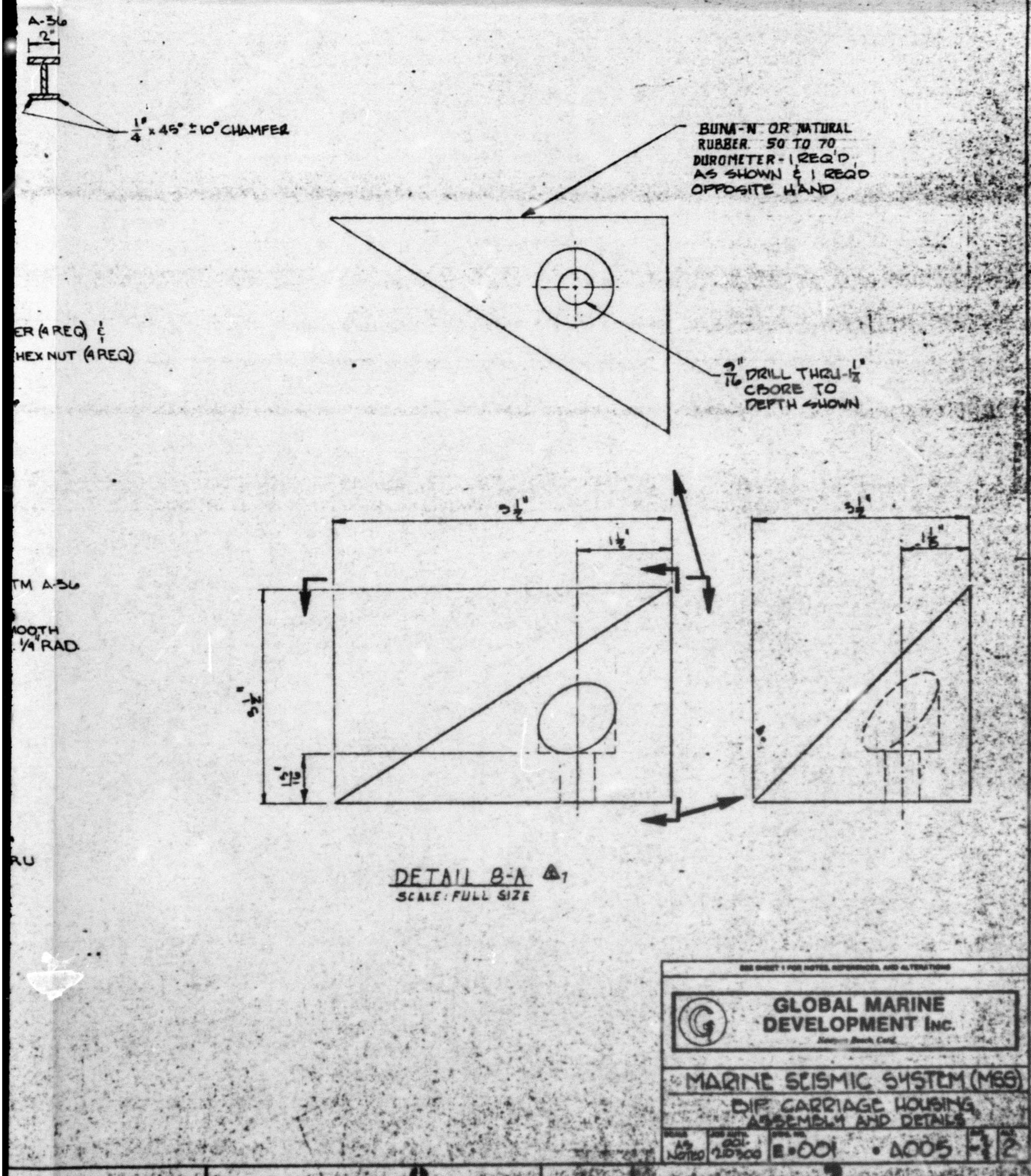

10
9
TO BOND USE WATER RESISTANT ADHESIVE AS PER MANUFACTURES RECOMMENDATIONS
*12 GA CS ℞ (1) REQ'D AS SHOWN (1) REQ'D OPPOSITE HAND
GRIND FLUSH
5/16
2 1/4
6 11/16
3/4 REF
50 DUROMETER NATURAL RUBBER OR BUTYL RUBBER (KOBUIENE ISOPRENE) OR EQUAL - 2 REQ'D
*12 GA CS ℞ (REF)
3/16 R
DETAIL 10-D
SCALE: 3"=1'-0"
5 1/2 CLR
4 3/4 REF
2 3/4
3/8 ℞ MAT'L: ASTM A-36
2"
1/4 x 45° ± 10° CHAMFER
3"
6 3/4"
ASTM A-36
1/2 ℞ ASTM A-36 (2 REQ'D)
1/2 LOCK WASHER (4 REQ) & 1/2"-13 UNC 2B HEX NUT (4 REQ)
SECTION 10-B
SCALE: 3"=1'-0"
* SEE NOTE #4
1/2"-13 UNC 2A x 2 1/4 HEX BOLT (2 REQ'D), PLAIN WASHER (2 REQ'D) LOCK WASHER (2 REQ'D) & 1/2"-13 UNC 2B HEX NUT (2 REQ'D)
16" PIPE ABOVE
3/4 ℞ MAT'L: ASTM A-36

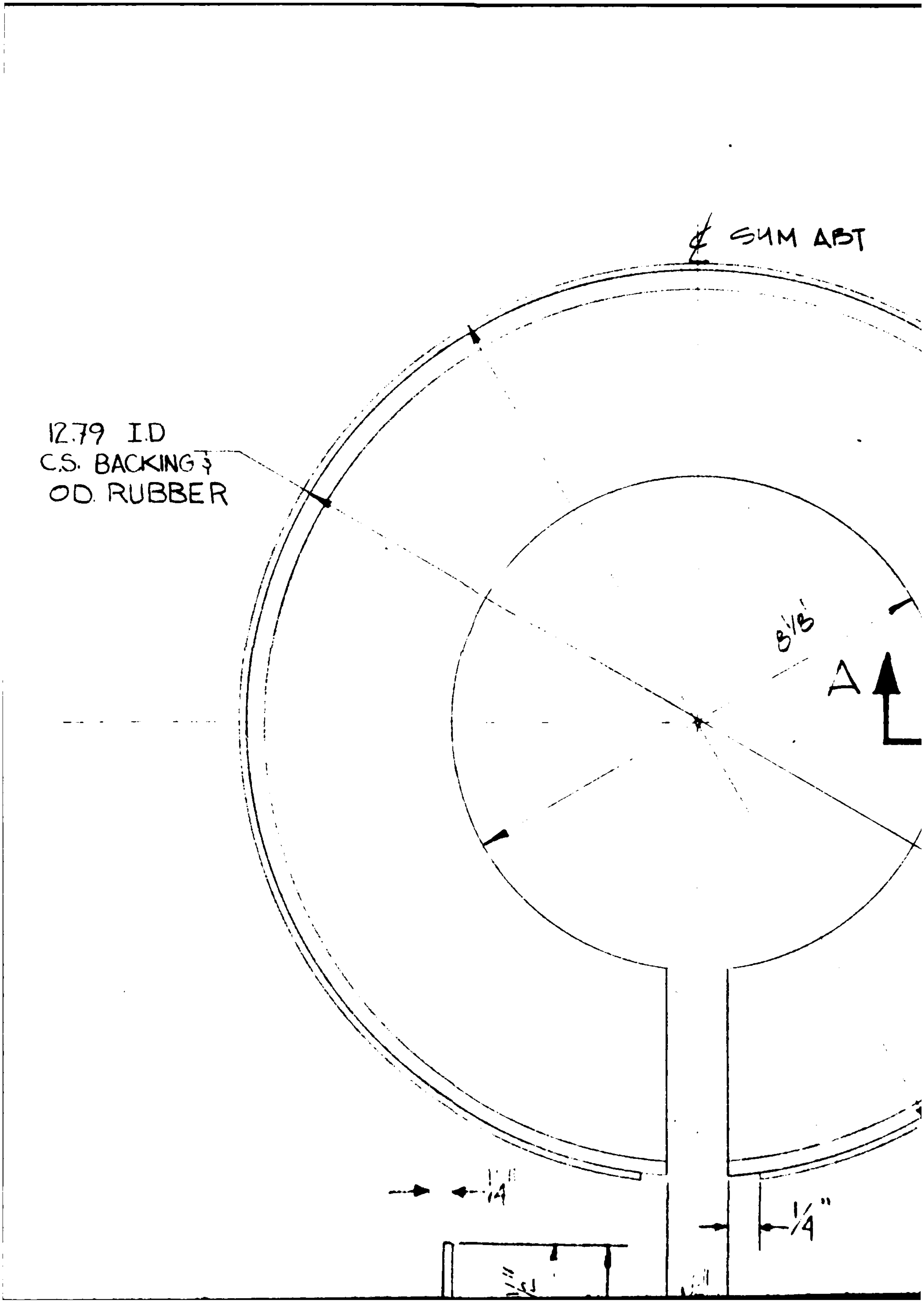

8
7
LIST OF MATERIALS
D
C
HAND
RAL RUBBER
$\frac{1}{4}$" x 45° ± 10° CHAMFER
(4 REQ) &
NUT (4 REQ)
BUNA-N OR NATURAL
RUBBER 50 TO 70
DUROMETER - 1 REQ'D
AS SHOWN & 1 REQ'D
OPPOSITE HAND
$\frac{9}{16}$" DRILL THRU-$1\frac{1}{4}$"
CBORE TO
DEPTH SHOWN
$5\frac{1}{2}$"
$1\frac{1}{2}$"
$5\frac{1}{2}$"
$1\frac{1}{2}$"


1 1/4" PL MAT'L: ASTM A-633 GR E (NORMALIZED) 50,000# PSI MIN. YIELD
1/2" PL ASTM A-131 (ABS AH-36) 51,000# PSI MIN YIELD
10" TO FIT TUBE DIA.
15°
11-A
12-15/16" HOLES EQUALLY SPACED ON A 14 1/4" B.C. MATCH DRILL WITH REF. DWG. #1 (HOLE PATTERN SAME AS API 10" 150# FLG)
TOP VIEW 11-B
SCALE: 3"=1'-0"
GRIND SMOOTH
MIN THICKNESS 1 3/4" AFTER MACHINING
1/2 x 45° SNIPE
3/8" PL MAT'L: ASTM A-36 (6 REQ'D)
1/2 PL 16" x 10" REDUCER MAT'L: ASTM A-131, (ABS AH-36 51,000 PSI MIN YIELD
BEVEL EDGE
16" DIA
14" SCH 40 PIPE (CUT TO SUIT)
SECTION 11-A
SCALE: 3"=1'-0"
SEE NOTE #4
3-B
4 1/2"
C
B
A
12
11

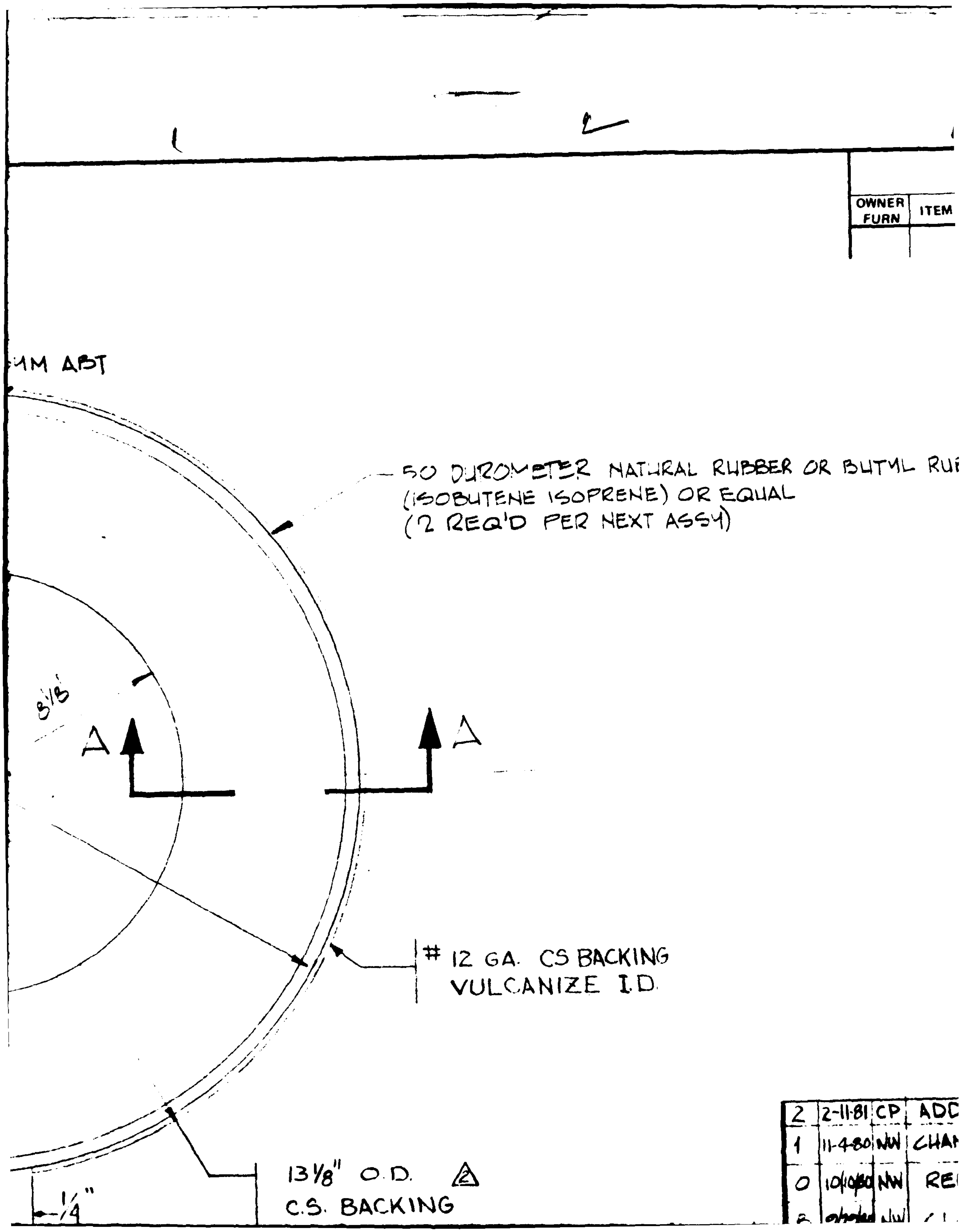


3/8" PL MAT'L: ASTM A-36
2"
1/4" x 45° ± 10° CHAMFER
3"
6 3/4"
1/4" PL ASTM A-36
1/2" PL ASTM A-36 (2 REQ'D)
1/2" LOCK WASHER (4 REQ) &
1/2"-13 UNC 2B HEX NUT (4 REQ)
SECTION 10-B 2 1,2
SCALE: 3"=1'-0"
* SEE NOTE #4
1/2"-13 UNC 2A x 2 1/2" LG HEX BOLT (2 REQ'D), PLAIN WASHER (2 REQ'D), LOCK WASHER (2 REQ'D) & 1/2"-13 UNC 2B HEX NUT (2 REQ'D)
16" PIPE ABOVE
3/4" PL MAT'L: ASTM A-36 (2 REQ'D)
GRIND SMOOTH APPROX. 1/4" RAD.
4 1/2" (REF)
3-B
SYM ABT
GRIND SMOOTH APPROX. 1/4" RAD. TYP.
3"
9/16" HOLE THRU
6"
SECTION 10-A 3
SCALE: 3"=1'-0"
* SEE NOTE #4
DETAIL
SCALE: FULL
10
9
8
5


A-36
2"
1/4" x 45° ± 10° CHAMFER
BUNA-N OR NATURAL RUBBER 50 TO 70 DUROMETER - 1 REQ'D AS SHOWN & 1 REQ'D OPPOSITE HAND
9/16" DRILL THRU-1 1/4" CBORE TO DEPTH SHOWN
ER (4 REQ) &
HEX NUT (4 REQ)
TM A-36
MOOTH
1/4" RAD
RU
3 1/2"
1 1/2"
DETAIL 8-A
SCALE: FULL SIZE
SEE SHEET 1 FOR NOTES, REFERENCES, AND ALTERATIONS
GLOBAL MARINE DEVELOPMENT Inc.
MARINE SEISMIC SYSTEM (MSS)
DIP CARRIAGE HOUSING ASSEMBLY AND DETAILS
AS NOTED
001-120300
E-001
A005
2



℄ SYM ABT
12.79 I.D
C.S. BACKING &
OD. RUBBER
8 1/8
A
1/4"
1/4"



OWNER FURN
ITEM
MM ABT
50 DUROMETER NATURAL RUBBER OR BUTYL RU
(ISOBUTENE ISOPRENE) OR EQUAL
(2 REQ'D PER NEXT ASSY)
3 1/8
A
A
12 GA. CS BACKING
VULCANIZE I.D.
13 1/8" O.D. 2
C.S. BACKING
1/4"
2 2-11-81 CP ADD
1 11-4-80 NW CHAN
0 10/10/80 NW RE

1 2

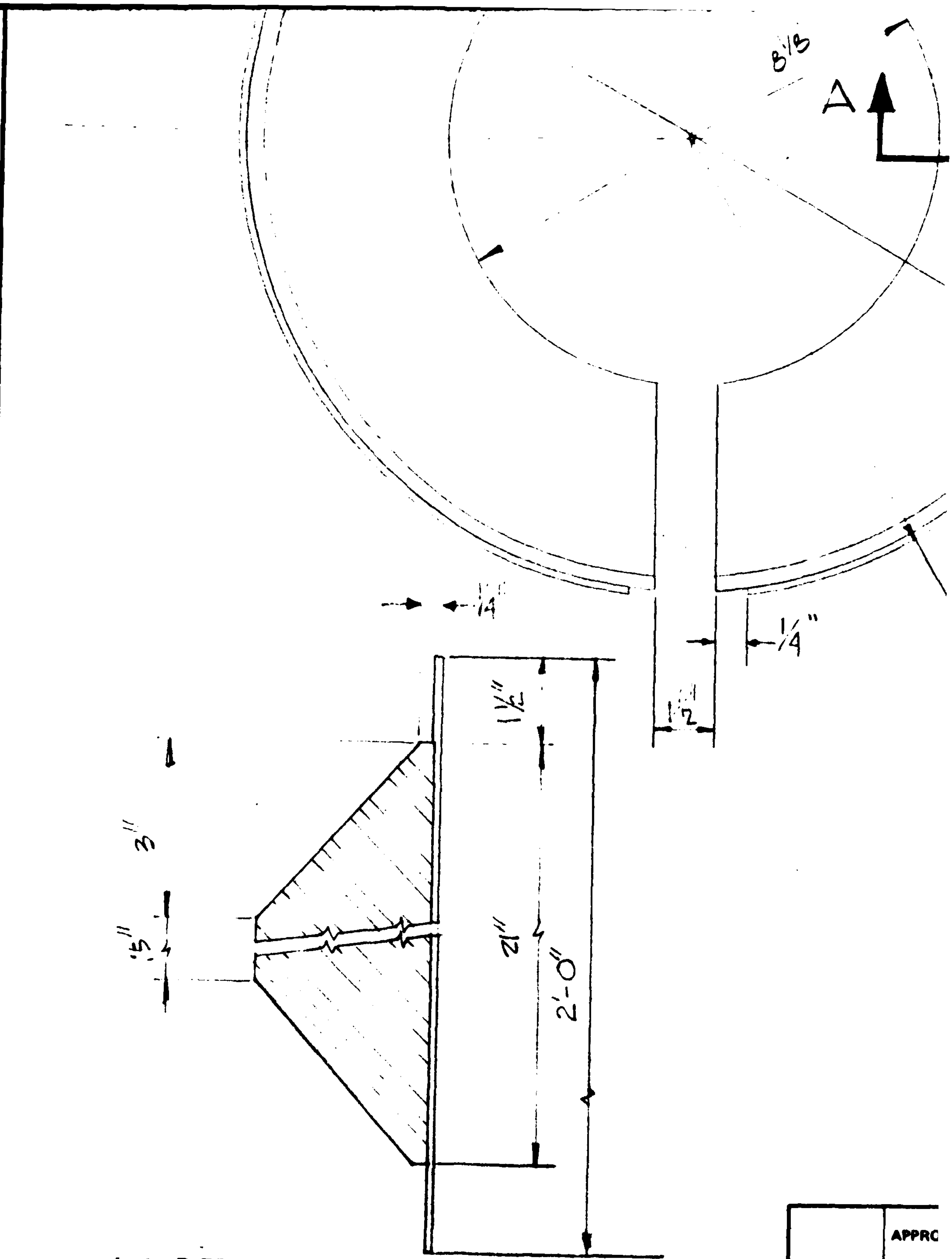
LIST OF MATERIALS

OWNER FURN	ITEM	QTY	DESCRIPTION	MATERIAL OR DWG NO.

ATURAL RUBBER OR BUTYL RUBBER
NE) OR EQUAL
XT ASSY)

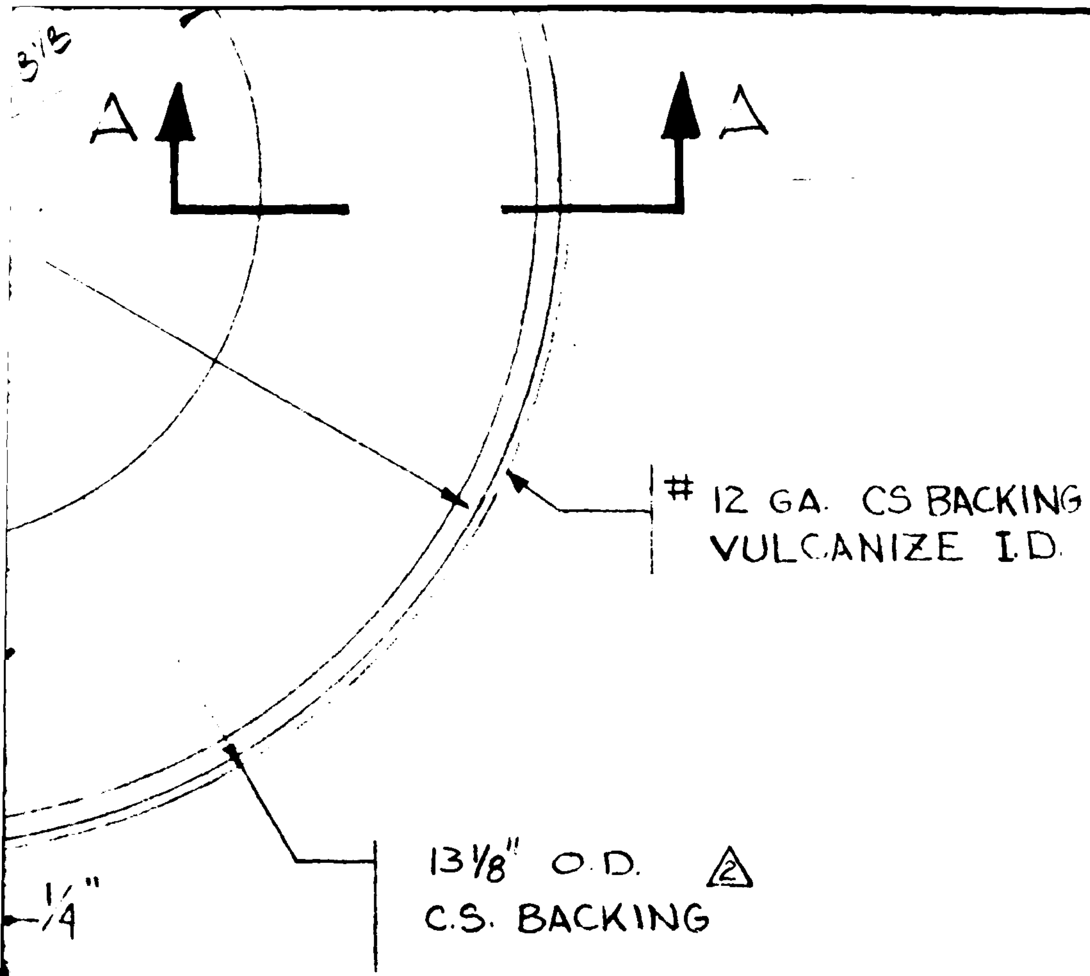
ING
.D.

2	2-11-81	CP	ADDED C.S. BACKING	006-323000	
1	11-4-80	NW	CHANGED MAT'L CALLOUT WAS NATURAL RUB	006-323000	
0	10/10/80	NW	RELEASE FOR CONSTRUCTION	001-210300	
B	9/29/80	NW	CLARIFY L/M - OPEN UP TOL.	001-210300	
A	8/11/80	NW	RELEASE FOR BID	001-210300	



SECTION A·A' 4 2

	APPRO
A.B.S.	
U.S.C.G.	



NO.	DATE	BY	
2	2-11-81	CP	ADDED
1	11-4-80	NW	CHANGE
0	10/10/80	NW	RELEA
B	9/29/80	NW	CLARI
A	8/11/80	NW	REL

D-001-A004

			NO. REQ'D		NEXT ASSEMBLY
				2	ALTERATION
				3-5-81	DATE
					LOS ANGELES
					NEWPORT BEACH
					HOUSTON
					PURCHASING
					CONSTRUCTION
					ENGINEERING
					USCG
				10	[redacted] CUSTOMER
				1	WALLERSTEDT
				1	DYE
				1	BUCHANAN
				1	MITCHELL
				1	FARNHAM
				2	LIBRARY

	APPROVED	EXAMINED OR REVIEWED	ALT. NO.	LETTER DATE	FILE REF. NO.
A.B.S.					
U.S.C.G.					

TOTAL NET WGT. MAT'L ______

TOTAL NET WGT. EQUIP. ______

TOTAL NET WEIGHT ______

D

MARINE S
LATERAL

	Initial	D
DFT.	N. WAGNER	8/11
ENGR	PRR	9/2
CHK	FARNHAM	
APPR	PRR	30
REL.	R.	10/

ING
D.

001-A004

NO.	DATE	BY	DESCRIPTION	JOB AUTH.	APPR
2	2-11-81	CP	ADDED C.S. BACKING	006-323000	RAW
1	11-4-80	NW	CHANGED MAT'L CALLOUT WAS NATURAL RUB.	006-323000	
0	10/10/80	NW	RELEASE FOR CONSTRUCTION	001-210300	RW
B	9/29/80	NW	CLARIFY L/M - OPEN UP TOL.	001-210300	RW
A	8/11/80	NW	RELEASE FOR BID	001-210300	

ALTERATIONS

NEXT ASSEMBLY
ALTERATION
ATE
OS ANGELES
EWPORT BEACH
OUSTON
URCHASING
ONSTRUCTION
NGINEERING
SCG
CUSTOMER
WALLERSTEDT
DYE
BUCHANAN
MITCHELL
FARNHAM
LIBRARY

T'L

UIP.

GLOBAL MARINE DEVELOPMENT INC.

Newport Beach, Calif.

MARINE SEISMIC SYSTEM (MSS)

LATERAL SHOCK ABSORBER RING DETAIL

	Initial	Dates
DFT.	N. WAGNER	8/11/80
ENGR	PRR	9/2/80
CHK.	[illegible]	[illegible]
APPR.	PRR	30 Sep 80
REL.	R. [illegible]	10/[illegible]

SCALE: NONE

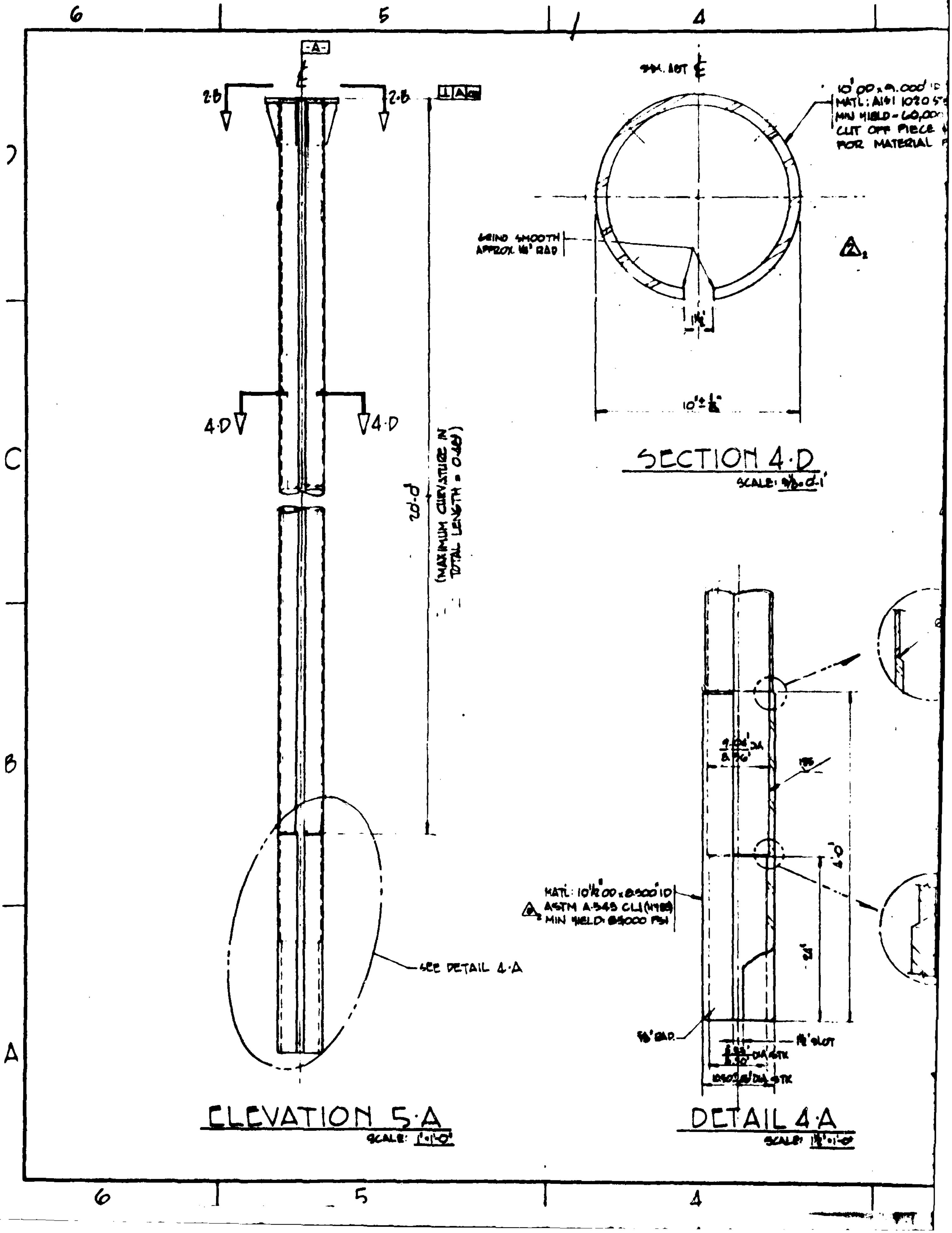
TOLERANCE UNLESS OTHERWISE NOTED
FRACTION ± 1/16" ANGULAR ± ½°
MILLIMETER ± 1. MM
( ) DESIGNATES MILLIMETER DIMENSIONS

JOB AUTH.: 001-210300

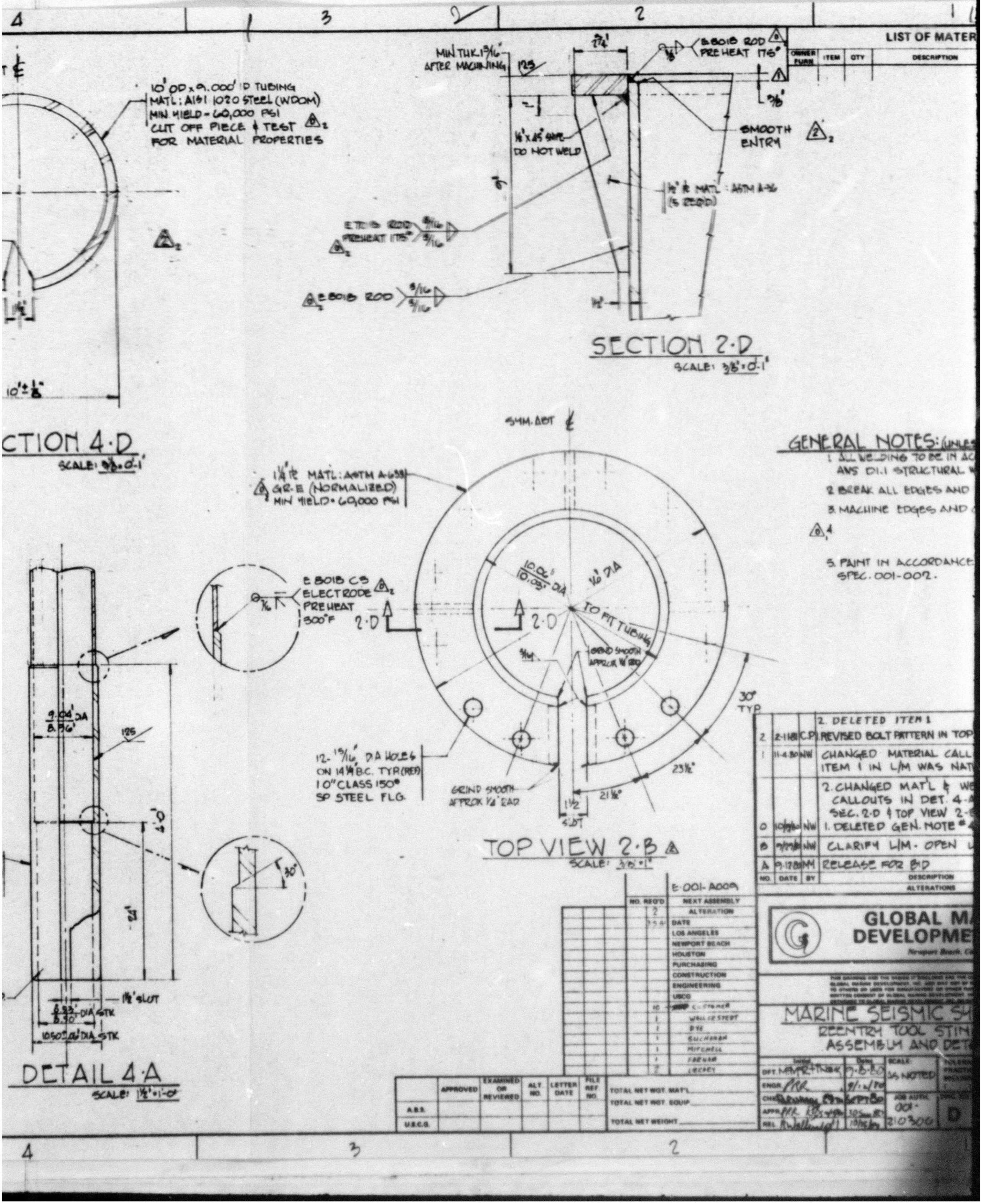
DWG. NO.: C 001 A006

SHT 1 OF 1

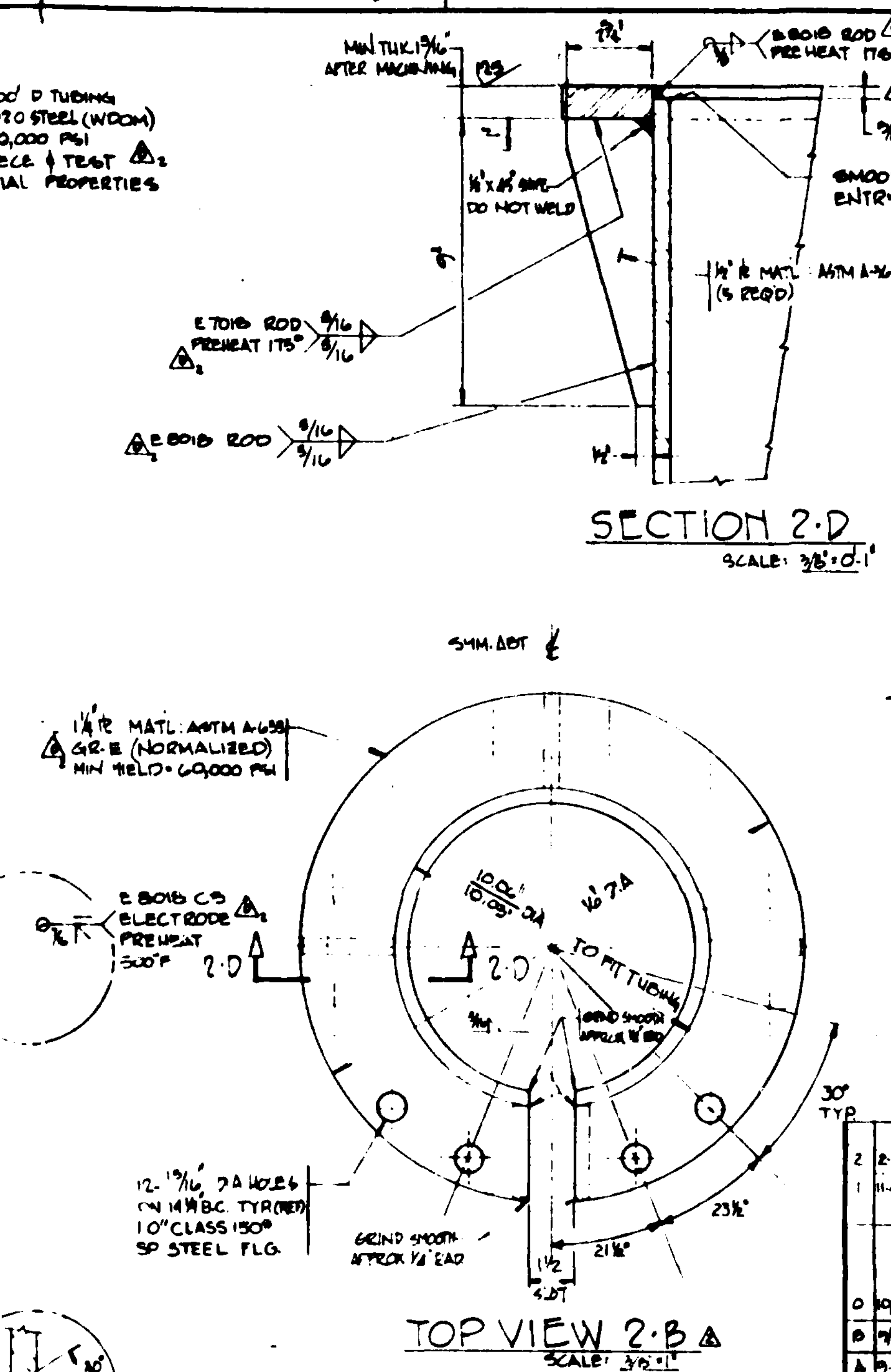
ALT 2



-A-
2·B
4·D
SEE DETAIL 4·A
ELEVATION 5·A
GRIND SMOOTH
SECTION 4·D
DETAIL 4·A



LIST OF MATER
OWNER FURN
ITEM
QTY
DESCRIPTION
MIN. THK. 1 3/16" AFTER MACHINING
E8018 ROD PREHEAT 175°
SMOOTH ENTRY
1/8" x 45° SHR. DO NOT WELD
1/2" PL MATL: ASTM A-36 (5 REQ'D)
E7018 ROD PREHEAT 175°
E8018 ROD
SECTION 2·D
SCALE: 3/8"=0'-1"
10" OD x 9.000" ID TUBING
MATL: AISI 1020 STEEL (WDOM)
MIN. YIELD = 60,000 PSI
CUT OFF PIECE & TEST FOR MATERIAL PROPERTIES
SECTION 4·D
SCALE: 3/8"=0'-1"
SYM. ABT
1 1/4" PL MATL: ASTM A-633 GR-E (NORMALIZED) MIN YIELD = 60,000 PSI
E 8018 C3 ELECTRODE PREHEAT 300°F
10.06" / 10.03" DIA
TO FIT TUBING
GRIND SMOOTH APPROX 1/4" RAD
12 - 15/16" DIA HOLES ON 14 1/4" B.C. TYP (REF) 10" CLASS 150# SO STEEL FLG.
GRIND SMOOTH APPROX 1/4" RAD
1 1/2" SLOT
30° TYP
23 1/2°
21 1/2°
TOP VIEW 2·B
SCALE: 3/8"=1"
9.04" / 8.96" DIA
1 1/2" SLOT
DIA STK
10.50" DIA STK
DETAIL 4·A
SCALE: 1 1/2"=1'-0"
GENERAL NOTES: (UNLES
1. ALL WELDING TO BE IN AC AWS D1.1 STRUCTURAL W
2. BREAK ALL EDGES AND
3. MACHINE EDGES AND
4
5. PAINT IN ACCORDANCE SPEC. 001-002.
2. DELETED ITEM 1
2 | 2-11-81 | C.P. | REVISED BOLT PATTERN IN TOP
1 | 11-4-80 | NW | CHANGED MATERIAL CALL ITEM 1 IN L/M WAS NAT
2. CHANGED MAT'L & WE CALLOUTS IN DET. 4-A SEC. 2-D & TOP VIEW 2-
0 | 10/29/80 | NW | 1. DELETED GEN. NOTE # 4
B | 9/29/80 | NW | CLARIFY L/M - OPEN
A | 9-17-80 | NM | RELEASE FOR BID
NO. | DATE | BY | DESCRIPTION
ALTERATIONS
E-001-A009
NO. REQ'D
NEXT ASSEMBLY
ALTERATION
DATE
LOS ANGELES
NEWPORT BEACH
HOUSTON
PURCHASING
CONSTRUCTION
ENGINEERING
USGS
CUSTOMER
WALLERSTEDT
DYE
BUCHANAN
MITCHELL
FORNER
LECKEY
APPROVED
EXAMINED OR REVIEWED
ALT. NO.
LETTER DATE
FILE REF NO.
A.B.S.
U.S.C.G.
TOTAL NET WGT. MAT'L
TOTAL NET WGT. EQUIP
TOTAL NET WEIGHT
GLOBAL MA
DEVELOPME
Newport Beach, C
MARINE SEISMIC SH
REENTRY TOOL STIN
ASSEMBLY AND DET
SCALE: AS NOTED
JOB AUTH. 001-210300
D



... OD TUBING
... 20 STEEL (WROM)
... 0,000 PSI
... ECE & TEST
... IAL PROPERTIES

LIST OF MATERIALS

ORDER PURCH	ITEM	QTY	DESCRIPTION	MATERIAL OR DWG NO.

GENERAL NOTES: (UNLESS OTHERWISE NOTED)

1. ALL WELDING TO BE IN ACCORDANCE WITH AWS D1.1 STRUCTURAL WELD CODE-STEEL
2. BREAK ALL EDGES AND REMOVE ALL BURRS.
3. MACHINE EDGES AND CORNER .015 MIN RADIUS
4. (deleted)
5. PAINT IN ACCORDANCE WITH GMDI SPEC. 001-002.

ALTERATIONS

NO.	DATE	BY	DESCRIPTION	JOB AUTH	APPR
2	2-11-81	C.P.	2. DELETED ITEM 1 REVISED BOLT PATTERN IN TOP VIEW 2-B	006-323000	
1	11-4-80	NW	CHANGED MATERIAL CALLOUT FOR ITEM 1 IN L/M WAS NATURAL RUBBER	006-323000	
0	10/80	NW	2. CHANGED MAT'L & WELD NOTE CALLOUTS IN DET 4-A, SEC 4-D, SEC. 2-D & TOP VIEW 2-B. 1. DELETED GEN. NOTE #4	001-210300	
B		NW	CLARIFY L/M - OPEN UP TOL.	001-210300	
A	9-17-80	NW	RELEASE FOR BID	001-210300	

E-001-A009

NO REQ'D	NEXT ASSEMBLY
2	ALTERATION
	DATE
	LOS ANGELES
	NEWPORT BEACH
	HOUSTON
	PURCHASING
	CONSTRUCTION
	ENGINEERING
	USGS
10	CUSTOMER
1	
1	
1	
1	
1	
2	

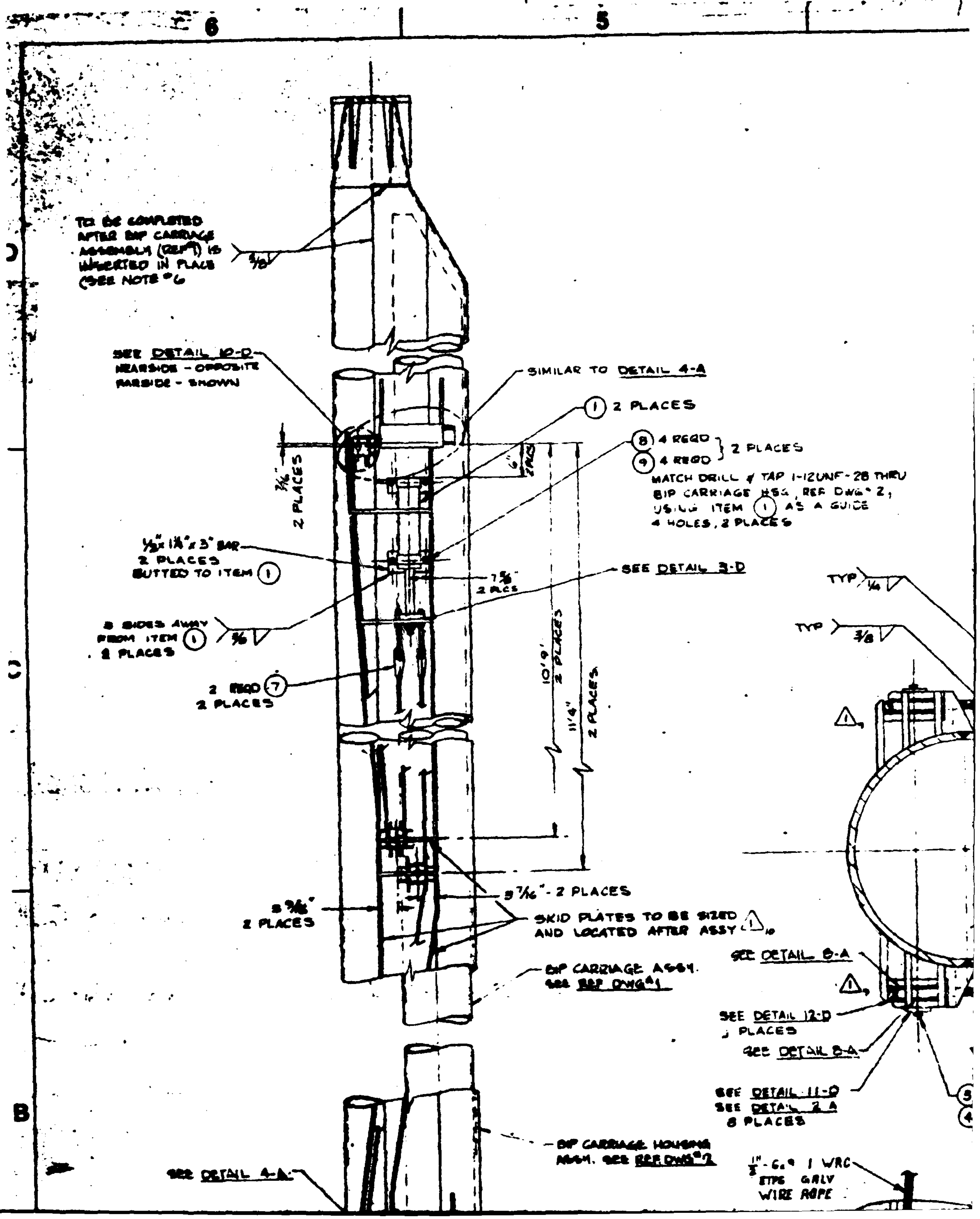
	APPROVED	FABRICATED OR RE-APPROVED	ALT NO	LETTER DATE	FILE REF NO
ABS					
USCG					

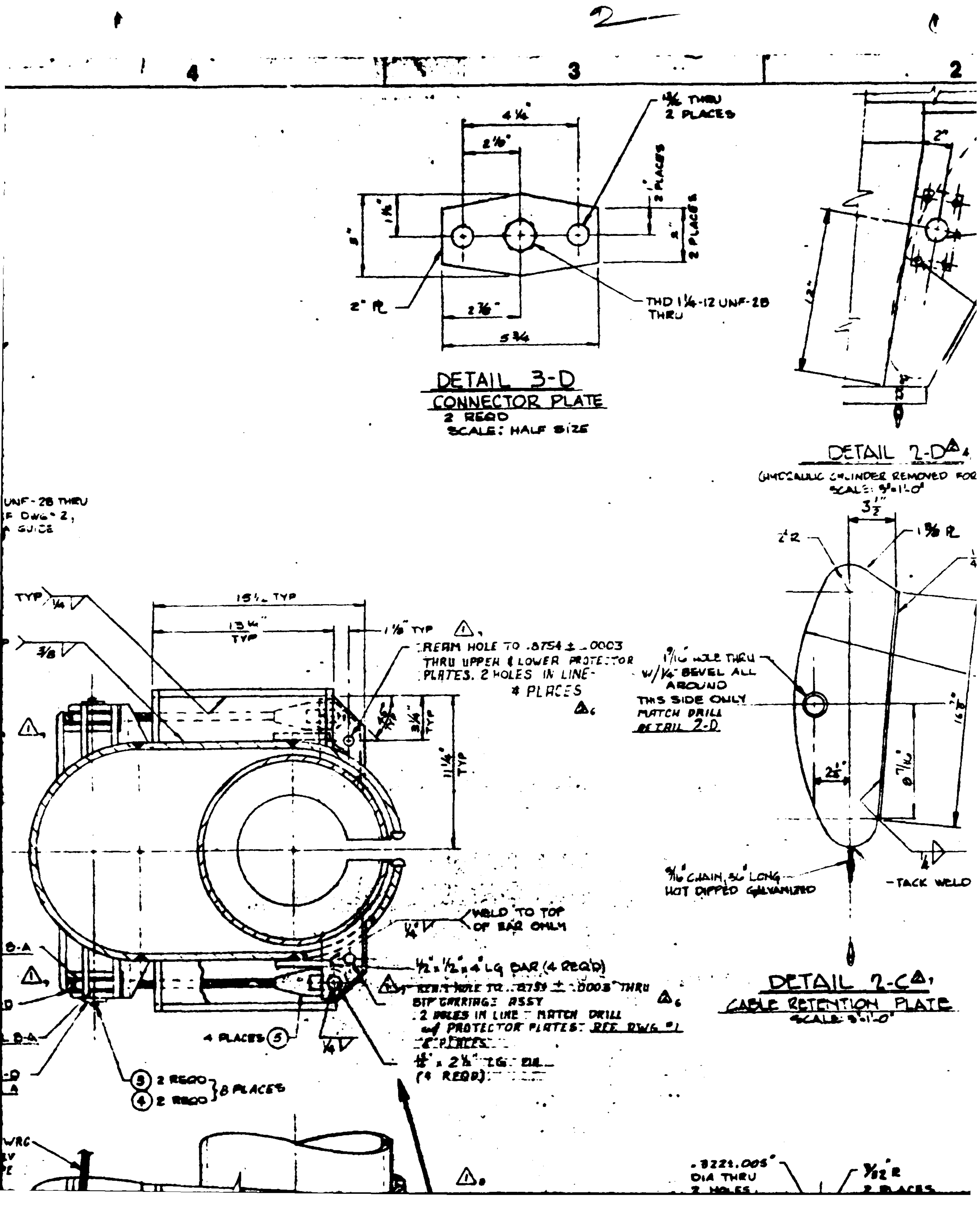
TOTAL NET WEIGHT MAT'L ____
TOTAL NET WEIGHT EQUIP ____
TOTAL NET WEIGHT ____

GLOBAL MARINE DEVELOPMENT INC.
Newport Beach, Calif.

MARINE SEISMIC SYSTEM (MSS)
REENTRY TOOL STINGER ASSEMBLY AND DETAILS

		DATE	SCALE	TOLERANCE UNLESS OTHERWISE NOTED
DFT		9-5-80	AS NOTED	FRACTION ± 1/16" ANGULAR ± ½°
ENGR		9/1/80		
CHK			JOB AUTH 001-210300	DWG NO D ·001 ·A007	SHT 1 OF 1	ALT 2
APPR				

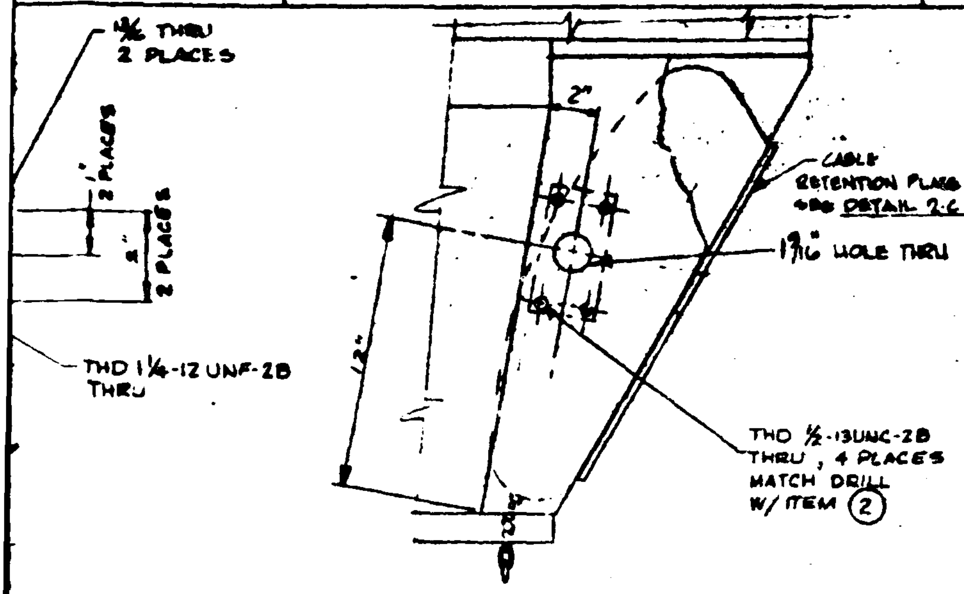

6
5
D
C
B
TO BE COMPLETED AFTER BIP CARRIAGE ASSEMBLY (REF 1) IS INSERTED IN PLACE (SEE NOTE #6
SEE DETAIL 10-D NEARSIDE - OPPOSITE FARSIDE - SHOWN
SIMILAR TO DETAIL 4-A
1 2 PLACES
8 4 REQD
9 4 REQD
2 PLACES
MATCH DRILL & TAP 1-12UNF-2B THRU BIP CARRIAGE HSG, REF DWG # 2, USING ITEM 1 AS A GUIDE 4 HOLES, 2 PLACES
7/16" 2 PLACES
1/2" x 1 1/4" x 3" BAR 2 PLACES BUTTED TO ITEM 1
7 5/8" 2 PLCS
SEE DETAIL 3-D
3 SIDES AWAY FROM ITEM 1 2 PLACES
2 REQD 7 2 PLACES
10'9" 2 PLACES
11'4" 2 PLACES
TYP 1/4
TYP 3/8
5 7/16" - 2 PLACES
5 5/16" 2 PLACES
SKID PLATES TO BE SIZED AND LOCATED AFTER ASSY
SEE DETAIL 8-A
BIP CARRIAGE ASSY. SEE REF DWG #1
SEE DETAIL 12-D PLACES
SEE DETAIL 8-A
SEE DETAIL 11-D
SEE DETAIL 2-A 8 PLACES
BIP CARRIAGE HOUSING ASSM. SEE REF DWG #2
SEE DETAIL 4-A
1/2" - 6x9 1 WRC EIPS GALV WIRE ROPE



4
3
2
4¼
2⅛
⅜ THRU
2 PLACES
2" R
2⅜
5¾
THD 1¼-12 UNF-2B
THRU
DETAIL 3-D
CONNECTOR PLATE
2 REQD
SCALE: HALF SIZE
DETAIL 2-D
SCALE: 3"=1'-0"
UNF-2B THRU
15¼ TYP
13¼ TYP
1⅛ TYP
REAM HOLE TO .8754 ± .0003
THRU UPPER & LOWER PROTECTOR
PLATES. 2 HOLES IN LINE
4 PLACES
1 9/16 HOLE THRU
W/ ¼ BEVEL ALL
AROUND
THIS SIDE ONLY
MATCH DRILL
DETAIL 2-D
11¼ TYP
WELD TO TOP
OF BAR ONLY
½" x ½" x 4" LG BAR (4 REQ'D)
BTP CARRIAGE ASSY
4 PLACES
½" x 2½" LG
(4 REQD)
2 REQD
8 PLACES
5/16" CHAIN, 36" LONG
HOT DIPPED GALVANIZED
TACK WELD
DETAIL 2-C
CABLE RETENTION PLATE
SCALE: 3"=1'-0"
DIA THRU
2 HOLES
2 PLACES

3

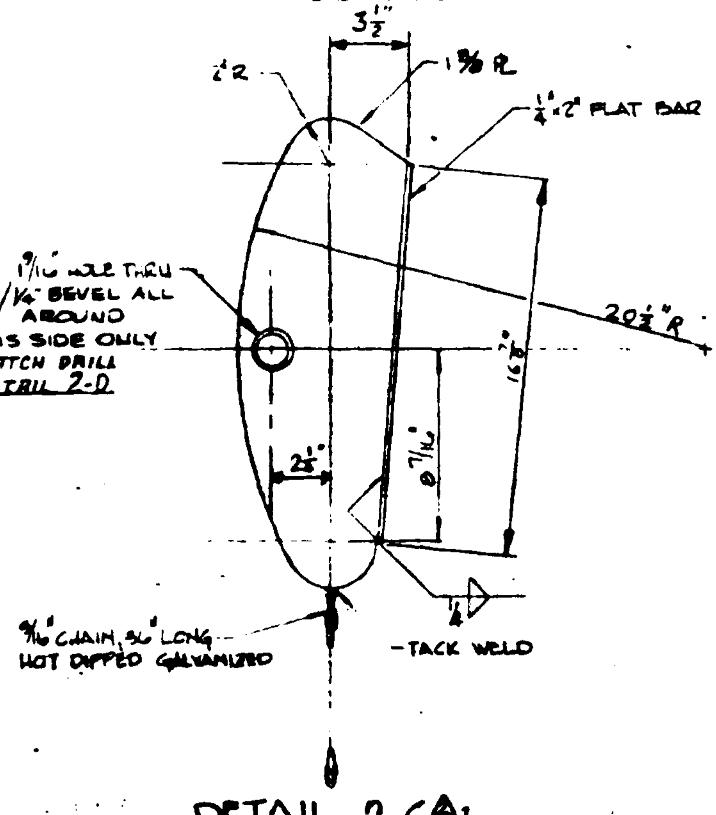
2 | 1



DETAIL 2-D△4

(HYDRAULIC CYLINDER REMOVED FOR CLARITY)

SCALE: 3"=1'-0"



DETAIL 2-C△7

CABLE RETENTION PLATE

SCALE 3"=1'-0"

LIST OF MATERIALS				
[illegible]	ITEM	QTY	DESCRIPTION	MATERIAL
	1	2	4" BORE, 12" STROKE SERIES "2H" HEAVY DUTY HYDRAULIC CYLINDER STYLE C (NFPA MX2) W/SS ROD & THREAD STYLE 42 ROD END 1¼-12 THREAD W/JAM NUT CUSHIONED BLIND END	[illegible]
	2	1	2" BORE, 2" STROKE SERIES "2H" HEAVY DUTY HYDRAULIC CYLINDER STYLE J (NFPA MP1) W/SS ROD & END STYLE [illegible]	
	3	16	WASHER, LOCK - ¼" I.D. x 1/16" THK	SS
	4	16	BOLT, HEX HD, ¼-20 THD x ½" LONG	SS
	5	4	½" CLOSED SPELTER SOCKET	
	6	4	⅛" COTTER PIN	
	7	4	BOLT, ELEVATOR SOCKET FOR ½" DIA WIRE ROPE 8" SHANK W/4" THD LENGTH	P/N 797-5 BREWER-TITCHENER CORP OR EQUAL
	8	8	WASHER, LOCK - 1" I.D. x ⅛ THK	SS
	9	8	BOLT, HEX HD, 1-12UNF-2A x 1¾" LG	SS

LIST OF MATERIAL CON'T ON SHT 2

GENERAL NOTES: (UNLESS OTHERWISE NOTED)

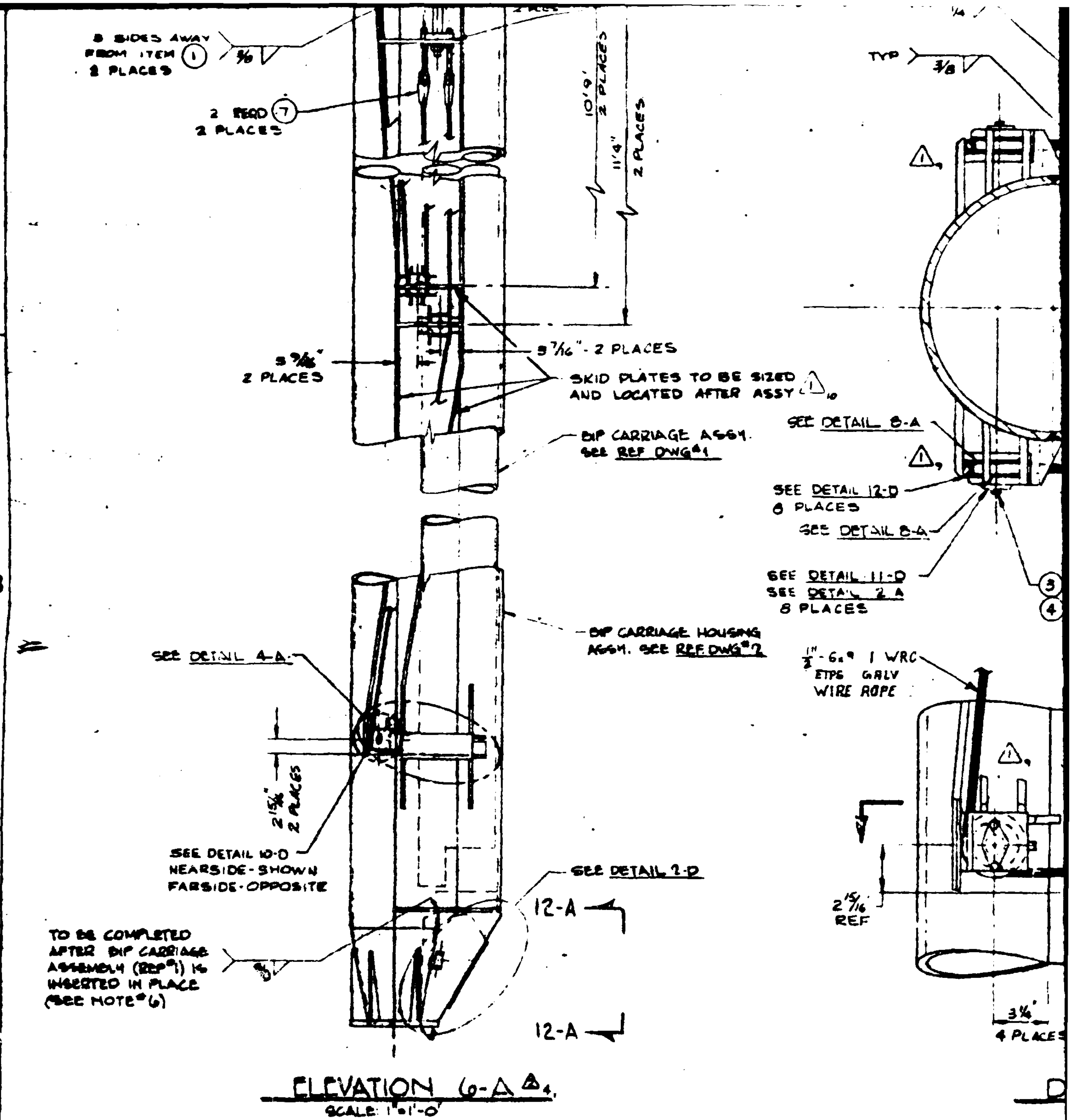
1. ALL MATERIAL TO BE ASTM A-36 OR EQUAL.
2. ALL WELDING TO BE IN ACCORDANCE WITH AWS D1.1 STRUCTURAL WELDING CODE - STEEL.
3. ALL MACHINE SURFACES TO BE 125√.
4. BREAK ALL SHARP EDGES & REMOVE ALL BURRS.
5. PAINT IN ACCORDANCE WITH SMOI SPEC 001-002.
6. ALL WELDS THIS ASSY SHALL USE E 7018 ELECTRODE.
7. △ GENERAL TOLERANCES ON DECIMAL DIMENSIONS
   - .X = ±.1
   - .XX = ±.03
   - .XXX = ±.010

REFERENCE DRAWINGS

1. D-001-A004 MARINE SEISMIC [illegible] BIP CARRIAGE [illegible] & DETAILS
2. E-001-A005 MARINE SEISMIC [illegible] BIP CARRIAGE HOUSING ASSEMBLY AND DETAILS

ALTERATIONS CON'T ON SHT 2 ZONE 7-A

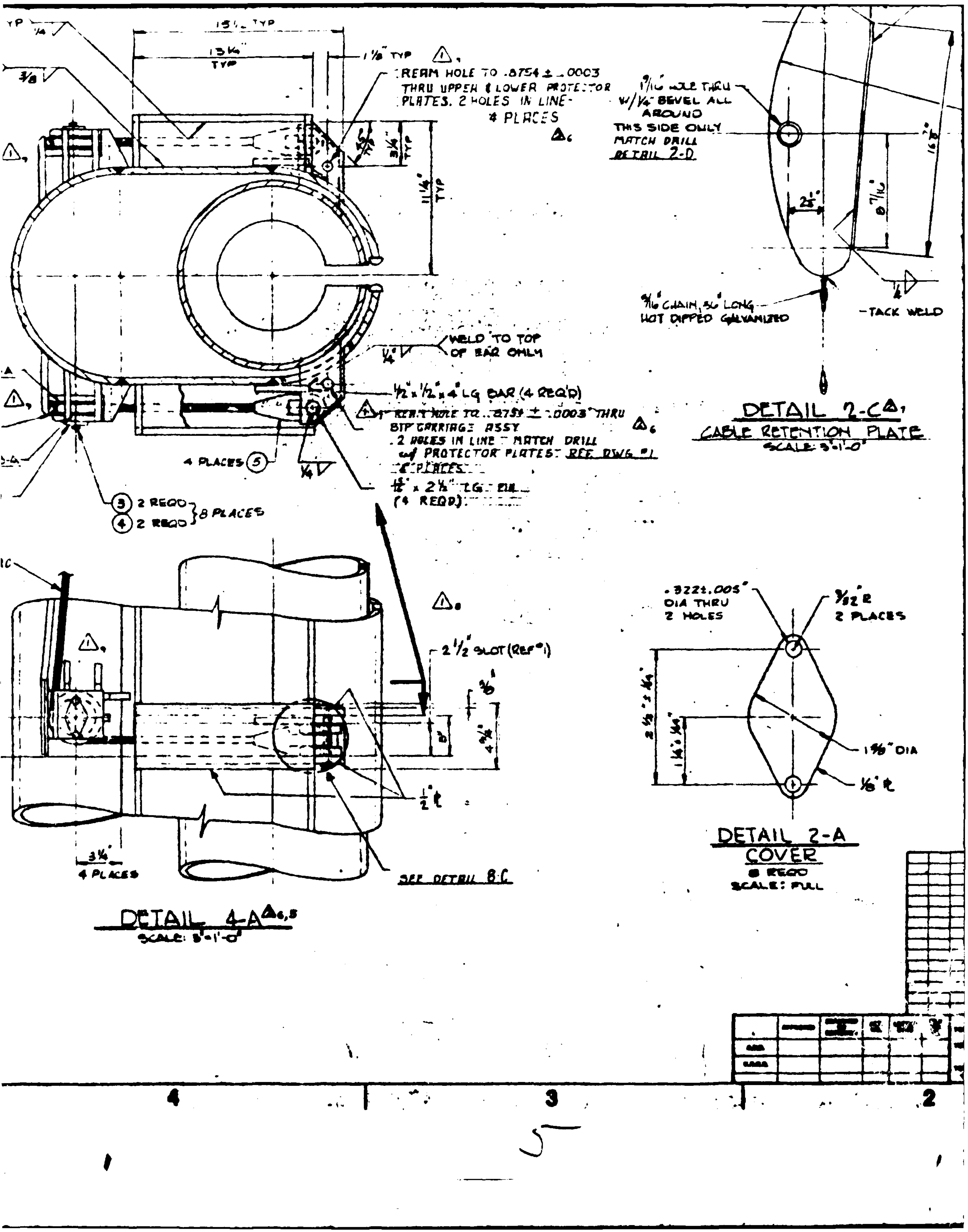
11. ADDED S/N 7.
10. ADDED SKID PLATES.
9. REVISED PICTURE TO AGREE W/SHEAVE SUPPORT DWGS.
8. DELETED TUBE CALLOUT.
7. CHANGED CALLOUT FOR NEW PIN.



ELEVATION 6-A
SCALE: 1"=1'-0"

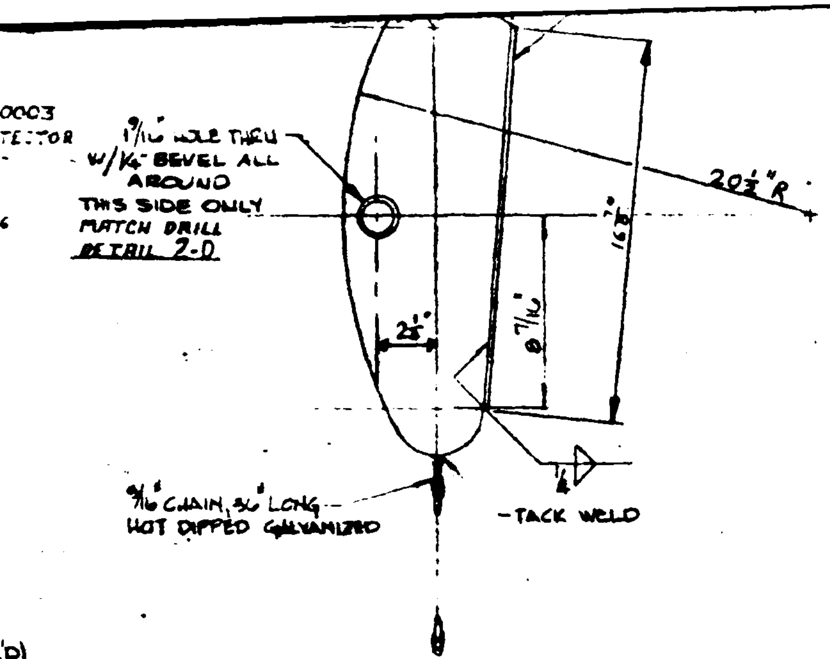
C
B
A
6
5

4



15 1/4 TYP
13 1/4" TYP
1 1/8" TYP
REAM HOLE TO .8754 ± .0003 THRU UPPER & LOWER PROTECTOR PLATES. 2 HOLES IN LINE 4 PLACES
1 1/16 HOLE THRU W/ 1/4 BEVEL ALL AROUND THIS SIDE ONLY MATCH DRILL DETAIL 2-D
3/4" TYP
11 1/4" TYP
2 1/2"
8 7/16
9/16 CHAIN, 36" LONG HOT DIPPED GALVANIZED
TACK WELD
WELD TO TOP OF BAR ONLY
1/2" x 1/2" x 4" LG BAR (4 REQ'D)
REAM HOLE TO .8754 ± .0003 THRU BTP CARRIAGE ASSY. 2 HOLES IN LINE MATCH DRILL w/ PROTECTOR PLATES REF DWG #1 4 PLACES
4 PLACES (5)
1/2" x 2 1/2" LG PIN (4 REQD)
(3) 2 REQD
(4) 2 REQD
8 PLACES
DETAIL 2-C
CABLE RETENTION PLATE
SCALE: 3"=1'-0"
.322±.005" DIA THRU 2 HOLES
9/32 R 2 PLACES
2 1/2" SLOT (REF #1)
1 5/8" DIA
1/8" ℓ
1/2" ℓ
3 1/4" 4 PLACES
SEE DETAIL 8-C
DETAIL 4-A
SCALE: 3"=1'-0"
DETAIL 2-A
COVER
8 REQD
SCALE: FULL
4
3
2

LIST OF MATERIAL CON'T ON SHT 2



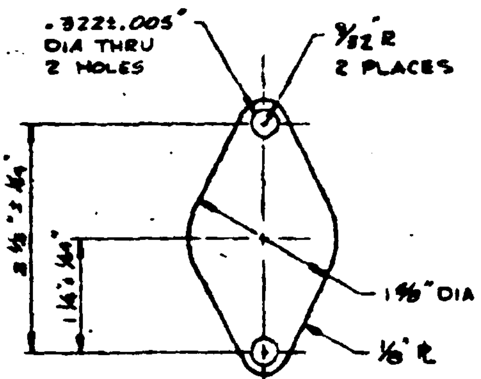
DETAIL 2-C
CABLE RETENTION PLATE
SCALE: 3"=1'-0"

GENERAL NOTES: (UNLESS OTHERWISE NOTED)

1. ALL MATERIAL TO BE ASTM A-36 OR EQUIVALENT.
2. ALL WELDING TO BE IN ACCORDANCE WITH AWS D1.1 STRUCTURAL WELDING CODE - STEEL.
3. ALL MACHINE SURFACES TO BE 125.
4. BREAK ALL SHARP EDGES & REMOVE ALL BURRS.
5. PAINT IN ACCORDANCE WITH GMDI SPEC 001-002.
6. ALL WELDS THIS ASSY SHALL USE E 7018 ELECTRODE.
7. GENERAL TOLERANCES ON DECIMAL DIMENSIONS
   - .X = ±.1
   - .XX = ±.03
   - .XXX = ±.010

REFERENCE DRAWINGS

1. D-001-A004 MARINE SEISMIC SYSTEM (MSS) BIP CARRIAGE ASSEMBLY & DETAILS
2. E-001-A005 MARINE SEISMIC SYSTEM (MSS) BIP CARRIAGE HOUSING ASSEMBLY AND DETAILS



DETAIL 2-A
COVER
8 REQD
SCALE: FULL

ALTERATIONS CONT ON SHT 2 ZONE 7-A

1			11. ADDED S/N 7. 10. ADDED SKID PLATES. 9. REVISED PICTURE TO AGREE W/SHEAVE SUPPORT DWGS. 8. DELETED TUBE CALLOUT. 7. CHANGED CALLOUT FOR NEW PIN. 6. COMPLETELY REVISED PIN. 5. REVISED DIMENSIONS & TOL TO DECIMALS. 4. REVISED GUSSET & CHGD DIMS. 3. REVISED DIMENSIONS. 2. ADDED VIEW. 1. REVISED SHEAVE SUPT. GUSSETS	001-	
0	10/30/80		DWG COMPLETELY REVISED ADDED SHEET 2 RELEASED FOR CONSTRUCTION	001-210300	
B			CLARIFY L/M - OPEN UP TOL	001-	
A			RELEASE FOR BID	001-210300	
NO.	DATE	BY	ALTERATIONS		

E-001-A005

NO. REQD.	
2	
30	CUSTOMER
1	WALLERSTEDT
1	DYE
1	BURNHAM
1	MITCHELL
1	FORNHAM
2	LIBRARY

GLOBAL MARINE DEVELOPMENT Inc.
Newport Beach, Calif.

MARINE SEISMIC SYSTEM (MSS)
BIP CARRIAGE HOUSING
MAIN ASSEMBLY

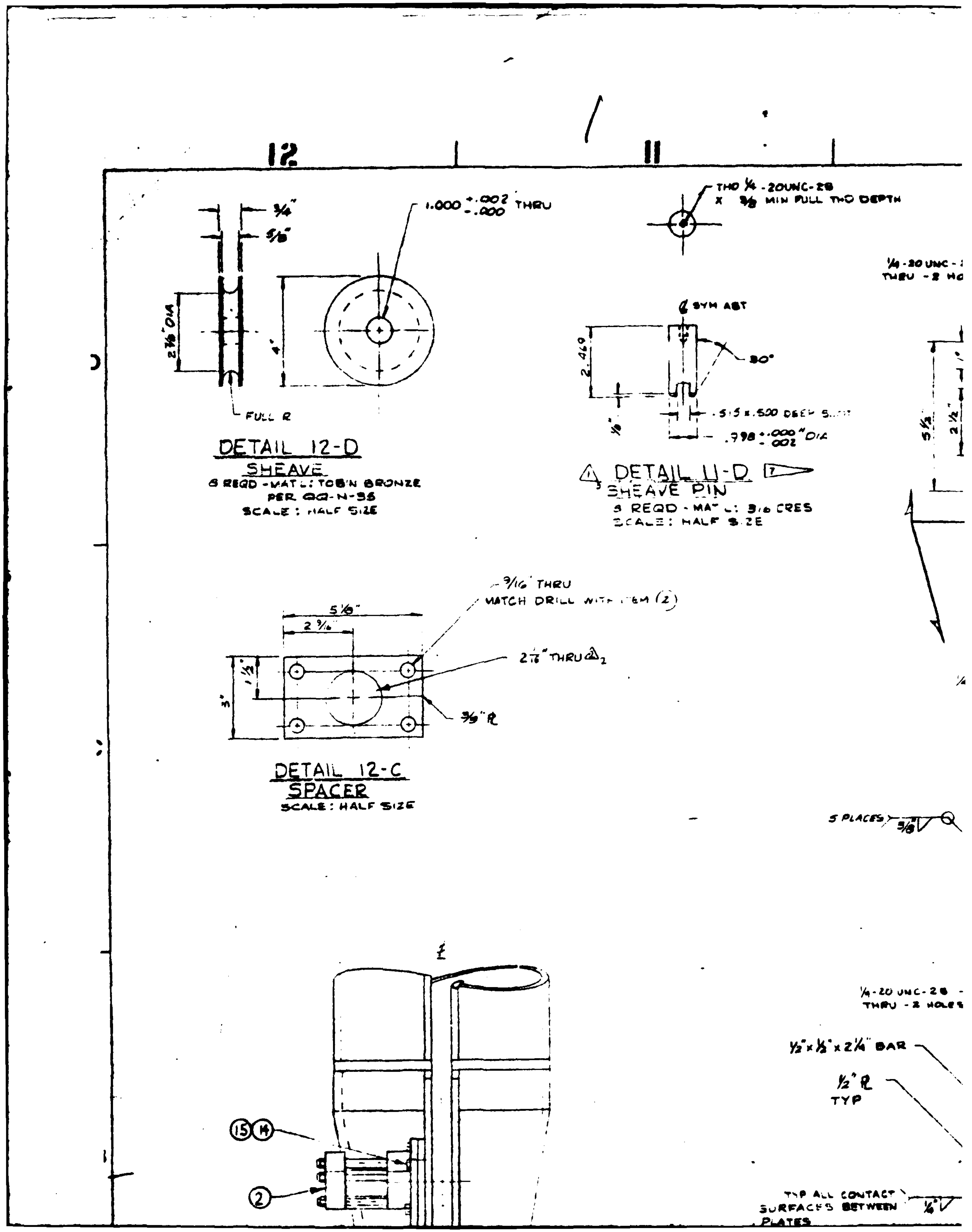
AS NOTED

001-210800

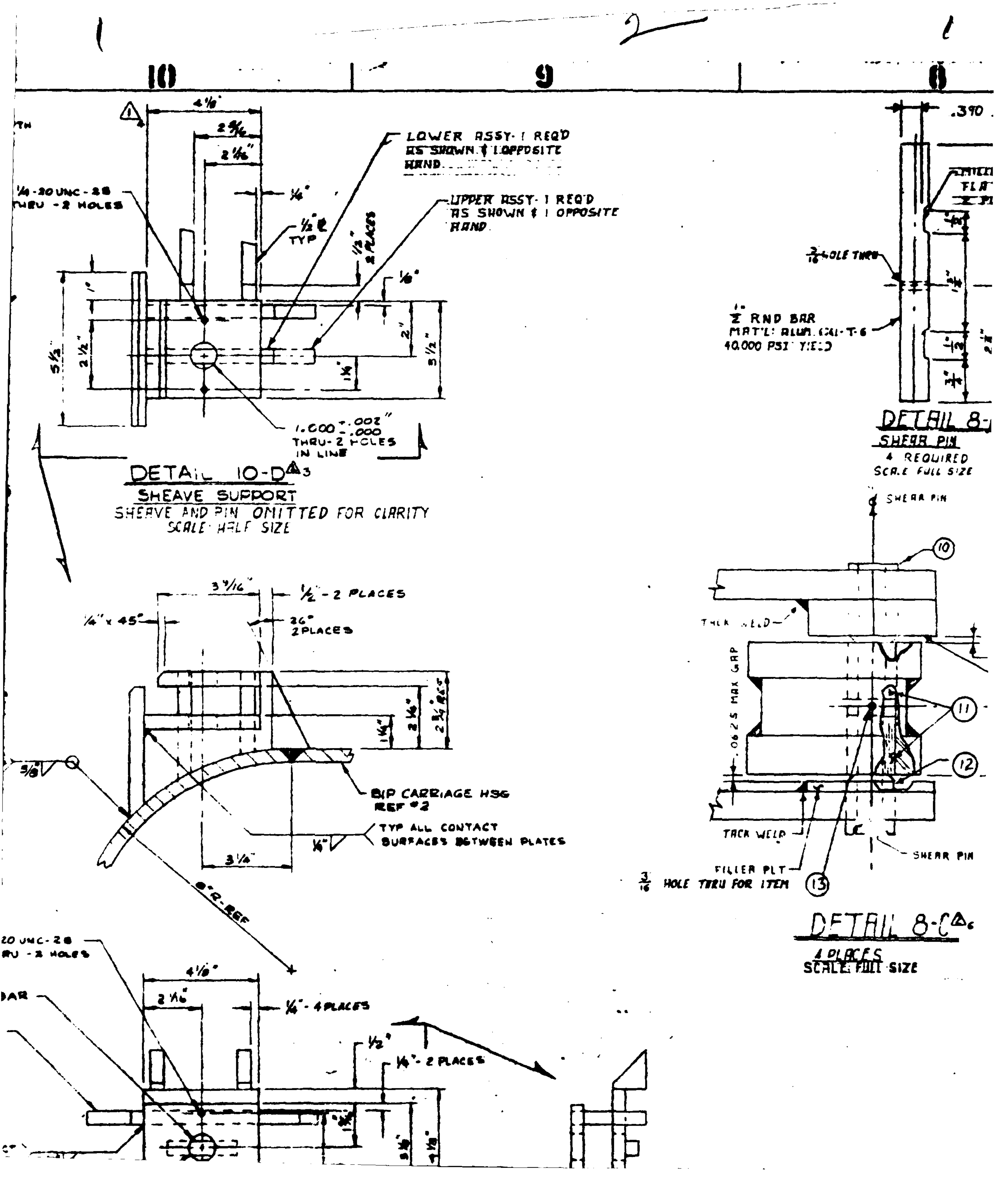
E-001-A005 2

2 1

A B C



12
11
1.000 +.002 -.000 THRU
3/4"
5/8"
2 7/8" DIA
4"
FULL R
DETAIL 12-D
SHEAVE
5 REQD - MAT'L: TOBIN BRONZE
PER QQ-N-35
SCALE: HALF SIZE
THD 1/4-20UNC-2B
X 3/8 MIN FULL THD DEPTH
℄ SYM ABT
30°
2.469
1/8"
.515 x .500 DEEP SLOT
.998 +.000 -.002 " DIA
DETAIL 11-D
SHEAVE PIN
5 REQD - MAT'L: 316 CRES
SCALE: HALF SIZE
1/4-20 UNC-2
THRU - 2 HO
5 1/8
2 1/2"
9/16" THRU
MATCH DRILL WITH ITEM (2)
5 1/8"
2 9/16"
2 7/16" THRU
1 1/2"
3"
3/8" R
DETAIL 12-C
SPACER
SCALE: HALF SIZE
5 PLACES
3/8
1/4-20 UNC-2B
THRU - 2 HOLES
1/2" x 1/2" x 2 1/4" BAR
1/2" R
TYP
15
14
2
TYP ALL CONTACT
SURFACES BETWEEN
PLATES
1/8"

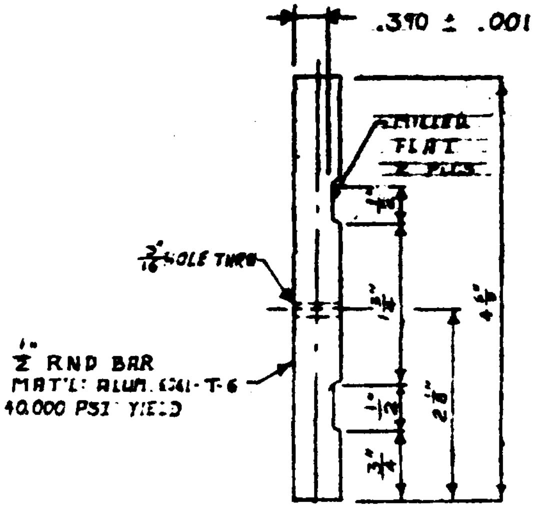


10
9
8
LOWER ASSY - 1 REQ'D AS SHOWN & 1 OPPOSITE HAND
UPPER ASSY - 1 REQ'D AS SHOWN & 1 OPPOSITE HAND
1/4-20 UNC-2B THRU - 2 HOLES
1/2" TYP
1/2" 2 PLACES
1.000 +.002 -.000 THRU - 2 HOLES IN LINE
DETAIL 10-D
SHEAVE SUPPORT
SHEAVE AND PIN OMITTED FOR CLARITY
SCALE: HALF SIZE
1/2" - 2 PLACES
1/4" x 45°
26° 2 PLACES
BIP CARRIAGE HSG REF #2
TYP ALL CONTACT SURFACES BETWEEN PLATES
8" R REF
20 UNC-2B
THRU - 2 HOLES
1/4" - 4 PLACES
1/4" - 2 PLACES
.390
3/16 HOLE THRU
1/2 RND BAR
MAT'L: ALUM. 6061-T-6
40,000 PSI YIELD
DETAIL 8-
SHEAR PIN
4 REQUIRED
SCALE FULL SIZE
SHEAR PIN
TACK WELD
.0625 MAX GAP
FILLER PLT
3/16 HOLE THRU FOR ITEM 13
10
11
12
DETAIL 8-C
4 PLACES
SCALE: FULL SIZE

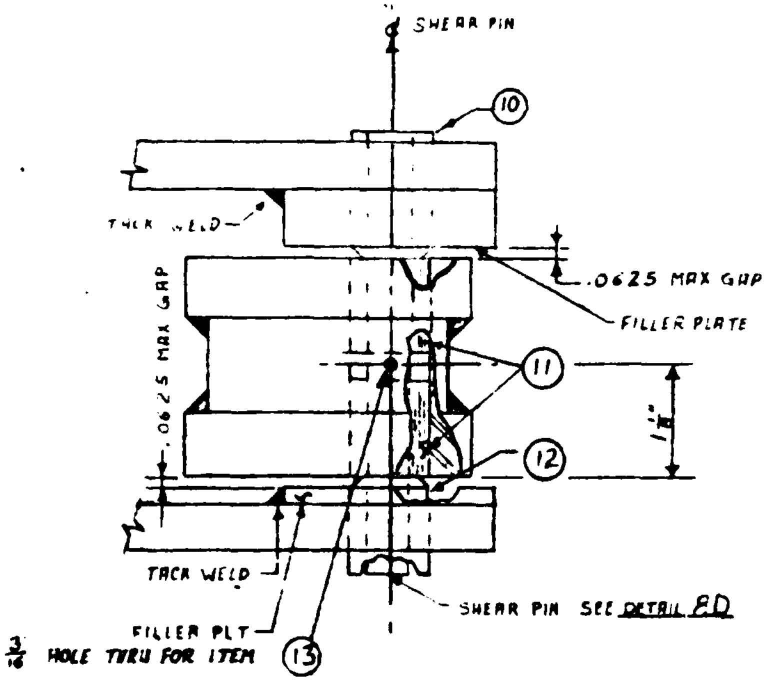
2 1 3

LIST OF MATERIALS

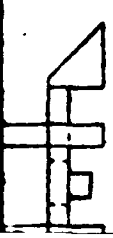
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	10	4	.5156 ID x 3/4" OD 1 1/8 LG DRILL BUSHING w/ 30° BEVEL (AMERICAN OR EQ)	
	11	8	.5156 ID x 3/4" OD x 1" LG DRILL BUSHING (AMERICAN OR EQUAL)	
	12	4	.5156 ID x 3/4" OD x 1" LG DRILL BUSHING w/ 30° BEVEL (AMERICAN OR EQUAL)	
	13	4	1/8" x 1 1/2" LG COTTER PIN	
	14	4	1/2" 13 UNC 2A x 1 1/2 LG HEX BOLT	SS
	15	4	1/2 LOCK WASHER	SS

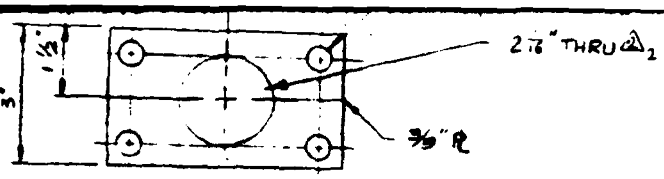


DETAIL 8-D
SHEAR PIN
4 REQUIRED
SCALE FULL SIZE

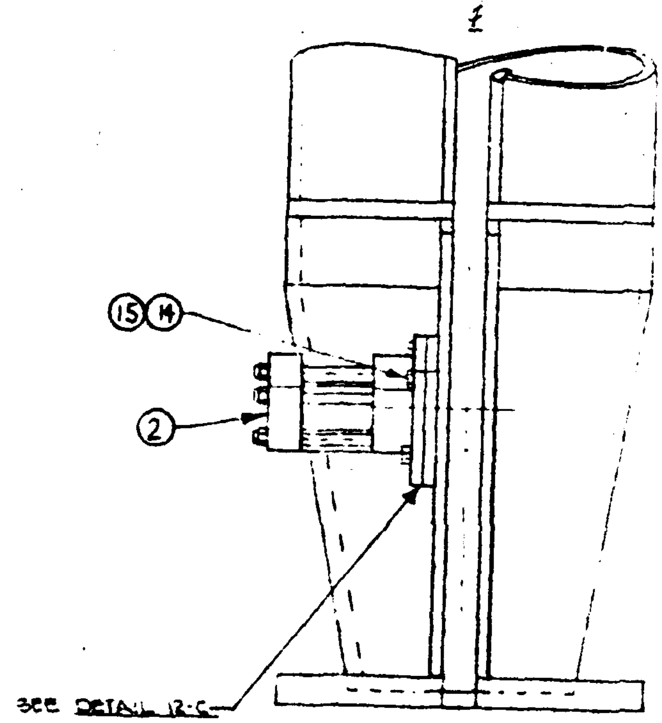


DETAIL 8-C
4 PLACES
SCALE: FULL SIZE

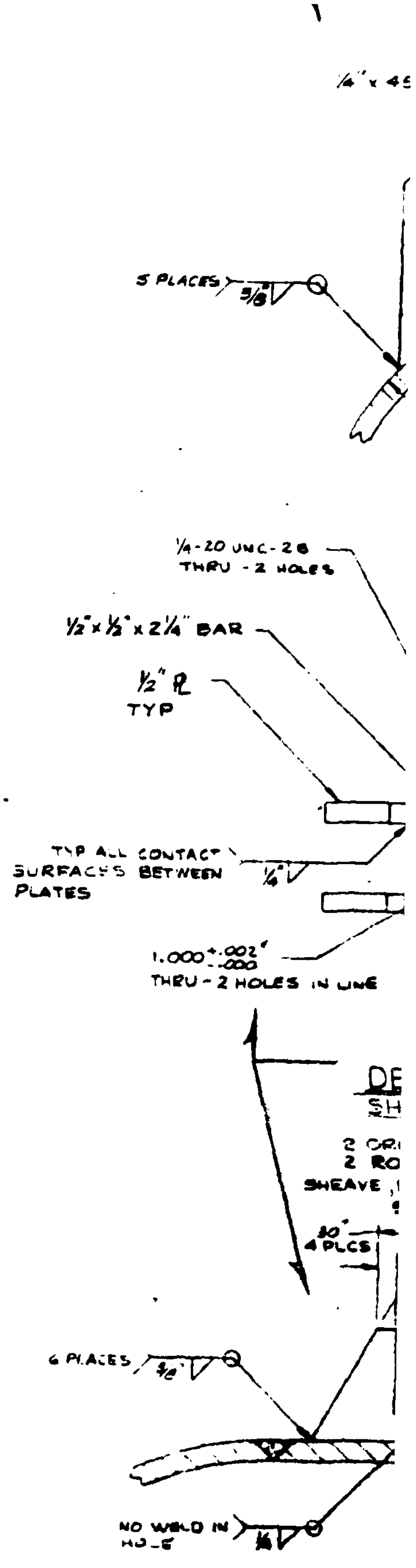




DETAIL 12-C
SPACER
SCALE: HALF SIZE

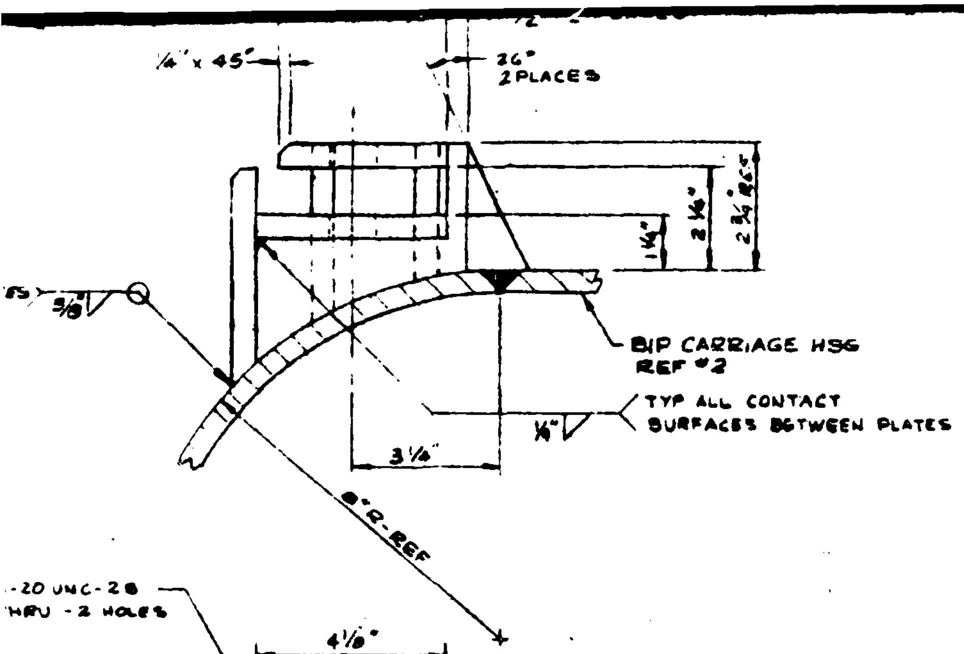


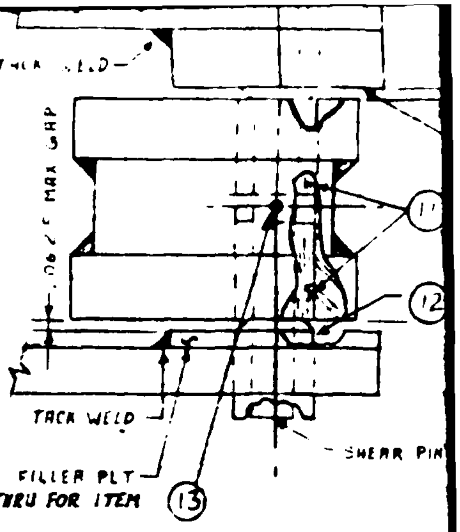
SECTION 12-A
SCALE: 3"=1-0



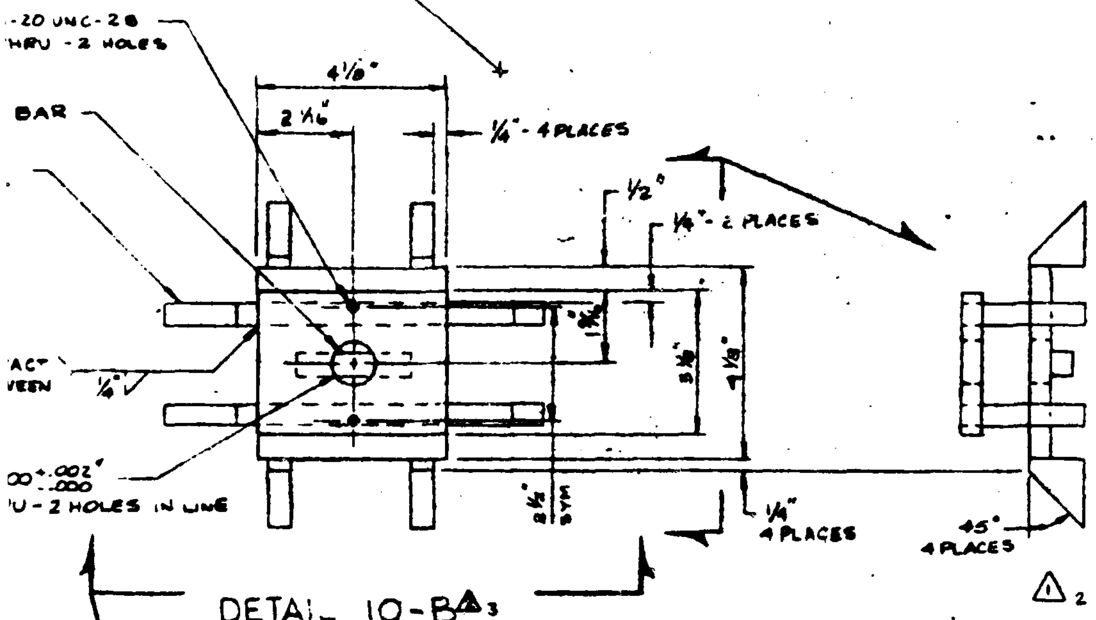
12

11

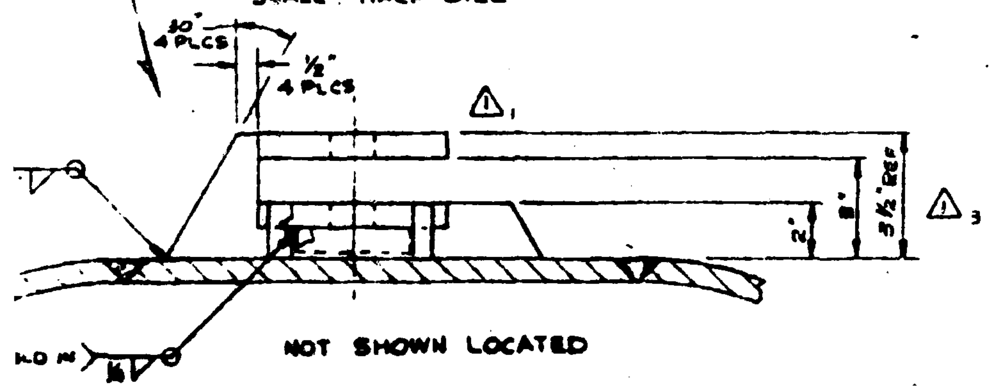




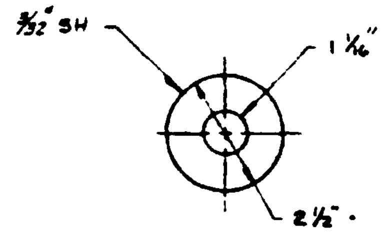
DETAIL 8-C
4 PLACES
SCALE: FULL SIZE



DETAIL 10-B △3
SHEAVE SUPPORT
4 REQD
2 ORIENTATED AS SHOWN
2 ROTATED 90°
SHEAVE, PIN & COVER OMITTED FOR CLARITY
SCALE: HALF SIZE



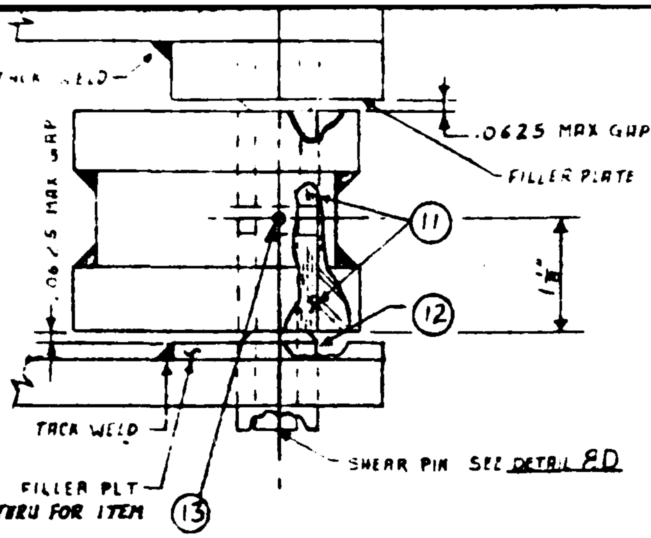
NOT SHOWN LOCATED



DETAIL 8-A
THRUST WASHER
MATERIAL: 1/4 HARD BRASS
16 REQD
SCALE: HALF SIZE

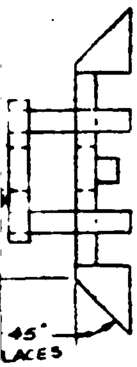
10 9 11

5

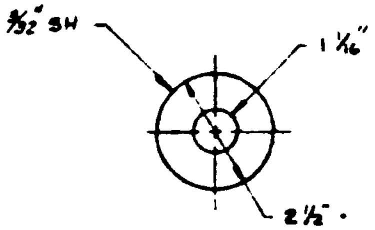


DETAIL 8-C △6

4 PLACES
SCALE: FULL SIZE



△2



△3

DETAIL 8-A
THRUST WASHER
MATERIAL: 1/4 HARD BRASS
16 REQD
SCALE: HALF SIZE

NO.	DATE	BY	DESCRIPTIONS		
2	2 23 [illegible]	[illegible]	1. REVISED DETAIL 2-C 2. CHANGED SHEAR RODS IN DET. 6-A, DELETED DET. 6-B 3. ADDED DETAILS 8-C & 8-D 5. ADDED 1/2 - 6x9 1. WRC WIRE ROPE. DET. 6-A 4. MOVED ITEM (HYDRAULIC CYLINDER) IN ELEV 6-A DETAIL 2-B & SECT. 12-A 3. REVISED SHEAVE SUPPORTS DETAIL 10-B & 10-D 2. CHANGED HOLE DIA TO 2 1/8 WAS 1 1/2 IN DETAIL 12-C 1. ADDED ITEMS [illegible] [illegible]	006-320000	[illegible]

GLOBAL MARINE DEVELOPMENT Inc.

MARINE SEISMIC SYSTEM (MSS)

BIP CARRIAGE HOUSING
MAIN ASSEMBLY

SCALE	JOB NO.	DWG NO.	SHEET	REV
AS NOTED	001-210300	E-001-A006	2/2	2

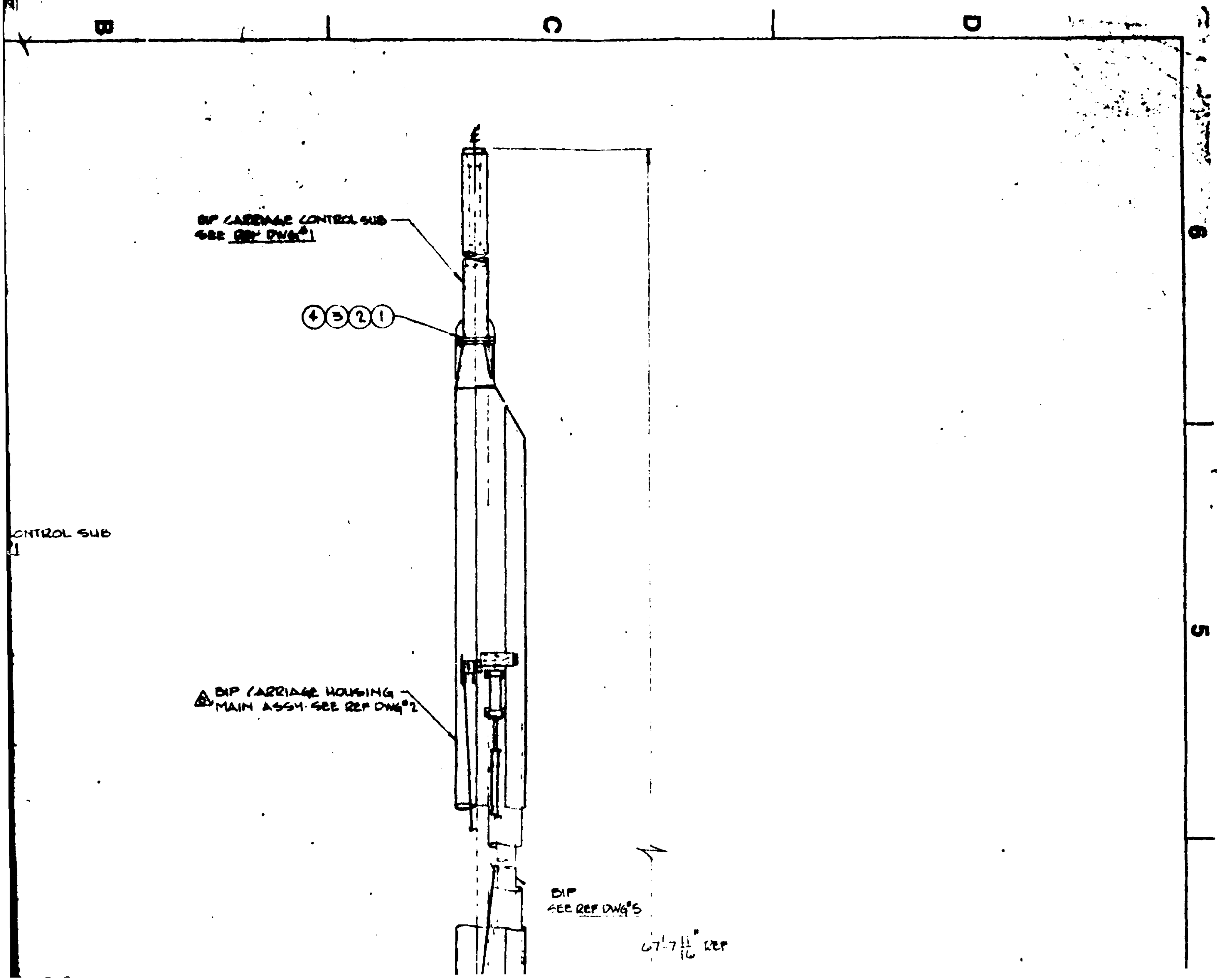
C

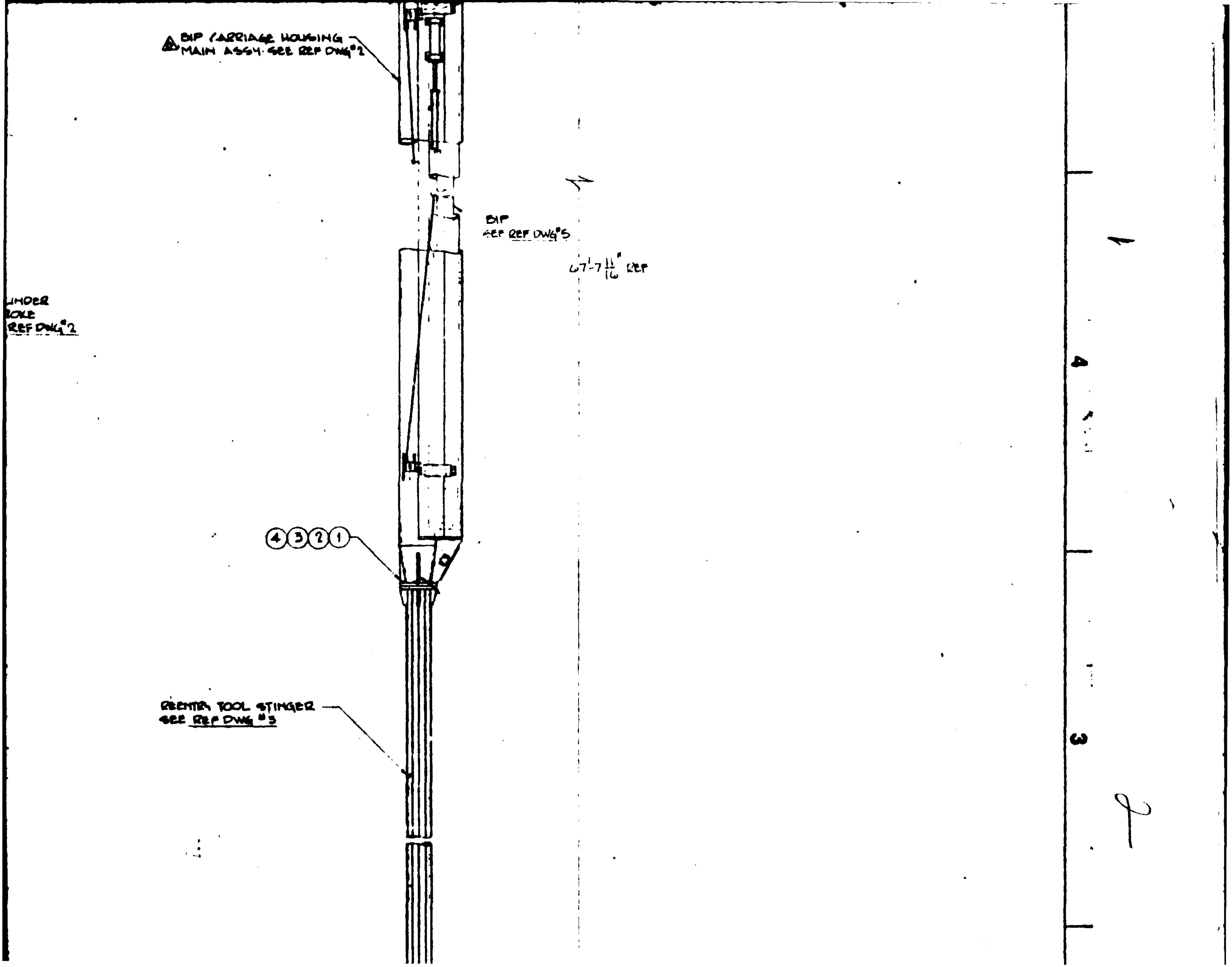
B

A

7

6


B
C
D
6
5
BIP CARRIAGE CONTROL SUB
SEE REF DWG #1
4 3 2 1
CONTROL SUB
BIP CARRIAGE HOUSING
MAIN ASSY. SEE REF DWG #2
BIP
SEE REF DWG #5
67'-7 11/16" REF

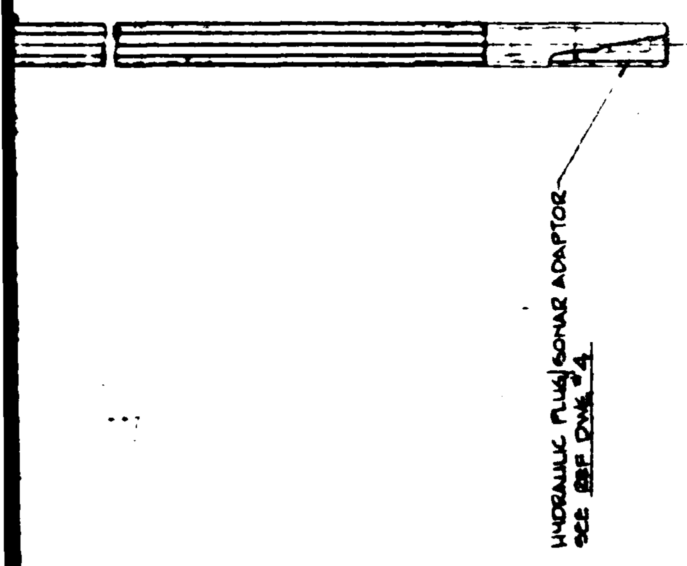

BIP CARRIAGE HOUSING
MAIN ASSY. SEE REF DWG #2
BIP
SEE REF DWG #5
67'-7 11/16" REF
CYLINDER
STROKE
REF DWG #2
4 3 2 1
REENTRY TOOL STINGER
SEE REF DWG #3

2 3

2 1

LIST OF MATERIALS

[illegible]	[illegible]	QTY.	[illegible]	[illegible]
	1	24	7/8"-14 UNC 2A x 3 3/4" LG. CORROSION RESISTING BOLT	ASTM A320 TYPE 3
	2	24	7/8" FLAT WASHERS	
	3	24	7/8" LOCK WASHER	
	4	24	7/8"-14 UNC 2B CORROSION RESISTING NUT	ASTM A320 TYPE 8
	F-1	6	8-8-CBTX-MALE ELBOW	S.S.
	F-2	2	8 HBTX UNION	
	F-3	1	8 SBTX MALE BRANCH TEE	
	F-4	1	1/2" RUPTURE DISK, SOLID DISK SET AT 2800 PSI	
	F-5	2	8-8-FBTX MALE CONNECTOR	
	F-4		1/2" x .065 SEAMLESS TUBING 18-8 TYPE 304 1/8" HARD	



ELEVATION 2-C

GENERAL NOTES: (UNLESS OTHERWISE NOTED)

1. ALL TUBING FITTING ARE JIC 37 1/2° FLAIR TYPE DESCRIPTION IS PER PARKER HANNIFIN CATALOG 4310 REV. SEPT 1968
2. (2) HYDRAULIC PIPING RUN TO BE DETERMINED BY MANUFACTURE.

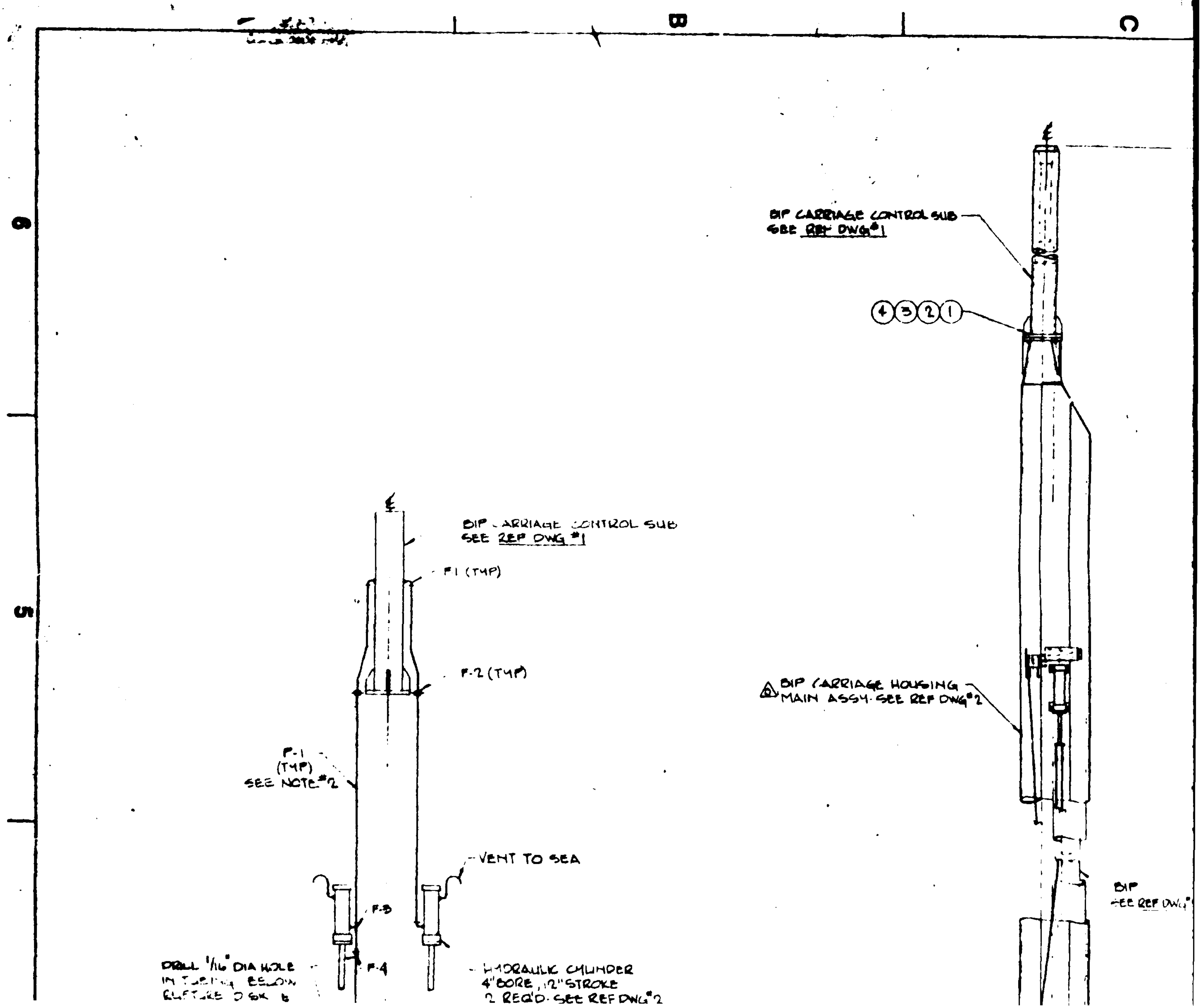
REFERENCE DRAWINGS:

1. E-001-A003 MARINE SEISMIC SYSTEM (MSS) BIP CARRIAGE CONTROL SUB DETAILS AND ASSEMBLY
2. E-001-A008 MARINE SEISMIC SYSTEM (MSS) BIP CARRIAGE HOUSING MAIN ASSEMBLY
3. D-001-A007 MARINE SEISMIC SYSTEM (MSS) REENTRY TOOL STINGER ASSEMBLY AND DETAILS
4. D-001-A010 MARINE SEISMIC SYSTEM (MSS) HYDRAULIC PLUG/SONAR ADAPTOR DETAILS

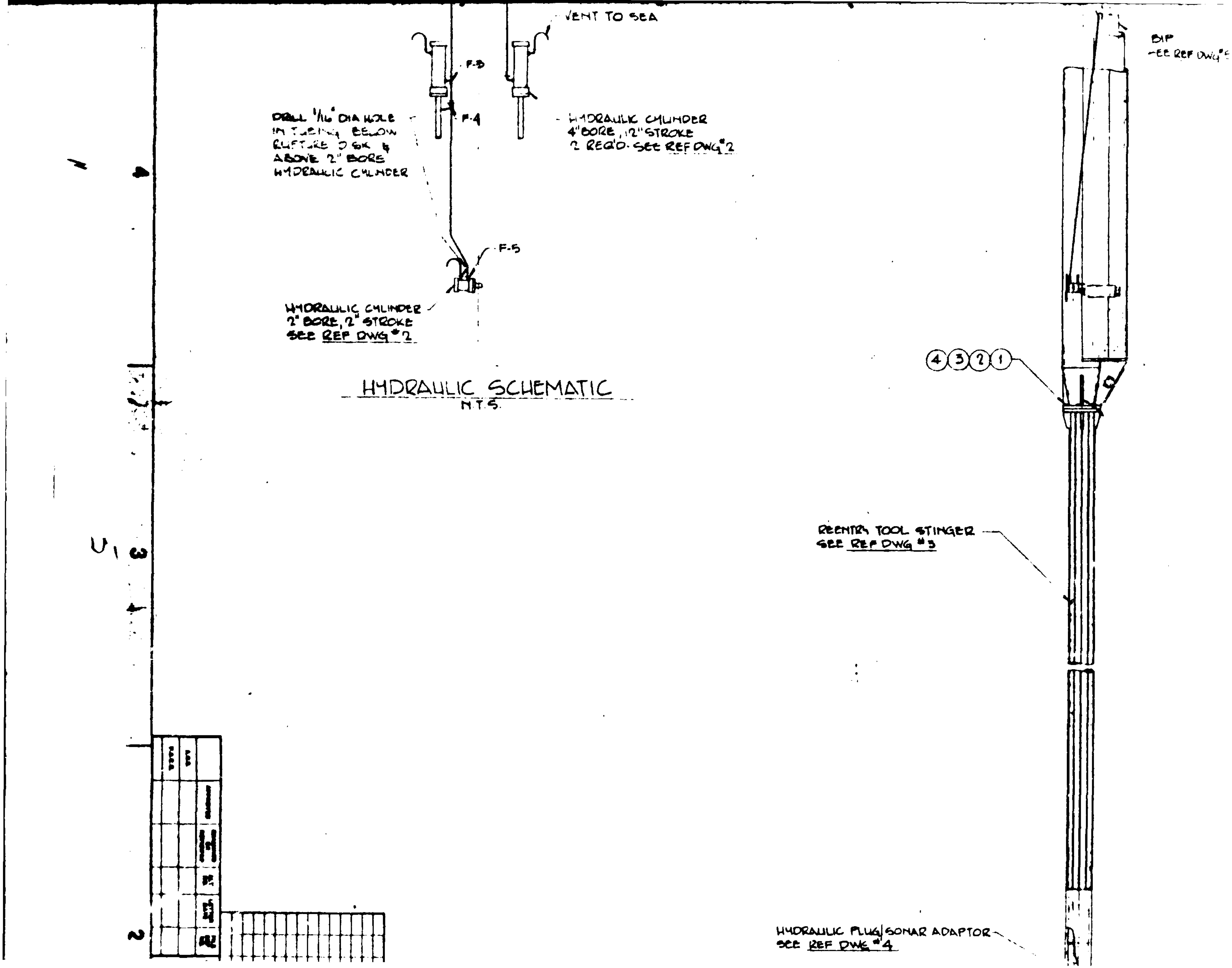
TELEDYNE GEOTECH DRAWINGS:

C

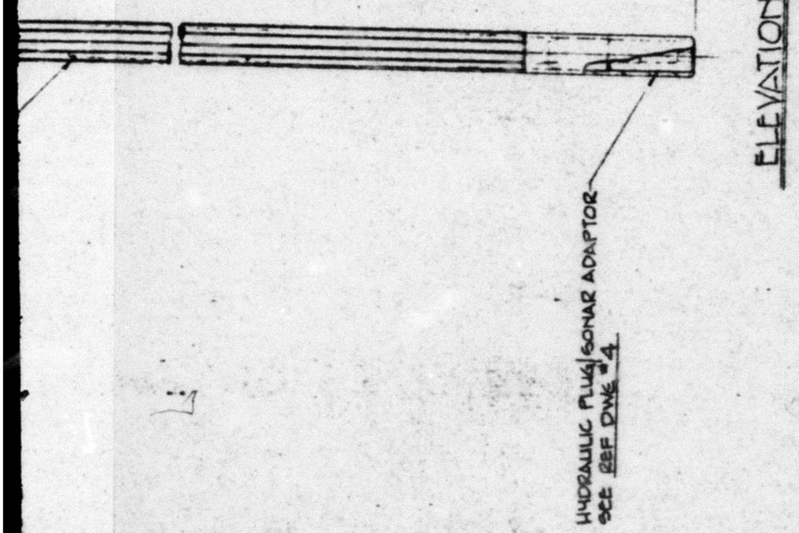
B



B
C
6
5
BIP CARRIAGE CONTROL SUB
SEE REF DWG #1
BIP CARRIAGE HOUSING
MAIN ASSY. SEE REF DWG #2
BIP
SEE REF DWG
BIP CARRIAGE CONTROL SUB
SEE REF DWG #1
F-1 (TYP)
F-2 (TYP)
F-1
(TYP)
SEE NOTE #2
VENT TO SEA
F-3
F-4
DRILL 1/16" DIA HOLE
IN TUBING BELOW
FLETURE D SK 6
HYDRAULIC CYLINDER
4" BORE, 12" STROKE
2 REQ'D. SEE REF DWG #2



HYDRAULIC SCHEMATIC
N.T.S.



GENERAL NOTES: (UNLESS OTHERWISE NOTED)

1. ALL TUBING FITTING ARE JIC 37 1/2° FLAIR TYPE DESCRIPTION IS PER PARKER HANNIFIN CATALOG 4310 REV. SEPT 1968
2. HYDRAULIC PIPING RUN TO BE DETERMINED BY MANUFACTURE. (0)

REFERENCE DRAWINGS:

1. E-001-A003	MARINE SEISMIC SYSTEM (MSS) BIP CARRIAGE CONTROL SUB DETAILS AND ASSEMBLY
2. E-001-A008	MARINE SEISMIC SYSTEM (MSS) BIP CARRIAGE HOUSING MAIN ASSEMBLY
3. D-001-A007	MARINE SEISMIC SYSTEM (MSS) REENTRY TOOL STINGER ASSEMBLY AND DETAILS
4. D-001-A010	MARINE SEISMIC SYSTEM (MSS) HYDRAULIC PLUG/SONAR ADAPTOR DETAILS

TELEDYNE GEOTECH DRAWINGS:

5. 990-53100	BIP

NO.	DATE	BY	DESCRIPTION	JOB AUTH.	APPR.
1	[illegible]	BP	CHANGED ITEM F-4 TO 2800PSI WAS 2500	206-323000	[illegible]
0	10/80	NW	2. ADDED NOTE #2 1. REVISED ELEV. 2-C PER REF. DWG #2 CHANGES	001-210300	RL
B	7/80	NW	REDRAWN FOR CLARITY	001-210300	[illegible]
A	8/79	NW	RELEASE FOR BID	001-210300	

ALTERATIONS

NO. REQ'D.	NEXT ASSEMBLY
1	ALTERATION
[illegible]	DATE
	PURCHASING
	CONSTRUCTION
	ENGINEERING
	USCG
	ABS
10	CUSTOMER
1	WILLER/STEDT
1	PYE
1	BUCHANAN
1	MITCHELL
1	FARNHAM
2	LIBRARY

	APPROVED	CHANGED OR REVISED	ALT. NO.	LETTER DATE	FILE REF. NO.
A.B.S.					
U.S.C.G.					

TOTAL NET WGT. MAT'L. ____
TOTAL NET WGT. EQUIP. ____
TOTAL NET WEIGHT ____

GLOBAL MARINE DEVELOPMENT Inc.
Newport Beach, Calif.

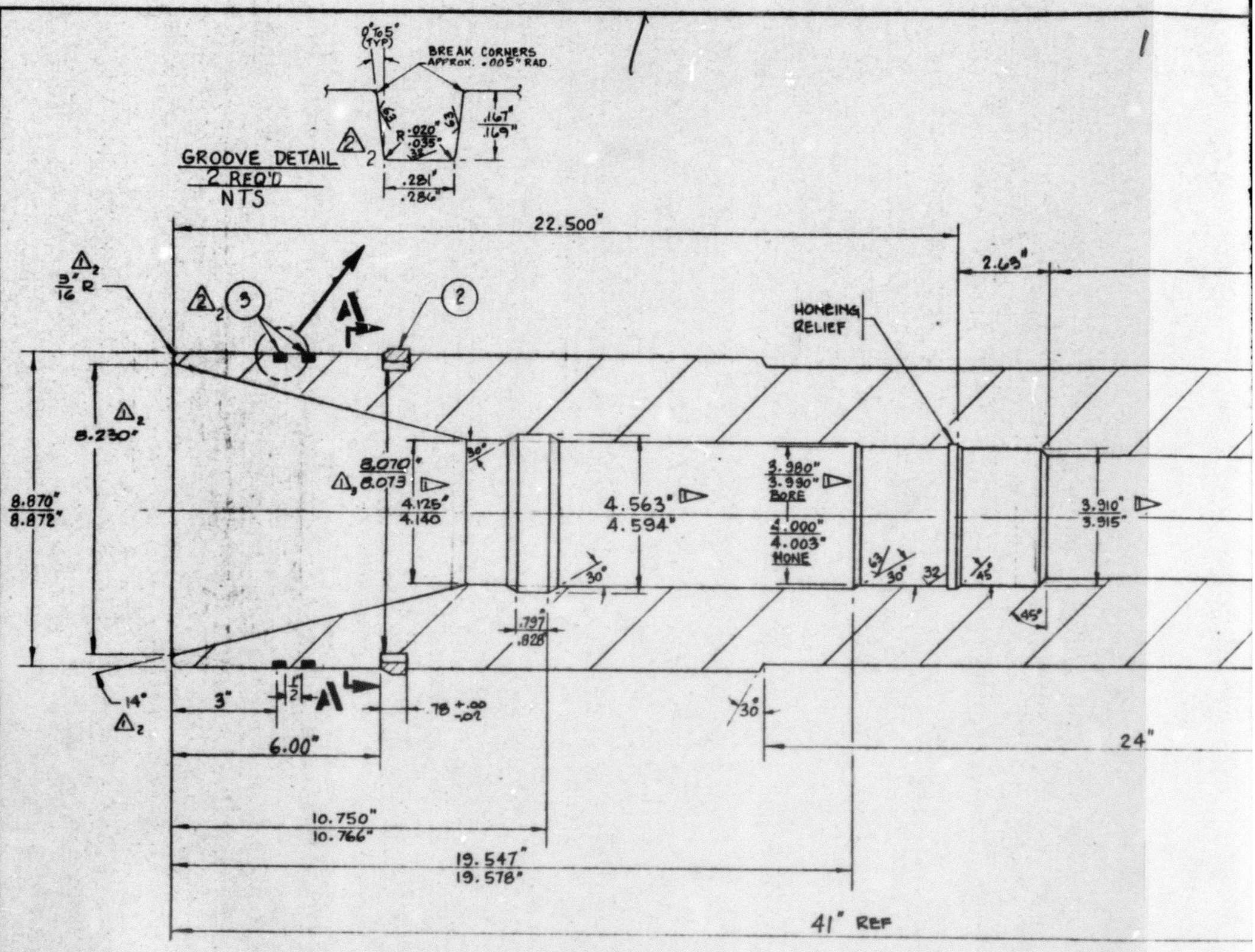
[illegible]

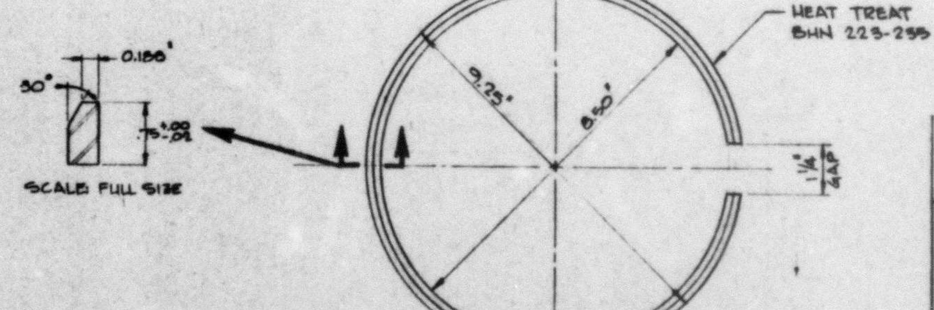
MARINE SEISMIC SYSTEM (MSS)
BIP REENTRY TOOL ASSEMBLY

DFT. N. WAGNER	8/1/80	SCALE 1/2 = 1'-0 & AS NOTED	TOLERANCE UNLESS OTHERWISE NOTED [illegible]
ENGR. [signature]	[illegible]		
CHK. FARNHAM [illegible]	SEPT 80	JOB AUTH. 001-210300	DWG. NO. E-001-A009
APPR. [signature]	30 Sep 80		SHT. 1 of 1 / ALT. 1
[signature]	[illegible]		

2 1

6





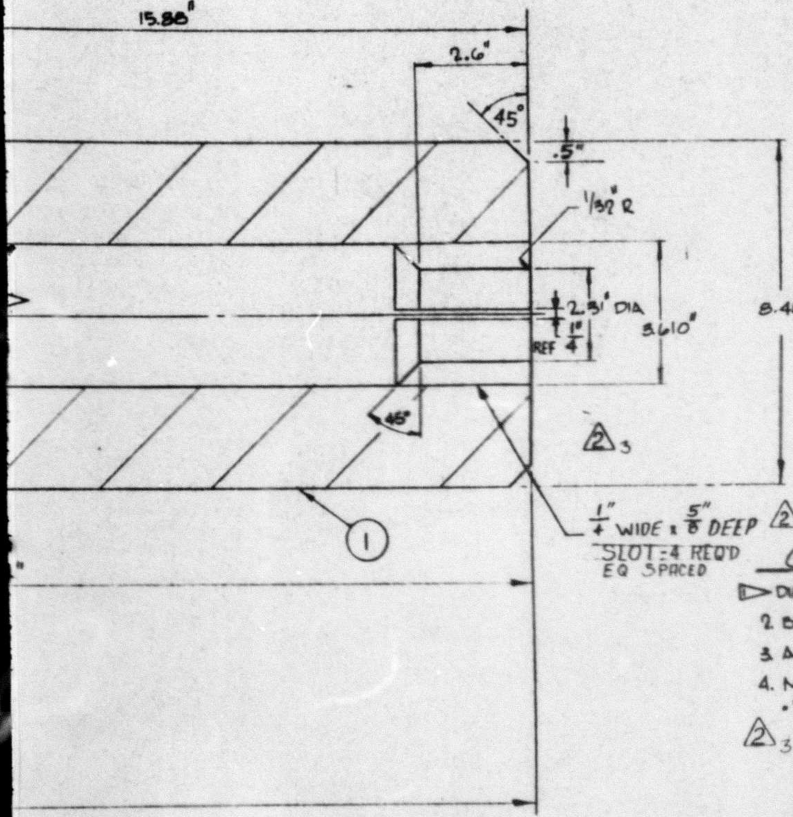
SECTION A-A

(2) SNAP RING

NO.	DATE	BY	DESCRIPTION
2	2-19	B.R.	3. DELETED NOTE #5 2. ADDED (1) MORE O-RING & GROOVE TO L/M & PLUG 1. ADDED 4 SLOTS AT BOTTOM OF PLUG
1	11-20-80		3. CHANGED: WAS 8.120/8.123 2. ADDED: 3/16R, 14°, 8.230 1. DELETED: 8 DIA, 6.50, 15°, 30°, 8, 4.160/4.175

ALTERATIONS

LIST OF MATERIALS				
OWNER FURN	ITEM	QTY	DESCRIPTION	MATERIAL OR DWG NO.
	1	1	H.P./S.A.	AISI 4140
	2	1	SNAP RING.	↓
	3	2	O-RING. PARKER-371 OR EQ 90 DUROMETER SHORE A HARDNESS	N. RUBBER



GENERAL NOTES: (UNLESS OTHERWISE NOTED)

1. DIAMETERS TO BE CONCENTRIC TO .030 TIR
2. BREAK ALL MACHINE CORNERS & RADII TO 0.01" MIN
3. ALL MACHINE SURFACES TO 125
4. MACHINE TOLERANCES TO BE .X ± .1, .XX ± .03, .XXX ± .010

ALTERATIONS CONTINUED BOTTOM OF SHEET

NO.	DATE	BY	DESCRIPTION	JOB AUTH.	APP'D
0	[illegible]	NW	1. CHANGED SNAP RING DIM. 2. CHANGED GROOVE DIM. 3. DIM. CHANGE WAS [illegible] 4. DIM. CHANGE WAS 2.75 5. DIM. CHANGE WAS 3.65 6. DIM. CHANGE WAS [illegible] 7. ADDED 90 DUROMETER HARDNESS O-RING	001-210300	RW
B	[illegible]	NW	CLARIFY L/M - OPEN UP TOL	001-210300	RW
A	[illegible]	AB	RELEASE FOR BID	001-210300	[illegible]

ALTERATIONS

NO. REQ'D	NEXT ASSEMBLY
	E-001-A009
2	ALTERATION
5581	DATE
	LOS ANGELES
	NEWPORT BEACH
	HOUSTON
	PURCHASING
	CONSTRUCTION
	ENGINEERING
	USCG
18	CUSTOMER
1	WALLERSTEDT
1	DYE
1	BUCHANAN
1	MITCHELL
1	FARNHAM
2	LIBRARY

	JOB AUTH.	APP'D
5 ... ING ... M & PLUG ... RT	006 323000	RW
... / 8.123 ... 30 ... , 15°, 30°, 8,	006-323000	MR / RW

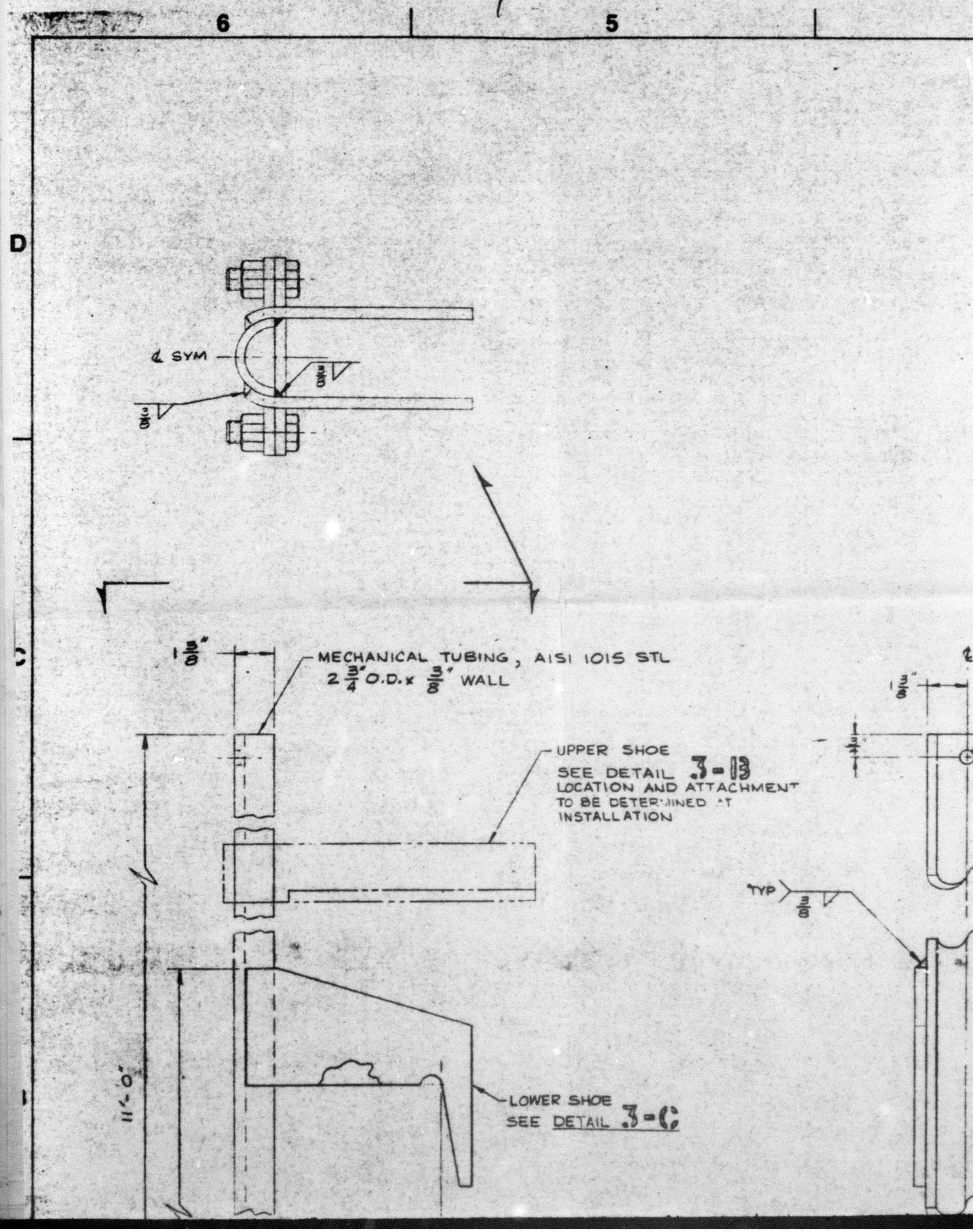
APPROVED	EXAMINED OR REVIEWED	ALT. NO.	LETTER DATE	FILE REF NO.
A.B.S.				
U.S.C.G.				

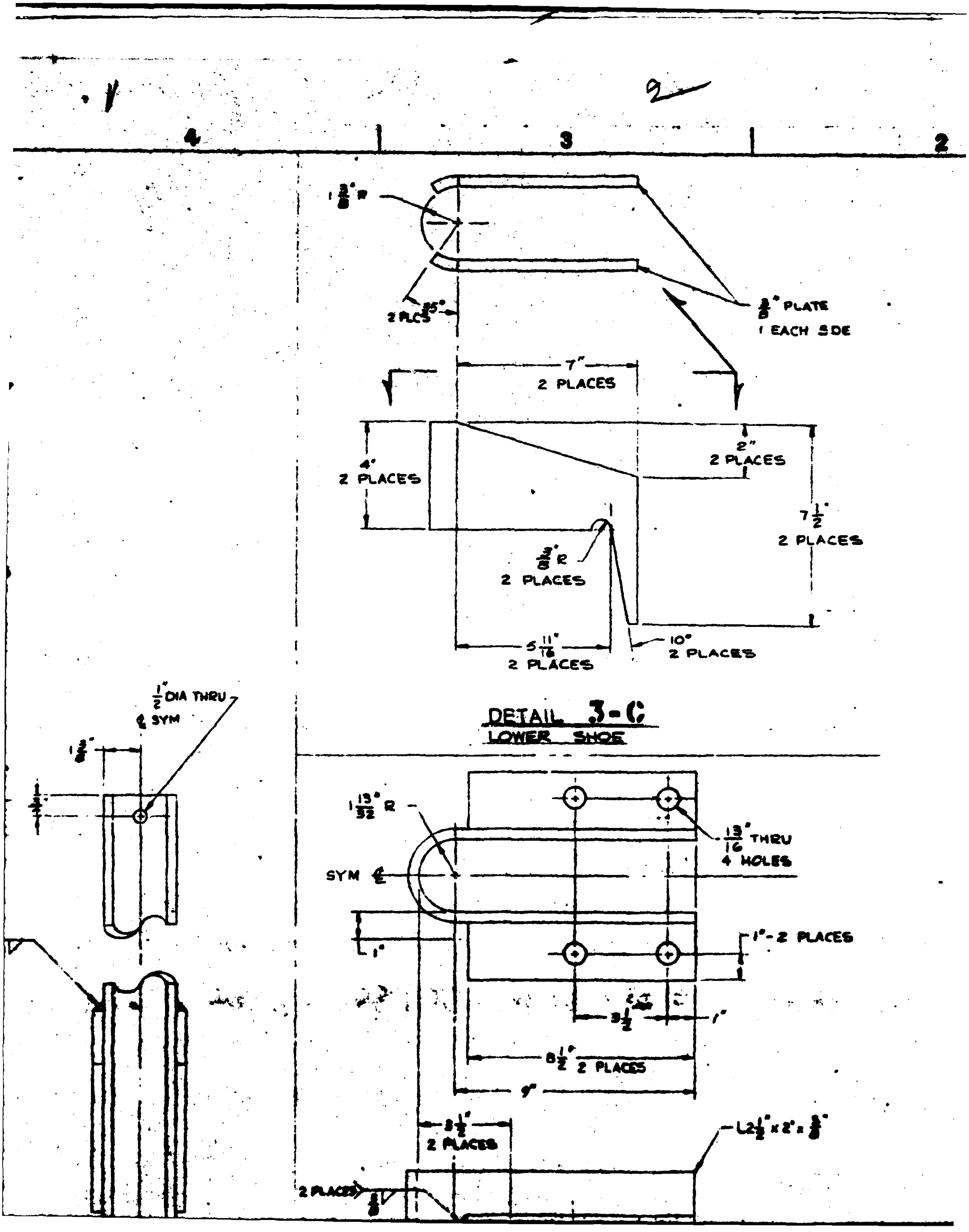
TOTAL NET WGT. MAT'L
TOTAL NET WGT. EQUIP
TOTAL NET WEIGHT

GLOBAL MARINE DEVELOPMENT INC.
Newport Beach, Calif.

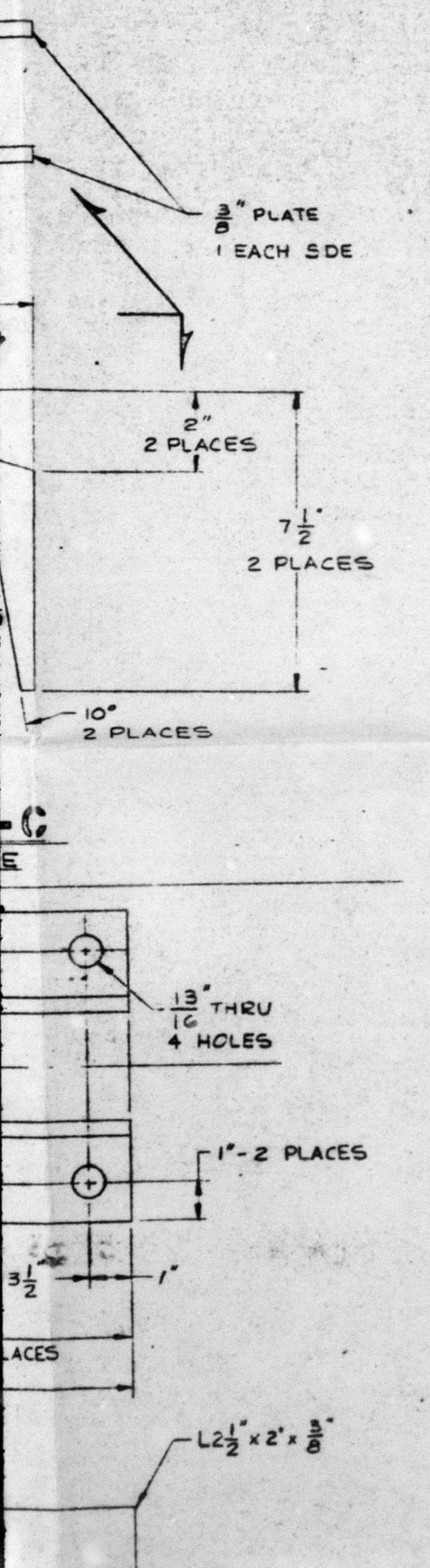
MARINE SEISMIC SYSTEM (MSS)
HYDRAULIC PLUG / SONAR ADAPTOR DETAILS.

Initial	Date	SCALE	TOLERANCE UNLESS OTHERWISE NOTED
DFT. B BUCHANAN	9-11-80	HALF SIZE & NOTED	FRACTION ± 1/16" ANGULAR ± ½° MILLIMETER ± 1. MM ( ) DESIGNATES MILLIMETER DIMENSIONS
ENGR. B. BUCHANAN	9-11-80		
CHK [illegible]	[illegible] 80	JOB AUTH. 001-210300	DWG. NO. D 001-A010 — SHT 1 OF 1 — ALT 2
APPR [illegible]	[illegible]		
REL. R Wallerstedt	10/15/80		


6
5
D
C
℄ SYM
MECHANICAL TUBING, AISI 1015 STL
2 3/4" O.D. x 3/8" WALL
1 3/8"
UPPER SHOE
SEE DETAIL 3-B
LOCATION AND ATTACHMENT
TO BE DETERMINED AT
INSTALLATION
LOWER SHOE
SEE DETAIL 3-C
11'-0"
TYP
3/8



DETAIL 3-C
LOWER SHOE

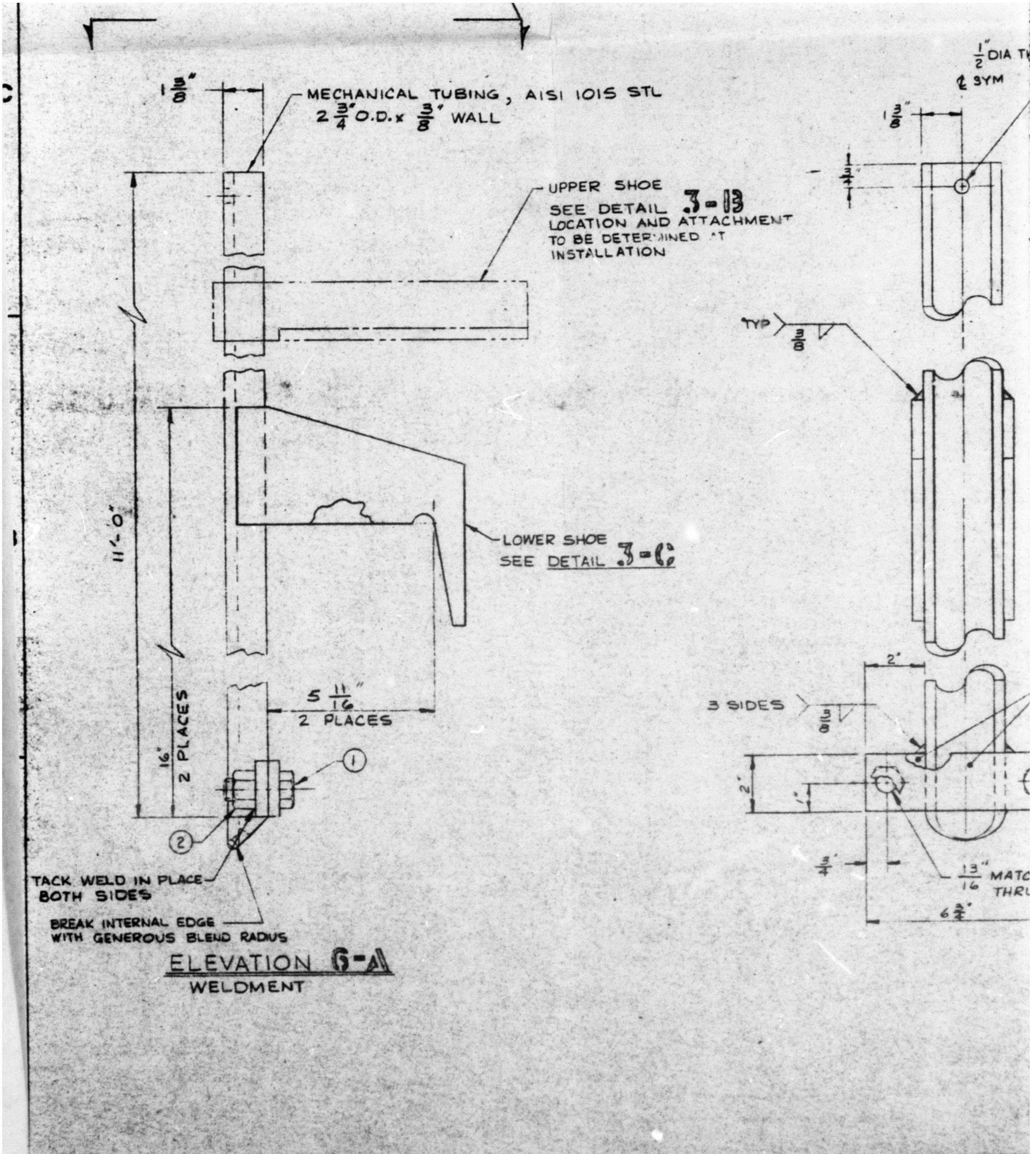


LIST OF MATERIALS

OWNER PART.	ITEM	QTY.	DESCRIPTION	MATERIAL OR DWG. NO.
	1	2	BOLT, 3/4"-10UNC-1A x 1 3/4" LONG, HOT DIP GALV	
	2	2	NUT, 3/4-10UNC-1B HOT DIP GALVANIZED	

GENERAL NOTES: (UNLESS OTHERWISE NOTED)

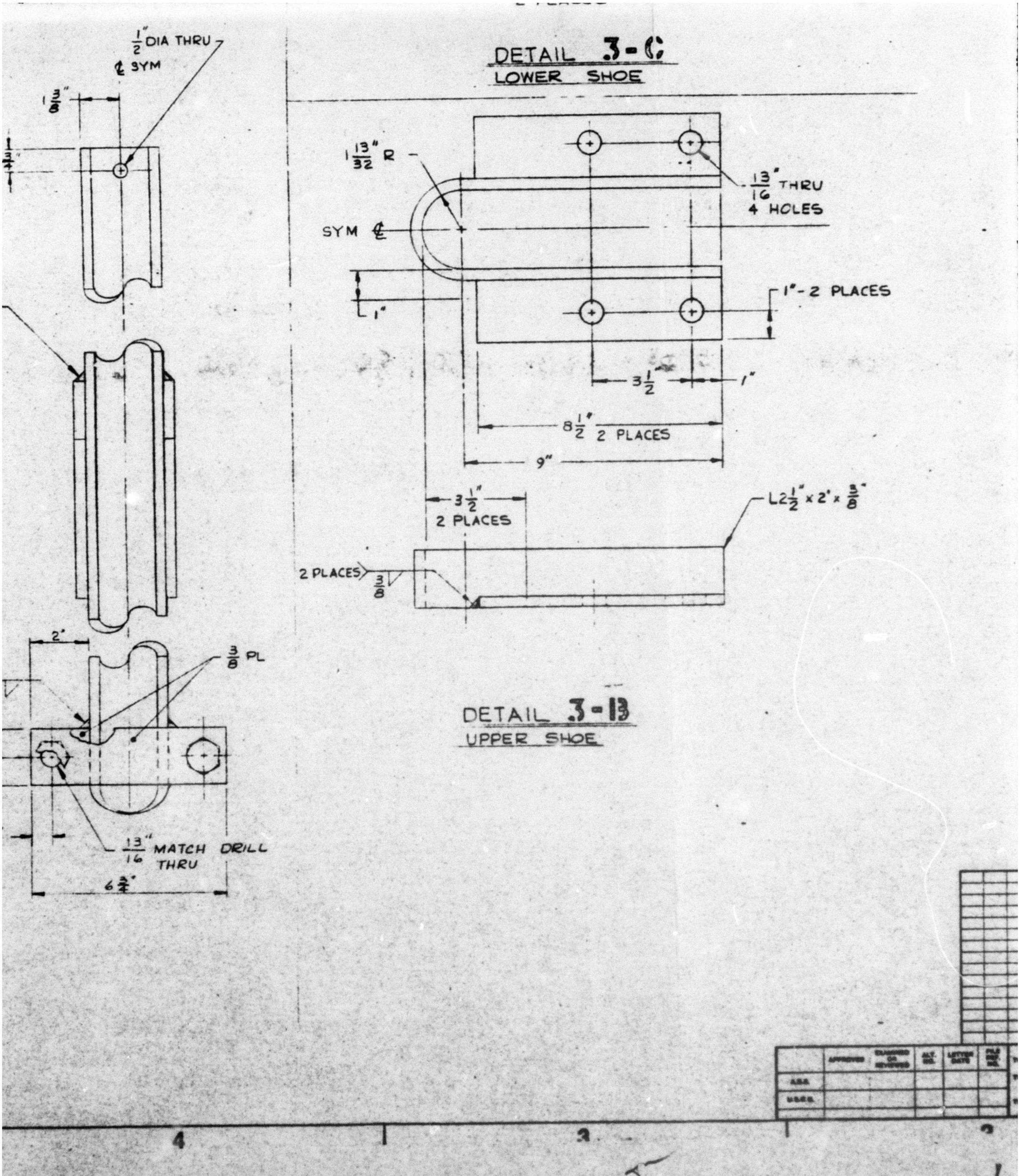
1. ALL PLATES & SHAPES TO BE PER ASTM A-36.
2. ALL WELDING TO BE IN ACCORDANCE WITH AWS PROCEDURES.
3. BREAK ALL SHARP EDGES & REMOVE ALL BURRS.



ELEVATION 6-A
WELDMENT

6 5 4

4

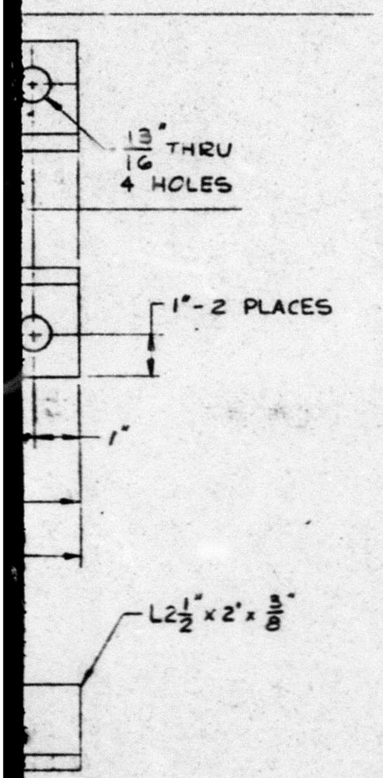


1/2" DIA THRU
℄ SYM
1 3/8"
3/8 PL
2"
13/16" MATCH DRILL THRU
6 3/4"
DETAIL 3-C
LOWER SHOE
1 13/32" R
13/16" THRU
4 HOLES
SYM ℄
1"
1"-2 PLACES
3 1/2
1"
8 1/2" 2 PLACES
9"
3 1/2"
2 PLACES
L2 1/2" x 2" x 3/8"
2 PLACES
3/8
DETAIL 3-B
UPPER SHOE
APPROVED
CHECKED OR REVIEWED
LETTER DATE
4
3

2 PLACES

GENERAL NOTES: (UNLESS OTHERWISE NOTED)

1. ALL PLATES & SHAPES TO BE PER ASTM A-36.
2. ALL WELDING TO BE IN ACCORDANCE WITH AWS PROCEDURES.
3. BREAK ALL SHARP EDGES & REMOVE ALL BURRS.



C

B

A

NO.	DATE	BY	DESCRIPTION	JOB AUTH.	APPR.
1			DELETED L 2" x 2" x 3/8" IN DETAIL 3-B, ELEV 6A		
0	11MAR80		RELEASE FOR CONSTRUCTION	006-325000	

ALTERATIONS

NO. REQ'D.	NEXT ASSEMBLY
	E-001-A014
1	ALTERATION
	DATE
	PURCHASING
	CONSTRUCTION
	ENGINEERING
	USCG
	ABS
10	CUSTOMER
1	WALLERSTEDT
1	DYE
1	ESCHMAN
1	MITCHELL
1	TIERNAN
2	LIBRARY

	APPROVED	CHANGED OR REVIEWED	ALT. NO.	LETTER DATE	FILE REF. NO.
ABS					
USCG					

TOTAL NET WGT. INST'L. ____

TOTAL NET WGT. EQUIP. ____

TOTAL NET WEIGHT ____

GLOBAL MARINE DEVELOPMENT Inc.

Newport Beach, Calif.

MARINE SEISMIC SYSTEM (MSS)
EM CABLE PROTECTOR AND
DETAILS & ASSEMBLY

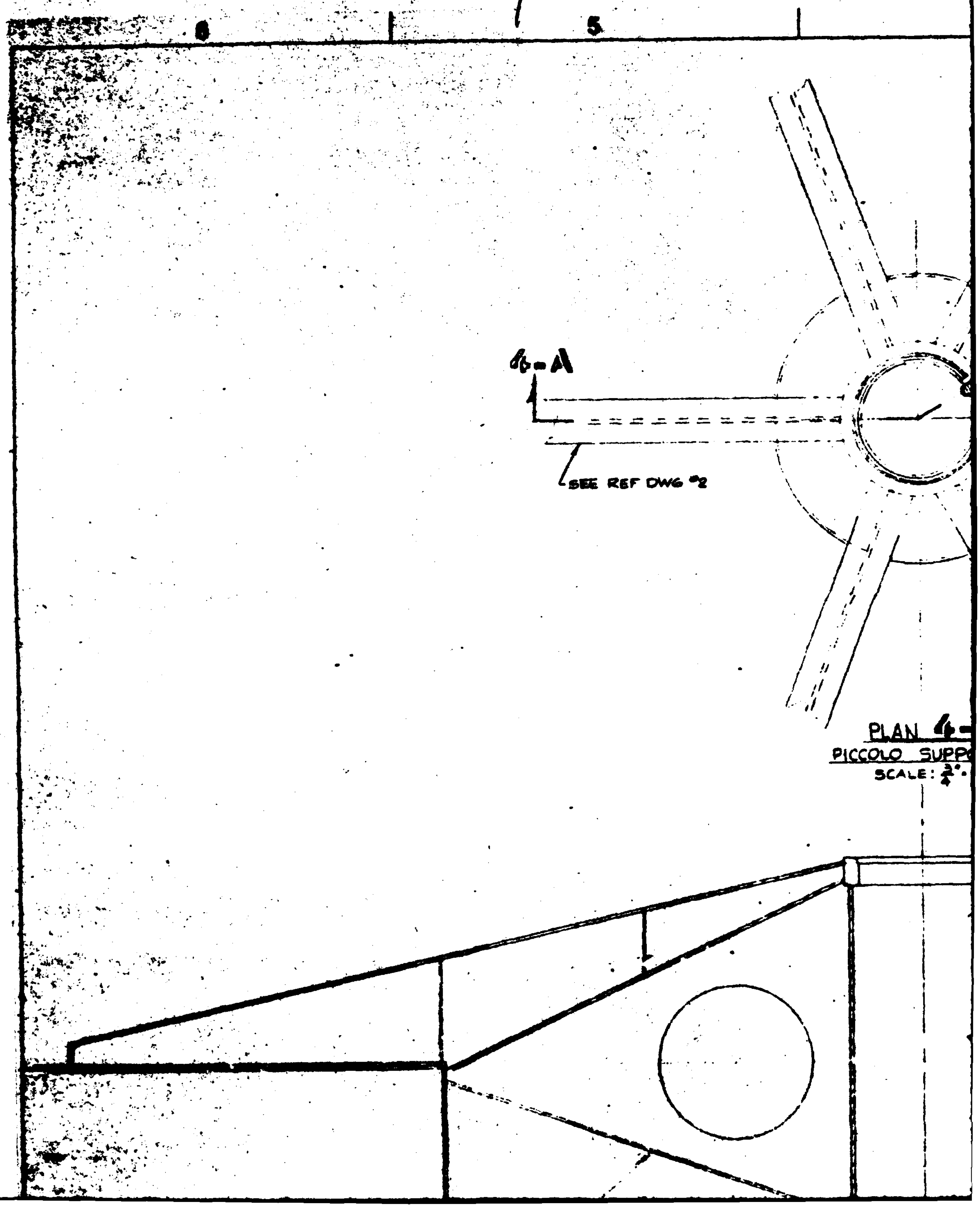
	DATE	SCALE	
DFT. [signature]	10/31/80	HALF SIZE	
ENGR. S. Dyo	19 Nov 80		
CHK. [signature]		JOB AUTH.	DWG. NO.
APPR. [signature]	11/17/80	00006-325000	E-001-A013
[signature]			

SHT. 1 of 1 ALT. 1

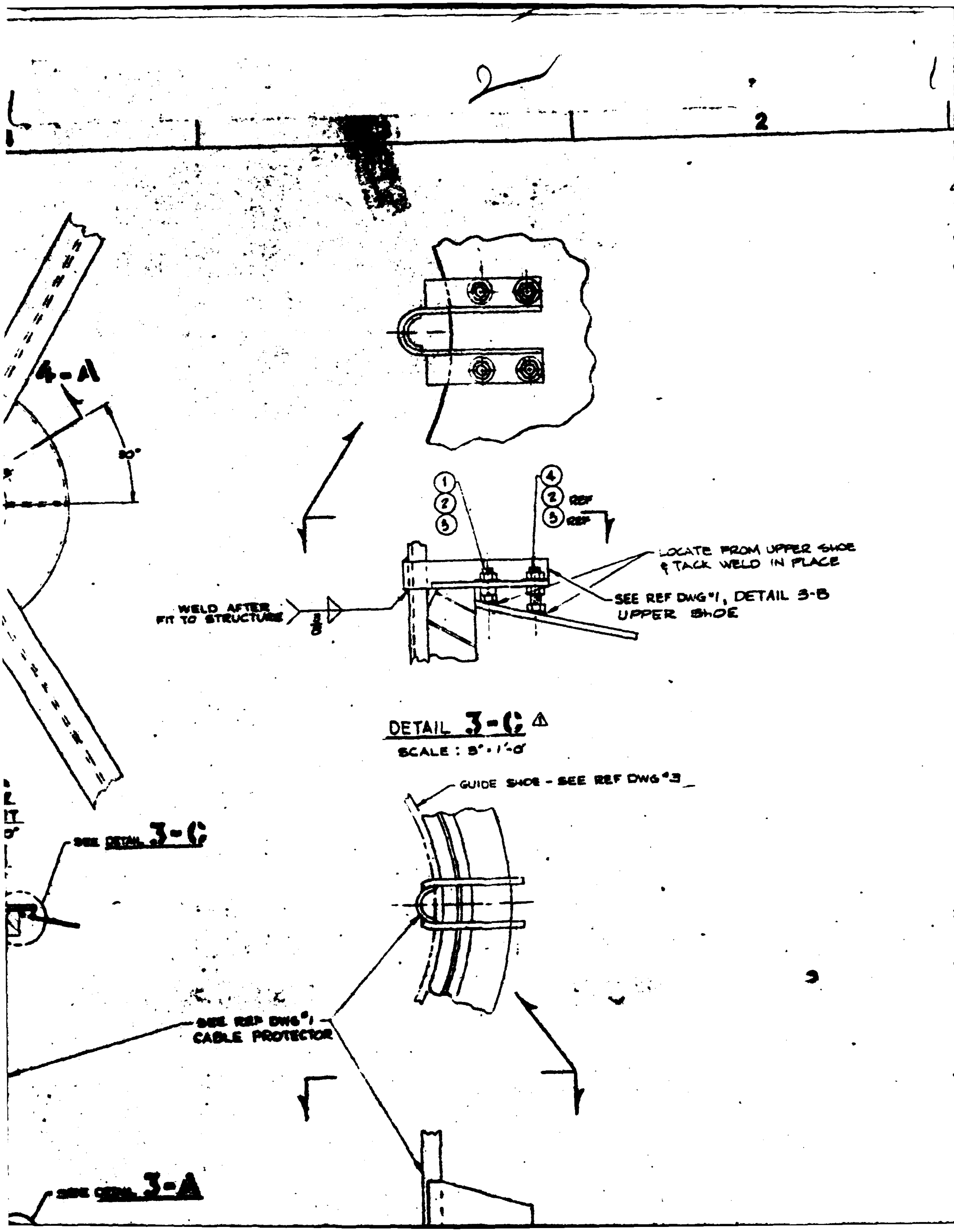
2 3 4

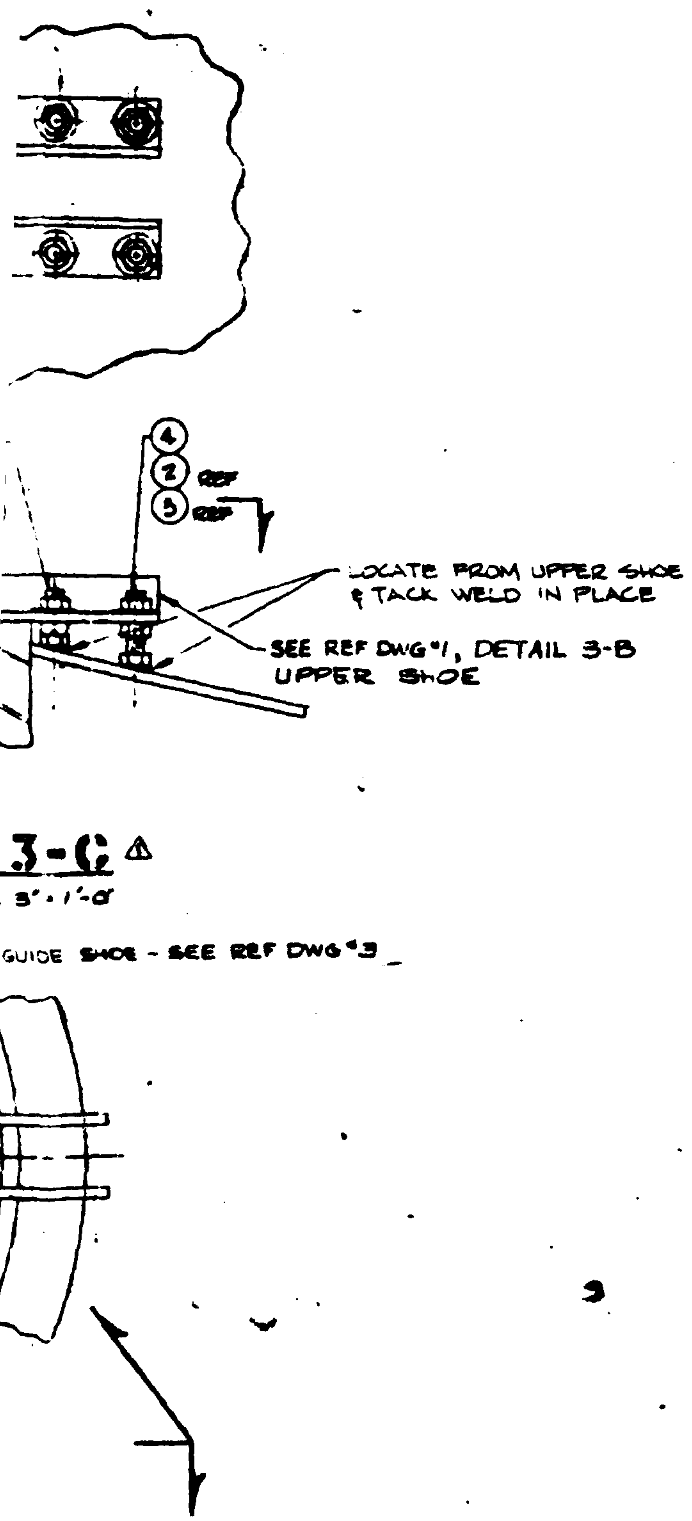
C

1



6
5
6-A
SEE REF DWG #2
PLAN 4-
PICCOLO SUPP
SCALE: 3/4"


2
4-A
30°
1
2
3
4
2 REF
3 REF
LOCATE FROM UPPER SHOE & TACK WELD IN PLACE
SEE REF DWG #1, DETAIL 3-B UPPER SHOE
WELD AFTER FIT TO STRUCTURE
DETAIL 3-C
SCALE: 3"=1'-0"
GUIDE SHOE - SEE REF DWG #3
SEE DETAIL 3-C
SEE REF DWG #1 CABLE PROTECTOR
SEE DETAIL 3-A

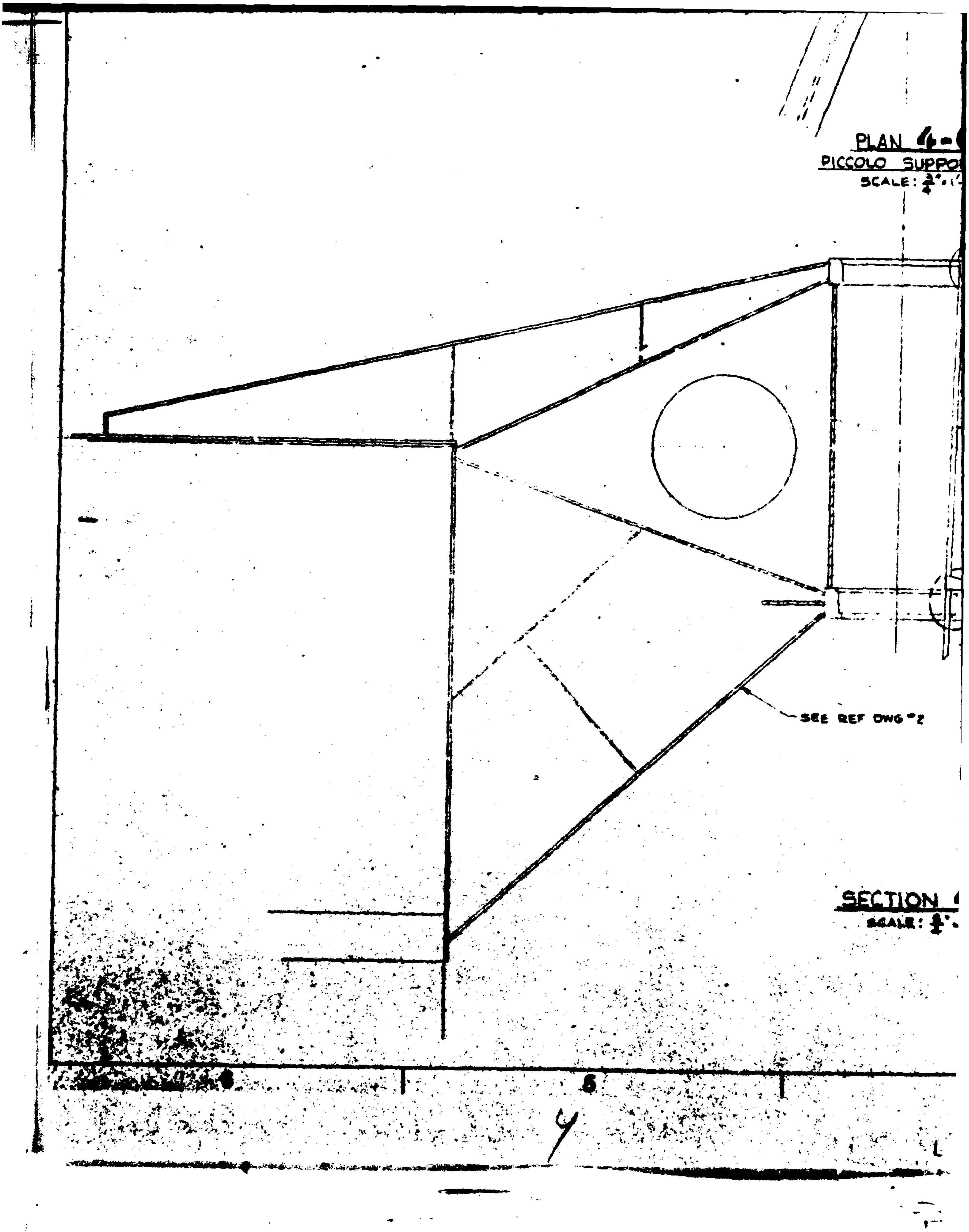


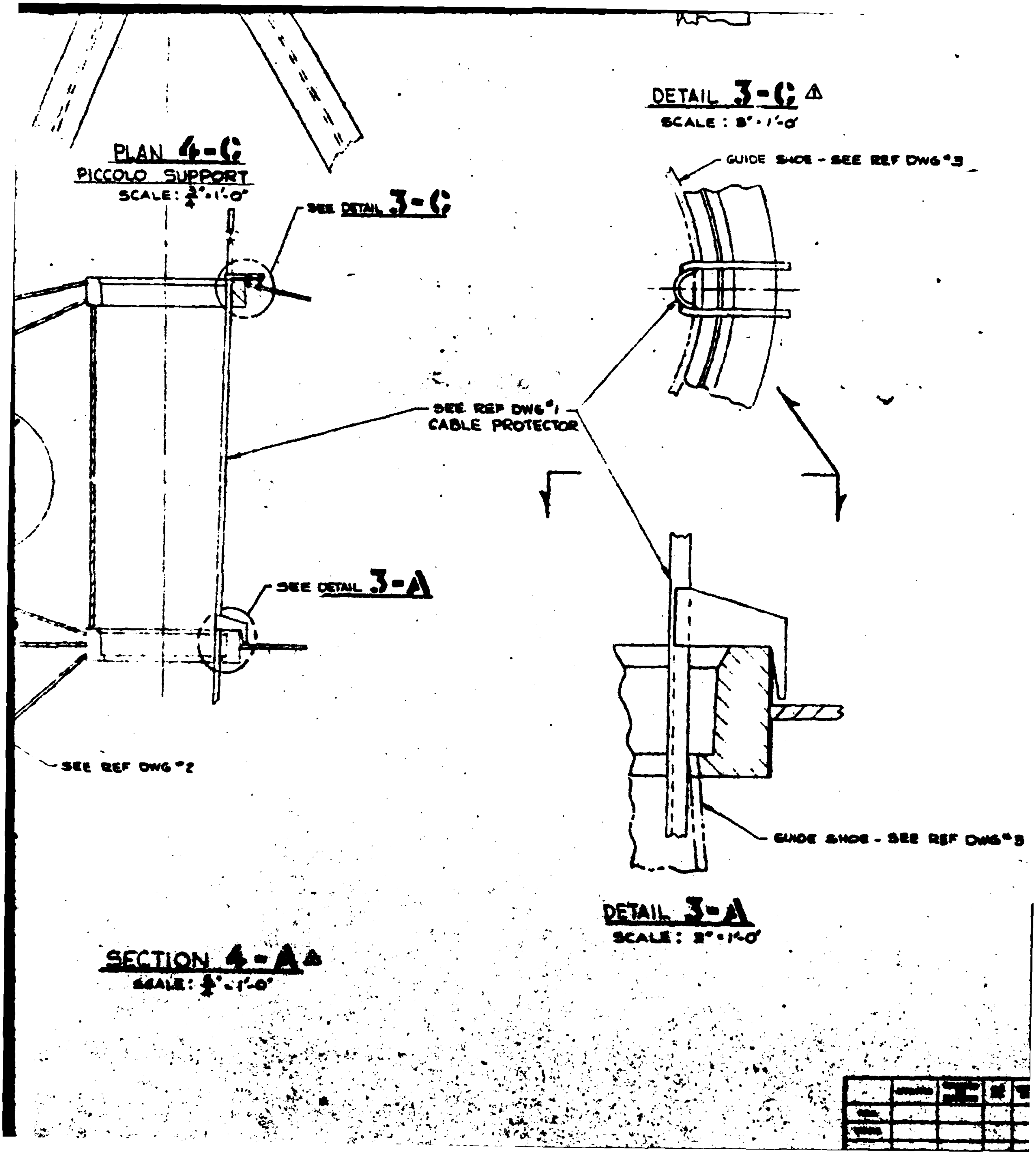
LIST OF MATERIALS

	[illegible]	[illegible]	QTY.	[illegible]	[illegible]
△		1	2	3/4"-10 UNC 2A x 2" LG HEX BOLT, HOT DIP GALV	
		2	4	WASHER, FLAT, 3/4" HOT DIP GALVAIZED	
△		3	8	3/4"-10 UNC 2B HEX NUT, HOT DIP GALV	
△		4	2	3/4"-10 UNC 2A x 2 1/2" LG HEX BOLT-HOT DIP GALV	

REFERENCE DRAWINGS

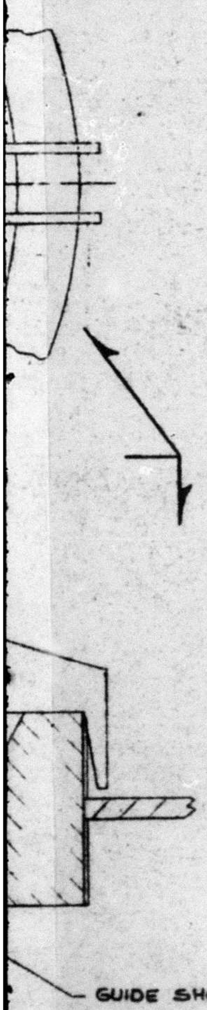
1. E-001-A013 EM CABLE PROTECTOR AND DETAILS AND ASSY
2. E-377-5040 GLOMAR II SUPPORT - SOFT PICCOLO AND GUIDE SHOE
3. E-377-5004 GLOMAR II GUIDE SHOE ARRANGEMENT & DETAILS


PLAN 4-
PICCOLO SUPPO
SEE REF DWG #2
SECTION
6
5


DETAIL 3-C ⚠
SCALE : 3"=1'-0"
GUIDE SHOE - SEE REF DWG #3
PLAN 4-C
PICCOLO SUPPORT
SCALE: 3/4"=1'-0"
SEE DETAIL 3-C
SEE REF DWG #1
CABLE PROTECTOR
SEE DETAIL 3-A
SEE REF DWG #2
GUIDE SHOE - SEE REF DWG #3
DETAIL 3-A
SCALE : 3"=1'-0"
SECTION 4-A ⚠
SCALE: 3/4"=1'-0"

3-C ⚠

3" = 1'-0"



A

• 1'-0"

C

REFERENCE DRAWINGS

1. E-001-A013 EM CABLE PROTECTOR AND DETAILS AND ASSY
2. E-377-S040 GLOMAR XI SUPPORT - 80FT PICCOLO AND GUIDE SHOE
3. E-377-S004 GLOMAR XI GUIDE SHOE ARRANGEMENT & DETAILS

B

NO.	DATE	BY	DESCRIPTION	JOB AUTH.	APPR.
1	3-3-81	NM	REVISED SECT 4-A, DET 3-C, ITEM #1 & ADDED ITEMS #3 & 4	006-323000	
0	11-18-80		RELEASE FOR CONSTRUCTION	006-323000	

ALTERATIONS

GLOBAL MARINE DEVELOPMENT Inc.

Newport Beach, Calif.

MARINE SEISMIC SYSTEM (MSS)
EM CABLE PROTECTOR
INSTALLATION ARRANGEMENT

SCALE: NOTED

JOB AUTH. 00006-323000

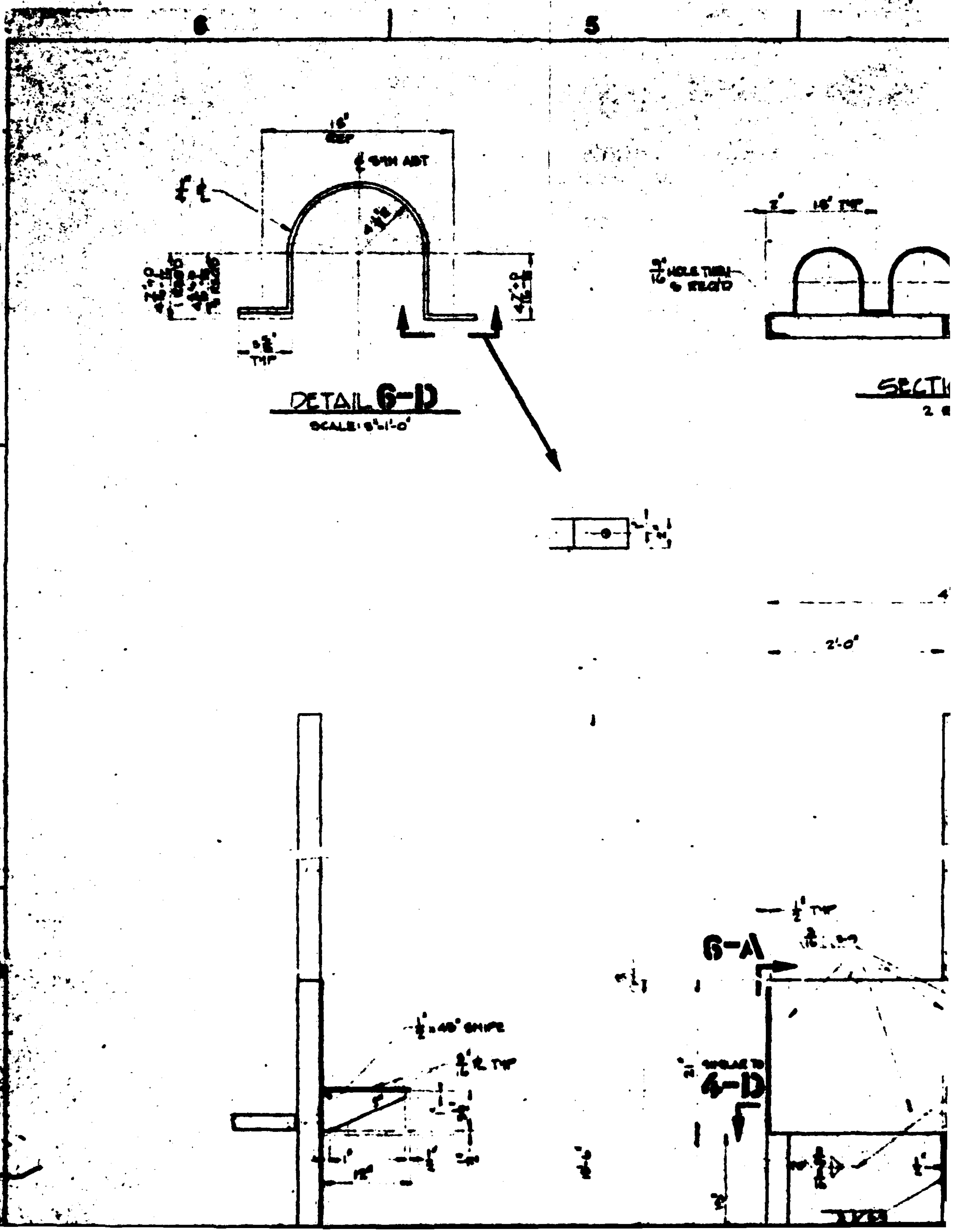
DWG. NO. E - 001 - A014

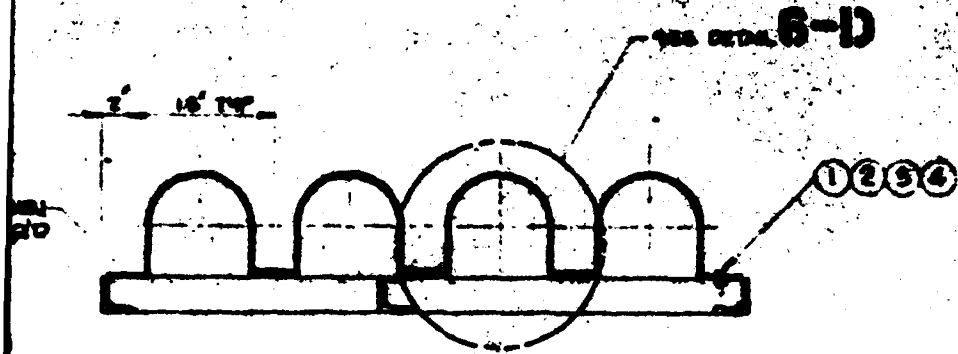
A

2

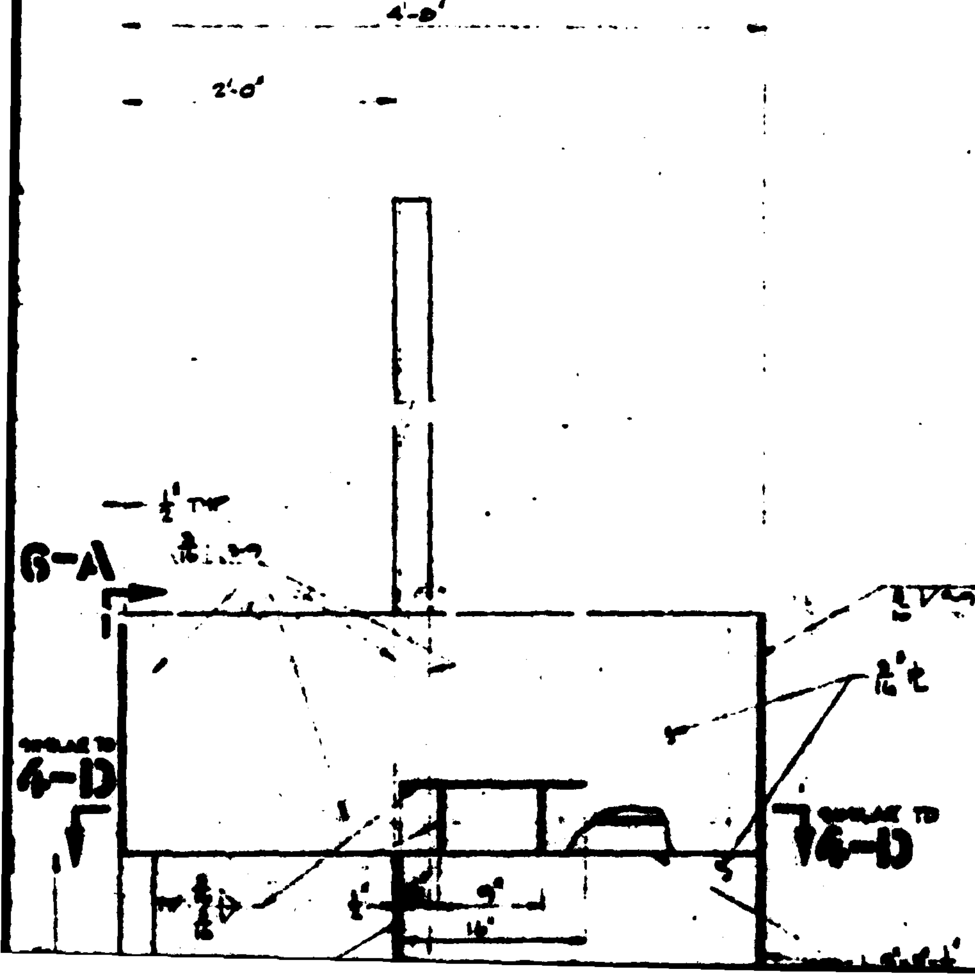
1

6


6
5
DETAIL 6-D
2'-0"
6-A
4-D



SECTION 4-D
2 REQUIRED



2 1 3

LIST OF MATERIALS

OWNER PART	ITEM	QTY.	DESCRIPTION	MATERIAL OR SPEC. NO.
	1	10	$\frac{1}{2}$"-13 UNC 2A x 1 $\frac{3}{4}$" LG HEX BOLT	
	2	10	$\frac{1}{2}$" PLAIN WASHER	
	3	10	$\frac{1}{2}$" LOCK WASHER	
	4	10	$\frac{1}{2}$"-13 UNC 2B HEX NUT	

D

C

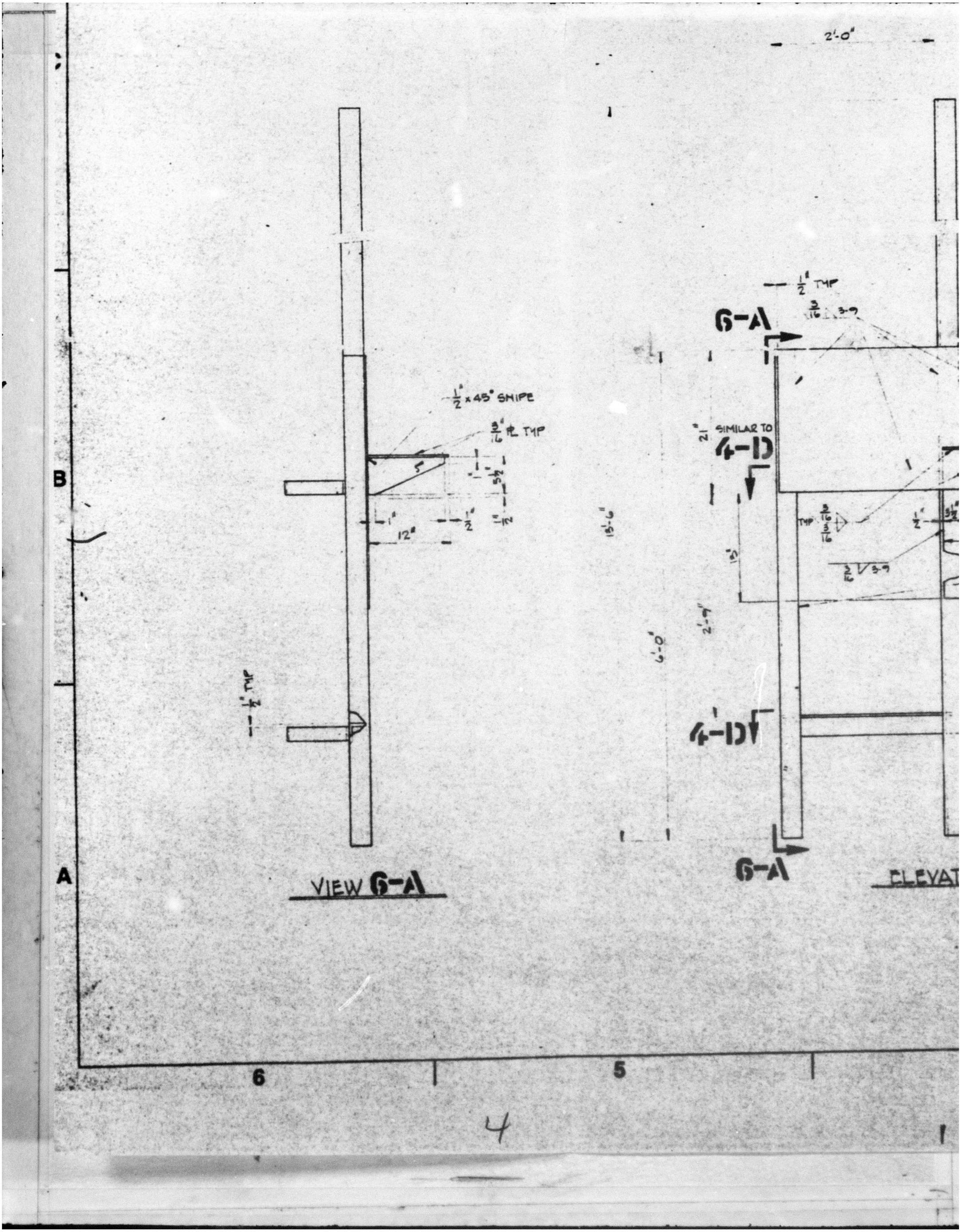
GENERAL NOTES: (UNLESS OTHERWISE NOTED)

1. ALL MATERIAL TO BE ASTM A-36.
2. BREAK ALL EDGES & REMOVE ALL BURRS.
3. ALL WELDS TO BE $\frac{3}{8}$" CONTINUOUS FILLET TYPE.
4. FOR DECK LOCATION ON GLOMAR CHALLENGER SEE REF. DWG. #1.

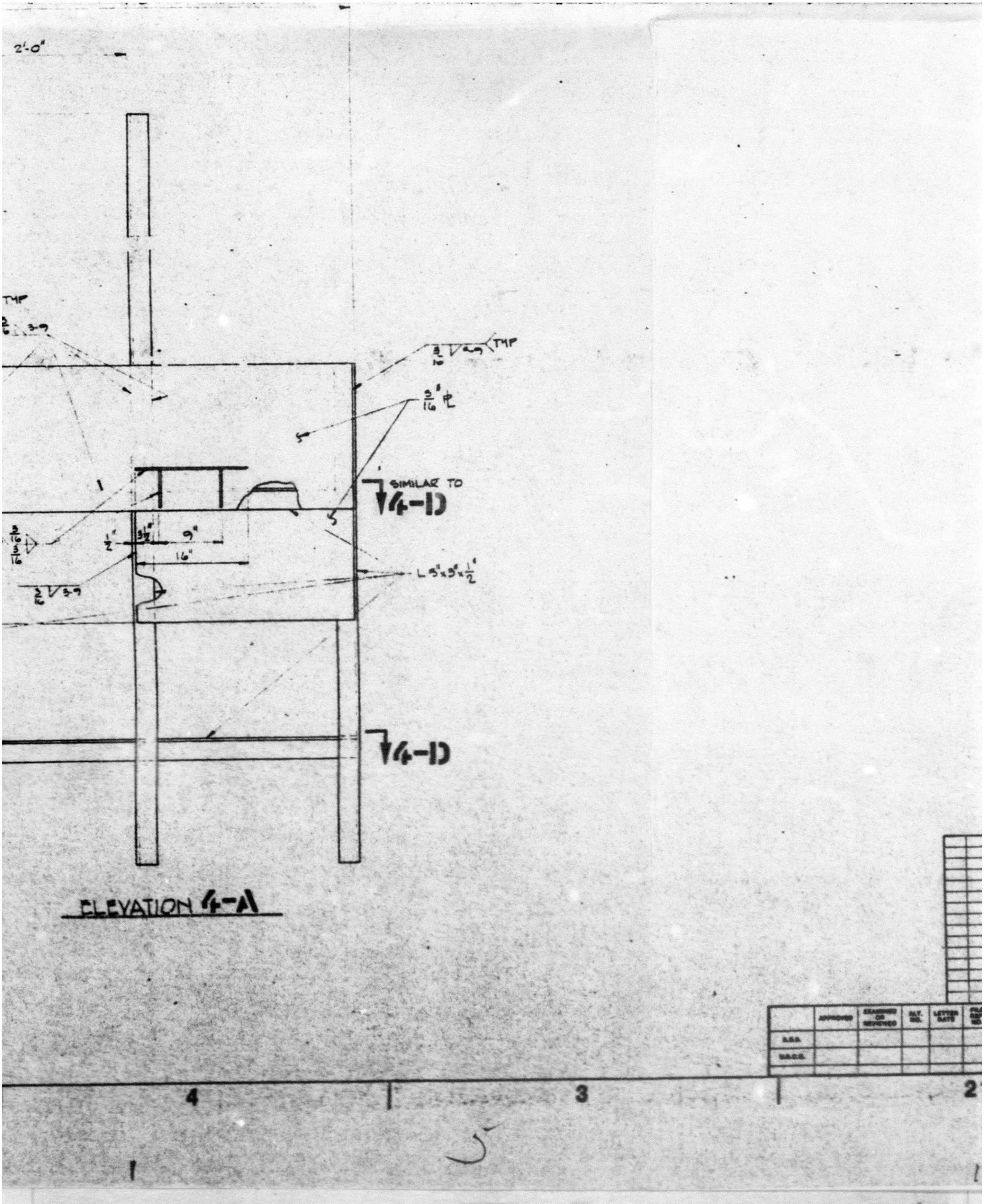
REFERENCE DRAWINGS:

1. E-001-A028 MARINE SEISMIC SYSTEM (MSS) GLOMAR CHALLENGER EQUIPMENT INSTALLATION ARRANGEMENT

B



2'-0"
1/2" TYP
3/16 3-9
6-A
1/2" x 45° SNIPE
3/16" PL TYP
SIMILAR TO
4-D
21"
5
3 1/2
1"
1/2"
1/2"
12"
15'-6"
TYP 3/16 3/16
15"
3/16 3-9
2'-9"
6'-0"
1/2" TYP
4'-D
6-A
VIEW 6-A
ELEVAT
B
A
6
5
4



2'-0"
TYP
SIMILAR TO
4-D
4-D
9"
16"
L 5"x3"x1/2"
ELEVATION 4-A
APPROVED
EXAMINED OR REVIEWED
4
3
2

GENERAL NOTES: (UNLESS OTHERWISE NOTED)

1. ALL MATERIAL TO BE ASTM A-36.
2. BREAK ALL EDGES & REMOVE ALL BURRS.
3. ALL WELDS TO BE $\frac{3}{8}$" CONTINUOUS FILLET TYPE.
4. FOR DECK LOCATION ON GLOMAR CHALLENGER SEE REF. DWG. #1.

REFERENCE DRAWINGS:

1. E-001-A028 MARINE SEISMIC SYSTEM (MSS) GLOMAR CHALLENGER EQUIPMENT INSTALLATION ARRANGEMENT

NO. REQ'D.	E-001-A020 NEXT ASSEMBLY
1	ALTERATION
3-3-81	DATE
	PURCHASING
	CONSTRUCTION
	ENGINEERING
	USCG
	ABS
	CUSTOMER
1	[illegible]
1	[illegible]
1	[illegible]
1	[illegible]
1	[illegible]
3	LIBRARY

	APPROVED	EXAMINED OR REVIEWED	ALT. NO.	LETTER DATE	FILE REF. NO.
A.B.S.					
U.S.C.G.					

TOTAL NET WGT. MAT'L. ______

TOTAL NET WGT. EQUIP. ______

TOTAL NET WEIGHT ______

NO.	DATE	BY	DESCRIPTION	JOB AUTH.	APPR.
1	3-9-81	[illegible]	ADDED $\frac{3}{16}$" PL x 13 WIDE TO ELEV 4-A	006-823000	[illegible]
0	11-26-80	NW	RELEASE FOR CONSTRUCTION	006-823000	[illegible]

ALTERATIONS

GLOBAL MARINE DEVELOPMENT Inc.

Newport Beach Calif.

MARINE SEISMIC SYSTEM (MSS)
HEAVE COMPENSATOR CONTROL BOARD
DETAILS AND ASSEMBLY

	NAME	DATE
DFT.	N. WAGNER	11-24-80
CHKR.	W. [illegible]	11-[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

SCALE: $1\frac{1}{2}$" = 1'-0" & NOTED

JOB AUTH. 006-823000

DWG. NO. E-001-A018

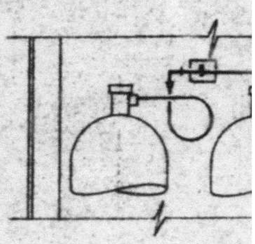
SHT. 1 of 1 REV. 1

2 1

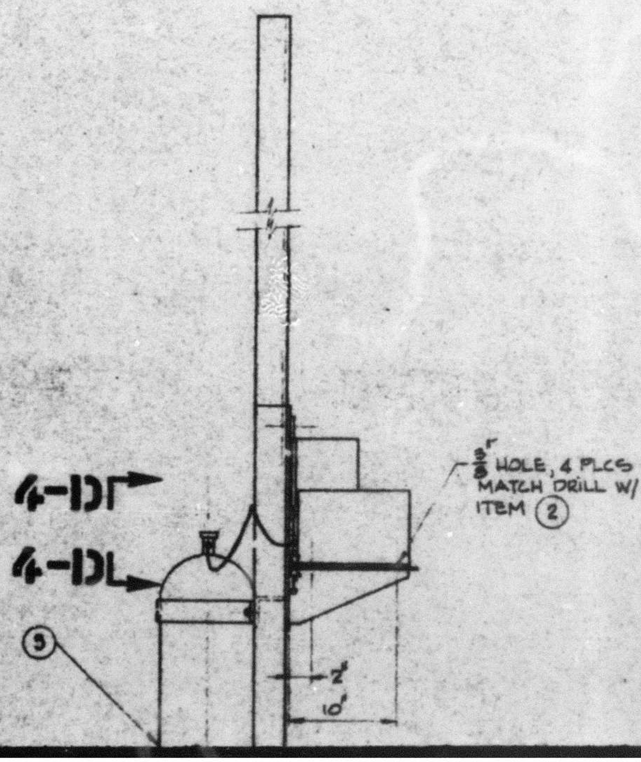
6

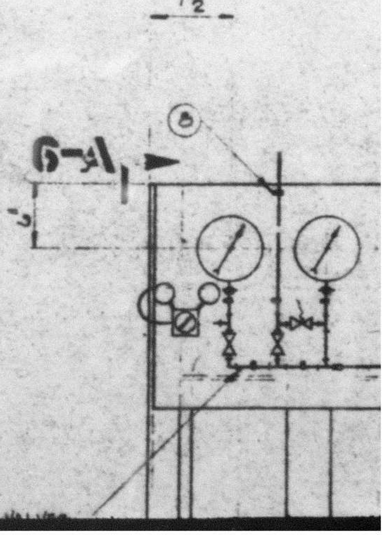
5

D

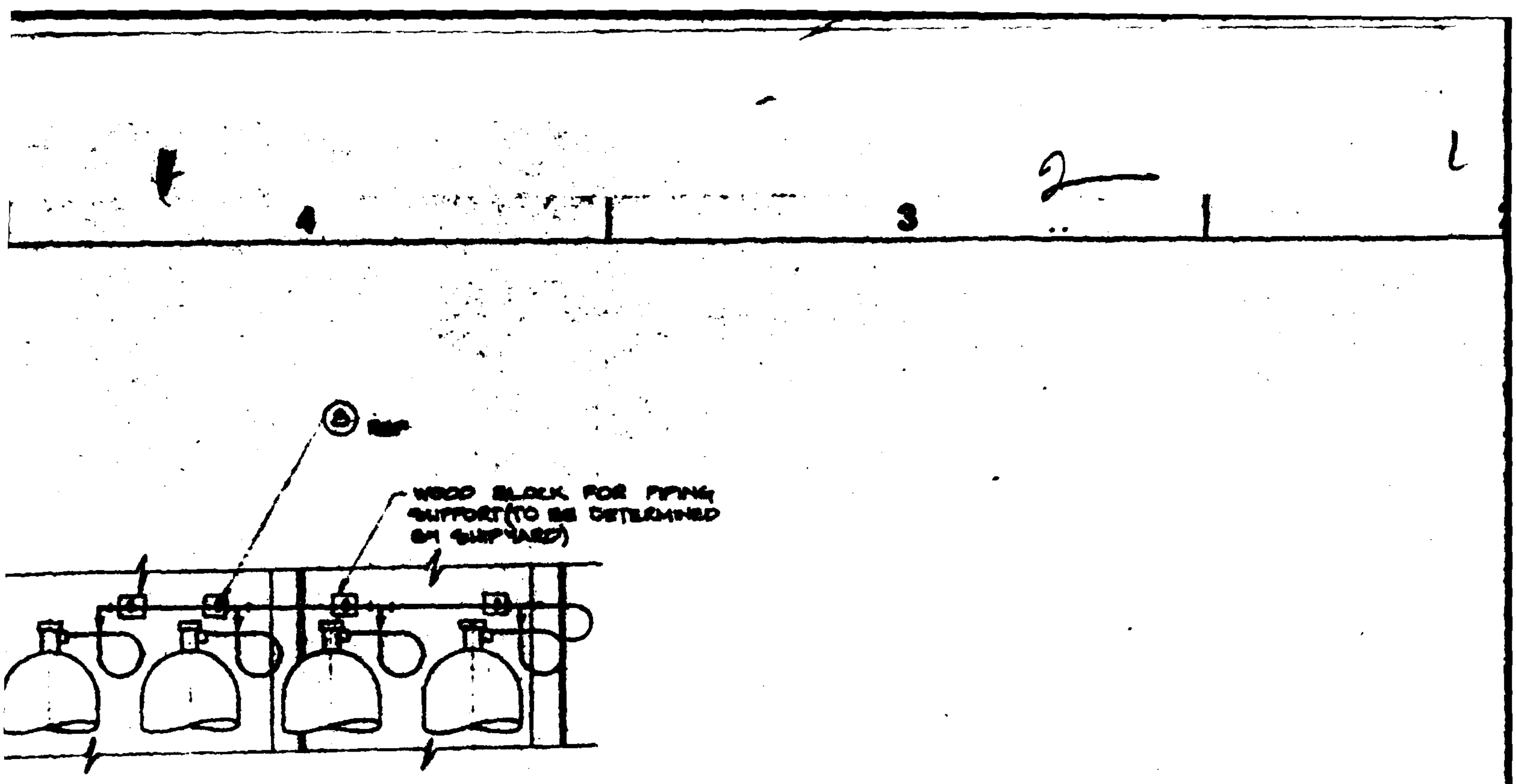


C



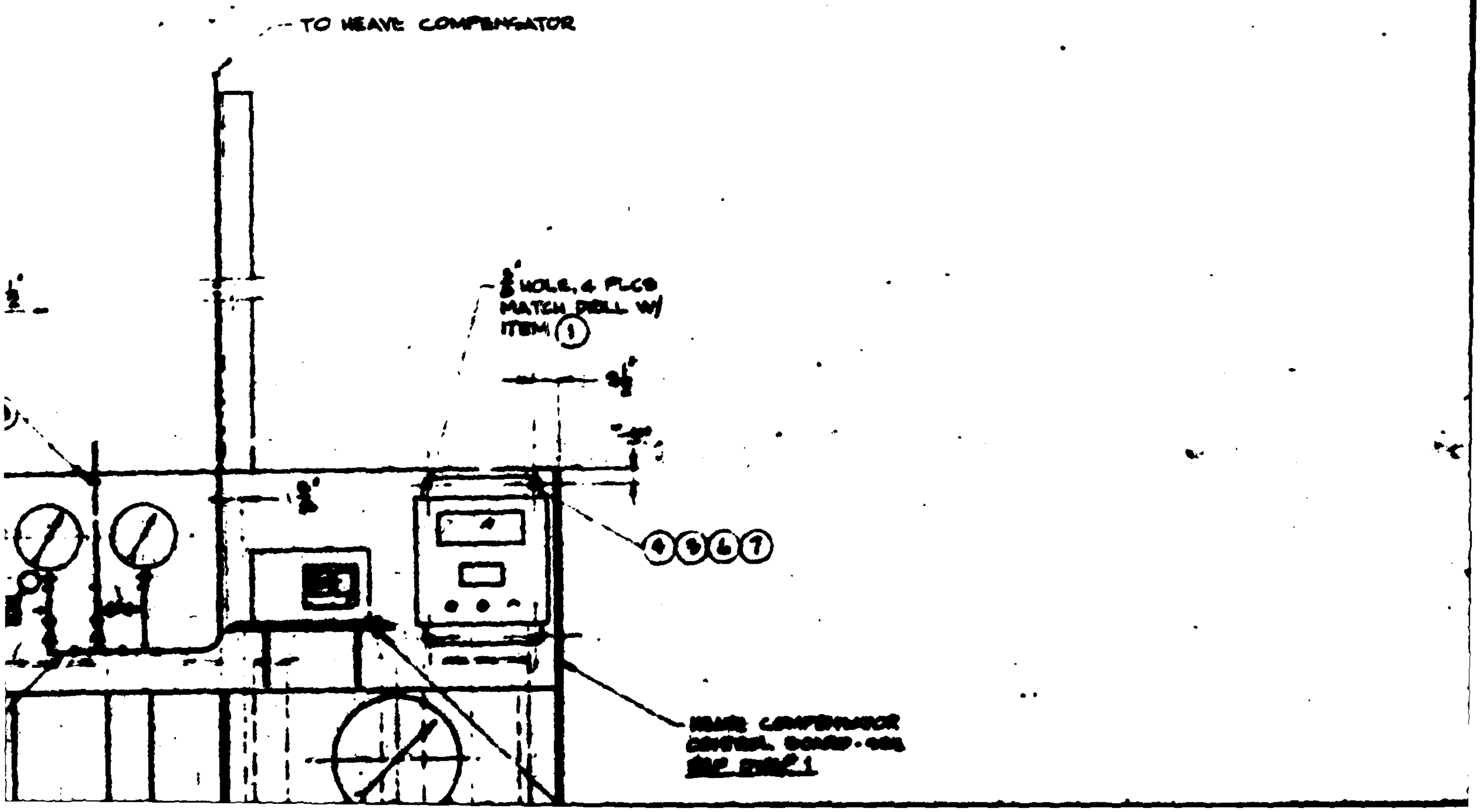


B



4
3
WOOD BLOCK FOR PIPING SUPPORT (TO BE DETERMINED BY SHIPYARD)

VIEW 4-D



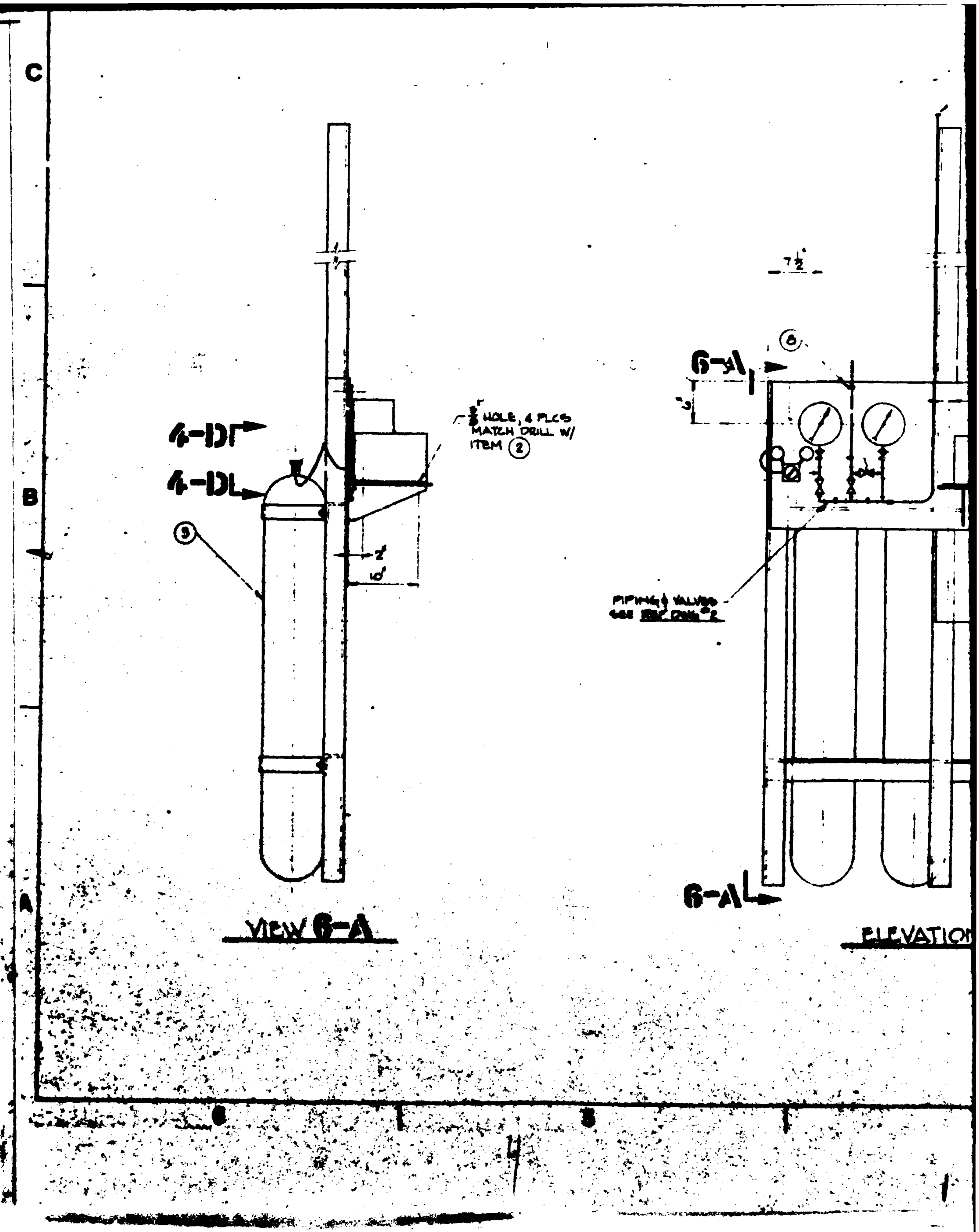
TO HEAVE COMPENSATOR
HOLE, 4 PLCS MATCH DRILL W/ ITEM 1
4 5 6 7

LIST OF MATERIALS

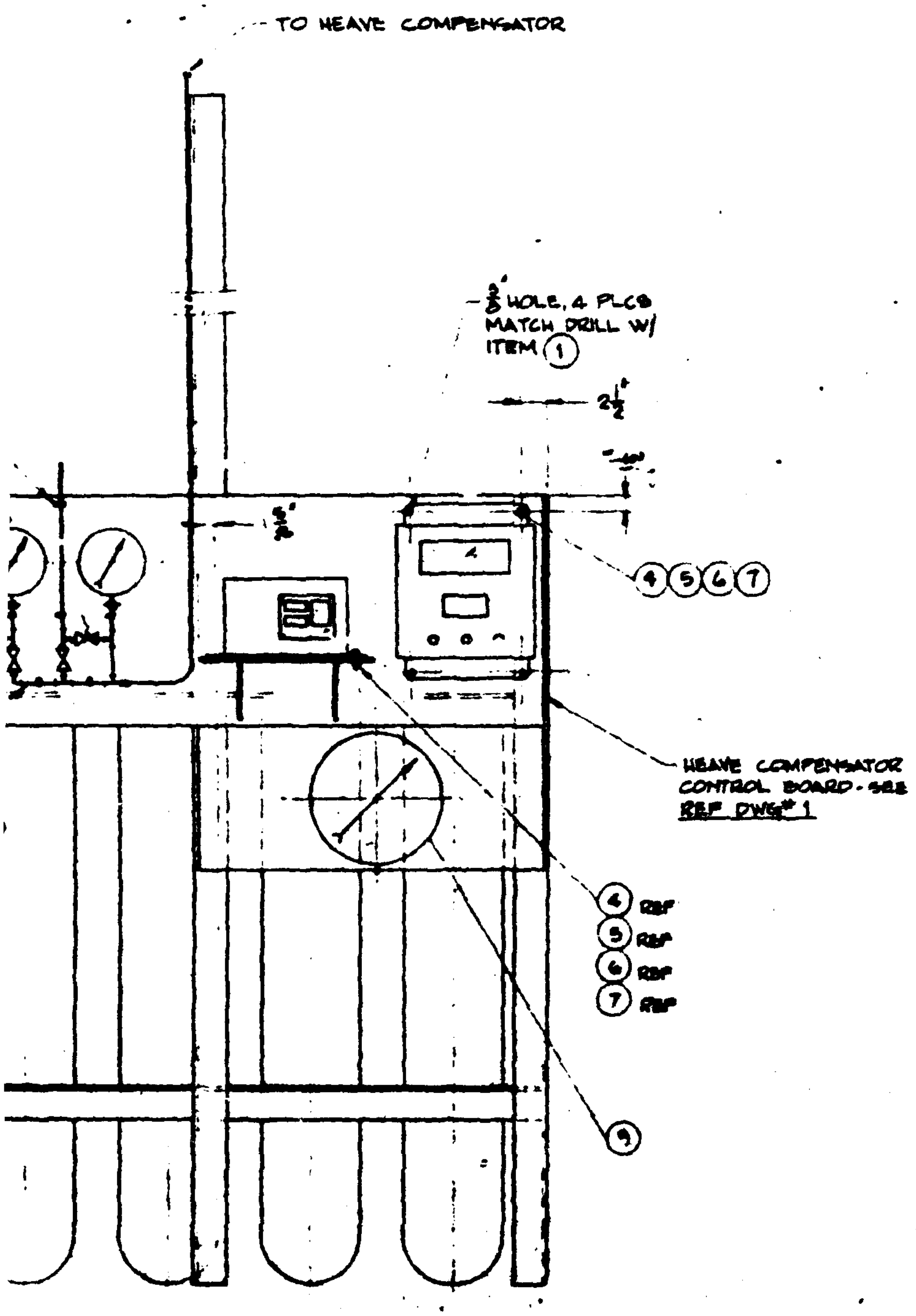
OWNER FURN.	ITEM	QTY.	DESCRIPTION	MATERIAL OR DWG. NO.
X	1	1	LINE TENSION MONITOR	MARTIN DECKER
X	2	1	LINE SPEED & LENGTH MONTR	MARTIN DECKER
X	3	4	NITROGEN BOTTLE	
	4	8	3/16"-18 UNC 2A x 1 1/4" LG HEX BOLT	
	5	8	3/16" PLAIN WASHER	
	6	8	3/16" LOCK WASHER	
	7	8	3/16"-18 UNC 2B HEX NUT	
	8	10	1/2" PIPE SUPPORT CLAMP	
	9	1	12" GAUGE (WAI2 INDICATOR W/CONNECTORS 30,000 CAP.)	MARTIN DECKER

REFERENCE DRAWINGS:

1. E-001-A016 MARINE SEISMIC SYSTEM (MSS) HEAVE COMPENSATOR CONTROL BOARD · DETAILS & ASSEMBLY
2. E-001-P001 MARINE SEISMIC SYSTEM (MSS) HEAVE COMPENSATOR PIPING DIAGRAM (SUPPLIED BY OTHER)



C
B
A
4-D
4-D
HOLE, 4 PLCS
MATCH DRILL W/
ITEM (2)
(9)
2"
10"
7 1/2"
(8)
6-A
6-A
VIEW 6-A
ELEVATION
6
5



ELEVATION "A"

4 3 2

5

C

REFERENCE DRAWINGS:

1. E-001-A018 MARINE SEISMIC SYSTEM (MSS) HEAVE COMPENSATOR CONTROL BOARD - DETAILS & ASSEMBLY
2. E-001-P001 MARINE SEISMIC SYSTEM (MSS) HEAVE COMPENSATOR PIPING DIAGRAM (SUPPLIED BY OTHER)

B

NO.	DATE	BY	DESCRIPTION	JOB AUTH.	APPR.
2	[illegible]	NW	ADDED ITEM #9 TO LM & ELEV. 4-A	006-329000	[illegible]
1	[illegible]	NW	CHANGED NEXT ASSY WAS E-001-A012	006-329000	[illegible]
0	[illegible]	NW	RELEASE FOR CONSTRUCTION	006-329000	[illegible]

ALTERATIONS

NEXT ASSEMBLY: E-001-A028

NO. REQ'D.	
2	ALTERATION
	DATE
	PURCHASING
	CONSTRUCTION
	ENGINEERING
	USCG
	ABS
10	CUSTOMER
1	[illegible]
1	[illegible]
1	[illegible]
1	[illegible]
1	[illegible]
1	[illegible]

	APPROVED	STAMPED OR STENCILED	[illegible]	LETTER DATE	[illegible]
A.B.S.					
U.S.C.G.					

TOTAL NET WGT. [illegible] ______

TOTAL NET WGT. [illegible] ______

TOTAL NET WEIGHT ______

GLOBAL MARINE DEVELOPMENT Inc.

Newport Beach, Calif.

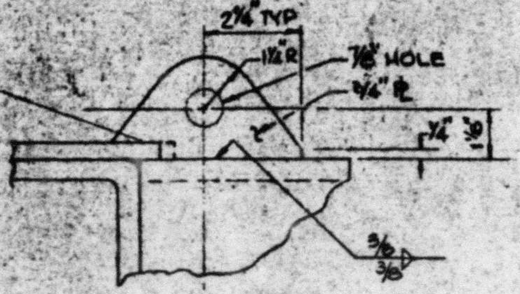
A

MARINE SEISMIC SYSTEM (MSS)
INSTRUMENTATION & CONTROLS
INSTALLATION

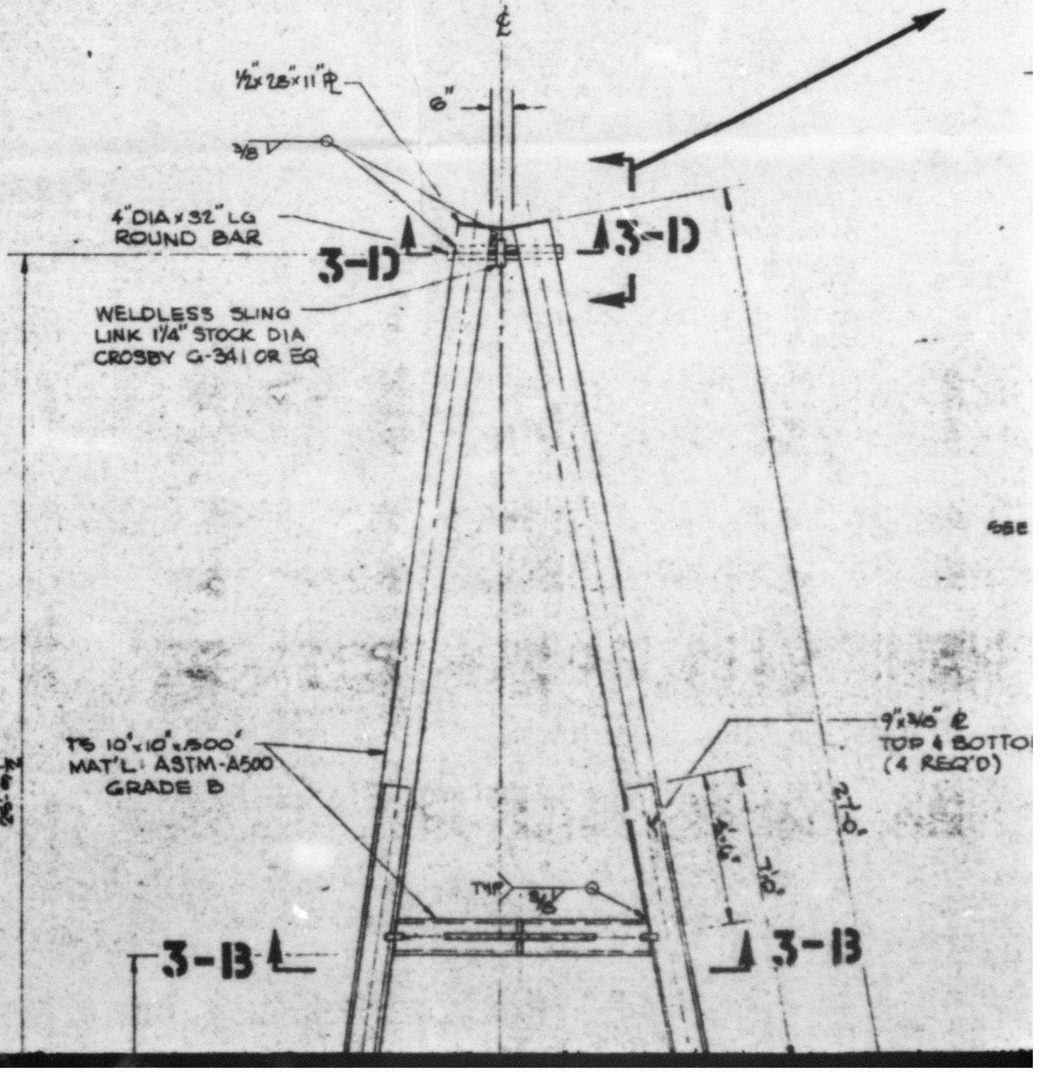
DRN. N. WAGNER	11-23-80	SCALE $1\frac{1}{2}"=1'-0"$	TOLERANCE UNLESS OTHERWISE NOTED
CHKD. N. [illegible]	[illegible]		
[illegible]	[illegible]	JOB AUTH. 006-329000	DWG. NO. E-001-A020
[illegible]	[illegible]		SHT. 1/1 REV. 2

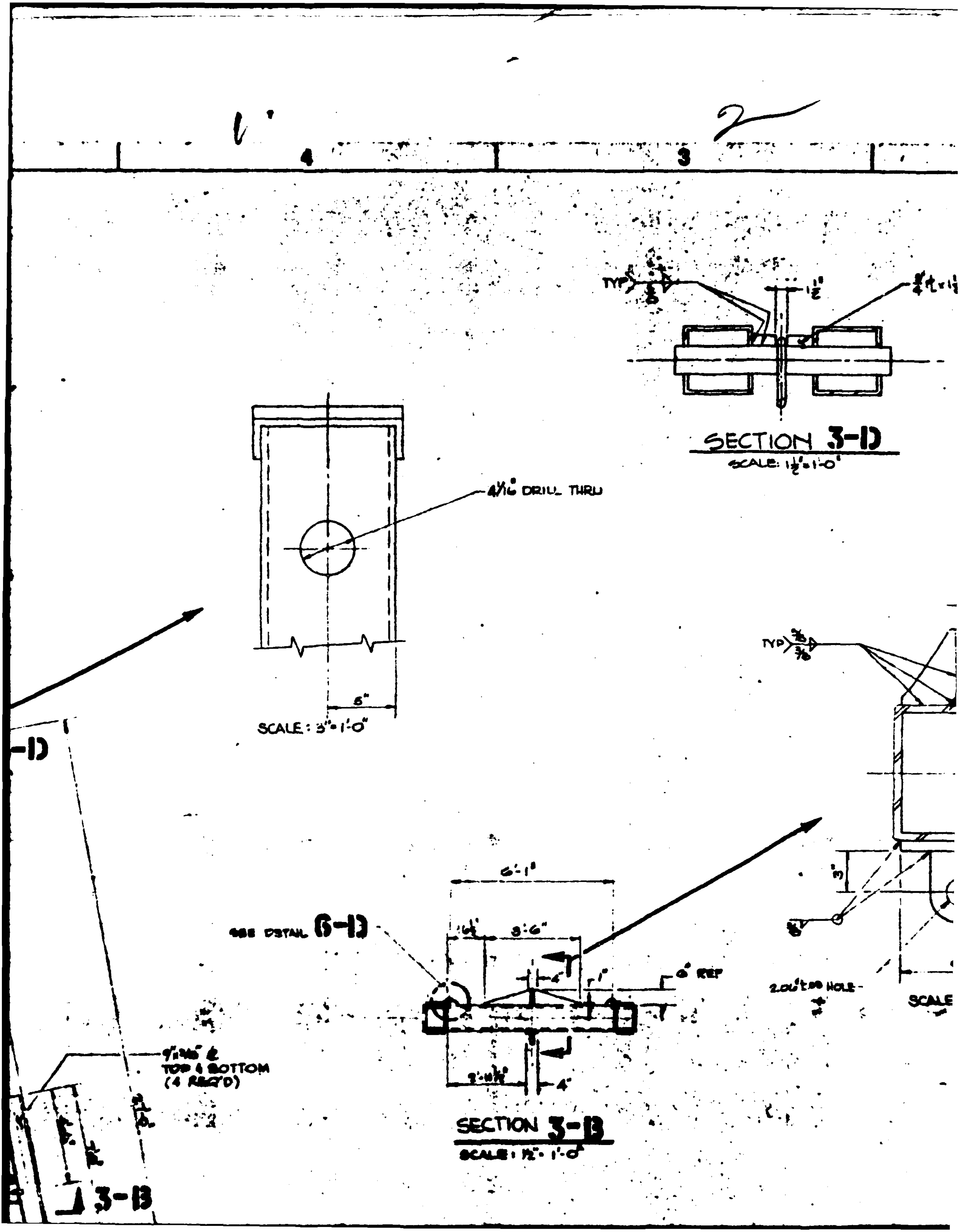
2 1

6



DETAIL 6-D
SCALE: HALF SIZE
2 REQ'D



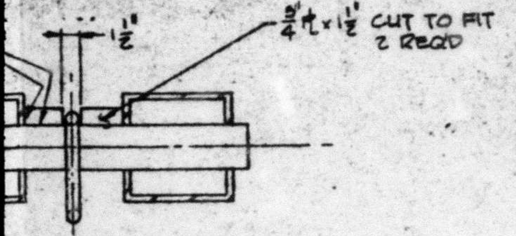

4
3
SECTION 3-D
4 1/16" DRILL THRU
5"
SCALE: 3"=1'-0"
6'-1"
3'-6"
SEE DETAIL 6-B
4"
1"
0" REF
TOP & BOTTOM
(4 REQ'D)
SECTION 3-B
3-B

3

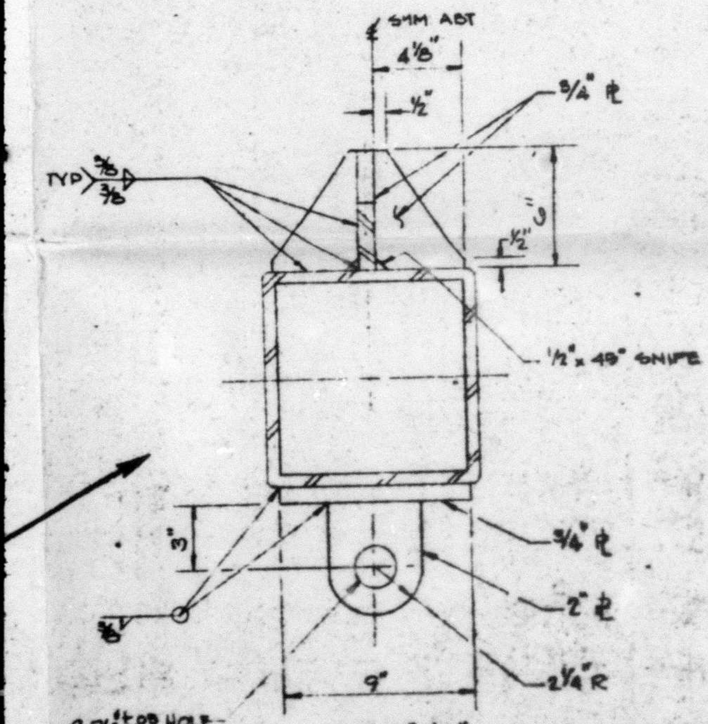
2	1

LIST OF MATERIALS

OWNER FURN.	ITEM	QTY.	DESCRIPTION	[illegible]



SECTION 3-D
SCALE: 1 1/2"=1'-0"



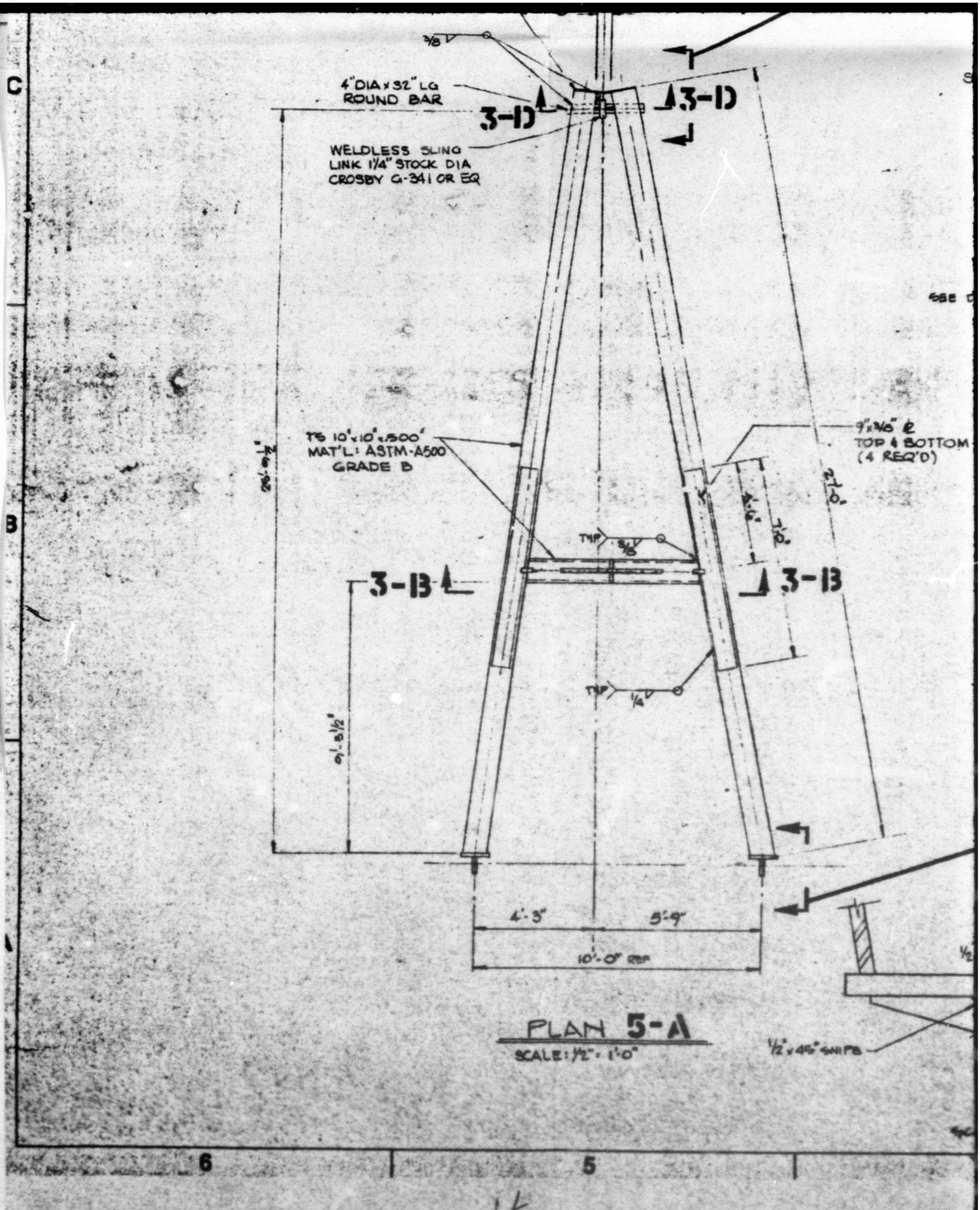
SCALE: 3"=1'-0"

GENERAL NOTES: (UNLESS OTHERWISE NOTED)

1. ALL MATERIAL TO BE ASTM A-36.
2. BREAK ALL EDGES & REMOVE ALL BURRS.
3. PAINT IN ACCORDANCE WITH GMDI SPEC. 001-002.
4. ALL WELDING TO BE IN ACCORDANCE WITH AWS PROCEDURES.

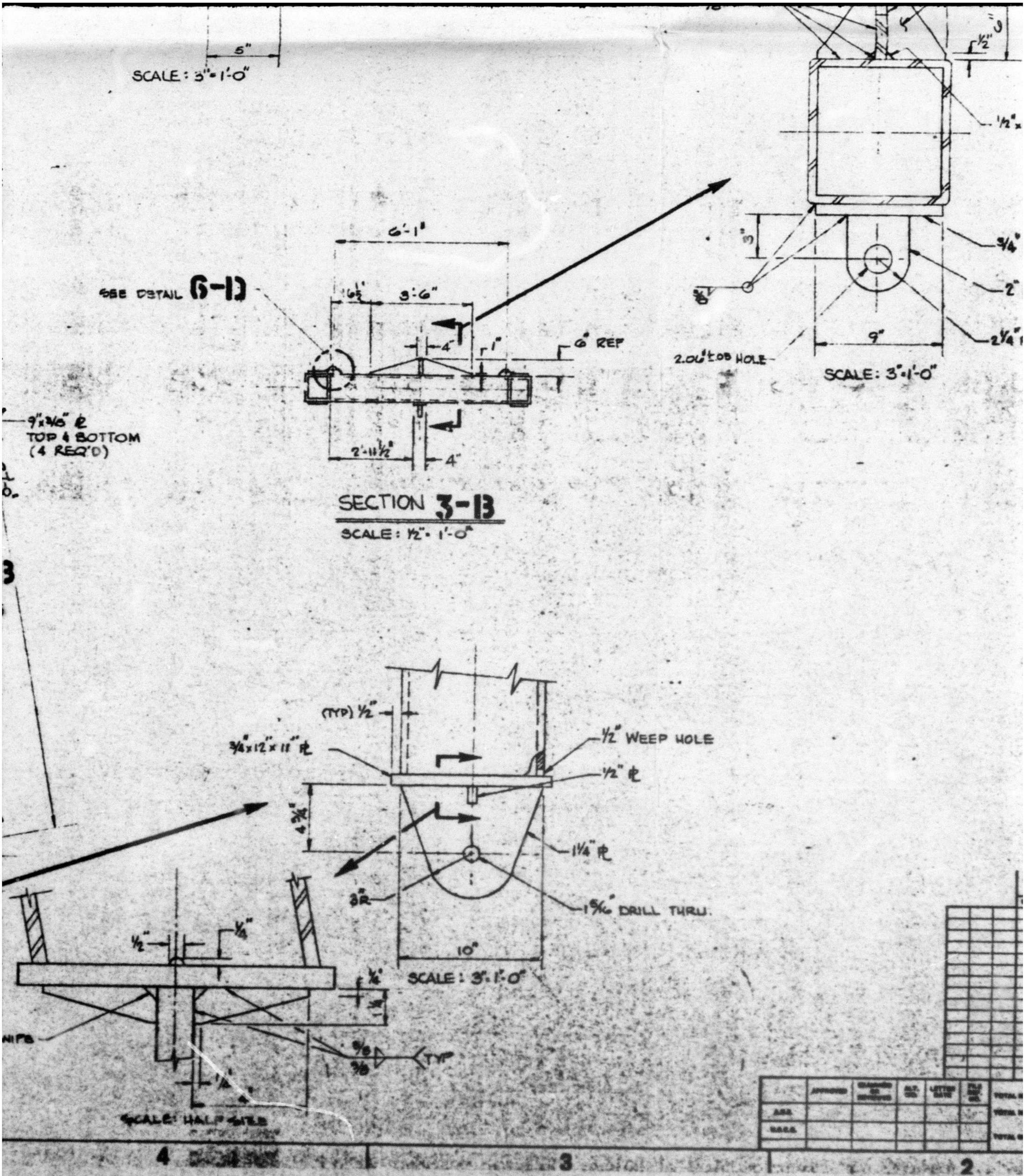
C

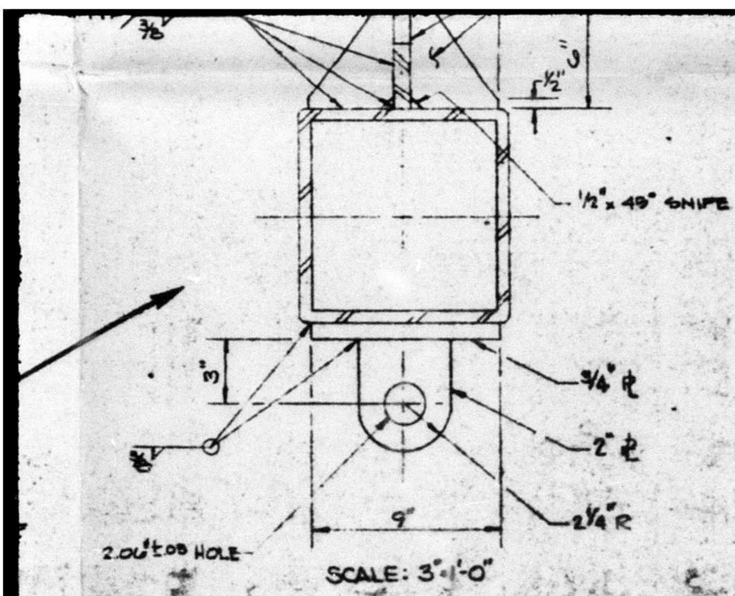
B



C
B
3/8
4" DIA x 32" LG
ROUND BAR
3-D
3-D
WELDLESS SLING
LINK 1¼" STOCK DIA
CROSBY G-341 OR EQ
TS 10" x 10" x .500"
MAT'L: ASTM-A500
GRADE B
9" x 3/8" ℄
TOP & BOTTOM
(4 REQ'D)
27'-0"
4'-6"
7'-0"
TYP
5/16
3-B
3-B
TYP
1/4
26'-8¼"
9'-3½"
4'-3"
5'-9"
10'-0" REF
PLAN 5-A
SCALE: ½" = 1'-0"
½" x 45° SNIPS
SEE D
6
5

4


5"
SCALE: 3" = 1'-0"
1/2"
6'-1"
SEE DETAIL 6-13
6 1/2"
3'-6"
4"
1"
6" REF
2'-11 1/2"
4"
9"x3/8" PL
TOP & BOTTOM
(4 REQ'D)
SECTION 3-13
SCALE: 1/2" = 1'-0"
3/4"
2"
2 1/4"
9"
2.06" ±.03 HOLE
SCALE: 3" = 1'-0"
(TYP) 1/2"
3/4"x12"x11" PL
1/2" WEEP HOLE
1/2" PL
1 1/4" PL
3"R
1 5/16" DRILL THRU.
10"
SCALE: 3" = 1'-0"
1/2"
1/4"
1/8"
5/8
5/8
TYP
SCALE: HALF SIZE
APPROVED
4
3
2
5



GENERAL NOTES: (UNLESS OTHERWISE NOTED)

1. ALL MATERIAL TO BE ASTM A-36.
2. BREAK ALL EDGES & REMOVE ALL BURRS.
3. PAINT IN ACCORDANCE WITH GMDI SPEC. 001-002.
4. ALL WELDING TO BE IN ACCORDANCE WITH AWS PROCEDURES.

NO.	DATE	BY	DESCRIPTION	JOB AUTH.	APPR.
1	5-2-81	DF	ADDED SECT. 3-D	006-523000	[illegible]
0	12-08	NW	RELEASE FOR CONSTRUCTION	006-523000	[illegible]
A	12-4-80	NW	PRELIMINARY RELEASE	006-523000	[illegible]

ALTERATIONS

NO. REQ'D.	NEXT ASSEMBLY
	E-001-A025
1	ALTERATION
	DATE
	PURCHASING
	CONSTRUCTION
	ENGINEERING
	MHCS
1	ABS
10	CUSTOMER
1	WALKER STEDT
1	DYE
1	BUCHANAN
1	MITCHELL
1	PARAHAM
2	LIBRARY

	APPROVED	EXAMINED OR REVIEWED	ALT. NO.	LETTER DATE	FILE REF. NO.
A.B.S.					
U.S.C.G.					

TOTAL NET WGT. MAT'L. ______

TOTAL NET WGT. EQUIP. ______

TOTAL NET WEIGHT ______

GLOBAL MARINE DEVELOPMENT Inc.
Newport Beach, Calif.

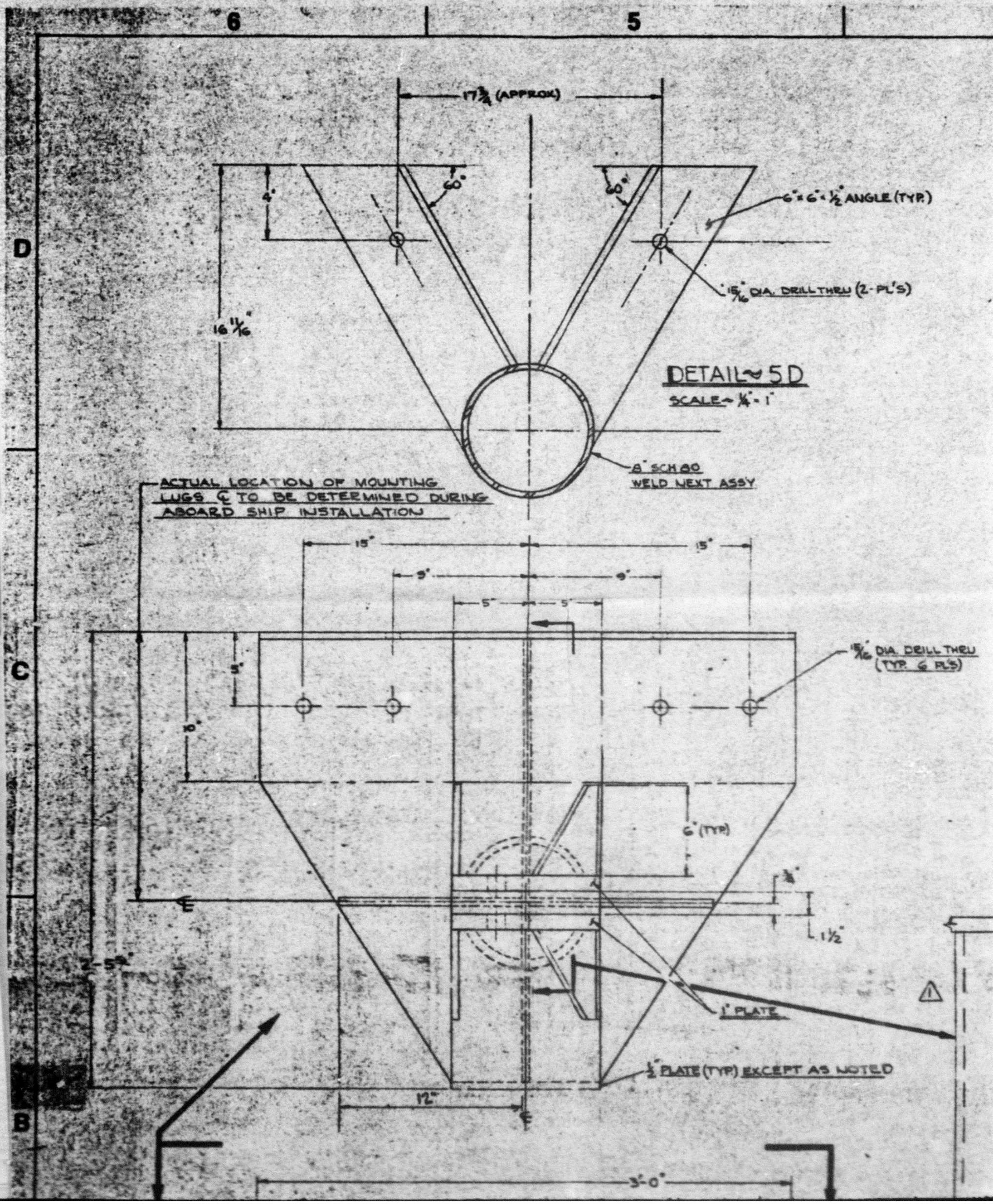
MARINE SEISMIC SYSTEM (MSS)
A-FRAME
DETAILS & ASSEMBLY

	NAME	DATE	SCALE	DWG. NO.
DFT.	ADT	12-4-80	AS NOTED	
ENGR.	W. Buchanan	12-4-80		
CHK.	[illegible]	Dec. 80	JOB AUTH. 006-523000	E-001-A022
APPD.	[illegible]	[illegible]		
APPD.	[illegible]	[illegible]		

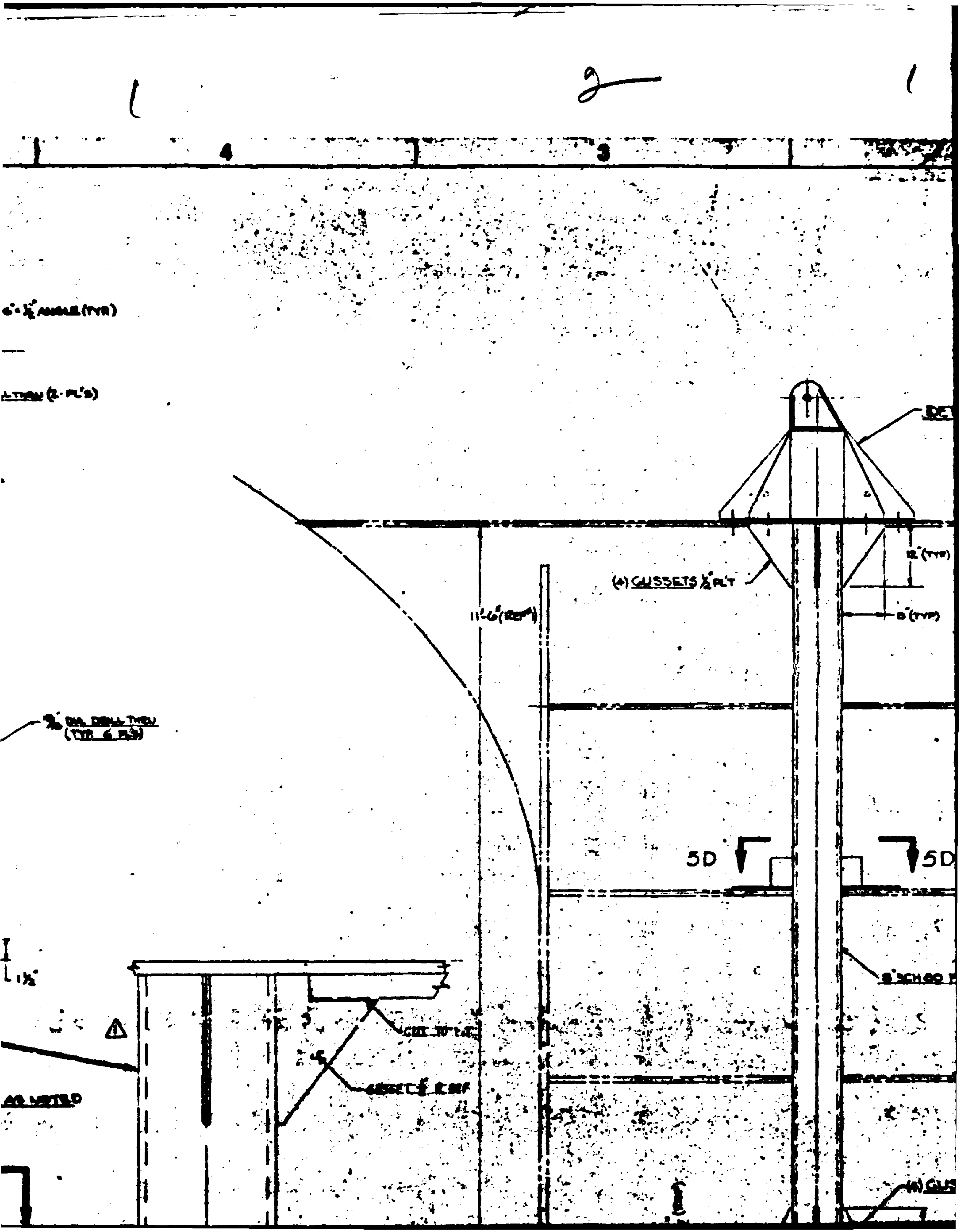
1

2

6



6
5
D
C
B
17¾ (APPROX)
4"
60°
60°
6"×6"×½" ANGLE (TYP.)
15/16" DIA. DRILL THRU (2-PL'S)
16 11/16"
DETAIL ~ 5D
SCALE ~ ¼" = 1"
8" SCH 80
WELD NEXT ASSY
ACTUAL LOCATION OF MOUNTING
LUGS ℄ TO BE DETERMINED DURING
ABOARD SHIP INSTALLATION
15"
15"
9"
9"
5"
5"
15/16" DIA. DRILL THRU
(TYP. 6 PL'S)
5"
10"
6" (TYP)
¾"
1½"
2'-5⅝"
1" PLATE
½" PLATE (TYP) EXCEPT AS NOTED
12"
3'-0"

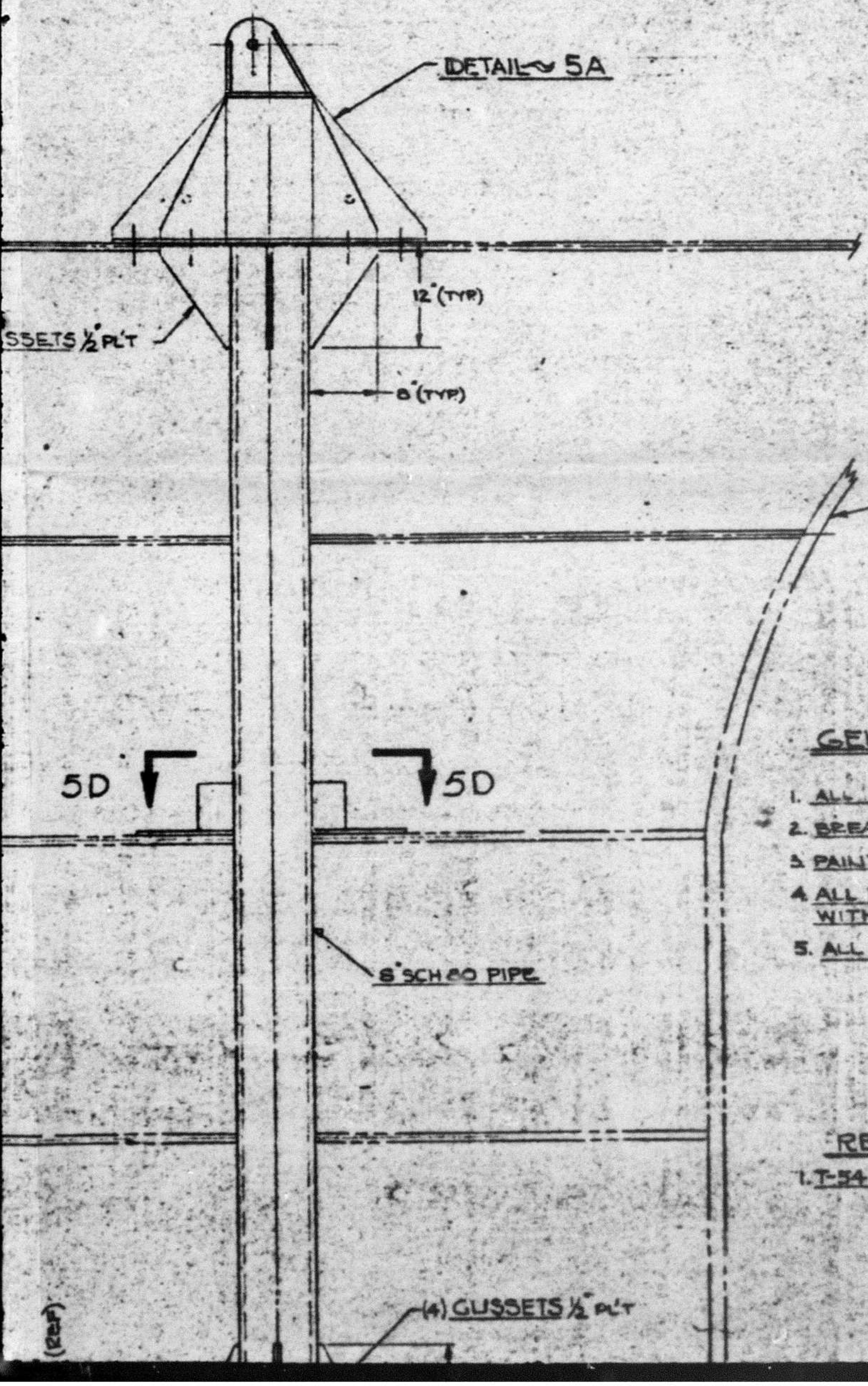

4
3
(4) GUSSETS 1/2" PL'T
12" (TYP)
8" (TYP)
5D
5D
AS NOTED

1 B

2 1

LIST OF MATERIALS

OWNER PURCH.	ITEM	QTY.	DESCRIPTION	MATERIAL OR DWG. NO.

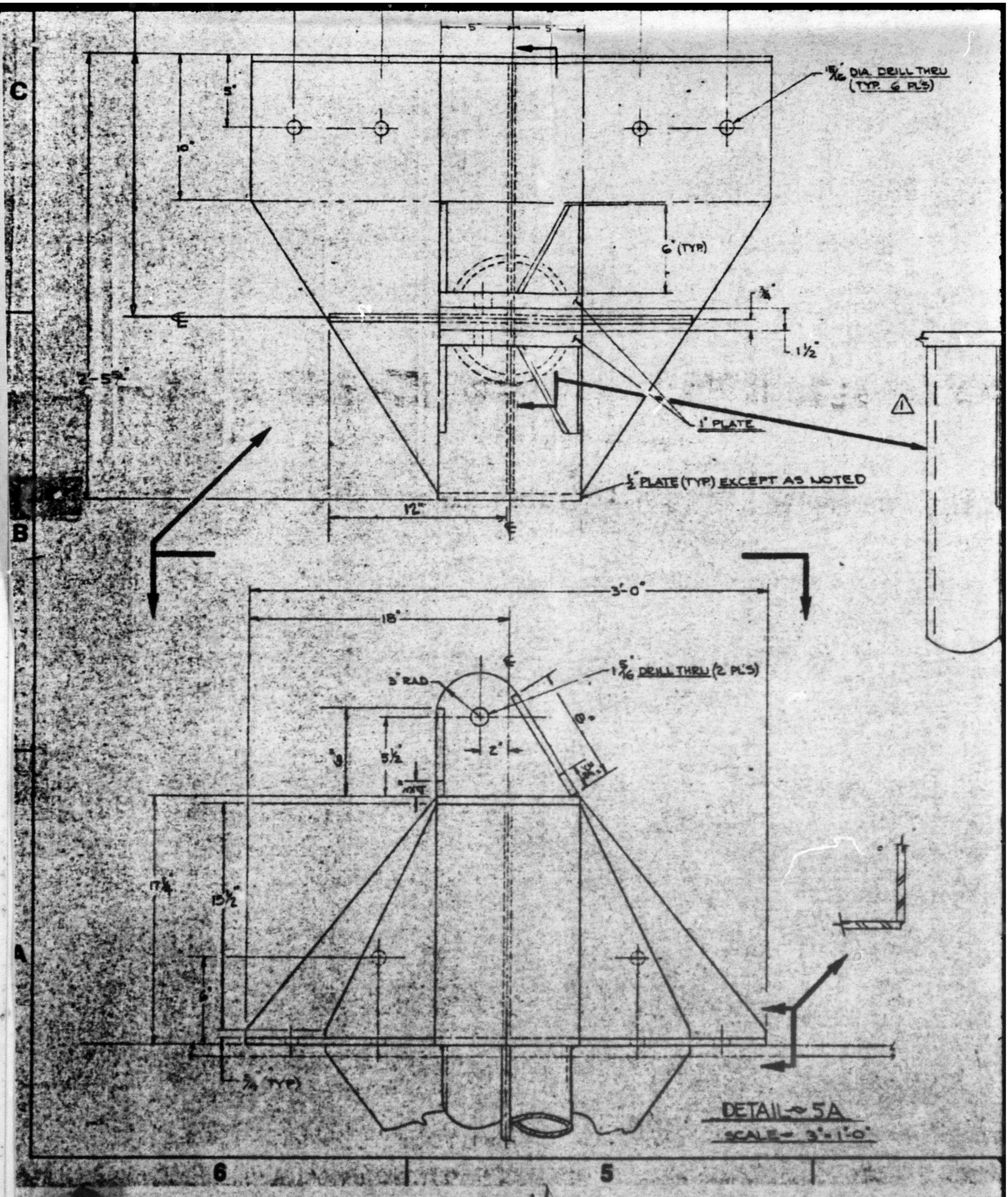


GENERAL NOTES: (UNLESS OTHERWISE NOTED)

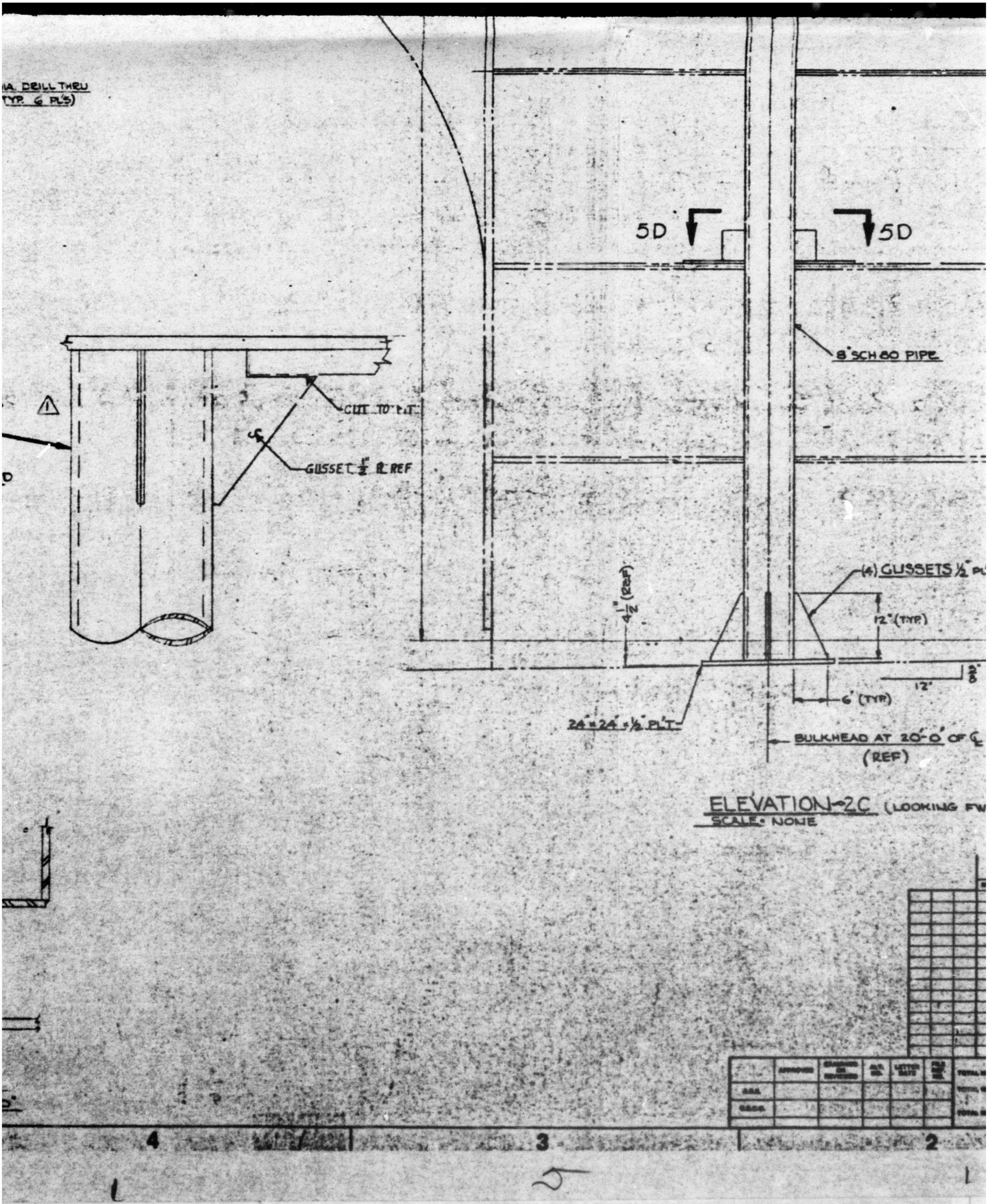
1. ALL MATERIAL TO BE ASTM A-36.
2. BREAK ALL EDGES & REMOVE ALL BURRS.
3. PAINT IN ACCORDANCE WITH GMDI SPEC. 001-002.
4. ALL WELDING TO BE IN ACCORDANCE WITH AWS PROCEDURES
5. ALL WELDS TO BE 3/16 CONTINUOUS FILET.

REFERENCE DRAWING:

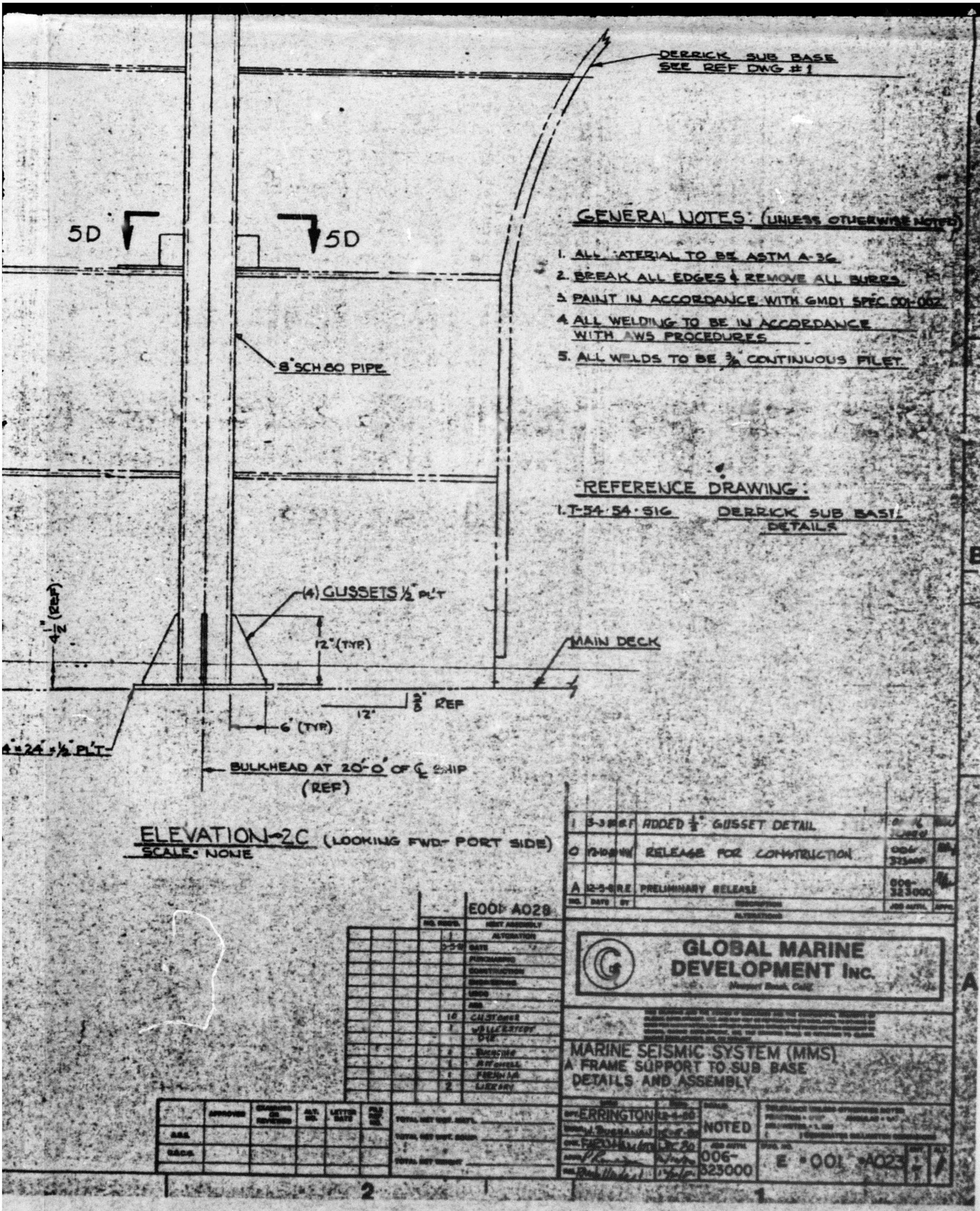
1. T-54-54-S16 DERRICK SUB BASE DETAILS

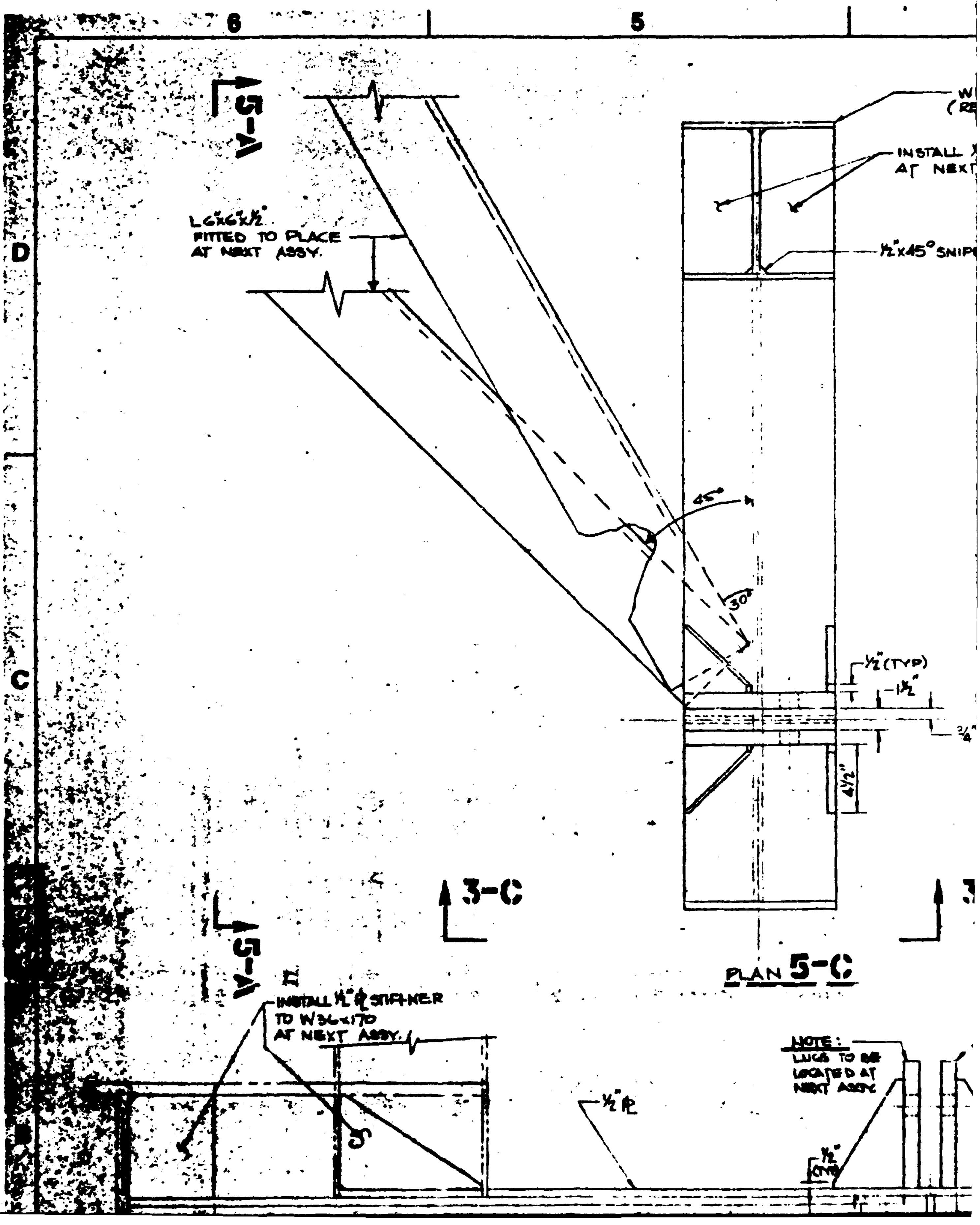


15/16" DIA. DRILL THRU (TYP. 6 PL'S)
6" (TYP)
1" PLATE
1/2" PLATE (TYP) EXCEPT AS NOTED
12"
3'-0"
18"
3" RAD.
1 5/16" DRILL THRU (2 PL'S)
2"
DETAIL ~ 5A
SCALE ~ 3" = 1'-0"

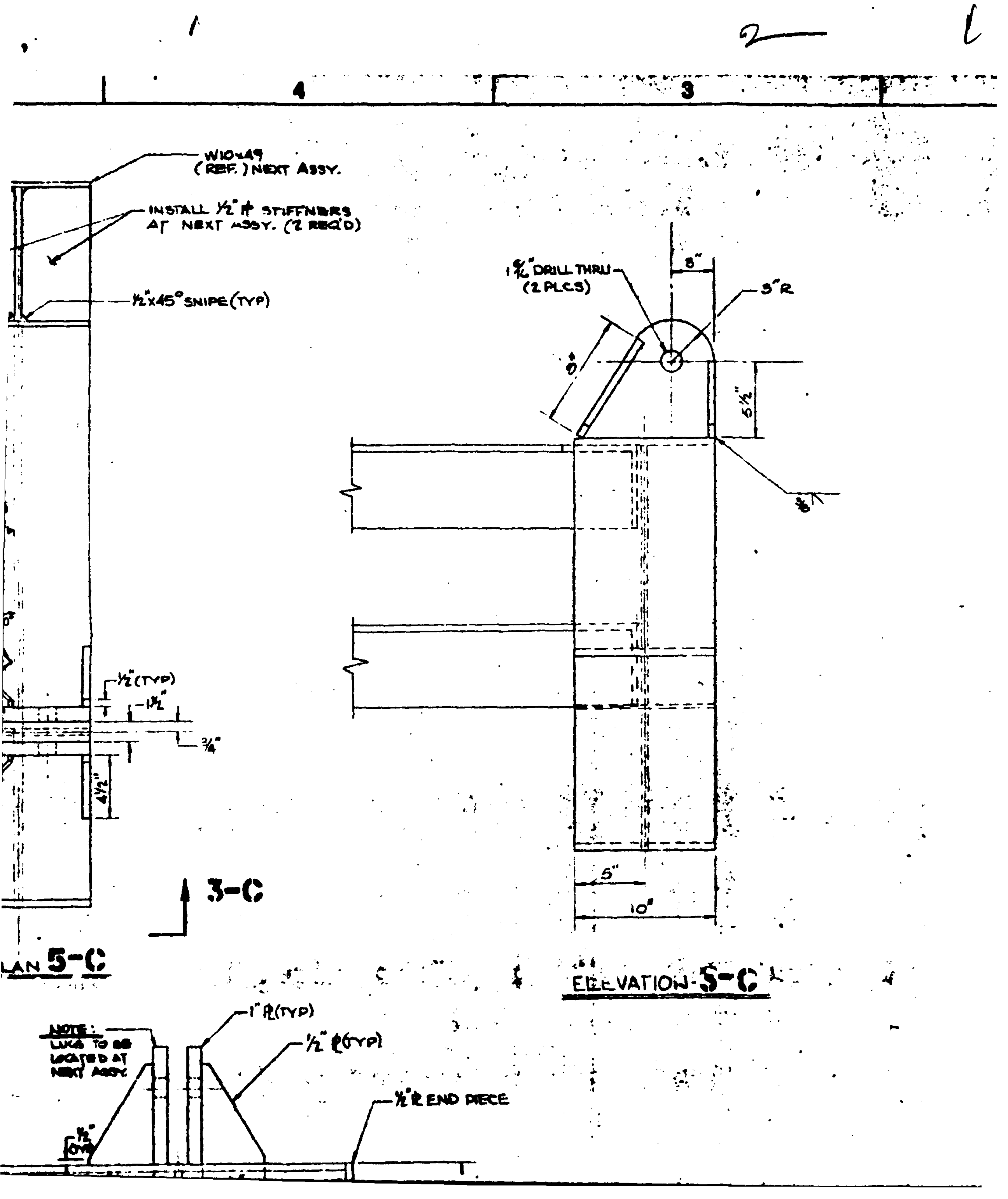


DIA. DRILL THRU
(TYP. 6 PL'S)
5D
5D
8" SCH 80 PIPE
CUT TO FIT
GUSSET 1/2" PL REF
(4) GUSSETS 1/2" PL
4 1/2" (REF)
12" (TYP.)
12"
6" (TYP.)
24" x 24" x 1/2" PL'T.
BULKHEAD AT 20'-0" OF ℄
(REF)
ELEVATION-2C (LOOKING FW
SCALE: NONE
4
3
2


DERRICK SUB BASE
SEE REF DWG #1
5D
5D
8" SCH 80 PIPE
GENERAL NOTES: (UNLESS OTHERWISE NOTED)
1. ALL MATERIAL TO BE ASTM A-36
2. BREAK ALL EDGES & REMOVE ALL BURRS
3. PAINT IN ACCORDANCE WITH GMDI SPEC 001-002
4. ALL WELDING TO BE IN ACCORDANCE WITH AWS PROCEDURES
5. ALL WELDS TO BE 3/8" CONTINUOUS FILET
REFERENCE DRAWING:
1. T-54-54-516 DERRICK SUB BASE DETAILS
(4) GUSSETS 1/2" PL'T
4 1/2" (REF)
12" (TYP)
MAIN DECK
3/8" REF
12"
6" (TYP)
24 × 24 × 1/2" PL'T
BULKHEAD AT 20'-0" OF ℄ SHIP (REF)
ELEVATION-2C (LOOKING FWD- PORT SIDE)
SCALE: NONE
E001-A028
1 ADDED 1/2" GUSSET DETAIL
0 RELEASE FOR CONSTRUCTION 006-323000
A PRELIMINARY RELEASE 006-323000
GLOBAL MARINE DEVELOPMENT INC.
Newport Beach, Calif.
MARINE SEISMIC SYSTEM (MMS)
A FRAME SUPPORT TO SUB BASE
DETAILS AND ASSEMBLY
ERRINGTON 12-4-80
NOTED
006-323000
E-001-A023
2
1
C
B
A
6



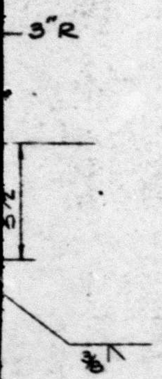
6
5
D
C
5-A
L6"x6"x½"
FITTED TO PLACE
AT NEXT ASSY.
INSTALL
AT NEXT
½"x45° SNIP
45°
30°
½"(TYP)
1½"
4½"
3-C
PLAN 5-C
INSTALL ½" ℄ STIFFNER
TO W36x170
AT NEXT ASSY.
½" ℄
NOTE:
LUGS TO BE
LOCATED AT
NEXT ASSY.
½"
(TYP)



4
3
W10x49 (REF.) NEXT ASSY.
INSTALL ½" ℞ STIFFNERS AT NEXT ASSY. (2 REQ'D)
½"x45° SNIPE (TYP)
1 5/16" DRILL THRU (2 PLCS)
3"
3"R
6"
5½"
3/8
½"(TYP)
1½"
¾"
4½"
3-C
5"
10"
PLAN 5-C
ELEVATION 5-C
NOTE: LUGS TO BE LOCATED AT NEXT ASSY.
1" ℞(TYP)
½" ℞(TYP)
½"(TYP)
½" ℞ END PIECE

2

1



LIST OF MATERIALS

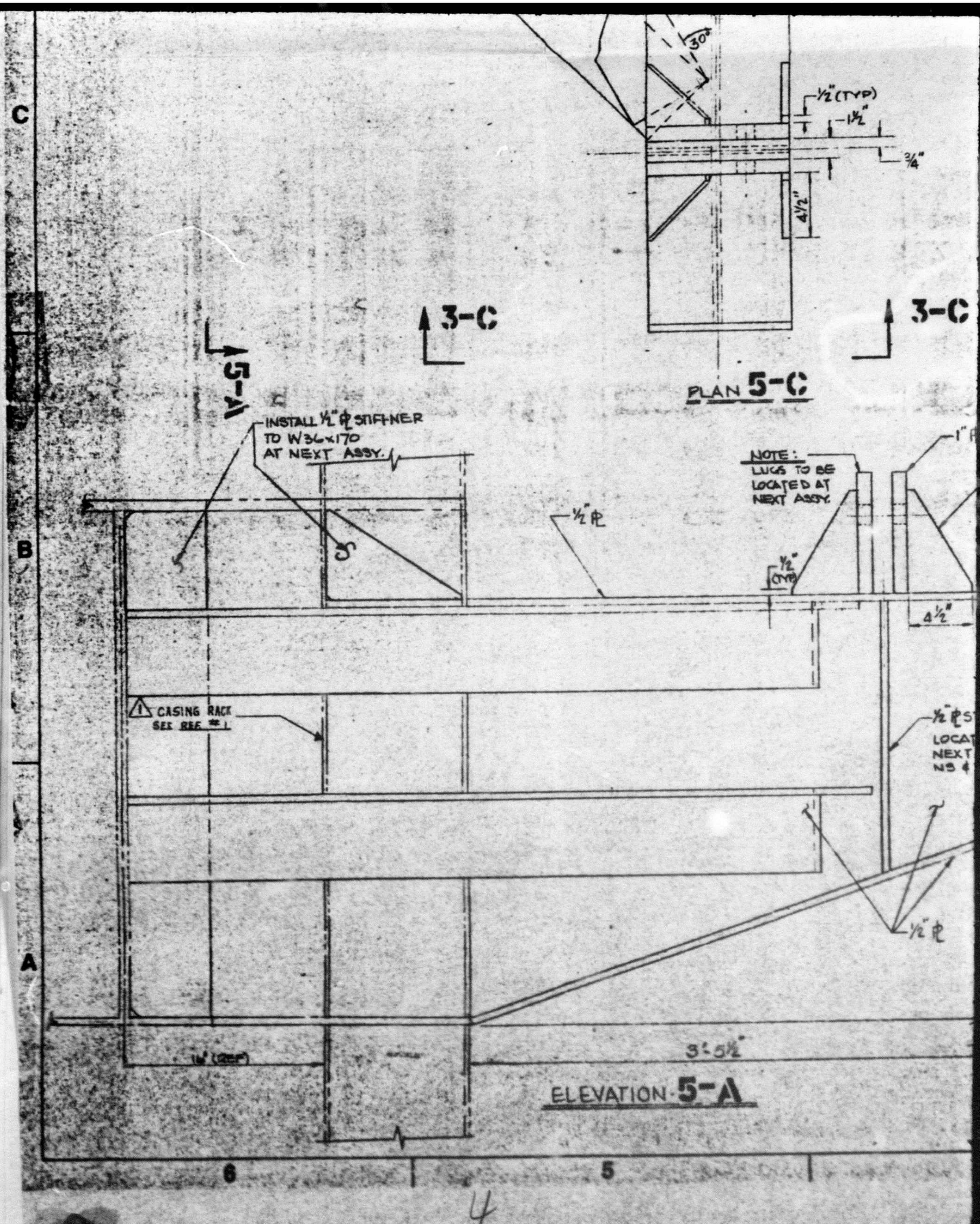
[illegible]	ITEM	QTY.	DESCRIPTION	MATERIAL [illegible]

GENERAL NOTES: (UNLESS OTHERWISE NOTED)

1. ALL MATERIAL TO BE ASTM A-36.
2. BREAK ALL EDGES & REMOVE ALL BURRS.
3. PAINT IN ACCORDANCE WITH GMDI SPEC. 001-002
4. ALL WELDING TO BE IN ACCORDANCE WITH AWS PROCEDURES.
5. ALL WELDS TO BE 3/8" CONTINUOUS FILLET.

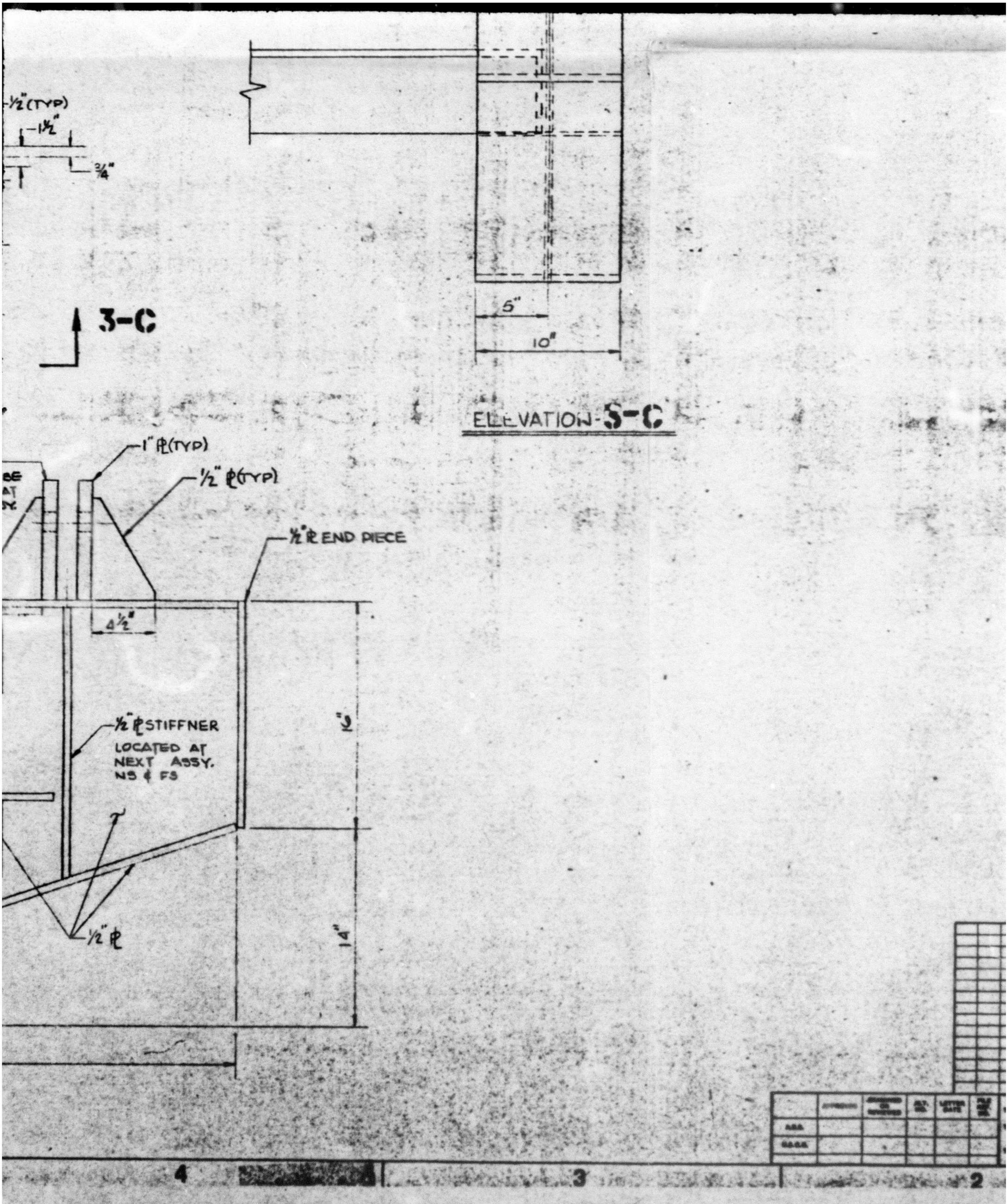
REFERENCE DRAWINGS:

1. T-54-54-315 CASING RACK LOCATION & DETAILS



C
B
A
30°
1/2" (TYP)
1 1/2"
3/4"
4 1/2"
3-C
3-C
5-A
PLAN 5-C
INSTALL 1/2" PL STIFFNER
TO W36x170
AT NEXT ASSY.
NOTE:
LUGS TO BE
LOCATED AT
NEXT ASSY.
1/2" PL
1/2" (TYP)
4 1/2"
CASING RACK
SEE REF. #1
1/2" PL
3'-5 1/2"
ELEVATION 5-A
6
5

4



1/2"(TYP)
1 1/2"
3/4"
3-C
5"
10"
ELEVATION-3-C
1" PL(TYP)
1/2" PL(TYP)
1/2" PL END PIECE
4 1/2"
1/2" PL STIFFNER
LOCATED AT NEXT ASSY. NS & FS
6"
14"
1/2" PL
4
3
2

2. BREAK ALL EDGES & REMOVE ALL BURRS.
3. PAINT IN ACCORDANCE WITH GMDI SPEC. 001-002
4. ALL WELDING TO BE IN ACCORDANCE WITH AWS PROCEDURES.
5. ALL WELDS TO BE 3/8" CONTINUOUS FILLET.

REFERENCE DRAWINGS:

1. T-54-54-315 CASING RACK LOCATION & DETAILS

NO.	DATE	BY	DESCRIPTION	JOB AUTH.	APPR.
1	3-2-81	OP	REVISED CASING RACK IN ELEV 5-A	006-323000	[illegible]
0	12-0-80	NN	RELEASE FOR CONSTRUCTION	006-323000	[illegible]
A	12-5-80	ADT	PRELIMINARY RELEASE	006-323000	[illegible]

ALTERATIONS

NO. REQ'D.	NEXT ASSEMBLY
	E-001-A028
	ALTERATION
	DATE
	PURCHASING
	CONSTRUCTION
	ENGINEERING
	USCG
	ABS
10	CUSTOMER
1	WALLERSTEDT
1	DYE
1	BUCHANAN
1	BRYGWELL
1	FREEMAN
2	LIBRARY

GLOBAL MARINE DEVELOPMENT Inc.
Newport Beach, Calif.

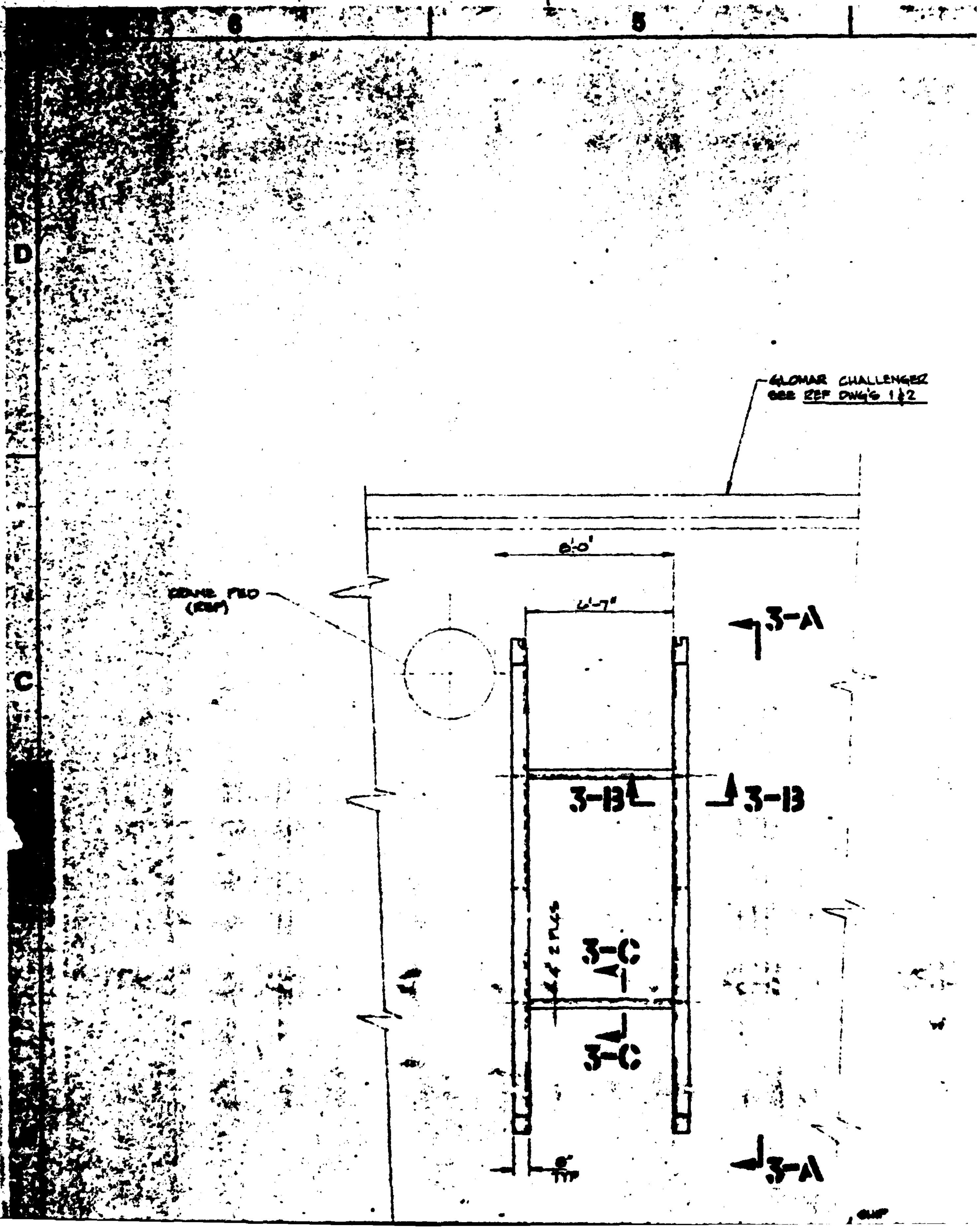
MARINE SEISMIC SYSTEM (MSS)
A-FRAME SUPPORT TO CASING RACK DETAILS

DR. ADT 12-5-80
SCALE 3" = 1'-0"
JOB AUTH. 006 323000
DWG. NO. E-001-A024

TOTAL NET WGT. MAT'L.
TOTAL NET WGT. SHAPE
TOTAL NET WEIGHT

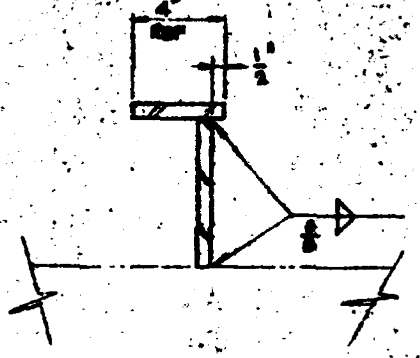
2 1

6


6
5
D
C
GLOMAR CHALLENGER
SEE REF DWG'S 1 & 2
6'-0"
3-A
3-B
3-B
3-C
3-C
3-A

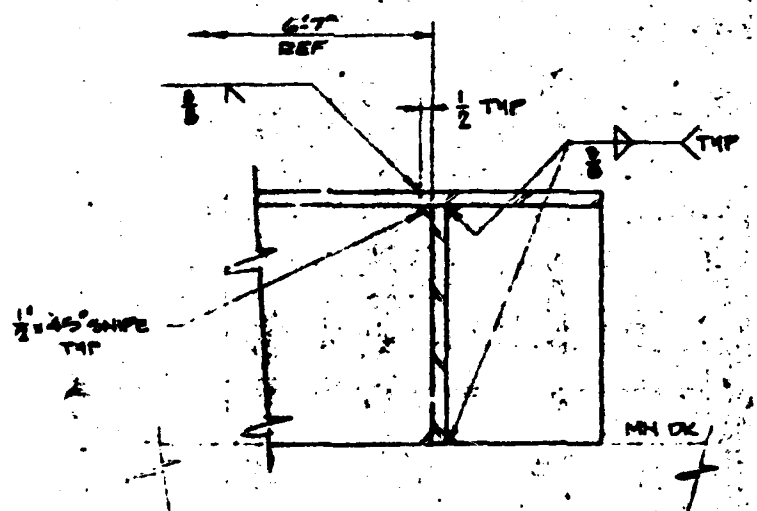
4 3 2

ALLENGER
'S 1½2



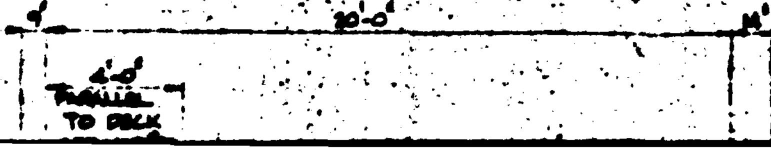
SECTION 3-C

SCALE: 3"=1'-0"



SECTION 3-B

SCALE: 3"=1'-0"



2 1 3

2	1

LIST OF MATERIALS

OWNER FURN.	ITEM	QTY.	DESCRIPTION	MATERIAL OR DWG. NO.

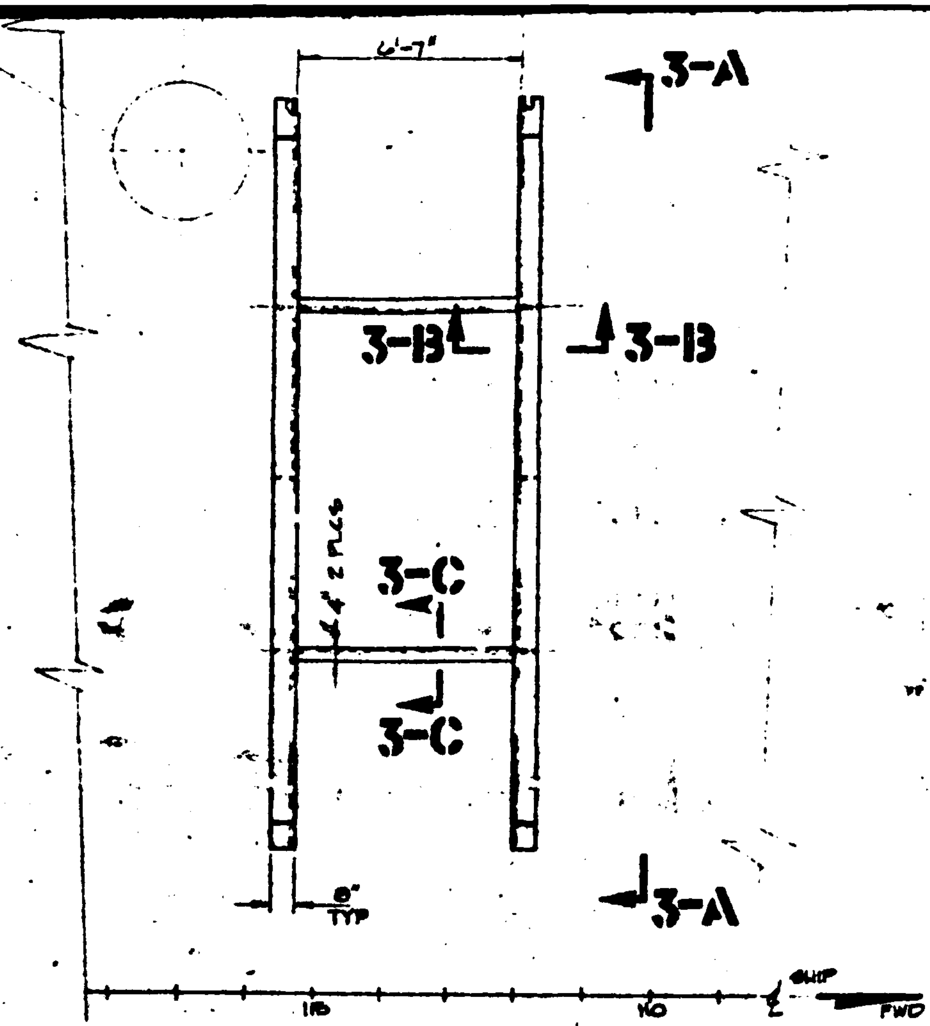
GENERAL NOTES: (UNLESS OTHERWISE NOTED)

1. ALL MATERIAL TO BE ASTM A-36.
2. FRAME SPACING IS 2'-0" IN AREA CONCERNED.
3. DECK HAS CAMBER BUT NO SHEER.
4. ALL MATERIAL TO BE 3/8" PLATE.

REFERENCE DRAWINGS:

1. D-577-AC73	GLOMAR CHALLENGER ARRANGEMENT-MAIN DECK & BELOW
2. T-54-54-H126	DECK PLATING & FRAMING SECTIONS & DETAILS

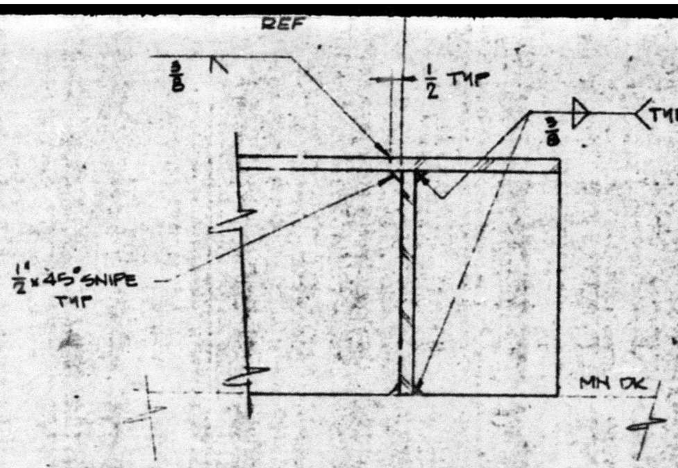
14'



PLAN VIEW 5-A

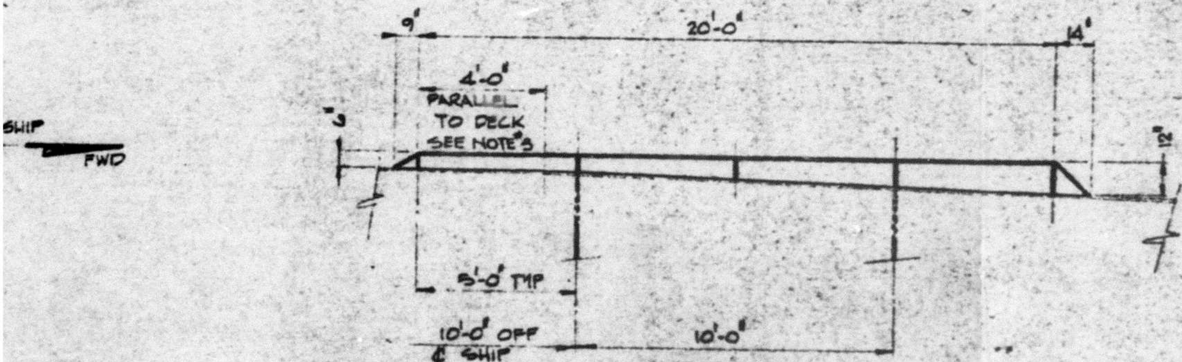
WINCH FOUNDATION-PORT SIDE AT MAIN DECK

SCALE: 3/8"-1'-0"



SECTION 3-B

SCALE: 3"=1'-0"



SECTION 3-A

PORT SIDE FRAME 110 LOOKING AFT

SCALE: 3/8"=1'-0"

	APPROVED	[illegible]	[illegible]	LETTER DATE	[illegible]
A.B.S.					
[illegible]					

4 3 2

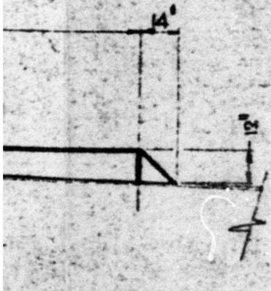
1 5

GENERAL NOTES: (UNLESS OTHERWISE NOTED)

1. ALL MATERIAL TO BE ASTM A-36.
2. FRAME SPACING IS 2'-0" IN AREA CONCERNED.
3. DECK HAS CAMBER BUT NO SHEER.
4. ALL MATERIAL TO BE 5/8" PLATE.

REFERENCE DRAWINGS:

1. D-377-A003 — GLOMAR CHALLENGER ARRANGEMENT-MAIN DECK & BELOW
2. T-54-54-H126 — DECK PLATING & FRAMING SECTIONS & DETAILS



(40)

...KING AFT

NO.	DATE	BY	DESCRIPTION	JOB NOTED	APPD.
0	12-10-80	NW	RELEASE FOR CONSTRUCTION	006-323000	
A	12-5-80	NW	PRELIMINARY RELEASE	006-323000	

ALTERATIONS

E-001-A028

NO. REQ'D.	NEXT ASSEMBLY
1	ALTERATION
3-5-81	DATE
	PURCHASING
	CONSTRUCTION
	ENGINEERING
	USCG
	ABS
10	CUSTOMER
1	WALLERSTEDT
1	PYE
1	BUCHANAN
1	MITCHELL
1	PARDHAM
2	LIBRARY

	APPROVED	EXAMINED OR REVIEWED	ALT. NO.	LETTER DATE	FILE REF. NO.
A.B.S.					
U.S.C.G.					

TOTAL NET WGT. MAT'L. ____

TOTAL NET WGT. EQUIP. ____

TOTAL NET WEIGHT ____

GLOBAL MARINE DEVELOPMENT Inc.

Newport Beach, Calif.

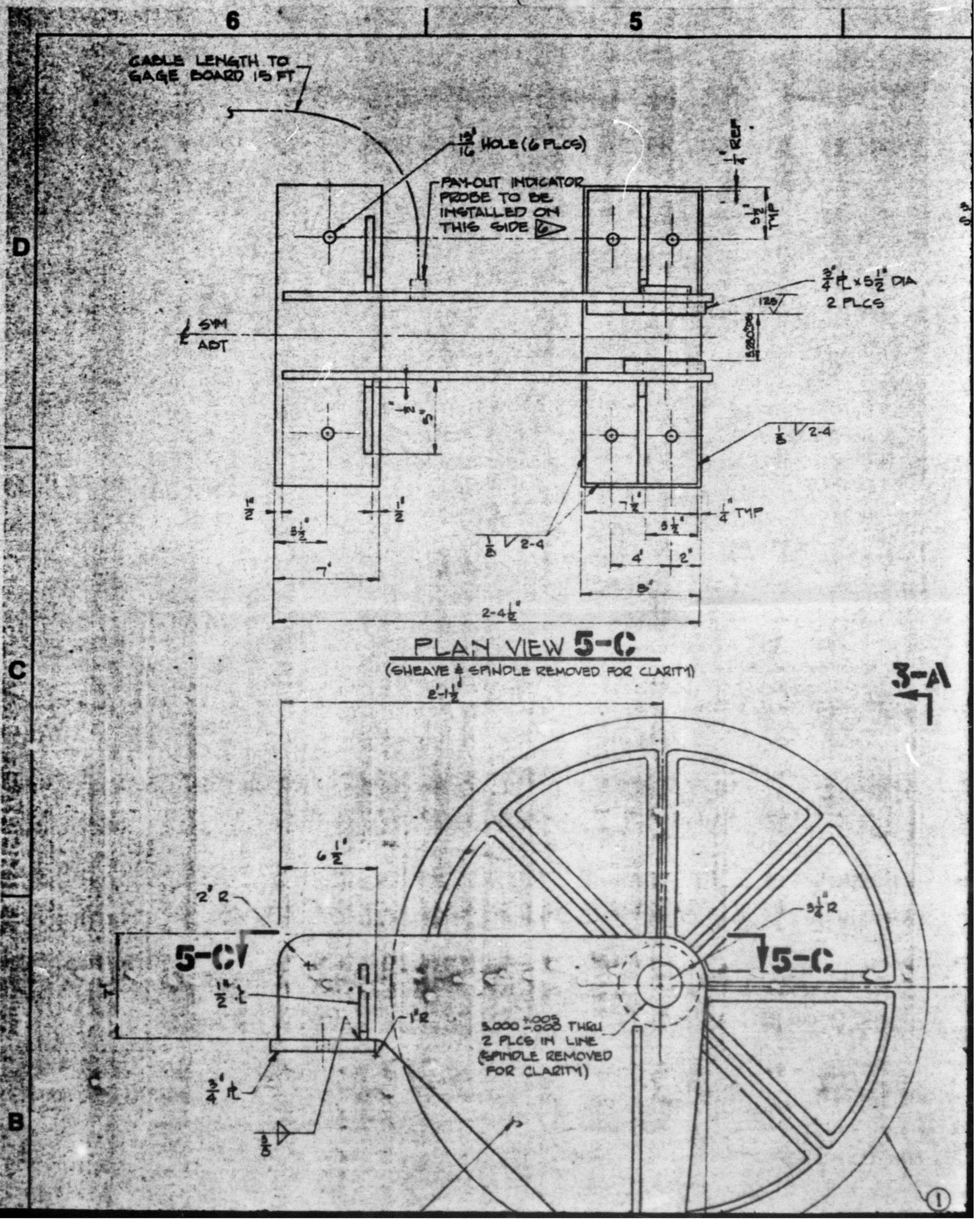
MARINE SEISMIC SYSTEM (MSS)
WINCH FOUNDATION
DETAILS AND ARRANGEMENT

DFT. M.G. WAGNER	12-3-80	SCALE AS NOTED
ENGR. N. Buchanan	12-8-80	
CHKD.	Dec 80	JOB NOTED 006-323000
APPD.		
		DWG. NO. E-001-A025, REV. 0

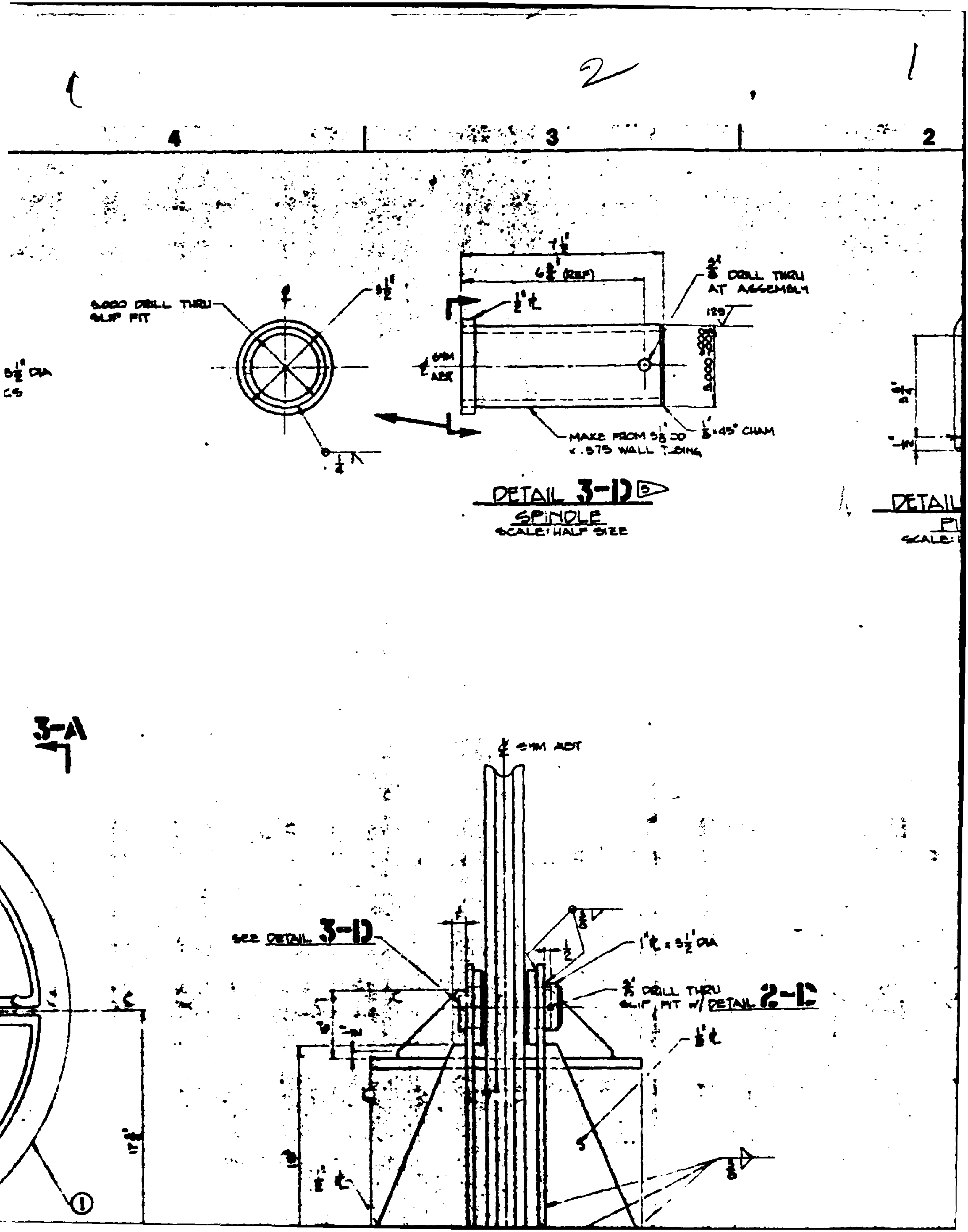
2

1

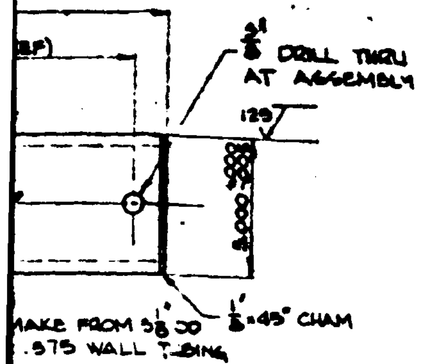
6



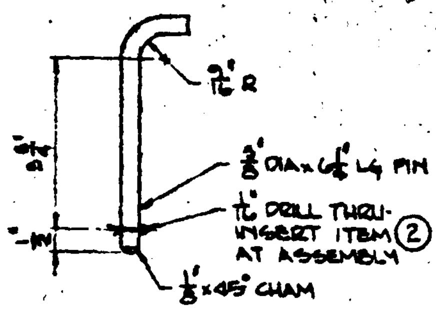
6
5
D
C
B
CABLE LENGTH TO GAGE BOARD 15 FT
13/16" HOLE (6 PLCS)
PAY-OUT INDICATOR PROBE TO BE INSTALLED ON THIS SIDE 6
1/4" REF
3 1/2" TYP
3/4" PL x 5 1/2" DIA 2 PLCS
125
SYM ABT
1/8 V 2-4
1/2"
3 1/2"
7"
2-4 1/2"
7 1/2"
1/4" TYP
3 1/2"
4"
2"
8"
PLAN VIEW 5-C
(SHEAVE & SPINDLE REMOVED FOR CLARITY)
3-A
2'-1 1/2"
6 1/2"
2" R
5-C
1/2" PL
1" R
3/4" PL
3/8
3 1/4" R
5-C
3.000 +.005 -.000 THRU 2 PLCS IN LINE (SPINDLE REMOVED FOR CLARITY)
1


4
3
2
3.000 DRILL THRU SLIP FIT
5 1/2
7 1/2
6 3/4 (REF)
DRILL THRU AT ASSEMBLY
1/2 ℄
℄ SYM ABT
MAKE FROM 5 1/8 OD x .375 WALL T.BING
1/8 x 45° CHAM
DETAIL 3-D
SPINDLE
SCALE: HALF SIZE
DETAIL
SCALE:
3-A
℄ SYM ABT
SEE DETAIL 3-D
1" ℄ x 5 1/2" DIA
DRILL THRU SLIP FIT W/ DETAIL 2-C
1/8" ℄

LIST OF MATERIALS				
[illegible]	[illegible]	QTY.	[illegible]	[illegible]
	1	1	36" DIA SHEAVE (PROVIDED BY NORDA)	CAMPBELL MOD 8176L6
	2	1	1/16" x 1/2" LG COTTER PIN	



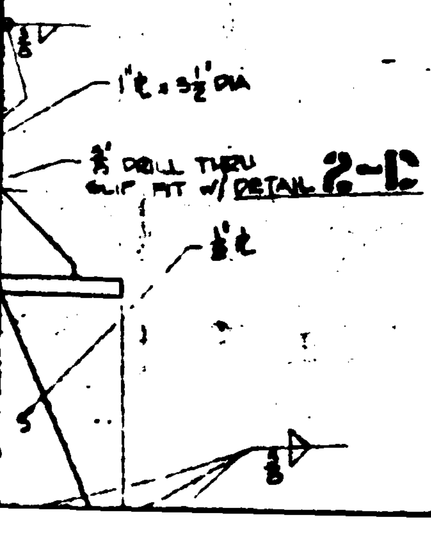
3-D
LE
SIZE



DETAIL 2-D
PIN
SCALE: HALF SIZE

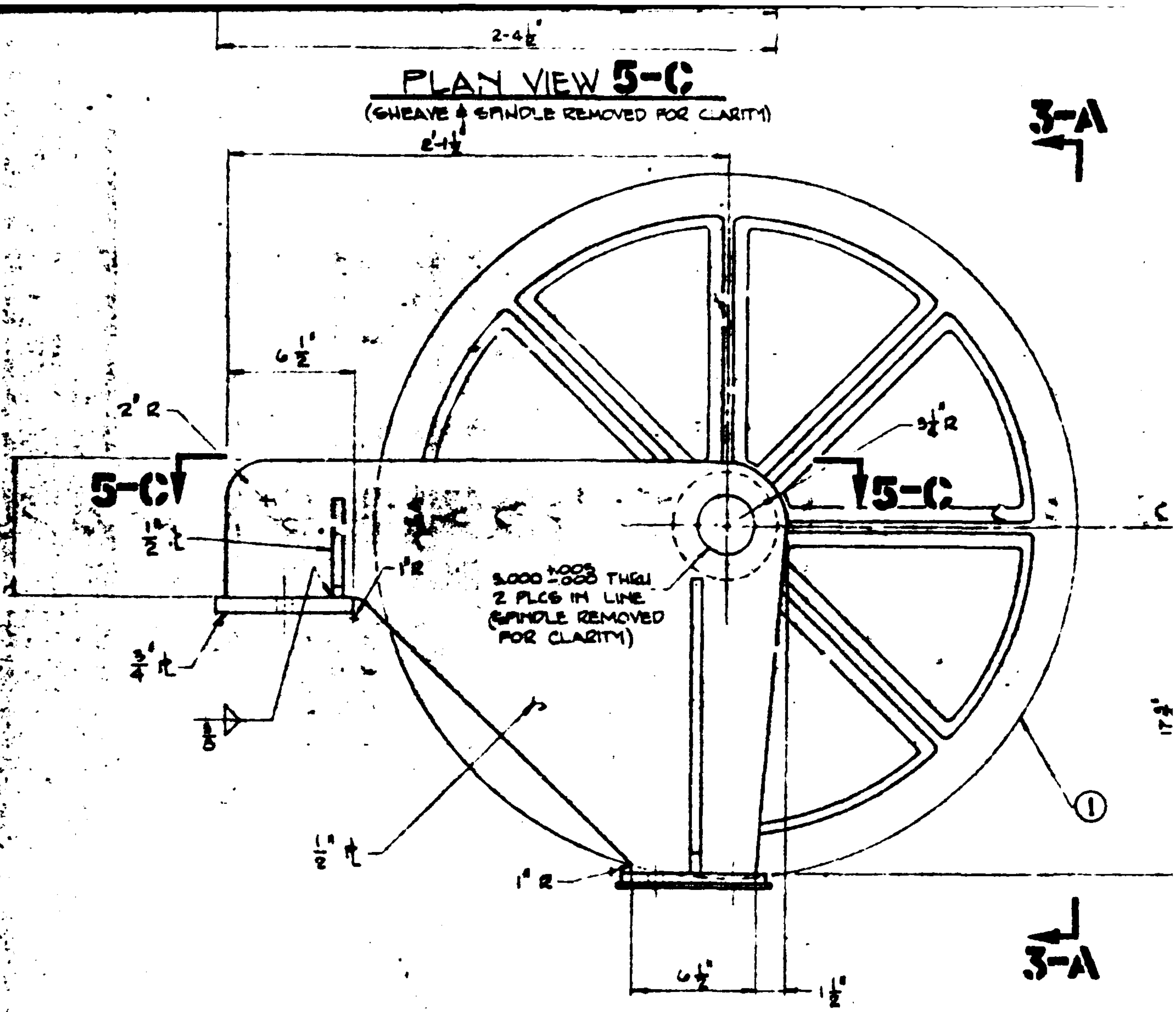
GENERAL NOTES: (UNLESS OTHERWISE NOTED)

1. ALL MATERIAL TO BE ASTM A-36.
2. BREAK ALL SHARP EDGES AND REMOVE ALL BURRS.
3. ALL WELDING TO BE IN ACCORDANCE WITH AWS PROCEDURES.
4. PAINT IN ACCORDANCE WITH GMD SPEC. 001-002.
5. IF POSSIBLE USE SPINDLE & PIN SUPPLIED WITH THE CAMPBELL SNATCH BLOCK.
6. DETAILS OF SIZE & EXACT LOCATION OF PROBE TO BE DETERMINED BY "SEA-MAC".
7. LUBRICATE SPINDLE WITH MARINE GREASE BEFORE ASSEMBLY.



PLAN VIEW 5-C

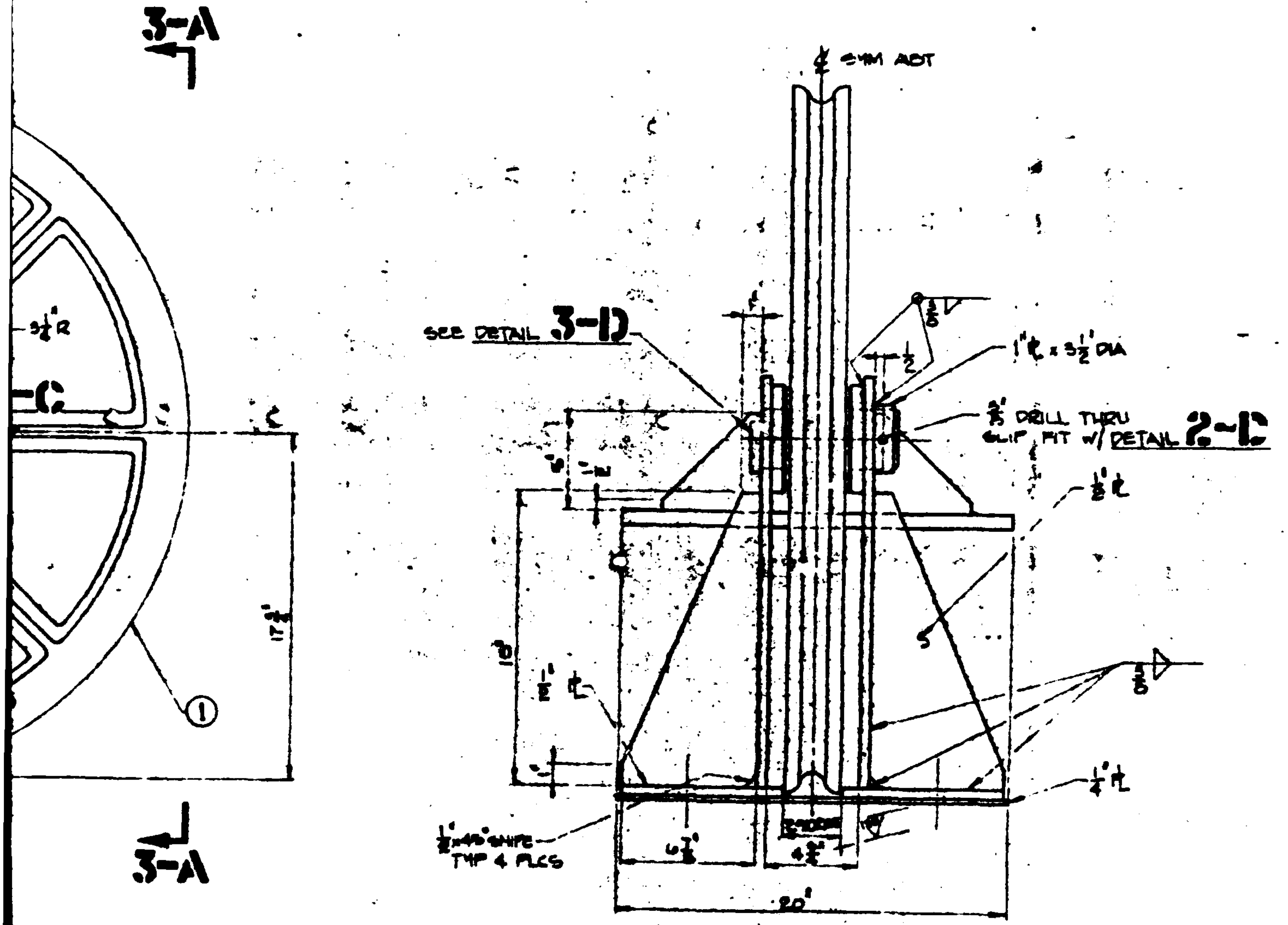
(SHEAVE & SPINDLE REMOVED FOR CLARITY)



ELEVATION 5-A

C
B
A
6
5

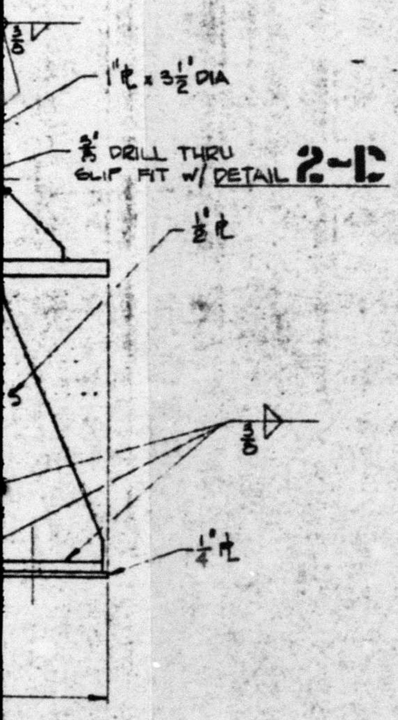
4


3-A
℄ SYM ABT
SEE DETAIL 3-D
1" ⅊ x 3½" DIA
DRILL THRU
SLIP FIT W/ DETAIL 2-C
½" ⅊
¼" ⅊
½" ⅊
½" x 45° SNIPE
TYP 4 PLCS
20"
3-A

VIEW 3-A

4 3

5



GENERAL NOTES: (UNLESS OTHERWISE NOTED)

1. ALL MATERIAL TO BE ASTM A-36.
2. BREAK ALL SHARP EDGES AND REMOVE ALL BURRS.
3. ALL WELDING TO BE IN ACCORDANCE WITH AWS PROCEDURES.
4. PAINT IN ACCORDANCE WITH GMDI SPEC. 001-002.
5. IF POSSIBLE USE SPINDLE & PIN SUPPLIED WITH THE CAMPBELL SNATCH BLOCK.
6. DETAILS OF SIZE & EXACT LOCATION OF PROBE TO BE DETERMINED BY "SEA-MAC".
7. LUBRICATE SPINDLE WITH MARINE GREASE BEFORE ASSEMBLY.

NO.	DATE	BY	DESCRIPTION	JOB AUTH.
0	1-6-81	NW	RELEASE FOR CONSTRUCTION	006-325000
A	12-30-80	NW	PRELIMINARY RELEASE	006-325000

ALTERATIONS

B-001-A027

NO. REQ'D.	NEXT ASSEMBLY
0	ALTERATION
3-5-81	DATE
	PURCHASING
	CONSTRUCTION
	ENGINEERING
	USGS
	ABS
10	CUSTOMER
1	WALLERSTEDT
1	DYE
1	BUCHANAN
1	MITCHELL
1	F. JERMAN
2	WERNET

	APPROVED	DIAGRAM OR REPORTED	ALT. NO.	LETTER DATE	FILE REF. NO.
A.B.S.					
U.S.G.S.					

TOTAL NET WGT. MATL. ______
TOTAL NET WGT. EQUIP. ______
TOTAL NET WEIGHT ______

GLOBAL MARINE DEVELOPMENT Inc.
Newport Beach, Calif.

MARINE SEISMIC SYSTEM (MSS)
IDLER SHEAVE SUPPORT
DETAILS & ASSEMBLY

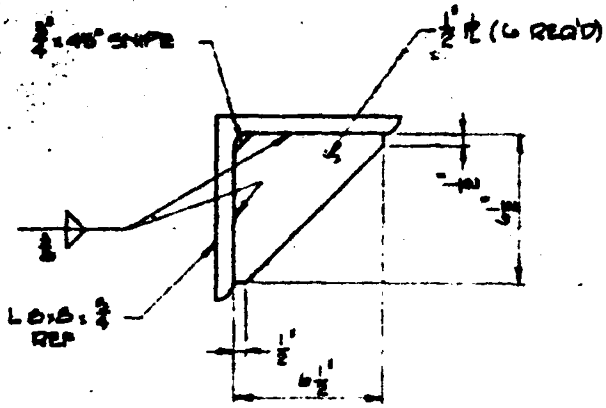
	NAME	DATE
DFT.	N. WAGNER	12-22-80
ENGR.	W. Buchanan	1-5-81
CHK.	[illegible]	[illegible]
APPD.	[illegible]	1-6-81
APPD.	R. Wallerstedt	

SCALE: 3/4"=1'-0" & AS NOTED
JOB AUTH. 006-325000
DWG. NO. E-001-A026
SHT. 1/1
ALT. 0

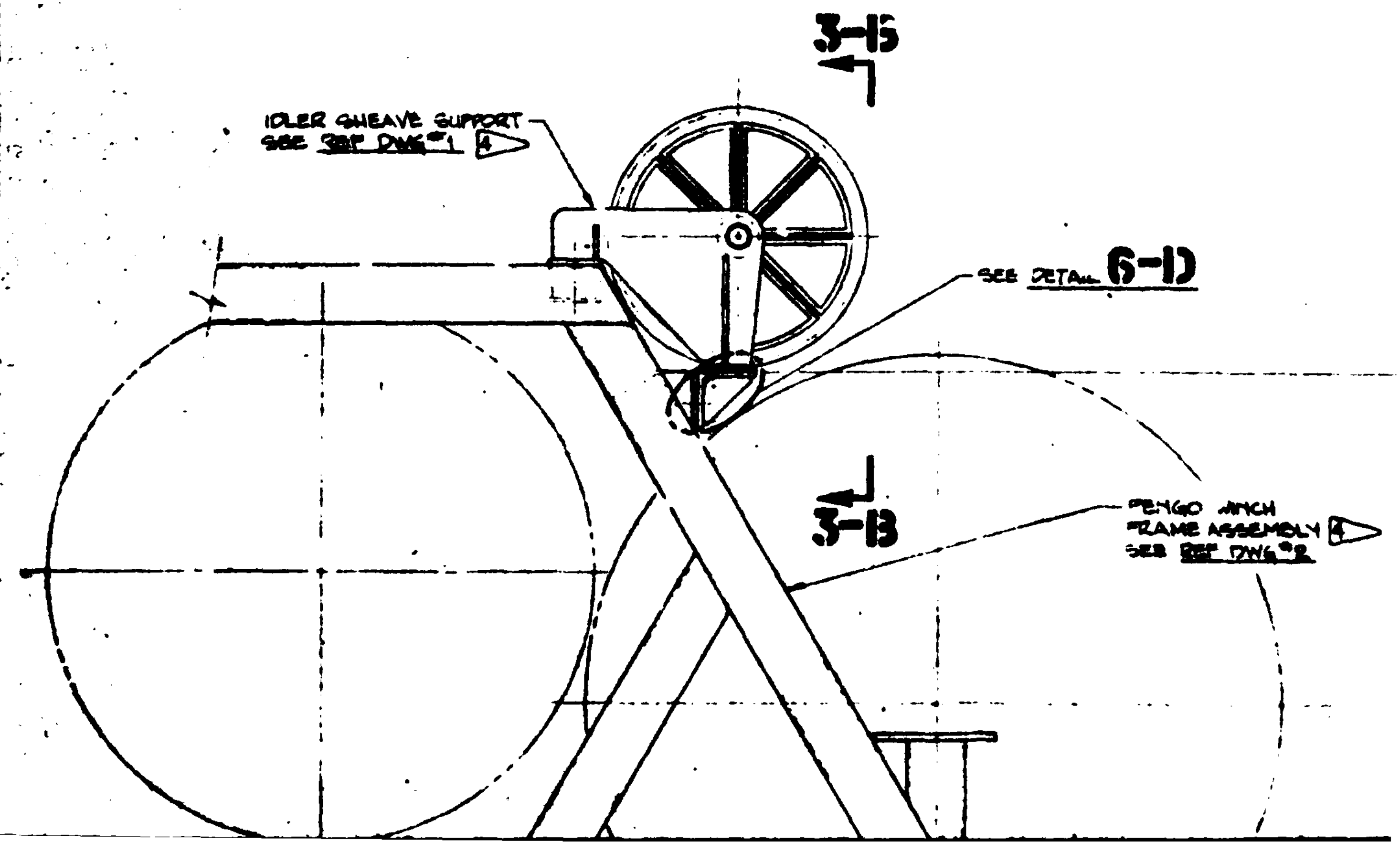
2 1

6

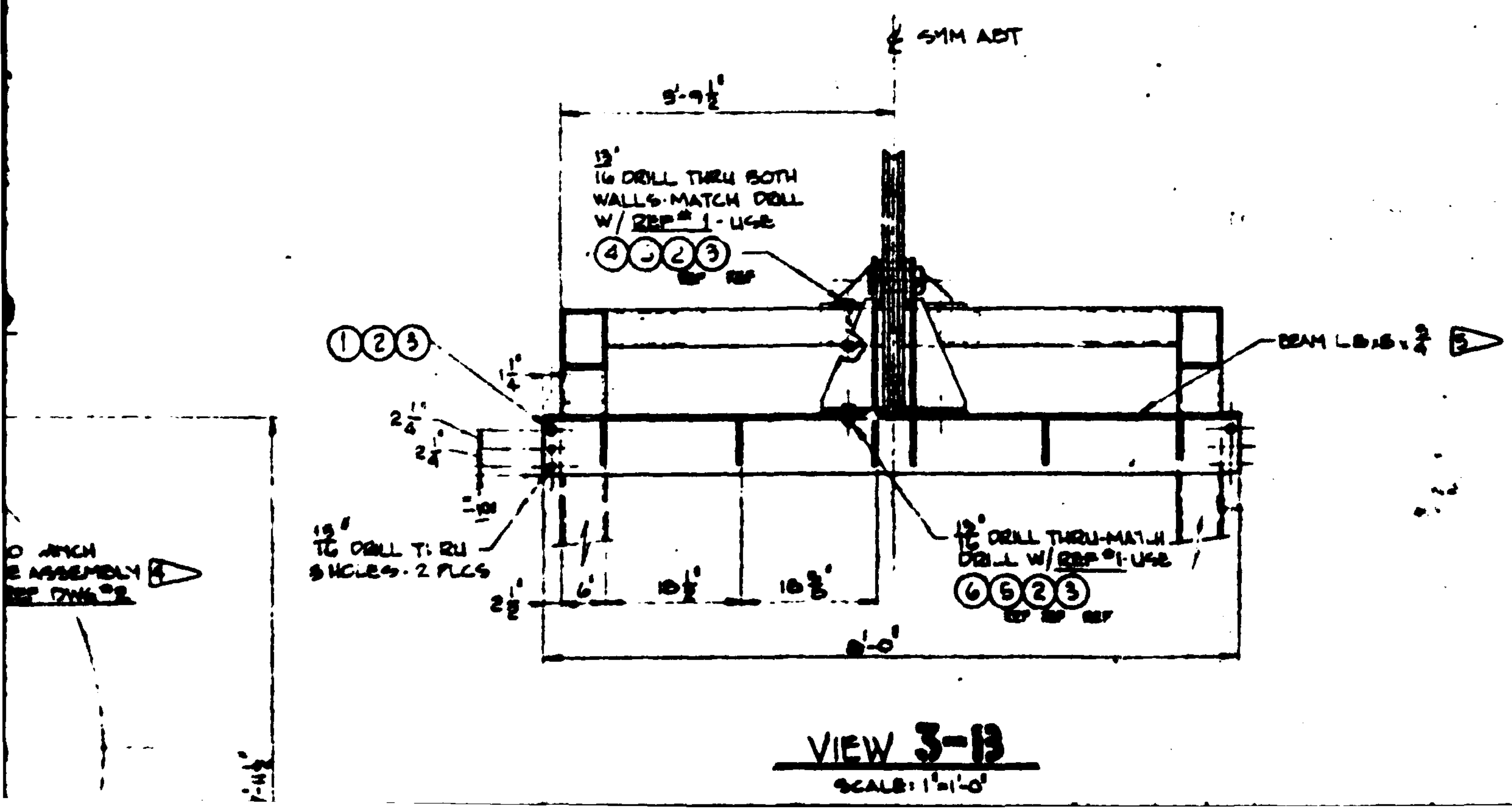
6 5



DETAIL 6-D
SCALE: 3"=1'-0"

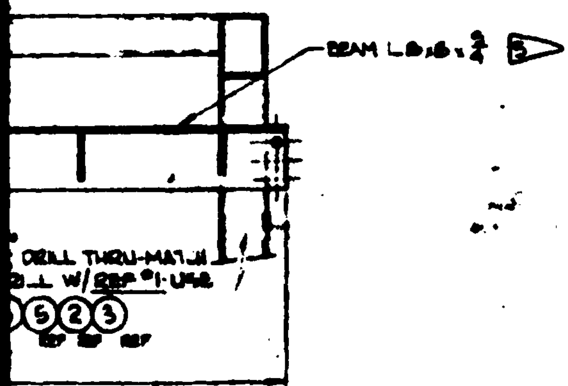


4 3 2



VIEW 3-B
SCALE: 1"=1'-0"

2 1 3



5 LIST OF MATERIALS				
[illegible]	ITEM	QTY.	DESCRIPTION	[illegible]
	1	6	3/4"-10 UNC 2A x 2 1/2" LG HEX BOLT	
	2	12	3/4" LOCK WASHER	
	3	12	3/4"-10 UNC 2B HEX NUT	
	4	2	3/4"-10 UNC 2A x 7" LG HEX BOLT	
	5	6	3/4" PLAIN WASHER	
	6	4	3/4"-10 UNC 2A x 2 1/2" LG HEX BOLT	

GENERAL NOTES: (UNLESS OTHERWISE NOTED)

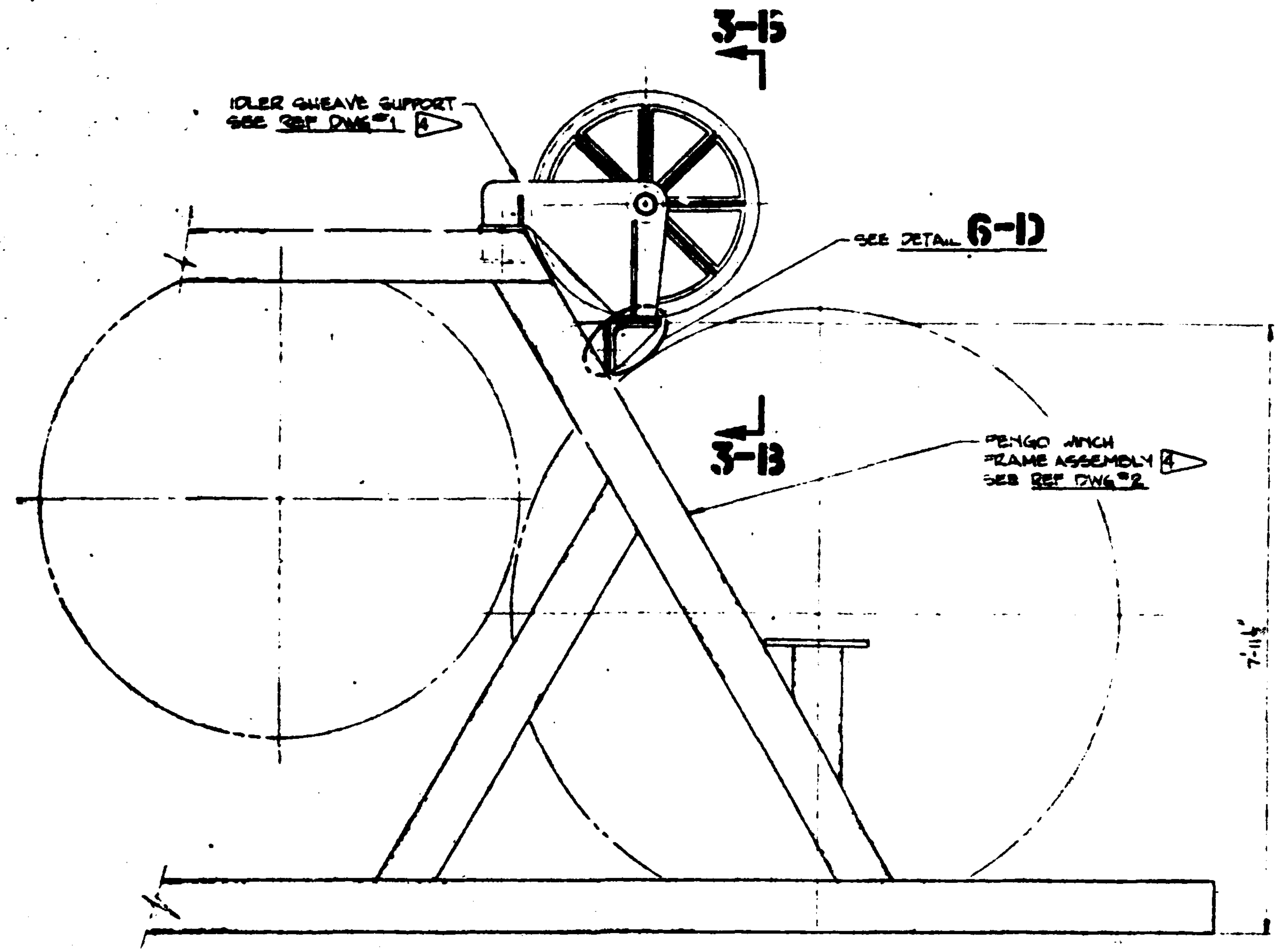
1. ALL MATERIAL TO BE ASTM A-36.
2. BREAK ALL EDGES & REMOVE ALL BURRS.
3. SHIMS SHOULD BE USED WHERE NECESSARY FOR ALIGNING IDLER SHEAVE SUPPORT.
4. IDLER SHEAVE SUPPORT & WINCH ARE OWNER FURNISHED.
5. SHIP YARD TO SUPPLY BEAM ASSEMBLY & ALL FASTENERS.

REFERENCE DRAWINGS:

1. B-001-A026 MARINE SEISMIC SYSTEM DRAW. IDLER SHEAVE SUPPORT DETAILS & ASSEMBLY

FMC EQUIPMENT

2. FTS-1005-000 FRAME ASSEMBLY

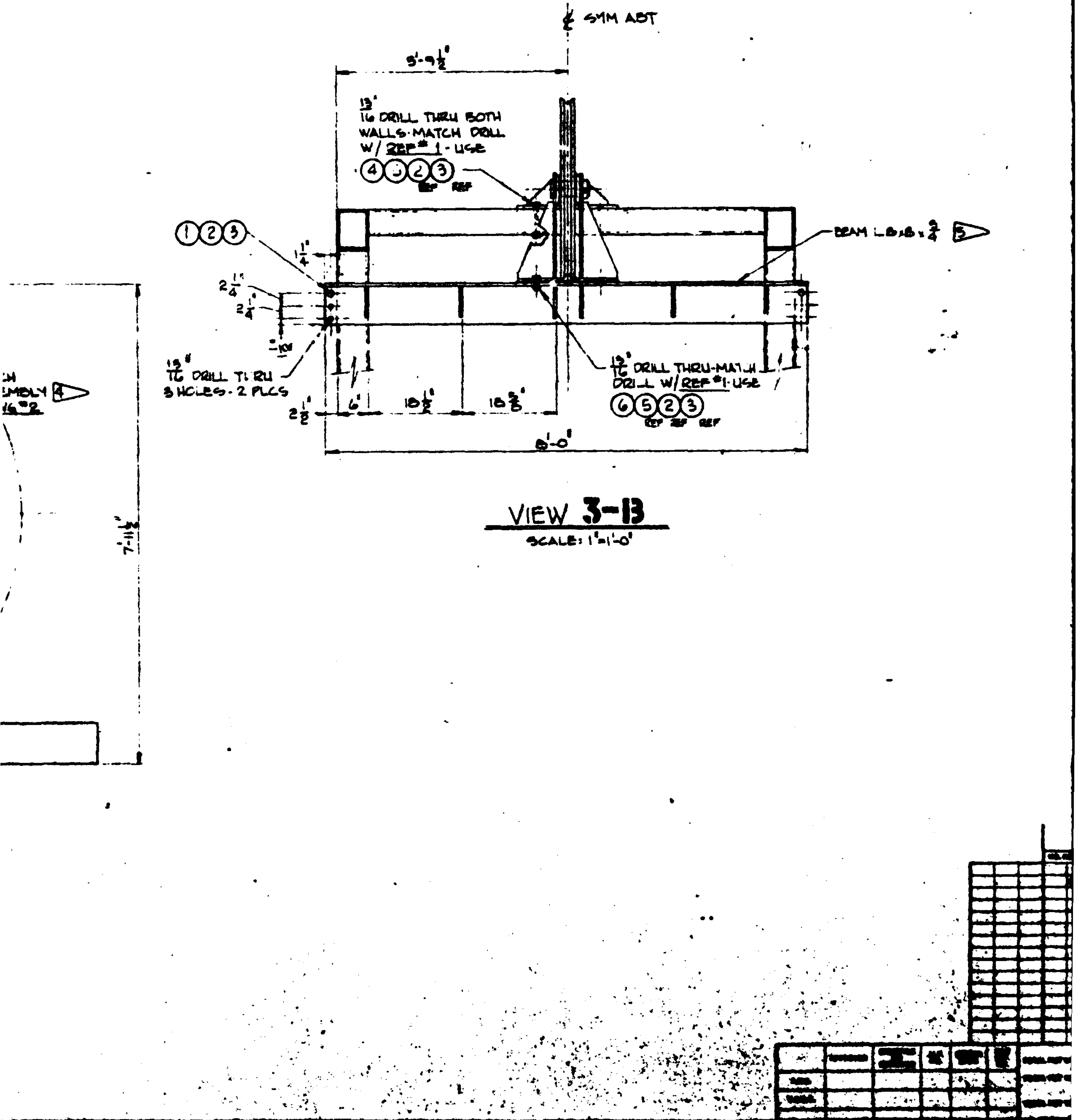


ELEVATION 5-A

SCALE: 1"=1'-0"

6 5 4

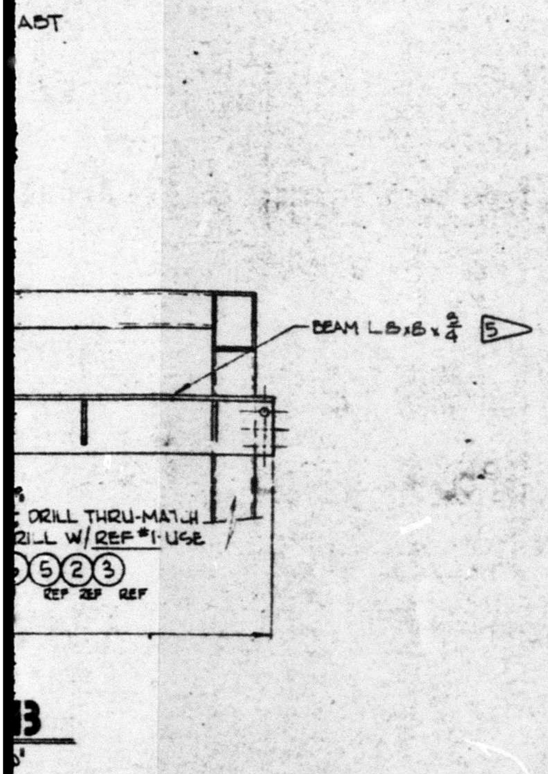
4



VIEW 3-B

SCALE: 1"=1'-0"

1. ALL MATERIAL TO BE ASTM A-36.
2. BREAK ALL EDGES & REMOVE ALL BURRS.
3. SHIMS SHOULD BE USED WHERE NECESSARY FOR ALIGNING IDLER SHEAVE SUPPORT.
4. IDLER SHEAVE SUPPOR. & WINCH ARE OWNER FURNISHED.
5. SHIP YARD TO SUPPLY BEAM ASSEMBLY & ALL FASTENERS.



REFERENCE DRAWINGS:

1. E-001-A026 MARINE SEISMIC SYSTEM (MSS) IDLER SHEAVE SUPPORT DETAILS & ASSEMBLY

FENGO EQUIPMENT

2. FIS-1005000 FRAME ASSEMBLY

NO.	DATE	BY	DESCRIPTION	JOB AUTH.	APPR.
0	1-12-80	NW	RELEASE FOR CONSTRUCTION	006-323000	
A	1-7-81	NW	PRELIMINARY RELEASE	006-323000	

ALTERATIONS

NO. REQ'D.	NEXT ASSEMBLY
	E-001-A028
0	ALTERATION
	DATE
	PURCHASING
	CONSTRUCTION
	ENGINEERING
	USGS
	ABS
10	CUSTOMER
1	WALLER STEW
1	DYE
1	BUCHANAN
1	A MCNEAL
1	FARNHAM
2	LIBRARY

	APPROVED	DRAWINGS OR REVISIONS	ALT. NO.	LETTER DATE	FILE NO.
A.B.S.					
U.S.G.S.					

TOTAL NET WGT. CALC. ______
TOTAL NET WGT. SCHD. ______
TOTAL NET WEIGHT ______

GLOBAL MARINE DEVELOPMENT Inc.
Newport Beach, Calif.

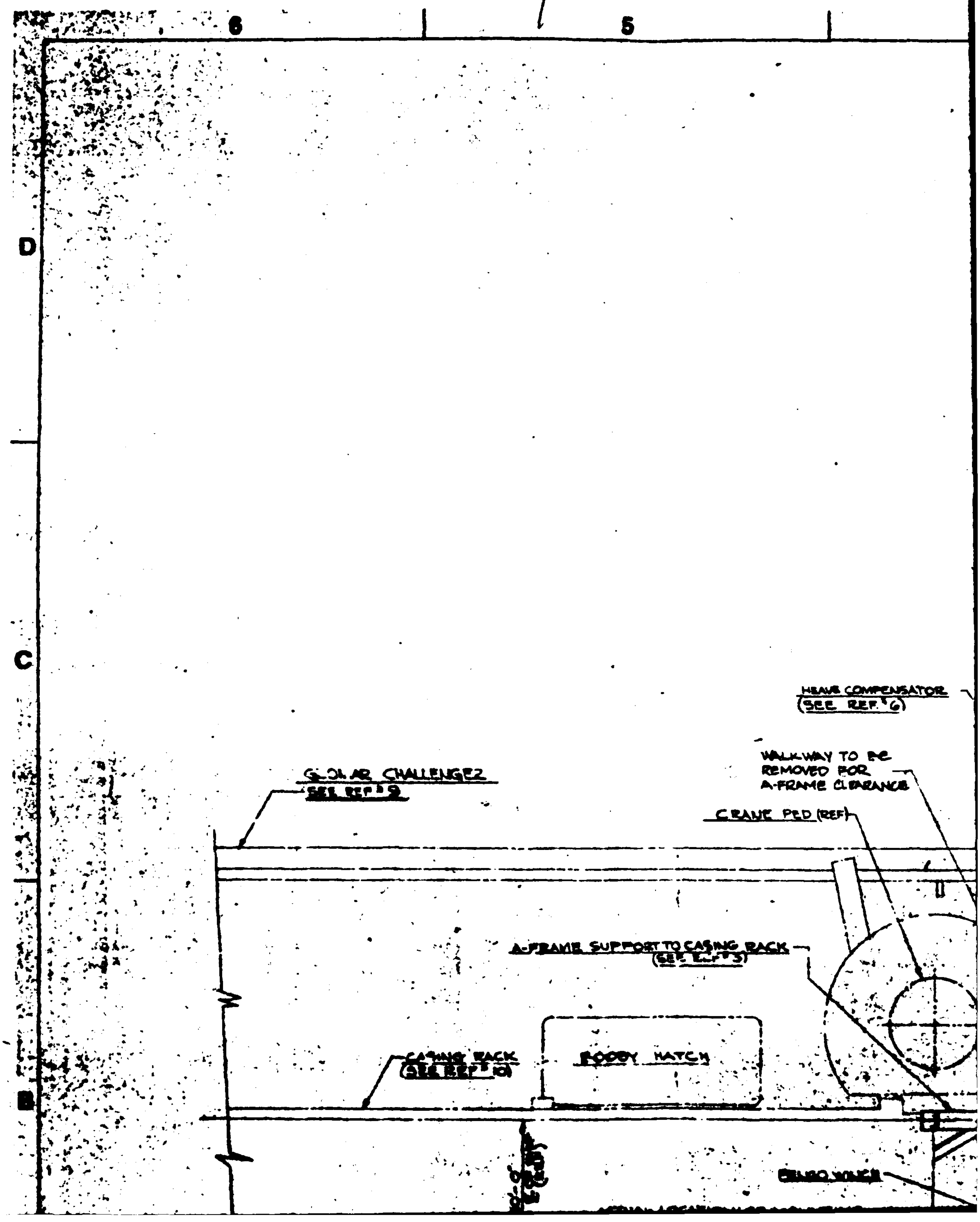
MARINE SEISMIC SYSTEM (MSS)
SHEAVE BEAM TO WINCH
ASSEMBLY AND INSTALLATION

	NAME	DATE	
DFT.	N. G. WAGNER	12-24-80	SCALE: AS NOTED
CHKD.	W. BUCHANAN	1-7-81	
ENG.	FARNHAM	1-8-81	JOB AUTH. 006-323000
APPD.	[illegible]	1-12-81	
MFG.	[illegible]	1-12-81	

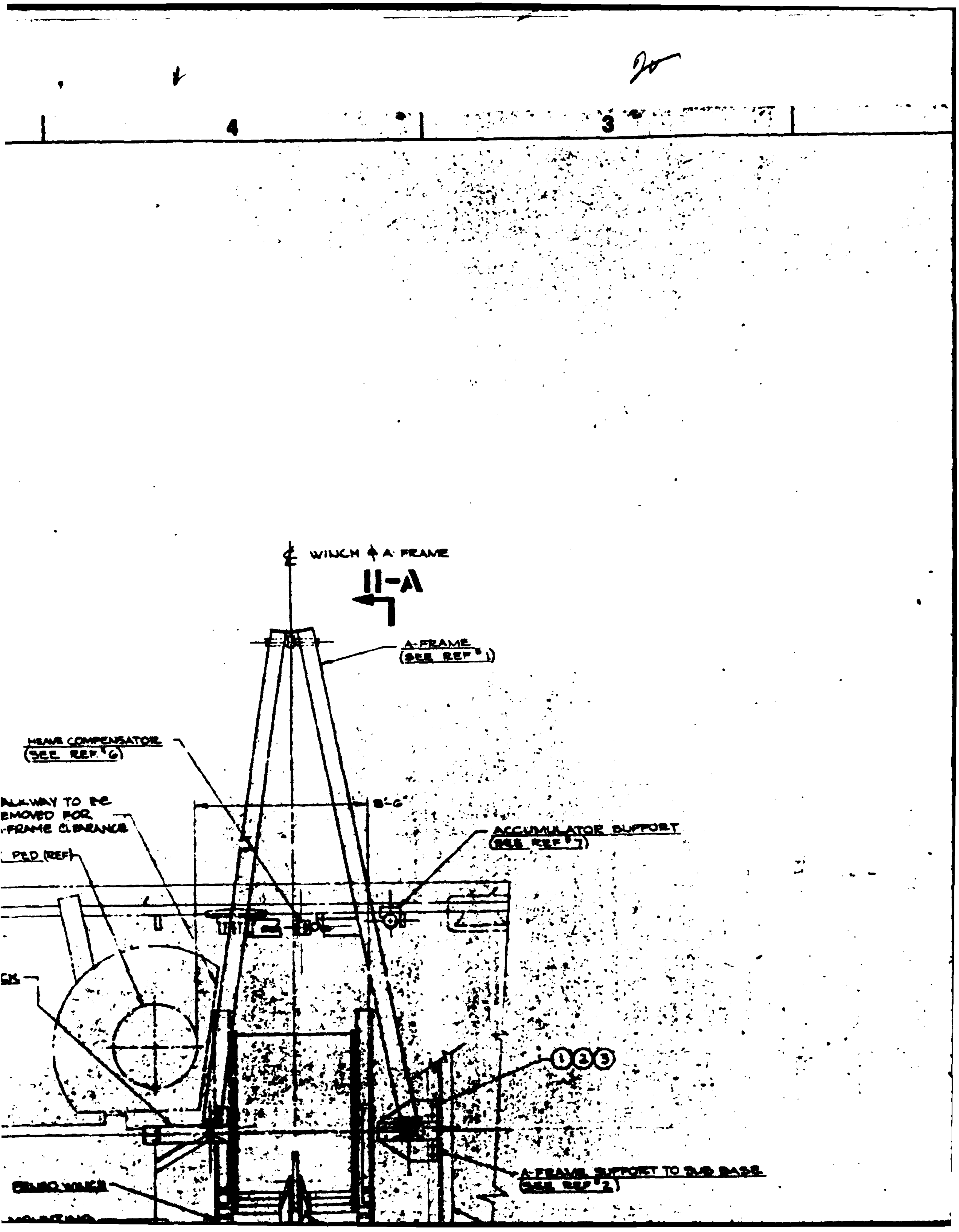
DWG. NO. E-001-A027 SHT. 1 OF 1 ALT. 0

2 1

6



6
5
D
C
B
HEAVE COMPENSATOR
(SEE REF 6)
WALKWAY TO BE
REMOVED FOR
A-FRAME CLEARANCE
CRANE PED (REF)
GLOMAR CHALLENGER
(SEE REF 9)
A-FRAME SUPPORT TO CASING RACK
(SEE REF 5)
CASING RACK
(SEE REF 10)
BOOBY HATCH



20
4
3
WINCH & A-FRAME
11-A
A-FRAME
(SEE REF 1)
HEAVE COMPENSATOR
(SEE REF 6)
ALKWAY TO BE
EMOVED FOR
-FRAME CLEARANCE
PED (REF)
8'-6"
ACCUMULATOR SUPPORT
(SEE REF 7)
1 2 3
A-FRAME SUPPORT TO SUB BASE
(SEE REF 2)

20

3

2	1

LIST OF MATERIALS

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	1	4	7/8"-9 UNC-2A × 5" LONG HEX BOLT	
	2	6	7/8"-9UNC-2B HEX NUT	
	3	6	7/8" STD FLAT WASHER	
	4	2	1 1/4"-7 UNC 2A × 5 LG HEX BOLT	
	5	2	1 1/4" LOCK WASHER	
	6	2	1 1/4"-7UNC 2B HEX NUT	
	7	1	ANCHOR SHACKLE	CROSBY OR [illegible]
X	8	1	CRANE LOAD CELL	[illegible]
X	9	1	36" DIA SHEAVE BLOCK	

GENERAL NOTES: (UNLESS OTHERWISE NOTED)

1. SHACKLE SIZE TO BE DETERMINED BY ITEM (9).

D

REFERENCE DRAWINGS:

1. E001-A022 MARINE SEISMIC SYSTEM (MSS) A-FRAME DETAILS & ASSEMBLY
2. E001-A023 MARINE SEISMIC SYSTEM (MSS) A-FRAME SUPPORT TO SUB BASE DETAILS & ASSEMBLY
3. E001-A024 MARINE SEISMIC SYSTEM (MSS) A-FRAME SUPPORT TO CASING RACK, DETAILS
4. E001-A025 MARINE SEISMIC SYSTEM (MSS) WINCH FOUNDATION DETAILS & ARRANGEMENT
5. E001-A027 MARINE SEISMIC SYSTEM (MSS) SHEAVE SUPPORT TO WINCH ASSY.
6. E001-A029 MARINE SEISMIC SYSTEM (MSS) HEAVE COMPENSATOR BRACKET MODIFICATION & DETAILS
7. E001-A030 MARINE SEISMIC SYSTEM (MSS) ACCUMULATOR SUPPORT DETAILS & ASSEMBLY
8. E001-A020 MARINE SEISMIC SYSTEM (MSS) INSTRUMENTATION & CONTROLS INSTALLATION
9. D377-A003 GLOMAR CHALLENGER ARRANGEMENTS MAIN DECK & BELOW

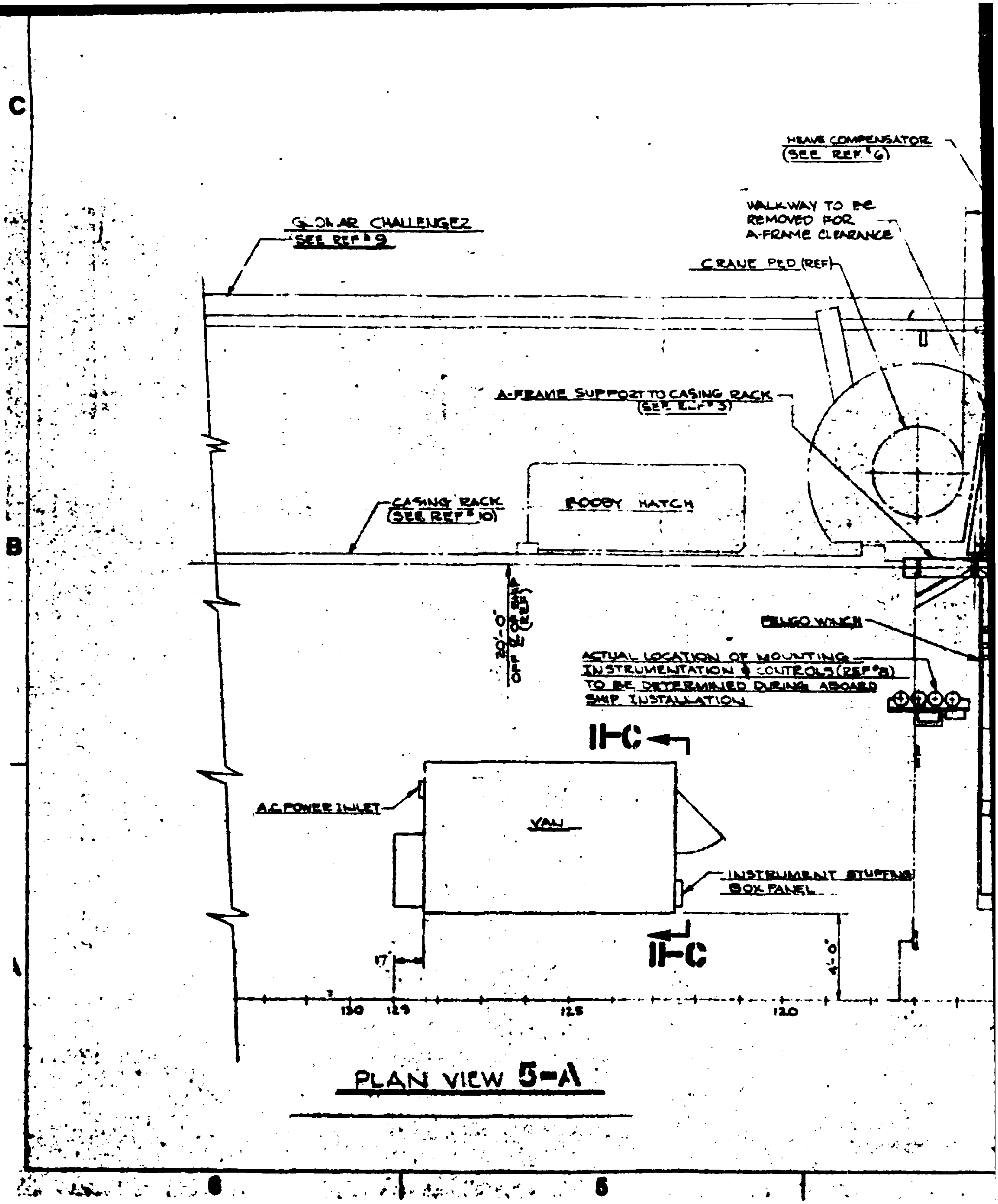
LEVINGSTON SHIPBUILDING CO.

10. T-54-54-515 CASING RACK LOCATION & DETAILS
11. T-54-54-516 DERRICK SUB BASE DETAILS

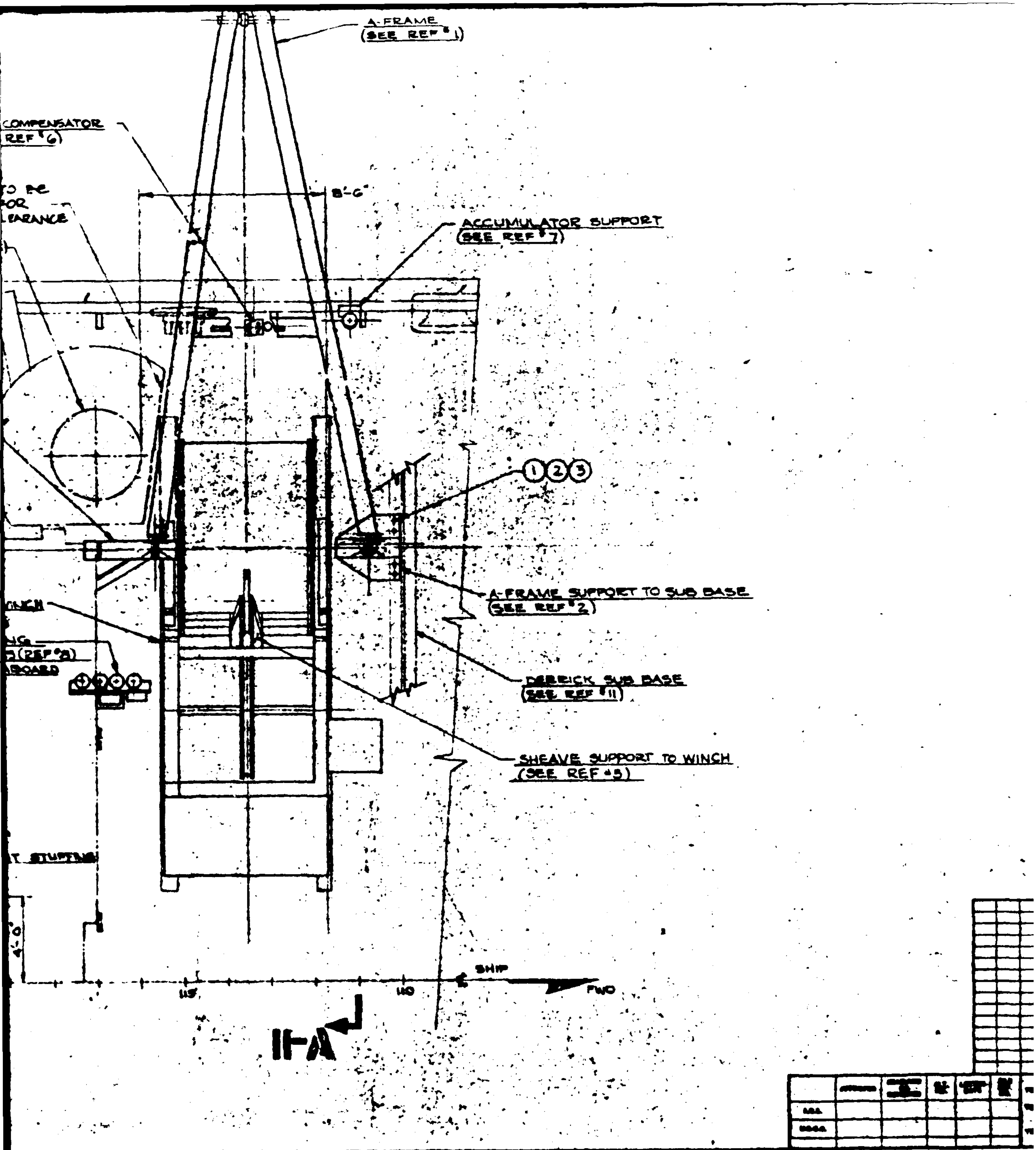
C

SUPPORT

PORT TO SUB BASE


C
B
HEAVE COMPENSATOR
(SEE REF 6)
WALKWAY TO BE
REMOVED FOR
A-FRAME CLEARANCE
CRANE PED (REF)
A-FRAME SUPPORT TO CASING RACK
CASING RACK
(SEE REF 10)
BOOBY HATCH
ACTUAL LOCATION OF MOUNTING
INSTRUMENTATION & CONTROLS (REF 8)
TO BE DETERMINED DURING ABOARD
SHIP INSTALLATION
II-C
A.C. POWER INLET
VAN
INSTRUMENT STUFFING
BOX PANEL
II-C
17"
4'-0"
130
129
125
120
6
5

PLAN VIEW 5-A



A-FRAME
(SEE REF # 1)
COMPENSATOR
REF # 6)
8'-6"
ACCUMULATOR SUPPORT
(SEE REF # 7)
1 2 3
A-FRAME SUPPORT TO SUB BASE
(SEE REF # 2)
DERRICK SUB BASE
(SEE REF # 11)
SHEAVE SUPPORT TO WINCH
(SEE REF # 5)
115
110
SHIP
FWD
IFA
4
3
2

RT

TO SUB BASE

BASE

RT TO WINCH

REFERENCE DRAWINGS

1.	E001-A022	MARINE SEISMIC SYSTEM (MSS) A-FRAME DETAILS & ASSEMBLY
2.	E001-A023	MARINE SEISMIC SYSTEM (MSS) A-FRAME SUPPORT TO SUB BASE DETAILS & ASSEMBLY
3.	E001-A024	MARINE SEISMIC SYSTEM (MSS) A-FRAME SUPPORT TO CASING RACK, DETAILS.
4.	E001-A025	MARINE SEISMIC SYSTEM (MSS) WINCH FOUNDATION DETAILS & ARRANGEMENT
5.	E001-A027	MARINE SEISMIC SYSTEM (MSS) SHEAVE SUPPORT TO WINCH ASSY
6.	E001-A029	MARINE SEISMIC SYSTEM (MSS) HEAVE COMPENSATOR BRACKET MODIFICATION & DETAILS
7.	E001-A030	MARINE SEISMIC SYSTEM (MSS) ACCUMULATOR SUPPORT DETAILS & ASSEMBLY
8.	E001-A020	MARINE SEISMIC SYSTEM (MSS) INSTRUMENTATION & CONTROLS INSTALLATION
9.	D377-A003	GLOMAR CHALLENGER ARRANGEMENTS MAIN DECK & BELOW

LEVINGSTON SHIPBUILDING CO.

10.	T-54-54-515	CASING RACK LOCATION & DETAILS
11.	T-54-54-516	DERRICK SUB BASE DETAILS

0		RELEASE FOR CONSTRUCTION
A		PRELIMINARY RELEASE

0	
10	CUSTOMER
1	WHALESTEDT
1	DYE
1	
1	
1	
2	

GLOBAL MARINE DEVELOPMENT Inc.

MARINE SEISMIC SYSTEM (MSS)

GLOMAR CHALLENGER EQUIPMENT INSTALLATION ARRANGEMENT

006 523000

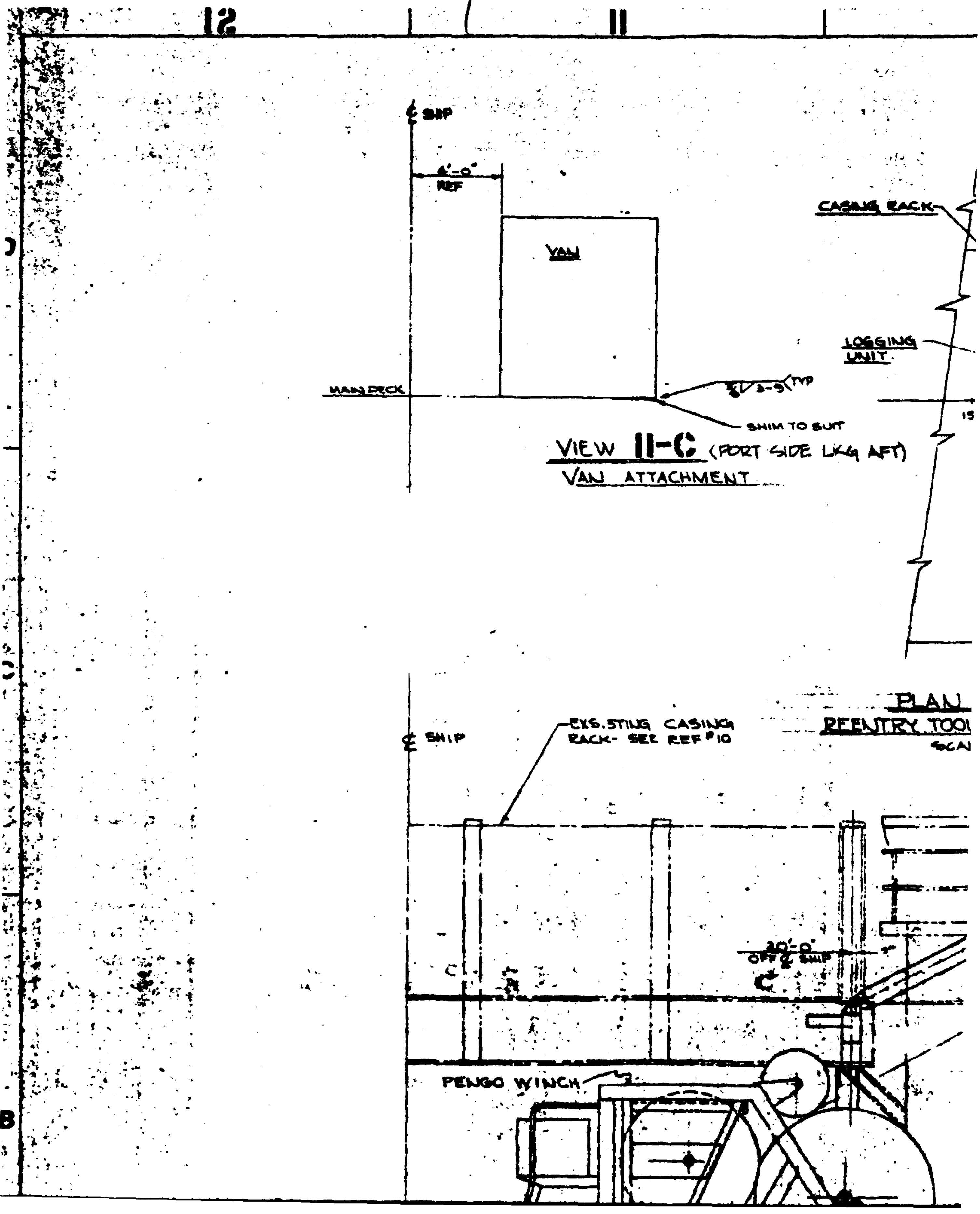
E-001-A026

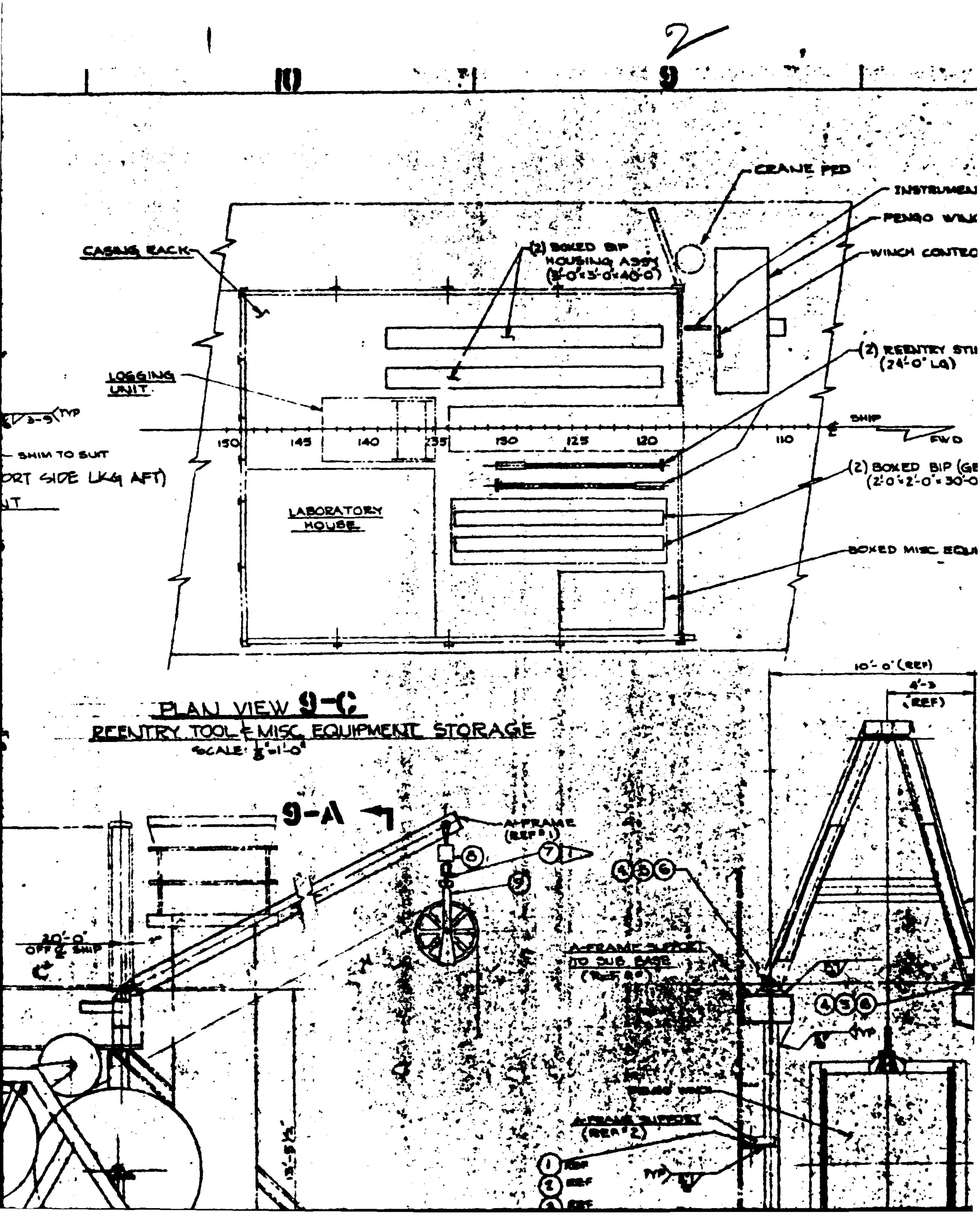
2

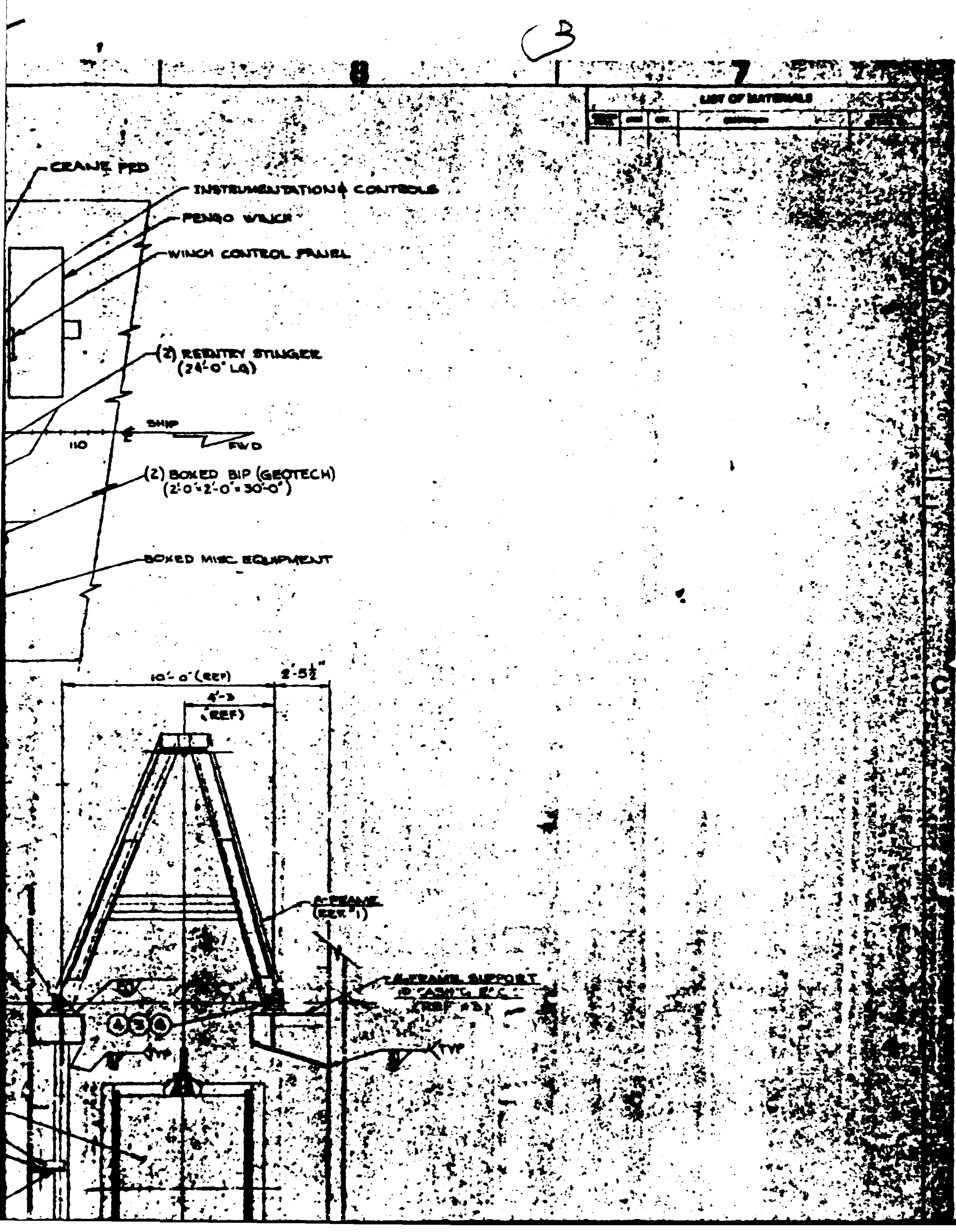
1

1

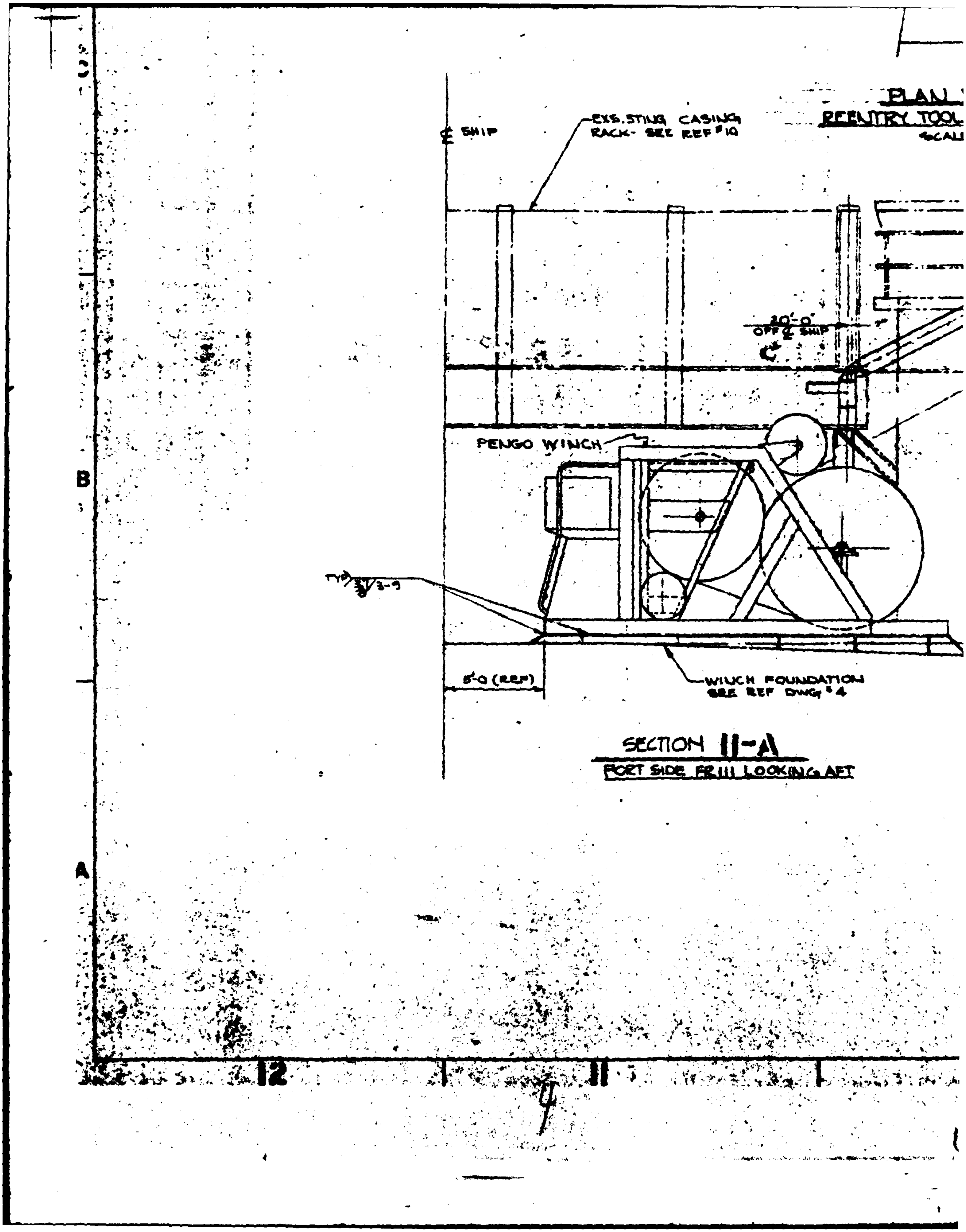
6


12
11
℄ SHIP
4'-0"
REF
VAN
CASING RACK
LOGGING UNIT
MAIN DECK
TYP
SHIM TO SUIT
VIEW 11-C (PORT SIDE LKG AFT)
VAN ATTACHMENT
PLAN
℄ SHIP
EXS. STING CASING
RACK- SEE REF #10
20'-0"
OFF ℄ SHIP
C
C
PENGO WINCH
B

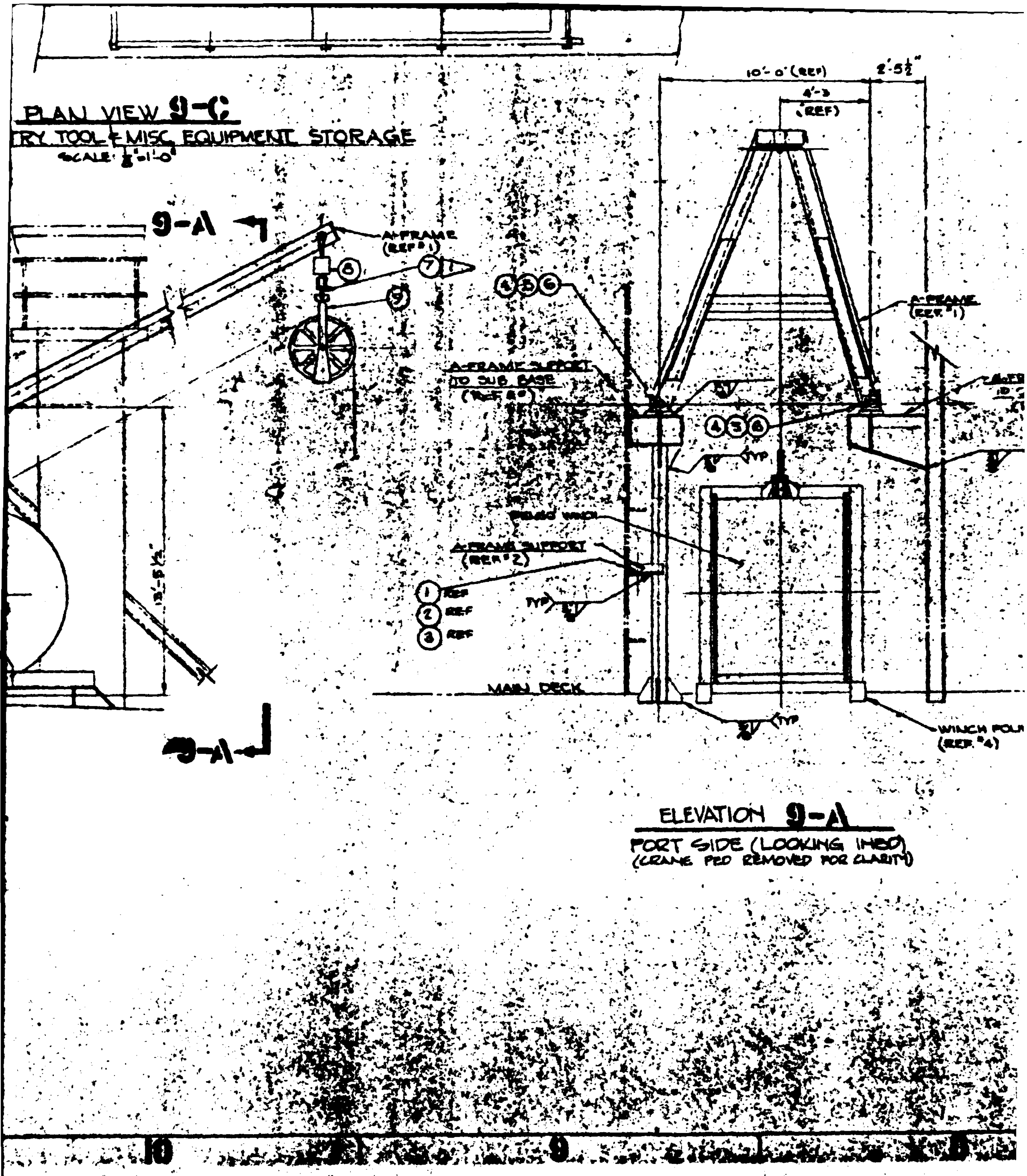

10
9
CRANE PED
CASING RACK
(2) BOXED BIP HOUSING ASSY (3'-0"x3'-0"x40'-0")
WINCH CONTRO
LOGGING UNIT
(2) REENTRY STI
(24'-0" LG)
SHIP
FWD
150
145
140
135
130
125
120
110
SHIM TO SUIT
ORT SIDE LKG AFT)
(2) BOXED BIP (GE
LABORATORY HOUSE
BOXED MISC EQU
10'-0" (REF)
4'-3 (REF)
PLAN VIEW 9-C
REENTRY TOOL & MISC EQUIPMENT STORAGE
9-A
A-FRAME (REF#1)
20'-0" OFF ℄ SHIP
A-FRAME SUPPORT TO SUB BASE
A-FRAME SUPPORT (REF#2)
TYP

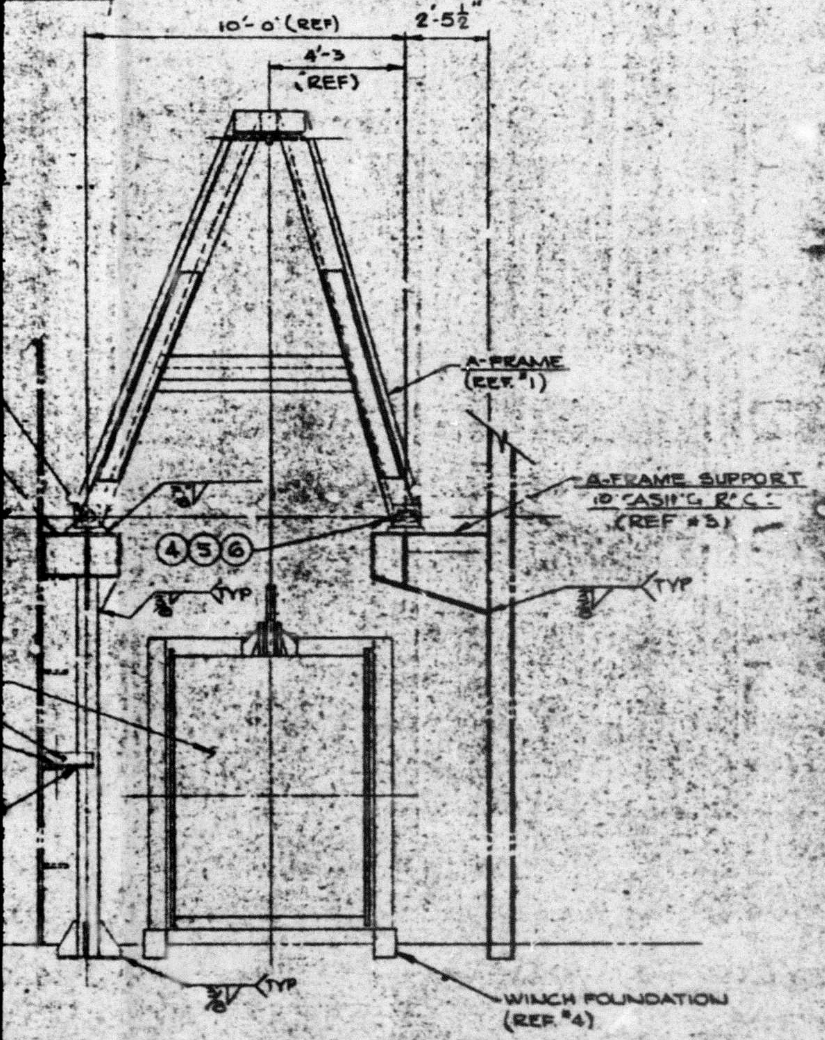


8
7
LIST OF MATERIALS
CRANE PED
INSTRUMENTATION & CONTROLS
PENGO WINCH
WINCH CONTROL PANEL
(2) REENTRY STINGER
(24'-0" LG)
SHIP
FWD
110
(2) BOXED BIP (GEOTECH)
(2'-0"×2'-0"×30'-0")
BOXED MISC EQUIPMENT
10'-0" (REF)
2'-5½"
4'-3
(REF)
A-FRAME
(REF 1)
A-FRAME SUPPORT
TYP
D
C



PLAN
REENTRY TOOL
SCAL
℄ SHIP
EXS. STING CASING
RACK- SEE REF #10
20'-0"
OFF ℄ SHIP
PENGO WINCH
TYP 3/8 3-9
5'-0 (REF)
WINCH FOUNDATION
SEE REF DWG #4
SECTION 11-A
PORT SIDE FR 111 LOOKING AFT
B
A
12
11


PLAN VIEW 9-C
TRY TOOL & MISC EQUIPMENT STORAGE
9-A
A-FRAME (REF #1)
8
7
9
4 5 6
A-FRAME SUPPORT TO SUB BASE
1 REF
2 REF
3 REF
A-FRAME SUPPORT (REF #2)
TYP
MAIN DECK
10'-0" (REF)
2'-5½"
4'-3 (REF)
A-FRAME (REF #1)
TYP
WINCH (REF #4)
ELEVATION 9-A
PORT SIDE (LOOKING INBD)
(CRANE PED REMOVED FOR CLARITY)
10
9



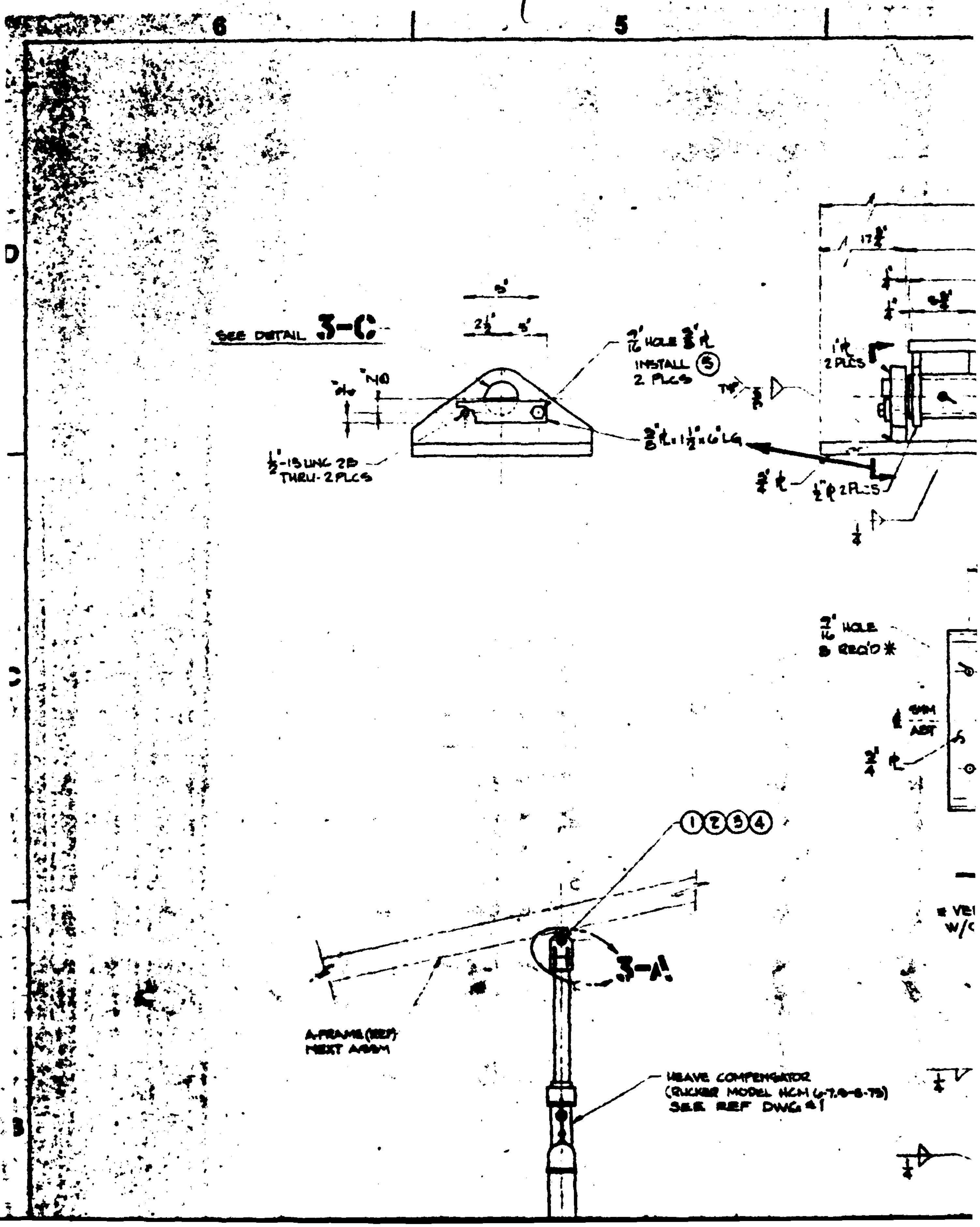
ELEVATION 9-A

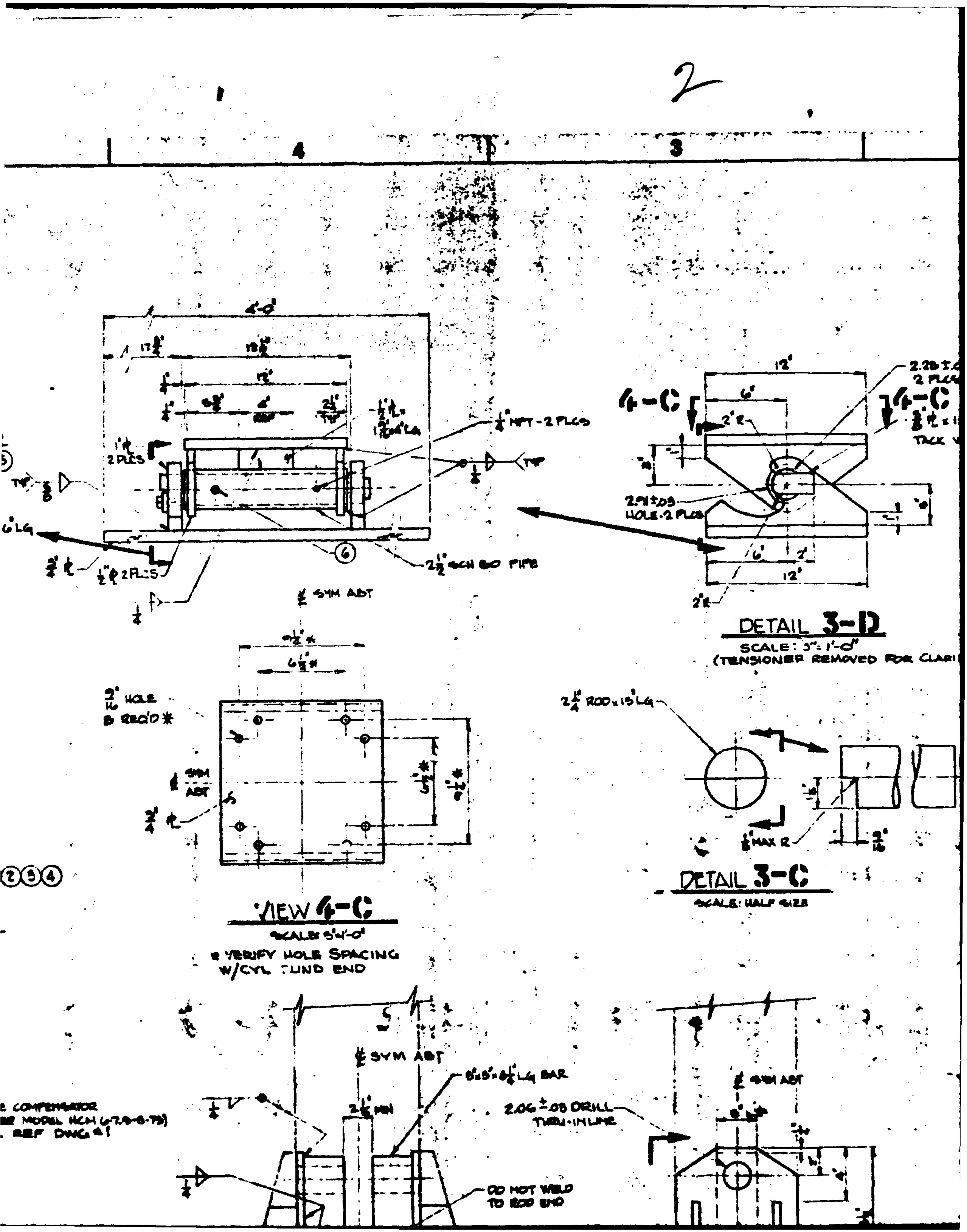
PORT SIDE (LOOKING INBD)
(CRANE PED REMOVED FOR CLARITY)

GLOBAL MARINE DEVELOPMENT Inc.

MARINE SEISMIC SYSTEM (MSS)
GLOMAR CHALLENGER
INSTALLATION ARRANGEMENT

E-001 A028 | 0

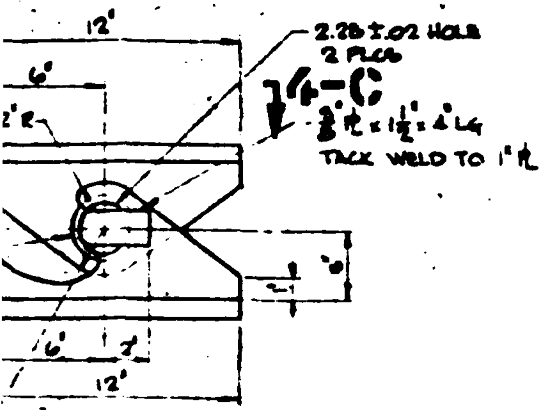

6
5
D
C
B
SEE DETAIL 3-C
INSTALL (5)
2 PLCS
THRU-2 PLCS
2 PLCS
REQ'D *
1 2 3 4
3-A
A-FRAME (REF)
NEXT ARM
HEAVE COMPENSATOR
SEE REF DWG #1



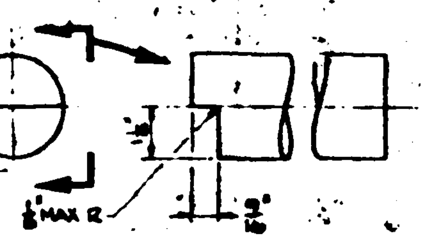
2
4
3
4'-0"
¼" NPT-2 PLCS
TYP
2½" SCH 80 PIPE
SYM ABT
4-C
2" R
12"
6"
2 PLCS
TACK
HOLE-2 PLCS
DETAIL 3-D
(TENSIONER REMOVED FOR CLARI
HOLE
SYM ABT
VIEW 4-C
VERIFY HOLE SPACING
W/CYL FUND END
MAX R
DETAIL 3-C
SCALE: HALF SIZE
SYM ABT
LG BAR
MIN
2.06 ± .03 DRILL
THRU-IN LINE
DO NOT WELD
TO ROD END
COMPENSATOR
MODEL
REF DWG

3

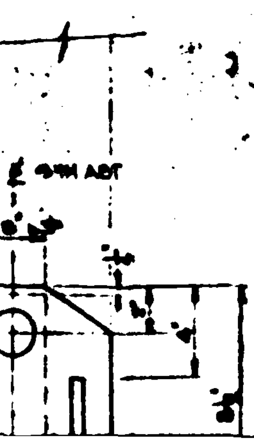
2	1



DETAIL 3-D
SCALE: 3"=1'-0"
(...ENSIONER REMOVED FOR CLARITY)



...IL 3-C
...E: HALF SIZE



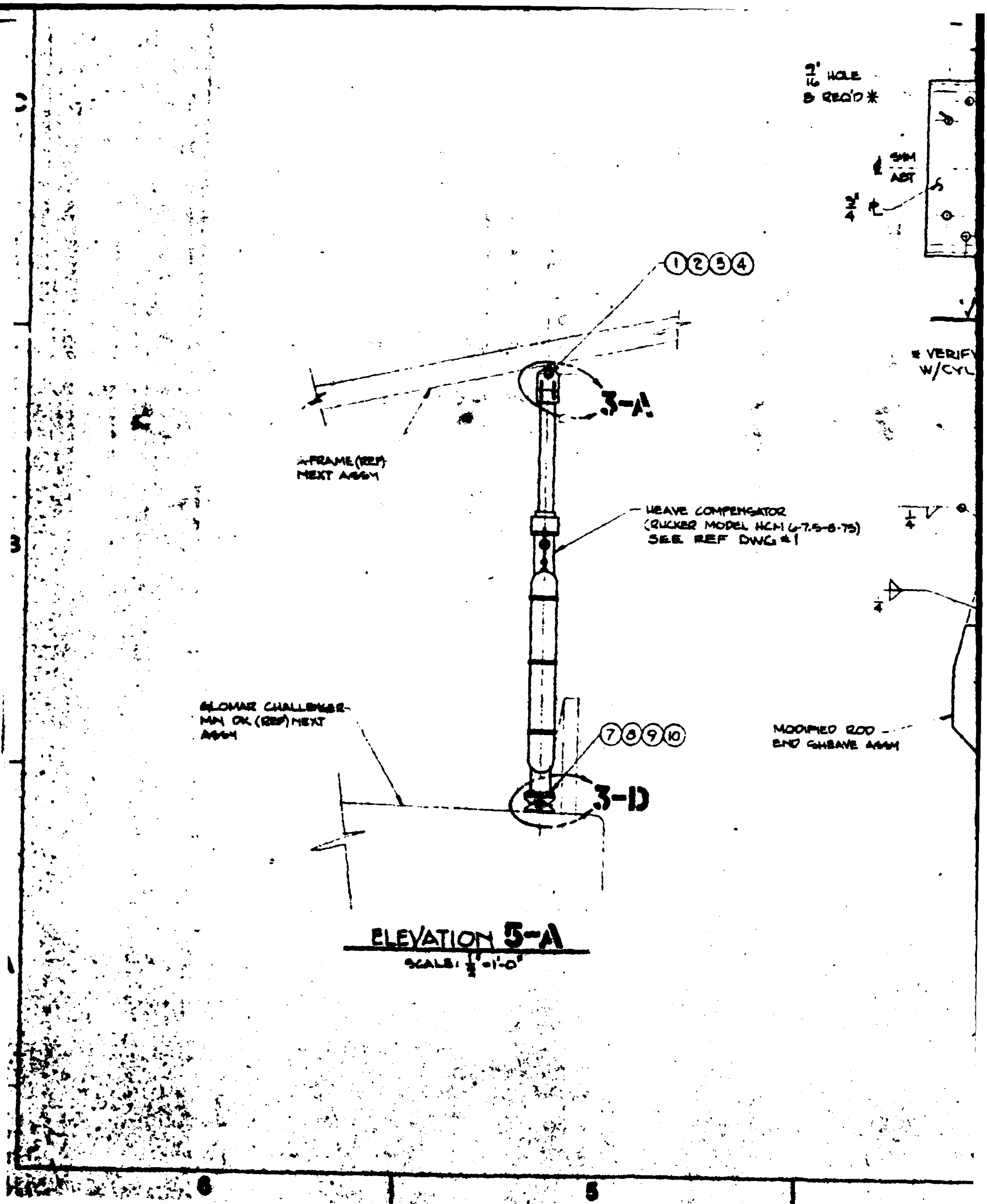
LIST OF MATERIALS				
[illegible]	[illegible]	QTY.	[illegible]	[illegible]
	1	1	2"-4 1/2 UNC 2A x 15" LG HEX BOLT	
	2	1	2" PLAIN WASHER	
	[illegible]	1	2" LOCK WASHER	
	4	1	2"-4 1/2 UNC 2B HEX NUT	
	[illegible]	2	1/2"-13 UNC 2A x 1" LG HEX BOLT	
	6	2	Mc MASTER-CARR NOSKI 1/8" STRAIGHT GREASE FITTING OR EQ.	
	7	8	1/2"-13UNC 2A x 3 1/2" LG HEX BOLT	
	8	8	1/2" PLAIN WASHER	
	9	8	1/2" LOCK WASHER	
	10	8	1/2"-13 UNC 2B HEX NUT	

GENERAL NOTES: (UNLESS OTHERWISE NOTED)

1. ALL MATERIAL TO BE ASTM A-36
2. BREAK ALL EDGES & REMOVE ALL BURRS.
3. PAINT IN ACCORDANCE WITH GMDI SPEC.001-002
4. ALL WELDING TO BE IN ACCORDANCE WITH AWS PROCEDURES.

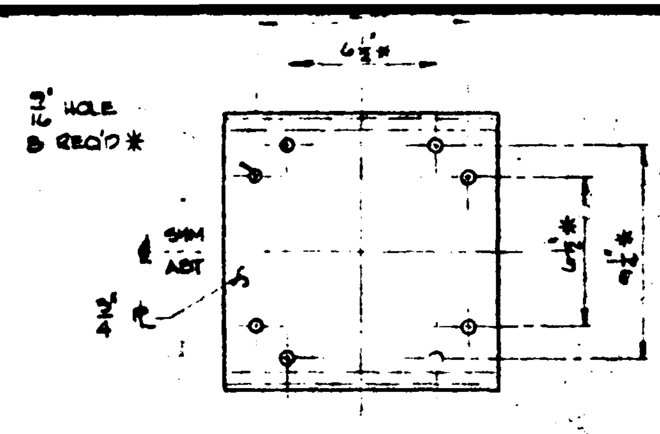
REFERENCE DRAWINGS

JOE STINE INC.
L.D. 6486 5 GUIDE LINE TENSIONER HORIZONTAL CEILING MOUNT.



ELEVATION 5-A
SCALE: 1/2"=1'-0"

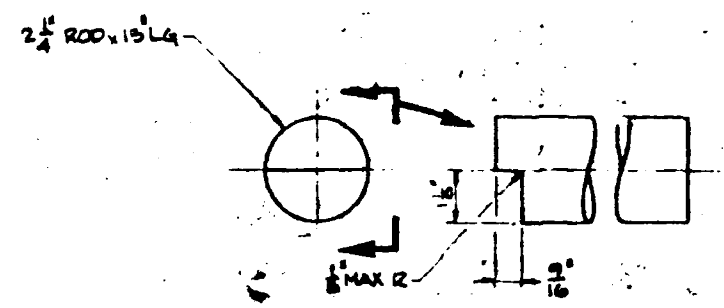
SCALE: 3":1'-0"
(TENSIONER REMOVED FOR CLARITY)



VIEW 4-C

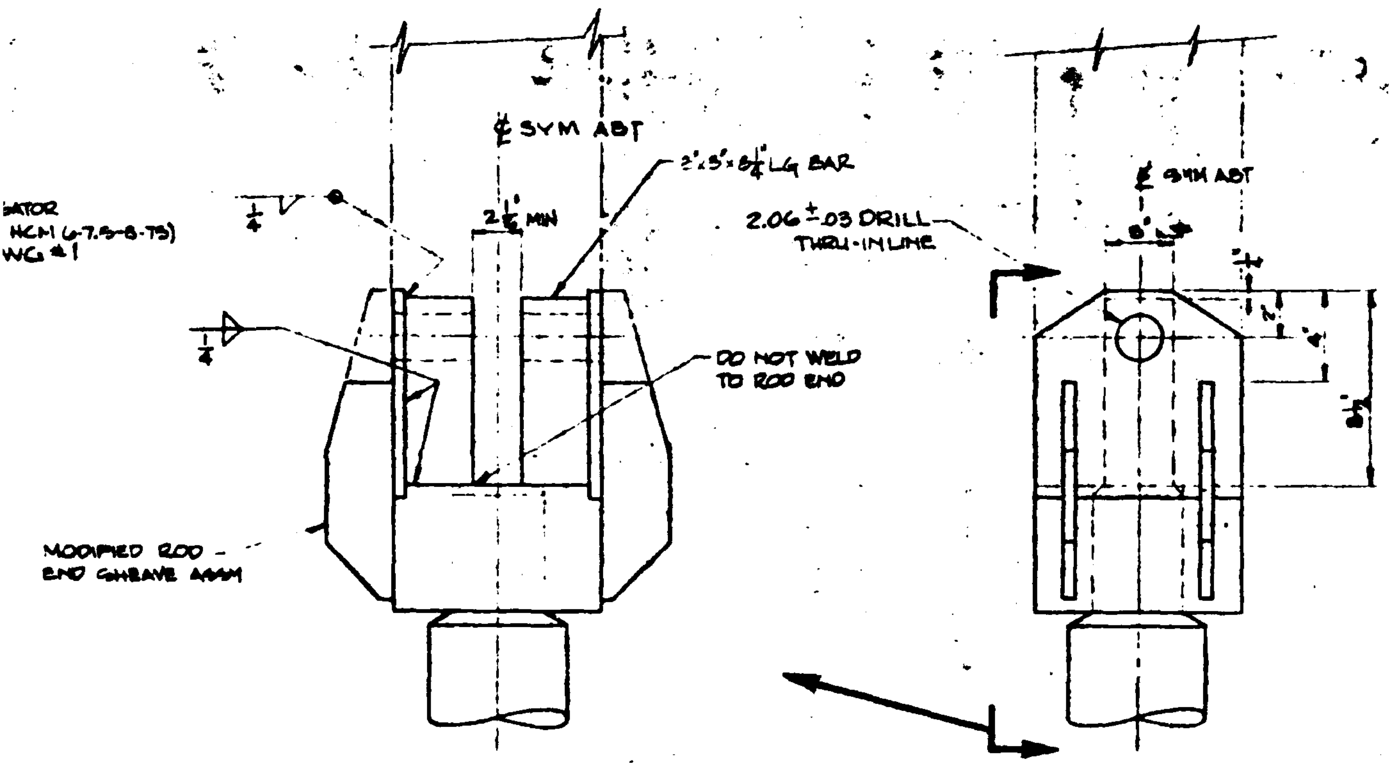
SCALE: 3"=1'-0"

* VERIFY HOLE SPACING W/CYL FUND END



DETAIL 3-C

SCALE: HALF SIZE



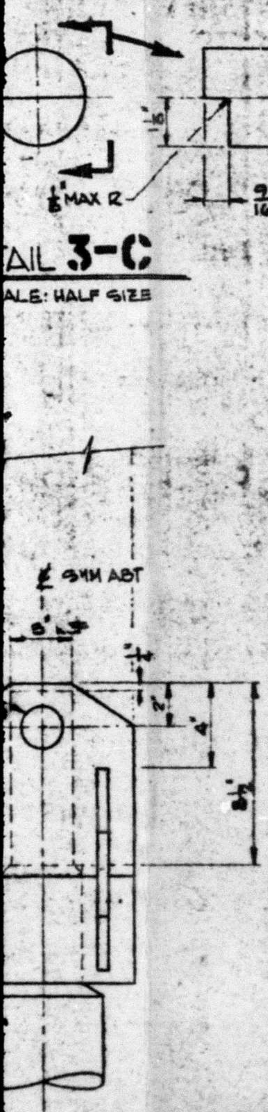
DETAIL 3-A

SCALE: 3"=1'-0"
(A-FRAME REMOVED FOR CLARITY)

4 3

DETAIL 3-D

SCALE: 3" = 1'-0"
(TENSIONER REMOVED FOR CLARITY)



DETAIL 3-C

SCALE: HALF SIZE

DETAIL 3-A

SCALE: 3" = 1'-0"
(TENSIONER REMOVED FOR CLARITY)

GENERAL NOTES: (UNLESS OTHERWISE NOTED)

1. ALL MATERIAL TO BE ASTM A-36
2. BREAK ALL EDGES & REMOVE ALL BURRS.
3. PAINT IN ACCORDANCE WITH GMDI SPEC. 001-002
4. ALL WELDING TO BE IN ACCORDANCE WITH AWS PROCEDURES.

REFERENCE DRAWINGS

JOE STINE INC.

1. D-6486 GUIDE LINE TENSIONER HORIZONTAL CEILING MOUNT.

NO.	DATE	BY	DESCRIPTION	JOB NO.	APPR.
0	12/...	NW	RELEASE FOR CONSTRUCTION	006-972000	
A	12/...	NW	PRELIMINARY RELEASE	006-972000	

ALTERATIONS

E-001-A028

NEXT ASSEMBLY

GLOBAL MARINE DEVELOPMENT Inc.
Newport Beach, Calif.

MARINE SEISMIC SYSTEM (MSS)
HEAVE COMPENSATOR BRACKET
MODIFICATIONS & DETAILS

SCALE: AS NOTED

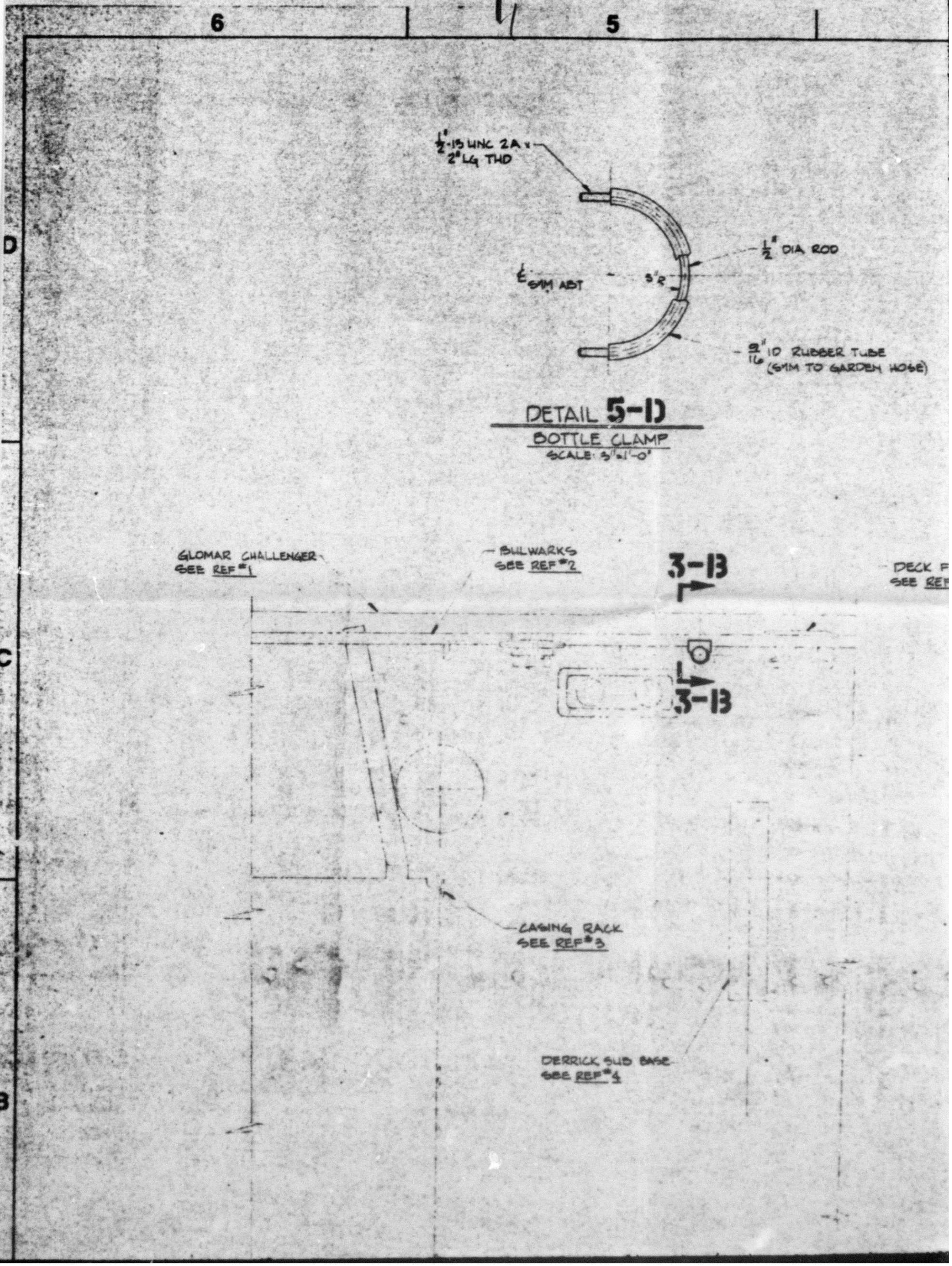
JOB NO. 006-972000

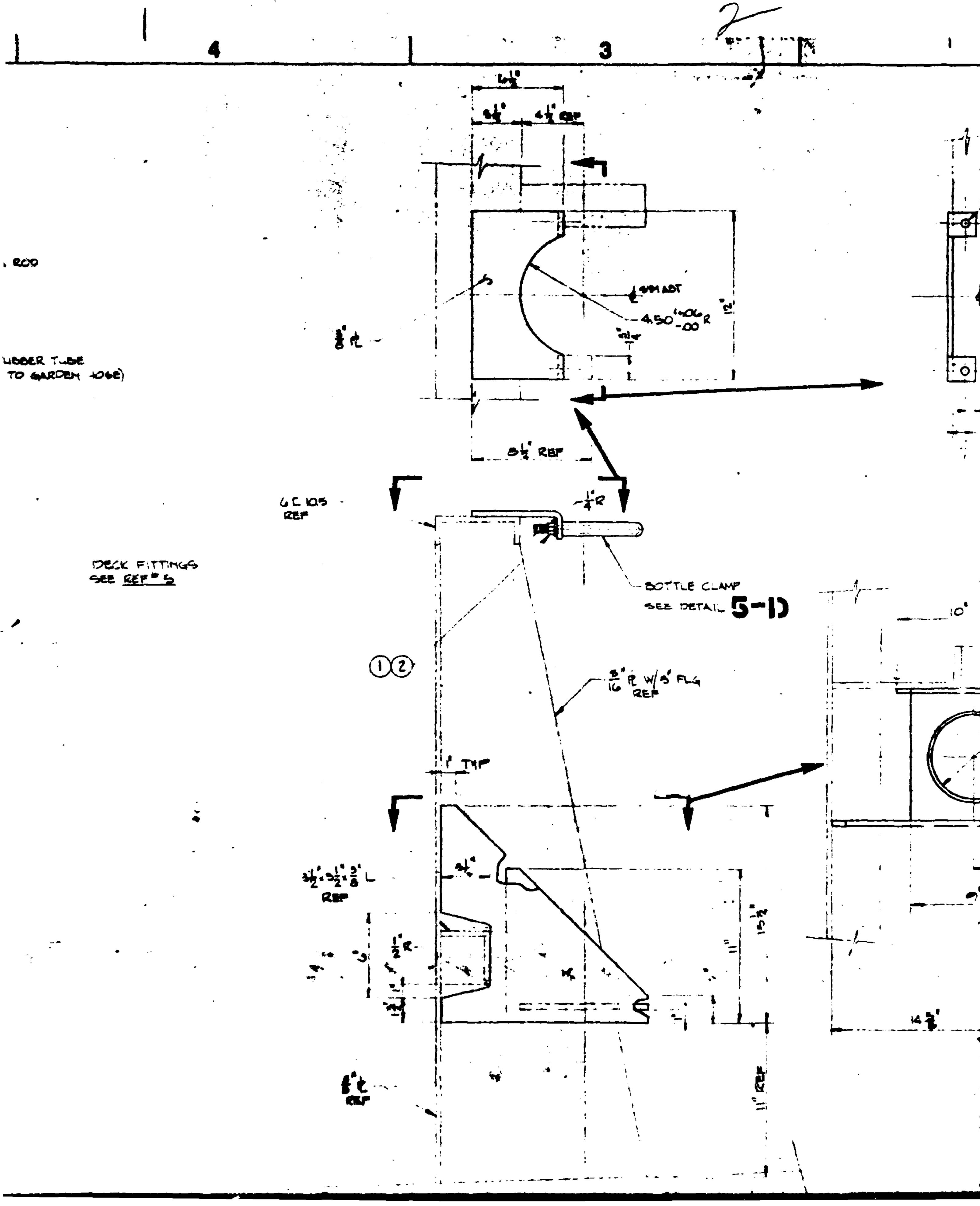
DWG. NO. E-001-A028

REV. 0

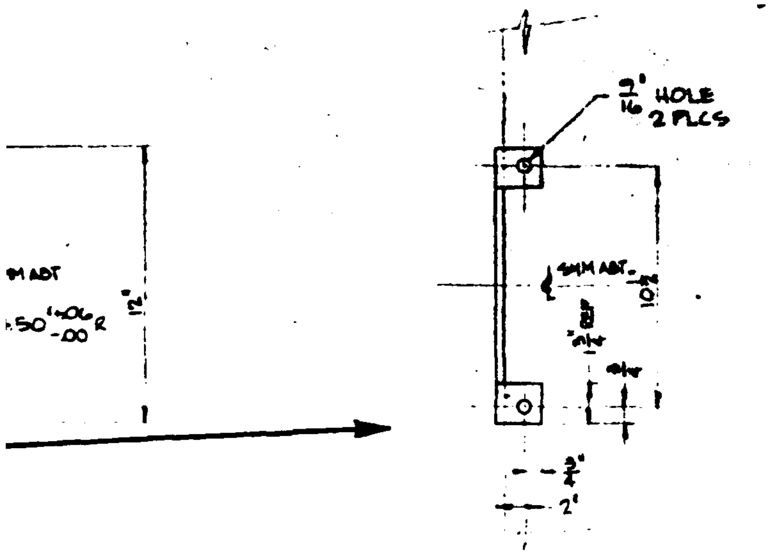
2 1

6


6
5
D
C
B
1/2"-13 UNC 2A x 2" LG THD
1/2" DIA ROD
℄ SYM ABT
3 1/2 R
9/16" ID RUBBER TUBE (SIM TO GARDEN HOSE)
DETAIL 5-D
BOTTLE CLAMP
SCALE: 3"=1'-0"
GLOMAR CHALLENGER SEE REF #1
BULWARKS SEE REF #2
3-B
3-B
CASING RACK SEE REF #3
DERRICK SUB BASE SEE REF #4

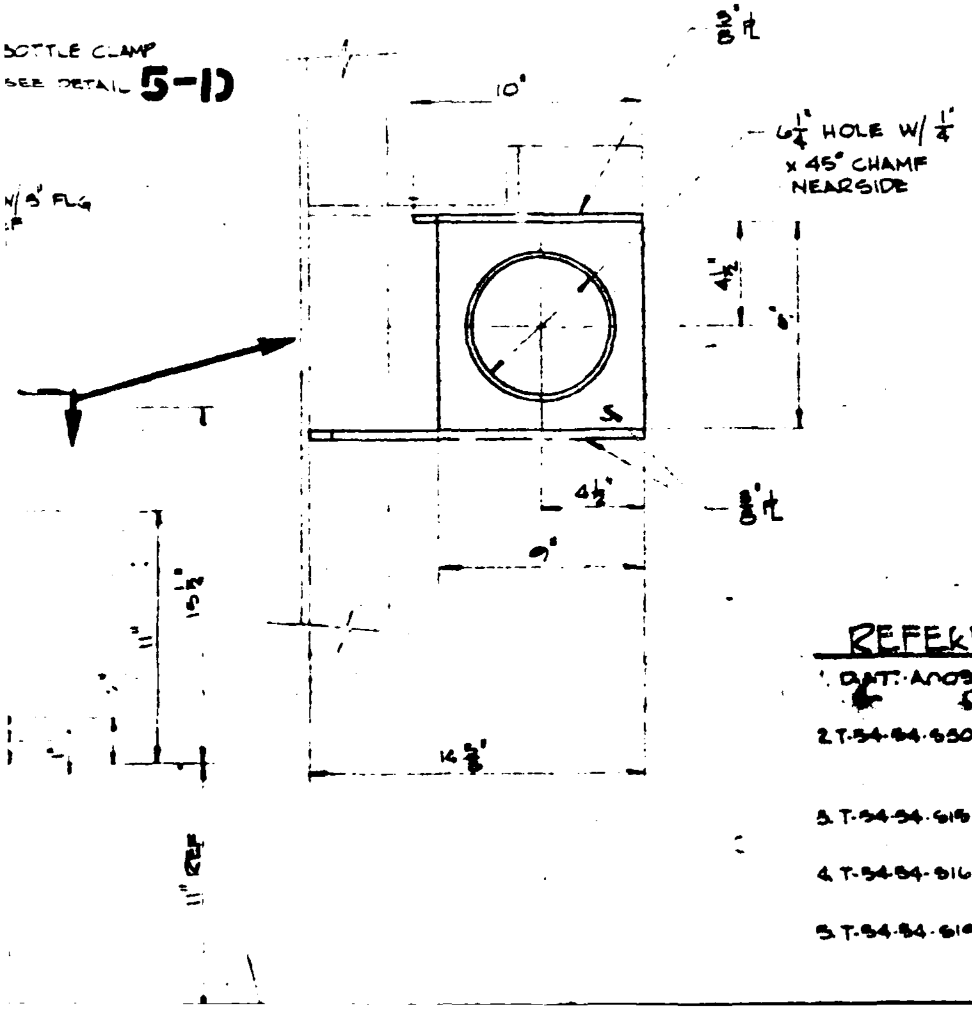

4
3
ROD
UBBER TUBE
TO GARDEN HOSE)
DECK FITTINGS
SEE REF # 5
BOTTLE CLAMP
SEE DETAIL 5-D
4.50 +.06 -.00 R
6 1/2 REF
GC 105
REF
1/4 R
5/16 PL W/ 3" FLG
REF
1" TYP
3 1/2 x 3 1/2 x 3/8 L
REF
1/2 R
11"
11" REF
10"
14 3/8"

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LIST OF MATERIALS				
	1	2	$\frac{1}{2}$"-13 UNC 2B HEX NUT	
	2	2	$\frac{1}{2}$" LOCK WASHER	



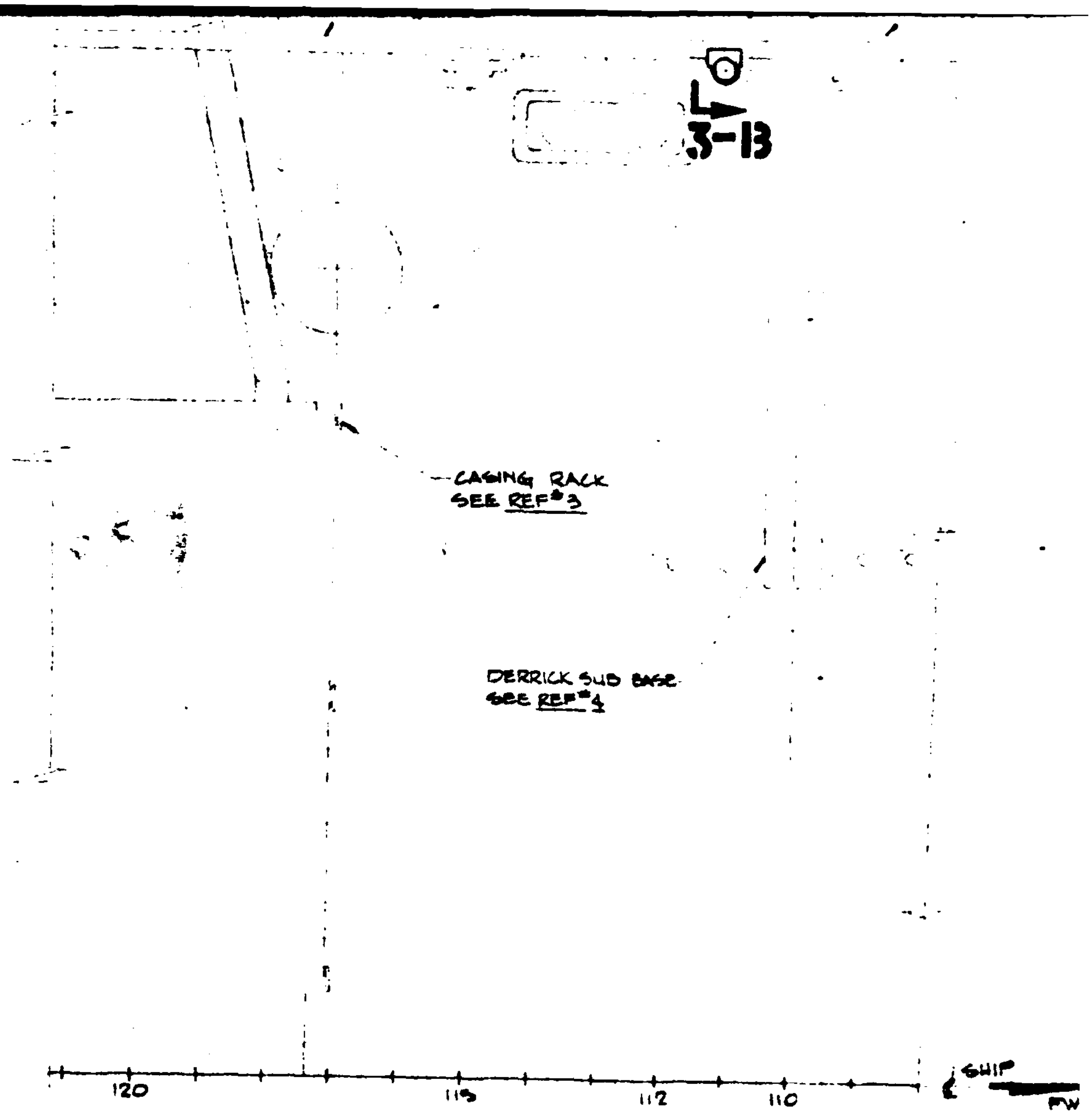
GENERAL NOTES: (UNLESS OTHERWISE NOTED)

1. ALL MATERIAL TO BE ASTM A-36.
2. BREAK ALL EDGES AND REMOVE ALL BURRS.
3. PAINT IN ACCORDANCE WITH GMDI SPEC. 001-002.
4. ALL WELDING TO BE IN ACCORDANCE WITH AWS PROCEDURES.
5. ALL WELDS TO BE $\frac{3}{8}$" CONTINUOUS FILLET.



REFERENCE DRAWINGS:

1. DWT. A103 — GLOMAR CHALLENGER ARRANGEMENTS MN DK & BELOW
2. T-54-54-550 — BULWARKS & FASHION PLATE MAS. DECK ARRANGEMENTS & DETAILS
3. T-54-54-515 — CASING RACK LOCATION & DETAILS
4. T-54-54-516 — DERRICK SUB BASE DETAILS
5. T-54-54-519 — DECK FITTINGS LOCATIONS & DETAILS

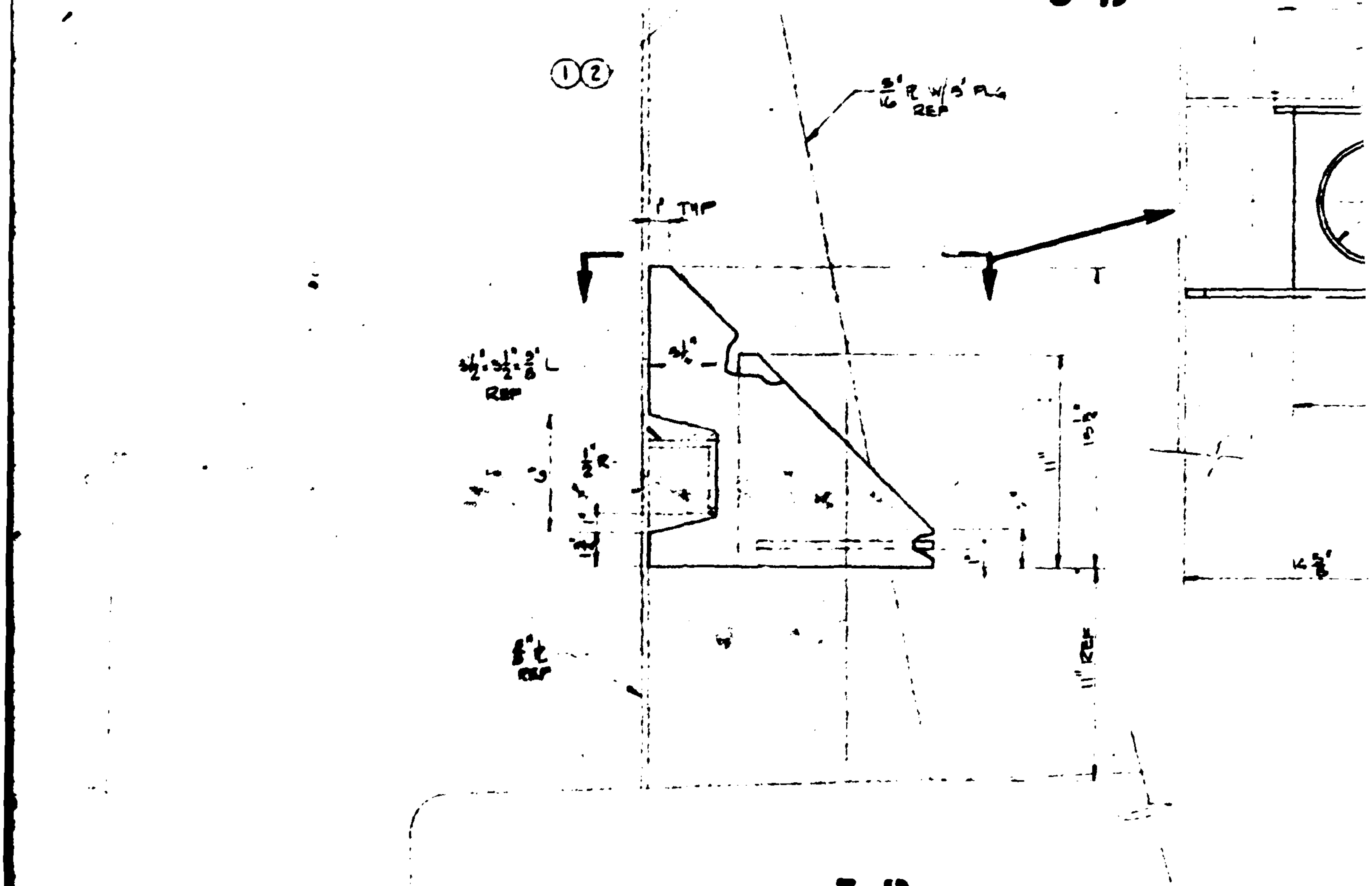


PLAN VIEW 5-A

PORT SIDE FR 109 TO FR 121

ACCUMULATOR SUPPORT LOCATION

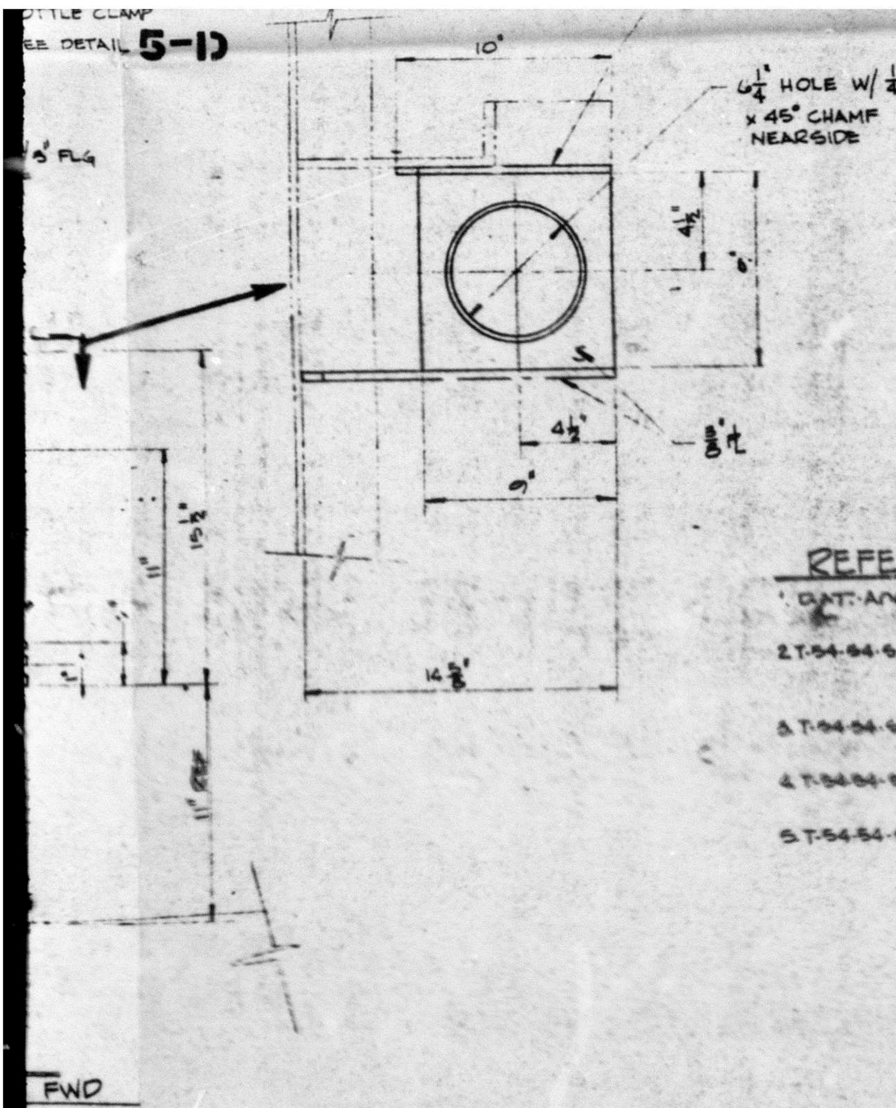
SCALE: 3/8"=1'-0"



SECTION 3-13

PORT SIDE FR 111 LOOKING FWD

SCALE: 3"=1'-0"



REFERENCE DRAWINGS:

1. DAT-A005 GLOMAR CHALLENGER ARRANGEMENT — MN DK & BELOW
2. T-54-54-550 BULWARKS & FASHION PLATE MAIN DECK ARRANGEMENTS & DETAILS
3. T-54-54-615 CASING RACK LOCATION & DETAILS
4. T-54-54-616 DERRICK SUB BASE DETAILS
5. T-54-54-619 DECK FITTINGS LOCATIONS & DETAILS

NO.	DATE	BY	DESCRIPTION	JOB NO.
O			RELEASE FOR CONSTRUCTION	006-973000
A			PRELIMINARY RELEASE	006-973000

ALTERATIONS

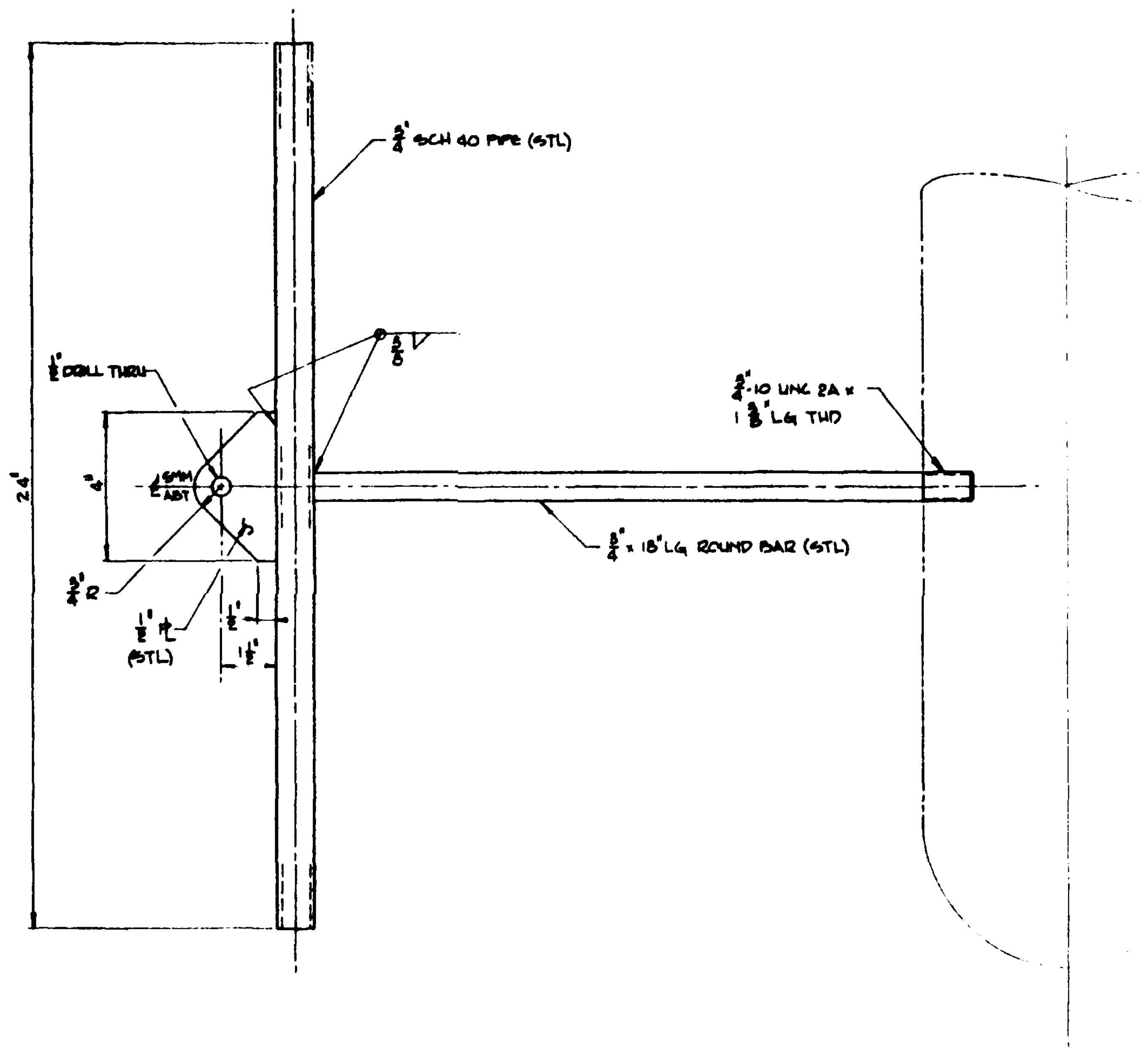
E-001-A028 NEXT ASSEMBLY

GLOBAL MARINE DEVELOPMENT Inc.
Newport Beach, Calif.

MARINE SEISMIC SYSTEM (MSS)
ACCUMULATOR SUPPORTS
DETAILS AND ASSEMBLY

SCALE: AS NOTED
JOB NO. 006-973000
DWG. NO. E-001-A030 REV. O

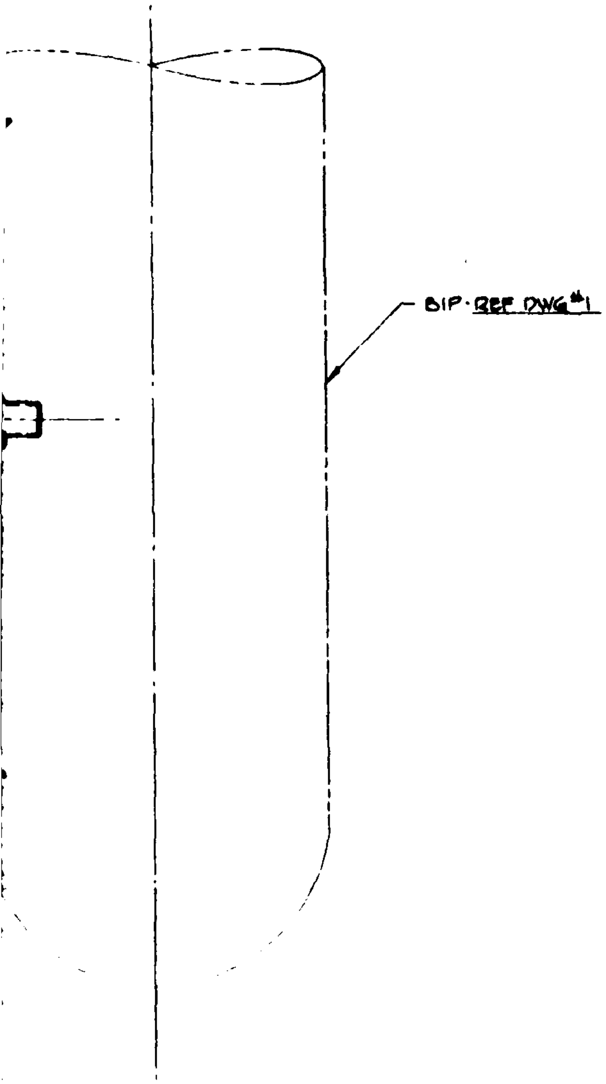
2 1



3/4" SCH 40 PIPE (STL)
3/8
1/2" DRILL THRU
24"
4"
SYMM ABT
3/4"-10 UNC 2A x 1 3/8" LG THD
3/4" x 18" LG ROUND BAR (STL)
3/4" R
1/2" PL (STL)
1/2"
1 1/2"

LIST OF MATERIALS

ITEM	QTY	DESCRIPTION	MATERIAL



GENERAL NOTES: (UNLESS OTHERWISE NOTED)

1. BREAK ALL EDGES & REMOVE ALL BURRS.

REFERENCE DRAWINGS:

TELEDYNE GEOTECH

1. D-990-53100 BIP

GMDI

2. E-001-T002 MARINE SEISMIC SYSTEM (MSS) BIP LOADING SEQUENCE

NO.	DATE	BY	DESCRIPTION		
0	1-13-81	NW	RELEASE FOR CONSTRUCTION	006-323000	

ALTERATIONS

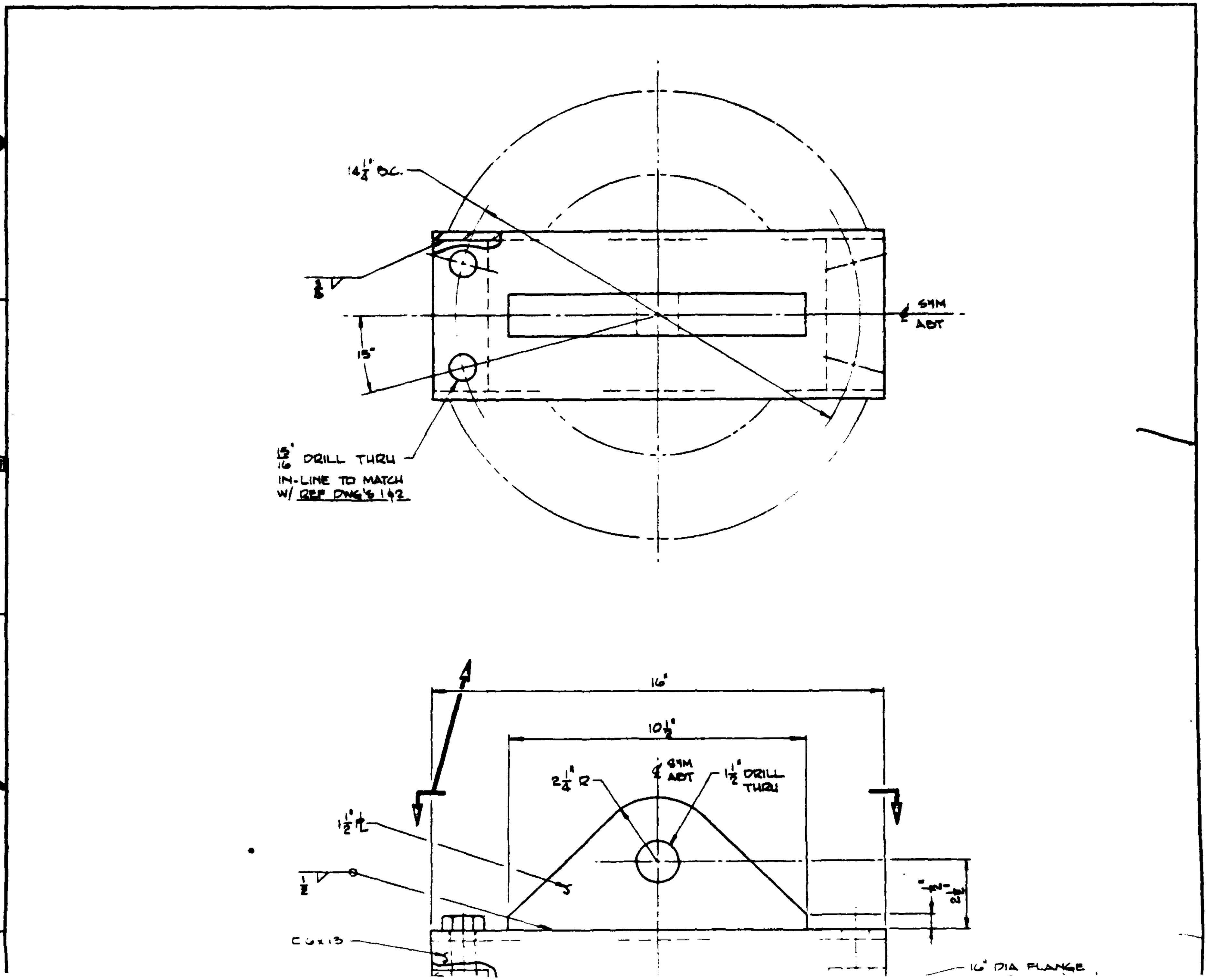
GLOBAL MARINE DEVELOPMENT INC.
Newport Beach, Calif.

NO. COPIES	DISTRIBUTION
10	CUSTOMER
1	WALLERSTEDT
1	DYE
1	McMAHON
1	MITCHELL
1	LARNHAM
2	LIBRARY

MARINE SEISMIC SYSTEM (MSS)
BIP HANDLING T-BAR
DETAILS

	NAME	DATE	SCALE
DFT.	N. WAGNER	1-13-81	HALF SIZE
CHKD.	J. Dye	1-13-81	
ENGR.			
APPD.		1-16-81	006-323000

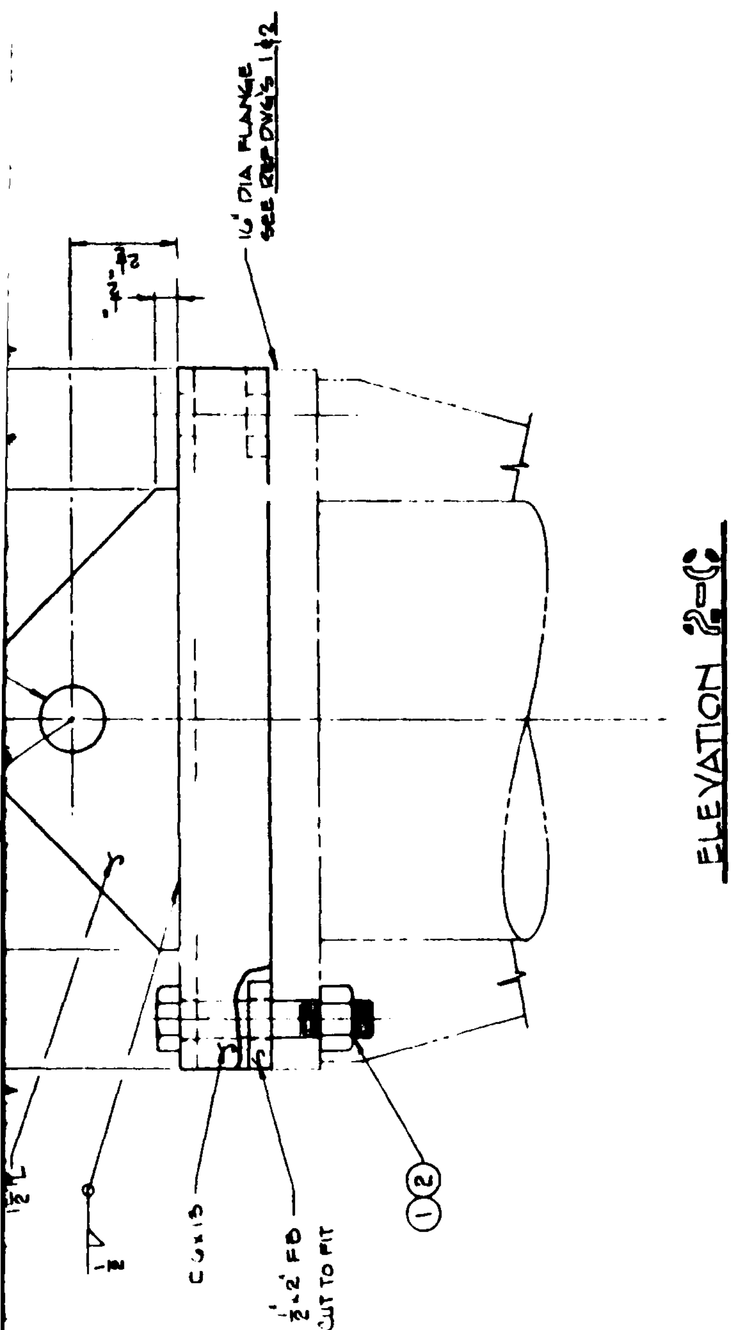
D · 001 · A031



14 1/4" B.C.
15°
SYM ABT
15/16" DRILL THRU
IN-LINE TO MATCH
W/ REF DWG'S 1 & 2
16"
10 1/2"
2 1/4" R
SYM ABT
1 1/2" DRILL THRU
1 1/2" PL
16" DIA FLANGE

LIST OF MATERIALS

	ITEM	QTY	DESCRIPTION	
	1	4	7/8"-9 UNC 2A x 4 1/2" LG HEX BOLT	
	2	4	7/8"-9 UNC 2B HEX NUT	



GENERAL NOTES: (UNLESS OTHERWISE NOTED)

1. ALL MATERIAL TO BE ASTM A-36 OR EQUAL
2. BREAK ALL EDGES & REMOVE ALL BURRS.

REFERENCE DRAWINGS:

1. D-001-A007 MARINE SEISMIC SYSTEM (MSS) REENTRY TOOL STINGER ASSEMBLY & DETAILS
2. D-001-A008 MARINE SEISMIC SYSTEM (MSS) BIP CARRIAGE HOUSING MAIN ASSEMBLY

NO.	DATE	BY	DESCRIPTION	JOB NO.
0	1-13-81	NW	RELEASE FOR CONSTRUCTION	006-573000

ALTERATIONS

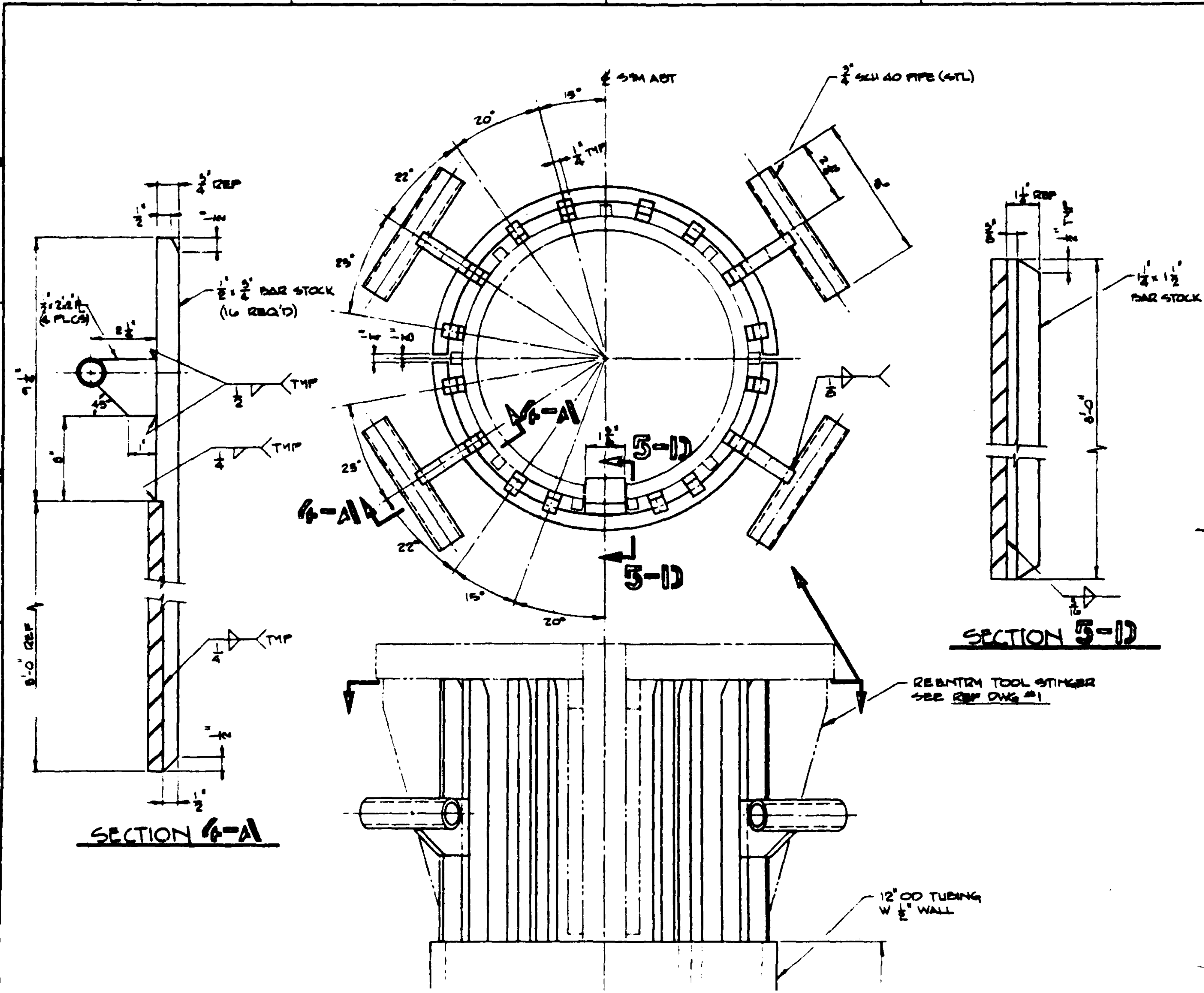
NO. REQ'D.	DIST.
10	CUSTOMER
1	WALLERSTEDT
1	PYE
1	BUCHANAN
1	MITCHELL
1	FERNHAM
2	LIBRARY

GLOBAL MARINE DEVELOPMENT INC.
Newport Beach, Calif.

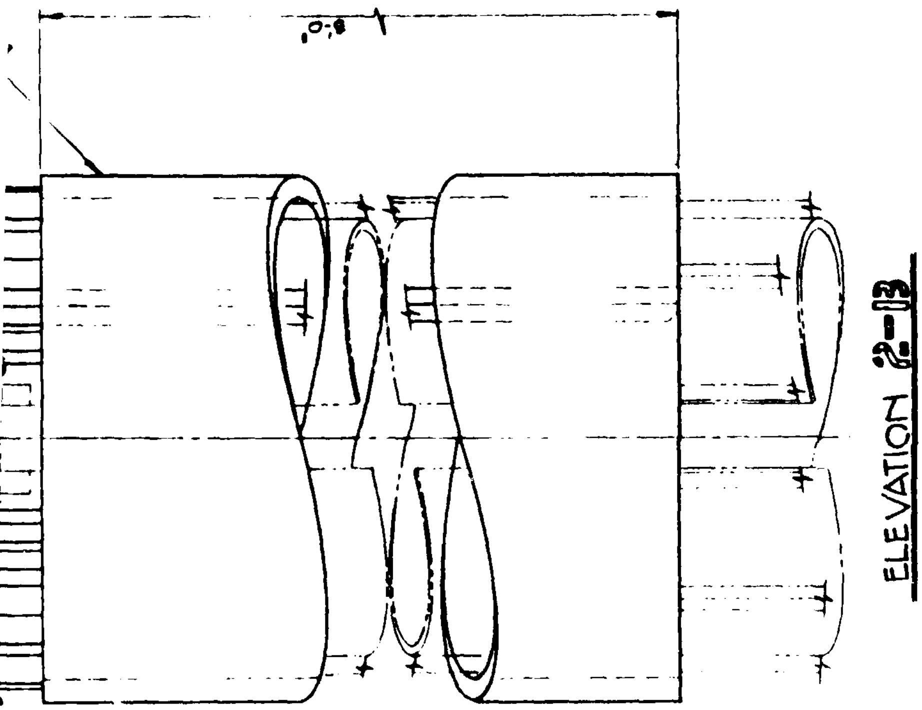
MARINE SEISMIC SYSTEM (MSS)
HANDLING TOOL FOR STINGER & CARRIAGE HOUSING - DETAILS

DFT. N WAGNER	1-13-81	SCALE HALF SIZE	
CHKD. S. Dye	1-13-81	JOB NO. 006-573000	DWG. NO. D-001-A032

TOTAL NET WGT. MAT'L ______
TOTAL NET WGT. EQUIP. ______
TOTAL NET WEIGHT ______



℄ SYM ABT
3/4" SCH 40 PIPE (STL)
1/2 x 3/4" BAR STOCK
(16 REQ'D)
1 1/4 x 1 1/2" BAR STOCK
TYP
5-D
6-A
SECTION 6-A
SECTION 5-D
REENTRY TOOL STINGER
SEE REF DWG #1
12" OD TUBING
W 1/2" WALL



LIST OF MATERIALS

SHEET PLATE	ITEM	QTY	DESCRIPTION	MATERIAL GS DWG NO.

GENERAL NOTES: (UNLESS OTHERWISE NOTED)

1. ALL MATERIAL TO BE ASTM A-36 OR EQUAL.
2. BREAK ALL SHARP EDGES & REMOVE ALL BURRS.

REFERENCE DRAWINGS:

1. D-001-A007 MARINE SEISMIC SYSTEM (MSS) REENTRY TOOL STINGER ASSEMBLY & DETAILS
2. E-001-T002 MARINE SEISMIC SYSTEM (MSS) BIP LOADING SEQUENCE

NO.	DATE	BY	DESCRIPTION	JOB AUTH.	APPD
0	1-15-81	NW	RELEASE FOR CONSTRUCTION	006-323000	

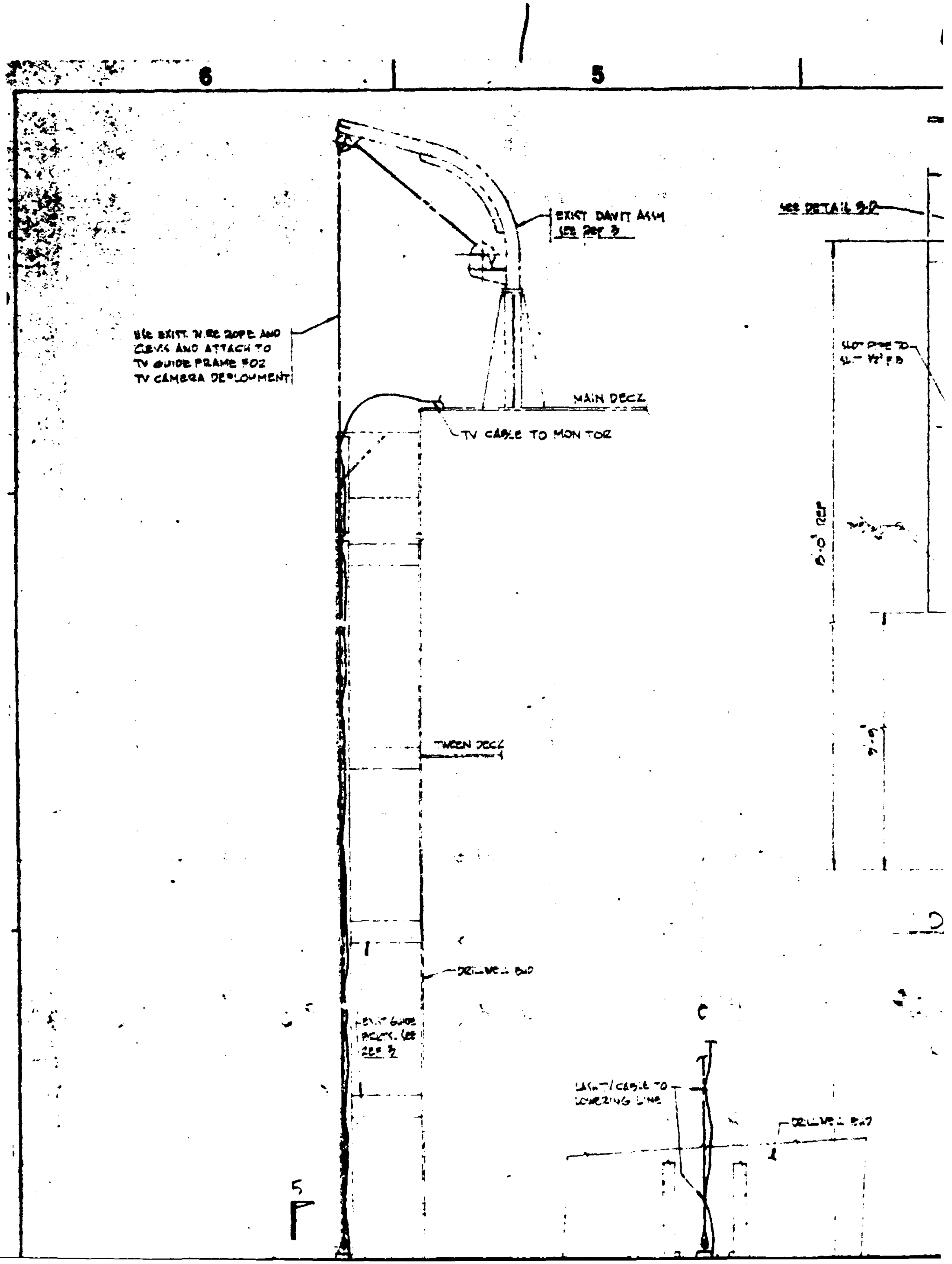
GLOBAL MARINE DEVELOPMENT INC.
Newport Beach, Calif.

MARINE SEISMIC SYSTEM (MSS)
SLIPS ADAPTOR FOR STINGER
DETAILS

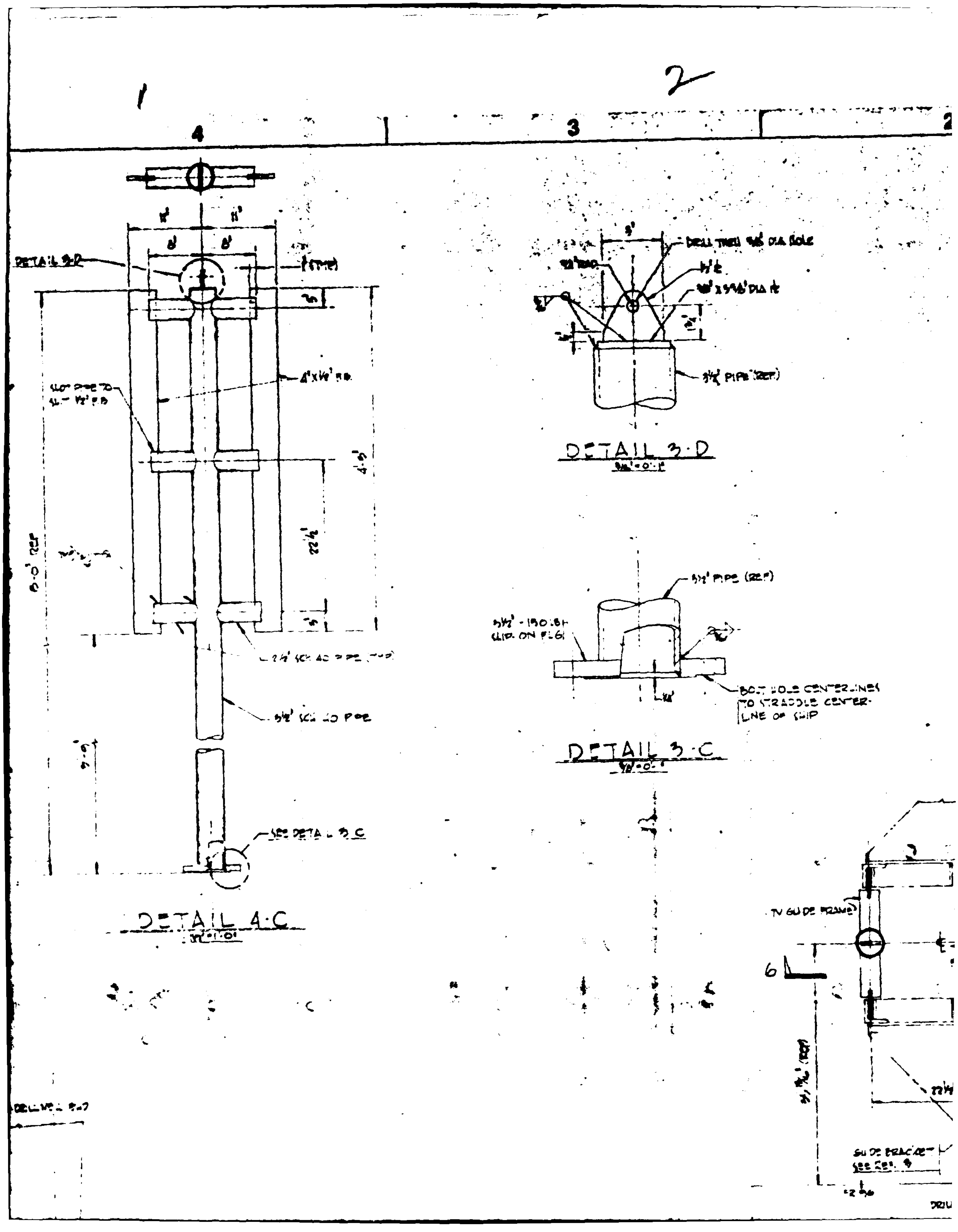
10	CUSTOMER	
1	WOLLERSTEDT	
1	DYE	
1	BUCHANAN	
1	MITCHELL	
1	FARNHAM	
2	LIBRARY	

	NAME	DATE
DFT	N. WAGNER	1-14-81
CHKD	S. Dye	1-16-81
	FARNHAM	1-19-81
APPD	P. Pumpan	1/20/81
	R. Wollerstedt	1/20/81

SCALE: HALF SIZE
JOB AUTH.: 006-323000
DWG NO.: D-001-A033
SHEET 1 OF 1
ALT: 0



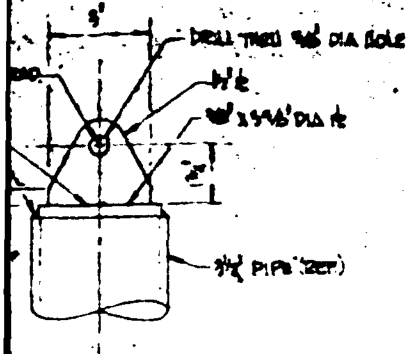
6
5
EXIST DAVIT ASSM
SEE REF 3
USE EXIST WIRE ROPE AND
CLEVIS AND ATTACH TO
TV GUIDE FRAME FOR
TV CAMERA DEPLOYMENT
MAIN DECK
TV CABLE TO MONITOR
TWEEN DECK
DRILLWELL BHD
C
LASHT/CABLE TO
LOWERING LINE
DRILLWELL BHD



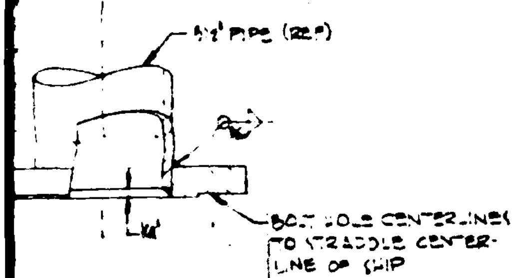
1
2
4
3
DETAIL 3-D
DRILL THRU 5/8" DIA HOLE
3 1/2" PIPE (REF)
DETAIL 3-D
3 1/2" PIPE (REF)
3 1/2" - 150 LB
SLIP ON FLG
BOLT HOLE CENTERLINES
TO STRADDLE CENTER-
LINE OF SHIP
DETAIL 3-C
4" x 1/2" F.B.
4'-5"
22 1/2"
6'-0" REF
2 1/2" SCH 40 PIPE (TYP)
3 1/2" SCH 40 PIPE
SEE DETAIL 3-C
DETAIL 4-C
TV GUIDE FRAME
6
GUIDE BRACKET
SEE DET. 4

2 1

LIST OF MATERIALS



DETAIL 3-D



DETAIL 3-C

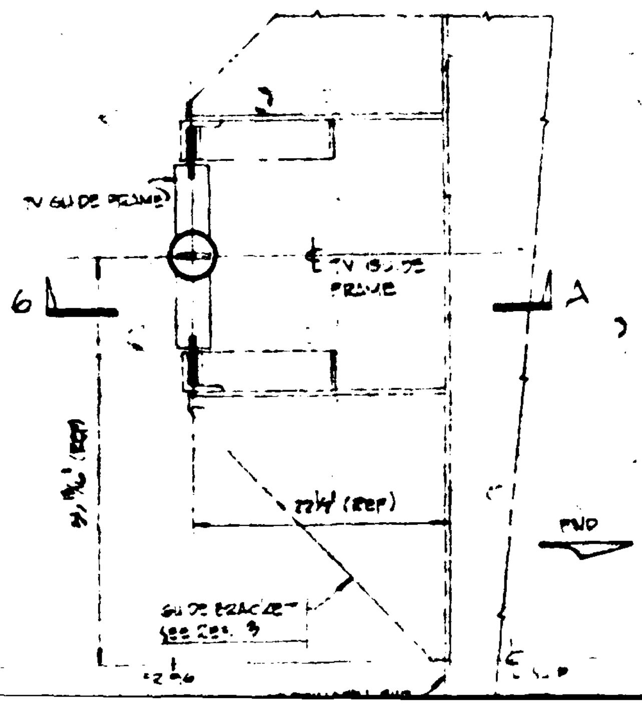
GENERAL NOTES (UNLESS OTHERWISE NOTED)

1. ALL PLATES AND SHAPES TO BE ASTM A-36 OR EQUAL
2. ALL WELDING TO BE IN ACCORDANCE WITH AWS PROCEDURES
3. BREAK ALL SHARP EDGES AND REMOVE ALL BURRS
4. ALL WELDS TO BE 1/4 CONTINUOUS FILLET.

REFERENCE DRAWINGS

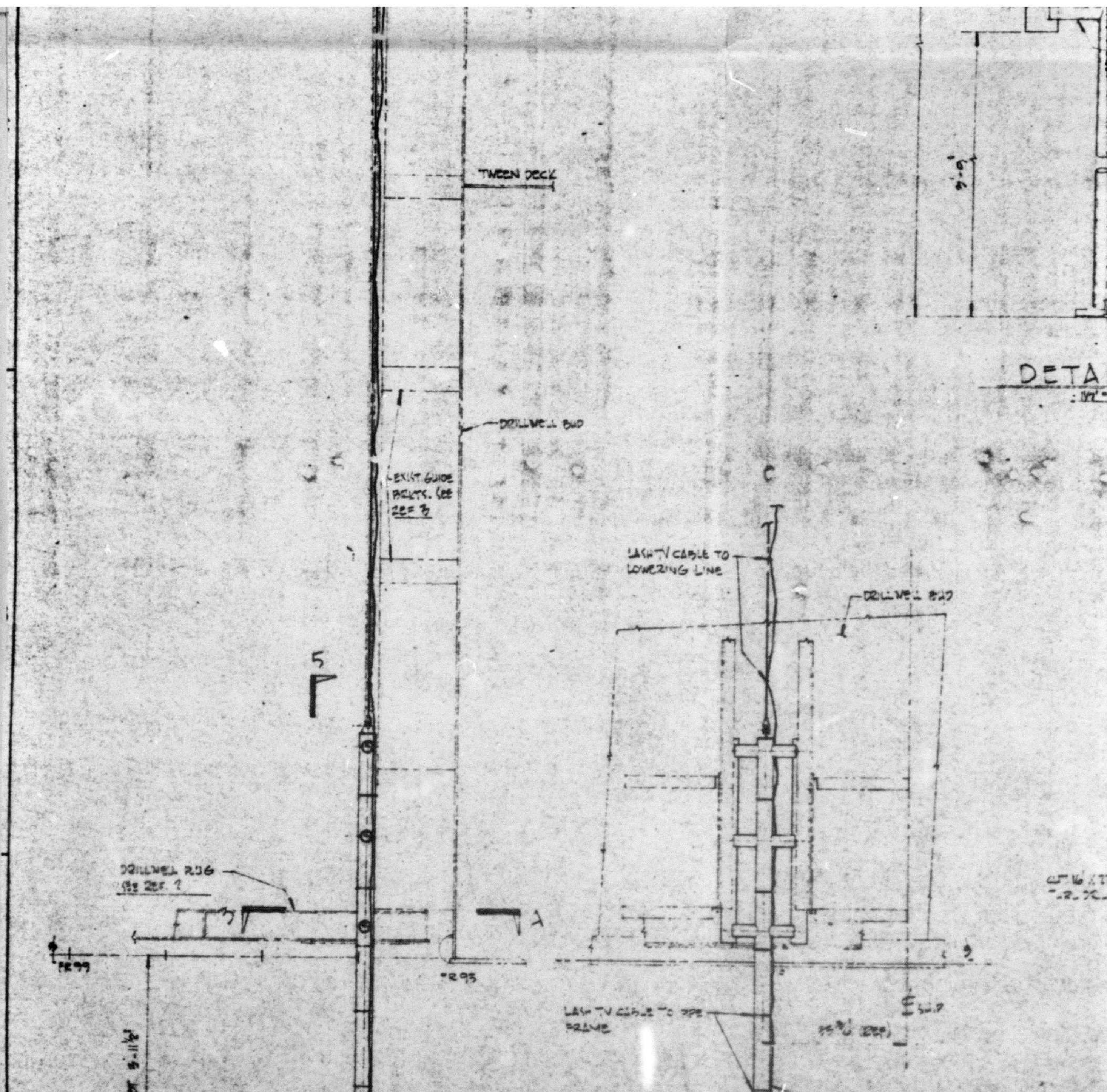
LEVINGSTON SHIPBUILDING CO

1. LT-54-54-48 DRILLWELL BULKHEAD
2. LT-54-54-#25 DRILLWELL PLUG
3. LT-1-54 H 4'x 6 HAIS PITOT LOG INSTALLATION & DETAILS



D

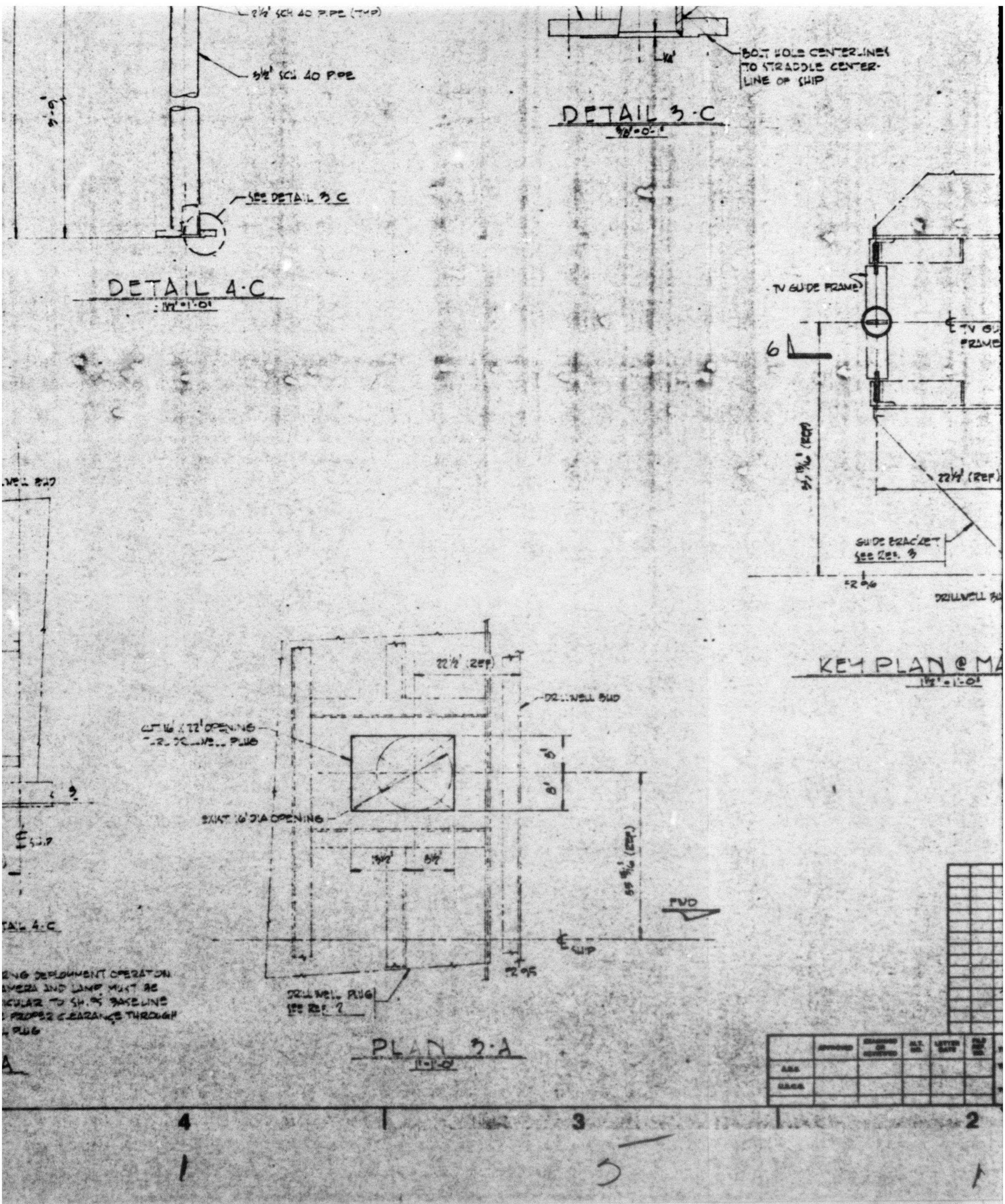
C



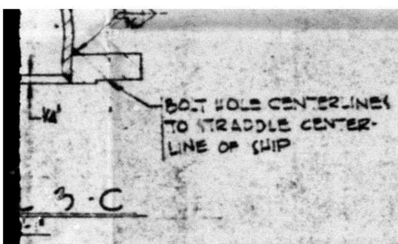
TWEEN DECK
DRILLWELL BHD
EXIST GUIDE BRKTS. SEE REF 3
5
DRILLWELL PLUG SEE REF. 7
A
FR 99
FR 93
APX. 3'-11½"
℄ PAN-TILT
A
LASH TV CABLE TO LOWERING LINE
DRILLWELL BHD
LASH TV CABLE TO PIPE FRAME
℄ SHIP
SEE DETAIL 4-C
SUB ASS. UNDERWATER CAMERA ASSEMBLY
NOTE: DURING DEPLOYMENT OPERATION THE TV CAMERA AND LAMP MUST BE PERPENDICULAR TO SHIP'S BASELINE TO INSURE PROPER CLEARANCE THROUGH DRILL WELL PLUG
DETA
ELEVATION 6-A
ELEVATION 5-A
6
5
4

4

1



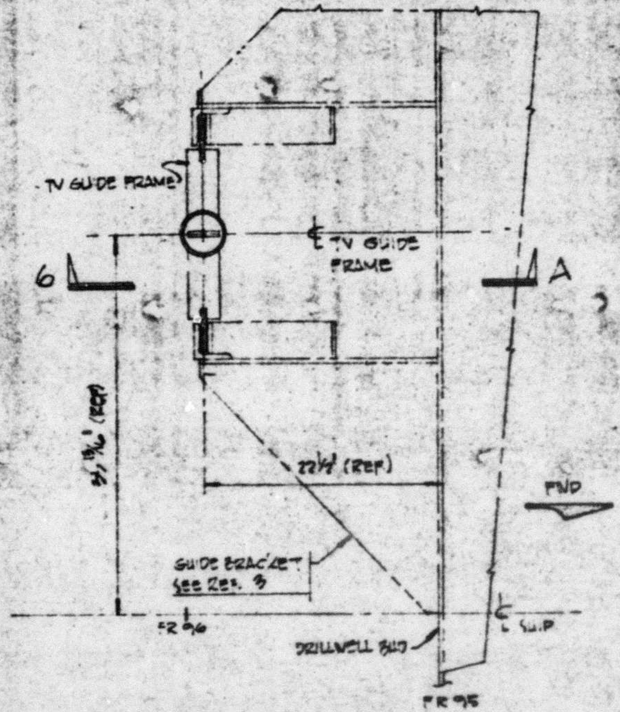
2½" SCH 40 PIPE (TYP)
3½" SCH 40 PIPE
SEE DETAIL 3·C
DETAIL 4·C
1½"=1'-0"
BOLT HOLE CENTERLINES
TO STRADDLE CENTER-
LINE OF SHIP
DETAIL 3·C
TV GUIDE FRAME
22½" (REF)
GUIDE BRACKET
SEE REF. 3
DRILLWELL BU
KEY PLAN @ MA
1½"=1'-0"
22½" (REF)
DRILLWELL BHD
CUT 16" X 22" OPENING
THRU DRILLWELL PLUG
EXIST 16" DIA OPENING
FWD
DRILLWELL PLUG
SEE REF. 7
PLAN 3·A
1"=1'-0"
TAIL 4·C
4
3
2



REFERENCE DRAWINGS

LEVINGSTON SHIPBUILDING CO

1. T-54-54-48 DRILLWELL BULKHEAD
2. T-54-54-#25 DRILL WELL PLUG
3. T-54-54 H412 & H415 PITOT LOG INSTALLATION & DETAILS



KEY PLAN @ MAIN DECK

1 1/2" = 1'-0"

NO. REQ'D.	NEXT ASSEMBLY
0	ALTERATION
3-2-9	DATE
	PURCHASING
	CONSTRUCTION
	ENGINEERING
	USCG
	ABS
10	CUSTOMER
1	WALLERSTEDT
1	DYE
1	BUCHANAN
1	BITCHELL
1	FARQUHAR
2	LIBRARY

	APPROVED	STANDARD OR CERTIFIED	ALT. NO.	LETTER DATE	FILE REF. NO.
A.B.S.					
U.S.C.G.					

TOTAL NET WGT. MATL. ______

TOTAL NET WGT. EQUIP. ______

TOTAL NET WEIGHT ______

NO.	DATE	BY	DESCRIPTION	JOB AUTH.	APPR.
0	4-7-81	MH	RELEASE FOR CONSTRUCTION	006-329000	

ALTERATIONS

GLOBAL MARINE DEVELOPMENT Inc.
Newport Beach, Calif.

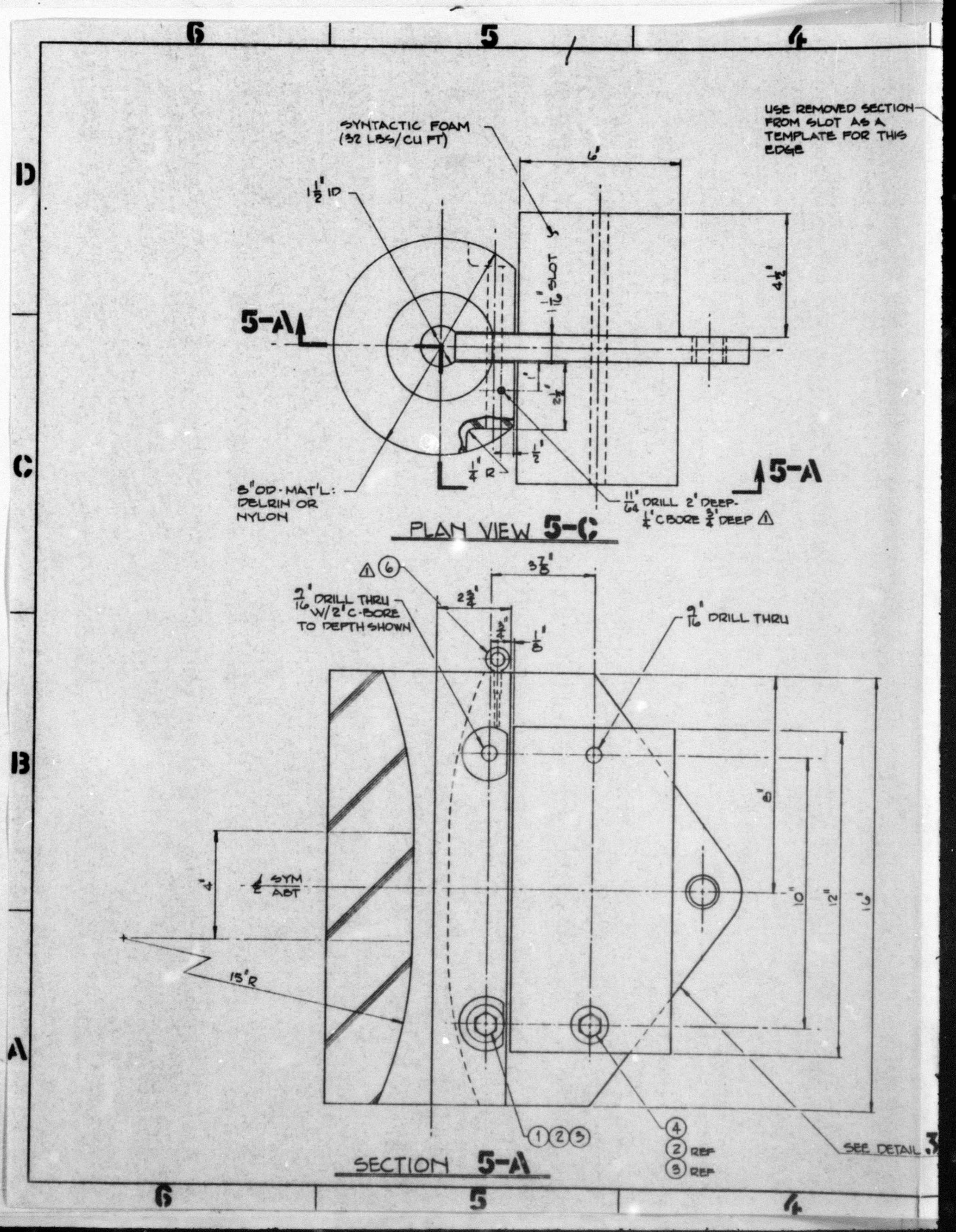
MARINE SEISMIC SYSTEM (MSS)

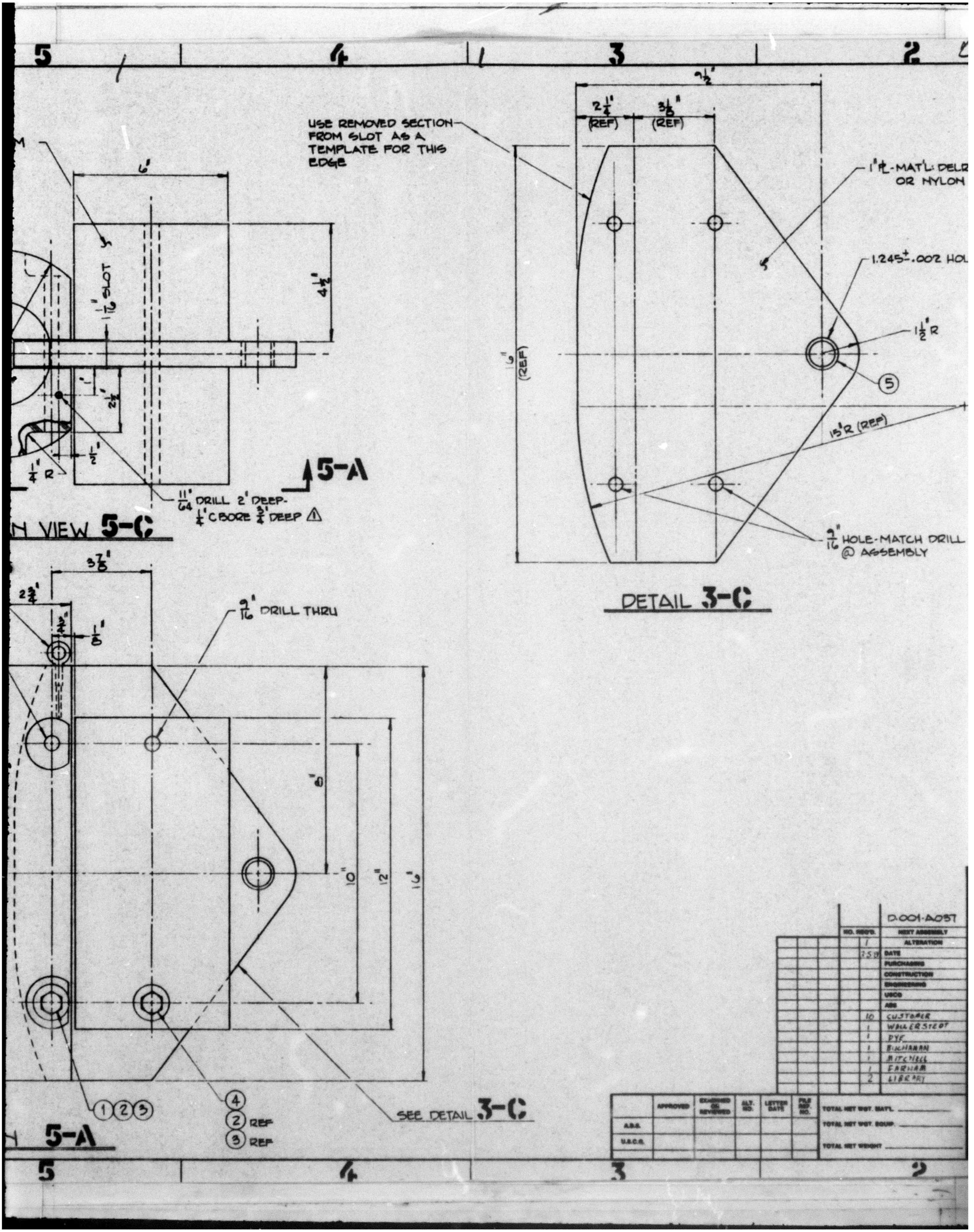
TV GUIDE FRAME
ASSEMBLY AND DETAILS

DFT. MCINTYRE	1-12-81	SCALE: AS NOTED	TOLERANCES UNLESS OTHERWISE NOTED
PROJ. W. BUCHANAN	1-19-81	JOB AUTH. 006-329000	DWG. NO. E 001 A034
CHK. FARQUHAR			SHT. 1 of 1
APPR. Buchanan	4/20/81		ALT. 0
Pudelkewicz	4/20/81		

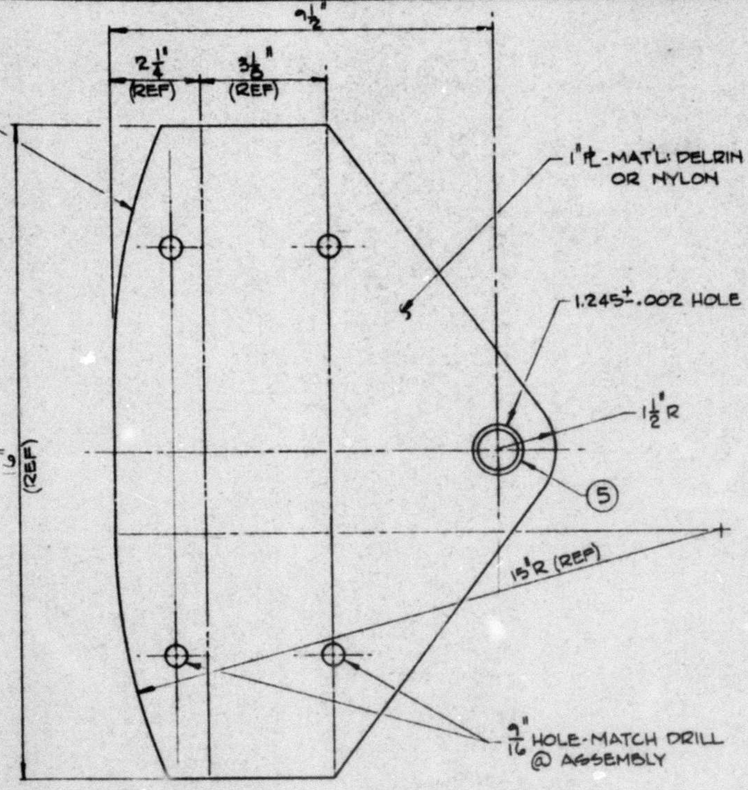
2 1

6


6
5
4
D
C
B
A
USE REMOVED SECTION FROM SLOT AS A TEMPLATE FOR THIS EDGE
SYNTACTIC FOAM (32 LBS/CU FT)
6"
1 1/2" ID
1 1/16" SLOT
4 1/2"
5-A
1/2"
2 1/4"
1/4" R
8" OD-MAT'L: DELRIN OR NYLON
11/64" DRILL 2" DEEP-
1/4" C BORE 3/4" DEEP
PLAN VIEW 5-C
6
3 7/8"
2 3/4"
7/16" DRILL THRU W/2" C-BORE TO DEPTH SHOWN
1/8"
9/16" DRILL THRU
8"
10"
12"
16"
4"
℄ SYM ABT
15" R
1 2 3
4
2 REF
3 REF
SEE DETAIL 3
SECTION 5-A



USE REMOVED SECTION FROM SLOT AS A TEMPLATE FOR THIS EDGE
1" PL-MAT'L: DELR
OR NYLON
1.245±.002 HOL
1½"R
15"R (REF)
9/16" HOLE-MATCH DRILL @ ASSEMBLY
DETAIL 3-C
6'
4½"
1 1/16" SLOT
5-A
11/64" DRILL 2' DEEP-
1/4" C'BORE 3/4" DEEP
N VIEW 5-C
3 7/8'
2 3/4'
9/16" DRILL THRU
SEE DETAIL 3-C
①②③
④
② REF
③ REF
N 5-A
D-001-A057
NO. REQ'D.
NEXT ASSEMBLY
ALTERATION
DATE
PURCHASING
CONSTRUCTION
ENGINEERING
USCG
ABS
CUSTOMER
WALLERSTEDT
DYE
BUCHANAN
MITCHELL
FARNHAM
LIBRARY
APPROVED
EXAMINED OR REVIEWED
ALT. NO.
LETTER DATE
FILE REF. NO.
ABS
USCG
TOTAL NET WGT. MAT'L.
TOTAL NET WGT. EQUIP.
TOTAL NET WEIGHT



DETAIL 3-C

LIST OF MATERIALS

OWNER FURN.	ITEM	QTY.	DESCRIPTION	MATERIAL OR DWG. NO.
	1	2	½"-13 UNC 2A x 7" LG GALV. HEX BOLT	STEEL
	2	8	½" GALV. PLAIN WASHER	
	3	4	½"-13 UNC 2B NYLOC STOP NUT	
	4	2	½"13 UNC 2A x 11" LG GALV. HEX BOLT	
	5	1	1.250±.001 OD x 1" ID x 1" LG BUSHING	316 S. STL
	6	1	¼" x 2" GALV. SCREW EYE BOLT (CROSBY G-275 OR EQUAL	STEEL

ALTERATIONS

NO.	DATE	BY	DESCRIPTION	JOB AUTH.	APPR.
1	3-2-81	NW	ADDED ITEM #6 (¼" SCREW EYE BOLT)	006-323000	
0	2-23-81	NW	RELEASE FOR CONSTRUCTION	006-323000	

D-001-A037

NO. REQ'D.	NEXT ASSEMBLY
1	ALTERATION
2-23-81	DATE
	PURCHASING
	CONSTRUCTION
	ENGINEERING
	USCG
	ABS
10	CUSTOMER
1	WALLERSTEDT
1	DYC
1	BUCHANAN
1	MITCHELL
1	FARHAM
2	LIBRARY

	APPROVED	EXAMINED OR REVIEWED	ALT. NO.	LETTER DATE	FILE REF. NO.
A.B.S.					
U.S.C.G.					

TOTAL NET WGT. MAT'L. ______

TOTAL NET WGT. EQUIP. ______

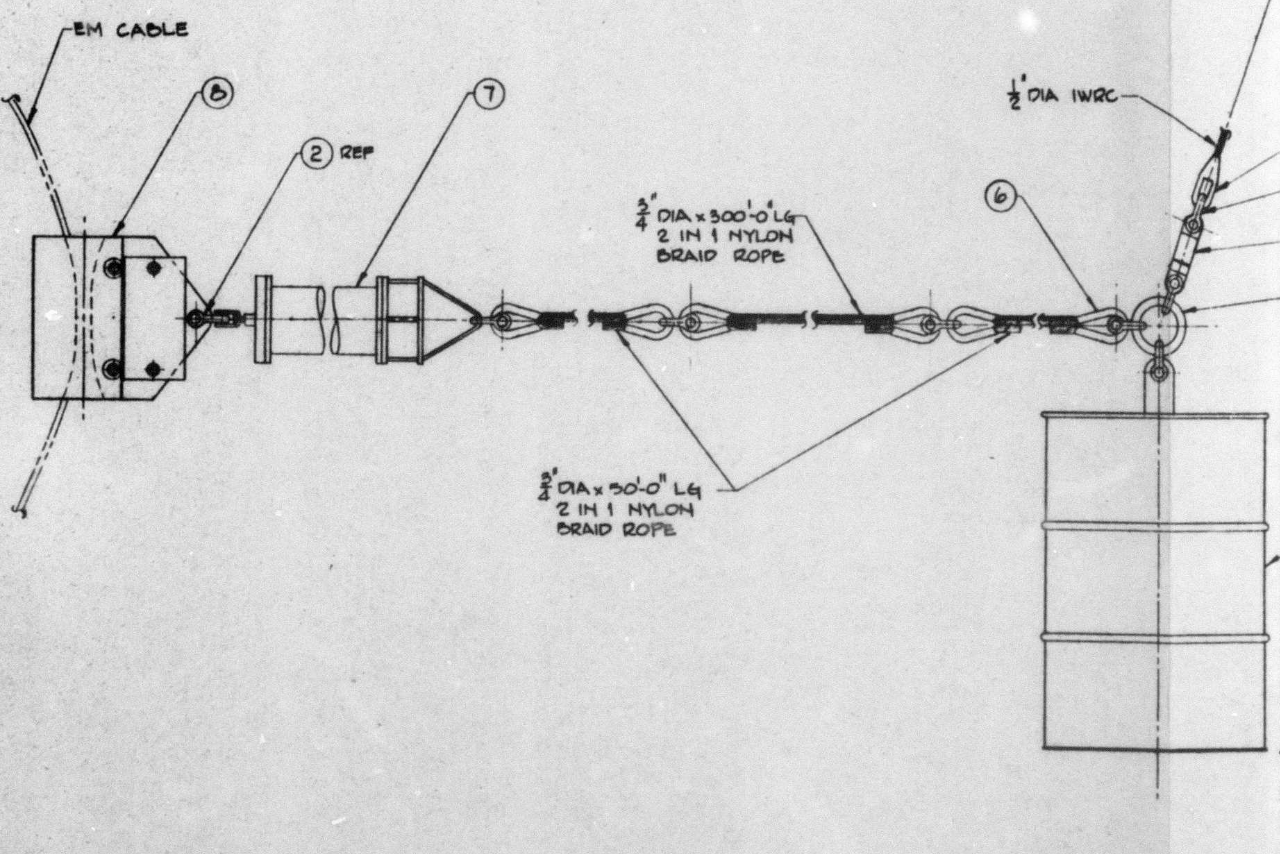
TOTAL NET WEIGHT ______

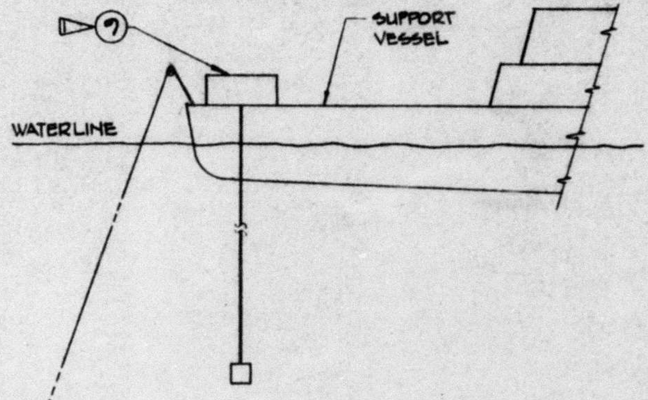
GLOBAL MARINE DEVELOPMENT INC.
Newport Beach, Calif.

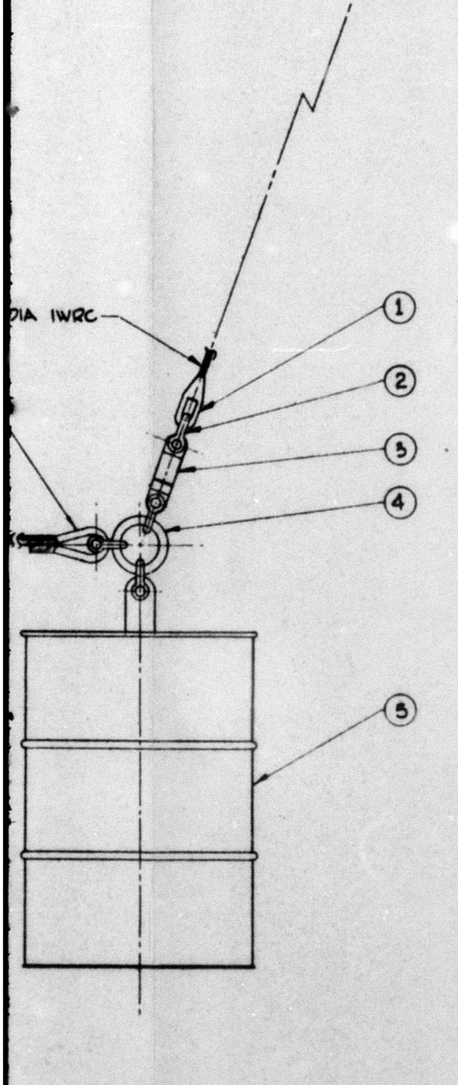
MARINE SEISMIC SYSTEM (MSS)
RUNNING FAIRLEADER DETAILS

	Date	SCALE	TOLERANCE UNLESS OTHERWISE NOTED
DFT. H. WAGNER	2-18-81	HALF SIZE	FRACTION ± 1/16" ANGULAR ± ½° MILLIMETER ± 1.500 ( ) DESIGNATES MILLIMETER DIMENSIONS
ENGR. N. Slade	2-20-81		
CHK. FARNHAM ZO	2-20-81	JOB AUTH. 006-323000	DWG. NO. D-001-A035 — SHT. 1 OF 1 — ALT. 1
APPR.			
REL.			

SEE DETAIL 3-C


EM CABLE
8
2 REF
7
3/4" DIA x 300'-0" LG
2 IN 1 NYLON
BRAID ROPE
6
1/2" DIA IWRC
3/4" DIA x 30'-0" LG
2 IN 1 NYLON
BRAID ROPE





LIST OF MATERIALS

OWNER FURN.	ITEM	QTY.	DESCRIPTION	MATERIAL OR DWG. NO.
	1	1	1/2" CLOSED SPELTER SOCKET (CROSBY G-417 OR EQUAL)	
	2	8	5/8" BOLT TYPE ANCHOR SHACKLE (CROSBY G-2130 OR EQUAL)	
	3	1	4 STL SWIVEL (MILLER TYPE 3, MODEL C OR EQUAL)	
	4	1	7/8" x 4" WELDLESS RING CROSBY S-643 OR EQUAL)	
	5	1	WEIGHT 2250# WET	
	6	6	3/4" ROPE THIMBLE GALVANIZED STEEL	
	7	1	RELEASE ACTUATOR (HELLE MODEL # 5207 OR EQUAL)	
	8	1	RUNNING FAIRLEADER	REF DWG #1
	9	1	COMMAND TRANSMITTER W/TRANSDUCER & 50 FT OF CABLE (HELLE MODEL 5148 OR EQUAL)	

GENERAL NOTES: (UNLESS OTHERWISE NOTED)

▷ ITEM (9) MAYBE PLACED ABOARD GLOMAR CHALLENGER.

REFERENCE DRAWINGS:

1. D-001-A035 MARINE SEISMIC SYSTEM (MSS) RUNNING FAIRLEADER DETAILS

NO.	DATE	BY	DESCRIPTION	JOB AUTH.	APPR.
0	2-23-81	NW	RELEASE FOR CONSTRUTION	006-323000	3/2/81

ALTERATIONS

NO. REQ'D.	NEXT ASSEMBLY
0	ALTERATION
3-3-81	DATE
	PURCHASING
	CONSTRUCTION
	ENGINEERING
	USCG
	ABS
10	CUSTOMER
1	WALLERSTEDT
1	DYE
1	BUCHANAN
1	MITCHELL
1	FARNAM
2	LIBRARY

GLOBAL MARINE DEVELOPMENT Inc.
Newport Beach, Calif.

MARINE SEISMIC SYSTEM (MSS)
DUAL SHIP ENTANGLEMENT SYSTEM ASSEMBLY

	APPROVED	EXAMINED OR REVIEWED	ALT. NO.	LETTER DATE	FILE REF. NO.
A.B.S.					
U.S.C.G.					

TOTAL NET WGT. MAT'L. ______
TOTAL NET WGT. EQUIP. ______
TOTAL NET WEIGHT ______

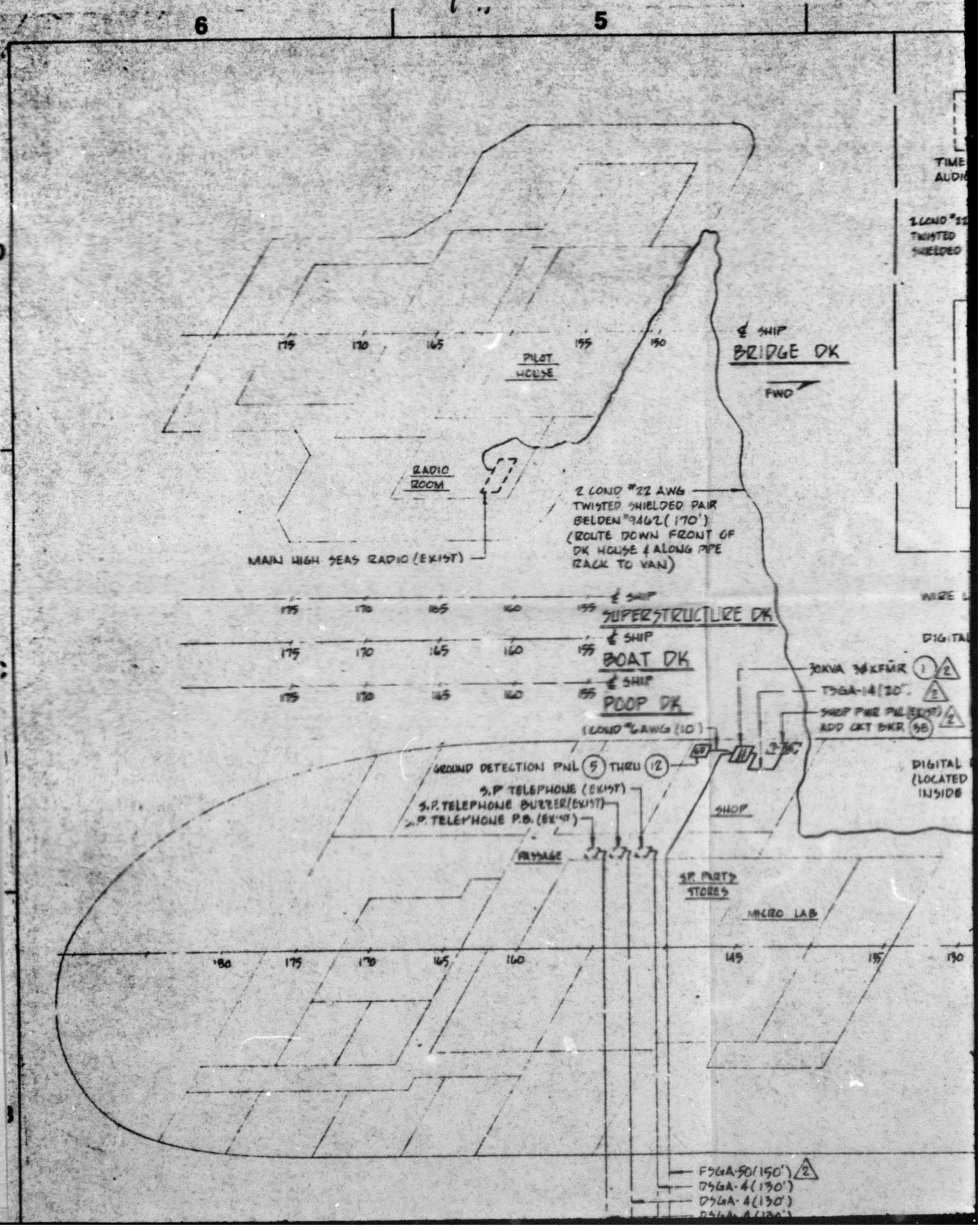
	Initial	Date
DFT.	WAGNER	2-17-81
ENGR.	N. Stolz	2-20-81
CHK.	Farisham	20 Feb 81
APPR.		2/23/81
REL.		2/2/81

SCALE: NONE

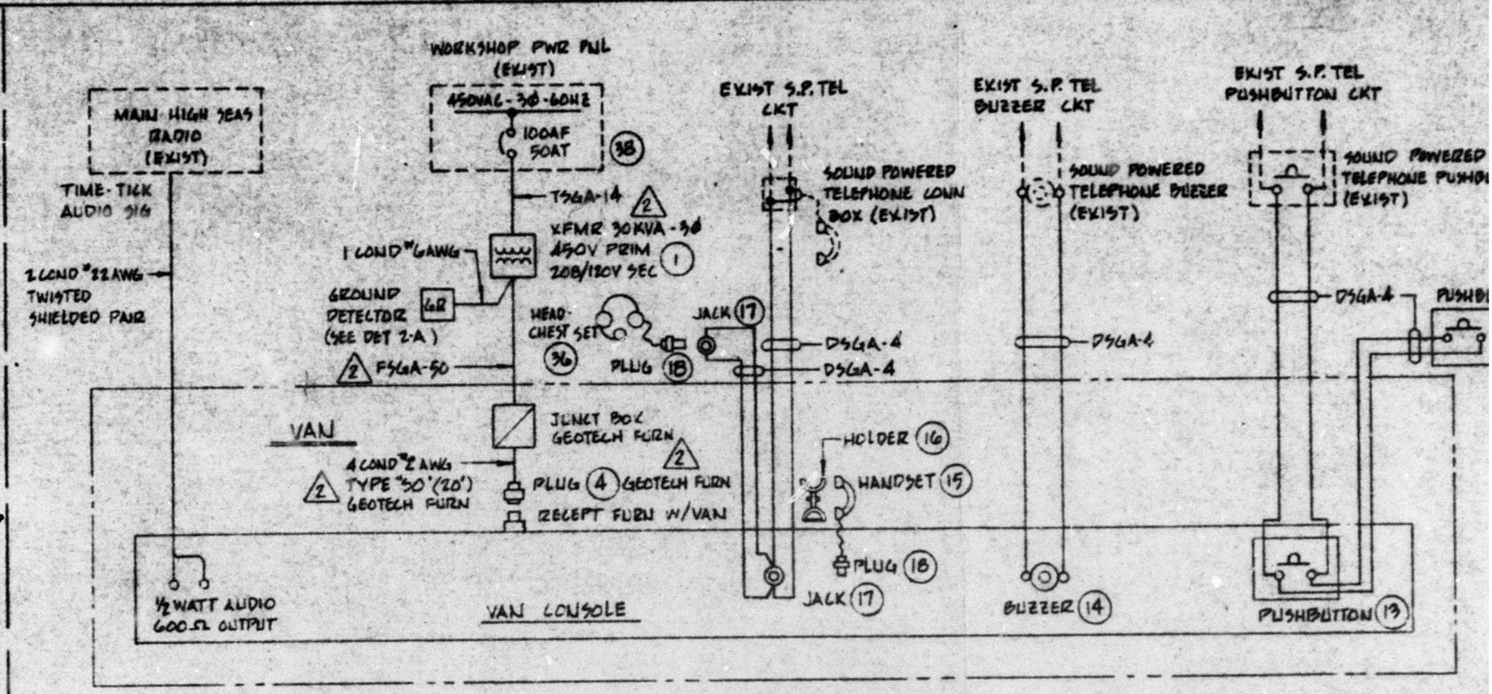
JOB AUTH. 006-323000

TOLERANCE UNLESS OTHERWISE NOTED: FRACTION ± 1/16" ANGULAR ± ½° MILLIMETER ± 1. MM ( ) DESIGNATES MILLIMETER DIMENSIONS

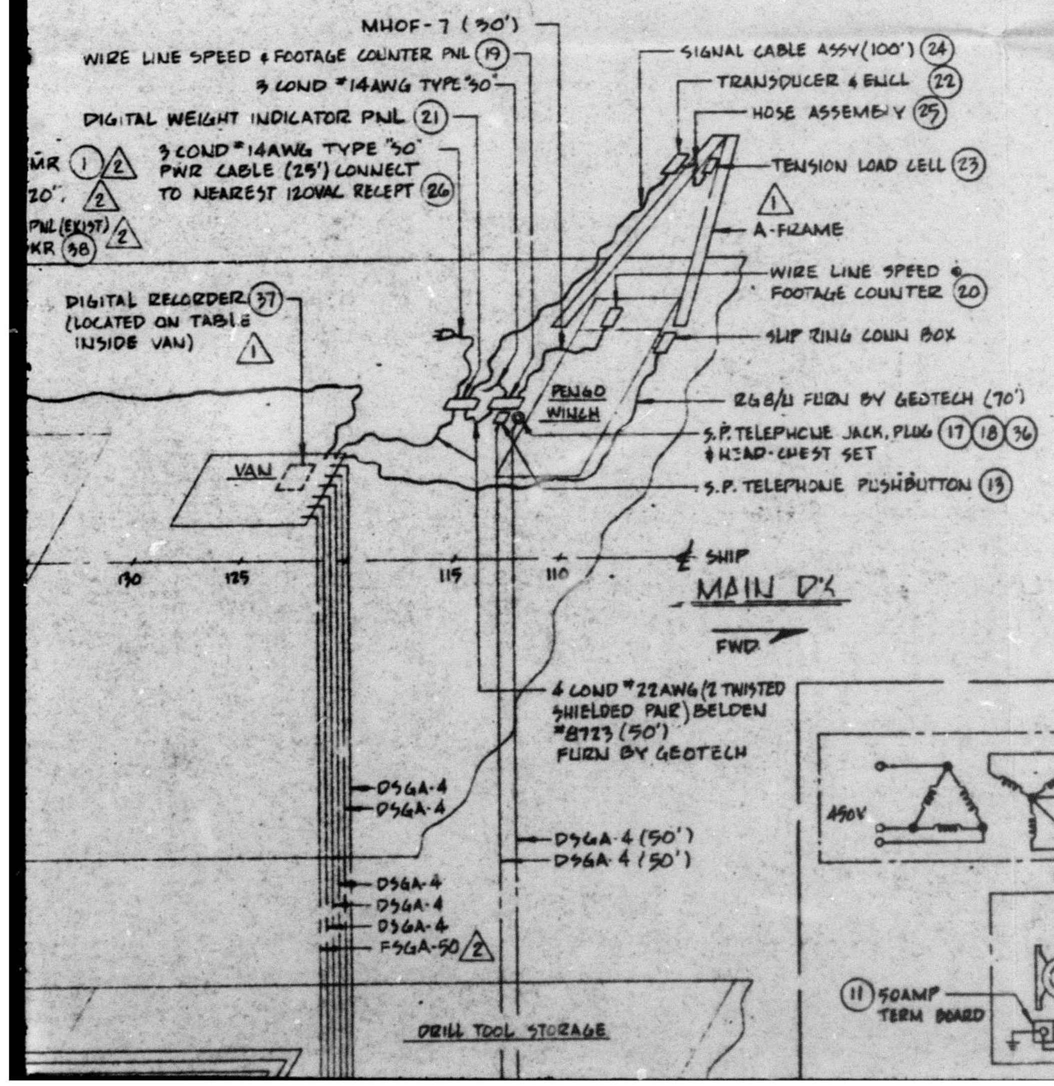
DWG. NO. D • 001 • A037 SHT. 1 of 1


6
5
℄ SHIP
BRIDGE DK
FWD
PILOT HOUSE
RADIO ROOM
2 COND #22 AWG TWISTED SHIELDED PAIR BELDEN #9462 (170') (ROUTE DOWN FRONT OF DK HOUSE & ALONG PIPE RACK TO VAN)
MAIN HIGH SEAS RADIO (EXIST)
℄ SHIP
SUPERSTRUCTURE DK
℄ SHIP
BOAT DK
℄ SHIP
POOP DK
1 COND #6AWG (10')
GROUND DETECTION PNL 5 THRU 12
S.P. TELEPHONE (EXIST)
S.P. TELEPHONE BUZZER (EXIST)
S.P. TELEPHONE P.B. (EXIST)
30KVA 3Φ XFMR 1 2
TSGA-14 (20') 2
SHIP PWR PNL (EXIST) ADD CKT BKR 38 2
SHOP
PASSAGE
S.P. PARTY STORES
MICRO LAB
FSGA-50 (150') 2
DSGA-4 (130')
DSGA-4 (130')
TIME AUDIO
2 COND #22 TWISTED SHIELDED
WIRE L
DIGITAL
DIGITAL (LOCATED INSIDE

4	3	2



BLOCK WIRING DIAGRAM

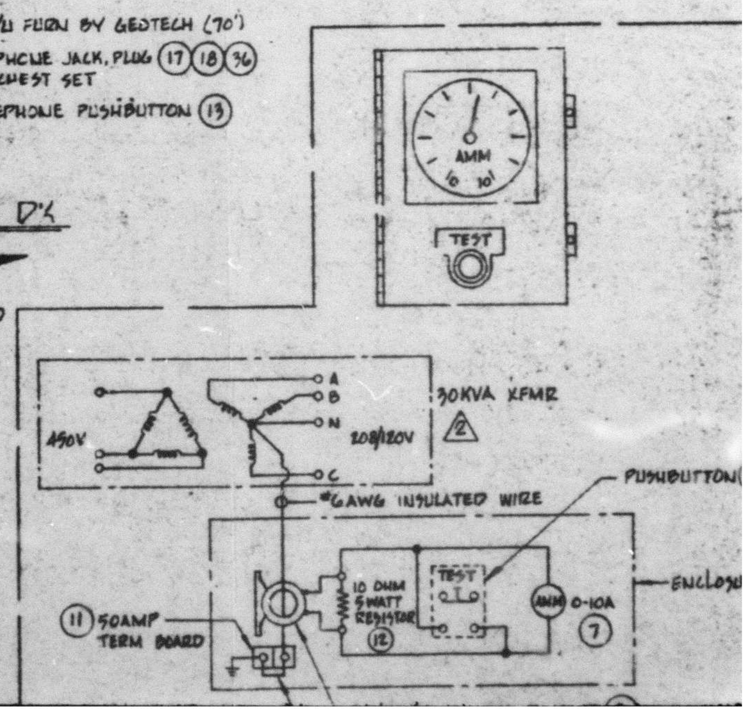


NOTES:

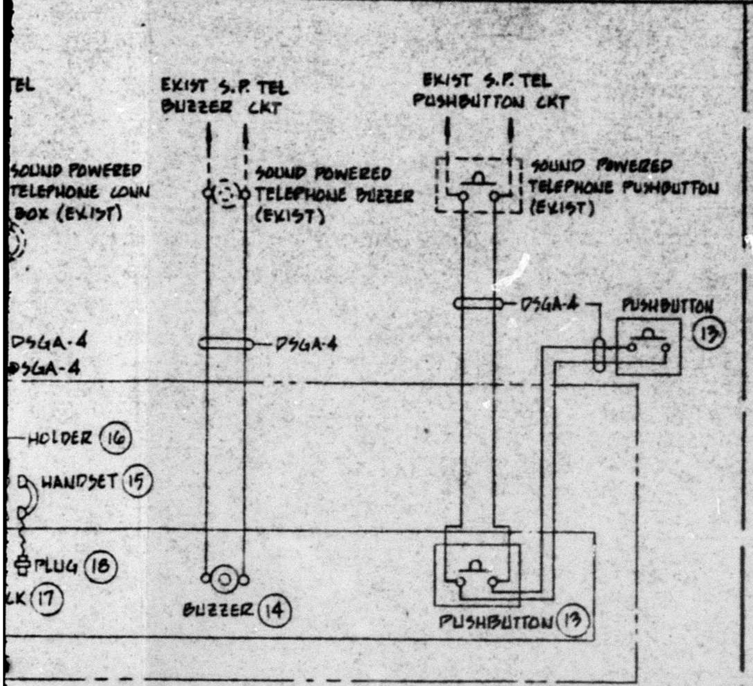
1. TEMPORARY INSTRUMENTATION CABLES TO ... TO STRUCTURE TO PREVENT PHYSICAL DAM... OCCURRING DURING PROJECT OPERATION.
2. WIRE ONE EACH (36) HEAD-CHEST SET INTO D... PILOT HOUSE "E" CALL SOUND POWERED TELEPH... FOR "HANDS FREE" COMMUNICATION TO WINCH & VAN

REFERENCES:

1. E-001-A012 (MSS) GLOMAR CHALLENGER ARRANGEMENT



2 1 3



NG DIAGRAM

(100') (24)
ENCL (22)
MBLY (25)
LOAD CELL (23)
E SPEED &
COUNTER (20)
CONN BOX
BY GEOTECH (70')
LK, PLUG (17) (18) (36)
T
PUSHBUTTON (13)

NOTES:

1. TEMPORARY INSTRUMENTATION CABLES TO BE STRAPPED TO STRUCTURE TO PREVENT PHYSICAL DAMAGE FROM OCCURRING DURING PROJECT OPERATION.
2. WIRE ONE EACH (36) HEAD-CHEST SET INTO DRILLER'S AND PILOT HOUSE "E" CALL SOUND POWERED TELEPHONE JUNCT BOX FOR "HANDS FREE" COMMUNICATION TO WINCH & VAN CONSOLE AREAS.

REFERENCES:

1. E-001-A012 (MSS) GLOMAR CHALLENGER INSTALLATION ARRANGEMENT

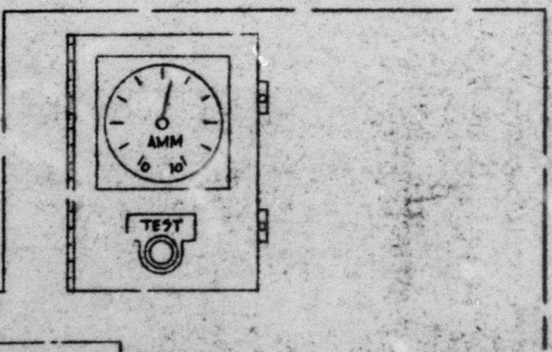
1

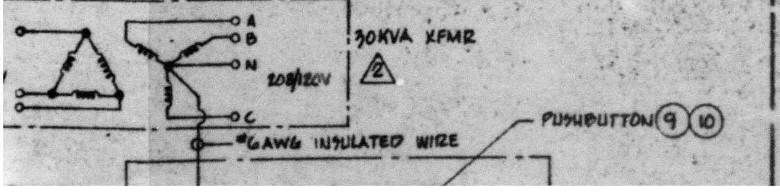
	OWNER FURN.	ITEM	QTY.	DESCRIPTION	MATERIAL OR DWG. NO.
				LIST OF MATERIALS	
△2		1	1	TRANSFORMER 30KVA, 3Ø, 480VAC PRI, 208/120VAC SEC	GEN ELECT 9T23B3872
△2		2			
△2		3			
△2		4	1	PLUG 4 POLE 4 WIRE 100A 240VAC	GEOTECH FURN
		5	1	ENCLOSURE 8"x6"x6" OIL TIGHT	HOFFMAN A-806CH
		6	1	INTERIOR PANEL FOR ITEM 5	HOFFMAN A-8P6
		7	1	AMMETER 4" DIAL, AC, 0-10A SCALE, FULL SCALE DEFLECTION	GEN ELECT 50-103 131LSNT
		8	1	CURRENT XFMR 10/5 RATIO	MIDWEST ELECT PROD 2CT210
		9	1	PUSHBUTTON 1 N.O. & 1 N.C. CONTACT BLOCK, BLACK BUTTON	GEN ELECT CR2940[illegible]
		10	1	NAMEPLATE MARKED "TEST" EXTRA LARGE FOR PUSHBUTTON	GEN ELECT NP-161658A
		11	1	TERMINAL BLOCK 2 POINT 50AMP	GEN ELECT CR2960[illegible]
		12	1	RESISTOR 10 OHM 5 WATT	
		13	2	PUSHBUTTON 120VAC W/N.O. SPRING RETURN CONTACTS	BENJAMIN 8493
		14	1	BUZZER 115VAC, 60HZ	BENJAMIN 8797-115V
		15	1	SOUND PWR TELEPHONE HANDSET	HOSE McCANN A-360
		16	1	SOUND PWR TELEPHONE HANDSET HOLDER	HOSE McCANN A-281
		17	2	JACK FOR SOUND PWR TELEPHONE	HOSE McCANN A-530
		18	2	PLUG FOR SOUND PWR TELEPHONE JACK	HOSE McCANN A-529
△1		19	1	WIRE LINE SPEED & FOOTAGE COUNTER METER PANEL	SEA-MAC
△1		20	1	WIRE LINE SPEED & FOOTAGE COUNTER	SEA-MAC
		21	1	DIGITAL WEIGHT INDICATOR PANEL	MARTIN-DECKER
		22	1	TRANSDUCER IN NEMA-12 ENCLOSURE	MARTIN DECKER H100361
		23	1	TENSION LOAD CELL	MARTIN-DECKER E[illegible]-2EE
		24	1	SIGNAL CABLE ASSY 100 FT LONG	MARTIN-DECKER DWC 208
		25	1	HOSE ASSY	MARTIN-DECKER J134-3
		26	1	3 COND #14AWG TYPE "SO" EXT CORD W/MOLDED PLUG 25' LONG	
		27	10'	1 COND #6AWG INSULATED WIRE	
△2		28	20'	4 COND #2 AWG TYPE "SO"	GEOTECH FURN
		29	170'	2 COND #22 AWG TWISTED SHIELDED PAIR	BELDEN #9462
		30	490'	DSGA-4 CABLE	
△2		31	20'	TSGA-14 CABLE	
△2		32	155'	FSGA-50 CABLE	
		33	30'	MHOF-7 FLEX CABLE	
		34	70'	RG 8/U COAX	GEOTECH FURN
		35	30'	4 COND #22 AWG (2 TWISTED SHIELDED PAIR BELDEN #8723	GEOTECH FURN
		36	3	SOUND PWR TELEPHONE HEAD-CHEST SET	HOSE McCANN A-330

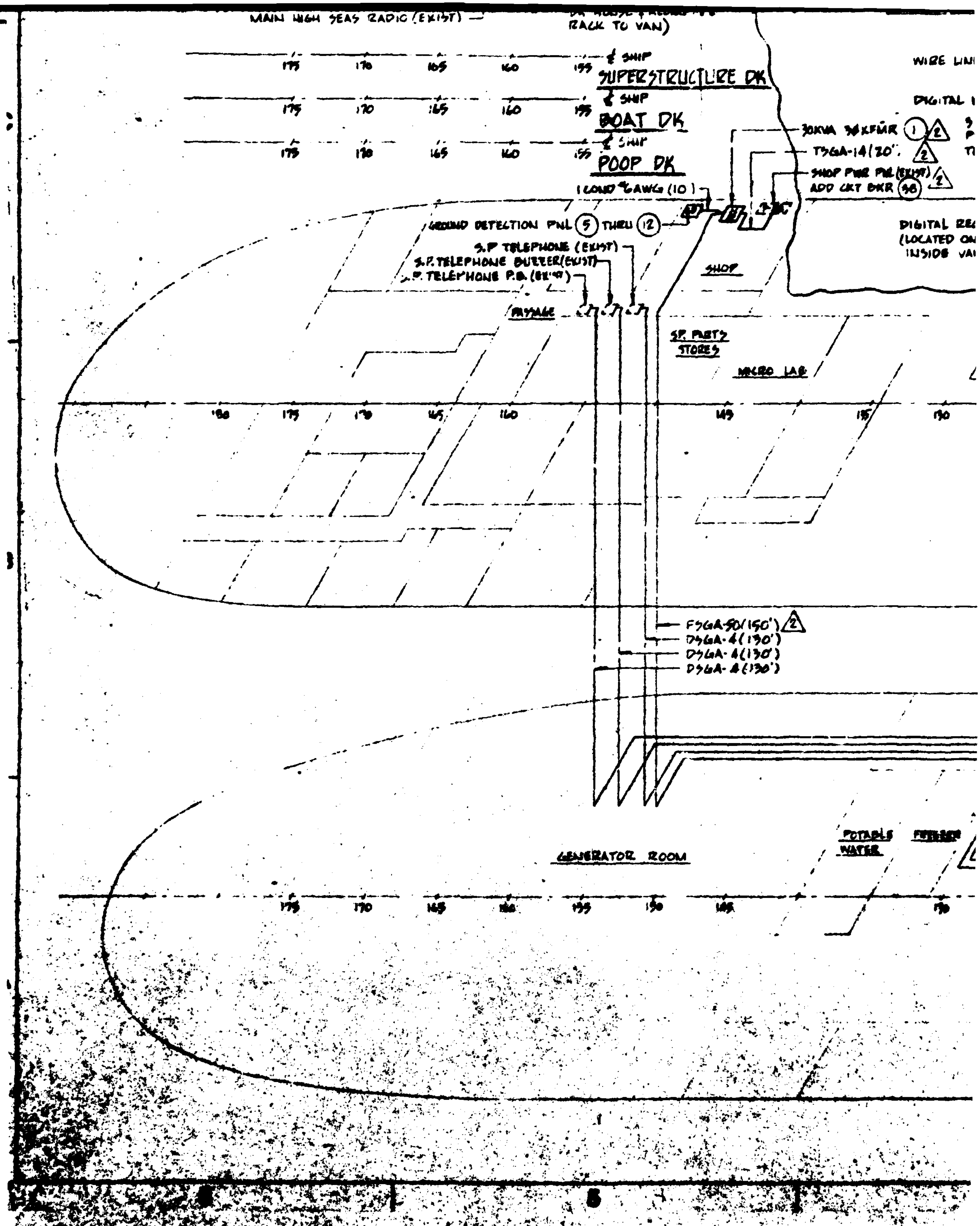
D

C

B







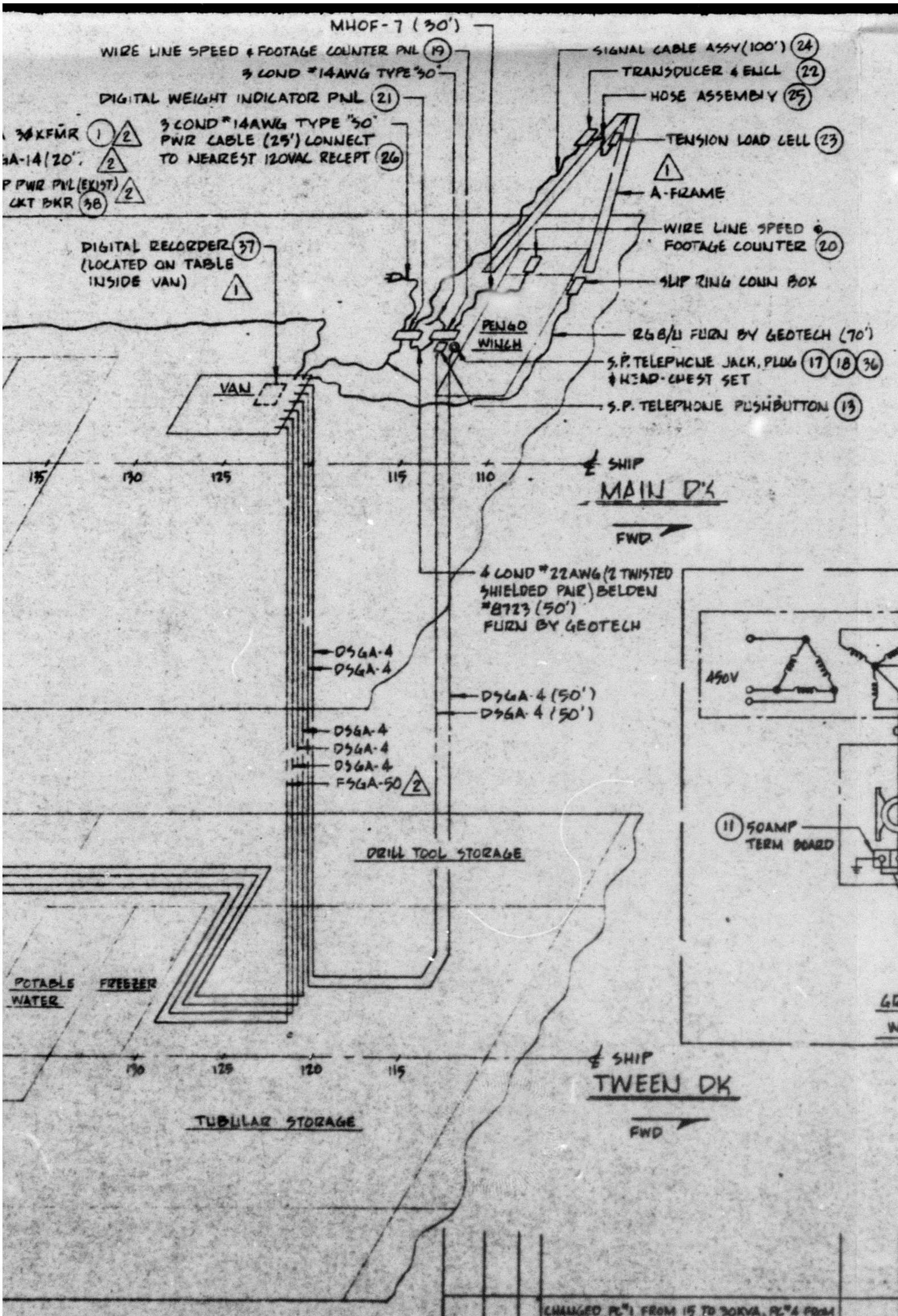
MAIN HIGH SEAS RADIO (EXIST)
RACK TO VAN)
℄ SHIP
SUPERSTRUCTURE DK
℄ SHIP
BOAT DK
℄ SHIP
POOP DK
1 COND #6 AWG (10)
GROUND DETECTION PNL (5) THRU (12)
S.P. TELEPHONE (EXIST)
S.P. TELEPHONE BUZZER (EXIST)
S.P. TELEPHONE P.B. (EXIST)
30KVA 3Φ XFMR (1) 2
TSGA-14 (20'). 2
SHOP PWR PNL (EXIST) 2
ADD CKT BKR (36)
WIRE LIN
DIGITAL
DIGITAL RE
(LOCATED ON
INSIDE VA
SHOP
PASSAGE
SP. PARTS STORES
MICRO LAB
FSGA-50 (150') 2
DSGA-4 (130')
DSGA-4 (130')
DSGA-4 (130')
GENERATOR ROOM
POTABLE WATER
175
170
165
160
155
150
145
135
130
180

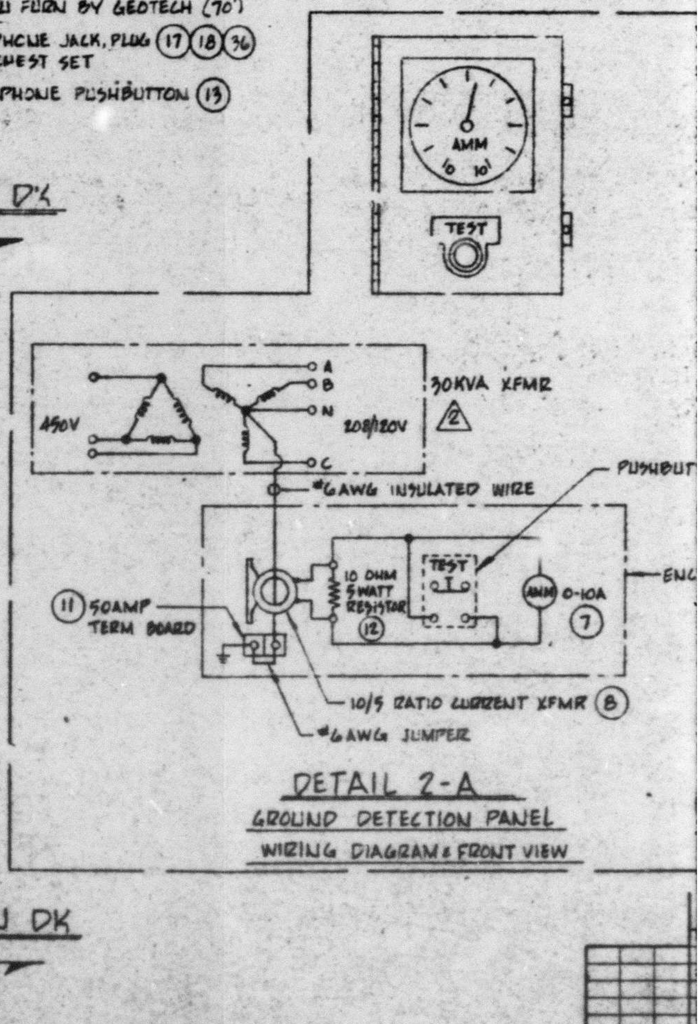
NOTES:

1. TEMPORARY INSTRUMENTATION CABLES TO STRUCTURE TO PREVENT PHYSICAL OCCURRING DURING PROJECT OPERATI
2. WIRE ONE EACH (36) HEAD-CHEST SET IN PILOT HOUSE "E" CALL SOUND POWERED TE FOR "HANDS FREE" COMMUNICATION TO WINCH

REFERENCES:

1. E-001-A012 (MSS) GLOMAR CHALLE ARRANGEMENT





DETAIL 2-A
GROUND DETECTION PANEL
WIRING DIAGRAM & FRONT VIEW

NO.	DATE	BY	DESCRIPTION	JOB AUTH	APPR
2	[illegible]	[illegible]	CHANGED PC#1 FROM 15 TO 30KVA, PC#4 FROM 30A TO 100A GEOTECH FURN, PC#26 FROM #8AWG TO #2AWG GEOTECH FURN, PC#31 FROM T-4 TO T-14, PC#32 FROM F-9 TO F-50 DELETED PC#2 DISC SW & PC#3 FUSES ADDED PC#38	00006 323000	[illegible]

	APPROVED	DRAWING OR REVIEWED	ALT. NO.	LETTER DATE	FILE REF NO.
A.B.S.					
U.S.C.G.					

4 3 2

5

(100') (24)
ENCL (22)
MBLY (25)
OAD CELL (23)
E SPEED &
OUNTER (20)
CONN BOX
BY GEOTECH (70')
CK, PLUG (17) (18) (36)
T
PUSHBUTTON (13)

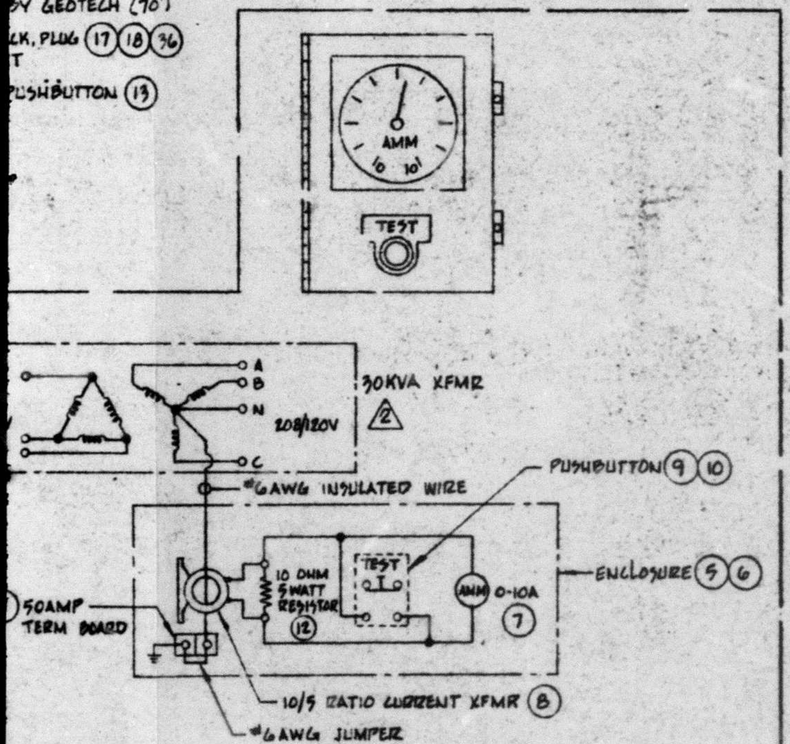
NOTES:

1. TEMPORARY INSTRUMENTATION CABLES TO BE STRAPPED TO STRUCTURE TO PREVENT PHYSICAL DAMAGE FROM OCCURRING DURING PROJECT OPERATION.
2. WIRE ONE EACH (36) HEAD-CHEST SET INTO DRILLER'S AND PILOT HOUSE "E" CALL SOUND POWERED TELEPHONE JUNCT BOX FOR "HANDS FREE" COMMUNICATION TO WINCH & VAN CONSOLE AREAS.

REFERENCES:

1. E-001-A012 (MSS) GLOMAR CHALLENGER INSTALLATION ARRANGEMENT

	15	1	SOUND PWR TELEPHONE HANDSET	HOSE MCCANN A-560
	16	1	SOUND PWR TELEPHONE HANDSET HOLDER	HOSE MCCANN A-281
	17	2	JACK FOR SOUND PWR TELEPHONE	HOSE MCCANN A-530
	18	2	PLUG FOR SOUND PWR TELEPHONE JACK	HOSE MCCANN A-529
△1	19	1	WIRE LINE SPEED & FOOTAGE COUNTER METER PANEL	SEA-MAC
△1	20	1	WIRE LINE SPEED & FOOTAGE COUNTER	SEA-MAC
	21	1	DIGITAL WEIGHT INDICATOR PANEL	MARTIN-DECKER
	22	1	TRANSDUCER IN NEMA-12 ENCLOSURE	MARTIN DECKER H10036A
	23	1	TENSION LOAD CELL	MARTIN-DECKER E35D-2EE
	24	1	SIGNAL CABLE ASSY 100 FT LONG	MARTIN-DECKER D1C200
	25	1	HOSE ASSY	MARTIN-DECKER [illegible]
	26	1	3 COND #14AWG TYPE "SO" EXT CORD W/MOLDED PLUG 25' LONG	
	27	10'	1 COND #6AWG INSULATED WIRE	
△2	28	20'	4 COND #2 AWG TYPE "SO"	GEOTECH FURN
	29	170'	2 COND #22 AWG TWISTED SHIELDED PAIR	BELDEN #9462
	30	490'	DSGA-4 CABLE	
△2	31	20'	TSGA-14 CABLE	
△2	32	155'	FSGA-50 CABLE	
	33	30'	MHOF-7 FLEX CABLE	
	34	70'	RG 8/U COAX	GEOTECH FURN
	35	50'	4 COND #22 AWG/2 TWISTED SHIELDED PAIR BELDEN #8723	GEOTECH FURN
	36	3	SOUND PWR TELEPHONE HEAD-CHEST SET	HOSE MCCANN A-330
△1	37	1	DIGITAL RECORDER (BCD INTERFACE)	HEWLETT-PACKARD 5055A
△2	38	1	CIRCUIT BREAKER 100AF-50AT 450VAC, 3 POLE	GEN ELECT TED-134050



DETAIL 2-A
GROUND DETECTION PANEL
WIRING DIAGRAM & FRONT VIEW

ALTERATIONS CONTINUED AT ZONE 3A

NO.	DATE	BY	DESCRIPTION	JOB AUTH.	APPD
△1	1/9/81	REE	CHANGED PC#19 & 20 FROM MARTIN DECKER TO SEA MAC, MOVED "A" FRAME FWD TO MEET LATEST DESIGN REQUIREMENTS, ADDED PC#37 DIGITAL CHART RECORDER TO INTERFACE WITH MARTIN-DECKER & SEA-MAC EQUIPMENT.	00006 323000	
0	11/20/80	REE	INITIAL RELEASE	00006 323000	

ALTERATIONS

NO. REQD.	NEXT ASSEMBLY
	ALTERATION
2	DATE
	PURCHASING
	CONSTRUCTION
	ENGINEERING
	USCG
	ABS
10	CUSTOMER
1	WALLERSTEIN
1	DYE
1	BOHANNAN
1	MITCHELL
1	PRASHAM
2	L. BRADY

...OKVA, PC#4 FROM ...PC#28 FROM ...FURN, PC#31 ...M F-4 TO F-50 ...C#3 FUSES	00006 323000	REE
	JOB AUTH	APPD

	APPROVED	DRAWINGS OR REVIEWED	ALT. NO.	LETTER DATE	FILE REF. NO.
A.B.S.					
U.S.C.G.					

TOTAL NET WGT. MATL. ____
TOTAL NET WGT. EQUIP. ____
TOTAL NET WEIGHT ____

GLOBAL MARINE DEVELOPMENT Inc.
Newport Beach, Calif.

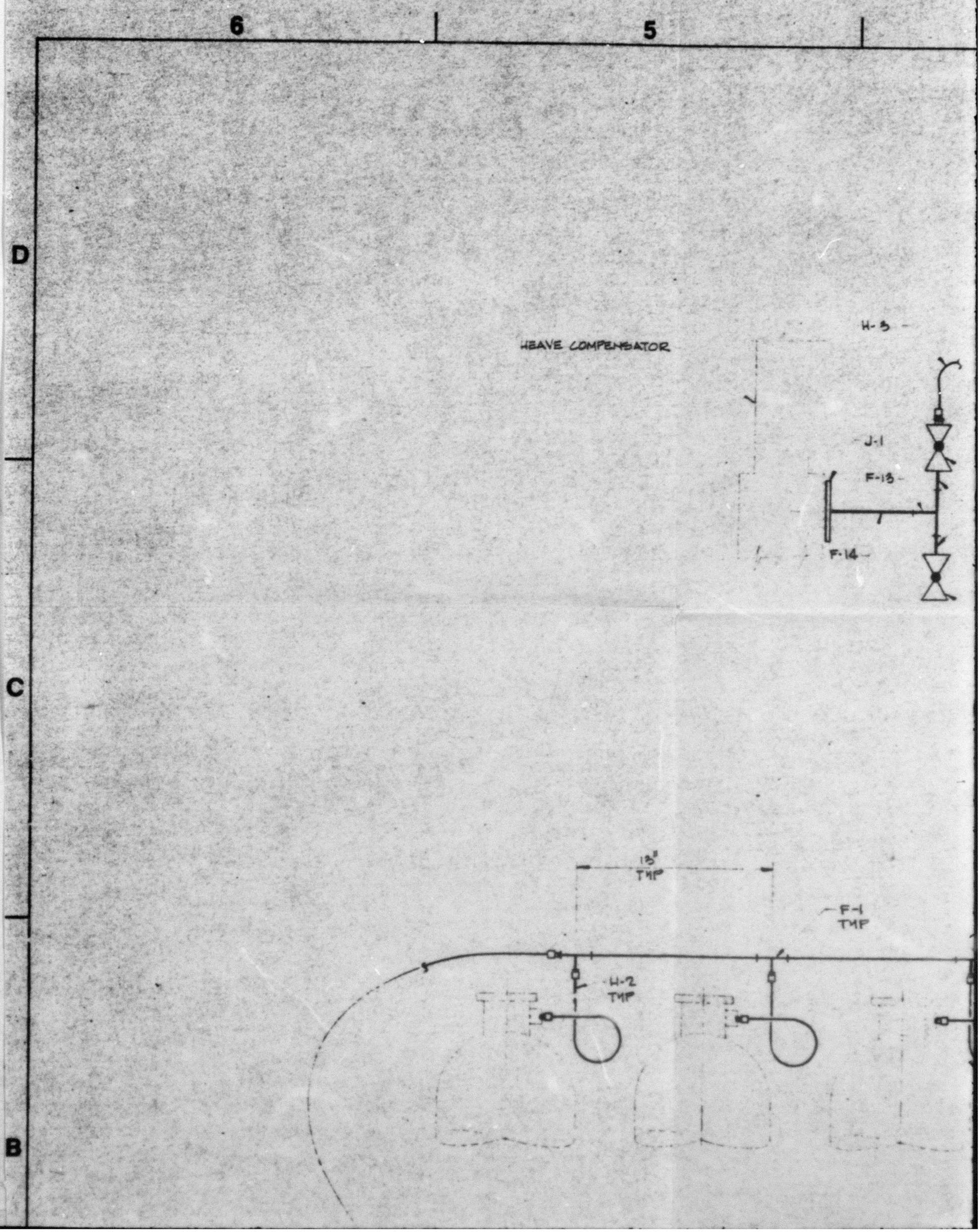
MARINE SEISMIC SYSTEM (MSS)
GLOMAR CHALLENGER
ELECTRICAL INSTALLATION

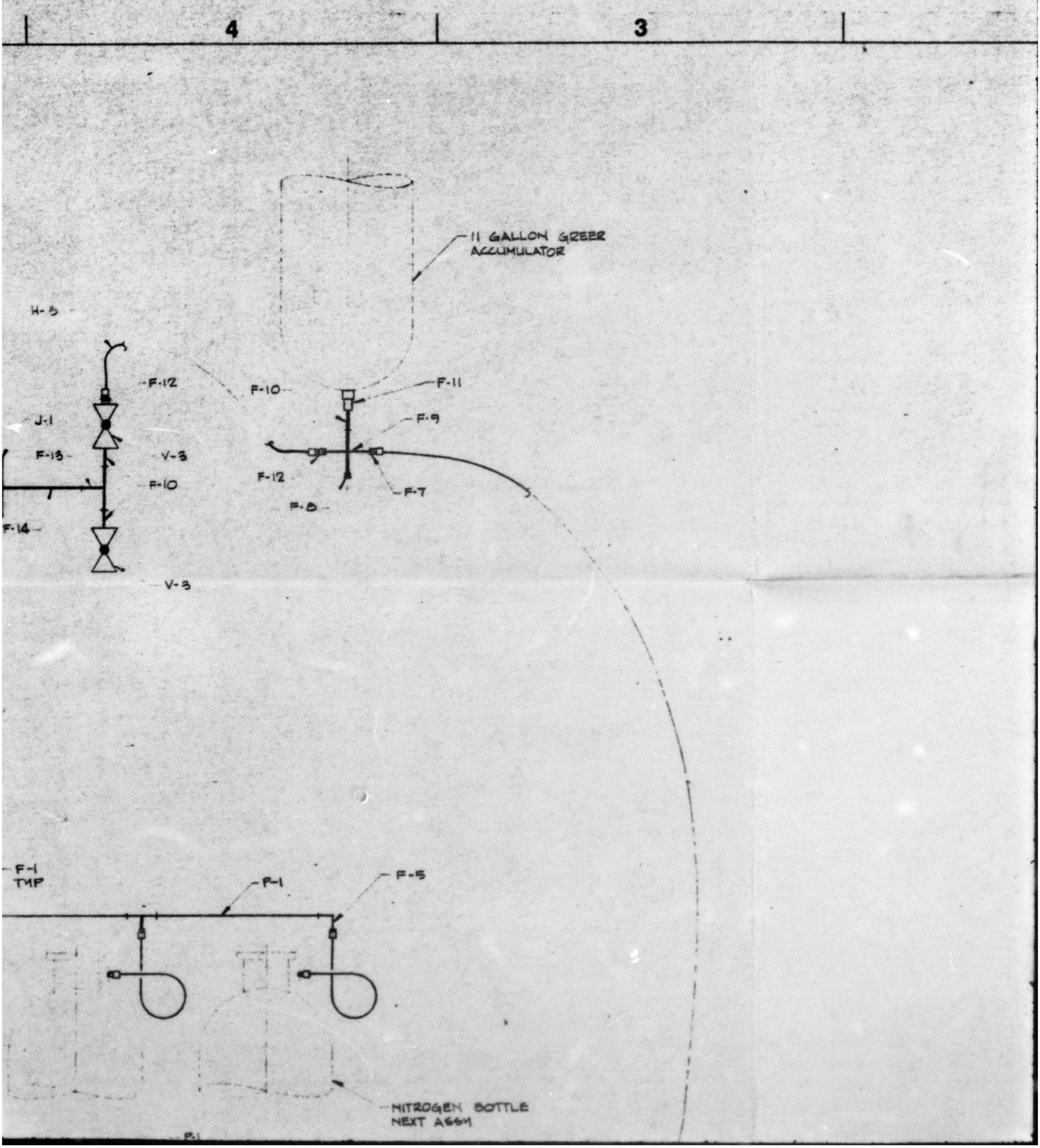
	NAME	DATE	SCALE	
DFT.	REE	11/10/80	1/8" = 1'-0" 1/4 ONLY	
DSGN.	REE	11/10/80		
CHK.	REE	11/12/80	JOB AUTH.	DWG. NO.
APPD.	[illegible]		00006 323000	E-001-E001 SHT 1 OF 1 ALT 2
APPD.	[illegible]			

2

1

1 6


6
5
D
C
B
HEAVE COMPENSATOR
H-3
J-1
F-13
F-14
13"
TYP
F-1
TYP
H-2
TYP



4
3
11 GALLON GREER ACCUMULATOR
H-3
F-12
J-1
F-13
V-3
F-10
F-14
V-3
F-10
F-11
F-9
F-12
F-7
F-8
F-1 TYP
P-1
F-5
NITROGEN BOTTLE NEXT ASSY
P-1

3

2 | 1

D

C

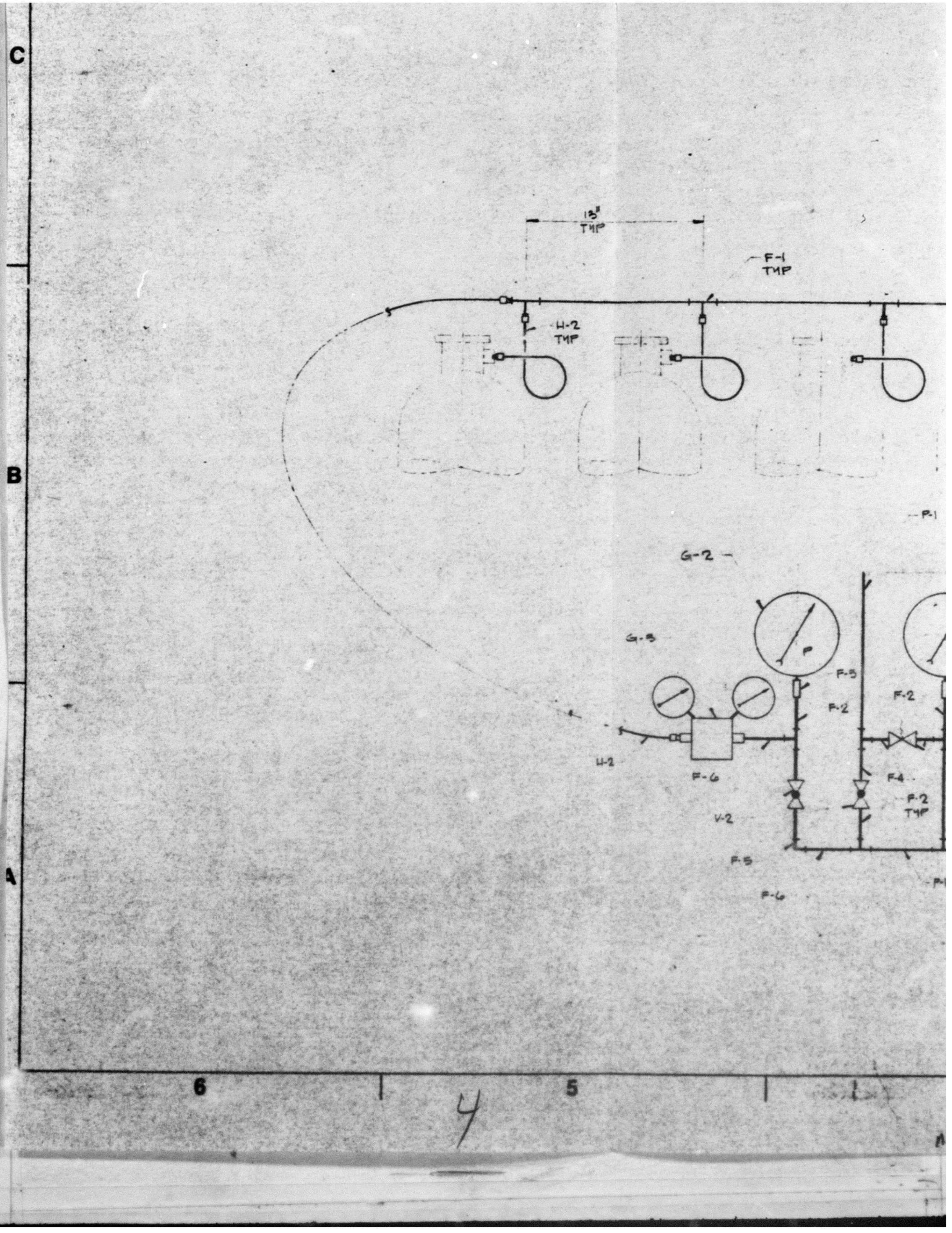
B

LIST OF MATERIALS

OWNER FURN.	ITEM	QTY.	DESCRIPTION	MATERIAL OR DWG. NO.
	F-1	8	1/4" THD TEE-3000#	ASTM A-105 GRADE A STL
	F-2	6	1/4"x3" LG THD NIPPLE SCH 80	ASTM A-5 GRADE-A-STL
	F-3	2	1/4" THD COUPLING-3000#	ASTM A-105 GRADE-A-STL
	F-4	2	1/4"x2" LG THD NIPPLE SCH 80	ASTM A-53 GRADE-A-STL
	F-5	2	1/4" THD 90° ELBOW 3000#	ASTM A-105 GRADE-A-STL
	F-6	2	1/4"x4" LG THD NIPPLE SCH 80	ASTM A-53 GRADE-A-STL
	F-7	1	1"x1/4" THD RED BUSHING 3000#	ASTM A-105 GRADE-A-STL
	F-8	1	1" THD PLUG-3000#	
	F-9	1	1" THD CROSS-3000#	
	F-10	3	1"x2" LG THD NIPPLE SCH 80	ASTM A-53 GRADE-A-STL
	F-11	1	2"x1" THD RED. BUSHING 3000#	ASTM A-105 GRADE-A-STL
	F-12	[illegible]	1" MALE THD/MALE JIC 37° FLARE HOSE ADAPTOR SYNFLEX 3A09-16A16	STEEL
	F-13	1	1" THD TEE-3000#	ASTM A-105 GRADE-A-STL
	F-14	1	1"x6" LG THD NIPPLE SCH 80	ASTM A-53 GRADE-A-STL
	G-1	1	GAUGE - 6" DIA 500-1500 PSI	
	G-2	1	GAUGE - 6" DIA 500-2500 PSI	
	G-3	1	REGULATOR - INLET PRESS 2360 PSI OUTLET PRESS FROM 500 PSI TO 1500 PSI 1/4" NPT	
	H-1	1	1/4" SYNFLEX HOSE x 70 FT LG W/ MALE PIPE SWIVEL ENDS - TYPE 3133-04-140-140-840	
	H-2	3	1/4" SYNFLEX HOSE x 18" LG W/MALE PIPE SWIVEL ENDS TYPE 3133-04	
	H-3	1	1" SYNFLEX HOSE x 10 FT LG W/ FEMALE SWIVEL ENDS-TYPE 2300-16	
	J-1	1	PIPE THREADED O-RING FLANGE 3000 PSI	
	P-1	5FT	1/4" SCH 80 PIPE	ASTM A-53 GRADE-A-STL
	V-1	1	1/4" THD IN-LINE RELIEF VALVE SET @ 1500 PSI	STEEL
	V-2	2	1/4" BALL VALVE	
	V-3	2	1" BALL VALVE	

GENERAL NOTES: (UNLESS OTHERWISE NOTED)

1. REMOVE GAUGES WHEN PRESSURE TESTING.
2. ALL PIPING TO BE TESTED AT 2500 PSI.
3. GAG RELIEF VALVE (V-1) DURING PRESSURE TESTING.



C
B
A
13"
TYP
F-1
TYP
H-2
TYP
P-1
G-2
G-3
P
F-3
F-2
F-2
F-2
H-2
F-6
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V-2
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F-6
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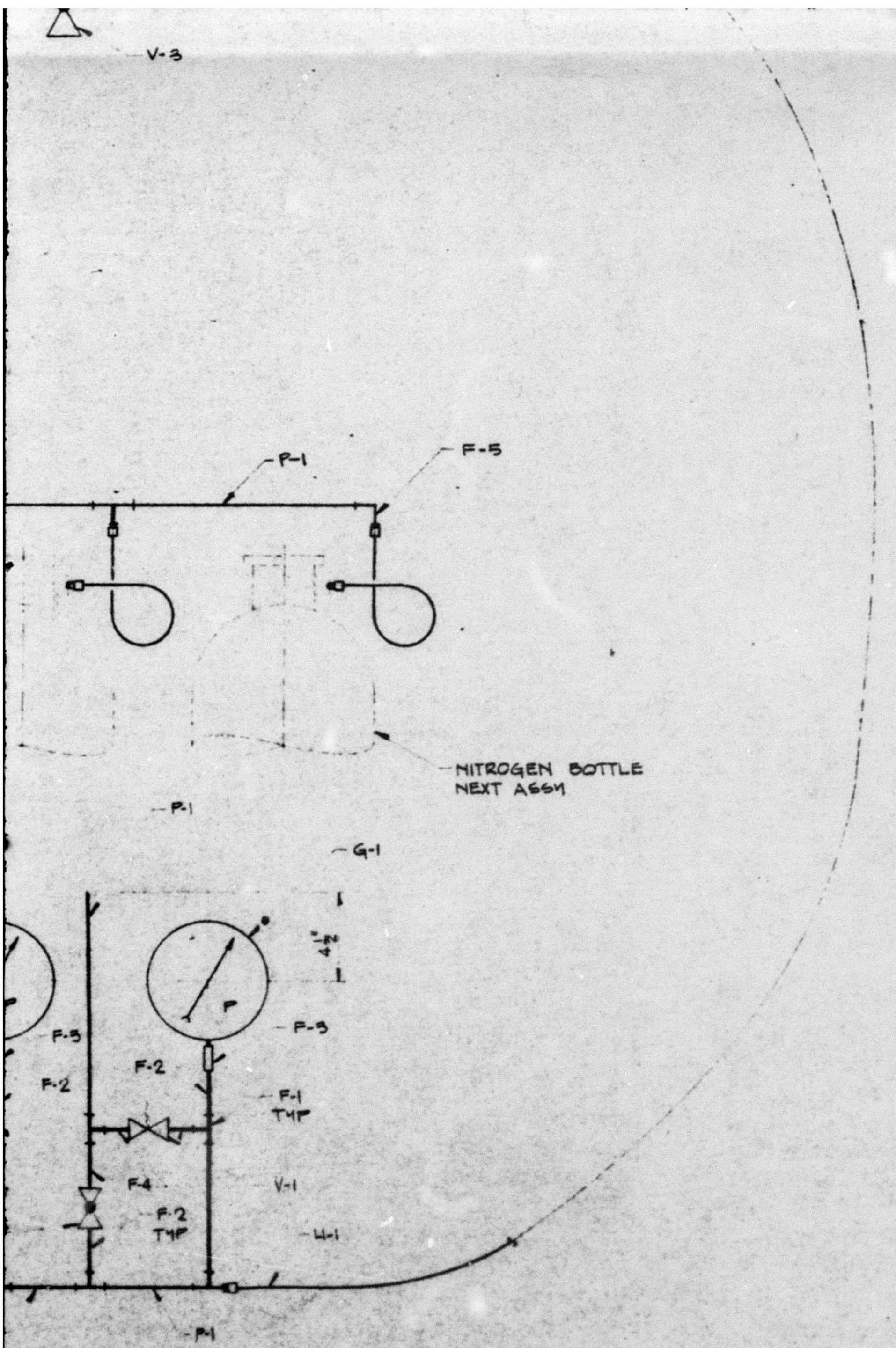
4



	APPROVED	EXAMINED OR REVIEWED	ALT. NO.	LETTER DATE	FILE REF. NO.	TOTAL
A.B.S.						TOTAL
U.S.C.G.						TOTAL

4 3 2

5

G-1	1	GAUGE - 6" DIA 500-1500 PSI	
G-2	1	GAUGE - 6" DIA 500-2500 PSI	
G-3	1	REGULATOR - INLET PRESS 2360 PSI OUTLET PRESS FROM 500 PSI TO 1500 PSI 1/4" NPT	
H-1	1	1/4" SYNFLEX HOSE x 70 FT LG W/ MALE PIPE SWIVEL ENDS - TYPE 3133-04-140-140-840	
H-2	5	1/4" SYNFLEX HOSE x 18" LG W/MALE PIPE SWIVEL ENDS TYPE 3133-04	
H-3	1	1" SYNFLEX HOSE x 10 FT LG W/ FEMALE SWIVEL ENDS-TYPE 3?00-16	
J-1	1	PIPE THREADED O-RING FLANGE 3000 PSI	
P-1	5FT	1/4" SCH 80 PIPE	ASTM A-53 GRADE A STL
V-1	1	1/4" THD IN-LINE RELIEF VALVE SET @ 1500 PSI	STEEL
V-2	2	1/4" BALL VALVE	
V-3	2	1" BALL VALVE	

C

GENERAL NOTES: (UNLESS OTHERWISE NOTED)

1. REMOVE GAUGES WHEN PRESSURE TESTING.
2. ALL PIPING TO BE TESTED AT 2500 PSI.
3. GAG RELIEF VALVE (V-1) DURING PRESSURE TESTING.

B

NO.	DATE	BY	DESCRIPTION	JOB AUTH.	APPR.
O	12-10-80	NW	RELEASE FOR CONSTRUCTION	006 323000	
A	12-1-80	NW	PRELIMINARY RELEASE	006 323000	

ALTERATIONS

NO. REQ'D.	E-001-A012
	NEXT ASSEMBLY
0	ALTERATION
7-5-?	DATE
	PURCHASING
	CONSTRUCTION
	ENGINEERING
	USCG
	ABS
10	CUSTOMER
1	WALLERSTEDT
1	DYE
1	BUCHANAN
1	MITCHELL
1	FARNHAM
2	LIBRARY

	APPROVED	EXAMINED OR REVIEWED	ALT. NO.	LETTER DATE	FILE REF. NO.
A.B.S.					
U.S.C.G.					

TOTAL NET WGT. MAT'L. ______

TOTAL NET WGT. EQUIP. ______

TOTAL NET WEIGHT ______

GLOBAL MARINE DEVELOPMENT Inc.

Newport Beach, Calif.

MARINE SEISMIC SYSTEM (MSS)

HEAVE COMPENSATOR PIPING DIAGRAM

	SIGN	DATE
DFT.	N. WAGNER	12-1-80
ENGR.	W.B./N.S.	12-1-80
CHK.	FARNHAM	DEC 80
APPR.	P.R.	DEC 80
REL.		12-?-80

SCALE: NONE

JOB AUTH. 006 323000

DWG. NO. E-001-P001

SHT. 1 OF 1

ALT. 0

A

2 1

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