PR1996-0053

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Rec: 4-9-96

Santos

EAST MEREENIE 40
UPPER P3/P4
FRACTURE STIMULATION PROGRAM

ONSHORE

Distribution:

Magellan Petroleum	1
O D & E Pty Ltd	1
Halliburton	1
NT Dept of Mines & Energy	1
Santos	3

August 1996

Prepared by:

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Senior Petroleum Engineer
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A Member of the Santos Ltd Group of Companies

Santos

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Telephone: (07) 3228 6666
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Ref: j:\dcr\pl\a724.doc
File: 37.11

Department of Mines and Energy
Energy Division
Centre Point Building, The Mall
DARWIN NT 0800
Attention: Mr E Nunn

Dear Sir

RE: EAST MEREENIE 40 - UPPER P3/P4
FRACTURE STIMULATION PROGRAM

Enclosed please find program for the upcoming fracture stimulation treatment for East Mereenie 40 for your approval.

Yours faithfully

for **A F MAYERS**
Manager Petroleum Engineering and Drilling
Queensland and Northern Territory
Business Unit

Department of Mines and Energy

Facsimile Transmission

Promoting Growth Through Resources

FAX SENT. . 4/9/96 . .

TO:	Santos	FROM:	D Sajdak
ATTENTION:	Mr A F Mayers	TELEPHONE:	(08) 8999 5426
FAX NUMBER:	(07) 3228 6522	FAX NUMBER:	(08) 89 995530
DATE:	04/09/96	Nº of Pages:	1 (including this page)
SUBJECT:	**East Mereenie # 40 and 41 Workover Program**		

Message:

Pursuant to Clause 622 of the Schedule of Onshore Petroleum Exploration and Production Requirements - 1993, I hereby approve the proposed workover program for East Mereenie #40 and 41 received on 03/09/96.

4/9/96

Dr Eric E Nunn
Director of Energy

Darwin Office:
GPO Box 2901
Darwin NT 0801

Alice Springs Office:
PO Box 2655
Alice Springs NT 0870

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Tennant Creek NT 0861

Northern Territory Government

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Rev: 4-9-96

CONTENTS

OBJECTIVE

To fracture stimulate the P4 and Upper P3 sands independently and then recomplete East Mereenie 40 as a tandem producer from the two zones.

WELL DATA

Location

Latitude: 24^0 01' 5.928" S
Longitude: 131^0 34' 31.927" E
Line:

Elevation

Ground Level: 757.1 m
Kelly Bushing: 763.2 m

Surface Casing

Size	Weight	Grade	Jnts No	Thread	Length	From M	To M	Remarks
10-3/4"				8RD	0.40	721.00	721.40	FLOAT SHOE
10-3/4"	40.5	H40	1	8RD	11.89	709.11	721.00	
10-3/4"				8RD	0.26	708.85	709.11	FLOAT COLLAR
10-3/4"	40.5	H40	59	8RD	701.79	7.06	708.85	
10-3/4"	40.5	H40		8RD	7.64	-0.58	7.06	LANDING JOINT

Production Casing

Size	Weight	Grade	Jnts No	Thread	Length	From M	To M	Remarks
5-1/2"			1	8RD	0.40	1666.60	1667.00	FLOAT SHOE
5-1/2"	17	L80	1	8RD	11.94	1654.66	1666.60	
5-1/2"			1	8RD	0.28	1654.38	1654.66	FLOAT COLLAR
5-1/2"	17	L80	140	8RD	1655.55	-1.17	1654.38	STICK UP

Cementing

Surface 10-3/4"
Class "A" cement
307 sacks, 15.6 ppg

Production 5-1/2"
Class "G" cement with 1% Halad 322
755 sacks, 15.8 ppg

TD 1673 metres KB

PBTD 1654 metres KB

RESERVOIR	Pacoota P3-120/130
Pressure	12066 kPa (1750 psig) at 1550 m KB (5086 ft) at 63^0C (145^0F)
	Virgin Pressure
RESERVOIR	Pacoota P4
Pressure	12618 kPa (1830 psig) at 1550 m KB (5086 ft) at 64^0C (148^0F)
	Virgin Pressure
Santos Cost Code	1EA-C642-775
Contact Personnel	PB Lansom (07) 3228 6541 DC Reeve (07) 3228 6540 SM Little (07) 3228 6534 / Mobile 0419 834 962

KILL FLUID CALCULATION SHEET

Reservoir Pressure	=	1830.0 psi at 1550 m KB (5086 ft)
Reservoir Temperature	=	145^0F @ 5086 ft
Fluid Kill Weight	=	$\frac{1830.0 + 25}{5086\ (0.052)}$
	=	6.7
Temperature Correction	=	$\frac{145 + 80}{2}$
	=	113 °F
Density Correction	=	0.003 (113 - 80)
	=	0.098 ppg
	=	6.8 ppg

Use 3% KCL filtered Brine at 80^0F - 8.48 ppg. This is equivalent to 10.82 lbs of KCL per barrel of water. Add 0.2% F75N surfactant when mixing the KCL Brine (8.4 gal F75N per 100 Bbl of KCL).

WELL HISTORY

East Mereenie 40 was drilled in April/May 1996 to develop the Lower P3 and P4 zones on the southern flank of the Mereenie Field. Due to the poor reservoir development of the Lower P3 unit, the project scope was changed to address the Upper P3 and P4 reservoirs. The well was initially completed over the P4 zone flowed oil to surface at 15-20 BOPD during a 24 hour flow test. The well was then perforated over the Upper P3 zone and came on-line at 80 BOPD with a minor decline. The well is currently producing 35 BOPD with no water. This program is planned to fracture stimulate the P4 and Upper P3 sands independently and then recomplete East Mereenie 40 as a tandem producer from the two zones.

1.0 WORKOVER WELL FOR P4 STIMULATION

1.1 Move in EWS rig complete with 2-7/8" frac string (180 joints). Strap all tubing on location.

1.2 Mix approximately 400 bbls of 3% Tech Grade KCL brine filtered to 10 micron and 0.2 % F75N surfactant and 0.25 gal/bbl of BE-5 Biocide.

1.3 Measure and record, then bleed off the production, intermediate and surface casing pressure.

1.4 Circulate 3% KCl down the tubing and bleed off the annulus pressure. Ensure well is dead and continue to monitor tubing head and casing head pressure.

1.5 Install back pressure valve (BPV). Remove existing wellhead. Nipple up BOP's, remove BPV and install two way check valve. Pressure test BOP's to 1500 psi. Remove two way check valve.

1.6 To release packer, apply an upstrain of 3000 lb to 6000 lb and rotate the tubing to the right from eight to ten turns at the tool, until the tool moves up the hole. Continue to rotate to the right several times while moving up the hole to be certain the slips are fully retracted. **NOTE THAT THE PACKER IS EXPECTED TO BE UNSET FOLLOWING P3 PERFORATION**

1.7 POOH Baker packer and tubing string. Tally and inspect tubing.

1.9 Make up frac BHA. RIH hydraulic fracture treatment string. (See Figure 3). Rabbit tubing and BHA, remove any scale or dirt prior to RIH. Fill tubing with filtered slick water and reverse circulate hole volume prior to setting packer.

1.9 Set AL-2 Lok-Set packer at 1565 m KB (5135 ft KB). Ensure the final joint of 2-7/8" EUE tubing is approximately 2 - 3 ft above the rig floor to allow hook up to Halliburton. Set packer with approximately 10 - 15,000 lbs compression. This should be sufficient to allow for thermal and pressure expansion during the treatment.

1.10 Install mini frac head of Halliburton. (See Figure 4).

2.0 P4 - FRACTURE STIMULATION

2.1 Rig Up

2.1.1 All frac tanks should be well cleaned prior to mixing fluid. Lined tanks should be used for the main frac gel storage.

2.1.2 Flush Halliburton lines. Rig up injection line from frac manifold to the wellhead.

2.1.3 Pressure test all lines against valve on top of wellhead to 9000 psi using slick water to fill lines. Hold for 10 minutes. Bleed off.

Note: The injection line from the frac manifold to the wellhead is to be staked down and anchored to the wellhead at the tubing/casing spool flange.

2.1.4 Rig up and stake down a 2" pressure release line from the casing/tubing annulus side arm valve and run it to a safe position at least 100 ft from the wellhead. This line will be tied into the cement pump truck which will be used to fill up the annulus, bleed off pressure if necessary during the job and reverse out sand in the tubing in the event of tubing failure during the job.

2.1.5 Rig up pump truck to this line, with casing side arm valve closed, pressure test to 2000 psi for five minutes. Bleed off. Open casing side arm valve and fill casing/tubing annulus with KCl water. **During the P4 fracture treatment, the casing/tubing annulus is to be kept full at all times with a minor positive pressure. This is due to the open perforations of the Upper P3.**

2.1.6 Contractor should rig up a pressure transducer to this line, and to the injection line, to continuously monitor at the frac van both annulus and injection wellhead pressures.

2.1.7 At no time should wellhead injection pressures exceed 7500 psi. On site instructions to pump unit operators must include specific details of pumps coming off line in a nominated sequence starting at 7000 psi. Set pop-offs as follows; injection line - 7500 psi annulus - 1800 psi.

2.2 Stress Testing

Note: Safety Meeting and equipment checks to be conducted prior to any high pressure pumping.

2.2.1 Rig up Expertest with tandem Schlumberger SLSR-A gauges (10000 psi pressure rating). Run gauges in hole on E-line and land in 2-3/8" XN-Profile (See Figure 3). Rig down Expertest.

2.2.2 Displace surface lines to filtered stress testing fluid. Refer to **Table 1** for fluid specifications.

2.2.3 Start filling hole at 5 BPM.

2.2.4 Breakdown formation before performing 10 Bbls injection/shut-in decline test at 5 BPM to evaluate closure and reservoir pressure. This will be used in assessing the accuracy of the stress profile used in the fracture treatment.

2.2.5 Perform step rate injection test with filtered treated water according to the following schedule:

Note each rate to be held for two minutes.

Injection Rate (bpm)	Volume (bbls)
0.5	1
1.0	2
1.5	3
2.0	4
3.0	5
5.0	6
7.0	10
10.0	20
12.0	24
15.0	30
	114 bbls

Stabilised pressures from each step-rate increment will be plotted vs injection pressure "on the fly" in order to determine "fracture extension pressure". Should extension pressure be calculated prior to pumping the higher rates, then the test will be terminated and the pressure decline monitored to detect closure pressure.

Note: Maximum care must be taken to ensure the minimum amount of fluid is used in stress test evaluations.

2.3 Mini Frac

2.3.1 Mix up 3000 gal fracturing fluid 3% KCl filtered brine containing a base 30 lb/1000 gal X-link Borate HPG gel system with additives. Refer to **Table 2** for fracturing fluid specification. Conduct quality control checks of fracturing fluid rheology prior to pumping.

2.3.2 Displace surface lines to mini frac fluid.

2.3.3 Pump 2000 gal mini frac fluid and filtered slick water displacement volume at 15 BPM, limiting the pump pressure to 7500 psi to initiate frac. Shut down pumps at the discretion of the frac supervisor.

2.3.4 Monitor pressure decline. Confirm fracture closure and calculate fluid leak off co-efficient and fluid efficiency.

2.3.5 After gel has broken down, rig up Expertest and POOH gauges and retrieve BHP data.

2.3.6 Analyse mini-frac data and redesign main frac treatment based upon results. Review design with the Brisbane office.

2.3.7 Mix chemicals for main frac treatment.

2.4 Main Fracture Treatment

2.4.1 Conduct safety meeting and equipment checks prior to commencement of job.

2.4.2 Conduct quality control checks on fracturing fluid.

2.4.3 Rig up and run in hole tandem Expertest EMR gauges and land in 2-3/8" XN-profile. Install head for main frac. Pressure test lines.

2.4.4 Pump main fracture treatment as redesigned following mini frac. Maximum treating pressure to be 7500 psi. Set hydraulic pop-off valve for 7500 psi.

Approximate job size based on comparison with East Mereenie 38 is as follows;
Fluid volume = 5000 gal
Pad volume = 1100 gal
Proppant volume = 8500 lbs
Pumping rate = 15 BPM

2.4.5 Commence displacement count after detecting drop in fluid density from densitometer at wellhead below 5 PPG.

Note: The actual displacement volume requires calculation for the final completion configuration. It will be 2 bbls less than total volume from densitometer to top perforation.

Conversions:

2-7/8" 6.5# tubing	=	0.2431 gals/ft
5-1/2" 17# casing	=	0.9764 gals/ft

2.4.6 Shut down pumps. Record pressure bleed off. Wait till gel breaks and pressure to bleed off. Flow back through tubing to bleed off remaining pressure so that WHP equals zero.

2.4.7 Open annulus. Bleed pressure slowly to 0 psi.

2.4.8 Release packer. POOH treatment string. Recover memory gauges.

Note: If early screen out, hold approximately 1,000 psi on Annulus when releasing packer and reverse circulate well clean. Actual pressure required to be calculated prior to reversing out.

3.0 ISOLATE P4 ZONE

3.1 Rig up wireline unit. RIH with blind box and tag proppant depth. If the P4 interval is not covered by proppant, dump proppant down wellbore to satisfactorily cover the P4 interval. RIH with blind box and ensure proppant depth is at approximately 1580 m KB (5184' KB). POOH with wireline.

4.0 RECOMPLETE WELL FOR UPPER P3 STIMULATION

4.1 Make up frac BHA. RIH hydraulic fracture treatment string. (See Figure 6). Fill tubing with filtered slick water prior to setting packer.

4.2 Set AL-2 Lok-Set packer at 1507 m KB (4944 ft KB). Ensure the final joint of 2-7/8" EUE tubing is approximately 2 - 3 ft above the rig floor to allow hook up to Halliburton and Schlumberger. Set packer with approximately 10 - 15,000 lbs compression. This should be sufficient to allow for thermal and pressure expansion during the treatment.

4.3 Close BOP's (pipe and annular). Pressure test annulus to 1500 psi to check BOP's and packer are holding.

4.4 Install mini frac head of Halliburton and Schlumberger. (See attached Figure 4).

5.0 UPPER P3 - FRACTURE STIMULATION

5.1 Rig Up

5.1.1 Flush Halliburton lines. Rig up injection line from frac manifold to the wellhead.

5.1.2 Pressure test all lines against valve on top of wellhead to 9000 psi using Slick water to fill lines. Hold for 10 minutes. Bleed off.

5.1.3 Rig up pump truck to the 2" pressure release line from the casing/tubing annulus. With the casing side arm valve closed, pressure test to 2000 psi for five minutes. Bleed off. Open casing side arm valve and fill casing/tubing annulus with KCl water. Pressure up the casing/tubing annulus to 1500 psi.

5.1.4 Contractor should rig up a pressure transducer to this line, and to the injection line, to continuously monitor at the frac van both annulus and injection wellhead pressures.

5.1.5 The annulus pressure should not be allowed to exceed 1600 psi if possible, but at all times be held below the safe working pressure of the tubing head spool (2000 psi). Set pop-offs for 1800 psi.

5.1.6 At no time should wellhead injection pressures exceed 7500 psi. On site instructions to pump unit operators must include specific details of pumps coming off line in a nominated sequence starting at 7000 psi. Set pop-offs at 7500 psi.

5.2 Stress Testing

Note: Safety Meeting and equipment checks to be conducted prior to any high pressure pumping.

5.2.1 Rig up Expertest with tandem Schlumberger SLSR-A gauges (10000 psi pressure rating). Run gauges in hole on E-line and land in 2-3/8" XN-Profile (See Figure 6). Rig down Expertest.

5.2.2 Displace surface lines to filtered stress testing fluid. Refer to **Table 1** for fluid specifications.

5.2.3 Start filling hole at 5 BPM.

5.2.4 Breakdown formation before performing 10 Bbls injection/shut-in decline test at 5 BPM to evaluate closure and reservoir pressure. This will be used in assessing the accuracy of the stress profile used in the fracture treatment.

5.2.5 Perform step rate injection test with filtered treated water according to the following schedule:

Note each rate to be held for two minutes.

Injection Rate (bpm)	Volume (bbls)
0.5	1
1.0	2
1.5	3
2.0	4
3.0	5

5.0	6
7.0	10
10.0	20
12.0	24
15.0	30
	114 bbls

Stabilised pressures from each step-rate increment will be plotted vs injection pressure "on the fly" in order to determine "fracture extension pressure". Should extension pressure be calculated prior to pumping the higher rates, then the test will be terminated and the pressure decline monitored to detect closure pressure.

Note: Maximum care must be taken to ensure the minimum amount of fluid is used in stress test evaluations.

5.3 Mini Frac

5.3.1 Mix up 5000 gal fracturing fluid 3% KCl filtered brine containing a base 30 lb/1000 gal X-link Borate HPG gel system with additives. Refer to**Table 2** for fracturing fluid specification. Conduct quality control checks of fracturing fluid rheology prior to pumping.

5.3.2 Displace surface lines to mini frac fluid.

5.3.3 Pump 4000 gal mini frac fluid and filtered slick water displacement volume at 15 BPM, limiting the pump pressure to 7500 psi to initiate frac. Shut down pumps at the discretion of the frac supervisor.

5.3.4 Monitor pressure decline. Confirm fracture closure and calculate fluid leak off co-efficient and fluid efficiency.

5.3.5 Analyse mini-frac data and redesign main frac treatment based upon results. Review design with the Brisbane office.

5.3.6 Mix chemicals for main frac treatment.

5.4 Main Fracture Treatment

5.4.1 Conduct safety meeting and equipment checks prior to commencement of job.

5.4.2 Conduct quality control checks on fracturing fluid.

5.4.3 Rig up and run in hole tandem Expertest EMR gauge and land in 2-3/8" XN-Profile. Install head for main frac. Pressure test lines and set pop-offs.

5.4.4 Pump main fracture treatment as redesigned following mini frac. Maximum treating pressure to be 7500 psi. Set hydraulic pop-off valve for 7500 psi.

Approximate job size based on comparison with East Mereenie 38 is as follows;
Fluid volume = 10000 gal
Pad volume = 5000 gal
Proppant volume = 14000 lbs
Pumping rate = 15 BPM

5.4.5 Commence displacement count after detecting drop in fluid density from densitometer at wellhead below 5 PPG.

Note: The actual displacement volume requires calculation for the final completion configuration. It will be 2 bbls less than total volume from densitometer to top perforation.

Conversions:

2-7/8" 6.5# tubing	=	0.2431 gals/ft
5-1/2" 17# casing	=	0.9764 gals/ft

5.4.6 Shut down pumps. Record pressure bleed off. Wait till gel breaks and pressure to bleed off. Flow back through tubing to bleed off remaining pressure so that WHP equals zero.

5.4.7 Open annulus. Bleed pressure slowly to 0 psi.

5.4.8 Release packer. POOH treatment string. Recover memory gauges.

Note: If early screen out, hold approximately 1,000 psi on Annulus when releasing packer and reverse circulate well clean. Actual pressure required to be calculated prior to reversing out.

5.4.9 RIH open ended 2-3/8" tubing and tag proppant. Record depth. Reverse circulate out proppant, 1 stand at a time to PBTD using 3% KCL brine. Circulate clean. POOH with 2-3/8" tubing.

6.0 WELL COMPLETION FOR PRODUCTION

6.1 Make up lower BHA including Baker Model DB packer (complete with millout extension), swage, pup joint, 'XN' nipple and wireline re-entry guide (per attached Figure 7).

6.2 Rig up Schlumberger complete with setting kit for Baker Model DB packer. RIH on wireline packer setting kit and above BHA.

6.3 Correlate on depth and set DB packer at approximately 1564 m KB (5131' KB). POOH with wireline. Rig down Schlumberger.

6.4 Make up remainder of BHA on top of packer seal assembly (see attached Figure 7). Both sliding sleeves should be closed. RIH and shoulder DB packer seal assembly. Pull up on tubing string and set seals in neutral position.

6.5 Rig up wireline unit. RIH with 'PX' plug and set in the 'X' profile of the Lower sliding sleeve at approximately 1562 m KB (5125' KB).

6.6 Nipple down BOP Stack.

6.7 Connect high pressure line to Annulus and ensure hole is full.

6.8 Connect high pressure line to tubing and set hydraulic packer by pressuring up to 1500 psi.

6.9 Pressure test Annulus to confirm packer is set.

6.10 RIH with wireline and retrieve "PX" blanking plug.

6.11 Install Wellhead Assembly.

6.12 RIH with wireline and open upper and lower Sliding Sleeves, swab well and flow to clean up.

6.13 Rig Release.

TABLE 1

TREATED WATER

ADDITIVE	CONC/1000 GALS	QUANTITY	DESCRIPTION
Clayfix II	3.0	45 gals	Clay Control
WG-11	10 lbs	150 lbs	Gelling Agent
HYG-3	1.0 lbs	15 lbs	pH Buffer
BE-5	0.4 gals	6 gals	Bactericide
Cla-Sta XP	5.0 gals	75 gals	Clay Control
Losurf 357	1.0 gals	15 gals	Surfactant

Note: Have K-34 on location to ensure adequate gel hydration, if needed.

TABLE 2

FRACTURING FLUID - BORAGEL H3595

ADDITIVE	CONC/1000 GALS	QUANTITY	DESCRIPTION
Clayfix II	3 gals	60 gals	Clay Control
WG-11	30 lbs	600 lbs	Gelling Agent
HYG-3	1 lbs	20 lbs	pH Buffer
BE-5	0.4 gals	8 gals	Bactericide
Losurf 357	1.0 gals	20 gals	Surfactant
BA50	5.4 lbs	108 lbs	Crosslinking Agent
MO-67	1.0 gals	24 gals	Activator
K-38	4.5 lbs	68 lbs	Crosslinker
SP Breaker	0 - 5 lbs	10 lbs	Breaker
Optiflo III	5 - 2 lbs	60 lbs	Delayed Release Breaker
Cla Sta XP	5.0 gals	20 gals	Clay Control

Note:

1. MO-67 is to be added on the fly.
2. Optiflo III breaker to be added during the mini-frac, the pad and the proppant laden fluid.
3. SP Breaker to be added to the proppant laden fluid.
4. Cla Sta XP to be run in the mini frac x-linked fluid

EAST MEREENIE 40

FRACTURING WORK STRING MATERIALS LIST

FRACTURE WORK STRING

SOURCE	DESCRIPTION
Howco	Halliburton treating head 3" NPT pin
Mereenie	X-Over 2-7/8" EUE pin x 3" NPT box
Mereenie	162 joints 2-7/8" N-80 6.5 lb/ft tubing EUE
Mereenie	2 each 5-1/2" Baker AL-2 45-B Lok-Set packer. 2-7/8" box x pin EUE. Make sure spare is available.
Mereenie	1 pre-perforated joint. 2-7/8" EUE tubing C/W 62 ¾" holes + 60½" holes
Mereenie	1 joint 2-7/8" EUE tubing 6.5 lb/ft
Mereenie	Crossover 2-7/8" EUE box 2-3/8" EUE pin
Mereenie	1 2-3/8" OTIS XN profile 2-3/8" EUE box pin
Mereenie	2 2-3/8" EUE collar
Mereenie	1 joint 2-3/8" 4.7 # EUE tubing
Mereenie	2-3/8" EUE wireline re-entry guide

Note: Ensure all crossovers are minimum 1.99" drift diameter.

EAST MEREENIE 40

PRODUCTION STRING

SOURCE	DESCRIPTION
EM 40	Tubing hanger 2-3/8" EUE top and bottom
EM 40	156 joints 2-3/8" 4.7# J55 EUE tubing
EM 40	1 x 2-3/8" Otis 121XA sliding sleeve
EM 40	1 joint 2-3/8" 4.7# J55 EUE J55 tubing
Mereenie	1 x 5-1/2" Baker FH Hydraulic Retrievable Packer, 2-3/8" EUE box and pin
EM 40	4 x joint 2-3/8" 4.7# J55 EUE J55 tubing
Mereenie	1 x 2-3/8" Baker CMD Sliding Sleeve c/w Otis "X" profile
EM 40	1 x 4' pup joint 2-3/8" 4.7# J55 EUE tubing
Mereenie	1 x Baker DB Packer Size 44-26, 5-1/2" casing, 3-1/2" NU box down
Mereenie	1 x Baker Mill Out Extension
Mereenie	1 x swage 3-1/2" NU box x 2-3/8" EUE pin
EM 40	1 4' pup joint 2-3/8" 4.7# J55 EUE tubing
EM 40	Otis 2-3/8" EUE "XN" Nipple
Mereenie	2-3/8" Wireline Re-entry Guide

EAST MEREENIE 40
PROGRAM APPROVAL

Prepared By: ..... Date 27/8/96

P B Lansom
Senior Reservoir Engineer

Reviewed By: ..... Date 28/8/96

S M Liddle
Staff Petroleum Engineer

Reviewed By: ..... Date 27/8/96

D C Reeve
Supervising Chief Petroleum Engineer

Approved By: ..... Date 29/8/96

A F Mayers
Manager - Petroleum Engineering & Drilling

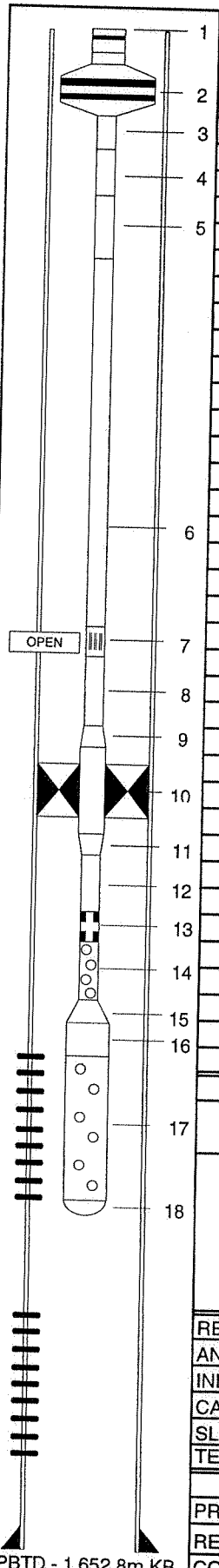
Figure 1

PETROLEUM ENGINEERING DEPARTMENT

DOWNHOLE 2-3/8" TCP TANDEM RECOMPLETION

Santos

WELL: EAST MEREENIE 40 - P3 **DATE:** 09 Aug 96



PBTD - 1,652.8m KB
DRILLER

ITEM No.	DESCRIPTION	LENGTH (m)	DEPTH KB (m)	MIN ID (in)
1	KB TO TOP OF TUBINGHEAD SPOOL	4.39		
2	KVAERNER NATIONAL 2-3/8" EUE TUBING HANGER	0.25	4.39	
3	1 PUP JOINT 2-3/8" 4.7# J55 EUE TUBING	1.87	4.64	
4	1 PUP JOINT 2-3/8" 4.7# J55 EUE TUBING	2.49	6.51	1.990
5	1 PUP JOINT 2-3/8" 4.7# J55 EUE TUBING	3.12	9.00	
6	156 JOINTS 2-3/8" 4.7# J55 EUE TUBING	1,495.33	12.12	
7	2-3/8" VITEX VXO SLIDING SLEEVE	0.88	1,507.45	1.875
8	1 JOINT 2-3/8" 4.7# J55 EUE TUBING	9.63	1,508.33	PIP
9	X-OVER 2-3/8" EUE BOX x 2-7/8" EUE PIN	0.15	1,517.96	
10	BAKER 5-1/2" x 2-7/8" EUE AL-2 LOCKSET PACKER 15# - 20#	1.43	1,518.11	
11	X-OVER 2-7/8" EUE BOX x 2-3/8" EUE PIN	0.15	1,519.54	
12	1 JOINT 2-3/8" 4.7# J55 EUE TUBING	9.64	1,519.69	
13	VITEX 2-3/8" EUE VXN LANDING NIPPLE	0.31	1,529.33	1.791
14	1 PERFORATED PUP JOINT 2-3/8" 4.7# J55 EUE TUBING	2.43	1,529.64	
15	SCHLUMBERGER 2-3/8" EUE OPEN SYSTEM FIRING HEAD	0.55	1,532.07	NO-GO
16	SCHLUMBERGER 3-3/8" SAFETY SPACER	2.38	1,532.62	
17	SCHLUMBERGER 3.67" TCP GUN	19.00	1,535.00	
18	BULL NOSE	0.24	1,554.00	
	END OF TCP ASSEMBLY		1,554.24	

NOTE: PACKER UNSEATED DURING PERFORATING AND IS STILL UNSET

NOTE: GAMMA RAY PIP TAG IN BOTTOM OF SLIDING SLEEVE

NOTE: TUBING HANGER HAS CIW BPV PREPARATION

NOTE: 1.5" X 8' DROP BAR ON TOP OF FIRING HEAD

PERFORATION INTERVALS

FORMATION	INTERVAL (m KB)	GUN SIZE	GUN TYPE	CHARGES SPF	CHARGES TYPE	CHARGES WT(g)
PACOOTA P3	1,535 - 1,554	3.67	TCP	5	J	37
PACOOTA P4	1,592 - 1,620	3-3/8"	TCP	6	RDX	22

REMARKS:	String weight includes 4,000 lb for travelling block assembly
ANNULUS FLUID:	Weathered crude
INDICATED STRING WEIGHT:	20,000 lb
CALCULATED STRING WEIGHT:	20,000 lb
SLACK-OFF WEIGHT:	20,000 lb. Packer is **NOT** set
TENSION:	

M0730022

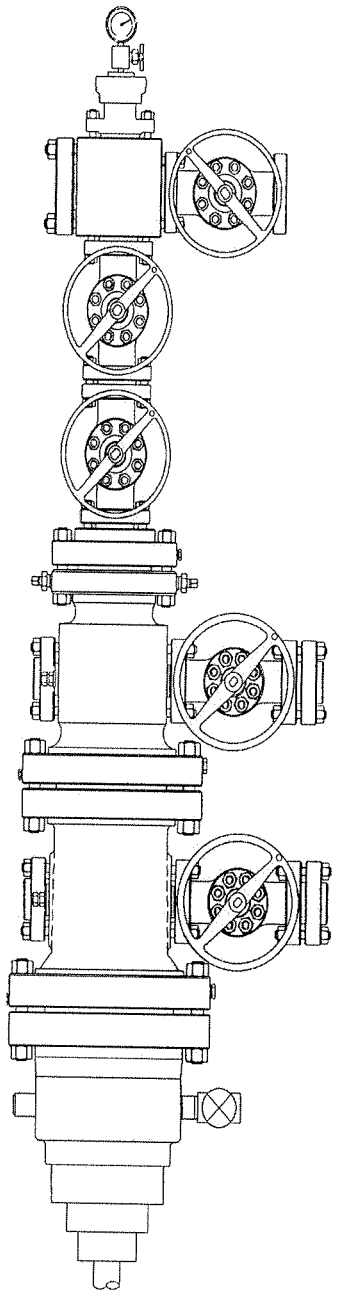
NOT TO SCALE	WELLSITE SUPERVISOR	I. FENDLEY	
PROPOSED:	INSTALLATION	DATE:	09 Aug 96
RE-COMPLETION:	DRAFTED:	DATE:	
COMPLETION: YES	REVISED:	DATE:	
CHECKED BY	BRIS:	BRIS:	

Figure 2

PETROLEUM ENGINEERING DEPARTMENT
SINGLE WELLHEAD AS INSTALLED

Santos

WELL: EAST MEREENIE # 40 **DATE:** 9 Aug 96



DESCRIPTION			
TREE CAP	MAKE/TYPE SIZE/RATING LIFT THREAD FITTINGS		Kvaerner National 2-1/16" 3000# 2-3/8" EUE 8RD 1-1/2" Reducer AG Valve Gauge
FLOW CROSS	MAKE SIZE RATING		2-1/16" x 2-1/16" x 2-1/16" 500 MTL Class EE
	OUTLET	FITTINGS	
	WING VALVE	MAKE TYPE SIZE RATING TRIM	Kvaerner National BHEL 2-1/16" 5000 psi N-1
UPPER MASTER VALVE	MAKE TYPE SIZE RATING TRIM		Kvaerner National BHEL 2-1/16" 5000 psi N-1
LOWER MASTER VALVE	MAKE TYPE SIZE RATING TRIM		Kvaerner National BHEL 2-1/16" 5000 psi N-1
ADAPTOR FLANGE	MAKE/TYPE SIZE/RATING		Kvaerner National 7-1/16" 3000 x 2-1/16" 5000
TUBING SPOOL	MAKE/TYPE SIZE/RATING		Kvaerner National DP70 11" 3000 x 7-1/16" 3000
	OUTLET 1	VALVE FITTINGS	2-1/16" 3000 Gate Valve c/w 2" NPT Companion Flange
	OUTLET 2	FITTINGS	1-1/2" VR Plug
*CASING SPOOL	MAKE/TYPE SIZE/RATING		Kvaerner National KSB 13-5/8" 3000 x 11" 3000
	OUTLET 1	VALVE FITTINGS	2-1/16" x 3000# Gate Valve 1-1/2" VR Plug
	OUTLET 2		Companion Flange tapped to 1/2" NPT
CASING BOWL	MAKE/TYPE SIZE/RATING		Kvaerner National NSB 13-5/8" 3000 x 13-3/8" 8RD
	OUTLET 1 OUTLET 2	VALVE FITTINGS	2" Ball Valve 2" Bull Plug
SURF CSG	SIZE/WT/GR/THD/DEPTH		10-3/4" 40.5# H40 / K55 8 Rd 721m
*INT CSG	SIZE/WT/GR/THD/DEPTH		N/A
PROD CSG	SIZE/WT/GR/THD/DEPTH		5-1/2" 17# L80 8 Rd 1,667m
TUBING	SIZE/WT/GR/THD/JTS		2-3/8" 4.7# J55 EUE 156 jts
TUBING HANGER	MAKE/TYPE LIFT THD./BPV PREP.		Kvaerner National 2-3/8" EUE / CIW BPV PREP.
REMARKS	STRING WT. INDICATED CALCULATED SLACKOFF WT. OTHER		22,000 lb 22,000 lb 22,000 lb

* Intermediate casing installed?
NO

AUTHOR: I. Fendley | DRAFTED: I. Fendley | DATE DRAWN: 9 Aug 96

M0730023

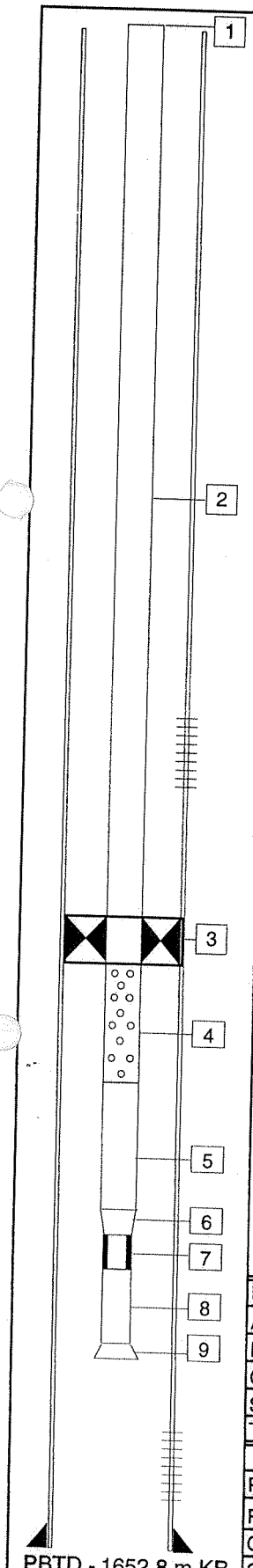
Figure 3

PETROLEUM ENGINEERING DEPARTMENT

Santos

P4 - FRACTURE STIMULATION TREATING STRING

WELL: EAST MEREENIE # 40 **DATE:** 27/8/96



ITEM No.	DESCRIPTION	LENGTH (m)	DEPTH KB (m)	MIN. ID. (in)
1	K.B. to top of 2-7/8" EUE tubing	1.83	0.00	
2	162 Jts. 2-7/8" 6.5# N80 EUE Tubing	1563.30	1.83	2.347
3	5-1/2" x 2-7/8" Baker AL-2 Lockset packer	1.38	1565.13	2.347
4	1 joint 2-7/8" 6.5# N80 EUE Perforated Tubing	9.65	1566.51	2.347
5	1 8' pup joint 2-7/8" 6.5# N80 EUE Tubing	2.44	1576.16	2.347
6	2-7/8" x 2-3/8" cross-over	0.32	1578.60	1.901
7	2-3/8" Otis XN nipple	0.38	1578.92	1.791
8	1 4' pup joint 2-3/8" J55 4.7# EUE Tubing	1.22	1579.30	1.901
9	2-3/8" EUE Re-entry guide	0.31	1580.52	1.901
			1580.83	

PERFORATION INTERVALS:

FORMATION	INTERVAL (M - KB)	GUN: SIZE	GUN: TYPE	CHARGES: SPF	CHARGES: TYPE	CHARGES: WT(g)
PACOOTA P3-120/130	1535 - 1554	3 2/3	TCP	5	J	37
PACOOTA P4	1592 - 1620	3 3/8	TCP	6	RDX	22

REMARKS:
ANNULUS FLUID:
INDICATED STRING WEIGHT:
CALCULATED STRING WEIGHT:
SLACK-OFF WEIGHT:
TENSION:

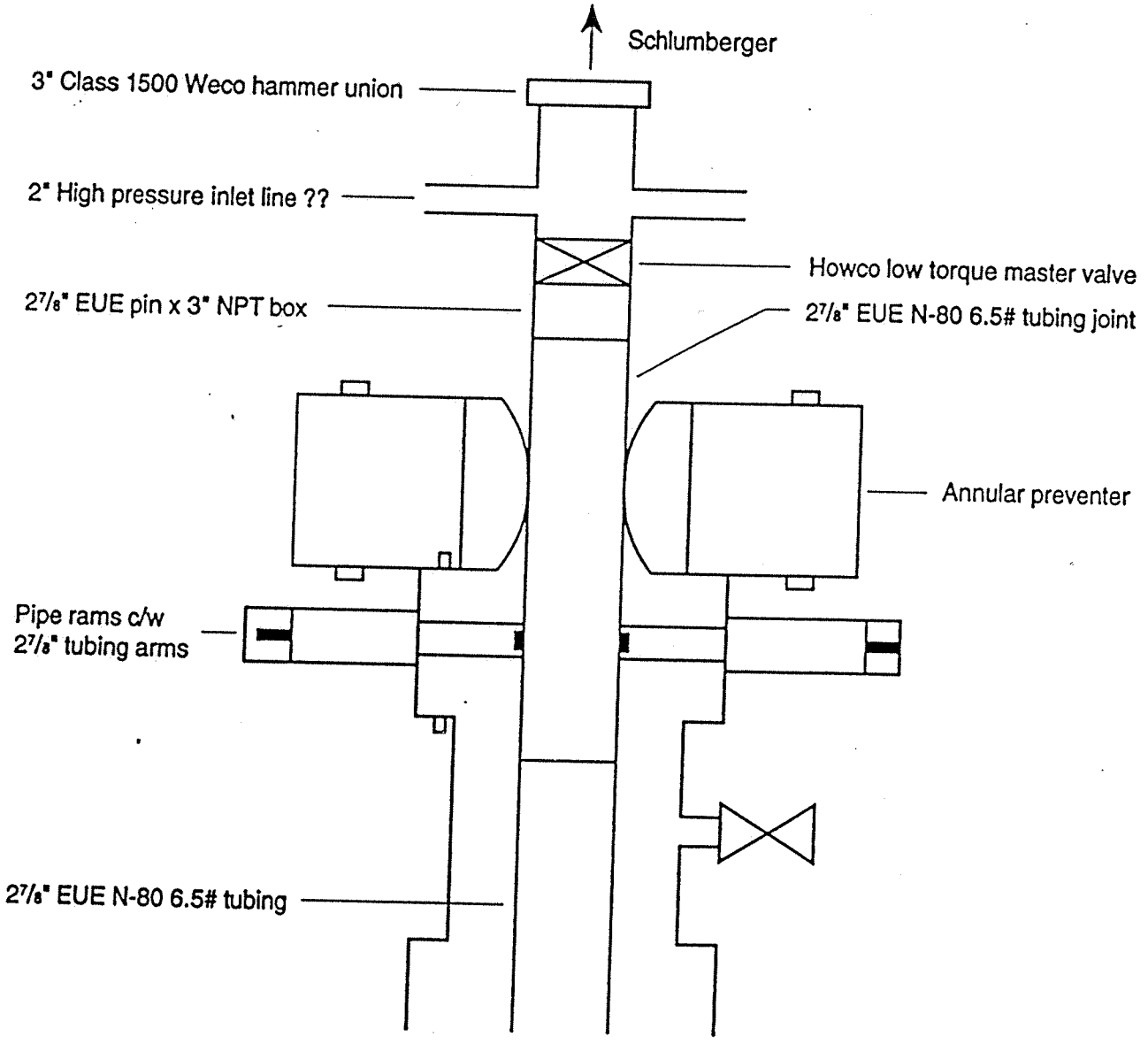
NOT TO SCALE	WELLSITE SUPERVISOR	I. Fendley
PROPOSED: YES	DATE OF INSTALLATION	
RE-COMPLETION:	DRAFTED: P. Lansom	DATE: 27/8/96
COMPLETION:	REVISED:	DATE:
OTHER:		

PBTD - 1652.8 m KB

Santos PETROLEUM ENGINEERING DEPARTMENT & DRILLING GROUP Figure 4

SURFACE WELLHEAD MANIFOLD FOR FRACTURE STIMULATION

WELL: EAST MEREENIE # 40 DATE OF INSTALLATION: SEP 96



NOTE - DRAWING IS NOT TO SCALE

AUTHOR: A. Paninczak DRAFTED: T. Luscombe DATE DRAWN: 25/8/94

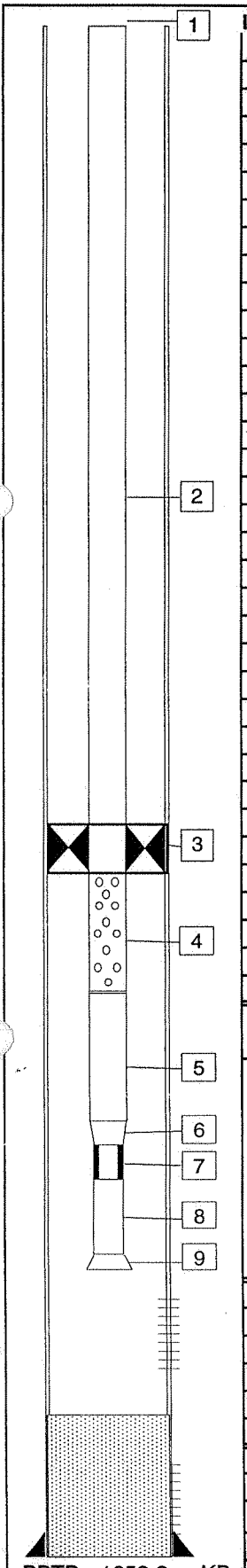
Figure 6

PETROLEUM ENGINEERING DEPARTMENT

Santos

UPPER P3 - FRACTURE STIMULATION TREATING STRING

WELL: EAST MEREENIE # 40 **DATE:** 27/8/96



ITEM No.	DESCRIPTION	LENGTH (m)	DEPTH KB (m)	MIN. ID. (in)
1	K.B. to top of 2-7/8" EUE tubing	1.83	0.00	
2	156 Jts. 2-7/8" 6.5# N80 EUE Tubing	1505.40	1.83	2.347
3	5-1/2" x 2-7/8" Baker AL-2 Lockset packer	1.38	1507.23	2.347
4	1 joint 2-7/8" 6.5# N80 EUE Perforated Tubing	9.65	1508.61	2.347
5	1 8' pup joint 2-7/8" 6.5# N80 EUE Tubing	2.44	1518.26	2.347
6	2-7/8" x 2-3/8" cross-over	0.32	1520.70	1.901
7	2-3/8" Otis XN nipple	0.38	1521.02	1.791
8	1 4' pup joint 2-3/8" J55 4.7# EUE Tubing	1.22	1521.40	1.901
9	2-3/8" EUE Re-entry guide	0.31	1522.62	1.901
			1522.93	

PERFORATION INTERVALS:

FORMATION	INTERVAL (M - KB)	GUN: SIZE	GUN: TYPE	CHARGES: SPF	CHARGES: TYPE	CHARGES: WT(g)
PACOOTA P3-120/130	1535 - 1554	3 2/3	TCP	5	J	37
PACOOTA P4	1592 - 1620	3 3/8	TCP	6	RDX	22

REMARKS:
ANNULUS FLUID:
INDICATED STRING WEIGHT:
CALCULATED STRING WEIGHT:
SLACK-OFF WEIGHT:
TENSION:

NOT TO SCALE	WELLSITE SUPERVISOR	I. Fendley
PROPOSED: YES	DATE OF INSTALLATION	
RE-COMPLETION:	DRAFTED: P. Lansom	DATE: 27/8/96
COMPLETION:	REVISED:	DATE:
OTHER:		

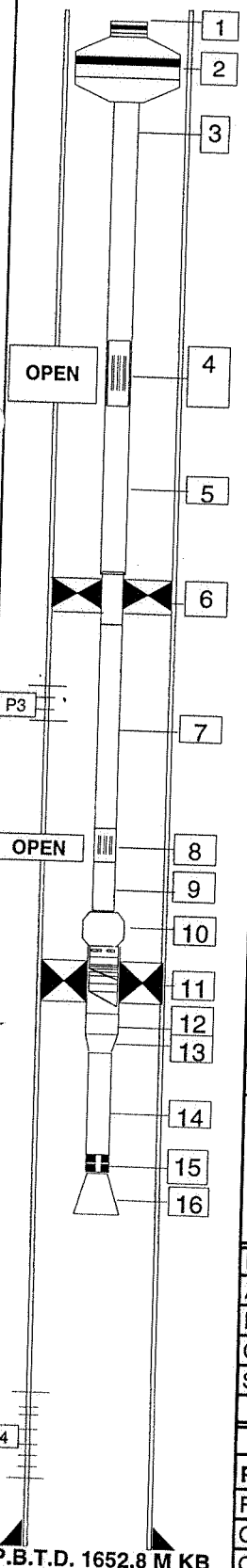
Figure 7

Santos PETROLEUM ENGINEERING DEPARTMENT

ACN 007 550 923

DOWNHOLE 2-3/8" TANDEM COMPLETION

WELL: **EAST MEREENIE 40** DATE: 27/8/96



P.B.T.D. 1652.8 M KB
DRILLER

ITEM No.	DESCRIPTION	LENGTH (M)	DEPTH (M)	MIN ID (in)
1	K.B. TO TOP OF TUBINGHEAD SPOOL	4.98		
2	KVAERNER NATIONAL 2-3/8" EUE TUBING HANGER	0.35	4.98	
3	156 X JOINTS 2-3/8" 4.7# J55 EUE TUBING	1505.40	5.33	
4	1 X 2-3/8" EUE OTIS SLIDING SLEEVE (DOWN TO OPEN)	0.88	1510.73	
5	1 X JOINT 2-3/8" 4.7# J55 EUE TUBING	9.65	1511.61	
6	1 X 2-3/8" X 5-1/2" BAKER FH PKR 15# TO 20# EUE	1.80	**1521.26**	
7	4 X JOINT 2-3/8" 4.7# J55 EUE TUBING	38.60	1523.06	
8	1 X BAKER 2-3/8" EUE CMD SLIDING SLEEVE WITH 'X' PROFILE	0.88	1561.66	
9	1 X 4' PUP JOINT 2-3/8" 4.7# J55 EUE	1.22	1562.54	
10	2-3/8" BAKER G22 LOCATOR SEAL ASSEMBLY SIZE 44-26 2-3/8" EUE BOX X 1/2 MULESHOE, W/- 2 'V-RYTE' SEAL UNITS	0.49	1563.76	
11	5-1/2" BAKER DB PACKER SIZE 44-26 F/- 13-17 # CASING , 90 DURO PACKING ELEMENT, 3-1/2" NU BOX DOWN	1.19	**1564.25**	
12	BAKER MILL OUT EXTENSION 3-1/2" NU PIN X PIN	1.65	1565.44	
13	SWAGE 3-1/2" NU BOX X 2-3/8" EUE PIN	0.54	1567.09	
14	1 4' PUP JOINT TUBING 2-3/8" 4.7# J55 EUE	1.22	1567.63	
15	1 X OTIS 2-3/8" EUE 11XN LANDING NIPPLE	0.39	1568.85	
16	1 X 2-3/8" WIRELINE RE-ENTRY GUIDE	0.18	1569.24	
	BOTTOM OF ASSEMBLY		1569.42	

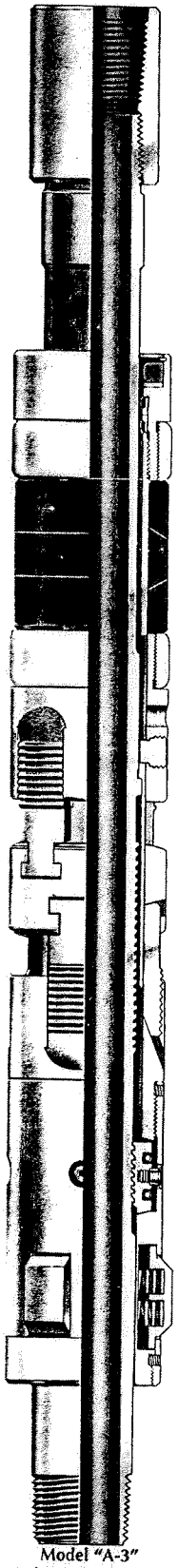
PERFORATION INTERVALS:

FORMATION	INTERVAL (M / KB)	GUN: SIZE	GUN: TYPE	CHARGES: SPF	CHARGES: TYPE	CHARGES: WT(g)
PACOOTA P3-120/130	1535 - 1554 m	3 2/3	TCP	5	J	37
PACOOTA P4	1592 - 1620 m	3 3/8	TCP	6	RDX	22

REMARKS:
ANNULUS FLUID:
INDICATED STRING WEIGHT:
CALCULATED STRING WEIGHT:
SLACK-OFF / TENSION:

NOT TO SCALE	WELLSITE SUPERVISOR	I FENDLEY
PROPOSED: YES	DATE OF INSTALLATION	
RE-COMPLETION:	DRAFTED: PETER LANSOM	DATE: 27/8/96
COMPLETION:	REVISED:	DATE:
OTHER:	CHECKED (JX):	DATE:
	CHECKED (BRIS):	DATE:


M0730027



Model "A-3" Lok-Set Retrievable Casing Packer

MODEL "A-3"™ LOK-SET® RETRIEVABLE CASING PACKER
Product No. 646-30

The "Lok-Set" combines features of both permanent and retrievable packers in one general purpose packer for production, injection, zone isolation and remedial operations.

MODEL "AL-2"™ LARGE-BORE LOK-SET RETRIEVABLE CASING PACKER
Product No. 646-28

The "AL-2 Lok-Set" is similar to the "A-3" and is recommended when a larger-than-normal bore through the packer is required.

FEATURES/BENEFITS

- "Lok-Set" holds pressure from above and below without requiring any set-down weight, tubing tension or hydraulic hold downs to maintain its pack-off.
- May be used to isolate bad casing and can serve as a tubing anchor when tension is applied as in pumping wells. In water-flood applications where seasonal temperature changes in injection water can cause problems for conventional packers, the "Lok-Set" permits the tubing to be set in a neutral condition.
- Opposed, non-transferring, dovetail slips prevent movement of the packer in either direction due to pressure differentials, while allowing the landing of the tubing in tension compression or neutral.
- Right-hand tubing rotation controls setting and releasing.
- Releaseable lock ring provides a no-return, ratchet takeup for holding compression of packing elements after pack-off. The lock can be released only by right-hand rotation of the mandrel. Left and right-hand multiple threads on the mandrel engage the segmented lock ring and permit movement of the mandrel in one direction only, relative to the lock ring. Movement in the opposite direction is possible only by rotating to the right.
- Ratchet takeups of 1/8-inch in the packer threads assure a complete pack-off.

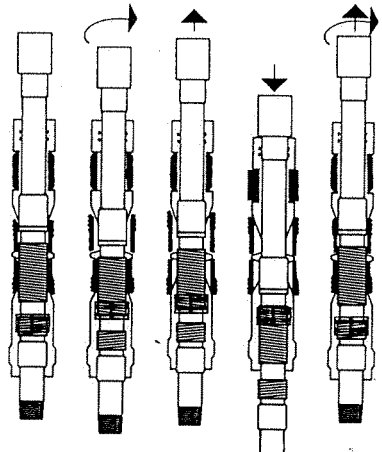
ACCESSORIES

On-Off Sealing Connector (Prod. No. 684-15)
Downhole Shut-off Valve (Prod. No. 684-10)

TO SET THE PACKER: Slacking off during right-hand rotation of the tubing causes the mandrel to move downward to free the slips and initiate setting. An initial 6,000 lb (2669 daN) set-down weight sets the upper slips and begins compression of the packing element. Then, 10,000 (4448 daN) to 12,000 lb (5338 daN) of upstrain engages the lower slips. Setting down 6,000 lb (2669 daN) to 10,000 lb (4448 daN) moves the mandrel through the lock ring to complete and lock-in the pack-off. If sufficient set-down weight is not available, left-hand rotation or spudding can be used to attain required pack-off force.

TO RELEASE THE PACKER: Apply an upstrain of 3,000 lb (1334 daN) to 6,000 lb (2669 daN) and rotate the tubing to the right from eight to ten turns at the tool, until the tool moves up the hole. Continue to rotate to the right several times while moving up the hole to be certain the slips are fully retracted.

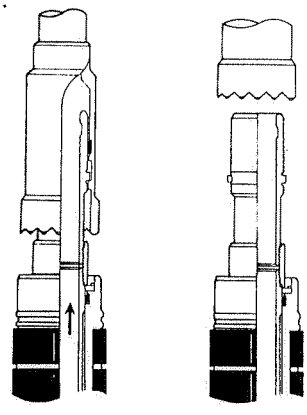
ORDERING EXAMPLE:
PRODUCT NO. *646-30*
SIZE: 47B4; THREAD & WT UP: 2-7/8 O.D. 6.4 lb/ft E.U. Box, yes (Baker equivalent acceptable?); THREAD & WT DOWN: 2-7/8 O.D. 6.4 lb/ft E.U. Pin, yes (Baker equivalent acceptable?) PACKING ELEMENT: 90-70-90 Nitrile; MATERIAL: Standard (Low Alloy Steel 36Rc Standard); COATING: PA-400 internal (internal/external), yes (Baker equivalent acceptable?); QTY: 5



Run in | Slack off, rotate right, engage upper slips | Pick up, engage lower slips | Set-down complete pack-off and lock-set | Release: pick up and rotate right

MODEL "FL-22"™ ON-OFF SEALING CONNECTOR
Product No. 684-15

Use of an On-Off Sealing Connector above a Lok-Set Packer is a very effective and popular combination. This hook-up permits retrieval of the tubing string with the formation blanked-off at the packer by setting a BFC Blanking Plug in the On-Off tools standard seating nipple profile. The On-Off tool also facilitates circulation of well fluids above the packer. Due to right-hand operation of the Lok-Set Packer, the "FL-22" Model (Left-hand off) On-Off tool is recommended.



MODEL "D" RETAINER PRODUCTION PACKER SPECIFICATION GUIDE

Casing				Packer[A]			Seal Assembly[B]		
O.D.	Weight[C]	I.D. Range In Which Packer May Be Run		Size[D]	Max O.D.	Diameter of Sealing Bore	Size	Min Bore Thru Seals[E]	
		Min	Max						
In. mm	Lb/ft	In. mm	In. mm		In. mm	In. mm		In.	mm
4-1/2[F] 114,30	17.7-20.0	3.600 91,44	3.696 93,88	19-25	3.475 88,27	2.500 63,50	20-25	1.865	47,37
	15.1-17.1	3.697 93,90	3.826 97,18	21-25	3.562 90,47				
	11.6-15.1	3.781 96,04	4.000 101,60	22-19	3.593 91,26	1.968 49,99	21-19	1.312	33,32
							20/40-19	.984	24,99
	9.5-13.5	3.920 99,57	4.090 103,89	23-26[G]	3.750 95,25	2.688 68,28	40/80-26	1.968	49,99
							41/81-26	1.750	44,45
	9.5-11.6	4.000 101,60	4.124 104,75	24-19	3.812 96,82	1.968 49,99	21-19	1.312	33,32
							20/40-19	.984	24,99
5 127,00	15-21	4.125 104,78	4.436 112,67	32-26[G]	3.968 100,79	2.688 68,28	40/80-26	1.968	49,99
							41/81-26	1.750	44,45
				32-25		2.500 63,50	20-25	1.865	47,37
				32-19		1.968 49,99	21-19	1.312	33,32
							20/40-19	.984	24,99
	11.5-13	4.437 112,70	4.670 118,62	34-26[G]	4.250 107,95	2.688 68,28	40/80-26	1.968	49,99
							41/81-26	1.750	44,45
				34-25		2.500 63,50	20-25	1.865	47,37
				34-19		1.968 49,99	21-19	1.312	33,32
							20/40-19	.984	24,99
5-1/2 139,70	23-26	4.625 117,48	4.811 122,20	42-26	4.328 109,93	2.688 68,28	40/80-26	1.968	49,99
							41/81-26	1.750	44,45
				42-19		1.968 49,99	21-19	1.312	33,32
							20/40-19	.984	24,99
	13-17	4.812 122,22	5.044 128,12	44-26	4.500 114,30	2.688 68,28	40/80-26	1.968	49,99
							41/81-26	1.750	44,45
				44-19		1.968 49,99	21-19	1.312	33,32
							20/40-19	.984	24,99
6 152,40	14-23	5.140 130,56	5.552 141,02	64-30	4.937 125,40	3.000 76,20	42/62-30	2.375	60,33
							40/60-30	1.970	50,04
6-5/8 168,28	24-32	5.540 140,72	5.921 150,39	81-32	5.350 135,89	3.250 82,55	60/80-32	2.406	61,11
							61/81-32	1.990	50,55
	17-32	5.675 144,14	6.135 155,83	82-32	5.468 138,89		60/80-32	2.406	61,11
							61/81-32	1.990	50,55
				82-26		2.688 68,28	40/80-26	1.968	49,99
							41/81-26	1.750	44,45
	17-20	6.049 153,64	6.366 161,70	84-32	5.687 144,45	3.250 82,55	60/80-32	2.406	61,11
							61/81-32	1.990	50,55
				84-26		2.688 68,28	40/80-26	1.968	49,99
							41/81-26	1.750	44,45
7 177,80	38-49.5	5.540 140,71	5.921 150,39	81-32	5.350 135,89	3.250 82,55	60/80-32	2.406	61,11
							61/81-32	1.990	50,55
	32-44	5.675 144,15	6.135 155,83	82-32	5.468 138,89		60/80-32	2.406	61,11
							61/81-32	1.990	50,55
				82-26		2.688 68,28	43/60-26	1.968	49,99
							41/81-26	1.750	44,45
	23-32	6.049 153,64	6.366 161,70	84-32	5.687 144,45	3.250 82,55	60/80-32	2.406	61,11
							61/81-32	1.990	50,55
				84-26		2.688 68,28	40/80-26	1.968	49,99
							41/81-26	1.750	44,45
	20-29	6.184 157,07	6.456 163,98	86-32	5.875 149,22	3.250 82,55	60/80-32	2.406	61,11
							61/81-32	1.990	50,55
	17-20	6.456 163,98	6.765 171,83	88-32	6.187 157,15		60/80-32	2.406	61,11
							61/81-32	1.990	50,55
				88-26		2.688 68,28	40/80-26	1.968	49,99
							41/81-26	1.750	44,45

Casing				Packer[A]			Seal Assembly[B]		
O.D.	Weight[C]	I.D. Range In Which Packer May Be Run		Size[D]	Max O.D.	Diameter of Sealing Bore	Size	Min Bore Thru Seals[E]	
		Min	Max						
In. mm	Lb/ft	In. mm	In. mm		In. mm	In. mm		In.	mm
7-5/8 193,68	45.3-52.8	6.184 157,07	6.456 163,98	86-32	5.875 149,22	3.250 82,55	60/80-32	2.406	61,11
							61/81-32	1.990	50,55
	33.7-39	6.456 163,98	6.765 171,83	88-32	6.187 157,15	3.250 82,55	60/80-32	2.406	61,11
							61/81-32	1.990	50,55
				88-26		2.688 68,28	40/80-26	1.968	49,99
							41/81-26	1.750	44,45
	24-33.7	6.706 170,33	7.025 178,44	92-32	6.375 161,93	3.250 82,55	60/80-32	2.406	61,11
							61/81-32	1.990	50,55
				92-26		2.688 68,28	40/80-26	1.968	49,99
							41/81-26	1.750	44,45
8-5/8 219,08	36-49	7.500 190,50	7.825 198,76	126-38	7.125 180,98	3.875/98,43	120-38	2.468	62,69
				126-40		4.000/101,60	80-40	2.985	75,82
	24-36	7.812 198,42	8.150 207,01	128-38	7.500 190,50	3.875/98,43	120-38	2.468	62,69
				128-40		4.000/101,60	80-40	2.985	75,82
9-5/8 244,48	36-53.5	8.438 214,33	9.001 228,63	194-47	8.125 206,38	4.750 120,65	192-47	3.875	98,43
							190-47	3.000	76,20
				194-40			191-47	2.500	63,50
						4.000	80-40	2.985	75,82
				194-32		3.250 82,55	60/80-32	2.406	61,11
							61/81-32	1.990	50,55
10-3/4[H][J] 273,05	60.7-81	9.250 234,95	9.660 245,36	212-47	9.000 228,60	4.750 120,65	190-47	3.000	76,20
							191-47 or 192-47	2.500 3.875	63,50 98,43
				212-32		3.250 82,55	80-32 or 81-32	2.406 1.990	61,11 50,55
	32.75-60.7	9.660 245,36	10.192 258,88	214-47	9.437 239,70	4.750 120,65	190-47	3.000	76,20
							191-47 or 192-47	2.500 3.875	63,50 98,43
				214-32		3.250 82,55	80-32 or 81-32	2.406 1.990	61,11 50,55
11-3/4[H][J] 298,45	38-60	10.772 273,61	11.150 283,21	220-47	10.437 265,10	4.750 120,65	190-47	3.000	76,20
							191-47 or 192-47	2.500 3.875	63,50 98,43
				220-32		3.250 82,55	80-32 or 81-32	2.406 1.990	61,11 50,55
13-3/8[H][J] 339,73	68-102	11.889 301,98	12.464 316,59	230-60	11.562 293,67	6.000 152,40	190-60	4.875	123,83
				230-47		4.750 120,65	190-47	3.000	76,20
							191-47 or 192-47	2.500 3.875	63,50 98,43
				230-32		3.250 82,55	80-32 or 81-32	2.406 1.990	61,11 50,55
	48-72	12.175 309,25	12.715 322,96	240-60	12.000 304,80	6.000 152,40	190-60	4.875	123,83
				240-47		4.750 120,65	190-47	3.000	76,20
							191-47 or 192-47	2.500 3.875	63,50 98,43
				240-32		3.250 82,55	80-32 or 81-32	2.406 1.990	61,11 50,55

(A) For information on packer or accessory sizes not found in this specification guide, refer to Baker Technical Manual or contact your Baker Representative.
(B) Tubing seal assemblies, tubing seal and spacer nipples.
(C) Includes some drill pipe and line pipe weights.
(D) When proposed for use in other than the casing weight range shown, contact your Baker Representative.
(E) Minimum bore applicable to standard Models "G", "E" and "K" Seal Assemblies only. Not applicable to Models "L", "M", and "N" Seal Assemblies with K-RYTE and R-RYTE Seals which may have reduced ID's.
(F) In 4-1/2" OD 11.6 lb/ft and heavier casing, the size 20 Wireline Pressure Setting Assembly is too large and the size 10 WLPSA must be used. In 4-1/2" 9.5 and 10.5 lb/ft casing, either the size 10 or 20 WLPSA may be used.
(G) Furnished as Prod. 415-05 and 415-13 only. These sizes have steel bodies.
(H) Packers for Sizes 10-3/4" and larger casing should be run and set on a hydraulic setting tool. Products 413-70, 413-71, 413-72, 415-70, 415-72, 415-74 or 437-12.
(J) Packers for these sizes of casing are also available with other size seal bores on special order.

PERMANENT PACKER SYSTEMS

BAKER OIL TOOLS
A Baker Hughes company

MODEL "A-3" LOK-SET RETRIEVABLE CASING PACKER
PROD. NO. 646-30
SPECIFICATION GUIDE

Casing				Packer			
OD	Weight[B]	ID Range In Which Packer May Be Run		Size	Nom ID	Max Gage Ring OD	Standard Thread Specification[A] (Box Up x Pin Down)
		Min	Max				
In. *mm*	Lb/ft	In. *mm*	In. *mm*		In. *mm*	In. *mm*	In. *mm*
4 *101,60*	9.5—12.9	3.340 *94,83*	3.548 *90,12*	41A2	1.500 *38,10*	3.244 *82,40*	2-3/8 OD EU 8RD *60,33*
4-1/2 *144,30*	21.6—23.6						
4 *101,60*	9.5	3.548 *82,40*	3.640 *92,46*	41A4		3.423 *112,35*	
4-1/2 *114,30*	18.8						
	13.5—17.7	3.696 *93,79*	3.920 *99,57*	41B		3.578 *90,88*	
	11.6—13.5	3.910 *99,31*	4.000 *101,6*	43A2	1.978 *50,24*	3.786 *96,16*	2-3/8 OD EU 8 RD x NU 10 RD *60,33*
	9.5—10.5	4.001 *101,6*	4.090 *103,9*	43A4			
5 *127,00*	15—18	4.250 *108,0*	4.408 *112,0*	43B		4.140 *105,16*	
	11.5—15	4.408 *112,0*	4.560 *115,8*	43C		4.265 *108,33*	
5-1/2 *139,70*	26						
	20—23	4.635 *117,5*	4.778 *121,4*	45A2		4.515 *114,68*	2-3/8 OD EU 8 RD *60,33*
	15.5—20	4.778 *121,4*	4.950 *125,7*	45A4		4.656 *118,26*	
	13—15.5	4.950 *125,7*	5.190 *131,9*	45B		4.796 *121,82*	
6 *152,40*	26						
	20—23	5.191 *131,9*	5.390 *136,9*	45C		5.078 *128,98*	
	15—18	5.391 *136,9*	5.560 *141,2*	45D		5.171 *131,34*	
6-5/8 *168,28*	34	5.561 *141,2*	5.609 *142,5*	45E		5.421 *137,69*	
	24—32	5.610 *142,5*	5.921 *150,4*	45F		5.499 *139,67*	
	24	5.830 *148,1*	5.937 *150,8*	47A2	2.441 *62,00*	5.671 *144,04*	2-7/8 OD EU 8 RD *73,03*
	17—24	5.922 *150,4*	6.135 *155,8*	45G	1.978 *50,24*	5.796 *147,22*	2-3/8 OD EU 8 RD *60,33*
	17—20	5.938 *150,8*		47A4	2.441 *62,00*	5.827 *148,01*	2-7/8 OD EU 8 RD *73,03*
7 *177,80*	38	5.830 *148,1*	5.937 *150,8*	47A2		5.671 *144,04*	
	32—35	5.938 *150,8*	6.135 *155,8*	47A4		5.827 *148,01*	
	26—29	6.136 *155,9*	6.276 *159,4*	47B2		5.983 *151,97*	
	23—26	6.276 *159,4*	6.366 *161,7*	47B4		6.093 *154,76*	
	17—20	6.456 *164,0*	6.578 *167,1*	47C2		6.281 *159,54*	
7-5/8 *193,68*	33.7—39	6.579 *167,1*	6.797 *172,6*	47C4		6.468 *164,29*	
	24—29.7	6.798 *172,7*	7.025 *178,4*	47D2		6.687 *169,85*	
	20—24	7.025 *178,4*	7.125 *181,0*	47D4		6.827 *173,41*	

MODEL "A-3" LOK-SET RETRIEVABLE CASING PACKER
PROD. NO. 646-30 (Cont'd)
SPECIFICATION GUIDE

Casing				Packer			
OD	Weight[B]	ID Range In Which Packer May Be Run		Size	Nom ID	Max Gage Ring OD	Standard Thread Specification[A] (Box Up x Pin Down)
		Min	Max				
In. *mm*	Lb/ft	In. *mm*	In. *mm*		In. *mm*	In. *mm*	In. *mm*
8-5/8 *219,08*	44—49	7.511 *190,8*	7.687 *195,2*	49A2	3.500 *88,90*	7.327 *186,11*	4 OD NU 8 RD *101,60*
	32—40	7.688 *195,3*	7.921 *201,2*	49A4		7.546 *191,67*	
	20—28	7.922 *201,2*	8.191 *208,1*	49B		7.796 *198,02*	
9-5/8 *244,48*	47—53.5	8.343 *211,9*	8.681 *220,5*	51A2		8.234 *209,14*	
	40—47	8.681 *220,5*	8.835 *224,4*	51A4		8.452 *214,68*	
	29.3—36	8.836 *224,4*	9.063 *230,2*	51B		8.608 *218,64*	

MODEL "AL-2" LARGE BORE LOK-SET RETRIEVABLE CASING PACKER
PROD. NO. 646-28
SPECIFICATION GUIDE

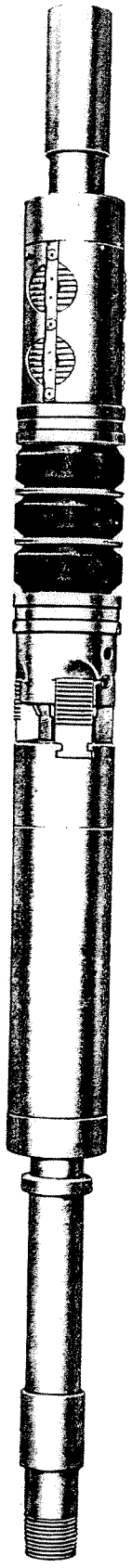
Casing					Packer				
OD	Weight[B]	Packer Size	ID Range In Which Packer May Be Run		Size	Nom ID	Max Gage Ring OD	Max. Diameter of Compressed Drag Block	Thread Spec. (Box Up x Pin Down)
			Min	Max					
In. *mm*	Lb/ft		In. *mm*	In. *mm*		In. *mm*	In. *mm*	In. *mm*	In. *mm*
5-1/2 *139,70*	20—23	45A2 x 2-3/8	4.625 *117,47*	4.778 *121,36*	45A2	2.375 *60,33*	4.515 *115,9*	4.592 *116,64*	2-7/8 OD EU 8 RD *73,03*
	15.5—17	45A4 x 2-3/8	4.778 *121,36*	4.892 *124,26*	45A4		4.656 *118,26*	4.750 *120,65*	
	13—15.5	45B x 2-3/8	4.950 *125,73*	5.190 *131,82*	45B		4.796 *121,82*	4.902 *124,51*	
6 *152,40*	26								
7 *177,80*	26—29	47B2 x 3.00	6.136 *155,85*	6.276 *159,41*	47B2	3.00 *76,20*	5.983 *151,97*	5.959 *151,36*	3-1/2 OD EU 8 RD *88,90*
	23—26	47B4 x 3.00	6.276 *159,41*	6.366 *161,77*	47B4		6.093 *154,76*		
	17—20	47C2 x 3.00	6.456 *163,98*	6.578 *167,08*	47C2		6.281 *159,54*		
7-5/8 *193,68*	33.7—39	47C4 x 3.00	6.579 *167,10*	6.797 *172,64*	47C4		6.468 *164,29*	6.520 *165,61*	
	24—29.7	47D2 x 3.00	6.798 *172,66*	7.025 *178,43*	47D2		6.687 *169,85*		
	20—24	47D4 x 3.00	7.025 *178,43*	7.125 *180,97*	47D4		6.827 *173,41*		

[A] Threads shown below are "standard" for the respective packer sizes. Other threads are available on request. Please specify threads when ordering.

[B] When selecting a packer for a casing weight common to two weight ranges (same OD), choose the packer size shown for the lighter of the two weight ranges. Example: For 7" 26 lb/ft casing use packer size 47B4. Under certain circumstances the other packer size may be run, such as when running in mixed casing strings.

Repair Kits, including such items as packing elements, seal rings, etc. are available for redressing Baker retrievable packers. Contact your Baker Representative. Use only Baker repair parts.

RETRIEVABLE PACKER SYSTEMS



Model "FH" Hydrostatic Single String Packer

MODEL "FH"™ HYDROSTATIC SINGLE STRING PACKER Product No. 781-08

This packer brings to single string retrievable packers the same rugged construction and dependable hydrostatic setting that have proven outstandingly successful with the Model "A-5" Hydrostatic Dual Packer.

The "FH" can be run in single-packer installations, as the lower packer in multiple-string hookups using hydrostatic or hydraulic duals, or in tandem in single string selective zone or multiple-zone production wells. In addition to applications where displacing and setting after the well is flanged up are desirable, the hydrostatic single is ideal for deviated or crooked holes where conditions are not suitable for mechanically set packers.

MODEL "FHL"™ HYDROSTATIC SINGLE STRING PACKER Product No. 781-20

The Model "FHL" Hydrostatic Packer is a large bore version of the "FH" Packer. Features, advantages, and operational procedures are basically the same as those described for the "FH".

MODEL "FHS"™ SELECTIVE HYDROSTATIC SINGLE STRING PACKER Product No. 781-10

MODEL "FHSL"™ SELECTIVE HYDROSTATIC SINGLE STRING PACKER Product No. 781-25

The Model "FHS" Selective Set Double-Grip Hydrostatic Single String Packer is a modified Model "FH" Hydrostatic Single String Packer equipped with a Selective Set Subassembly to allow (1) the tubing string to be tested prior to setting, and (2) selective setting and individual testing of any number of packers run in combination.

The Model "FHSL" Selective Set Double-Grip Large Bore Hydrostatic Single String Packer (size 47 x 2.75 and size 47 x 2.81) is a large bore version of the "FHS" Packer. Contact your Baker Representative for more information on this model.

FEATURES/BENEFITS

- Flanged up completion/no tubing manipulation required.
- Hydrostatic/hydraulic setting.
- Pack-off is mechanically locked in.
- Standard hydraulic hold downs.
- Simple upstrain shear-release or optional rotational-release.
- Multiple packing element system.

OPERATION: The Model "FH" Hydrostatic Packer is actuated by pressuring the tubing, and this is generally done in one of three ways:

(1) Dropping a ball to seat in a Baker Hydro-Trip Pressure Sub or Shear-out Ballseat Sub (Prod. No. 799-28 or 469-21) located below the packer.

(2) Use of a Baker Differential Displacing Valve (Prod. No. 759-17) provided operations will not require pressuring the tubing before the displacing valve is to be opened.

(3) Landing a BFC Blanking Plug in a BFC Seating Nipple or Sliding Sleeve below the packer (Prod. Nos. 801-50, 801-55 and 810-04). In most cases, the plug can be run, the packer set, and the plug retrieved all in one trip.

Where more than one Model "FH" Packer is to be run, only one of these plugging devices needs to be used below the lowermost packer. This arrangement will result in simultaneous setting of all the "FH" Packers when the tubing is pressured. If simultaneous setting is not desirable, shear values can be altered so the packers will set in sequence, the bottom first and the top last.

TO SET PACKER WHERE HYDROSTATIC PRESSURE IS GREATER THAN 1,500 PSI (10,34 MPa)

Run the packer to setting depth, flange up the well and displace the tubing. Using one of the methods mentioned above, plug the tubing and increase tubing pressure to approximately 1,000 psi (6,89 MPa) over annulus pressure at the packer. The shear screws will shear, exposing the setting mechanism to the hydrostatic pressure in the well. This pressure completely sets and packs-off the packer.

The Body Lock Ring mechanically locks in the set so that a drop in hydrostatic pressure can have no effect on the packer. After the packer is set, the tubing is opened by pressuring to force the tripping ball through the pressure sub or displacing valve or by retrieving the BFC plug.

TO SET PACKER WHERE HYDROSTATIC PRESSURE IS LESS THAN 1,500 PSI (10,34 MPa): The packer is dressed with additional shear screws to increase the actuating pressure to 2,000 psi (13,78 MPa); and the Hydro-Trip Pressure Sub or Shear-out Ballseat Sub is dressed to require 3,500 psi (24,12 MPa) differential to blow the ball through after the packer is set.

USING A DIFFERENTIAL DISPLACING VALVE: This valve offers distinct advantages where it is desirable to displace the tubing after the well is flanged up and the tubing sealed off in a packer below the "FH". The valve is opened and the tubing displaced, then one ball is dropped to set the packer and close the valve.

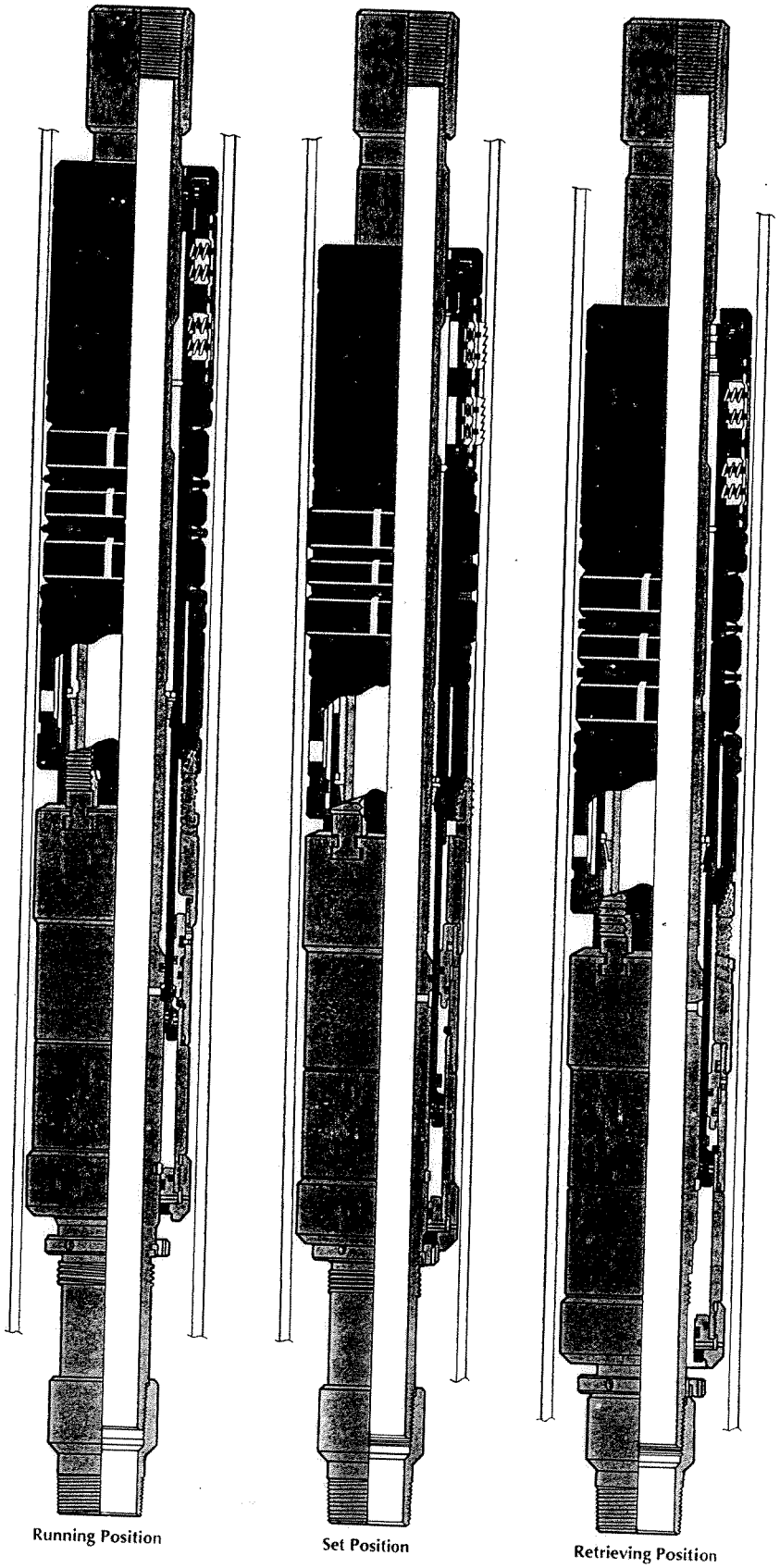
TO RELEASE THE PACKER: The standard Model "FH" Packer is equipped with a 30,000 lb (3344 daN) Shear Ring for a straight upstrain release. Other values of Shear Rings available are shown in the table below.

An alternate rotational-release is available on special order, which permits the packer to be released by taking an upstrain and rotating to the right. The rotational release has a 50,000 lb (22240 daN) [40,000 lb (17792 daN) on Size 43] straight upstrain shear-out safety release.

ORDERING EXAMPLE:
PRODUCT NO. *781-08*
SIZE: 47B2; THREAD & WT UP: 2-7/8 O.D. 6.4 lb/ft New Vam Box, N/A (Baker equivalent acceptable?)
THREAD & WT DOWN: 2-7/8 O.D. 6.4 lb/ft New Vam Pin, N/A (Baker equivalent acceptable?)
PACKING ELEMENT: 90-70-90 Nitrile
SHEAR RATING: 30,000 lbs.
MATERIAL: 41XX 22Rc (BMS-A099) Flow wetted (Low Alloy Steel 36Rc Standard); COATING: None (internal/external), N/A (Baker equivalent acceptable?); QTY: 5

SHEAR RING AVAILABILITY GUIDE

PACKER SIZE	SHEAR RATING Lb x 1,000 *daN*			
	20 *8896*	30 *13344*	40 *17792*	50 *22240*
43	X	X	X	
45	X	X	X	X
47	X	X	X	X
49	X	X	X	X
51	X	X	X	X



Model "FH" Hydrostatic Single String Packer Operation

BAKER OIL TOOLS
A Baker Hughes company

RETRIEVABLE PACKER SYSTEMS

SPECIFICATION GUIDE

Casing				Packer			
OD	Weight[A]	ID Range In Which Packer May be Run		Size	Nom ID	Max Gage Ring OD	Standard Thread Specifications[B] Box Up & Pin Down
		Min	Max				
In. *mm*	Lb/ft	In. *mm*	In. *mm*		In. *mm*	In. *mm*	In. *mm*
4-1/2 *114,30*	9.5—13.5	3.910 *99,31*	4.090 *103,89*	43A	1.978 *50,24*	3.786 *95,16*	2-3-8 OD EU 8RD *60,33*
5 *127,00*	15—18	4.250 *107,95*	4.408 *111,96*	43B		4.140 *105,16*	
	11.5-15	4.408 *111,96*	4.560 *115,82*	43C		4.255 *108,33*	
5-1/2 *139,70*	26						
	20—23	4.625 *117,48*	4.778 *121,36*	45A2		4.515 *114,68*	
	15.5—20	4.778 *121,36*	4.950 *125,73*	45A4		4.656 *118,26*	
	13—15.5	4.950 *125,73*	5.190 *131,83*	45B		4.796 *121,82*	
6 *152,40*	26						
	20—23	5.191 *131,85*	5.390 *136,91*	45C		5.078 *128,98*	
	15—18	5.391 *136,93*	5.560 *141,22*	45D		5.171 *131,34*	
6-5/8 *168,28*	34	5.561 *141,25*	5.609 *142,47*	45E2		5.421 *137,69*	
	28—32	5.610 *142,49*	5.791 *147,09*	45E4		5.499 *139,67*	
7 *177,80*	24—28 38	5.791 *147,09*	5.921 *150,39*	46A4	2.416 *61,37*	5.603 *142,32*	2-7-8 OD EU 8 RD *73,03*
6-5/8 *168,28*	24	5.830 *148,08*	5.937 *150,80*	47A2		5.671 *144,04*	
	17—20	5.938 *150,83*	6.135 *155,83*	47A4		5.827 *148,01*	2-7-8 OD EU 8RD *73,03* or
7 *177,80*	38	5.830 *148,08*	5.937 *150,80*	47A2	2.416 *61,37* or 2.000 *50,80*	5.671 *144,04*	
	32—35	5.938 *150,83*	6.135 *155,83*	47A4		5.827 *148,01*	
	26—29	6.136 *155,85*	6.276 *159,41*	47B2		5.983 *151,97*	
	20—26	6.276 *159,41*	6.456 *163,98*	47B4		6.093 *154,76*	
	17—20	6.456 *163,98*	6.578 *167,08*	47C2		6.281 *159,54*	
7-5/8 *193,68*	33.7—39	6.579 *167,11*	6.797 *172,64*	47C4		6.468 *164,29*	2-3-8 OD EU 8RD *60,33*
	24—29.7	6.798 *172,67*	7.025 *178,44*	47D2		6.687 *169,85*	
	20—24	7.025 *178,44*	7.125 *180,98*	47D4		6.827 *173,41*	
8-5/8 *219,08*	44—49	7.511 *190,78*	7.687 *195,25*	49A2	3.000 *76,20* or 2.416 *61,37* or 2.000 *50,80*	7.327 *186,11*	3-1/2 OD EU 8RD *88,90* or 2-7/8 OD EU 8RD *73,03* or 2-3-8 OD EU 8RD *60,33*
	32—40	7.688 *195,28*	7.921 *201,19*	49A4		7.546 *191,67*	
	20—28	7.922 *201,22*	8.191 *208,05*	49B		7.796 *198,02*	
9-5/8 *244,48*	47—53.5	8.343 *211,91*	8.681 *220,50*	51A2		8.233 *209,12*	
	40—47	8.681 *220,50*	8.835 *224,41*	51A4		8.452 *214,68*	
	29.3—36	8.836 *224,43*	9.063 *230,20*	51B		8.608 *218,64*	

MODEL "FH" HYDROSTATIC SINGLE STRING PACKER Prod. No. 781-08

[A] When selecting a packer for a casing weight common to two weight ranges (same OD), choose the packer size shown for the lighter of the two weight ranges. Example: For 7" 20 lb/ft. casing use packer size 47C2. Under certain circumstances the other packer size may be run, such as when running in mixed casing strings.

[B] Threads shown below are "standard" for the respective packer mandrel sizes. Other threads are available on request. Please specify threads when ordering.

Repair kits, including such items as packing elements, seal rings, etc., are available for redressing Baker retrievable packers. Contract your Baker Representative. Use only Baker repair parts.

SPECIFICATION GUIDE

Casing				Packer			
OD	Weight[A]	ID Range In Which Packer May be Run		Size	Nom ID	Max Gage Ring OD	Standard Thread Specifications[B] Box Up & Pin Down
		Min	Max				
In. *mm*	Lb/ft	In. *mm*	In. *mm*		In. *mm*	In. *mm*	In. *mm*
6-5/8 *168,28*	24	5.830 *148,08*	5.921 *150,39*	47A2	3.000 *76,20*	5.671 *144,04*	3-1/2 OD EU 8RD *88,90*
	20	5.989 *152,12*	6.094 *154,79*	47A4		5.827 *148,01*	
	17	6.135 *155,83*	6.276 *159,41*	47B2		5.983 *151,97*	
7 *177,80*	38	5.830 *148,08*	5.921 *150,39*	47A2		5.671 *144,04*	
	32-35	5.989 *152,12*	6.094 *154,79*	47A4		5.827 *148,01*	
	26-29	6.135 *155,83*	6.276 *159,41*	47B2		5.983 *151,97*	
	20-26	6.276 *159,41*	6.456 *163,98*	47B4		6.093 *154,76*	
	17-20	6.456 *163,98*	6.578 *167,08*	47C2		6.281 *159,54*	
7-5/8 *193,68*	33.7-39	6.579 *167,11*	6.765 *171,83*	47C4		6.468 *164,29*	
	24-29.7	6.766 *171,86*	7.025 *178,44*	47D2		6.687 *169,85*	
	20-24	7.025 *178,44*	7.125 *180,98*	47D4		6.827 *173,41*	
9-5/8 *244,48*	47-53.5	8.343 *211,91*	8.681 *220,50*	51A2x 4-3/4	4.750 *120,65*	8.233 *209,12*	5-1/2 OD Long Casing *139,70*
				51A2			
	40-47	8.681 *220,50*	8.835 *224,41*	51A4	4.000 *101,60*	8.452 *214,68*	4-1/2 OD Long Casing *114,30*
	29.3-36	8.836 *224,43*	9.063 *230,20*	51B		8.608 *218,64*	

MODEL "FHL" HYDROSTATIC SINGLE STRING PACKER Prod. No. 781-20

[A] When selecting a packer for a casing weight common to two weight ranges (same OD), choose the packer size shown for the lighter of the two weight ranges. Example: For 7" 20 lb/ft. casing use packer size 47C2. Under certain circumstances the other packer size may be run, such as when running in mixed casing strings.

[B] Threads shown below are "standard" for the respective packer mandrel sizes. Other threads are available on request. Please specify threads when ordering.

Repair kits, including such items as packing elements, seal rings, etc., are available for redressing Baker retrievable packers. Contact your Baker Representative. Use only Baker repair parts.

MODEL "D"™ AND "DB"™ RETAINER PRODUCTION PACKER

Baker's Model "D" and "DB" Retainer Production Packers are the most widely used, most versatile, high performance permanent production packers available. They are frequently used as a permanent squeeze or testing packer or as a permanent or temporary bridge plug.

The Model "DB" Packer is distinguished from the Model "D" by the "DB's" threaded (Box or Pin) bottom guide. This "DB" Guide can be specified for acceptance of a Millout Extension, a Seal-Bore Extension, or virtually any component desired. Model "D" Packers and their guides can also be ordered separately by those interested in maximum inventory flexibility. Ordering examples and additional information concerning product numbers for packers without guides, material options, guide commodity numbers, o-rings, back-up rings and set screws may be found in Appendix A. Millout extensions, seal bore extensions and their crossovers should be ordered separately. See pages 30-31 and Appendix B for additional information regarding these components.

FEATURES/BENEFITS

- Proven reliability.
- Slim line design.
- Solid construction that makes possible a significant savings in rig time by providing a 50% faster run-in (compared to former permanent packers) without fear of impact damage or premature setting.
- Two opposed sets of full-circle, full-strength slips.
- A packing element that resists swab-off but packs-off securely when the packer is set.
- Unique Interlocked Expandable Metal Back-Up Rings that contact the casing creating a positive packing element extrusion barrier.

PACKER SETTING:

Electric Line (p. 33)
Tubing (p. 34)
—Setting procedures and equipment are the same for both Model "D" and "DB".

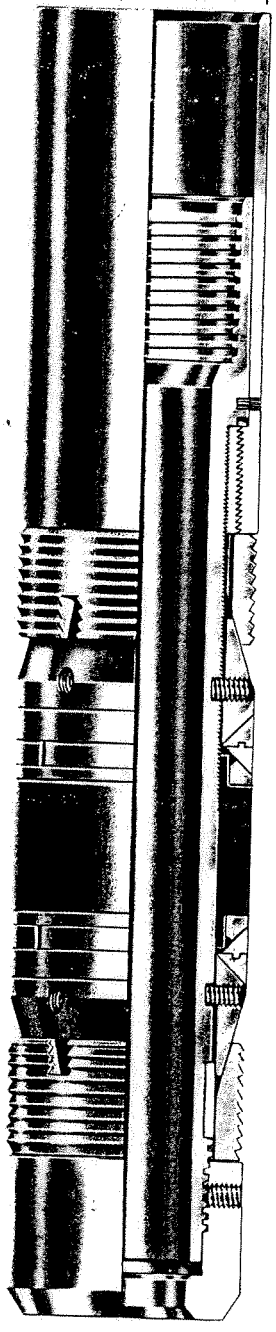
PACKER REMOVAL:

Milling Tools (p. 54-55)

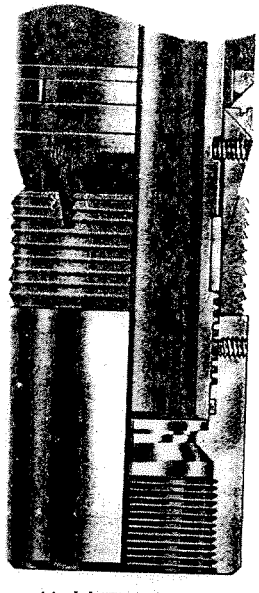
PACKER ACCESSORIES:

Tubing Seal Assemblies (p. 36-40)
Seal Bore Extensions (p. 30) and Appendix B
Millout Extensions (p. 30-31) and Appendix B
Packer Plugs (p. 52-53)
Expansion Joints (p. 48-49)
Parallel Flow Systems (p. 50-51)
Tubing Seal Receptacles (p. 44-46)

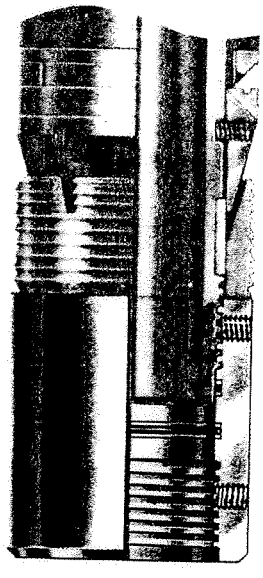
See Appendix A for additional product numbers and ordering information.



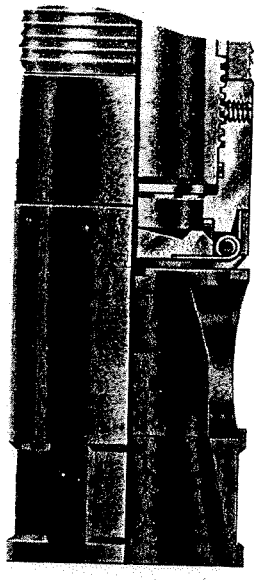
Model "D" Retainer Production Packer with Blank Guide
This guide serves only as a bottom sub and does not accommodate tailpipe.
Product No. 415-13



Model "DB" Retainer Production Packer with "B" Guide For Millout Extension
Product No. 415-05 (Nitrile)
Product No. 415-25 (Aflas)



Model "DB" Retainer Production Packer with "B" Guide For Seal Bore Extension
Product No. 415-05 (Nitrile)
Product No. 415-25 (Aflas)



Model "D" Retainer Production Packer with Flapper Valve Guide
This guide serves as a back pressure valve and does not accommodate tailpipe.
Product No. 415-01

Aflas™ Trademark of Asahi Glass Company.

DOWN HOLE SEALING SYSTEMS

PACKER TO TUBING SEAL SYSTEM SELECTION

A variety of sealing accessories are available for use with Retainer Production Packers. Each is designed to meet the specific requirements of certain completion techniques. To select the proper packer-to-tubing seal system for any well completion, careful consideration must be given to present and future well conditions. Factors which must be considered are:

- Seal movement
- Maximum pressure differential
- Maximum and minimum temperaures
- Well Fluids (H_2S, CO_2, or other corrosives and inhibitors)

These enviromental considerations will determine the best combination of packer seal accessory type (locator, anchor or other), accessory material (metals), and seal stack (elastomers) for use in each case.

MODEL "G"™ LOCATOR TUBING SEAL ASSEMBLY

Basic assembly includes two seal stacks. Any number of seal units can be added for increased length. Designed for use in Models "D", "F-1", "N", "SB-3", "SC-2P" and "Retrieva-D" seal bore packers. Although not commonly used in this way, they are also compatible with the lower seal bore in most sizes of "DA", "FA", "SAB-3" and "Retrieva-DA" Packers. Production tubes, tailpipe or other accessories with OD's compatible with packer bore can be attached to the bottom of this seal assembly.

MODEL "K"™ LOCATOR TUBING SEAL NIPPLE

Used for sealing in the upper bore of Model "DA", "FA", "SAB-3" "SABL-3" and "Retrieva-DA" Packers. One seal stack is used on this seal nipple so no upward movement can be tolerated, therefore, sufficient set-down weight must be available to prevent movement. Supplied with blank or half mule shoe bottom sub which will not accomodate tail pipe or production tubes.

MODEL "N"™ LOCATOR TUBING SEAL NIPPLE

Similar to the "K" Locator tubing seal nipple but designed for use in extremely hostile environments in Model "DA", "FA" "SAB-3" "SABL-3" and "HEA" Packers. The "N" features metal-to-metal internal connections and is used with R-RYTE, Seal-RYTE, K-RYTE, K-HEET and A-HEET seal stacks.

Refer to Appendix C for ordering examples and product numbers.

The **Locator Tubing Seal Assembly** is the simplest packer seal system. It is run in the well on the production tubing string until its no-go shoulder "locates" on the top of the packer. This positions one or two seal stacks in the packer's sealbore and establishes a seal between the packer and the tubing. The number of seal stacks in the packer's bore is determined by the type of packer being used. Packers with enlarged upper or alternate seal bores use seal nipples with one seal stack. Packers which do not have alternate seal bores will accept seal assemblies with two or more seal stacks.

When a Locator Tubing Seal Assembly is landed on a packer the tubing is normally set in compression to compensate for any contraction of the tubing during treating operations. It is not always possible or desirable to slack off sufficient weight, particularly in deep deviated wells, to compensate for contraction. In such a case, additional length must be added to the packer's sealbore using sealbore extensions and to the locator tubing seal assembly using a combination of spacer tubes along and additional seal units.

MODEL "G" LOCATOR TUBING SEAL ASSEMBLY WITH SPACER TUBE

This extended Model "G" Locator Tubing Seal Assembly is furnished with 6 seal stacks. Designed for installations requiring tubing movement, this seal assembly should only be used with packers with seal bore extensions or with retrievable packer bore receptacles. Like all locator tubing seal assemblies, it should be landed with sufficient set-down weight to prevent seal movement. When used in a properly designed system, this seal assembly will give long service life even if movement occurs.

MODELS "L"™ and "LM"™ LOCATOR TUBING SEAL ASSEMBLY WITH SPACER TUBE

Similar to the "G" Locator tubing seal assembly with spacer tube but designed for use in extremely hostile environments in Models "D", "F-1", "HE", "SB-3" and "SC-2P" seal bore packers. Normally furnished with 3 seal stacks and 3 debris barriers. The "L" features metal-to-metal internal connections and is used with V-RYTE, R-RYTE, Seal-RYTE, K-RYTE, K-HEET and A-HEET seal stacks. The "LM" also features a compression energized metal-to-metal packer to tubing seal.

BAKER OIL TOOLS
A Baker Hughes company

ELECTRIC WIRELINE PACKER SETTING

MODEL "E-4" WIRELINE PRESSURE SETTING ASSEMBLY
Product No. 437-02

This tool is used for setting Baker Models "D", "DA", "F", "F-1", "FA-1", "FA", "HE" and "HEA" Retainer Production Packers. "Retrieva-D", "Retrieva-DA", "Lok-Set" and "SC-2P" Retrievable Seal Bore Packers are also set using this tool. Also required is the Model "B" Wireline Adapter Kits, the equipment and skilled services of a licensed wireline perforating and/or logging service company are also required.

OPERATION:

The proper size wireline adapter kit is installed in the packer. The packer and adapter kit are then connected to the pressure setting assembly. These are run to setting depth on the electric wireline.

A small charge of electrical current, transmitted through the electric wireline, ignites the power charge in the setting assembly, gradually building up gas pressure. This pressure provides the controlled force necessary to set the packer. When the prescribed setting force has been applied to the packer, the release stud in the wireline adapter kit parts thus freeing the setting equipment from the packer, allowing it to then be retrieved. The proper release stud is shipped with each packer at export. The "E-4" wireline pressure setting assembly is recommended for use at temperatures below 400°F.

MODEL "L" HI-TEMP WIRELINE PRESSURE SETTING ASSEMBLY
Product No. 437-12

The Hi-Temp Setting Tool is designed to perform the same function as the Model "E-4" Wireline Pressure Setting Assembly in wells which are greater than 400°F. To accommodate some of the packers being made for high temperatures, this setting tool can apply up to 90,000 lbs. force. It also has a metering device which can slow the setting action, from almost instantaneous to over one hour. The tool is made in two versions, a two stage and a three stage. The three stage version is for applications where there is not enough hydrostatic pressure to operate the two stage tool. The primary power source for both versions is hydrostatic pressure acting against atmospheric pressure. An igniter and a small power charge are used to shear off the end of a plug and open a port to the well fluid which provides the controlled force to set the packer and part the release stud. The igniter and charge are rated to operate to a maximum temperature of 600°F.

The same Model "B" Wireline Adapter Kits used with the Model "E-4" are used with the Model "L" Pressure Setting Assembly. The OD of the Model "L" is 3.625 inches and it can be used to run and set packers in 4 1/2" OD and larger casing.

Use of the Baker Slow-Set Power Charge, Product No. 437-66, is recommended when setting permanent or retrievable packers using 10 or 20 size Model "E-4" Wireline Pressure Setting Assemblies.

MODEL "H" WIRELINE FEELER AND JUNK CATCHER
Product No. 439-01

This tool is run into the well on electric line prior to running the packer to assure that the well bore is large enough to permit subsequent passage of the packer. The tool also serves to clean the well of debris that might foul the packer and cause premature setting. It is also suggested that in well conditions involving high downhole temperatures, that the firing head of the setting assembly be run on top of the Junk Catcher to assure that the setting assembly will not prematurely detonate on the subsequent packer run.

Product No. 437-02
Model "E-4" Wireline Pressure Setting Assembly
For setting Baker Models "D", "DA", "F", "FA", "F-1", "FA-1", "HE" or "HEA" Retainer Production Packers and Models "Retrieva-D", "Retrieva-DA" Lok-Set and "SC-2P" Retrievable Seal Bore Packers.

Product No. 438-09
Model "B" Wireline Adapter Kit
Used with Models "E-4" & "L" Wireline Pressure Setting Assembly and Model "J" Hydraulic Setting Assemblies.

Product No. 437-12
Model "L" Hi-Temp Wireline Pressure Setting Assembly
For setting Baker Models "D", "DA", "F", "FA", "F-1" or "FA-1" "HE" or "HEA" Retainer Production Packers and Models "Retrieva -D", "Retrieva-DA", Lok-Set and "SC-2P" Retrievable Seal Bore Packers

WELL NAME:- **EM40 - Actual Directional Results**

MEASURED DEPTH Metres	HOLE ANGLE DEGREES	AZIMUTH			AZIMUTH DEG N=0, E=90 S=180, W=270	DISPLACEMENT NORTH/SOUTH Metres	DISPLACEMENT EAST/WEST Metres	TVD Metres	DOGLEG SEVERITY deg/30m	VERTICAL SECTION Metres
0.0	0.00	N	0	E	0.0	0	0	0.0	0.00	0.0
33.7	0.01	S	1	E	179.0	0	0.0	33.7	0.00	0.0
61.8	0.01	S	1	E	179.0	0	0.0	61.8	0.00	0.0
90.0	0.25	S	20	W	200.0	0	0.0	90.0	0.00	0.1
117.8	0.01	N	1	W	359.0	0	-0.1	117.8	0.28	0.1
146.3	0.40	N	74	W	286.0	0	-0.1	146.3	0.42	0.1
174.5	0.50	N	53	W	307.0	0	-0.3	174.5	0.00	0.3
202.7	0.50	N	40	W	320.0	0	-0.5	202.6	0.12	0.6
230.8	0.70	N	24	W	336.0	1	-0.6	230.8	0.28	0.8
258.3	0.90	N	23	W	337.0	1	-0.8	258.3	0.22	1.2
286.3	1.00	N	31	W	329.0	1	-1.0	286.3	0.18	1.6
315.2	1.25	N	40	W	320.0	2	-1.3	315.2	0.32	2.2
344.1	1.50	N	35	W	325.0	2	-1.8	344.0	0.29	2.9
373.0	1.60	N	39	W	321.0	3	-2.2	372.9	0.15	3.7
401.8	1.90	N	41	W	319.0	4	-2.8	401.8	0.32	4.6
430.7	2.10	N	35	W	325.0	4	-3.4	430.7	0.30	5.6
459.6	2.00	N	24	W	336.0	5	-3.9	459.5	0.42	6.6
488.5	2.10	N	10	W	350.0	6	-4.2	488.4	0.53	7.6
517.4	1.80	N	5	W	355.0	7	-4.4	517.3	0.36	8.5
546.3	1.80	N	1	E	1.0	7	-4.4	546.2	0.20	8.5
575.2	2.10	N	15	E	15.0	8	-4.2	575.0	0.58	9.2
604.1	2.00	N	34	E	34.0	9	-3.8	603.9	0.71	9.9
633.0	2.10	N	38	E	38.0	10	-3.2	632.8	0.18	10.5
671.1	3.50	N	40	E	40.0	11	-2.0	670.9	1.10	11.6
700.6	6.75	N	34	E	34.0	14	-0.4	700.2	3.35	13.5
729.4	9.75	N	35	E	35.0	17	1.9	728.8	3.12	17.1
758.9	10.70	N	38	E	38.0	21	5.0	757.8	1.11	21.7
787.8	14.20	N	37	E	37.0	26	8.8	786.0	3.64	27.6
816.7	17.00	N	34	E	34.0	32	13.3	813.8	3.03	35.1
845.6	20.20	N	33	E	33.0	40	18.4	841.2	3.34	44.1
874.4	23.50	N	30	E	30.0	49	24.0	868.0	3.62	54.8
903.3	26.40	N	36	E	36.0	59	30.6	894.1	4.00	66.9
944.8	27.20	N	26.5	E	26.5	75	40.3	931.2	3.15	85.5
983.2	27.75	N	29.5	E	29.5	91	48.7	965.2	1.16	103.3
1021.7	27.75	N	29	E	29.0	107	57.4	999.3	0.18	121.2
1060.3	27.50	N	32.5	E	32.5	122	66.6	1033.5	1.28	139.1
1098.8	26.90	N	26	E	26.0	137	75.2	1067.8	2.36	156.7
1137.4	26.00	N	25	E	25.0	153	82.6	1102.3	0.78	173.8
1175.9	25.90	N	23	E	23.0	168	89.4	1136.9	0.69	190.6
1214.3	26.00	N	23	E	23.0	184	96.0	1171.5	0.08	207.4
1252.8	26.50	N	23	E	23.0	199	102.6	1206.0	0.39	224.4
1272.1	26.40	N	25	E	25.0	207	106.1	1223.3	1.39	232.9
1305.5	29.90	N	20	E	20.0	222	112.2	1252.7	3.79	248.6
1334.4	32.90	N	19	E	19.0	236	117.2	1277.4	3.16	263.6
1353.7	34.00	N	17	E	17.0	246	120.5	1293.5	2.42	274.1
1363.3	34.50	N	17.5	E	17.5	251	122.1	1301.4	1.79	279.5
1382.6	35.60	N	19.5	E	19.5	262	125.6	1317.2	2.47	290.4
1401.8	36.90	N	15.5	E	15.5	273	129.0	1332.7	4.22	301.7
1421.1	38.20	N	13	E	13.0	284	131.9	1348.0	3.12	313.2
1441.0	38.80	N	14.5	E	14.5	296	134.8	1363.6	1.67	325.4
1460.3	38.80	N	18	E	18.0	308	138.2	1378.6	3.42	337.3
1498.8	38.10	N	15	E	15.0	331	145.0	1408.8	1.55	361.1
1536.6	36.00	N	19	E	19.0	352	151.7	1438.9	2.54	383.7
1565.4	36.20	N	18	E	18.0	369	157.1	1462.2	0.65	400.6
1582.7	36.20	N	18	E	18.0	378	160.2	1476.2	0.00	410.8
1603.6	36.20	N	22	E	22.0	390	164.8	1493.1	1.85	423.2
1661.4	36.00	N	18	E	18.0	422	176.4	1539.8	1.23	457.2
1673.0	36.00	N	18	E	18.0	428	178.5	1549.1	0.00	464.0

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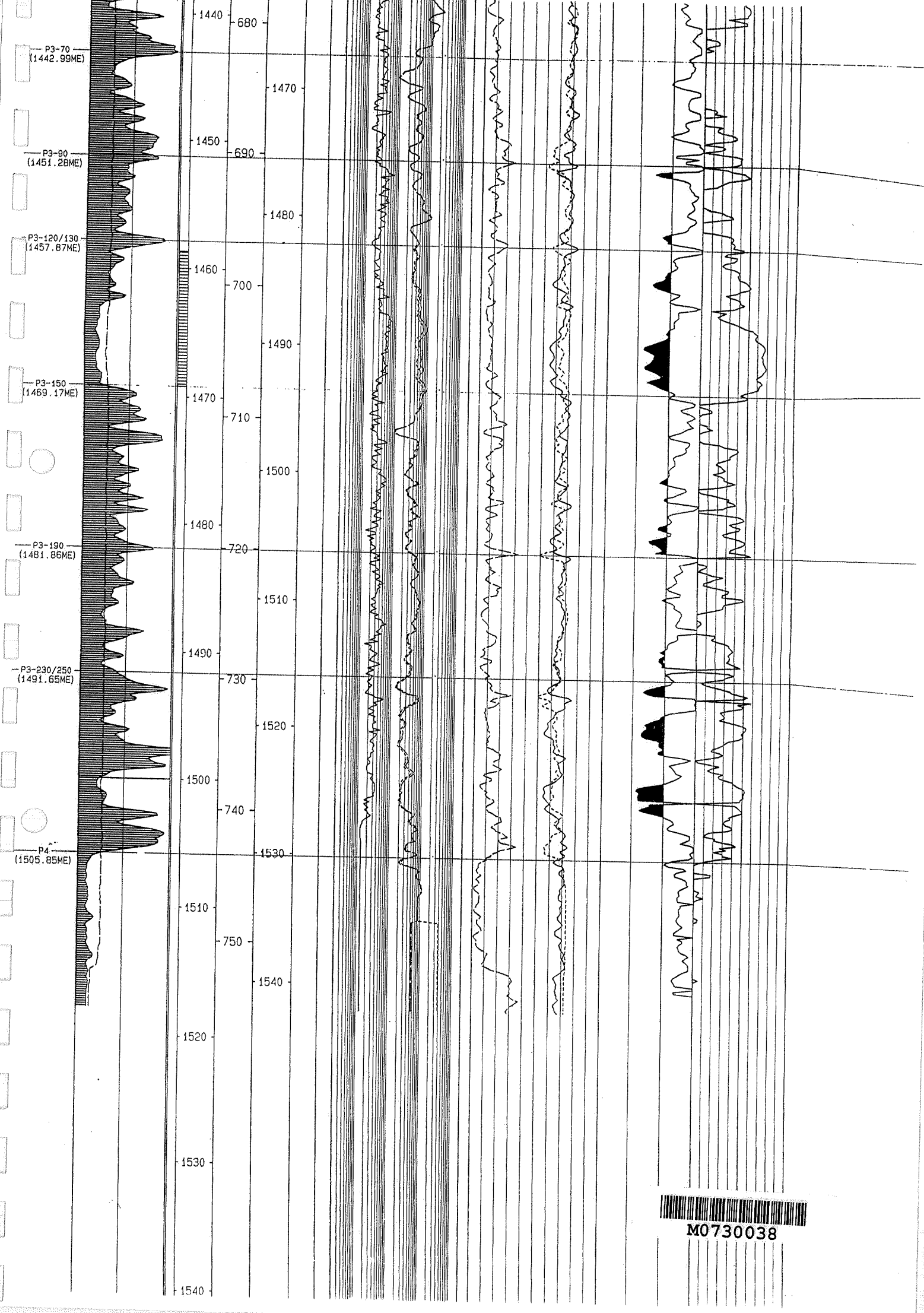
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