A/S NORSKE SHELL E&P

TANANGER

DRILL STEM TEST PROGRAMME

WELL 31/2-8

RIG: BORGNY DOLPHIN

FINAL COPY 2.08.82

OPERATIONS ENG. 2.8.82

SENIOR OPERATIONS ENG.

CHIEF PETROLEUM ENG.

DRILLING SUPT.

TECHNICAL MANAGER

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DEPTH CONTROL

All depths quoted in this programme for packer setting and perforating refer to the FDC/CNL log, no. 3, of 19.07.82 made from "Borgny Dolphin".

A. OBJECTIVES AND GENERAL TEST OUTLINE

1. Objectives

To assess the nature, composition and producibility of reservoir fluid in the interval 1843-1848 m BDF where hydrocarbon shows have been observed in the cores.

2. General Test Outline

The intention of the test is to collect a representative formation sample from the potential hydrocarbon bearing sand reservoir in the interval 1843-1848 m BDF. After perforation of the interval a Halliburton DST string will be run and a retrievable RTTS packer set. After opening the tool the well be flow tested until it either kills itself or the water cushion reaches surface. The test will then be concluded and the DST string retrieved. The test zone will be abandoned by setting a cement plug across the perforations. If the well appears to flow the well will be killed and the drillpipe changed out for tubing to permit further flow testing of the well.

B. PREPARATION

Prior to carrying out step 1 below, the 8½" hole section will have been abandoned and a cement plug set across the 9 5/8" casing shoe with the TOC at approximately 2650 m.

1. Rig up Schlumberger. A correlation CCL/GR log will be run over the interval 1900 - 1800 m BDF if the CBL/VDL/CCL/GR log from the T.D. logging is unacceptable for correlation.

   Note: This log will be used to ensure accurate depth control for depths quoted in this programme, in subsequent packer setting, and perforation operations.

2. RIH with gauge ring/junk basket to 1900 m BDF. POH.

3. RIH and set a Backer Model 'N' bridge plug at 1870 m BDF. POH and rig down Schlumberger. (Check shear bolt of setting tool).

   Note: See Appendix 2 for safety precautions whilst handling explosives devices.

4. RIH with open ended drill pipe and tag the bridge plug. With the OEDP at bottom, circulate well to mud of 1.20 S.G. Spot 25 bbls of viscous brine on bottom (weight 1.20). POH.

   Note: See Appendix 1 for the handling and the mixing of brine.

5. Make up the flow head on one single of drill pipe joint and lay down same on piperack.

C. PERFORATING INTERVAL 1843 - 1848 m BDF

(Depth reference FDC/CNL log run no. 3 of 19.07.82)

1. Rig up Schlumberger. RIH and perforate the interval 1843 - 1848 m BDF with 4" casing guns at 4 shots per foot, 90 deg phasing. Observe well then POH and check the gun.

   Note: See Appendix 2 for safety precautions whilst perforating.

2. Rig down Schlumberger.

D. INSTALLATION OF DST STRING FOR TEST INTERVAL 1843 - 1848 m BDF

1. Run the DST string as shown in Fig. 1 using 1690 psi (= 1190 m) fresh water cushion. This will give a 1000 psi draw down on the formation as the reservoir pressure from RFT was measured to 2690 psi. Fill up drill pipe to required height - each stand whilst RIH. The following pressure/ temperature gauges are to be run:

   a) In Halliburton "bundle" carrier:

      1 x RT 7 temperature gauge, 0-200 degs. F, 72 hour clock.

      2 x RPG 3 pressure gauges, 0-5000 psi with 2 x 72 hour clocks.

   b) In blanked off BT cases:

      1 x Temperature recorder, 0-200 degs F, 72 hour clock.

      1 - BT pressure gauges, 0-10000 psi with 1 x 72 hour clock.

   Note: a) Ensure that the Hydraulic By Pass is in open position while RIH so that fluid can bypass the packer.

   b) Adjust length of 5" drill pipe so that when the RTTS packer is set, the shoe of the DST string is 5 m or more above the top perforations.

2. Make up drill pipe riser with fluted hanger and EZ-tree on the DST string. Continue to RIH and space out the DP riser to give an overstand of +/- 4 m at the rig floor when the fluted hanger lands in the wellhead. RIH and land fluted hanger to confirm space out. Pull back one single.

3. Disconnect elevators, install 40' x 2½" strops and pick up flow head with the single D.P. joint and make up same to the test string.

4. Install Chiksan lines to flow and kill sides of the flow head and pressure test same to 3000 psi.

5. Set fluted hanger into wellhead wearbushing and mark D.P. at the rotary table. Pick up 2½ - 3 m, turning pipe to the right (1½ turns required at packer). Lower string and note loss of weight of drill collars (c. 28 000 lbs) as RTTS packer sets and slip joints commence closing. The Hydraulic By Pass will close when the RTTS packer is set. Continue lowering string until fluted hanger lands in the wellhead wearbushing again.

6. Close middle 5" pipe rams around the slick joint.

7. Install wireline lubricator and wireline BOP and test same to 3000 psi/15 minutes.

8. Rig up wireline. RIH with 2.900" blind box and note the air/water cushion interface. POH.

E. TEST PROGRAMME INTERVAL 1843 - 1848 m BDF

1. Pressure up annulus to open the APR-N tester valve (c. 1000 psi required). Apply the annular pressure for +/- 1½ mins and then bleed off thereby restricting the initial flowing period to +/- 2 mins. Leave the well closed in for one hour.

2. Re-open APR-N by applying annulus pressure for the extended flow period, which will be determined by actual well performance.

   Note: Monitor annulus pressure throughout the flow period.

   i) No flow to surface

      a) Keep the well open for two hours after the "bubble bucket" indicates no further fluid entry.

      b) Rig up wireline. RIH with 2.900" blind box and note the new level of the air/water cushion interface and calculate volume of influx. POH with wireline.

      c) Pressure up annulus to close the APR-M sampler valve (c. 2000 psi required), and thereby also opening its circulating ports.

      d) Reverse out fluids (using the Halliburton unit) from the test string to holding tanks, taking samples of formation fluid in 20 ltr. tin cans and/or 45 gal drums. Also measure the volume pumped until the water cushion reaches surface, and volumes of all fluids recovered.

      e) Open the pipe rams around the 5" slick joint and rotate drill pipe (approximately 1/4 turn to the right is required at the bottom) to unseat the packer. This will also open the upper RTTS circulating valve.

   ii) Flow to surface

      a) When water cushion reaches surface, shut in the well at the choke manifold. Pressure up annulus to close the APR-M sampler valve (c. 2000 psi required). This will result in a pressure increase at the choke manifold indicating that the APR-M circulating ports are opened.

      b) Reverse out fluids (using the Halliburton unit) from the test string to holding tanks, taking samples of formations fluids in 20 ltr. tin cans and/or 45 gal drums as required.

      c) Leave well closed in the for a pressure build-up period of duration equal to that of the flow period (maximum 4 hrs.).

         Note: When brine from annulus returns to surface whilst reversing direct flow to mud pits via degasser.

e) Open the pipe rams around the 5" slick joint and rotate drill pipe (approximately 1/4 turn to the right is required at the bottom) to unseat the packer. This will also open the RTTS circulating valve.

Note: If the water cushion does flow to reach surface the well will be killed and a separate test programme will be advised if further flow testing of the well is required.

3. Observe annulus for losses, if everything is satisfactory, rig down flow head and POH with test string, keeping annulus full and observing for losses. Spot viscous mud pills if losses are encountered.

4. POH until the drain valve beneath the stand of DC's is above the rotary table. Do not unscrew the APR-M sampler valve as fluids, at reservoir pressure, will be trapped between the APR-M sampler valve and the APR-N tester valve. Bleed down the pressure inside the DC's collecting all the fluids recovered (approximately 27 gallons).

5. Retrieve and lay down remaining DST tools.

6. Rig up wireline. RIH with wireline sandbailer and tag bottom. Record hold-up depth and retrieve sample of sand (if any). Rig down wireline.

F. ABANDONMENT OF INTERVAL 1843-1848 M

1. RIH with 200m, 2-7/8" tubing stringer on 5" DP. Wash down to bridge plug at 1870m, ciculating with mud. Note and collect a sample, if any, of sand recovered. Continue circulating with mud until the hole is displaced back to uniform mud of weight 1.20 S.G.

2. With the tubing stinger shoe at 1865 m set a 175 m cement plug using the following slurry: -

   15.8 ppg Class G
   0.15 gps CFR-2L
   4.96 gps Freshwater
   1.16 cuft/sx yield

   (Thickening time +/- 2:00 hrs:mins)

   Displace with mud. POH slowly to place the tubing shoe +/- 30m above the TOC and reverse the tubing and DP clean watching out for losses. Close BOP's and attempt to squeeze away a maximum of 10 bbls of cement through the perforations using a maximum surface pressure of 2000 psi. Maintain pressure for 3 hours. POH.

3. RIH and tag cement plug with 8-1/2" bit, using 20,000 lbs weight, when surface samples are hard.

4. Pressure test plug to 2000 psi/15 minutes.

5. POH with 8-1/2" bit and commence well abandonment programme (to be advised seperately).

APPENDIX 1

HANDLING AND MIXING OF CALCIUM CHLORIDE BRINE

HANDLING OF CaCl BRINE

$CaCl_2$, both as brine and powder can cause unpleasant skin irritation and even blistering if allowed to remain in contact with the skin. It is therefore important that personnel involved in work where they may be exposed to the brine or powder should be protected as follows:

i) Rubber gloves (gauntlet type to cover wrists).

ii) Waterproof slicker suits with hoods.

iii) Rubber boots (leather boots are shrivelled by the brine).

iv) Full face masks for use when mixing powdered $CaCl_2$.

v) Barrier cream (e.g. "Vaseline") for use on exposed skin, particularly face, neck and wrists, to prevent direct skin contact with the brine.

Additionally, whenever brine/powder is inadvertently splashed onto clothing then the affected clothes should be changed and washed forthwith. Never allow brine to dry on the skin or clothes. If brine is splashed into the eye, wash the eye at once with copious amounts of fresh water.

MIXING OF CaCl BRINE

The following instructions are for the mixing of 50 bbls of 1.20 SG Calcium Chloride brine in the slug pit, the formulation is to be verified by a pilot check performed at the wellsite.

1. Thoroughly clean the slug pit and flush all the mixing lines and hoppers that are to be used for mixing with water. Also flush clean with water the transfer lines from the slug pit to the Halliburton unit.

2. Add 46 bbls of drill water to the slug pit.

3. Add 4700 lbs of Calcium Chloride (Peladow) to the drill water while circulating through the mixing hopper.

   Note: a) Fluid in the slug pit is to be thoroughly agitated during mixing or the Calcium Chloride flakes will drop out and settle on the bottom of the tank.

   b) This mixing process is a exothermic reaction therefore as the brine is quite hot while being mixed it will weigh less when initially mixed than when cooled down.

TO VISCOSIFY THE PRE-MIXED CALCIUM CHLORIDE BRINE

1. Reduce the PH of the brine to between 3 and 5 by the addition of 7-8 lbs J286 powder.

   Note: The J286 is to be added SLOWLY to the brine while circulating through the mixing hopper.

2. Add +/- 50 lbs of J164 (HEC) to the brine.

   Note: The J164 is to be added SLOWLY to the brine while circulating through the mixing hopper. If not added SLOWLY "fish eyes" will form which could possibly cause perforation damage later.

   Agitate for 30 mins to ensure the J164 (HEC) is fully dispersed and hydrated.

3. Add caustic soda (while taking the standard precautions for handling) to the brine and increase the PH to around 8.5.

   Note: Ensure that the caustic soda solution is fully dispersed in the gelled brine before adding more as precipitates will form if the PH increases above 10.

The basic brine should be mixed up well in advance of being required and should only be gelled up 3-4 hrs prior to being required.

APPENDIX 2

SAFETY PROCEDURE FOR HANDLING EXPLOSIVES AND FLOWING WELL

SAFETY DURING LOADING AND FIRING

Before the gun is armed all transmitters, cranes, welding machines, radar, etc. must be switched off and remain swiched off until the gun is fired. After firing, transmission can be resumed until the gun has been pulled to about 100 m below the seabed, but must then cease until the gun has been laid down and checked.

Portable transmitters should be placed in one room to prevent accidental transmission.

Helicopters should not be permitted to land on the platform during perforations, or to approach closer than 150 m. Supply and standby boats must also stand off from the rig at this time.

WORK INVOLVING EXPLOSIVES

Work involving the use of explosives should be carried out only by specialist personnel and should never be done during an electrical storm.

During any job involving the use of explosives, the number of personnel employed should be kept to a minimum. All other persons should be excluded from the danger area (e.g. walkway and derrick floor) throughout the operation.

Warning signs should be placed on access routes to the danger area to prevent access by unauthorised persons.

The Platform Manager (Captain) is to inspect equipment and check safety procedures.

Two hours before each perforating run the Petroleum Engineer will telex Base with an estimate of when the radio beacon, VHF transmitter, etc. will be closed down and for how long. Actual times will be advised by the Radio Operator.

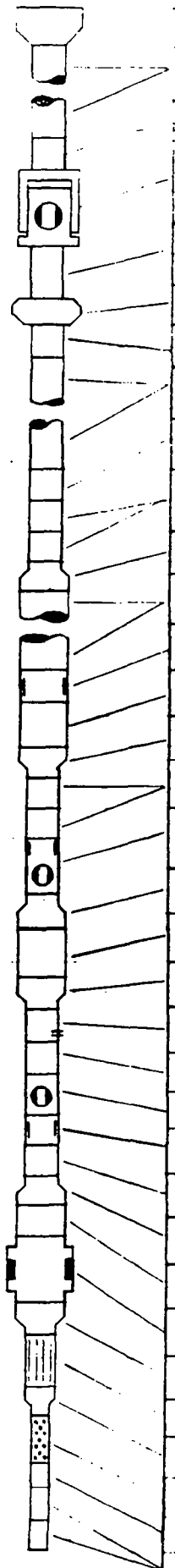
This is particulary important if a helicopter flight is scheduled for the rig concerned.

The first perforation must be carried out in daylight but later runs may be carried out at night. However, if in the course of the production test a well is killed due to unforeseen circumstances, the first of any subsequent perforations must also be carried out in daylight.

A constant check must be made to ensure that no voltages is measured between the casign and the rig at surface. In the event that voltage is measured, all sources of electrical energy must be switched off. (N.B. This may preclude perforating at night).

FIGURE (1)

DST STRING FOR 9 5/8" CASING TEST, WELL 31/2-8



ITEM DESCRIPTION		MIN I.D."	MAX O.D.
X-OVER 5½" ACME (B) x 4½" I.F. (P). C-75	(F)	3.515	
DRILL PIPE 4½" I.F.		4.276	6.37
X-OVER 4½" I.F. (B) x 4½" ACME (P). C-75	(F)	3.515	5.31
FLOPETROL E/2 TREE, H2S SERVICE, 10.000 PSI W.P. 4½" ACME (B) x (B)	(F)	3.000	10.75
SLICK JOINT, 4½ ACME (P) x (P), C-75	(F)	3.000	5.00
FLUTED HANGER, 4½" ACME (B) x (B), C-75	(F)	3.000	15.0
X-OVER, 4½" ACME (P) x 4½" I.F. (P)	(F)	3.000	5.00
DRILL PIPE 4½" I.F.		4.276	5.00
X-OVER, 4½" I.F. (B) x 3½" I.F. (P)	(H)	2.750	6.12
SLIPJOINTS (2), 5' STROKE, 3½" I.F. (B) x (P)	(H)	2.250	5.00
X-OVER, 3½" I.F. (B) x 4½" I.F. (P)	(H)	2.750	6.12
DRILL COLLARS, 20.000 LBS.		4.276	6.37
RTTS CIRCULATING VALVE;	(H)	3.000	6.12
DRILL COLLAR, 1 STAND		4.276	6.37
X-OVER, 4½" I.F. (B) x 3½" I.F. (P)	(H)	2.750	6.37
SLIPJOINTS (2), 5' STROKE, 3½" I.F. (B) x (P)	(H)	2.250	5.00
APR-M SAFETY REVERSING VALVE, 3½" I.F. (B) x (P)	(H)	2.250	5.00
X-OVER, 3½" I.F. (B) x 4½" I.F. (P)	(H)	2.750	6.12
DRILL COLLAR, 1 STAND	(H)	4.276	6.37
X-OVER, 4½" I.F. (B) x 3½ F.H. (P)	(H)	2.500	6.12
DRAIN VALVE, 3½" F.H (B) x (P)	(H)	4.625	2.2
X-OVER, 3½" F.H. (B) x 3½ I.F. (P)	(H)	5.125	2.2
APR-N TESTER VALVE, 3½" I.F. (B) x (P)	(H)	5.000	2.25
HYDRAULIC BY PASS VALVE, 3½" I.F. (B) x (P)	(H)	2.250	4.62
"BIG JOHN" JARS, 3½" I.F. (B) x (P)	(H)	2.370	4.6
X-OVER, 3½" I.F. (B) x 4½" I.F. (P)	(H)	2.750	6.12
RTTS SAFETY JOINT, 4½" I.F. (B) x (P)	(H)	3.120	6.1
RTTS PACKER, 4½" I.F. (B) x (P) 9 5/8"	(H)	4.000	8.2
X-OVER, 4½" I.F. (B) x 3½" I.F. (P)	(H)	2.000	6.1
BUNDLE CARRIER, 3½" I.F (B) x (P)	(H)	2.250	5.3
X-OVER, 3½" I.F. (B) x 2 7/8" EUE (P)	(H)	2.500	4.7
PERFORATED TUBING, 2 7/8" EUE (B) x (P)	(H)	2.000	3.0
X-OVER, 2 7/8" EUE (B) x 2 7/8" DP (P)	(H)	2.000	4.0
BLANKED OFF BT CASES, 2 7/8" DP (B) x (P)	(H)		

(F) FLOPETROL TOOLS (H) HALLIBURTON TOOLS

FLOWSCHEME ON RIGFLOOR DST 3½-8

(1) 3⅛"/10.000 W.P. FLOWHEAD WITH AUT. WINGVALVE.
(2) 2"/1502 KILL-LINE + 2" FST SWING CHECK VALVE.
(3) MASTERGATE (HAND-OPERATED)
(4) REEL SKID (CONTROL HOSE)
(5) E/Z TREE AND LUB. VALVE CONTROL CONSOLE
(6) GLYCOL INJECTION PUMP + HOSE
(7) 3"/1502 CHICKSAN LOOPS
(8) DATA HEADER
(9) CHOKE MANIFOLD { INLET: 3"/1502 FEMALE; OUTLET: 3"/002 MALE
(10) X-OVER 3"/1002 FEMALE x 3"/1502 MALE
(11) 3"/1002 CHICKSAN LOOP
(12) PERMANENT 3"/10.000 FLOWLINE, 3"/1502 FEMALE INLET.
(13) PERMANENT 6" FLOWLINE (NOT TO BE USED)

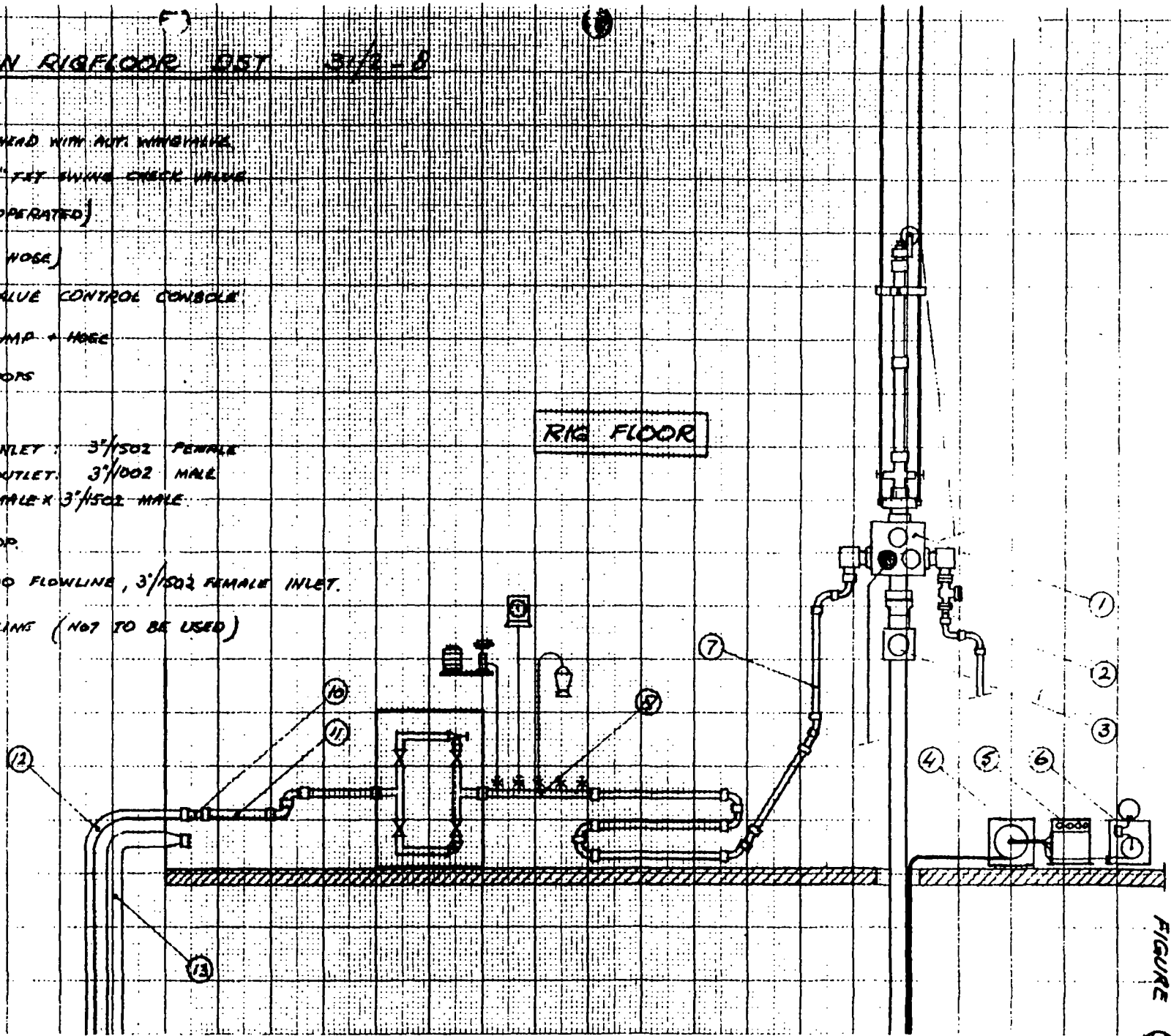


FIGURE (2)

JULY 1982
EPPP/12

FLOWSCHEME ON MAIN DECK DST 31/2-8

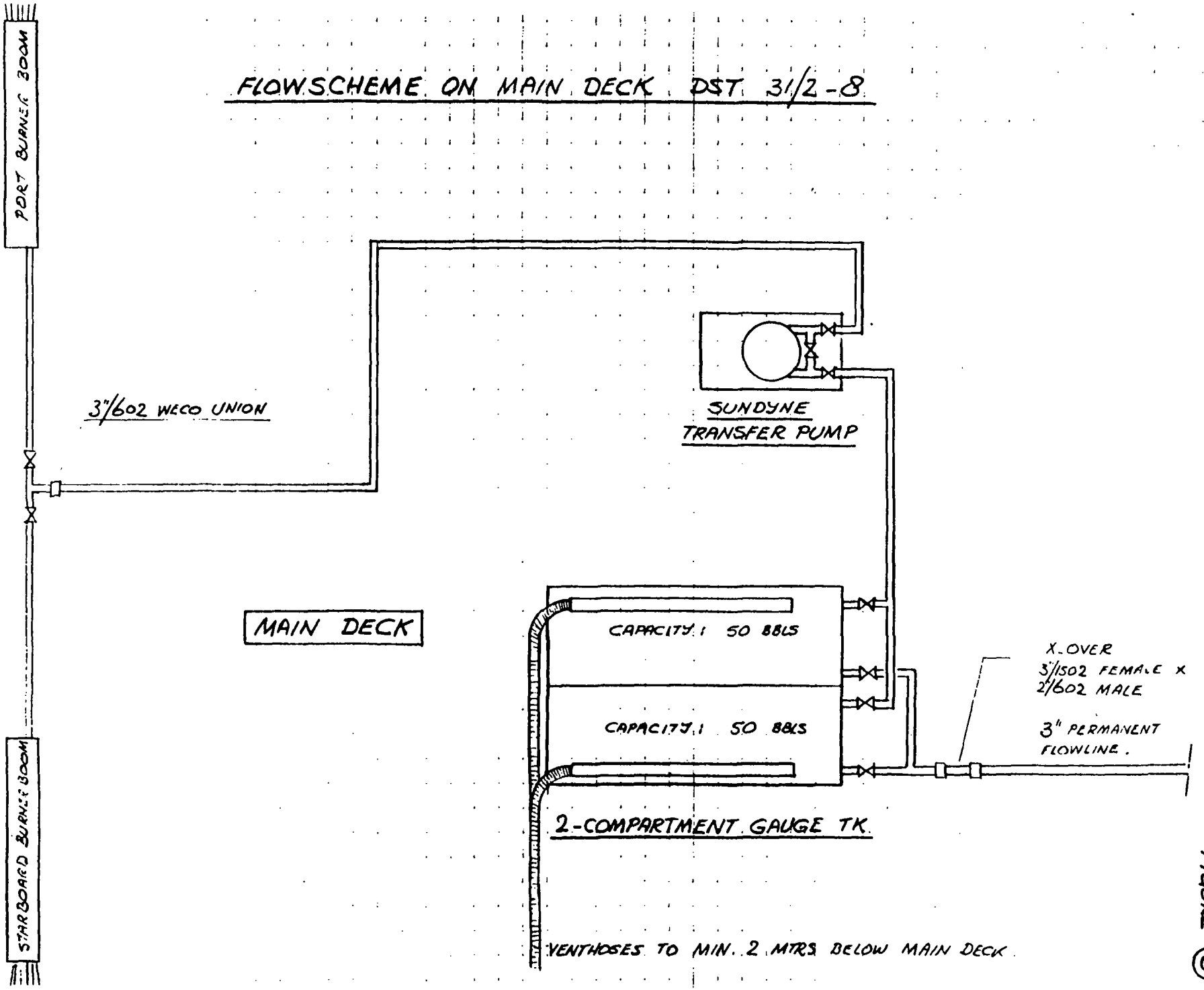


FIGURE (3)

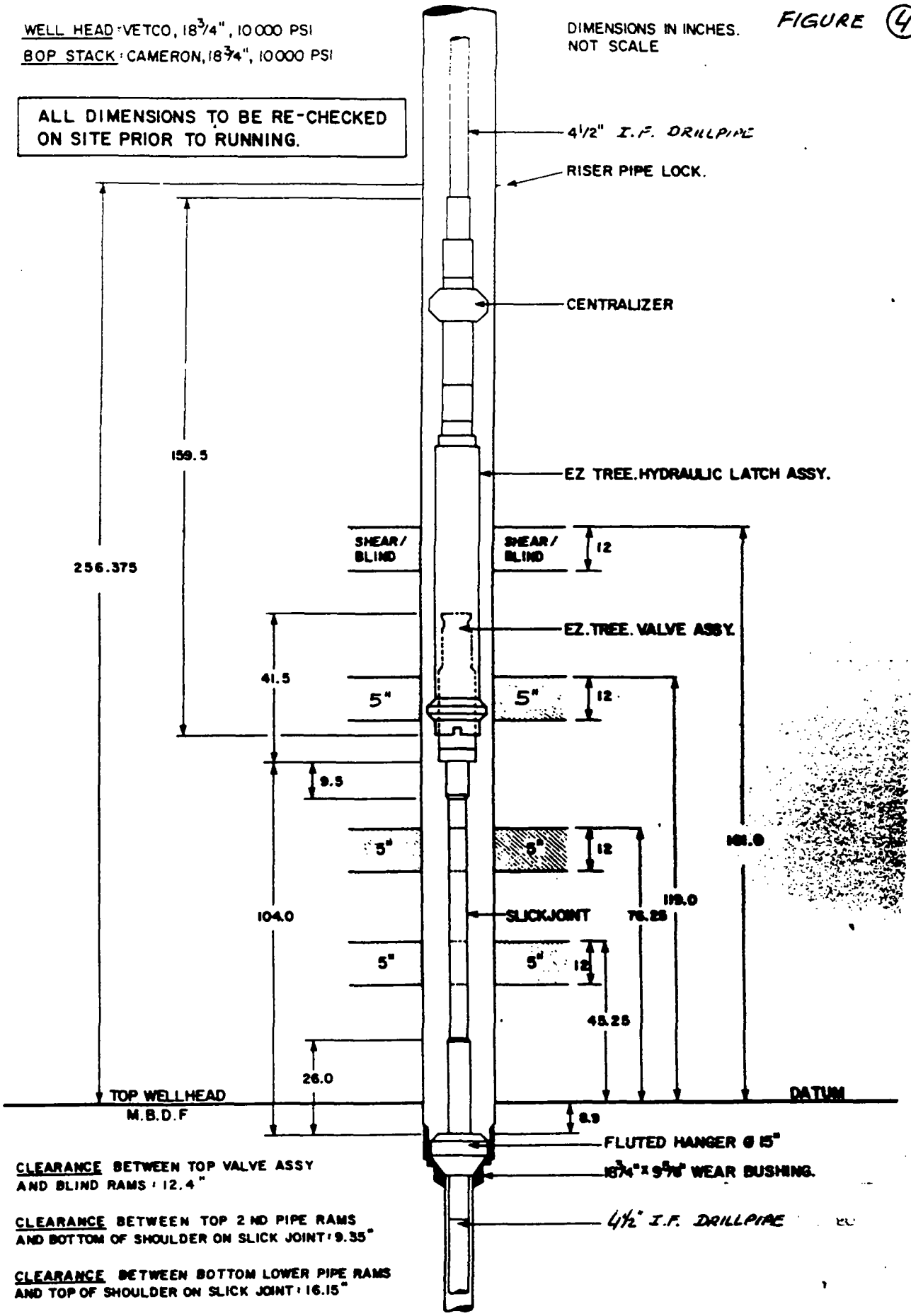
EZ TREE SPACE OUT WELL 31/2-8 RIG BORGNY DOLPHIN

FIGURE (4)

WELL HEAD : VETCO, 18 3/4", 10 000 PSI
BOP STACK : CAMERON, 18 3/4", 10000 PSI

DIMENSIONS IN INCHES.
NOT SCALE

ALL DIMENSIONS TO BE RE-CHECKED ON SITE PRIOR TO RUNNING.



CLEARANCE BETWEEN TOP VALVE ASSY AND BLIND RAMS : 12.4"

CLEARANCE BETWEEN TOP 2 ND PIPE RAMS AND BOTTOM OF SHOULDER ON SLICK JOINT : 9.35"

CLEARANCE BETWEEN BOTTOM LOWER PIPE RAMS AND TOP OF SHOULDER ON SLICK JOINT : 16.15"

BACK PLUGGING AND TESTING DIAGRAM

FIGURE (5)

WELL 31/2-8

RKB 0m

25m